

CENTRAL ASIA

Waste Management OUTLOOK



Waste Management Outlook for Central Asia



This report is based on official information and the contributions of experts from the countries, on state-of-the-environment reports and statistics, on the activities of international projects and on local initiatives

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Project supervision: Jan Dusik, Keith Alverson, Mijke Hertoghs, Natalia Alexeeva, Mahesh Pradhan, Tomas Marques, Sylvie Motard, Lyngararasan Mylvakanam, Claudia Giacovelli

Concept and coordination: Viktor Novikov, Firuza Illarionova, Otto Simonett

Editing: Geoff Hughes

Art work and layout: Maria Libert

Graphics: Emmanuelle Bournay

Base maps: Matthias Beilstein

Contributors: Jamal Khanmedova (Turkmenistan), Batyr Ballyev (Turkmenistan), Amangul Ovezberdiyeva (Turkmenistan), Batyr Mamedov (ICSD Secretariat), Rauf Sabitov (Jabagly Manas), Biymirza Toktoraliyev (Kyrgyzstan), Kanybek Isabayev (Kyrgyzstan), Aigerim Abdyzhaparova (Kyrgyzstan), Irina Bekmirzaeva (Uzbekistan), Natalia Shulgina (Uzbekistan), Kazken Orazalina (Kazakhstan), Bizara Dosmakova (Kazakhstan), Vera Mustafina (Kazakhstan), Ayzhan Ryskulova (Kazakhstan), Sergey Yurcha (Kazakhstan), Jalil Buzrukov (Tajikistan), Sattor Boltaev (Tajikistan), Okilboy Tuev (Tajikistan), Ekaterina Vorobyeva (Russia), Reka Soos (Resources and Waste Advisory Group), Gabriela Gavgas (Resources and Waste Advisory Group), Hermann Koller (Managing Director, ISWA) and Aditi Ramola (ISWA).

We regret any errors or omissions that may unwittingly have been made.

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Foreword

On maps of global environmental challenges, Central Asia sometimes appears as a white spot because of lack of data or little relevance to the specific issues. At other times, including on hazardous industrial waste, the region ranks high, but little information is available to local and international readers about municipal solid waste and even less information is available on recent progress. A construction boom, rapidly growing motorization, diversification and significant growth in agricultural production coupled with urban-rural migration and population growth all affect the changing waste situation. At the same time, the region is embracing a green economy concept, and welcomes global experience, modern technologies and progressive thinking.

This Regional Waste Management Outlook is the first comprehensive, impartial and comparative assessment of the waste management situation and outlook for Central Asia. It reflects the collective body of knowledge, and draws on the work of country experts and on official reports and studies. This report is based on a profound analysis of the waste management legislation, policies, capacities, projects and actors, and strives to convey information in a highly visual and simple manner.

UN Environment

Executive Summary

In 2016, in light of decisions taken earlier by the Interstate Sustainable Development Commission of Central Asia, UN Environment committed to the preparation of a waste management outlook for Central Asia. This report, produced jointly with Zoï Environment Network and experts and institutions in Central Asia, fulfils that commitment.

Waste governance

In the last 3-5 years, all the Central Asia countries have shown remarkable progress in improving waste governance by introducing or revising waste legislation, programmes, policies, structures and incentives. Kazakhstan has strengthened waste control and statistics, introduced new waste standards and targets and promoted the development of a green economy. Kyrgyzstan has strengthened environmental and technical safety controls over industrial and municipal waste. Tajikistan has formulated a draft national waste management strategy, currently under consideration in the government, and has welcomed international donors to improve waste management countrywide. Turkmenistan has upgraded its waste legislation and institutions. Between 2014 and 2016, Uzbekistan implemented major waste infrastructure upgrades, and in 2017 the country launched a five-year waste programme that aims to significantly improve waste collection coverage and recycling; modernize landfills; and strengthen waste controls, coordination, institutions and policies. There are differences in environmental management and macroeconomic conditions among

the five countries of Central Asia, and waste management ranges from privately led to state-funded to internationally sponsored.

Waste financing and investments

The use of economic instruments for environmental protection, including waste management, in Central Asia is dominated by pollution charges that are levied on different types of waste, emissions and discharges. Often they are channeled to local budgets without earmarking for waste-related purposes. In addition, the current system does not create incentives for polluters to change their behavior since charges are often low, collection is problematic and there is a need to distinguish the revenue-raising impact from the behaviour-changing role of economic instruments. The application of pollution charges is linked to a system of permits that specify the maximum volume of generated waste of each industrial facility. If the volume of waste exceeds these limits then non-compliance fees or penalties are applied.

All the countries charge user fees for the collection and disposal of household waste, though these are typically low, and the revenues are barely enough to cover the costs. Kazakhstan leads the region in the number of private sector players in municipal solid waste management, but on the rates of recycling, waste collection coverage and state financing of waste management, Uzbekistan is, perhaps, the regional champion.

Investment financing in the waste sector comes mostly from donors. There are rare examples of municipalities financing waste modernization projects from their own budgets or attracting private financing. Several public-private waste processing partnerships in the recent past did not perform well or as planned – the waste plants in Almaty and Astana, Kazakhstan, for example. The economic turbulence in 2008 and 2014-2016, combined with a lack of subsidies, low tariffs, and not well coordinated or functioning waste infrastructure and policies affected profitability and operations. The legal base for private sector participation and public-private partnerships in waste management needs to be further strengthened.

Donors are driving positive changes in upgrading and improving waste management across the region and are helping overcome the limited capacity at the local level to develop and implement modern waste management approaches. The joint investments of the European Bank for Reconstruction and Development (EBRD) and the European Union Investment Facility for Central Asia (EU IFCA) are by far the largest in the waste management sector in the region. The Asian Development Bank (ADB) is implementing a waste project in Tashkent, while the World Bank is assisting with industrial and municipal waste strategies and projects in Kazakhstan. Many investment projects are new, so it's too early to make conclusions about their effectiveness and impact.

The common objectives of these projects are rehabilitation of the waste infrastructure and improvement of financial and operational management. The projects include improvements in waste collection services, equipment and containers; closure of old and overfilled disposal sites; and the construction of sanitary or modern landfills with waste transfer stations based on local needs. These are much-needed first steps for the protection of public health and the environment. Old and poorly functioning landfills that are non-revenue generating are a burden to commu-

nities and are difficult to properly close without external financing. In addition to technical measures, financial assistance includes improving the accounting and identifying the costs of waste services. The main sources of repayment of the international loans are user charges, which imply increasing tariffs over time to achieve cost recovery.

Household waste

As the population, the standard of living and consumption in Central Asia increase, so does the volume of waste and the amount of potentially hazardous waste in the residential, medical and transport sectors. Waste disposal of low quality and open landfills are still in widespread use across the region. Recycling is mainly a private activity, and the infrastructure to increase recycling rates or introduce selective collection is still lacking.

Nevertheless, shifts towards the application of modern approaches to waste management are evident across the region. Internationally and locally funded projects to modernize waste systems are gaining momentum. The business of waste collection and recycling is expanding as the role of the private sector grows, and waste legislation, programmes and incentives are evolving. The coverage of the waste collection systems for residential areas is high in cities, but most rural and many small town inhabitants do not yet have access to well-established waste collection. In the most populous countries – Kazakhstan and Uzbekistan – the current waste collection coverage is estimated at about 60-70 per cent, and coverage is smaller in other states. The recycling rates for municipal waste are hard to estimate across the region, since statistics are missing, or recycling relies on an informal sector that is not well documented. Uzbekistan is perhaps ahead of others in recycling with estimated rates of 5-10 per cent, followed by Kazakhstan with 2-3 per cent, and lower rates for the other countries. Informal recycling can be significant in large cities.

After food waste, paper is the second largest constituent of municipal waste across Central Asia, through the proportion of plastics is growing. State-run wastepaper and biodegradable waste collection schemes were well developed in the Soviet period, but since independence they have either disappeared or shrunk. Private and municipal incentives in recent years in Kazakhstan's and Uzbekistan's cities have promoted growth in recycling.

Each country has notable accomplishments. In Kazakhstan, the Environmental Code – a unique type of framework legislation in Central Asia – since 2016 has had provisions for Extended Producer Responsibility, according to which individuals and legal entities that manufacture products in Kazakhstan or import products must collect, transport, treat, decontaminate, reuse and recycle waste once their products are no longer usable. New waste legislation and structures in Turkmenistan promote modern waste management, the first waste recycling plant has been built near Ashgabat and the country has markedly improved industrial waste management in the Caspian Sea area. Uzbekistan's most recent programme on improving waste management promises major positive changes through better waste awareness, collection, recycling and disposal practices. Tajikistan leads the region in the number internationally funded waste projects covering all major cities and legacy sites of radioactive waste and agrochemicals. In addition, it leads in climate adaptation and resiliency planning. The Kyrgyz Republic is doing well on tourism waste clean-up in the mountain ecosystems, improving the waste situation in the major cities and moving forward with initiatives on legacy waste.

Many communities across Central Asia practice voluntary public clean-up efforts that involve a broad cross-section of the public, from students to senior officials, and include the cleaning of streets, backyards, public spaces, parks and rivers and the improvement of amenities.

Industrial and legacy waste

The extractive and metallurgical industries that are drivers of Central Asian economies generate large amounts of waste. Fortunately, many enterprises recycle or reuse their waste and have introduced modern technologies to improve efficiency and minimize waste. The rate of industrial waste recycling varies from less than 5 per cent to more than 20 per cent per country, but in some sectors waste reuse and recycling exceeds 50 per cent. Many historical industrial pollution sites have already been remediated or are in the planning stages, but the largest and most difficult industrial hazardous waste sites still require major investments and long-term solutions, as preliminary control measures may not last long. People who graze their animals and drink water close to industrial hazardous waste or PCB-contaminated sites may unwittingly be exposing themselves to a risk of poisoning. Because hazardous waste can affect soil and water, it is not only people and domestic animals potentially at risk, but the vegetation and crops on which they depend, the ecosystems in which they live, and the water sources they use.

Some of the hazardous waste is located in desert areas with low populations, but some industrial towns also have their share. In the mountainous countries – where much of the waste is upstream from populated areas – even small amounts of hazardous waste carry significant risks. With the highest population density in Central Asia outside the cities, the Ferghana Valley and the surrounding mountains are home to industry and waste. 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 and from mercury, antimony, copper, gold and iron smelting and processing.

As more industrialized nations, Kazakhstan and Uzbekistan generate much more industrial waste than Kyrgyzstan and Tajikistan, while Turkmenistan's oil and gas industries do not generate much waste. On the other hand, Kyrgyzstan and Tajikistan suffer most from the pollution legacies left by non-functional and abandoned industries, particularly uranium mining, and have no resources or expertise of their own to handle this massive and hazardous waste. They are supported by Russia and the EU in environmental assessments and clean-up efforts. With existing technologies it is often impossible or prohibitively expensive to clean up all the hazardous waste that has been released, leaving waste prevention and minimization as the best options for future socioeconomic development.

Agricultural and food waste

Agriculture is the main source of income for the rural population – the majority in the Central Asia region. Most farmers use organic fertilizers and biological plant protection methods that minimize both waste generation and soil pollution. Heavy use of pesticides and mineral fertilizers in the past badly affected soil and water quality and created pollution hotspots. Nevertheless, bad timing, inappropriate crop harvesting methods and pests can dramatically affect the harvest, and some produce is lost between the field and the table. Food losses also occur during transportation, processing and retailing. In the absence of waste separation in Central Asia, almost all organic and food waste in urban areas is mixed with other types of waste, and only a small part is composted or used as livestock feed. The results include increased waste tonnage and greenhouse gas emissions, and low quality of recyclable waste.

1. Introduction

Over the 25-year period of independence from 1991-1992 to 2016 the five countries of Central Asia – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan – went through difficult, but important economic reforms and changes in their systems of governance, and gained stronger national identities. With abundant mineral reserves and natural resources, the region provided for many of the needs of the Soviet economy in mining, manufacturing and agricultural production. Many Soviet-era projects were implemented on a grand scale with equally large environmental consequences – the shrinking of the Aral Sea, for example. The long list of abandoned waste sites includes numerous uranium mines and tailings, mercury and chemical plants, military bases and test sites with toxic spills and radioactive contamination, and ownerless dumps with toxic agrochemicals and waste. Today, Central Asia still has large amounts of industrial and legacy waste.

On the other hand, the Soviet waste recycling system was well developed, and successfully handled the major waste streams of that time – paper, scrap metal, reusable glass bottles and food waste. The Soviets provided waste education and engagement programmes for schoolchildren, but with the transition to a market economy, the programmes ended. Following the collapse of the Soviet Union, all of the former Soviet republics in Central Asia have suffered from a lack of maintenance and investment, poor enforcement of legislation and a lack of institutional capacity. As a result, waste collection and recycling rates drastically declined during the 1990s, but because the governance and economic models have changed, as have consumption patterns and the composition of waste, past practice is not fully applicable to the current situation.

Geographically, Central Asia is full of contrasts that have implications for waste management. Its vast deserts with low population density stand in contrast to its densely populated areas. The availability of land and prevailing public ownership of lands outside of agriculture and built-up areas makes landfilling a more attractive waste management option than others. The climate features hot summers, harsh winters, and a mix of wet and dry conditions and seasons. The high mountain regions are subject to natural disasters, melting glaciers and changes in the rock and soil stability, all of which need to be taken into account when planning solutions for sound long-term waste management and disposal. Finally, relatively rich economies with income based on nature resource extraction and industry (Kazakhstan, Uzbekistan and Turkmenistan) contrast with poorer economies (Tajikistan and Kyrgyzstan) whose main income remains agriculture and remittances from labour migration.

Outlook

The United Nations Environment Programme (UN Environment), jointly with the International Solid Waste Association (ISWA), produced a global waste management outlook in 2015. This regional outlook is commissioned by UN Environment, and builds on key findings and issues raised in the global assessment by zooming in on Central Asia. It relies on country inputs, official statistics and reports and outcomes of the regional waste meeting in Almaty (December 2016). The outlook production process was informed by the UNEP waste management outlook for mountain regions (2016) and Zoi's waste and chemicals visual synthesis for Central Asia (2013).

Since the outlook is a forward looking analysis, anticipated progress and achievements by 2025-2030 portrayed in the report cannot be guaranteed, as uncertainties are linked to the dynamics of the global and regional economies, funding levels, technologies, policies and capacities. Several key issues recommended for exploration by the global outlook include food waste, construction and demolition waste and e-waste.

Several United Nations Sustainable Development Goals (SDGs) reflect waste priorities by 2030:

- Substantially reduce waste generation through prevention, reduction, recycling and reuse
- Halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses
- Reduce the adverse environmental impact of cities, including from municipal waste
- Advance environmentally sound management of chemicals and wastes throughout their life cycle

The regional outlook for Central Asia covers the broad range of waste challenges, but focuses primarily on household waste. The intention of the outlook is to provide a snapshot of the regional waste situation and dynamics, accessible to various users including politicians, non-governmental actors and the private sector, for policy development and cooperation on waste management solutions for Central Asia. Reducing health and environmental risks from waste mismanagement is neither simple nor inexpensive, and the amount of infrastructure investments and governance work that needs to be done is daunting, but the countries of Central Asia are already taking promising steps.

Ongoing cooperation between UN Environment and Central Asian countries on sound waste and chemical management includes support in preparing management

strategies for waste and chemicals, improving the availability and quality of data on waste, and strengthening institutional management and coordination for implementation of the international agreements.

The waste challenge

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 what results from inefficient production on the other. In Central Asia these two concepts are referred to as “consumption waste” and “production waste”. While countries have some common waste definitions in law and participate in international reporting under conventions and collect statistics, differences remain in the classifications and the scope of coverage. Given the different systems of waste classification and limited waste data availability in Central Asia, it is difficult to form a clear regional overview of hazardous, industrial and municipal waste – what and how much is generated, and what and how it is handled. The weighing of wastes is relatively recent and not universally practiced. Most cities still rely on estimates of waste based on the volume of the vehicles used for collection and disposal. It is often unclear whether the data refer to household waste or to all waste from the residential area, or whether it is waste as generated, as collected, or as delivered to a disposal site, and whether separation of materials for recycling has already taken place. Measurements and estimates tend to be limited to the formal waste management system. Activities outside of that system, including uncontrolled dumping, burning, and recycling by the informal sector, are neither measured nor reported. Data on the composition of waste are often not comparable as measurement tends to be occasional and not carried out on a consistent basis.

About the difficulties of Classifying Waste

- How is waste collection coverage measured?
- Is there a differentiation between controlled disposal of waste and open dumping?
- How is the informal sector accounted for?
- Is all waste properly counted? Food losses and waste included? Construction and demolition waste included?

how dangerous is it for human health and the biosphere?

Waste toxicity approach

HAZARDOUS WASTE
STABILIZED WASTE

- How do you handle hazardous waste?
Eliminate
Reuse, recycle
Relocate (export) to be treated
Relocate to a safer site
Stabilize (or convert to less toxic)
Dispose of in controlled conditions
Place in temporary storage

what activity generated it?

Waste origin approach

TRANSPORTATION WASTE
PACKAGING WASTE

how is it handled?
who is in charge?

Waste management approach

MUNICIPAL WASTE
HOUSEHOLD WASTE
STREET CLEANING WASTE
WASTE FROM MARKETS

- ... and some frequently asked questions

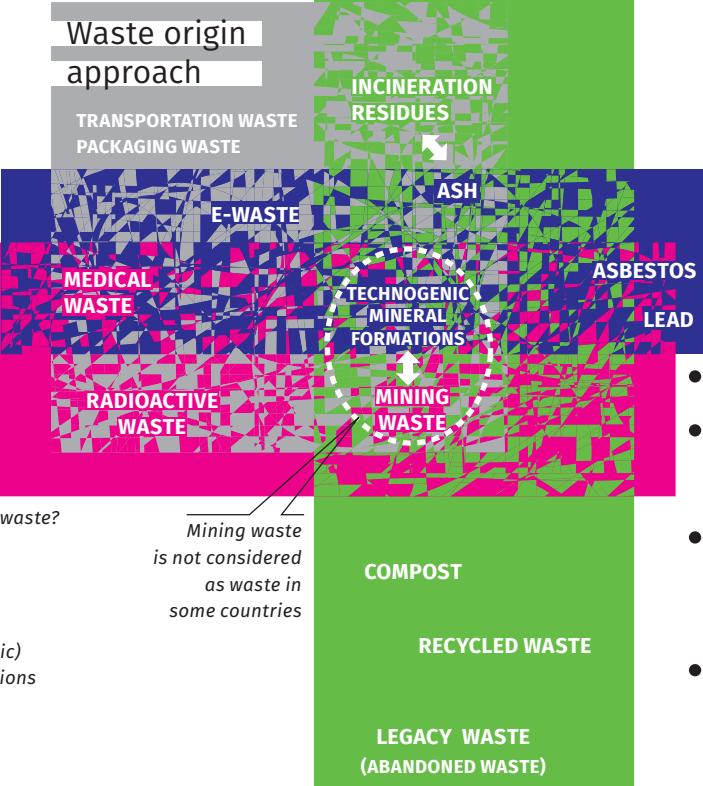
- How do you charge for waste?
Per household or apartment?
Per resident or person formally registered?
Per type of entity (commercial, public)?
Per waste bag volume or weight?
Differentiated by waste composition or recyclable vs. non-recyclable?
Inclusive of costs of collection, transportation and disposal?
Inclusive of recycling and waste system modernization costs?

what does it consist of?

Waste composition approach

ORGANIC WASTE
PLASTIC WASTE

- How do you systematically study waste composition?
- What is happening with the residues of waste recycling? (e.g., mercury extracted from Hg-containing lamps)
- What is actually counted? Waste generated, collected? Quantities transported, disposed of? Waste volume or weight?
- How is recycling estimated? Recycled shares of generated or collected municipal waste? Recycled waste processed from all sources (municipalities, companies)?



COMPOST
RECYCLED WASTE

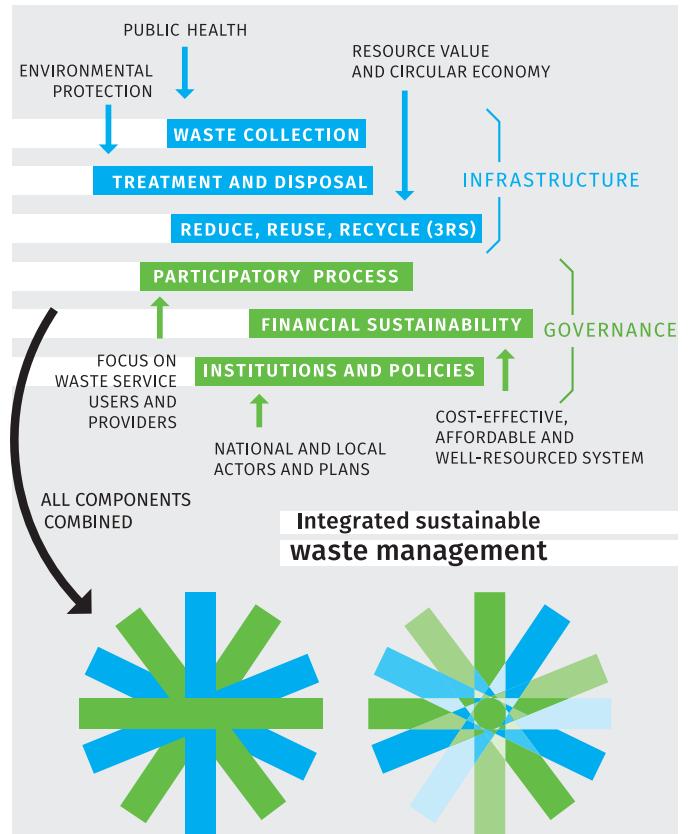
LEGACY WASTE
(ABANDONED WASTE)

Municipal solid waste management as we know it today has its origins in the epidemics in Europe and North America in the nineteenth century, when public health actions focused on improving sanitary conditions and collecting waste. Until the emergence of the environmental movements and concerns in the 1960s and 1970s, the norm was for uncontrolled disposal or open burning of wastes. Local environmental impacts and marine contamination became severe, leading to comprehensive environmental legislation with waste controls.

The modern concept of Integrated Sustainable Waste Management (ISWM) brings together three physical components that provide the necessary infrastructure for solid waste management:

- Waste collection driven primarily by public health
- Waste treatment and disposal driven primarily by environmental protection
- The 3Rs – reduce, reuse, recycle – driven by the resource value of the waste and more recently by the global drive toward production efficiency and a circular economy

In addition, ISWM focuses on including stakeholders, particularly service users and service providers. The list extends to manufacturers, brand owners, importers and others in the supply chain. Financial sustainability – an essential element – requires the system to be cost-effective, affordable and well resourced. Finally, ISWM needs sound institutions and proactive policies at the national and local levels. In addition to ISWM, the Integrated Waste and Resource Management is addressing various sides of the waste challenge and paves the way to a transition to a green economy.



Waste / not waste

TURNING A PROBLEM...

WASTE

.. INTO A VALUABLE COMMODITY

RECYCLABLES

Potentially interested businesses

From recycled raw material...

END-OF-LIFE VEHICLES OR ELECTRONICS

FERROUS SCRAP

COPPER SCRAP

ALUMINIUM SCRAP

USED PET BOTTLES

BROKEN GLASS

DISCARDED NEWSPAPER

TEXTILE SCRAP

ORGANIC WASTE

STIMULATED RECYCLING BUSINESSES MARKET

dismantling
sorting / separating

RECOVERY PROCESS

cutting / shearing / shredding
cleaning / depolluting
chemical / thermal processing
baling / packaging
shipping

RECYCLED IRON

RECYCLED STEEL

RECYCLED ALUMINIUM

RECYCLED COPPER

RECYCLED PLASTICS

RECYCLED GLASS

RECYCLED PAPER

COMPOST

STEEL INDUSTRY

ELECTRONICS MANUFACTURING

CAR MANUFACTURING

CONSTRUCTION INDUSTRY

CLOTHING INDUSTRY

PACKAGING INDUSTRY

BEVERAGE INDUSTRY

BOOK PRODUCTION

PAPER INDUSTRY

AGRICULTURE

LANDSCAPING

... to directly usable end-products

CONTROL OF THE WASTE [BEFORE RECOVERY]

Is this particular waste recyclable in an environmentally sound manner?

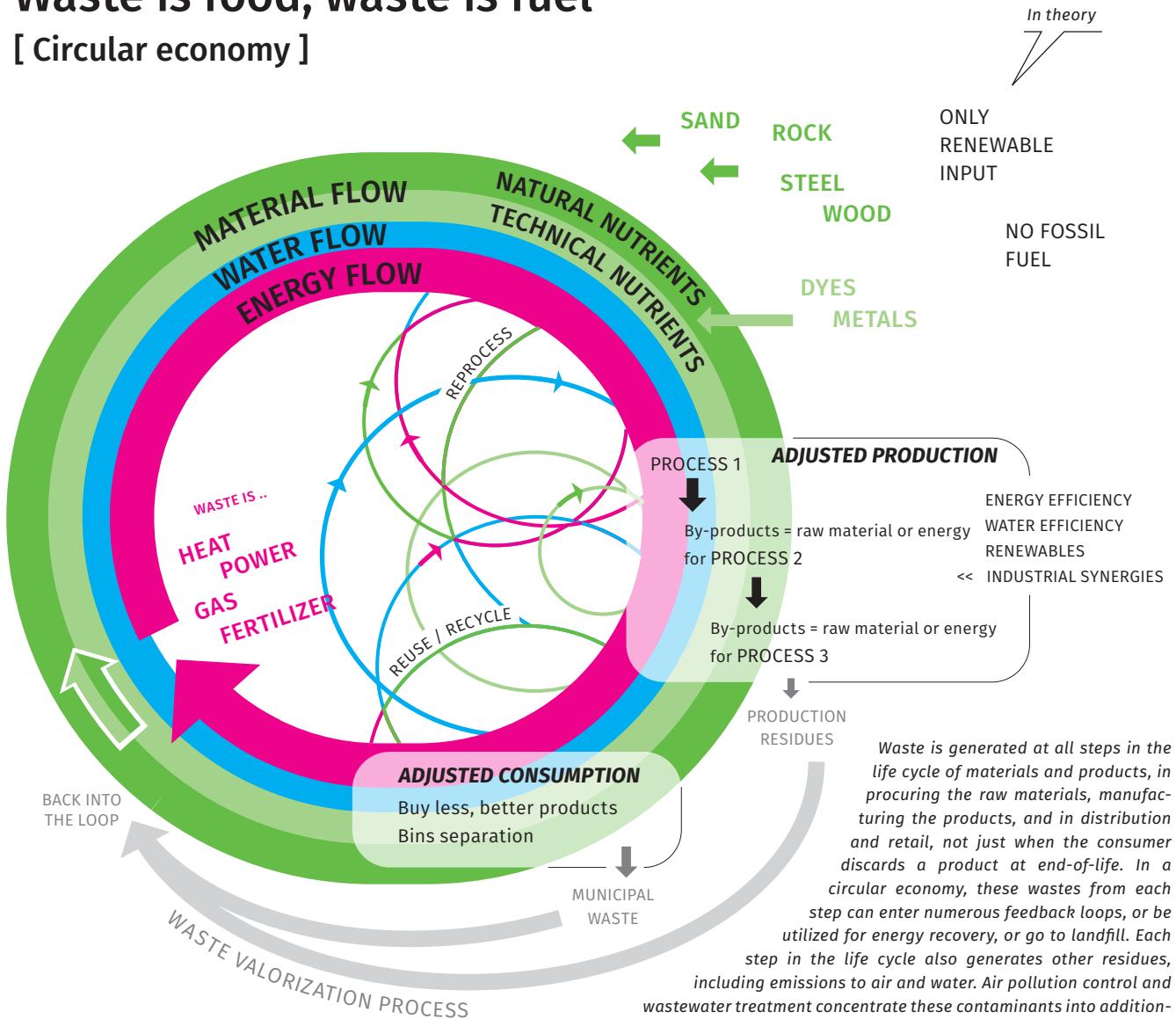
QUALITY CONTROL AND FINAL MATERIAL APPROVAL [AFTER RECOVERY]

SECONDARY WASTE

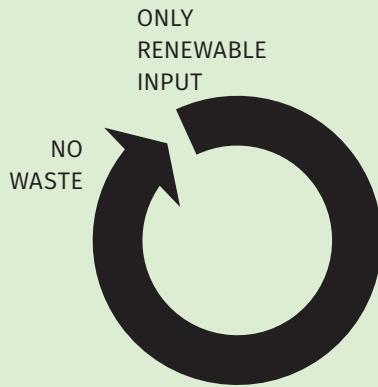
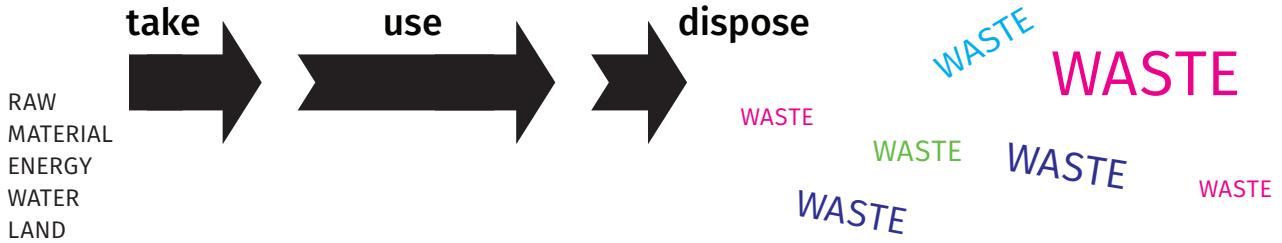
Countries are continuously rethinking and revising regulations on the status of secondary materials and the conditions under which some of them are lifted out of the waste category. For example, in Kazakhstan many types of mining waste are considered to be technogenic mineral deposits. Huge piles of sulphur waste generated as a by-product of oil extraction and processing in the Caspian region disappeared in 2015 thanks to reuse and export opportunities, advancing Kazakhstan to the list of top-ten global sulphur exporters.

Waste is food, waste is fuel

[Circular economy]



Shifting away from a linear production system



to a circular economy

- >> Resources kept in use for as long as possible, extracting their maximum value
- >> Products and materials recovered and renewed

means considering separately

NATURAL NUTRIENTS

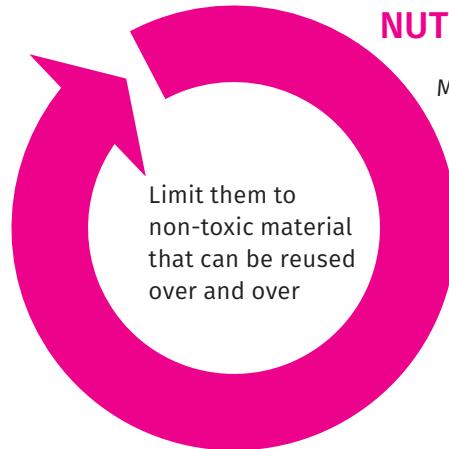
WATER
WOOD
SAND
ROCK
CLAY



AND

TECHNICAL NUTRIENTS

METALS
FIBERS
DYES



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 source. Many of these dumping grounds have long since passed their useful life, but some continue in service. Many existing landfills, except for large cities, tend to be poorly organized, with inadequate planning and engineering, no waste sorting or inventories 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.

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 and release toxic substances. The inadequate compaction of the waste increases the washouts that cause erosion and releases into the environment. Not so long

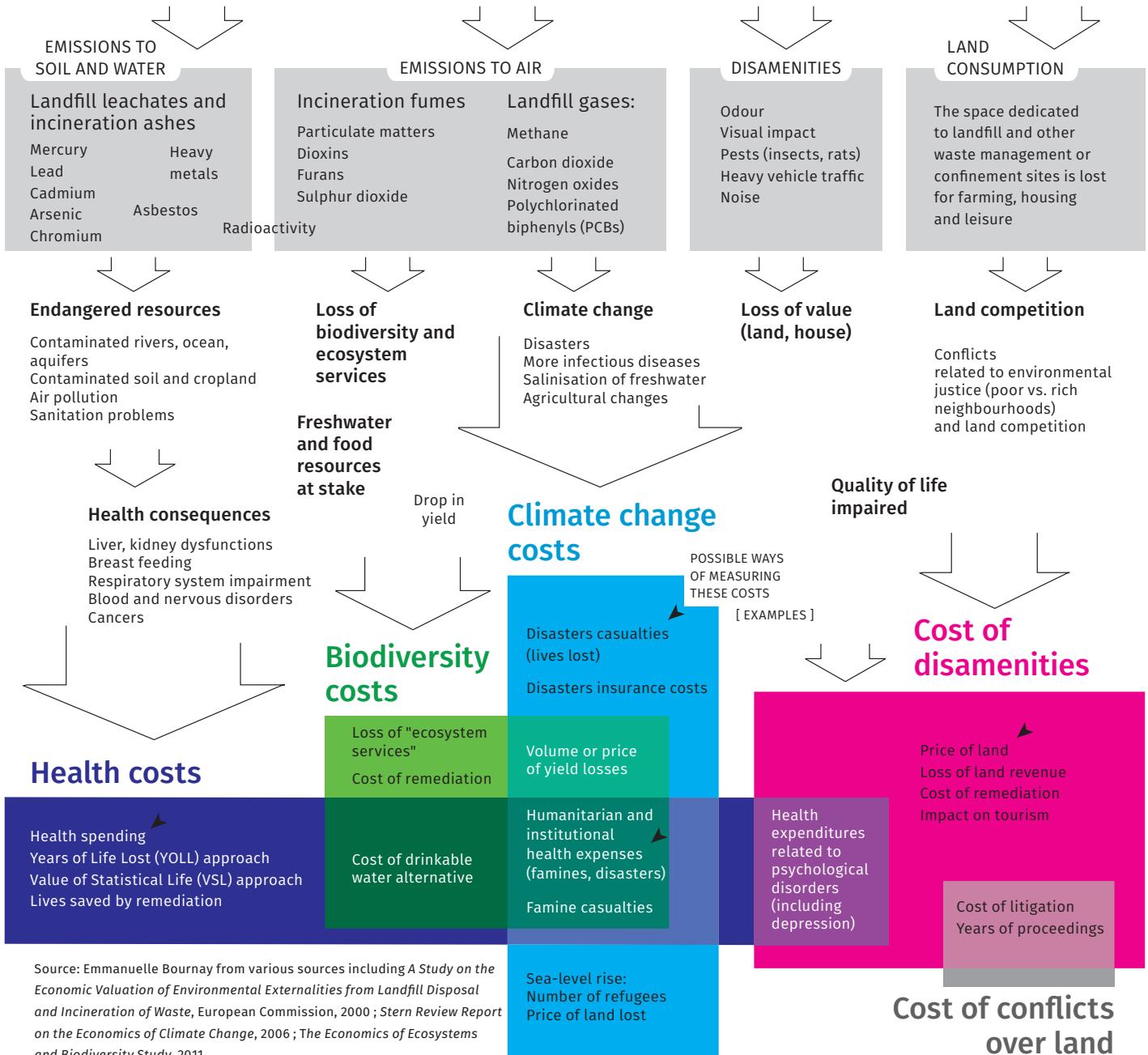
ago, the failure to collect and manage waste properly, including healthcare waste, resulted in random dumping and the burning of waste either by spontaneous combustion or because fires were deliberately set. Fallen leaves are burned rather than composted in the cities, and the emissions are a health hazard. But such practices of open waste burning have visibly reduced.

Infrastructure, technology, energy and labour inputs make waste management expensive, but there are many hidden costs as well. Easily identifiable pollution draws attention, but most environmental damage associated with waste is hard to measure and even to recognize – greenhouse gas emissions from waste or climate change impacts on waste sites, for example, or damage to ecosystems and biodiversity. Waste also damages health and causes loss of amenities by discouraging tourism, for example, and ultimately requiring land restoration. Society needs to recognize these hidden impacts to understand the actual price it has to pay.

Waste external costs

a dry but useful approach

LANDFILL, INCINERATION AND OTHER WASTE-RELATED ACTIVITIES



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 Study*, 2011.



Open waste dump (Issyk Kul, Kyrgyzstan)

Legacy waste: Uranium tailings and waste rock (Istiklol, former Taboshar, Tajikistan)



Legacy waste: Mercury smelting slag and mining waste (Khaidarkan, Kyrgyzstan)



Kazakhstan



Geography

2.7 million km²

Mainly steppes and desert



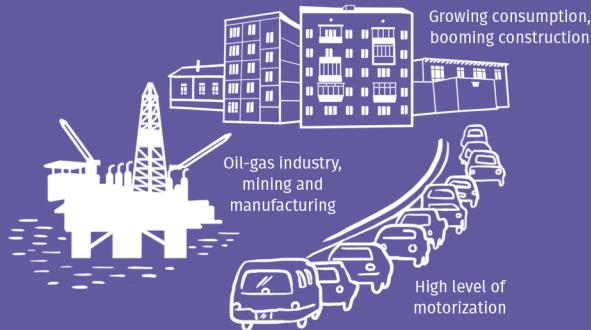
Population

Each person represents 1 million



Economy, lifestyle

GDP: US \$10 500 per capita



Waste generation (tonnes per year)

Industrial waste



Municipal waste



3-6 million

Waste collection coverage

Each truck represents 10%



Waste recycling

Most recycled waste items and capacities



Waste disposal



	Current situation	Outlook
 Regulations	● ● ● ● ○ Comprehensive waste legislation; clear long-term targets; adequate enforcement	● ● ● ● ● New waste standards and local roadmaps
 Institutions	● ● ● ● ○ Strong national waste department; adequate local environmental control	● ● ● ● ● Stronger capacity of local waste and municipal authorities
 Economic tools and investments	● ● ● ○ ○ Acceptable tariffs; EPR; growth in the private sector	● ● ● ● ○ International investments and public-private partnerships
 Infrastructure: waste collection	● ● ● ● ○ Good coverage in cities; basic coverage in rural areas	● ● ● ● ● Comprehensive country-wide coverage
 Infrastructure: waste disposal	● ● ○ ○ ○ Obsolete methods dominate; closure of old and illegal sites; modernization and new landfills	● ● ● ● ○ Sanitary landfills; controlled sites; disposal of mixed waste discouraged
 Infrastructure: waste recycling	● ● ○ ○ ○ Low recycling rates; growing niche and capacity; waste sorting plants	● ● ● ○ ○ More waste recycled, including biodegradable; better infrastructure
 Legacy waste clean-up	● ● ● ○ ○ Success with small and medium sites	● ● ● ● ○ Most sites are safe; major sites addressed
 Information: awareness and education	● ● ● ○ ○ Generally good progress	● ● ● ● ○ Improved awareness and skills; responsible behaviour
 Information: data and statistics	● ● ● ○ ○ Adequate statistics; open data, but of limited coverage and use	● ● ● ● ○ More open and local data; better quality and coverage
 Partnerships	● ● ● ● ○ Active and growing waste networks; high inclusivity	● ● ● ● ● Stronger networks; forums

Least developed ← ○ ○ ○ ○ ○ → Highly developed



Waste situation in Kazakhstan 15-20 years ago

Municipal waste management

-  Poor
-  Satisfactory
-  Comprehensive

Industrial waste management

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions



Current waste situation in Kazakhstan and outlook

Municipal waste management

- Poor
- Satisfactory
- Comprehensive

Industrial waste management

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

- Ongoing successful waste processing, recycling and modern municipal waste management
- Mixed results and lessons learned in waste processing and recycling
- Planned and ongoing waste system modernization and recycling

With the largest land area of any country in Central Asia, Kazakhstan has diverse industry – oil and petrochemicals concentrated in the west, and mining, metallurgy, chemicals and energy in the north and east. Its population of almost 18 million is unevenly distributed, with the central and western desert-like parts of the country being the least populated.

Kazakhstan is the only country in the region that has introduced extended producer responsibility (EPR) and the EPR national operator. Relatively detailed waste statistics exist along with targets on waste collection and recycling. In addition to national waste legislation and programmes, there are regional roadmaps and action plans on better waste management. The Kazakhstan Waste Association is considered a unique platform in Central Asia that works with private sector, NGOs, citizens and governmental agencies to promote sound waste practices.

Kazakhstan has accumulated more than 28 billion tonnes of waste, including 100 million tonnes of municipal solid waste and up to 2 billion tonnes of hazardous waste of amber (A) and red (R) classes. The generation of industrial waste increased from 100 to 900 million tonnes per year in the 2000-2010 period, while hazardous waste increased from 100 to 300 million tonnes. By 2015, hazardous waste generation declined to 250 million tonnes. Municipal solid waste generation increased from 1.5 to more than 3.5 million tonnes over the last 10-15 years. In addition, an estimated 1.5 million tonnes are generated in rural areas, making the country's total solid waste generation 5-6 million tonnes per year. Current rates of waste

recycling vary from less than 2-3 per cent for municipal waste to 23 per cent for industrial waste with even higher rates for hazardous waste (30 per cent).

Different cities of Kazakhstan have tried different waste management approaches that depend on infrastructure, governance and financing. The initial waste sorting plant in Almaty did not perform well financially, while the operational efficiency of the waste plants in Astana and Shymkent is lower than expected. Nevertheless, the private sector is actively participating in numerous successful waste recycling and solid waste disposal schemes. Considering lessons learned, many Kazakh cities are planning waste sorting and waste-to-energy plants and improved landfills with local and international investments in the coming years. Kazakhstan has a diverse network of recycling hubs that serve the population, businesses and industries across the country.

Radioactive and toxic industrial waste is still a concern in several parts of the country, but Kazakhstan has enjoyed success in clean-up efforts. The state programme on uranium mines closure and rehabilitation implemented between 2001 and 2010 introduced safety measures in most small and medium-sized abandoned uranium mines and waste sites across Kazakhstan, but it has not tackled the large sites, such as the Koshkar-Ata tailings. Mercury contamination sites in the industrial areas in Temirtau and Pavlodar have been remediated, and the clean-up of the adjacent rivers continues. More clean-up actions are planned for PCB- and POPs-contaminated sites.

Recycling hubs in Kazakhstan



Hazardous toxic industrial waste in Kazakhstan



Industrial waste per province



Kyrgyzstan



Geography

199 thousand km²

Mountains with risk of disasters and melting glaciers. Little space for waste storage



Population

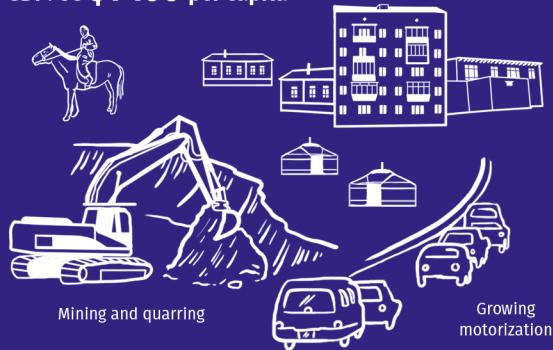
Each person represents 1 million



Economy, lifestyle

GDP: US \$1 100 per capita

Rural-urban migration, construction boom



Waste generation (tonnes per year)

Industrial waste



10 million

Municipal waste

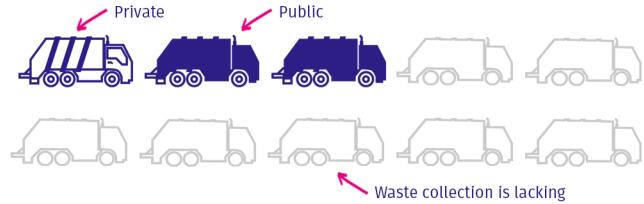


1 million

100-150 million
tonnes of the accumulated industrial waste

Waste collection coverage

Each truck represents 10%



Waste recycling

Most recycled waste items and capacities

1-10%

(Estimate)

Paper



Plastic



Informal collection and recycling



Waste disposal

Poorly controlled waste site

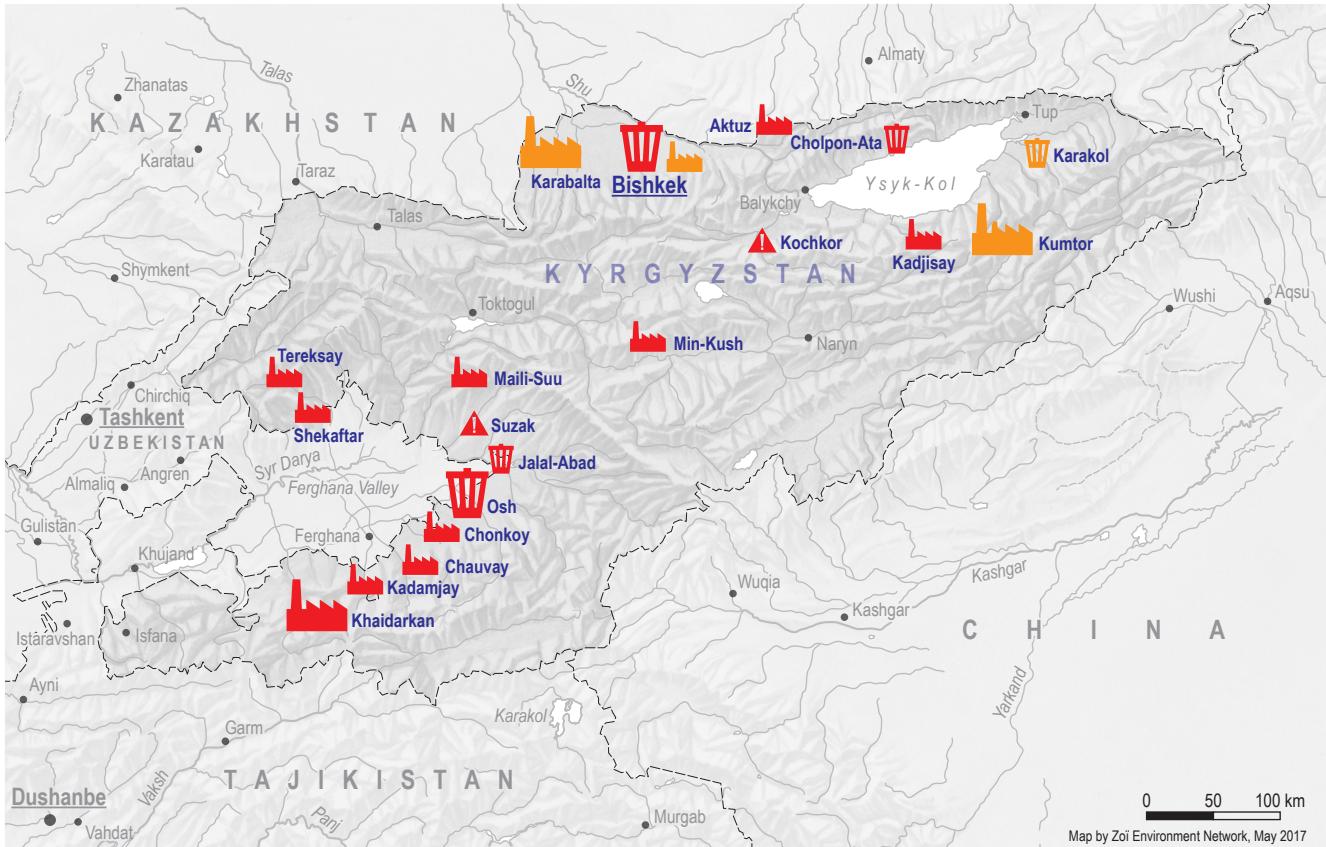


Open dumping is still a common practice



	Current situation	Outlook
 Regulations	 Outdated legislation; no waste targets or active strategies	 Updated regulations; national and local action plans
 Institutions	 Waste controls, but weak enforcement capacity; limited coordination	 Stronger capacity at national and local levels; improved enforcement
 Economic tools and investments	 Low performance and low tariffs; reliance on international donors	 International investments and public-private partnerships
 Infrastructure: waste collection	 Basic urban coverage; limited rural coverage; modernization in progress	 Better coverage and quality of waste collection
 Infrastructure: waste disposal	 Obsolete methods; illegal and unauthorized dumping; modernization of larger sites	 Better controlled landfills; closure and rehabilitation; sanitary landfill for Bishkek
 Infrastructure: waste recycling	 Low recycling; dominant informal sector; growth in private sector	 More waste recycled; better integrated informal sector
 Legacy waste clean-up	 Clean-up or improved control of several priority sites with international support	 All priority sites safer and better controlled
 Information: awareness and education	 Limited progress and coverage; NGOs most active	 Improved awareness, public clean-up activities
 Information: data and statistics	 Some statistics and data on waste, but limited coverage and use	 More open and local data; better quality and coverage
 Partnerships	 Growing cooperation on legacy waste and actions on e-waste	 Growth in partnerships and better coordination

Least developed ← ○ ○ ○ ○ ○ → Highly developed



Waste situation in Kyrgyzstan 15-20 years ago

Municipal waste management

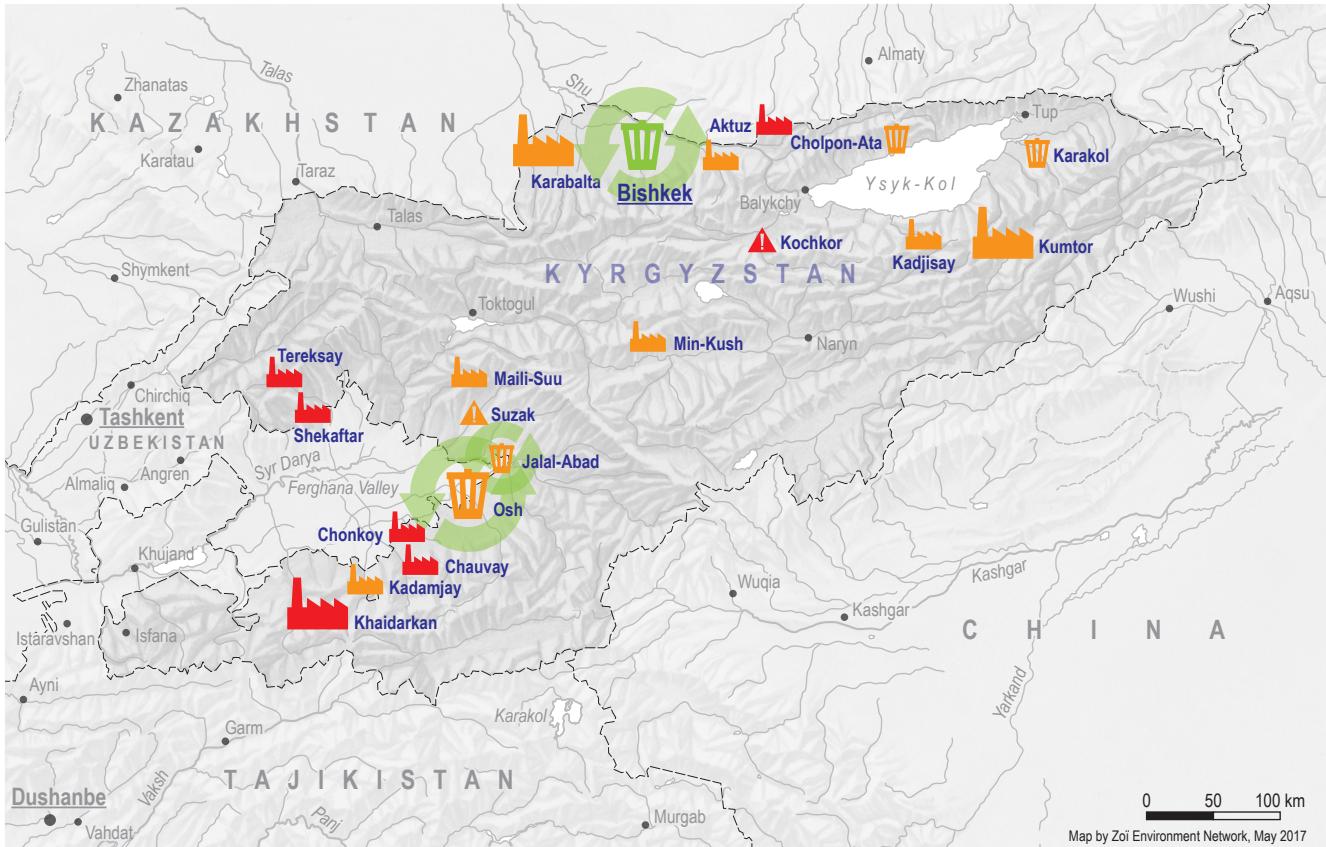
-  Poor
-  Satisfactory
-  Comprehensive

Industrial waste management

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions



Current waste situation in Kyrgyzstan and outlook

Municipal waste management

- Poor
- Satisfactory
- Comprehensive

Industrial waste management

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

- Ongoing successful waste processing, recycling and modern municipal waste management
- Mixed results and lessons learned in waste processing and recycling
- Planned and ongoing waste system modernization and recycling

Most of Kyrgyzstan is mountainous terrain where the headwaters of the key rivers in Central Asia are located. About 145 million tonnes of the country's hazardous waste accumulated during the Soviet period and about 100 million since independence, mostly from mining and processing. Recently Kyrgyzstan has generated between 5 and 10 million tonnes of industrial waste annually, most of it in the Issyk-Kul Province gold mining sector. More than 200 enterprises are handling waste collection and processing, with recycling rates reaching 40-50 per cent for the industrial waste.

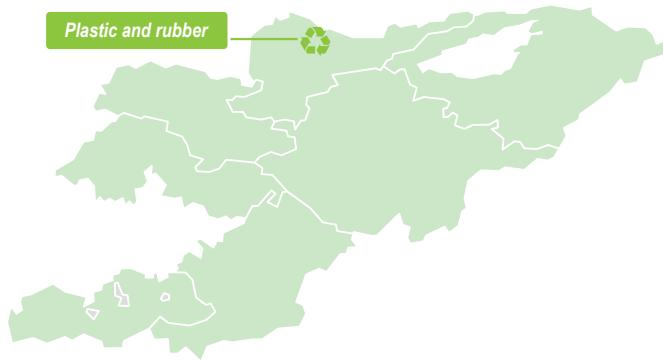
The capital city of Bishkek in the north and the Osh city agglomeration in the south – the largest sources of municipal waste – generate 70-80 per cent of all the collected municipal waste. The country produces more than 1 million tonnes of municipal waste annually. Most of this waste is collected and sent for disposal at about 50 legally operating landfills, but part of it ends up in hundreds of unofficial waste dumps.

In recognition of the potential damage to its image, Kyrgyzstan regards waste clean-up and disposal 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 metal at abandoned industrial waste sites often destroy the surface protective covers (where they exist), thereby increasing the impact of the waste. Mine waste has fueled discontent and resistance to mining, and has had a considerable economic impact.

Solid waste management still relies on old practices, principally dumping on open ground, simple landfilling and open burning. Until recently, the conditions in most waste collection points and urban landfills were unsatisfactory. With support from international donors, a visible progress has been achieved in 2014-2016 in the major cities, including Bishkek, Osh and Jalalabad. Informal waste sorting and recycling is significant, involving as many as 1 000 people at the Bishkek landfill site alone. Some studies suggest municipal waste recycling rates of up to 10 per cent, but a more conservative estimate is 1 per cent, with Bishkek considered as the main hub of the country's recycling business. Such extensive informal recycling emerged in the gap left in the market following the demise of the former Soviet state-sponsored recycling system. Poverty is another major driver and waste separation and reselling provide a supplement to income of the vulnerable groups.

Most encouraging of all are the initiatives taken by national fund for nature conservation, volunteers, CSOs and the general public across the country. In cities, at the iconic Lake Issyk-Kul and in the remote mountains, youth and women led initiatives work to collect rubbish and make these areas cleaner and more attractive places for living and visiting. Youth participate in waste reuse and recycling master classes, while women, as key players in household arrangements and planning contribute to waste reduction through traditional approaches to the reuse of wool, food waste and other materials.

Recycling hubs in Kyrgyzstan



Hazardous toxic industrial waste in Kyrgyzstan



Industrial waste per province

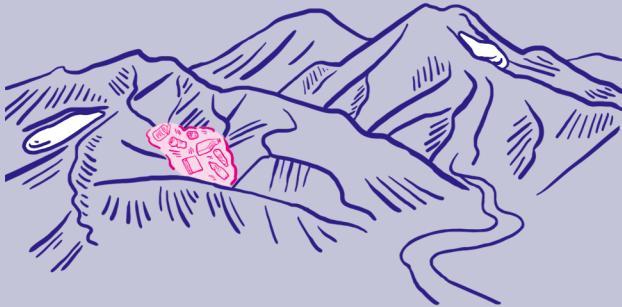


Tajikistan



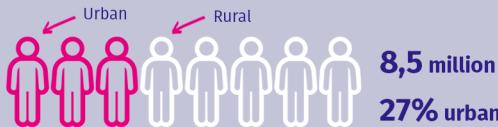
Geography

142,5 thousand km² Mountains with risk of disasters and melting glaciers. Little space for waste storage



Population

Each person represents 1 million



Economy, lifestyle

GDP: US \$900 per capita

Significant labour migration, construction boom



Waste generation (tonnes per year)

Industrial waste



No data

Municipal waste



**2 million m³ or
0,6-2 million tonnes**

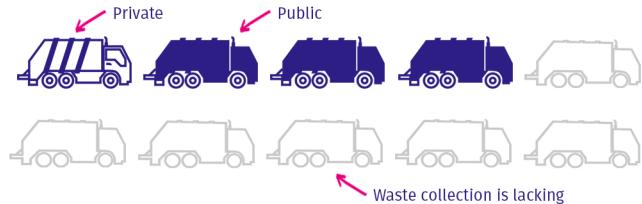
(Estimate)

100-150 million

tonnes of the accumulated industrial waste

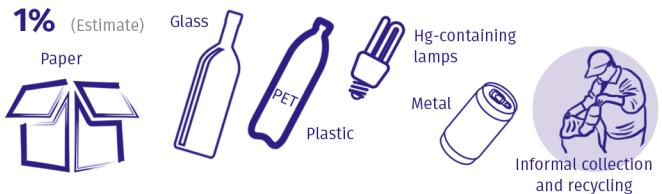
Waste collection coverage

Each truck represents 10%



Waste recycling

Most recycled waste items and capacities

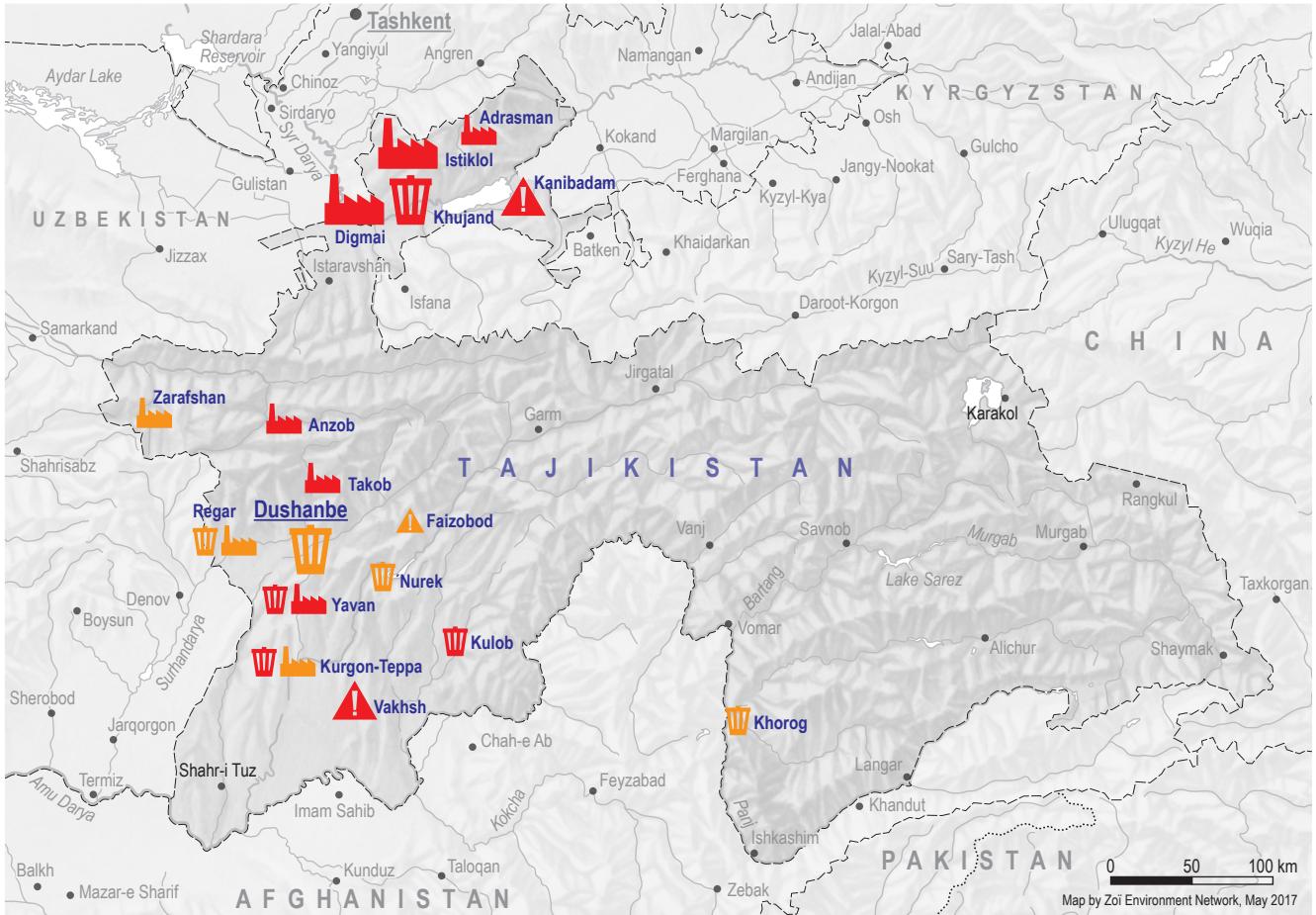


Waste disposal



	Current situation	Outlook
 Regulations	 Outdated legislation; basic waste targets and new strategy	 Updated regulations; clear targets; local waste roadmaps
 Institutions	 Controls in place, but enforcement weak, and coordination limited	 Stronger capacity at national and local levels; improved enforcement
 Economic tools and investments	 Average performance; ongoing revision of tariffs; high reliance on international support	 International investments; public-private partnerships; more complete tariffs
 Infrastructure: waste collection	 Growing urban coverage; limited rural coverage; modernization in major cities	 Better coverage and quality of waste collection; major extension of services needed
 Infrastructure: waste disposal	 Low-quality disposal; ongoing improvements at many waste sites	 Better controlled landfills; old sites closed or rehabilitated; new sanitary landfills
 Infrastructure: waste recycling	 Low recycling; dominant informal sector; growth in the private sector	 More waste is recycled; informal sector better integrated
 Legacy waste clean-up	 International support for clean-up or improved control	 All priority sites safer and better controlled
 Information: awareness and education	 Limited progress and coverage, NGOs most active	 Improved awareness; public clean-up activities
 Information: data and statistics	 No time series and industrial waste data; low coverage and quality	 More open and robust data; industrial waste statistics
 Partnerships	 Limited	 Growing networks and links

Least developed ← ○ ○ ○ ○ ○ → Highly developed



Waste situation in Tajikistan 15-20 years ago

Municipal waste management

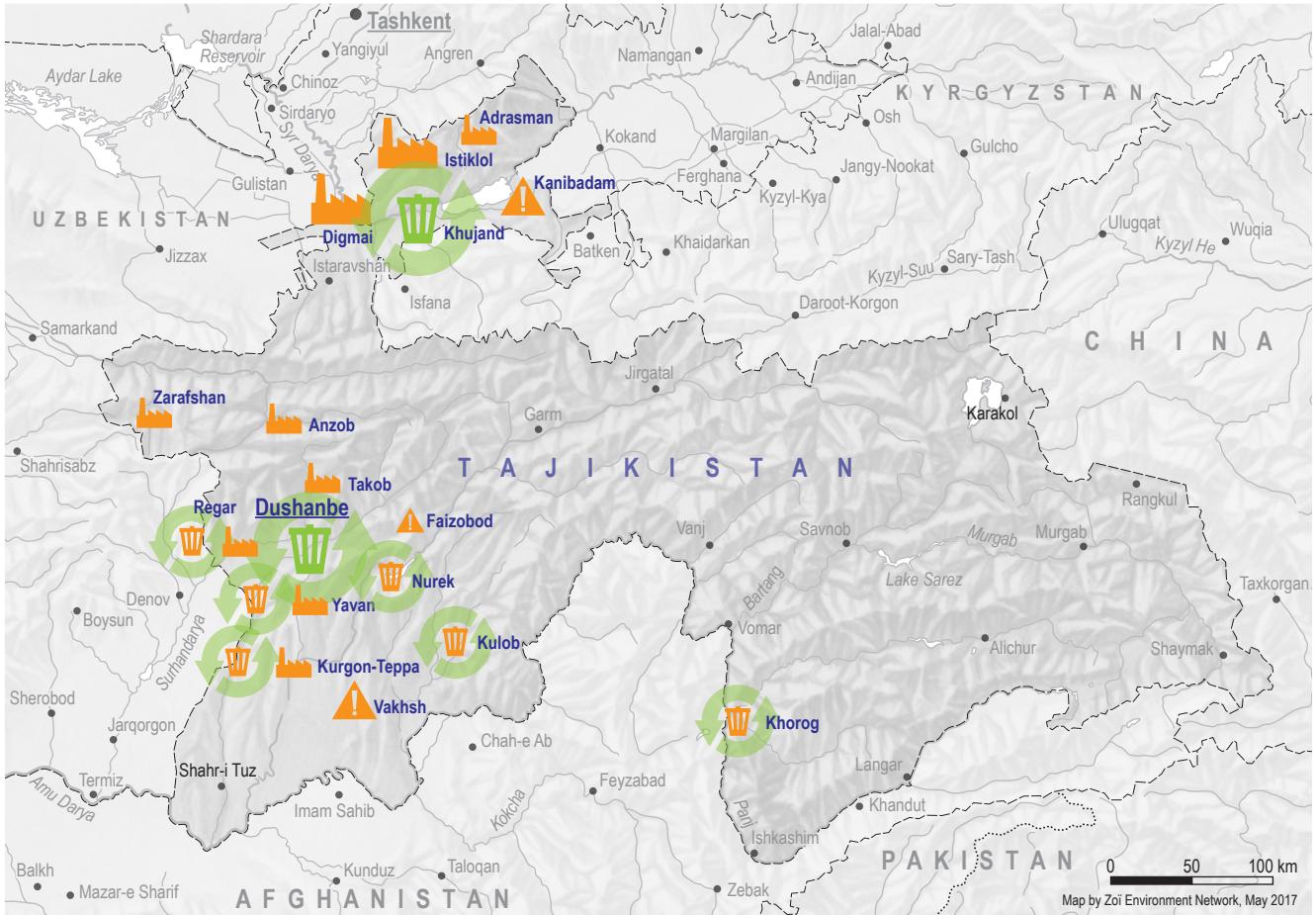
-  Poor
-  Satisfactory
-  Comprehensive

Industrial waste management

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions



Current waste situation in Tajikistan and outlook

Municipal waste management

-  Poor
-  Satisfactory
-  Comprehensive

Industrial waste management

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions

-  Ongoing successful waste processing, recycling and modern municipal waste management
-  Mixed results and lessons learned in waste processing and recycling
-  Planned and ongoing waste system modernization and recycling

Most of Tajikistan's waste, along with most of the population and industry, is concentrated in the lower elevations in the south-western and northern parts of the country. The rest of the country comprises high mountains with little population and no 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.

Tajikistan has the most rapidly growing population in Central Asia (2.2 per cent natural increase or 200 000 people per year), and with only 26 per cent of the people living in cities, is the least urbanized nation in the region. Waste collection coverage is relatively high for urban areas at 70-85 per cent and very low for rural areas – below 10-15 per cent. As a result, the municipal waste generation and collection rate (38 per cent) is probably the lowest in the region – amounting to 0.6 million tonnes (converted from estimated 2 million m³) or less than 100 kg per person as the country average. In the capital city of Dushanbe, more than 250 000 tonnes of waste per year are delivered to the waste landfill. Waste metal, PET and waste paper processing and mercury lamp recycling capacities exist in Dushanbe and the Gissar Valley. In Khujand, the second largest city of Tajikistan generating about 50 000 tonnes of municipal waste per year, there is a growing potential for sorting and recycling of paper, glass, metals and textile waste. Official waste collection and disposal practice does not include waste separation. There is, however, an active informal system.

National and local authorities place high priority on maintaining clean cities, and requested assistance of international donors to support sound waste management. With recently accomplished, ongoing and planned waste projects of EBRD, the main cities of the country will have better waste collection services and disposal practices. In addition, EBRD, the European Union and Russia support technical studies and rehabilitation of the uranium waste legacies and other organizations, such as the United Nations Development Programme, the Organization for Security and Co-operation in Europe and the FSD (Fondation Suisse de Déminage) support actions on pesticide dumps.

Tajikistan has no industrial waste statistics, but estimates suggest that amounts of industrial waste are growing due to a boom in the industrial and construction sector. Studies and records put the estimates of historical industrial waste in excess of 150 million tonnes over an area of 1 000 ha, mostly in northern Tajikistan. Some progress in industrial waste recycling in the active aluminum and textile sectors has been made, but most uranium and toxic waste legacies remain unresolved.

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 have switched to biological methods and organic fertilizers. Two large toxic agricultural waste sites – Vakhsh and Kanibadam – containing up to 10 000 tonnes of obsolete and prohibited pesticides from the Soviet period posed major environmental and health risks until recently. Both sites are now fenced off and better controlled thanks to technical support from international organizations.

Recycling hubs in Tajikistan



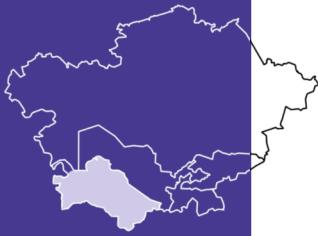
Hazardous toxic industrial waste in Tajikistan



Industrial waste per province



Turkmenistan



Geography

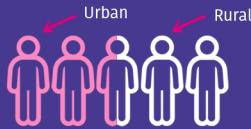
0.5 million km²

Mainly deserts, coastal zone and some mountains, Hot and dry climate



Population

Each person represents 1 million



5 million

50% urban

(Estimate)

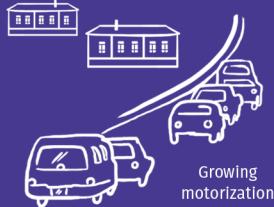
Economy, lifestyle

GDP: US \$6 600 per capita

Construction boom, significant role of the state in waste financing and management



Oil and gas extraction, chemical and textile industries



Growing motorization

Waste generation (tonnes per year)

Industrial waste



0.5-1 million

(Estimate)

Municipal waste

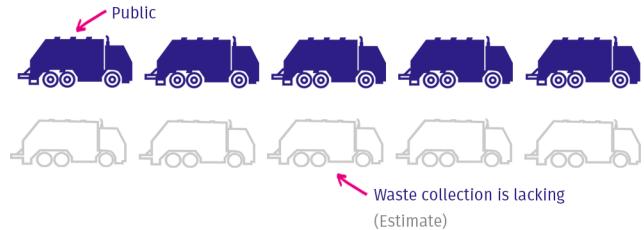


0.5-1 million

(Estimate)

Waste collection coverage

Each truck represents 10% (Estimate)



Waste recycling

Most recycled waste items and capacities

1% Estimate



Waste disposal



Poorly controlled waste site



Open dumping is still a common practice

	Current situation	Outlook
 Regulations	● ● ● ○ ○ New waste legislation; basic targets; rules being prepared	● ● ● ○ ○ New waste regulations; clear targets and action plans
 Institutions	● ● ● ○ ○ Controls and institutions in place; strong enforcement and coordination	● ● ● ● ○ Stronger capacity; better skills and sectoral coverage
 Economic tools and investments	● ● ● ○ ○ State financing; low tariffs; no international or private sector engagement	● ● ● ● ○ Public-private partnerships; more complete tariffs
 Infrastructure: waste collection	● ● ● ○ ○ Growing coverage in urban and rural areas; clean cities	● ● ● ● ○ More complete coverage
 Infrastructure: waste disposal	● ● ○ ○ ○ Low-quality disposal; on-going improvements and better controls at many sites	● ● ● ○ ○ Better controlled and authorized landfills; closure and rehabilitation of old sites; new sanitary landfills
 Infrastructure: waste recycling	● ○ ○ ○ ○ Low recycling	● ● ○ ○ ○ More waste is recycled, including biodegradable
 Legacy waste clean-up	● ● ● ○ ○ Clean-up and improved control of many sites funded by the state	● ● ● ● ○ Most sites safe or better controlled, including large pollution hotspots
 Information: awareness and education	● ● ○ ○ ○ Limited progress and coverage; NGOs most active	● ● ● ○ ○ Improved awareness; public clean-up activities
 Information: data and statistics	● ○ ○ ○ ○ No time series and industrial waste data; low coverage and quality	● ● ○ ○ ○ More open and robust data; industrial waste statistics;
 Partnerships	● ○ ○ ○ ○ Limited	● ● ○ ○ ○ Growing networks and links

Least developed ← ○ ○ ○ ○ ○ → Highly developed



Waste situation in Turkmenistan 15-20 years ago

Municipal waste management

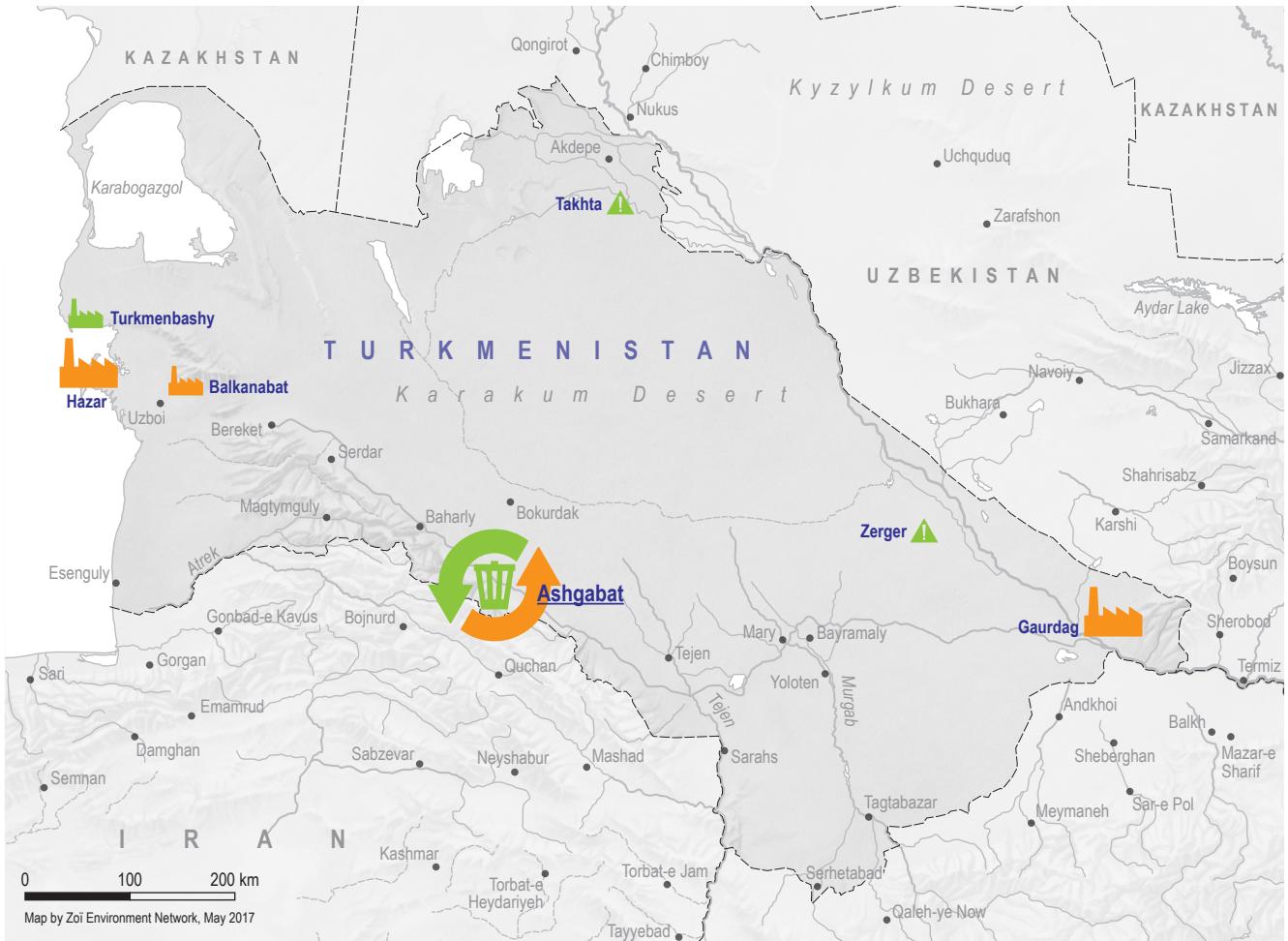
-  Poor
-  Satisfactory
-  Comprehensive

Industrial waste management

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions



Current waste situation in Turkmenistan and outlook

Municipal waste management

- Poor
- Satisfactory
- Comprehensive

Industrial waste management

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

- Ongoing successful waste processing, recycling and modern municipal waste management
- Mixed results and lessons learned in waste processing and recycling
- Planned and ongoing waste system modernization and recycling

Turkmenistan is characterized by its large predominantly desert area and relatively small population. Turkmenistan's hazardous industrial 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 the Turkmenbashi Gulf. The country's industrial profile has diversified and production levels have increased since independence, particularly in textiles and the mineral fertilizer industry.

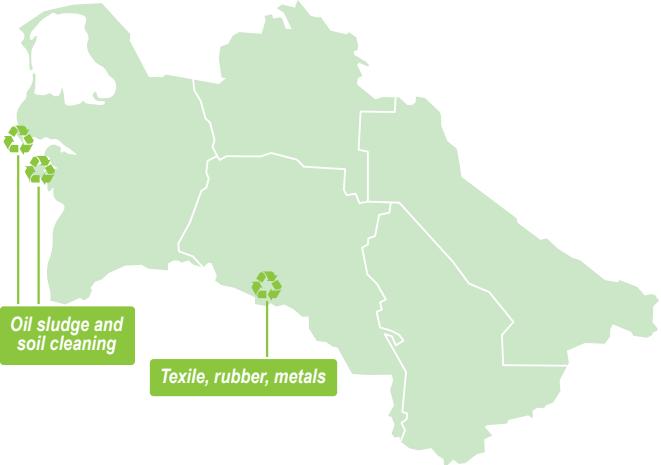
An estimated 0.5-1 million tonnes of municipal waste are produced annually in Turkmenistan, and almost all of it goes to landfills. Ashgabat landfill receives up to 200 000 tonnes of waste per year. Waste separation has not yet been introduced, but new waste legislation, strategies and institutions are promoting waste collection coverage and recycling, and the rates of waste collection and coverage have increased. In Turkmenistan, the collection and disposal of municipal waste and street cleaning are the responsibility of municipalities defined as sanitary services, and are funded from the state budget and local charges, and supervised by the Ministry of Muni-

pal (Communal) Economy. The private sector and international players are not present in waste recycling, but there are emerging private initiatives on rubber and metal recycling as well as oil waste processing.

Turkmenistan has recently adopted new legislation and revised the basic laws that regulate and stimulate measures aimed at reducing the negative impact of waste on public health and the environment, including waste law, nature protection law, and water and land legislation. A modern waste processing plant, including a healthcare waste processing facility, was built near Ashgabat.

Turkmenistan has recently made good progress on the relocation and safe disposal of radioactive legacy waste generated during 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 country and disposed of it in specially designated sites that are fenced, guarded and regularly inspected.

Recycling hubs in Turkmenistan



Hazardous toxic industrial waste in Turkmenistan



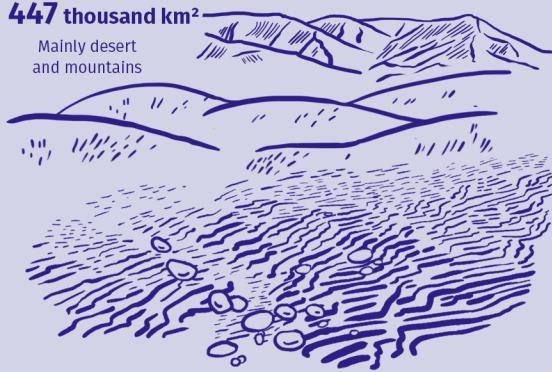
Uzbekistan



Geography

447 thousand km²

Mainly desert and mountains



Population

Each person represents 1 million

Urban



Rural



32 million
50% urban

Economy, lifestyle

GDP: US \$2 100 per capita



Waste generation (tonnes per year)

Industrial waste

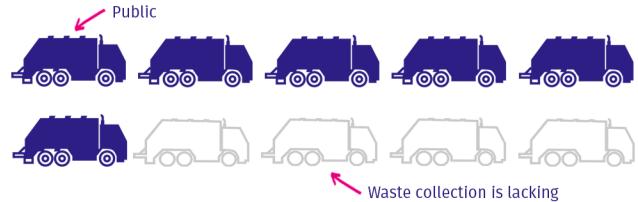


Municipal waste



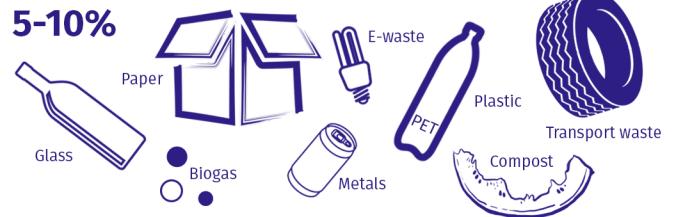
Waste collection coverage

Each truck represents 10%



Waste recycling

Most recycled waste items and capacities



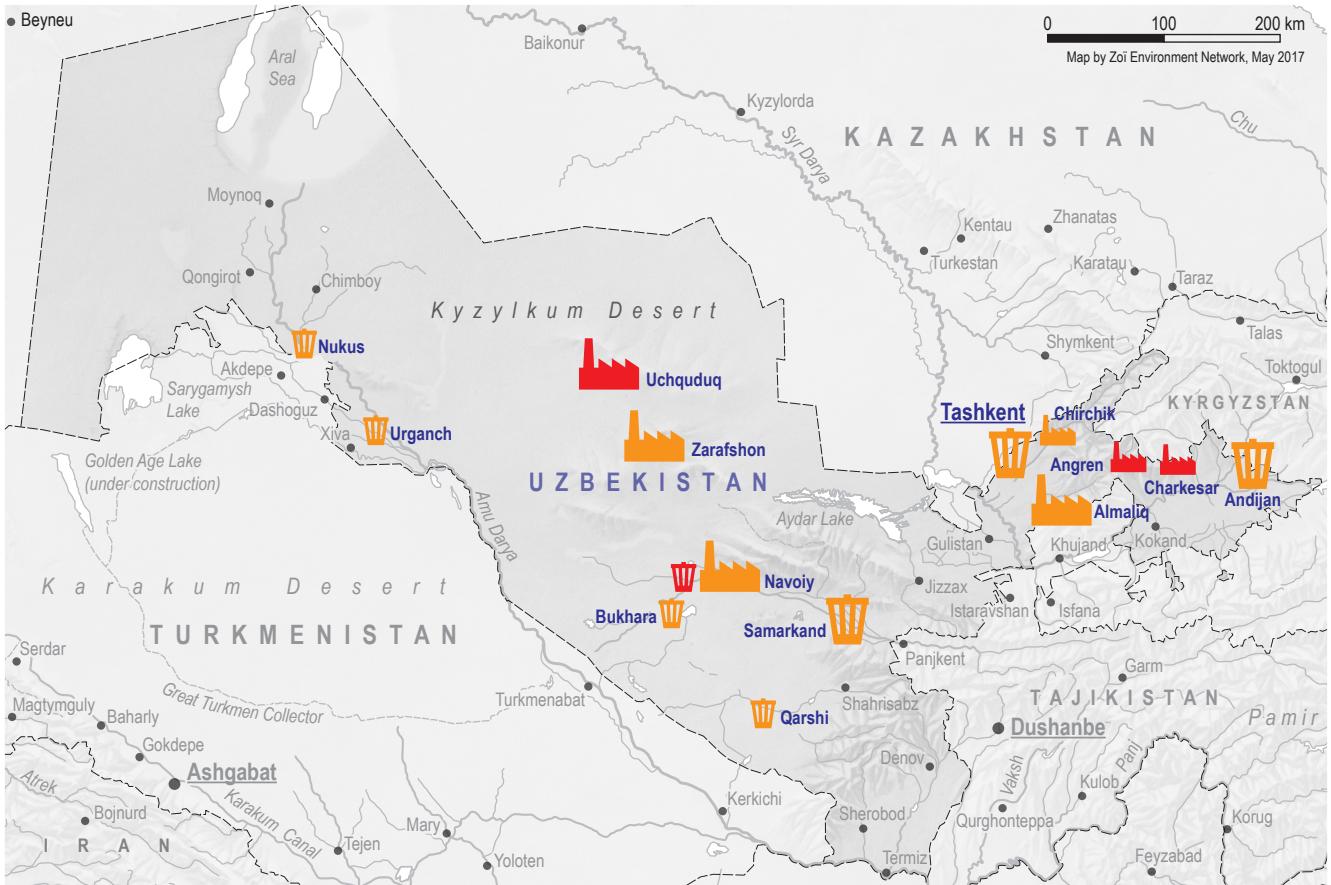
Waste disposal

Open dumping is still a common practice



	Current situation	Outlook
 Regulations	 Functioning legislation, adequate enforcement; new waste strategy with clear targets and funding	 New waste standards; local action plans; efficient enforcement
 Institutions	 Advanced national and local waste and environment controls; new institutional structure	 Stronger capacity of national and local authorities
 Economic tools and investments	 Significant national funding; generally sufficient and affordable tariffs; growing incentives	 International investments and public-private partnerships
 Infrastructure: waste collection	 Good urban coverage; growing rural coverage	 Comprehensive country-wide coverage
 Infrastructure: waste disposal	 Average disposal; closure of sites; improved controls; modernization in progress	 Sanitary landfills and better controlled dumps; landfilling without segregation discouraged
 Infrastructure: waste recycling	 Low to average recycling; growing capacities	 More waste is reused and recycled, including biodegradable waste
 Legacy waste clean-up	 Success with small and medium sites	 Most sites safe; major sites addressed
 Information: awareness and education	 Generally good progress and coverage, with some limitations	 Better awareness and behaviour; waste education
 Information: data and statistics	 Basic statistics, but limited data of average quality	 More open and local data; better quality and coverage
 Partnerships	 Strong role of mahallas (traditional local public units), growing partnerships	 Broad networks, forums and improved coordination

Least developed ← ○ ○ ○ ○ ○ → Highly developed



0 100 200 km
Map by Zoi Environment Network, May 2017

Waste situation in Uzbekistan 15-20 years ago

Municipal waste management

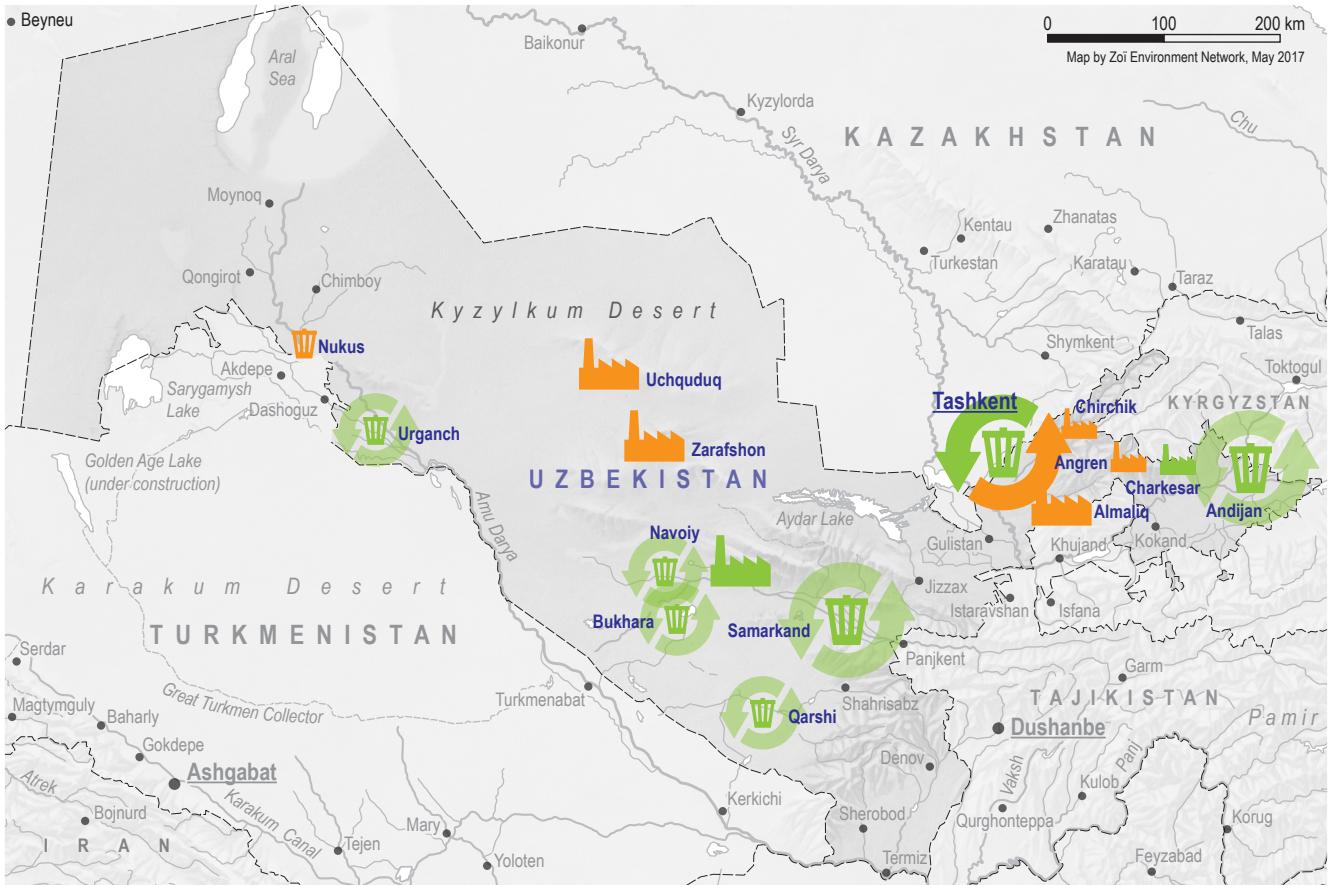
-  Poor
-  Satisfactory
-  Comprehensive

Industrial waste management

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

-  Poor/Abandoned
-  Satisfactory/Controlled access and conditions
-  Comprehensive/Remediation and advanced solutions



Current waste situation in Uzbekistan and outlook

Municipal waste management

- Poor
- Satisfactory
- Comprehensive

Industrial waste management

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

Legacy waste and toxic chemicals

- Poor/Abandoned
- Satisfactory/Controlled access and conditions
- Comprehensive/Remediation and advanced solutions

- Ongoing successful waste processing, recycling and modern municipal waste management
- Mixed results and lessons learned in waste processing and recycling
- Planned and ongoing waste system modernization and recycling

Uzbekistan is the most populous of the Central Asian countries (32 million), and has a diverse economic profile. Most industrial waste is generated and concentrated in the Navoiy province in the middle remote desert part of the country and around the cities of Tashkent, Almalyk and Chirchik. Soviet legacies include the accumulation of agricultural chemicals in several locations and abandoned uranium mining sites in Charkesar and Yangiabad.

In 2014-2016, the country achieved remarkable progress in upgrading municipal waste infrastructure, and in 2017 the president launched a major five-year programme to improve waste collection, disposal and recycling country-wide. In parallel, new institutional structures are being established, including a state inspectorate on waste and specialized state-managed enterprises on waste in all provinces. The ongoing ADB project on improving municipal waste management in Tashkent will be complemented by state funding and international partners to improve waste management in all major cities.

The amount of municipal waste generation exceeds 4.2 million tonnes per year with waste generation per person declining from 200 kg per person about ten years ago to less than 150 kg today, although it varies significantly between the cities and urban-rural areas. Historically,

the country has managed municipal waste well, and in recent years it has improved its municipal waste management systems. Uzbekistan has recycling schemes for paper, glass, plastics and metals, and it leads the region with recycling rates at 5-10 per cent. While most of the waste collection and some waste recycling is arranged by municipal and state-owned companies, there is a drive towards involvement of the private sector and public-private partnerships. More than 60 per cent of the country's population is covered by waste collection services and in the next five years this coverage is expected to grow to more than 90 per cent. Tashkent is the main recycling hub, along with several industrialized cities, but the number of hubs is growing.

Uzbekistan's industries generate between 40 and 80 million tonnes of waste annually. Several mining and chemical enterprises have shifted to technologies that allow more efficient extraction and production, generate less hazardous waste and reuse more of the waste. Earlier, Uzbekistan's agricultural production relied to a large degree on massive applications of 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 changed and biological methods for plant protection and productivity prevail.

Recycling hubs in Uzbekistan



Hazardous toxic industrial waste in Uzbekistan





Paper waste collection point (Almaty, Kazakhstan)



Street art and waste (Bishkek, Kyrgyzstan)



PET waste bin (Kazakhstan)

Plastic pollution (Issyk Kul, Kyrgyzstan)



3. Regional snapshot

The snapshot of the regional situation begins with a summary of the international conventions on waste and the countries participation in those conventions, and concludes with a series of tables that summarize various aspects of how the countries in the region approach waste.

International conventions

Many Central Asian countries are members of international agreements on sound waste and chemical management, or adhere to their main principles. This section summarizes the main agreements and the related duties or obligations.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal has the following key aims:

- Minimizing the generation of hazardous wastes
- Promoting the environmentally sound management of hazardous wastes

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade facilitates the exchange of information on hazardous chemicals through the provision of a decision-making process for imports and exports.

The Stockholm Convention on Persistent Organic Pollutants includes a list of 26 chemicals for which the production and use should be prohibited or restricted.. Persistent organic pollutants remain in the environment for a long time, can be transported for long distances by wind and water currents, accumulate through the food web and pose a threat to human health and wildlife.

The Minamata Convention on Mercury was signed in 2013, and entered into force in August 2017. (As of 25 August 2017, it was ratified by 74 countries and signed by 128 countries.) It aims to protect human health and the environment from anthropogenic emissions and releases of mercury and its compounds, and also regulates trade, sources of supply and processes that use mercury or mercury compounds, artisanal gold mining using mercury, environmentally safe storage of mercury and disposal of mercury waste.

The Framework Convention for the Protection of the Marine Environment of the Caspian Sea contains provisions on sources of environmental pollution, protocols on land-based sources of pollution and response to oil spills.

The Framework Convention on Environmental Protection for the Sustainable Development of Central Asia proposes mechanisms and priorities for cooperation in waste management and other relevant regional issues. Three of the five countries have signed the convention.

TABLE 1. Participation in multilateral agreements related to waste management

	Basel Convention	Rotterdam Convention	Stockholm Convention	Minamata Convention	Strategic Approach (SAICM)
Kazakhstan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Kyrgyzstan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Tajikistan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Turkmenistan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uzbekistan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Bases for comparisons

Differences in the completeness and availability of waste data, and in definitions and time series inevitably limit regional comparisons and the assessments for different sectors, countries and activities. The writing team made an effort to aggregate information that shows relative progress or performance in specific areas – waste collection coverage, recycling, institutional capacity and financing. The series of tables that follows visually represent progress and the comprehensiveness of waste policies, technologies and tools. The tables for each specific subject denote more progress, broader coverage or better completeness with coloured bullets: the more coloured bullets the better. These relative rankings allow comparisons among the countries and across different timelines.

Regional snapshot tables mainly refer to the current time. The outlook section tables look back into the recent past, portray the current situation and project the likely developments for the next 10-15 years. The outlook is based on a combination of the national waste goals, programmes and strategies and ongoing dynamics and waste projects that are likely to shape the future situation. In some cases that are highlighted, the ranking is not really applicable, for example, where waste activities are fully covered by the state budget and there is no need and niche for the private sector or where information is not sufficient to make comparisons or assessments.

The following legend applies to the series of tables that appear through the rest of this report.

	General situation	Governance: policies and institutions
 Limited	Limited progress and low capacity; narrow geographic coverage; inadequate completeness; low funding and performance	Absent controls; low capacities; outdated rules and legislation; lack of measurable waste targets and clear responsibilities
 Undeveloped	Intensive discussions and studies; informal not systematic approach and partial coverage; limited funds	Narrow mandates and qualified staff shortages; vague strategies and responsibilities for specific types and hazardous waste; lack of enforcement
 Balanced	Basic geographic and sectoral coverage, with the need of extension; tools and mechanisms work, but low efficiency	Legislative basis in place, but without by-laws, regulations and standards; reforms planned or ongoing, but implementation fairly constrained; no long-term targets
 Advanced	Broad geographic and thematic coverage; adequate capacities and enforcement; good efficiency	Modern laws, by-laws, standards, action plans and targets adopted, responsible parties defined, but not fully implemented
 Complete	Complete geographic coverage; all measures aligned with leading international practices, and implemented at all levels; high efficiency and sustainability	Advanced legal and institutional frameworks supported by good enforcement; all relevant stakeholders involved; coordination on legal provisions and responsibilities
 No data or not applicable	No information, not applicable or not applied	Lacking or not yet in place

Financing, economic tools and investments	Information and public awareness	Infrastructure: collection, recycling and disposal of waste
Low tariffs not covering the basic costs; very limited funding; penalties not efficient; incentives missing; some pilot projects	Authorities, business and citizens poorly informed; data and statistics lacking or poor quality; limited access	Informal sector and outdated practices; low coverage; no targets or incentives; not economically attractive
Funding and subsidies inadequate for long-term and viable solutions; acceptable tariffs, but barely cover the costs of modernization or transition to better waste practices	Basic statistics and monitoring conducted; warning signs and prevention; information inadequate for decisions, comparisons and progress assessment	Part of waste segregated and recycled, but mainly from businesses or via informal pickers; small coverage and recycling ratio
Funding and investments adequate for individual cities or addressing small and medium-sized polluted sites; diverse financial-economic tools	Information and statistics available; public informed, but the impact of information not systematic and efficient	Coverage good, waste segregation practiced or improving, but recycling ratio low; better control of final disposal
Private sector involved; funds and investments cover all major cities and sites; public-private partnerships growing and extended producer responsibility	Data up-to-date, available, comparable, but not detailed (no local level or sector-specific); sufficient public awareness; pro-active NGOs	Operational capacities for extended producer responsibility and recycling; good levels of collection and waste recycling
Broad transition to green (circular) economy; sufficient funding for most waste tasks and rehabilitation of major polluted sites; long-term considerations, including climate risks addressed	Data robust and openly available; high levels of public awareness and engagement; educational programmes for children; training for professionals	Proactive partnerships, associations; high levels of collection and recycling; attractive conditions and incentives; advanced technologies and waste minimization
Negligible or lacking	Negligible, lacking or not available	Negligible or lacking

Waste management across the region

The regional snapshot tables summarize various aspects of waste management ranging from actions on legislation and governance, waste financing and recycling markets to information and waste statistics in the region. The tables reflect information available as of May 2017.

TABLE 2. International investments and projects on waste management

	European Bank for Reconstruction and Development and EU	Asian Development Bank*	World Bank*	Others: GEF, AFD, SDC/SECO	Private Sector
Kazakhstan	● ● ○ ○ ○	○ ○ ○ ○ ○	● ● ● ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Kyrgyzstan	● ● ● ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ○ ○ ○ ○
Tajikistan	● ● ● ● ○	○ ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○
Turkmenistan**	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○
Uzbekistan	● ● ○ ○ ○	● ● ● ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ○ ○ ○ ○

* Including completed projects to reduce the risk from the Mayлуу-Suu uranium tailings and disasters and the Issyk Kul region sustainable development in Kyrgyzstan and waste management in Uzbekistan

** In Turkmenistan, all waste management costs are paid out of the state budget or from company funds.

TABLE 3. Legislation and strategies on waste

	Law on Waste	Regulations and standards	National waste strategies, targets	Local waste strategies and roadmaps	Strategies for special waste and chemicals
Kazakhstan	● ● ● ● ○	● ● ● ● ○	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○
Kyrgyzstan	● ● ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○
Tajikistan	● ● ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○	● ● ○ ○ ○	● ● ○ ○ ○
Turkmenistan	● ● ● ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○
Uzbekistan	● ● ○ ○ ○	● ● ● ○ ○	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○

TABLE 4. Management capacity for municipal solid waste

	State competent authorities	Inter-institutional coordination and sharing of responsibilities	Local authorities	Waste-focused NGOs and public movements	Waste associations and private sector
Kazakhstan	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ● ○	● ● ● ○ ○
Kyrgyzstan	● ● ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○	● ○ ○ ○ ○
Tajikistan	● ● ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ○ ○ ○ ○
Turkmenistan	● ● ● ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○
Uzbekistan	● ● ● ○ ○	● ● ○ ○ ○	● ● ● ○ ○	● ● ○ ○ ○	● ● ○ ○ ○

TABLE 5. Financial and economic tools and mechanisms for sound waste management

	Tariffs	Charges and taxes on waste disposal	Penalties for exceeding the agreed waste limits	Extended Producer Responsibility (EPR)	Private sector: Collection and disposal	Private sector: Recycling
Kazakhstan	● ● ○ ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○
Kyrgyzstan	● ● ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○
Tajikistan	● ● ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○
Turkmenistan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○
Uzbekistan	● ● ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○

TABLE 6. Waste recycling and market opportunities

	Paper	Glass	Plastic	Metal	Tires and old vehicles	E-waste	Organic waste
Kazakhstan	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ○ ○ ○
Kyrgyzstan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○
Tajikistan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○
Turkmenistan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○	○ ○ ○ ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○
Uzbekistan	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○

TABLE 7. Historical industrial and agricultural waste and pollution

	Industrial waste legacies and spills	Uranium mining legacies and radioactive waste	Dumps and storage facilities for agricultural chemicals and pesticides
Kazakhstan	● ● ● ○ ○	● ● ● ● ○	● ● ● ○ ○
Kyrgyzstan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○
Tajikistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○
Turkmenistan	● ● ● ○ ○	● ● ● ● ○	● ● ● ● ○
Uzbekistan	● ● ● ○ ○	● ● ● ● ○	● ● ● ○ ○

TABLE 13. Waste statistics, training and public awareness

	Statistics	Cadastrs, maps and detailed data	Coverage of waste issues in schools	Specialized education on waste	Information in the mass media
Kazakhstan	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○	● ○ ○ ○ ○	● ● ● ○ ○
Kyrgyzstan	● ● ● ○ ○	● ● ○ ○ ○	● ● ○ ○ ○	○ ○ ○ ○ ○	● ● ○ ○ ○
Tajikistan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○
Turkmenistan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○	○ ○ ○ ○ ○	● ○ ○ ○ ○
Uzbekistan	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ○ ○ ○ ○	● ● ● ○ ○



Obsolete pesticides disposal site and awareness poster, Southern Kyrgyzstan

4. Key issues

Waste management trends in the region vary greatly not only by country, but by city, source, type of waste and context. This section of the report looks back on the situation and problems 15-20 years ago, the recent situation and provides an outlook for the near future. The chapter considers the effects of waste on environmental health; the relationships between climate change, disasters and waste; food losses and food waste; construction and demolition waste; transportation waste; and electronic waste.

Environmental health

Authorities in the cities of Central Asia have long focused on maintaining sanitary conditions. In the difficult initial transition years to independence, however, the timely collection of waste became difficult and provoked in many cities the growth of spontaneous landfills, the overcrowding of garbage collection sites, the open burning of waste and a general deterioration of sanitary conditions.

Even with noticeable progress in solving the timely removal of domestic waste and the increasing coverage of this service in municipalities, the waste reduction and disposal problems remain relevant. In general, both the infrastructure and the culture of waste separation among the population and businesses are not yet well developed. The collection of leaves and street debris often results not in composting, but in on-site open burning, which worsens air quality in populated areas. The use of waste, for instance old tires or plastic as fuel poses health risks. Informal waste collectors contribute to sorting and processing, but are at risk of infections and dis-

eases. Specific data on these problems are inadequate, but the relationship between waste and environmental health is well known and understood.

For many years now, the cities of Central Asia have been using a simple solution to the problem of municipal solid waste – disposal in primitive landfills. With respect to municipal waste dumps the saying “Out of sight, out of mind” fits well. Many existing landfills have exceeded their recommended operating lives and volume limits. Most of these landfills are not well equipped in engineering terms. Incoming waste is neither weighed nor inspected. Waste is generally compressed and compacted, but waste gas collection is not conducted, and waste is often affected by spontaneous fires, releasing toxic fumes. In the absence of leachate-proof layers, groundwater contamination is a risk. Some municipal waste landfills allow disposal of construction and healthcare waste, some of which contains hazardous substances. In some cities, residential areas have grown to the extent that they are directly adjacent to landfills. This proximity poses a threat to the health of residents.

Healthcare waste includes sharp objects such as syringes; infected waste; mercury-containing waste such as discarded thermometers; and obsolete antibiotics, all of which pose environmental health threats. The removal and disposal of healthcare waste should follow certain procedures, and the waste should not be mixed with other types of waste. Some medical waste is still openly burned (leading to unintentional releases of dioxins and furans), but increasingly healthcare waste is sterilized and burned in special incinerators.

TABLE 9. Collection and removal of municipal solid waste

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ● ● ○ ○	● ● ● ● ○	● ● ● ● ●
Kyrgyzstan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Tajikistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Turkmenistan	● ● ○ ○ ○	● ● ● ○ ○	● ● ● ● ○
Uzbekistan	● ● ● ○ ○	● ● ● ● ○	● ● ● ● ●

TABLE 10. Controlled disposal of municipal solid waste in line with modern standards and closure of illegal and overfilled waste dumps

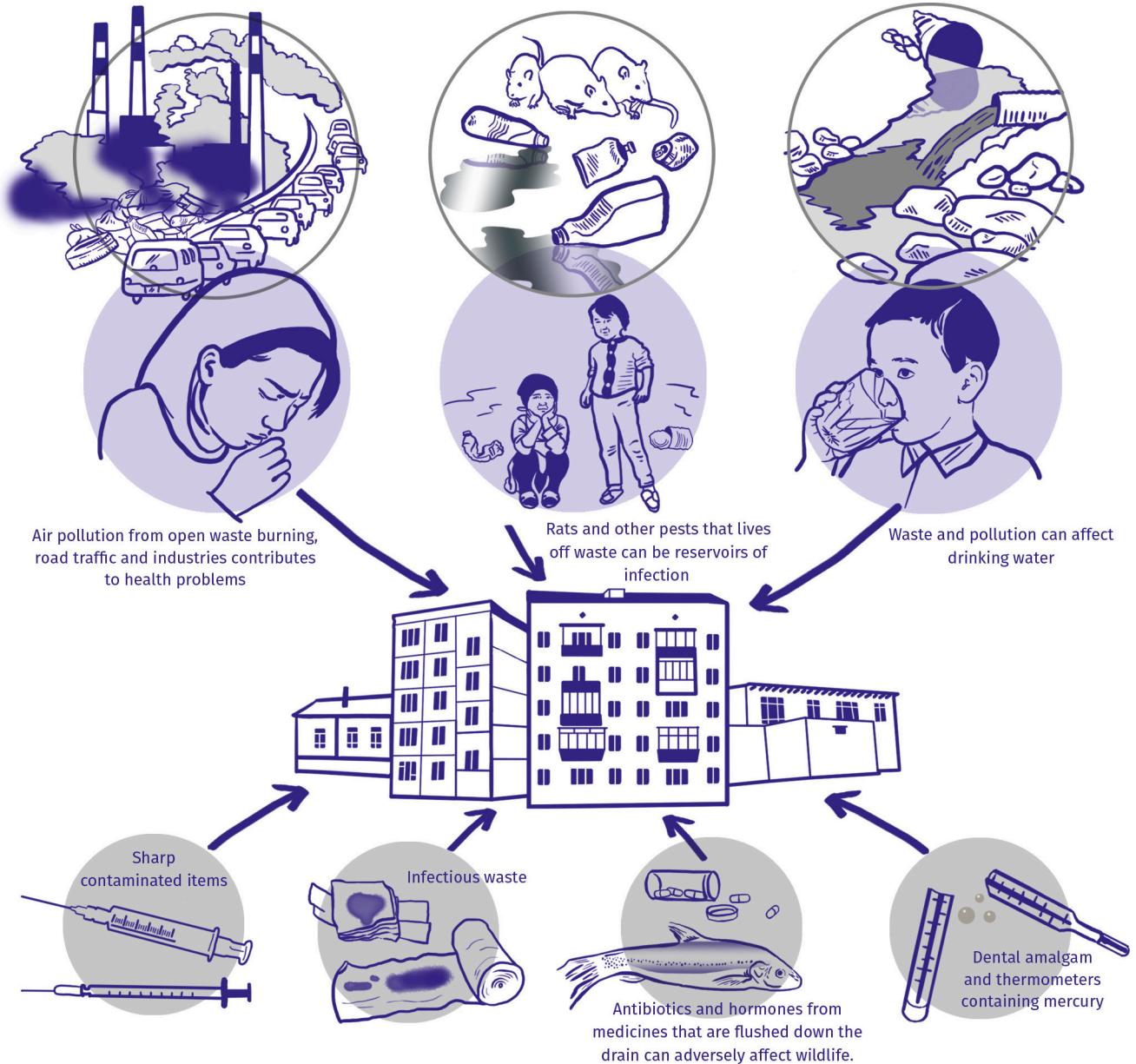
	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ○ ○ ○ ○	● ● ● ○ ○	● ● ● ● ○
Kyrgyzstan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Tajikistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Turkmenistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Uzbekistan	● ○ ○ ○ ○	● ● ● ○ ○	● ● ● ● ○

TABLE 11. Elimination of open burning of waste, including medical waste

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ● ○ ○ ○	● ● ● ● ○	● ● ● ● ●
Kyrgyzstan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Tajikistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Turkmenistan	● ○ ○ ○ ○	● ● ● ○ ○	● ● ● ● ○
Uzbekistan	● ● ○ ○ ○	● ● ● ○ ○	● ● ● ● ○

Environmental health and healthcare waste

Waste in the environment can compromise public health in many ways. Healthcare waste is often invisible, and can be harmful to human health.



Outdated fleet of garbage trucks and waste containers
10 years ago (2007, Bishkek, Kyrgyzstan)



Modern garbage trucks (2016, Bishkek, Kyrgyzstan)



Municipal waste management: balance of revenues and expenses

Solid waste management is a core service provided by or on behalf of local authorities to residents, and can be considered a basic human right. The authorities may raise the funding required for waste management from a tariff, a tax or a transfer from local or national budgets. All of these sources can work well, so long as the system is transparent, fits with local customs and tradition and satisfies customers. The current waste tariffs in Central Asia mainly cover the costs of waste collection and transportation to, and final disposal at, poorly maintained landfills. Existing revenues barely cover operating costs, so establishing appropriate cost-recovery mechanisms attractive to investors and conducive to long-term and efficient functioning of the system is an important part of successful waste projects.

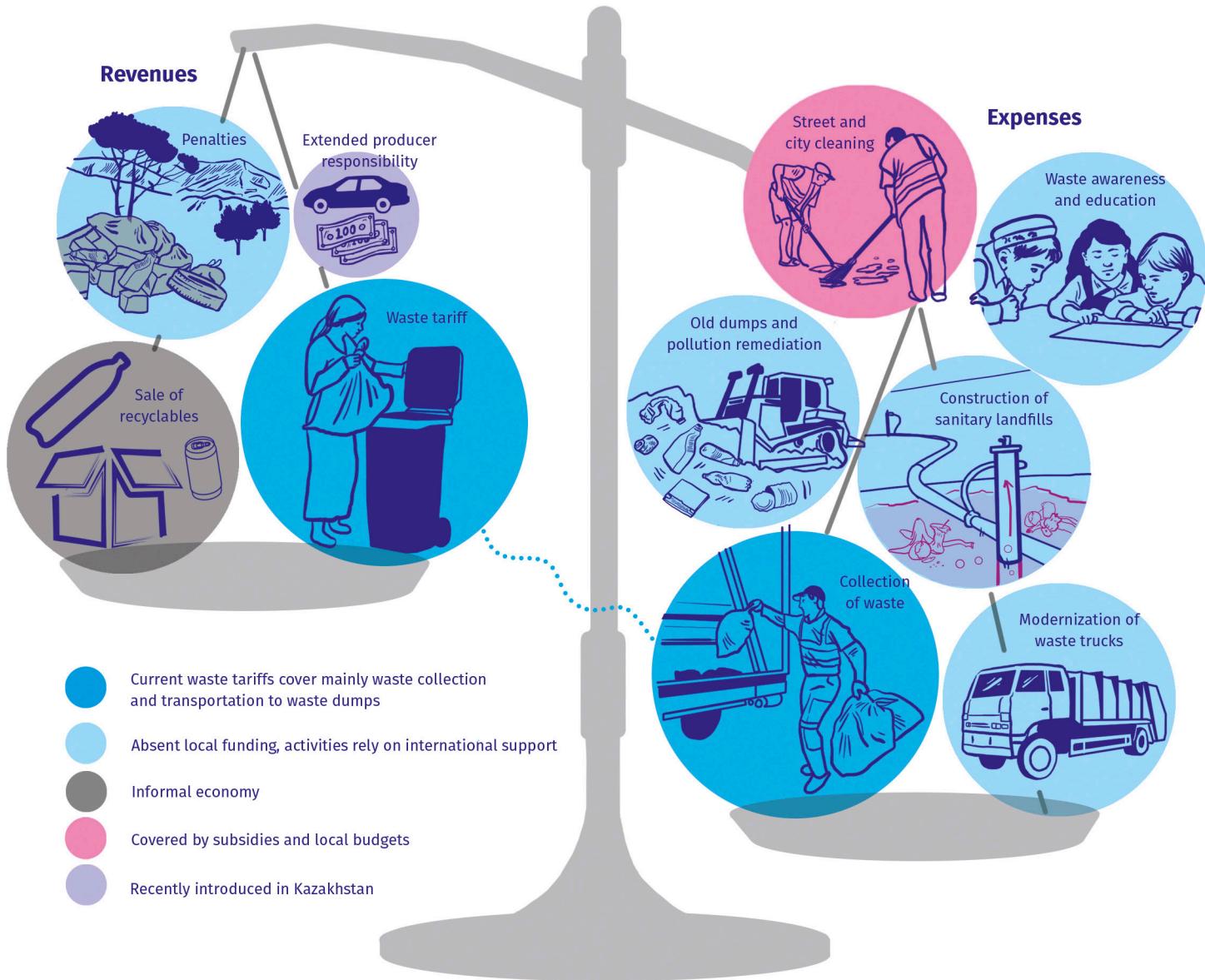
Waste management has recently started to attract the private sector and public-private partnerships. In Kazakhstan, more than 100 private companies are involved and the introduction of the extended producer responsibility implies future growth. In other countries of Central Asia, the role of the private sector in waste management is less significant, and state-owned enterprises dominate. It is important that environmentally sound disposal be priced, but care is required to ensure that this does not serve as a driver or trigger for illegal disposal and that the new financial tools incentivize the prevention and sorting of waste by generators. There is no right or wrong financing model – each situation requires a tailor-made solution. The aim should be to increase cost recovery and ensure support is available to those who cannot afford to pay.

TABLE 12. Development of a green economy and the evolution of integrated waste management

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ○ ○ ○ ○	● ● ● ○ ○	● ● ● ● ○
Kyrgyzstan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Tajikistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Turkmenistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Uzbekistan	● ● ○ ○ ○	● ● ● ○ ○	● ● ● ● ○

Municipal waste management: balance of revenues and expenses

Waste management relies on direct and indirect subsidies because expenses often outweigh revenues.



Waste management, climate change and natural disasters

Methane leaks from landfills and emissions from agricultural wastes are not large compared to other sources of greenhouse gas emissions in Central Asia. Nevertheless, they affect the climate, and the spontaneous or intentional burning of waste adversely affects air quality. In turn, the warming of the climate also affects the storage and disposal conditions for hazardous industrial waste, especially in the mountains and in the coastal zone of the Caspian Sea.

Caspian Sea level fluctuations associated with weather and climate variability can lead to the flooding of oil wells and waste infrastructure, increasing the risk of pollutants entering the sea in Turkmenistan and Kazakhstan. In Kyrgyzstan and Tajikistan, gold and other mineral resources are extracted in the high mountains, permafrost and glacier zones. Climate warming here leads to a change in the rock properties, increasing the melting of glaciers,

and in the long term may affect the safety of industrial waste sites in the absence of monitoring and remediation. Landslides, mudflows and intensive erosion affect several mines and tailings. International donors support feasibility studies and measures in both countries to improve the safety and management of hazardous waste.

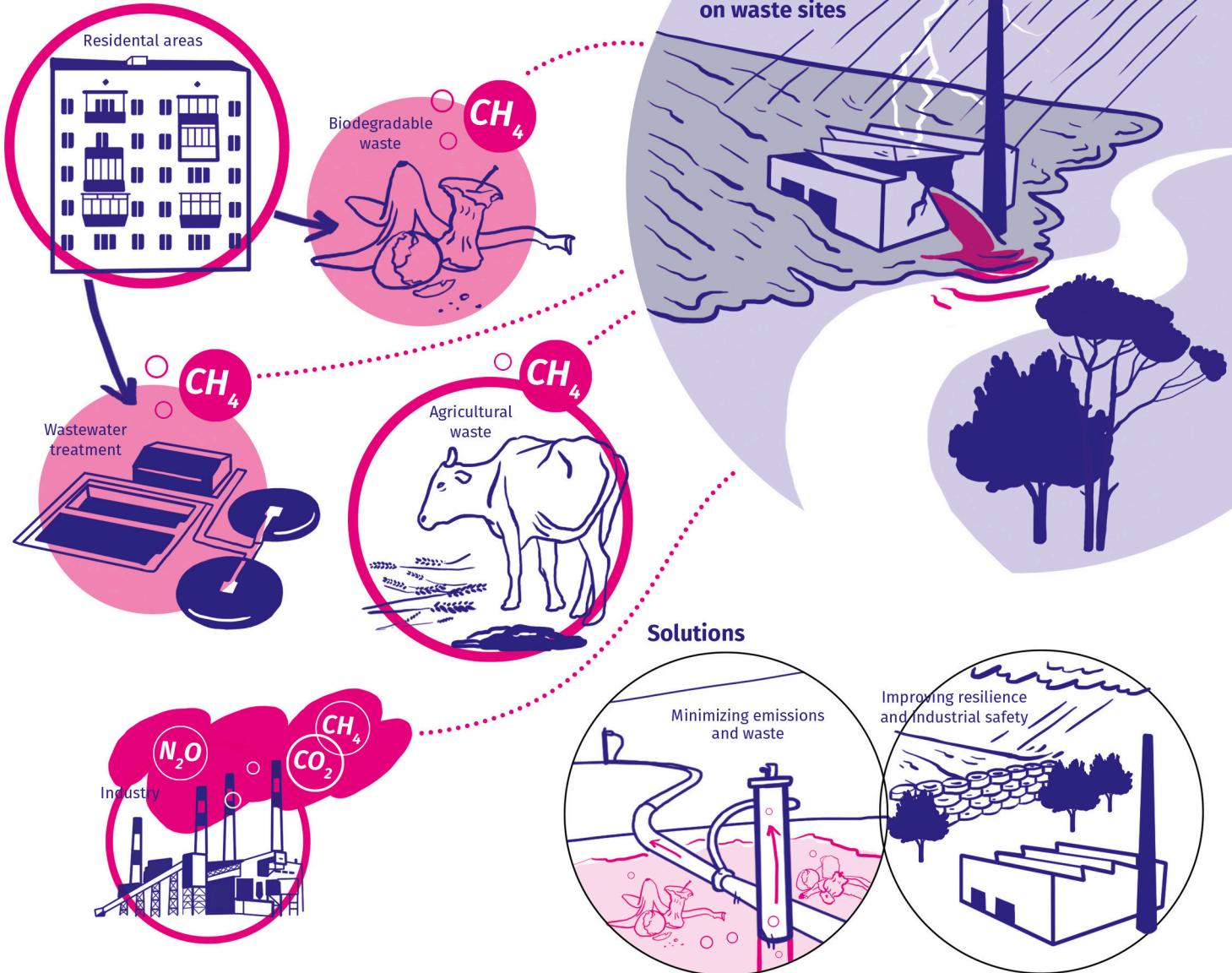
In connection with the adoption of the Paris Agreement on Climate Change in 2015, countries and donors are increasingly focusing on the problem of climate change and its relationship to waste management. In the long term, economically feasible projects on landfill gas capture and energy recovery from waste, as well as biogas energy generation in agriculture, are possible. Farms may operate biogas plants, and the region may adopt low-waste and energy-saving technologies, and may improve the climate resiliency of hazardous waste disposal facilities.

TABLE 13. Biogas and energy production from waste

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○	● ● ● ○ ○ ○
Kyrgyzstan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Tajikistan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Turkmenistan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Uzbekistan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○

Waste management, climate change and natural disasters

Municipal and agricultural wastes emit greenhouse gases (mostly methane) that affect the climate system, which in turn may adversely affect waste storage sites.



Food losses and waste

The Global Waste Outlook (2015) calls on countries and regions to assess food losses and food waste, and to develop appropriate measures. According to a Food and Agriculture Organization of the United Nations (FAO) assessment (2013), over 1 billion tonnes of edible food products – one third of total world food production – are lost every year. According to selective studies by FAO (2014), in Kazakhstan and Tajikistan, food is lost at various stages of harvesting, transportation, storage and use. The countries of Central Asia are known for their hospitality and the quality of their food, and for their rational handling of food waste. Bread products are almost never discarded, for example, but collected and used for animal feed, and meat-and-milk waste at the consumer level is generally small due to the high cost of these products.

The greatest losses of food products occur at the harvesting stage. Agricultural pests, unfavorable weather and ineffective harvesting account for losses of 1-3 per cent (for meat) and 10-20 per cent (for root crops, fruits, vegeta-

bles and grains). Processing, storage and transportation losses are especially significant for root crops, fruits, vegetables and meat and dairy products. Poor-quality roads, a hot climate, inadequate storage technologies and energy shortages or power cuts exacerbate the magnitude of losses. As a result, the food losses on the way from fields and farms through warehouses, bazaars and shops to the consumer's table range from 7-15 per cent for meat and milk to 30-40 per cent for fruits and vegetables.

A common feature of the rural areas of Central Asia is that a large proportion of kitchen scraps are used for pet food, as compost or as fuel. In cities, biodegradable waste is not separated and goes to landfills in a mixed form. Kazakhstan has set a goal to increase the share of a separate collection of biodegradable waste to 30 per cent by 2030. This, among other things, will reduce the cost of processing other types of waste and reduce the total amount of waste for disposal. Table 14 shows the extent to which cities in the region separate their biodegradable waste.

TABLE 14. Segregation and recycling of biodegradable waste in Central Asian cities

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○	● ● ● ○ ○ ○
Kyrgyzstan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Tajikistan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Turkmenistan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Uzbekistan	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○	● ● ● ○ ○ ○

Food losses and waste

Food losses start in the field and continue through processing and transportation. Most leftover food now ends up in waste dumps, but could be used as animal feed or compost

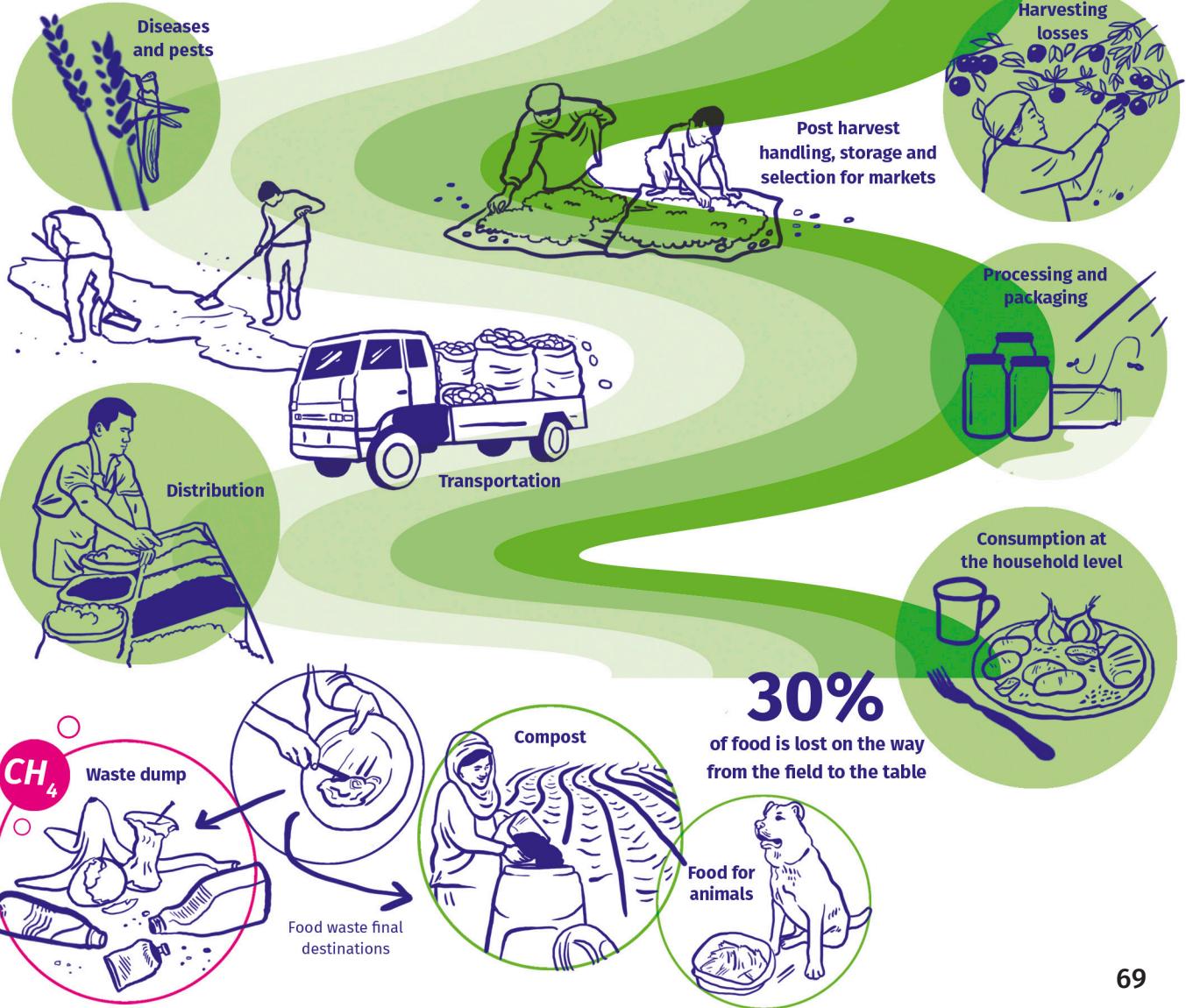


Wheat

Milk

Vegetables

Fruits



Construction and demolition waste

The UNEP Global Waste Management Outlook (2015) calls the attention of the regions to the problem of construction and demolition waste. Construction companies and residents of Central Asia often do not realize the potential risk associated with old roofs and pipes made of asbestos; wood treated with creosote; solvents; and mercury-containing lamps. Some of these materials are toxic and harmful to nervous and reproductive systems, or can cause cancer or other problems with the liver, kidneys and lungs. Disposal of these materials requires special measures.

Construction waste, including bulky concrete waste, is most often thrown out in the suburbs, near rivers, into

ravines or mixed with other waste in landfills. The construction boom in Central Asia is generating significant waste, but statistics are either limited (Kazakhstan) or nonexistent. In rural areas, much construction waste is either reused or, because it is mainly clay or stone, does less environmental damage than construction waste in urban areas. And some types of houses in the countryside – such as the yurts of the Tien Shan or traditional mud brick and stone houses of the Pamir-Alai – are eco-friendly in their use of local natural materials. Recycling and reuse of construction waste in cities and the restricting the amount of construction waste that goes to landfills are beginning to gain momentum in Kazakhstan, Turkmenistan and Uzbekistan.

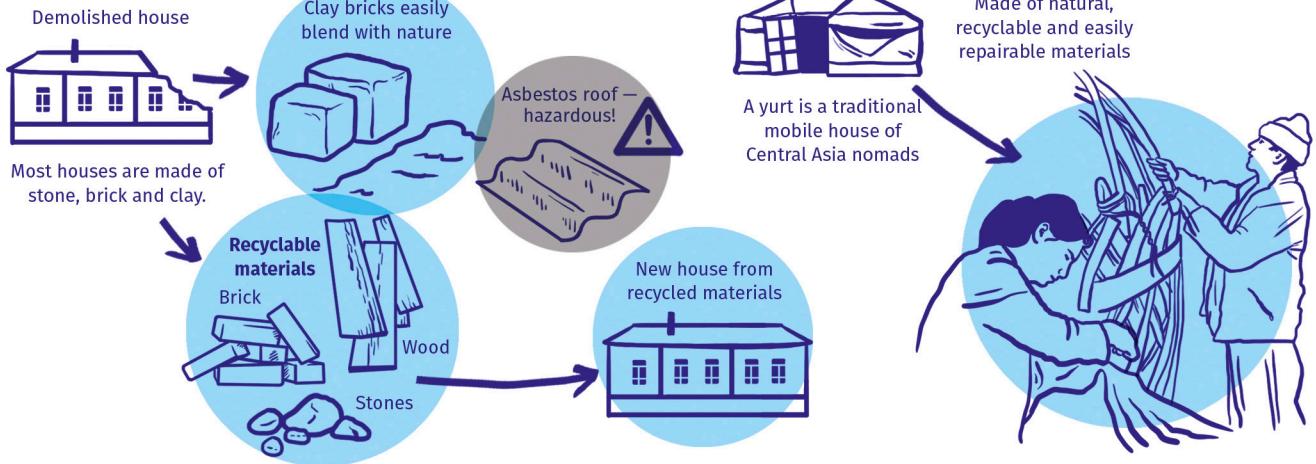
TABLE 15. Recycling and appropriate disposal of construction waste in Central Asia cities

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ○ ○ ○ ○	● ● ● ○ ○	● ● ● ● ○
Kyrgyzstan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○
Tajikistan	● ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○
Turkmenistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○
Uzbekistan	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○

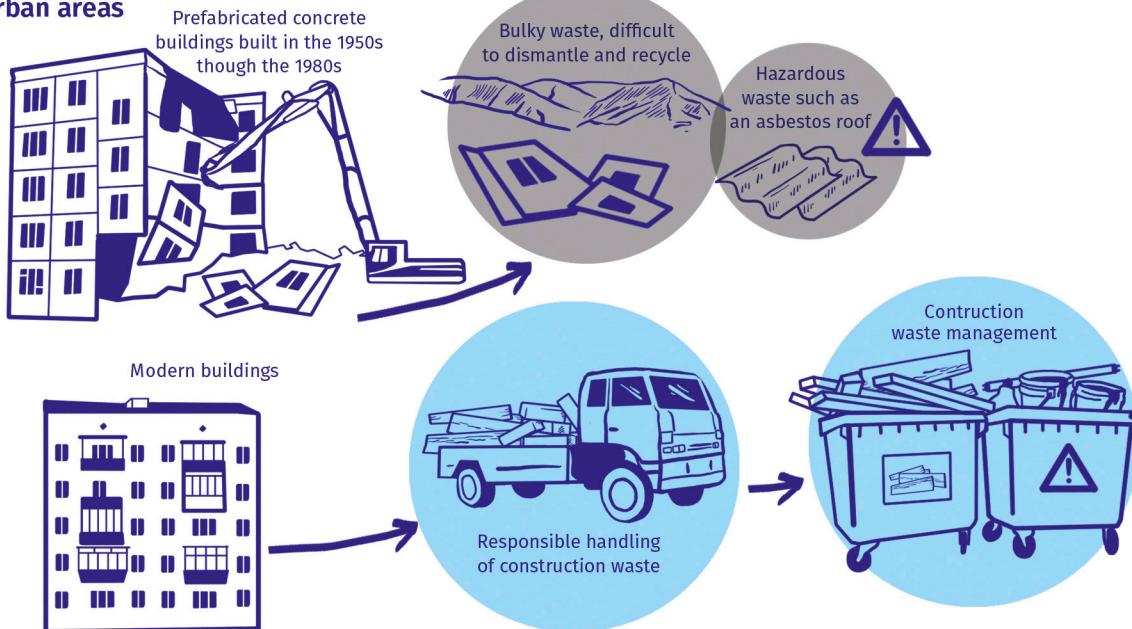
Construction and demolition waste

Most rural houses in Central Asia use local materials, and yurts are fully recyclable and reusable. Construction and demolition waste in urban areas contains hazardous and bulky materials.

Rural areas



Urban areas



Transportation waste

The number of cars in Central Asia is steadily growing, and so is the amount of waste from motor vehicles. Used tires are a serious problem. Tires can leach toxic substances in landfills, and when burned, they release harmful substances and fine particles. Tires are reused on sports grounds and to strengthen riverbanks. Outside of Kazakhstan, Central Asia has no full-scale systems for recycling old machines, lead-acid batteries, used oils, brake fluid and antifreeze. Uzbekistan has a well developed car manufacturing capacity and is contemplating introduction of domestic waste recycling schemes and technologies for the transport sector and offering car recycling to its key export and trade partners, particularly Russia.

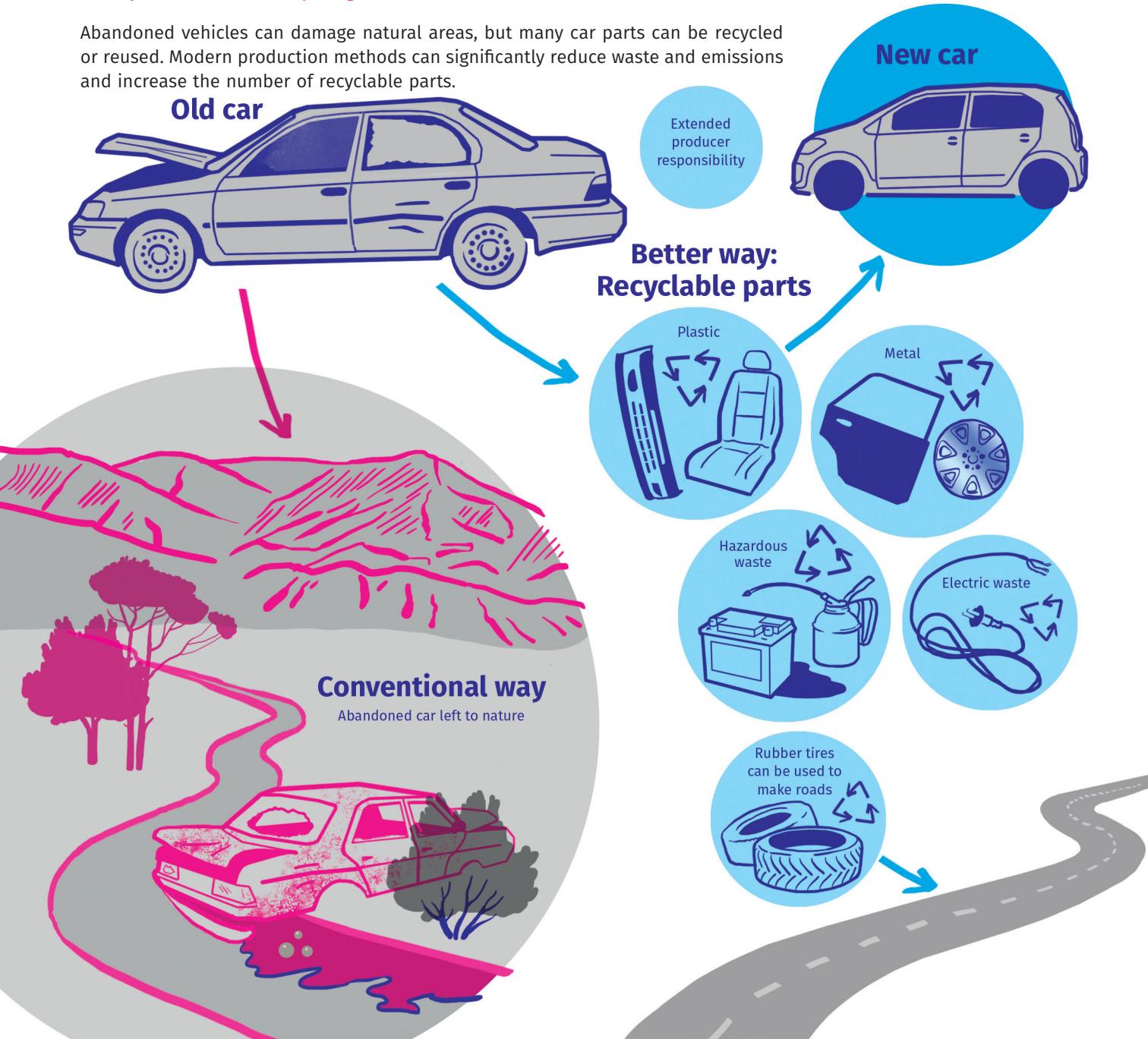
From 2000 to 2017, the number of vehicles in Kazakhstan increased by 350 per cent from 1.3 million to almost 5 million cars, with more than half of them older than 10 years. At 250 cars per 1 000 persons, Kazakhstan displays the highest level of motorization in Central Asia today. In 2016, in the first year of active service, the national extended produced responsibility operator, Operator ROP, collected 5 665 vehicles with an average age of 25-30 years, mostly Soviet-made cars, 18 000 tonnes of used tires, 14 000 tonnes of lead accumulators and 6 000 tonnes of waste oil and lubricants that will be recycled. With the launch of recycling plant in 2017, about 50 000 cars could be recycled each year.

TABLE 16. Recycling and appropriate disposal of transportation waste

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ○ ○ ○ ○ ○	● ● ● ○ ○	● ● ● ● ○
Kyrgyzstan	○ ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Tajikistan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Turkmenistan	● ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○
Uzbekistan	● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○	● ● ● ○ ○ ○

Transport waste and recycling

Abandoned vehicles can damage natural areas, but many car parts can be recycled or reused. Modern production methods can significantly reduce waste and emissions and increase the number of recyclable parts.



Electronic Waste

The quantity of electronic waste and electrical and electronic products with a finite service life is growing rapidly all over the world. Central Asia is no exception: over the past decade, the number of users of computers and mobile phones in the region has risen sharply.

The composition of electronic waste can be hazardous to the environment and human health. Lamps containing mercury, batteries containing cadmium and lead, and the development of nanotechnology all require close attention to protect human health and the environment.

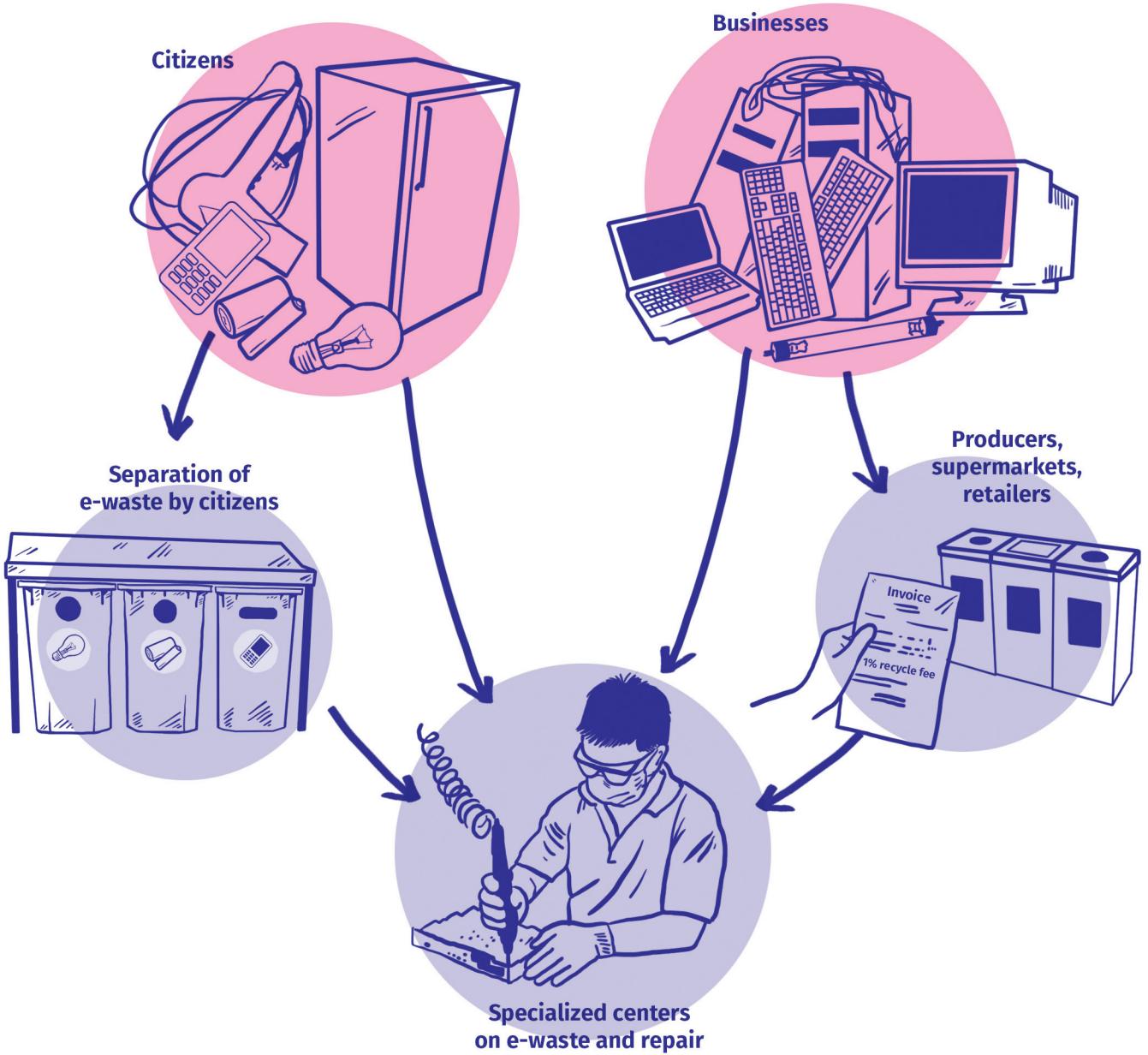
In Central Asia, the separate collection of lamps and batteries has not yet been developed, and awareness of the problems arising from the careless handling of electronic waste is lacking. In Kazakhstan and Uzbekistan, the capacities and coverage for removing mercury from mercury-containing lamps is expanding, and Tajikistan is planning to do more in this regard. In Kazakhstan, the systems for the return and disposal of used electric equipment and waste are becoming more open and accessible to the population.

TABLE 17. Collection and recycling of electronic waste in Central Asia

	← Recent past 1995-2000	Present 2014-2017	Outlook 2025-2030 →
Kazakhstan	● ○ ○ ○ ○	● ● ● ○ ○	● ● ● ● ○
Kyrgyzstan	○ ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○
Tajikistan*	○ ○ ○ ○ ○	● ● ○ ○ ○	● ● ○ ○ ○
Turkmenistan	○ ○ ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○
Uzbekistan*	● ○ ○ ○ ○	● ● ○ ○ ○	● ● ● ○ ○

* Mostly mercury-containing lamps

E-waste



5. The way forward

The management of municipal waste and the maintenance of sanitation, along with the supply of drinking water and energy, public transport and communications, are the most important services for modern society, especially in cities. The need to live in a healthy environment is almost the same as the need for food and shelter. Therefore, proper waste management is both a contribution to the protection of public health and to the protection of the environment. This does not mean that all attention should be directed to the collection and disposal of waste, because the best way to manage waste is to treat it as a resource and minimize it in the first place.

Waste management professionals and authorities in the countries of Central Asia have made significant progress in solving the problem of municipal waste. In many cities, garbage collection and sanitation systems have visibly improved, and more waste is recycled and reused despite of the ever-increasing amounts and diversity of municipal solid waste. Through their own efforts and with international support, the countries have managed to solve some of the problems associated with hazardous and legacy waste.

But in some remote areas of Central Asia, hazardous waste inherited after the collapse of the USSR is still a

problem. The processing of waste mainly involves businesses or informal collectors using artisanal methods, and no systemic sorting of waste is practiced. Most municipal waste, like in years past, goes to landfills that do not meet modern standards, and in some cases are illegal or unofficial. Large amounts of waste from tourism often accumulate in the frequently visited mountains, glaciers and along the banks of rivers and lakes. The region does not have a well-developed ecological culture, and public awareness of waste issues remains low.

Municipalities and local authorities often are the owners of the land and are responsible for the legacy of contaminated sites, for operating landfills and for waste collection. In many cases, they are determined to improve waste management practices, but often lack the funding, knowledge, technology and effective local strategies to meet national targets and comply with regulations.

National and local authorities, the private sector, ordinary citizens, and public and international organizations can contribute to the solution of the pressing waste problem in Central Asia. UN Environment and other partners will try to help in the preparation and implementation of strategies and the implementation of measures at various levels.

Solutions: Who

Tackling waste challenge requires concerted or, at least, synergistic efforts by various actors at different levels from international and regional players and institutions, to national and local governments, NGOs and citizens as well as the private sector and the waste industry.

International and regional actors and networks

- Promoting the environmentally sound management of hazardous wastes in the region by providing technical and financial support for the implementation of the Basel Convention
- Supporting the network of organizations working in municipal solid waste, including regional partnership on municipal waste streams (plastic, tires, e-waste) that often cross national borders
- Promoting an exchange of information, business links and experience exchange for competent authorities and recyclers in the region to increase the capacity, knowledge of technologies and economies of scale for recycling
- Supporting efforts to mobilize resources to address historical pollution sites and legacy hazardous waste sites, including the rehabilitation of obsolete pesticide dumps and former Soviet uranium mining sites and tailings
- Enabling access to international waste expertise and strengthening institutional capacity through ISWA, UN Environment's International Science and Technology Center, and UNEP's special programme on waste and chemicals
- Supporting the waste management priority of the Interstate Commission Sustainable Development Commission (ISDC) of the International Fund for Saving the

Aral Sea (IFAS) of Central Asia (CA) by strengthening the institutional capacity, using comparable waste indicators for data exchange and maintaining a regional inventory of major waste sites

- Welcoming the participation of interested partners in EXPO-2017 in Astana, and in other important regional forums, such as the Green Energy and Waste Recycling forum, to discuss waste problems and green technologies
- Translating global assessments and methodologies on waste management into Russian so that more potential users can read and apply this information

Activities at the regional level are designed to address regional experience exchange, improve the access of the Central Asia region to global information and modern knowledge, develop waste partnerships for economies of scale, and foster clean-up efforts where national funds or expertise or isolated actions are not sufficient.

National institutions

- Improving waste management laws and regulations based on continuous feedback and interaction with stakeholders for greater effectiveness, efficiency and compliance
- Developing and gradually updating waste standards and incentives, and strengthening waste management departments and institutional capacities in order to implement national policy more effectively and involve the private sector in waste management
- Developing and revising long-term waste management strategies and roadmaps with clear targets and realistic consideration of state financing, extra-budgetary sources and public-private partnerships
- Creating and strengthening mechanisms for inter-institutional coordination on waste management

- Attracting domestic and foreign investments, including grants, loans and technical assistance in clean up of historical pollution and modernization of outdated or ineffective waste management practices
- Applying consistent and reliable methods related to data and information on waste, with continuous improvements in waste statistics and monitoring
- Producing and updating inventories on municipal and industrial wastes, mapping historical pollution and improving openness, accessibility, and completeness of national waste information
- Preparing briefings for decision makers and themed reports on waste, and promoting knowledge and awareness of municipal and hazardous waste issues in school programmes and through the mass media

Clear waste targets, long-term strategies, and modern but not too burdensome legislation supported by adequate institutional capacities are all important factors for successful waste management at the national level. In addition, in the conditions of Central Asia, access to financing is often decided at the national level, while the success of many waste projects depends on awareness among the public, businesses and politicians about waste issues across sectors.

Municipalities and local authorities

- In cooperation with central authorities, the private sector and international investors, carrying out practical work to improve and modernize landfills to a sanitary level (or compliance with modern standards), to improve collection rate of payments and the depth of waste tariffs
- Rehabilitating and closing illegal landfills and contaminated sites
- Raising public awareness of the risks posed by existing and abandoned facilities with hazardous waste and chemicals, improving control measures and restricting access to these facilities

- Working on the ecological image of municipalities, organizing public local clean up actions, promoting local ecological products and goods made from recyclables

The share of expenses on municipal waste collection and removal accounts for about 90 per cent of total waste tariffs in developing countries with relatively low income, where wastes are disposed of in open landfills that do not meet modern standards. A similar situation is observed in many cities of Central Asia. Local measures to improve waste management should be aimed at expanding the coverage of waste collection, the gradual closure of uncontrolled landfills, investments in improving environmental standards and increasing the separation and processing of municipal waste.

The rate of waste payments collection is rarely 100 per cent. A good estimate is 90 per cent with a minimum delay in payment. The mechanism for collection of waste payments must correspond to local approaches and culture. In some cases it is better to manage waste payment as a direct fee for waste services, and in other cases it can be part of utility bills. Some cities may integrate waste fees into a city tax or charge per waste bag or weigh-volume. Local authorities have the important task of balancing the recovery of waste management costs with the affordability of waste tariffs for the population. Taking into account that more foreign and private investments are going to waste management, financial stability and ability to repay loans and make the business profitable are essential conditions. At the same time, payments for sound waste management should not exceed one per cent of the household income in a given locality.

The costs associated with the remediation of environmental damage often fall on the shoulders of local authorities and society, while the existing mechanisms for allocating funds generated by waste payments or through pollution fines are not fully returned to local budgets or are not assigned to

the budget lines for environment remediation. The issues of creating the rehabilitation funds and the distribution of payments in connection with the activities of mining and other industries are addressed in different ways and do not always guarantee the restoring the environment. Further elaboration on the optimal financial flows and funding schemes related to minimizing and eliminating the consequences of environmental impacts is a major task. In addition, the system of payments for waste should be built in such a way that waste minimization and recycling is more profitable than payments for waste disposal in landfills.

The private sector

The private sector, being both a waste producer and a key partner in collection, processing and reuse can implement innovative technologies and approaches in waste management, and can develop cooperation and dialogue with authorities to create successful models of public-private partnerships. The private sector in Central Asia has sufficient experience and can achieve even greater results with the following:

- Product life cycle assessment focused on reducing the volume of production waste and the use of hazardous substances
- Introduction of repair services and recovery options for waste reuse or recycling
- Introduction of modern systems of environmental management and certification for more sound use of resources and for the reduction of ecological footprint
- Support for local and national authorities in the implementation of specific cleanup projects, as well as cooperation with residents on this issue
- Increases in the level of industrial and chemical safety of storage facilities or final disposal of wastes, including emergency preparedness and consideration of the possible consequences of climate change (especially for the coastal zones and high mountains)

Considering that informal waste collection, sorting and processing in some locations in Central Asian are significant, further assessment of this sector and more complete integration of informal waste collectors and small enterprises into the formal waste management system can help achieve environmental and health objectives.

Civil society and public organizations

Civil society and public organizations are important stakeholders who often come up with initiatives that can influence policy at different levels, and whose goodwill is decisive in the success of local and national waste strategies. In addition, the environmental culture and the choice of products by consumers can seriously affect the choices of producers and the waste management market.

The possible actions of public organizations and initiative groups of citizens include:

- Disseminating information on the risks associated with hazardous waste to the local population, especially the younger generation
- Organizing clean-up activities, if possible in cooperation with local authorities and businesses
- Conducting campaigns, competitions and demonstrations on sorting and proper handling of different types of waste, and developing skills for waste minimization
- Assisting central and local authorities in identifying and documenting illegal waste dumps
- Developing pilot projects and initiatives on new directions – the utilization of electronic waste, the rapid assessment of the toxicity of toys and other items and assistance in collecting waste paper and other recyclables
- Promotion and advocacy for environmentally friendly local products and packaging and other measures aimed at consuming the most environmentally friendly products

Solutions: What

Infrastructure is essential to the development of an effective, sustainable waste management system, as are tariffs and incentives for waste collection, sorting, transportation, processing, reuse and disposal. In addition, the system's success depends on how well it responds to the needs of the populations and sectors it serves. A key message from the global and regional waste outlooks is that there is no "one size fits all" solution – each local situation is different, and each solution needs to be tailored to the specific social, cultural and political context.

The general priority order of the waste hierarchy is prevention; reuse and reduce hazardous and other waste to a minimum; recycling; and final disposal. Assessing the current regional waste situation with an outlook for 2025-2030, the following solutions emerge as priorities, not as sequential steps, but as the set of waste management solutions to the problems facing the region. One cannot afford to wait until one problem is solved before beginning to address the next. However, it is not possible to do everything and reach high standards at once, particularly when resources are limited.

Providing a regular and reliable waste collection service to all residents is a public health priority. Uncontrolled waste dumping and open burning need to be eliminated. A waste generator will choose the cheapest and simplest available disposal options. In the absence of effective waste awareness, regulations, facilities and financing that often means, for household waste, dumping it on vacant grounds, into ravines or watercourses; or burning it to "reduce" the perceived nuisance of accumulated piles of waste.

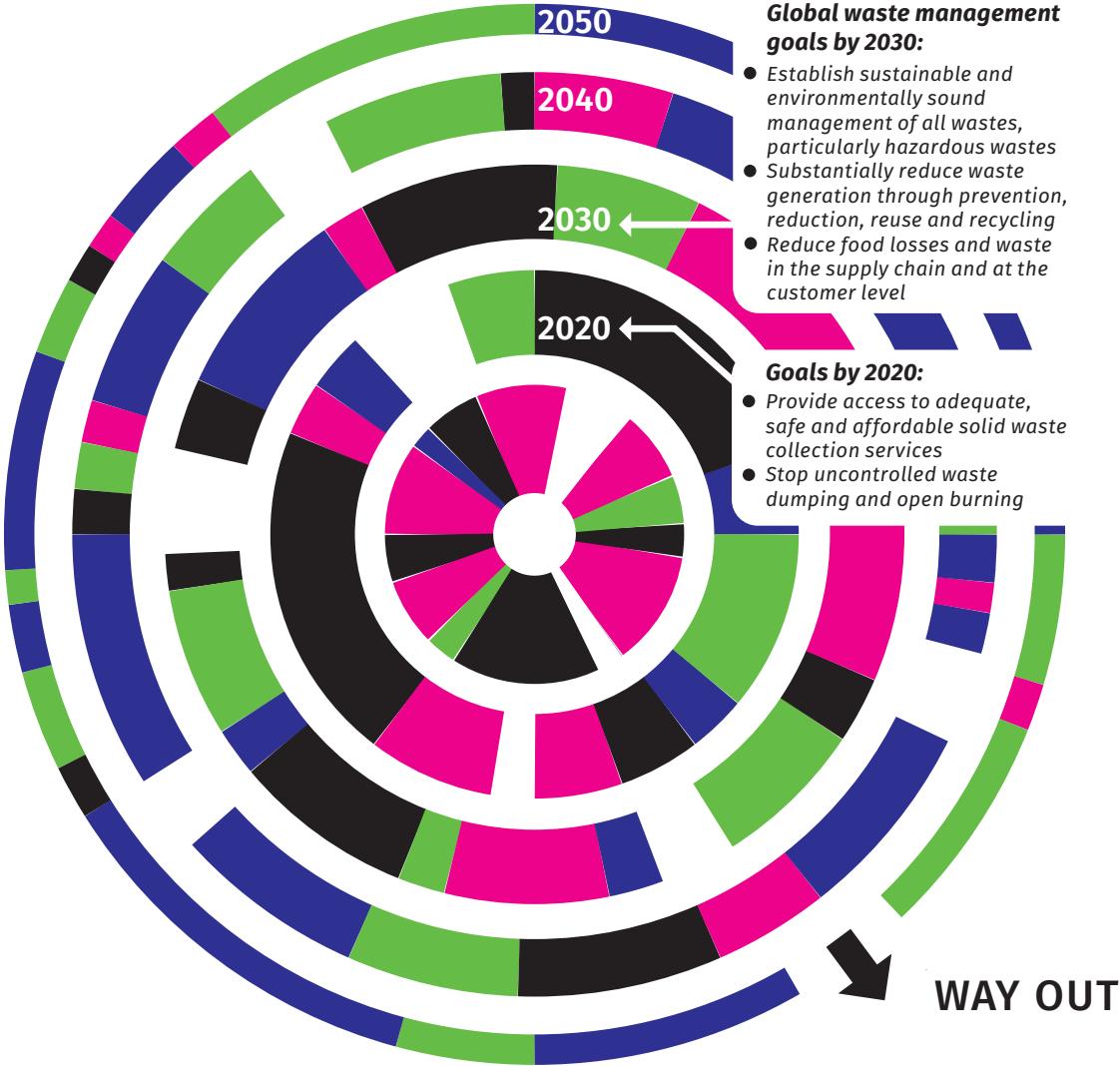
Waste needs to be properly managed in order to protect public health and the environment. But that does not imply an exclusive focus on waste collection and disposal: the best way to manage waste is as a resource, and

by avoiding materials becoming waste in the first place. Recycling is part of all natural processes, and re-establishing this for waste is a key element. The recent experience of Central Asia countries show that it is useful to distinguish between dry recyclables (metals, glass, paper, plastics) and wet organics. Organics, which in some areas account for more than half of all household waste, may return to the agricultural value chain as either animal feed or soil compost and the overall amount of waste can be greatly reduced if recycling, along with waste prevention, is effectively implemented. Key factors in determining the feasibility of recycling are the amount and quality (purity) of collected materials, so keeping materials clean and separate is essential to success.

Preventing the mixing of hazardous and non-hazardous waste and improving the control of hazardous waste streams are also important tasks. The cost of reclamation of hazardous waste sites and historical pollution caused by mining, the military or agriculture can be prohibitive. Countries of Central Asia on their own and with the technical assistance from donors have conducted environment risk assessments of many of these sites, and have put some of the sites in a safe state. Notwithstanding the progress made, there is still much to be done to ensure remediation of the remaining sites. The next steps should include mobilizing resources to implement better control measures, to eliminate pollution, and to build modern temporary or final hazardous waste storage facilities. Many products in daily use as well as from healthcare contain hazardous materials – mercury-containing batteries, lamps and other e-waste, sharp articles and expired medicines, asbestos roofs, solvents. These should ideally be segregated at the source, collected separately and managed within the hazardous waste streams. This long-term task requires good awareness, appropriate facilities and well-developed partnerships and coordination.

Relying just on increasing recycling and on more environmentally sound disposal methods to cope with rapidly increasing waste may put a strain on institutions and budgets. Therefore, developing effective practices for waste prevention is becoming an emerging priority. A life cycle approach suggests that the focus of waste management should shift upstream, aiming to tackle the problem at the top of the waste hierarchy and through sustainable consumption and production. This approach includes designing out waste to prevent its generation; reducing both quantities and the use of hazardous substances; repairing, reusing and other logistics for end-of-life products. Prevention and reduction of food losses and waste should become an integral part of wider efforts on food security and the reduction of greenhouse gas emissions. Biomass, including agricultural crop residues and other organic waste, is one of the renewable energy sources considered in Central Asia as part of a green economy transition.

Waste solutions



Reduce and ultimately stop uncontrolled waste dumping and burning

Stop the open burning of waste

Expand the system of affordable waste collection and removal services for all, or at least the densely populated areas of countries, including the countryside

Identify and close unofficial and illegal open waste dumps, and replace uncontrolled open dumps with controlled waste facilities

To the extent possible, build new or upgrade existing landfills to modern standards with the possibility of final sorting and the processing of waste and energy recovery

Bring hazardous waste under control

Separate the potentially hazardous waste from non-hazardous at the source to minimize contamination and facilitate reuse and recycling

Better regulate and control the flows of hazardous waste, emissions and effluents in mining, industry, healthcare, agriculture, construction and other economic activities

Secure budgetary financing and extra-budgetary contributions for remediation of the remaining historical pollution and hazardous waste legacy sites

Consider the possible impacts of natural disasters and the effects of climate change on the long-term stability and safety of facilities containing hazardous waste

Focus on waste prevention and introduce other principles of a green economy

Significantly increase the rate of the processing of production and consumption waste, and maximize repair, reuse and remanufacture

Design and implement technologies and products that generate little or no waste and promote packaging and materials that contain the minimum of hazardous substances

Develop taxation, procurement and other incentives that support a green economy

Develop environmentally sound opportunities to recover energy from waste and cut greenhouse gas emissions from municipal waste landfills and agricultural waste

Implement systematic segregated collection and recycling of waste

Improve waste tariffs and public awareness in order to maintain affordable and quality waste services, and make the waste separation and recycling attractive for citizens and business

Introduce financial mechanisms and incentives, including extended producer responsibility, to increase the attractiveness of recycling

Introduce a combination of multi-stream and simplified (dry waste and wet organics) systems for segregated collection and subsequent processing, and maximize recycling

Promote local markets for compost, and national and regional markets for glass, plastic, paper and rubber

Solutions: How

The success of many of the proposed waste solutions rests on the prospects for changes in thinking and behaviour, and the development of a sense of responsibility for the environment to the extent that people put their waste into the proper management system. For waste generators it starts with proper handling and sorting of waste and presenting it for collection in waste containers or dedicated sites, rather than open dumping on the streets, in waterways or on nearby vacant land. For people it means placing waste in a bin rather than dropping litter on the street. For product manufacturers and supply chains it is zero-waste production, reduction of waste during a product's life cycle and facilitating product recycling. For consumers, it is making choices on what to purchase taking into account the ecological footprint and durability of a product and deciding whether to reuse or repair. It is critical for the success of a waste management system that all the relevant stakeholders are fully on board. Initiatives to change behaviour can be led by governments, local authorities, non-governmental organizations and active citizen groups and volunteers.

A useful model for interventions to achieve behaviour change combines four action areas:

1. **Enable** – make it easy for people to practice the behaviour required to achieve the goals, e.g., by making available information and clear instructions together with the facilities
2. **Engage** – get people involved, e.g., through public awareness and community participation
3. **Encourage** – give the right signals, e.g., through incentives to make the behaviour attractive financially or in some other way and penalties for non-compliance
4. **Exemplify** – lead by example, e.g., through pilot projects to show how the behaviour can be changed and the benefits it brings; and through government institutions being seen achieving the goals in the management of their own waste

Developing partnerships has many advantages in municipal solid waste management. The involvement of the private sector may include better access to financing, lower costs for services and greater experience in technologies. Similarly, involving the local community and small-scale entrepreneurs can be advantageous for social inclusion. There is not a universal answer, and even within the same city, it is common to find several different models for providing different aspects of the overall waste services. But where public-private partnerships are used, it is important that cities develop the capacity – both technical and managerial – to develop, tender, manage and supervise the contracts. The international players are also important partners for improving waste management. Although responsibility rests with national and local authorities, technical assistance or technology transfer can be provided when requested.

Waste governance starts from strategic goals and guiding principles. Improved access to waste services, waste prevention and recycling rates and environmentally sound management and disposal are all important goals to be considered. Waste management planning requires a long time horizon – it is essential to ensure continuity of actions and a collegiate approach with other relevant sectors and ministries, to assign responsibilities clearly and to spend time creating effective partnerships.

Environmentally sound waste management exists as a result of proactive policies actively implemented and enforced by strong institutions. Experience has shown that effective waste management systems use multiple types of policy instruments in a coherent and balanced mix. Thus direct regulation is complemented by both economic and financial instruments, providing incentives and disincentives for specific waste practices; and social instruments, based on communication and interaction with stakeholders.

The policy and institutional system needs to evolve with, and for, the local situation and get rooted and supported under the local circumstances. This is a long-haul learning process that takes effort and commitment, and requires resources, expertise and capacities. Technological solutions need to support the goals and match the local situation. Function, purpose, track record and real costs of various technologies need to be explored first.

A combination of legislation and credible, consistent enforcement provides the basis for implementation of the basic waste management principles and hierarchy. They define the concepts, set standards for the performance of facilities and operations, establish targets, and set forth sanctions in cases of non-compliance and violation. Direct regulations need to allocate responsibilities clearly among stakeholders. It is particularly important that each government authority has clear responsibilities and duties and that overlaps among them are avoided. Direct regulation has often been introduced in stages with progressively more stringent standards so that the actors in the system develop expertise and raise necessary financial resources. Stable yet flexible legislation and strategies increase the overall efficiency of waste actions and allow enterprises to plan long-term investments.

New and modern legislation and strategies often focus on raising the standards of the infrastructure and the practices for waste handling – perhaps replacing uncontrolled disposal with controlled facilities and strengthening the waste standards and recycling rates. This may raise an implementation conundrum – waste generators or service providers cannot comply with the new legislation and raise the finance to invest in new facilities until they have the regulatory certainty or subsidies. Unfortunately, Central Asia have a history of new expensive facilities (waste processing plants) going out of business or

showing low efficiency because waste generators were still able to use cheaper facilities or methods of disposal, or when the waste management systems were not well adapted to new technologies and partnerships were weak and incentives missing. Paying due attention to the entire waste management chain, finances and regulations is critical; it is important to allow time for new instruments, technologies and strategies to be implemented, and to carefully consider all lessons learned.

By its nature, waste management is relevant to a number of agencies. Environmental agencies usually have the central role. Institutional capacities to prepare laws and regulations and, particularly, to enforce them, are of paramount importance. For effectiveness and credibility, it is better to keep separate the two roles of policymaking and enforcement. Waste management works best if the institutional functions for air and water pollution control and waste management are integrated. The increasing emphasis on waste prevention necessarily draws in an even wider range of affected industries and ministries. These include the extractive industry, manufacturing, healthcare, agriculture and other sectors. It is important that each agency bears responsibility for the management of specific waste types or streams and has sufficient authority and capacity for effective enforcement and coordination.

Economic instruments steer stakeholder behaviour and practices through market-based incentives and disincentives. Taxes on landfilling and waste disposal without any segregation could be imposed to discourage this method and practice; fiscal benefits and tariffs are used to encourage private and international investments in solid waste management. Extended producer responsibility will hold producers, importers and others in the supply chain accountable for products placed on the local market at the end of the product's life.

Goal setting, evaluation of the effectiveness of waste policies and measures, and the choice of technologies rely strongly on information and data on waste. Understanding the current state and dynamics is important for understanding the waste management bottlenecks, finding solutions and measuring performance. How is the implementation going? Is the legislation working and is it being enforced? Is the situation manageable for all the actors? Who is involved? How? What are the interactions, what works well and what does not? Are there barriers and limiting factors?

During preparation of the Central Asia waste outlook it was noted that the available data are often contradictory, unreliable and at times obsolete. Several major landfills in the region measure waste by weight, but most operators use waste volume metrics. Conversions between weight and volume employ various methods and factors. Sometimes the data do not distinguish between waste generation, collection, delivery to the landfill or final disposal, and do not specify whether the waste was segregated. Many aspects of waste management are not taken into account or impossible to cover in the official statistics, for example, uncontrolled open dumping or informal sector. Data on waste composition is often uncertain or selective.

Continuous improvements of the waste information system and waste statistics are important steps for the entire region. These steps should consider social instruments that focus on communications, raising the awareness of the public and businesses, and encouraging the active participation of communities and stakeholders. The aim goes beyond just providing information to promoting active engagement and leading by example on an ongoing basis, as behaviour change takes time. Information on waste should be credible, easily understandable and regular, and first of all it should be relevant to the daily activities and concerns of people. Otherwise, this information will easily be lost in the numerous information streams.

Waste solutions

Information for public awareness and decision-making

- Monitor waste composition and use weighbridges to measure waste quantities
- Measure waste prevention and recycling by sector and waste stream
- Develop fit-for-purpose data collection to allow sound strategic planning
- Improve the completeness, reliability and availability of waste statistics and information
- Be transparent – make waste and pollution data available online
- Benchmark performance of solid waste management systems using available indicators and highlight areas for improvement

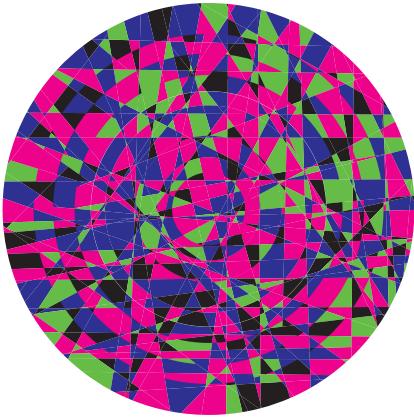
Partnerships

- Invest in dialogue, education, communication and collaboration
- Work with manufacturers to move toward a circular economy
- Build stakeholder engagement into waste prevention and minimization
- Establish mutually beneficial partnerships to deliver effective and sustainable waste services
- Include communities and informal sectors in an integrated waste system
- Strengthen commitment to waste management goals, solutions and continuity of actions



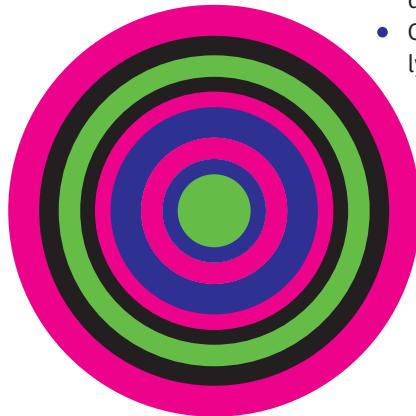
Proactive policies and sound institutions

- Develop a long-term waste management strategy to provide a stable framework for investment in waste infrastructure and recycling
- Enact national waste legislation that reflects modern realities and implements regulations in stages
- Develop policy instruments, legislation and economic and social instruments
- Specify institutional responsibilities and duties that avoid gaps and overlaps
- Provide waste departments with the appropriate level of authority to enforce the regulations in a consistent and effective manner



Economic incentives and tools

- Know costs and revenues of the waste management
- Find the appropriate financing model and sources of funding for investment
- Price waste collection and disposal to provide incentives to reduce, reuse and recycle Increase cost recovery gradually while supporting those who cannot afford to pay
- Charge large waste generators the full cost of sound management of their waste
- Provide large waste generators with incentives to reduce, reuse or recycle waste
- Consider extended producer responsibility, particularly in transport, electronics and packaging



Youth and women have a significant role to play in the implementation of waste solutions, information dissemination and awareness. The change in behaviour, habits and the formation of skills on proper waste handling is relatively easy to achieve among children and young people. It is important to ensure that women and men are involved in decision-making related to waste solutions at both local and national levels.

This report concludes with an illustration of sources and types of biodegradable waste and how different actors can address it in sophisticated and simple ways. Biodegradable waste is the most common type of solid waste in rural and urban residential areas of Central Asia and in many developing regions. Such waste includes leaves, cotton stalks and other vegetative matter from farm or garden; kitchen leftovers and table scraps; or spoiled fruits and vegetables from bazaars and farmers markets. Currently, a significant proportion of biodegradable waste is mixed with other types of waste and sent to landfills or openly burned. Once the waste is mixed, it can no longer be reused or recycled easily or cost-effectively, so segregating the waste at the source is the preferred strategy. If waste is burned in open conditions, it results in air pollution and health risk.

Many kinds of biodegradable waste can still be used as food. One person's stale bread may be part of another person's survival strategy, and many charitable organizations salvage unwanted food for distribution to those

in need. Food waste that is unfit for human consumption may be suitable as feed for pets or livestock. And cooking oils past their usefulness in food preparation, along with other biodegradable waste, may contribute to the energy supply as biofuels.

In addition to these strategies, composting is always an option. This low-technology tradition is a simple and elegant way to turn fruit and vegetable peelings, grass clippings and fallen leaves into a natural soil amendment. Family compost bins have been in use for ages, and in the modern era, composting is more and more often employed in schools, businesses and neighbourhoods.

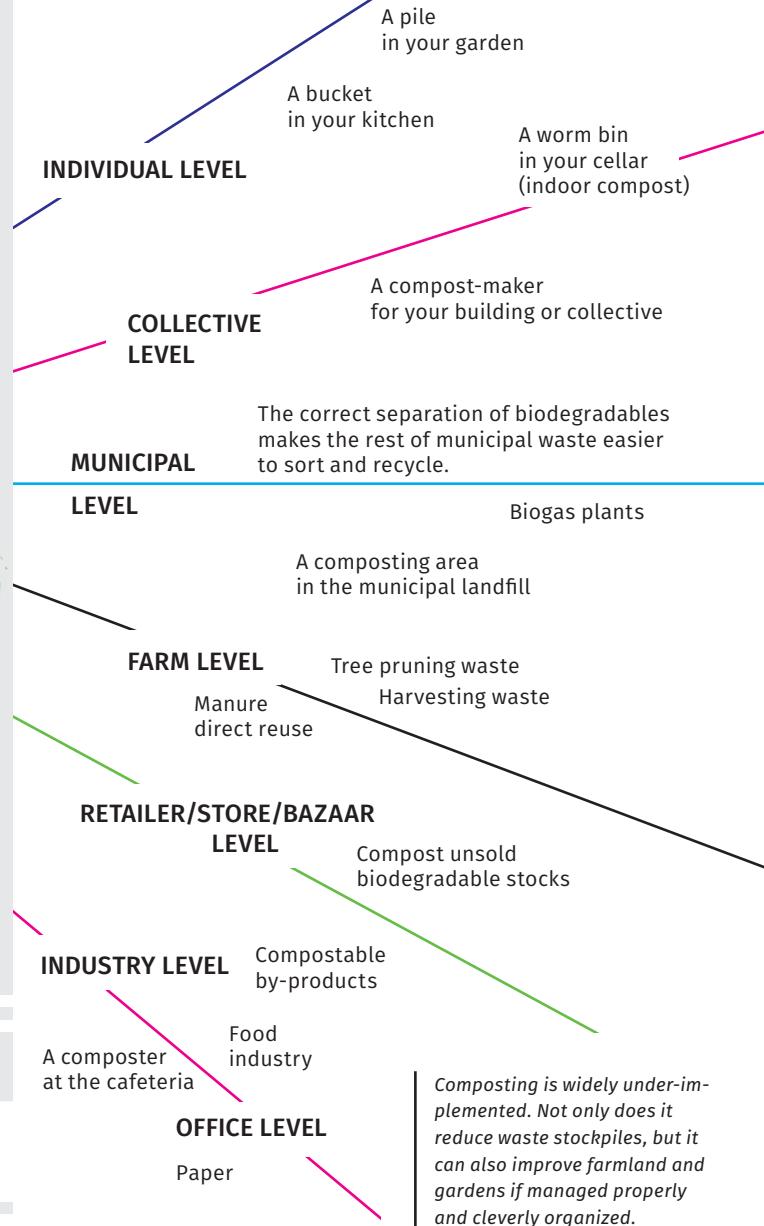
Individuals, municipalities, businesses and national governments can take various actions to tackle the waste challenge if they have information, incentives and suitable infrastructure, guided by regulations, economic opportunities and motivation to make their area and, perhaps, the rest of the world cleaner, healthier and better.

Biodegradable waste

What's easily degraded



The many possible scales



Abbreviations

ADB	Asian Development Bank
AFD	Agence française de développement
CA	Central Asia
CSO	Civil Society Organization
EBRD	European Bank for Reconstruction and Development
EPR	Extended Producer Responsibility
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GPS	Global positioning system
ICSD	Interstate Commission for Sustainable Development
IFAS	International Fund for Saving the Aral Sea
IFCA	European Union Investment Facility for Central Asia
ISWA	International Solid Waste Association
ISWM	Integrated Sustainable Waste Management
NGO	Non-governmental organization
PCB	Polychlorinated biphenyl
PET	Polyethylene terephthalate
POP	Persistent Organic Pollutant
SDC	Swiss Agency for Development and Cooperation
SECO	Swiss State Secretariat for Economic Affairs
UNEP	United Nations Environment Programme

Photo credits

Cover photo: plastic pollution in Kyrgyzstan, Elena Kreuzberg, p. 18 Elena Kreuzberg, p. 19 top
Ikrom Mamadov, p. 19 bottom Zoi Environment Network, p. 50 Kazakhstan Waste Association,
p. 51 Elena Kreuzberg, p. 59 Kanybek Isabaev, p. 63 top Kyrgyz Union of Photojournalists,
p. 63 bottom Zoi Environment Network

Comments and notes

1. The data for Kazakhstan are mainly taken from the national reports on the state of the environment and use of natural resources (dated 2014 and 2015) and the national ecological statistics. More detailed information on Kazakhstan and other countries of Central Asia is available in the background information document prepared as part of the outlook (in Russian).
2. The State Agency for Environmental Protection and Forestry under the Government of the Kyrgyz Republic is not responsible for country data presented in the outlook. Data on radioactive (legacy) and industrial waste in Kyrgyzstan is based on information of the State cadastre of mining waste in the Kyrgyz Republic, official assessments on hazardous processes and phenomena in the Kyrgyz Republic published by the Ministry of Emergency Situations and studies by the Kyrgyz-Russian Slavic University. Additional information on industrial and municipal solid waste is sourced from national (ecological) statistics of the Kyrgyz Republic.
3. Due to lack of reliable data on the amount in tonnes of the collected municipal solid waste except for Dushanbe and Khujand cities, the conversion from volume to weight applies a factor of 250-300 kg/m³. Considering the reported volume of waste collection at 2 million m³ per year, the amount of this waste is estimated at 0.6 million tonnes. In view of incomplete waste collection coverage and limitations in statistical data, experts estimate that the amount of solid municipal waste generation may be 1 to 2 million tonnes per year.
4. Waste definitions in the legislation of Central Asian countries have both common features and differences. In Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, solid household waste (municipal solid waste) refers to consumption wastes from the population. In Kazakhstan, solid household waste is a part of municipal waste – i.e., waste generated in populated areas as a result of human activities as well as production waste, similar in composition and origin. Calculation of the generation of the solid waste in Central Asia is carried out in various ways with varying degrees of coverage, so making comparisons is a difficult task.
5. The Scientific-Information Center of the Interstate Sustainable Development Commission of Central Asia draws readers' attention to the final outcome document of the UN Rio +20 Summit «The Future We Want» (2012) and the Sustainable Development Goals (2015) till 2030, both of which emphasize the priority of developing a “green” economy, the urgency of addressing waste challenges and the need to involve all stakeholders. Regional environmental priority themes include waste management. The Framework Convention for the Protection of the Environment for the Sustainable Development of Central Asia (Article 11) calls for cooperation on national and regional waste inventories, establishment of a network of clean technology centers and measures to reduce the risk of transboundary impact of waste and tailings.
6. Data given in the outlook on solid waste does not consider liquid wastes originating in populated areas,

an estimated 0.5 tonnes per person per year. Simply made, but rather uncomfortable toilets, common in rural areas of Central Asia, cause groundwater pollution and may trigger infectious disease outbreaks when pollutants are washed away into surface water, for example, by floods. The alternative approach of “ecological sanitation”, which has already been tested in some sites in Kazakhstan, separates liquid waste into feces and urine that are treated separately resulting in waste products that can be applied to improve soil fertility.



Clean-up action “Taza Issyk-Kul”, Eco Demi, Kyrgyzstan

References and sources

International online data and sources:

Asian Development Bank (ADB) → <https://www.adb.org>

Basel Convention → www.basel.int

European Bank for Reconstruction and Development (EBRD) → <http://www.ebrd.com>

European Union-Central Asia cooperation on environment, climate change and water → <http://wecoop2.eu/>

Food and Agriculture Organization of the UN (FAO) → <http://www.fao.org/faostat/>

International HCH & Pesticides Association (IHPA) → www.ihpa.info

International Solid Waste Association (ISWA) → <http://www.iswa.org>

Minamata Convention → <http://www.mercuryconvention.org>

Regional Environmental Centre of Central Asia (REC CA) → <http://carececo.org>

Rotterdam Convention (PIC) → www.pic.int

Stockholm Convention (POPs) → www.pops.int

Strategic approach (SAICM) → <http://www.saicm.org>

UN Environment International Environmental Technology Center (IETC) → <http://web.unep.org/ietc/>

UN Environment Special Programme → <http://web.unep.org/chemicalsandwaste/special-programme>

UN Habitat → <https://unhabitat.org/theme/solid-waste/>

United Nations Economic Commission for Europe (UNECE), environmental division → www.unece.org/env/welcome

World Bank (WB) Development Indicators → <http://databank.worldbank.org/data>

Waste Atlas → <http://www.atlas.d-waste.com/>

National institutions, sources and statistics:

Kazakhstan statistics → <http://stat.gov.kz>

Kazakhstan's bulletins and monitoring data compilations on the state of the environment → http://www.kazhydromet.kz/ru/monitor_osreda

Kazakhstan's Extended Producer Responsibility national operator → <https://www.recycle.kz>

Kazakhstan's Ministry of Energy → <http://www.energo.gov.kz>

Kazakhstan's National Report on the State of the Environment in 2015 → <http://doklad.ecogofond.kz/>

Kyrgyzstan statistics → www.stat.kg

Kyrgyzstan's National Report on the State of the Environment, an online version → <http://nd.nature.kg>

Tajikistan statistics → www.stat.tj

Tajikistan's Committee on Environmental Protection → www.hifzitabiat.tj

Tajikistan's State of the Environment Report 2001/2003 → <http://enrin.grida.no/htmls/tadjik/soe2001/eng/>

Tajikistan's Sub-Office of the Scientific Information Centre of the Interstate Sustainable Development Commission under the IFAS of Central Asia → <http://filial-nic-mkur.tj/ru/>

Turkmenistan's State Committee for Environmental Protection and Land Resources → <http://nature.bushluk.com/ru/>

Uzbekistan statistics → <http://www.stat.uz>

Uzbekistan's state priority development directions → <http://strategy.regulation.gov.uz>
Uzbekistan's State Committee on Ecology and Environmental Protection → www.uznature.uz

Selected public organizations, waste associations and companies:

Kazakhstan Center for Sustainable Development (NGO) → <http://csd-center.kz>
Kazakhstan Waste Association → <http://www.kaz-waste.kz>
Kazakhstan's e-waste recycling company "Techno-Resource" → <http://tresurs.kz>
Kazakhstan's glass recycling company "SAF" → <http://www.saf.kz>
Kazakhstan's Green Women (NGO) → www.greenwomen.kz
Kazakhstan's PET recycling company "Vtorpolimer" → <http://vtorpolimer.kz>
Kazakhstan's waste paper recycling company "Kazkagazy" → <http://www.kazakhstankagazy.com>
Kyrgyzstan's "Biom" (NGO) → www.biom.kg
Kyrgyzstan's Independent Ecological Expertise (NGO) → <http://eco-expertise.org>
Kyrgyzstan's "Taza Bishkek" → <http://musor.kg/>
Tajikistan's Foundation for Support of Civil Initiatives (NGO) → <http://www.fsci.tj>
Tajikistan's Little Earth (NGO) → <http://www.leworld.org>
Uzbek environmental information network (NGO) → <http://sreda.uz>

International reports and assessments:

Asian Development Bank (ADB, 2017). Kyrgyzstan Issyk-Kul Sustainable Development Project: <https://www.adb.org/projects/41548-013/main>
Asian Development Bank (ADB, 2017). Uzbekistan Solid Waste Management Improvement Project <https://www.adb.org/projects/45366-004/main>
European Bank for Reconstruction and Development (EBRD, 2012). Concession and PPP laws assessment: <http://www.ebrd.com/downloads/legal/concessions/pppreport.pdf>
European Union FLERMONECA project website → <http://www.naturalresources-centralasia.org/flermoneca/>
FAO's Food losses and waste web-page: <http://www.fao.org/food-loss-and-food-waste/en/>
FAO (2014a). Food losses and waste in Kazakhstan. Country report by S. Shortan: http://www.fao.org/fileadmin/user_upload/Europe/documents/Publications/FLW/FLW_assessment_Kazakhstan.pdf
FAO (2014b). Food losses and waste in Tajikistan. Country report by U. Nabieva: http://www.fao.org/fileadmin/user_upload/Europe/documents/Publications/FLW/FLW_assessment_Tajikistan.pdf
UNEP's Basel Convention, Zoë Environment Network and GRID-Arendal (2012). Vital Waste Graphics 3: <http://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW-EWASTE-PUB-VitalWasteGraphics-3.English.pdf>
United National Environment Programme (UNEP, 2013). Resource efficiency: economics and outlooks for Eastern Europe, the Caucasus and Central Asia: http://www.grid.unep.ch/products/3_Reports/REEO_for_EECCA.pdf
United Nations Environment Programme (UNEP, 2016). Proceedings of the regional workshop on e-waste. Bishkek, 6-8 July, 2016.
United National Environment Programme and International Solid Waste Association (UNEP and ISWA, 2015). Global Waste Management Outlook → www.unep.org
United National Environment Programme, GRID-Arendal and International Solid Waste Association (UNEP, GRID-Arendal and ISWA, 2016). Waste Management Outlook for Mountain Regions → <http://gridarendal-website.s3.amazonaws.com/>

[production/documents/:s_document/6/original/WasteMountains_screen.pdf?1483646246](#)

United Nations Development Programme (UNDP, 2004). Environment and Development Nexus in Kazakhstan: <https://www.thegef.org/sites/default/files/ncsa-documents/2147-22347.pdf>

United Nations Development Programme (UNDP, 2009). Capacity building for improved waste management in Kyrgyzstan. Social survey and research on solid municipal waste management in Bishkek and Osh.

United Nations Development Programme (UNDP, 2011a). Communal services in Kyrgyzstan: Poverty and social impacts assessment. Regallet G., Slay B. (eds).

United Nations Development Programme (UNDP, 2011b). Communal services in Tajikistan: Poverty and social impacts assessment. Lam S., Slay B. (eds).

United Nations Development Programme and Environment and Security Initiative (UNDP and ENVSEC, 2011a). Remediation and relocation of the Min-Kush tailings in Kyrgyzstan. Pre-feasibility study.

United Nations Development Programme and Environment and Security Initiative (UNDP and ENVSEC, 2011b). Remediation of soil and drainage waters and post-remediation control at site No 5 of Charkesar-2 uranium mine, Uzbekistan

United Nations Development Programme and Environment and Security Initiative (UNDP and ENVSEC, 2011c). Remediation of the Taboshar uranium mining waste in Tajikistan. Pre-feasibility study.

United Nations Development Programme and Environment and Security Initiative (UNDP and ENVSEC, 2011d). Strengthening Coordination of Project Formulation and Mobilization of Resources for Sustainable Radioactive Waste Management in Central Asia. Regional Action Plan and Strategy on Resource Mobilisation.

United Nations Development Programme and Environment and Security Initiative (UNDP and ENVSEC, 2011e). Remediation of the Ak-Tuz legacy mining site in Kyrgyzstan. Pre-feasibility study.

United Nations Economic Commission for Europe (UNECE, 2008). The Second Environmental Performance Review of Kazakhstan: <http://www.unece.org/index.php?id=14813>

United Nations Economic Commission for Europe (UNECE, 2009). The Second Environmental Performance Review of Kyrgyzstan: <http://www.unece.org/index.php?id=14802>

United Nations Economic Commission for Europe (UNECE, 2010). The Second Environmental Performance Review of Uzbekistan: http://www.unece.org/publications/environment/epr/epr_uzbekistan.html

United Nations Economic Commission for Europe (UNECE, 2012a). The First Environmental Performance Review of Turkmenistan: <http://www.unece.org/index.php?id=31562>

United Nations Economic Commission for Europe (UNECE, 2012b). The Second Environmental Performance Review of Tajikistan: <https://www.unece.org/index.php?id=31560>

United Nations Economic Commission for Europe (UNECE, 2017). The Third Environmental Performance Review of Tajikistan

United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), United Nations Economic Commission for Europe (UNECE), Organization for Security and Co-operation in Europe (OSCE), Regional Environmental Centre (REC) and North Atlantic Treaty Organization (NATO). 2005. Environment and Security. Transforming Risks into Cooperation. Central Asia. Ferghana - Osh - Khujand area.

United Nations Environment Programme and Interstate Sustainable Development Commission (UNEP and ISDC, 2006). Reports on Priority Ecological Problems in Central Asia: <http://ekh.rrcap.ait.asia/?q=node/2569>

World Bank (2008). Tashkent solid waste management project performance report: <http://documents.worldbank.org/curated/en/430041468131973481/Uzbekistan-Tashkent-Solid-Waste-Management-Project>

World Bank (2011). Kazakhstan's Nura River Clean-Up Project <http://projects.worldbank.org/P059803/nura-river-clean-up-project?lang=en>

World Bank and Kazakhstan's Ministry of environmental protection (2014). Industrial Hazardous Waste Management Strategy for Kazakhstan.

World Bank (2015a). Legal, institutional framework and financial assessment of municipal solid waste management in Kazakhstan

World Bank (2015b). Kazakhstan's hazardous and POPs waste management project: <http://projects.worldbank.org/P114830?lang=en>

Zoi Environment Network (2013). Central Asia Visual Synthesis: Waste and Chemicals: www.zoinet.org

National laws, strategies and reports:

Governments of Uzbekistan, Kazakhstan, Kyrgyz Republic, Tajikistan and Turkmenistan (2001). Regional Environmental Action Plan for Central Asia. Section on Waste Management.

Kazakhstan's Ministry of Environmental Protection (2011). List of abandoned and legacy mining sites, environmentally hazardous industries and waste.

Kazakhstan's Ministry of Environmental Protection and State Enterprise "Information analytical centre on environmental protection" (2010). National Report on the Control of Trans-boundary Movements of Hazardous Waste and Waste Disposal. Shabanova V., Orzalina K. (eds).

Kyrgyz Ministry of Emergency Situations and German Federal Institute for Geosciences (2008). Hydrochemical groundwater monitoring in Maili-Suu. Reduction of hazards posed by uranium tailings. Jung H.G. and Wagner F. (eds).

Kyrgyz State Agency on Environmental Protection and Forestry and UNITAR (2009). Updated National Chemicals Management Profile of the Kyrgyz Republic.

Republic of Kazakhstan, Concept on the Transition to the Green Economy: http://online.zakon.kz/Document/?doc_id=31399596#pos=31;-243 and <http://adilet.zan.kz/rus/docs/P1300000750>

Republic of Kazakhstan, Ecological Code (2007, continuously updated): <http://adilet.zan.kz/rus/docs/K070000212>

Republic of Kazakhstan, Extended Producer Responsibility implementation rules: <http://adilet.zan.kz/rus/docs/P1600000028>

Republic of Kazakhstan (2014), National waste management modernization programme 2014-2050 (cancelled in 2016) <http://adilet.zan.kz/rus/docs/P1400000634>

Republic of Kazakhstan, Waste Classifier: <http://adilet.zan.kz/rus/docs/V070004775>

Tajikistan's National implementation plan for the Stockholm Convention (2007).

Tajikistan's National waste management strategy 2017-2030 (draft).

Tajikistan's State Statistics Committee (2009). Results of the survey on municipal waste in Dushanbe.

Turkmenistan, Law on nature protection (2014)

Turkmenistan, Law on waste (2015)

Uzbek State Committee for Nature Protection (2008). State of the environment and nature resource use in Uzbekistan in 1988-2007. National report.

Uzbek State Committee for Nature Protection (2010). State of the environment and nature resource use in Uzbekistan in 2007-2009. National report.

Uzbek State Committee for Nature Protection and UNITAR (2012). National chemicals management profile.
Uzbekistan's Ministry of Economy (2007). Tashkent Waste Composting Project for CDM.

Research papers and studies:

- Boboeva Sh. (2015). MSc thesis, Department of Earth and Environmental Engineering; School of Engineering; Columbia University. Current state of waste management in Tajikistan and potential for a waste-to-energy plant in Khujand city: http://www.seas.columbia.edu/earth/wtert/sofos/Boboeva_thesis.pdf
- Arzieva A. (2013). MSc thesis, Department of Environmental Sciences and Policy; Central European University. Reforming the Waste Dumping in Bishkek with the Intervention of International Development Aid: http://www.etd.ceu.hu/2013/arzieva_aikokul.pdf
- Edge R. (2010). Assessment and Proposals for Uranium Production Legacy Sites in Central Asia: An International Approach. Synthesis Report produced for the International Atomic Energy Agency: <https://gssn.iaea.org/RTWS/general/Shared%20Documents/Remediation/Remediation%20Evaluation%202012/AssessmentandProposalsforUraniumProductionLegacySitesinCentralAsia.pdf>
- Grehov A. (2009). MSc thesis, Department of Environmental Sciences and Policy; Central European University. Management of Solid Municipal Waste. The case study of Ashgabat, Turkmenistan: http://www.etd.ceu.hu/2009/grehov_aleksey.pdf
- Inglezakis V., et.al. (2015). Analysis of current situation in municipal waste management and implementation of decision support software in Astana, Kazakhstan: https://www.researchgate.net/publication/274309877_Analysis_of_Current_Situation_in_Municipal_Waste_Management_and_Implementation_of_Decision_Support_Software_in_Astana_Kazakhstan In Proceedings of the 5th International Symposium on Energy from Biomass and Waste 2014, Venice, Italy.
- Kunze Ch., Walter U., Wagner F., Schmidt P., Barnekowb U., Gruber A., (2007). Environmental impact and remediation of uranium tailings and waste rock dumps at Mailuu-Suu, Kyrgyzstan. Expert report.
- Mirsaidov I. (2011). Overview of tailings and rehabilitation issues at former uranium enterprises in Tajikistan. Presentation for international conference on uranium mining legacy waste in Central Asia.
- Mitsubishi Industries (2014). Study on waste-to-energy project in Almaty, Kazakhstan: https://www.jetro.go.jp/ext_images/jetro/activities/contribution/oda/model_study/energy_infra/pdf/h25_report02_en.pdf
- Ospanova, S. (2014). Assessing Kazakhstan's policy and institutional framework for a green economy. International Institute of Environment and Development Country Report: <http://pubs.iied.org/pdfs/16559IIED.pdf>
- Proceedings of the Regional Conference "Uranium Tailings: Local Problems, Regional Consequences, Global Solutions", Bishkek, April 21-24, 2009.
- Tauw (2009). Obsolete Pesticides Technical Study in Kyrgyz Republic, Republic of Tajikistan and the Republic of Uzbekistan. Inception reports for the World Bank.
- Torgoev I., Aleshin U., Ashirov G. (2008). Ecological problems of the uranium tailings sites in the Ferghana Valley area.
- Webb S. (2009). Management of environmental risks associated with landfills in seismically active regions in the new independent states of Central Asia. PhD thesis submitted to University of Natural Resources and Applied Life Sciences, Vienna. https://zidapps.boku.ac.at/abstracts/download.php?dataset_id=7249&property_id=107
- Wilson, D. et al. (2013). Waste management and recycling in the former Soviet Union: Bishkek, Kyrgyzstan. Waste Management and Research: https://www.researchgate.net/publication/258200465_Waste_management_and_recycling_in

[the former Soviet Union The City of Bishkek Kyrgyz Republic Kyrgyzstan](#)

- Yakovleva N., Slazhneva T., Korchevsky A., Salagaeva V., Kalykova A., Darisheva M. (2010). Assessment of environmental impacts on public health in Ust-Kamenogorsk, one of the most polluted cities of Kazakhstan.
- Yarullina Z. (2016). Report for the EU-CA meeting on environmental cooperation on modernization of the waste management system in Uzbekistan: http://wecoop2.eu/sites/default/files/documents/events/presentations/15.%20Zulfiya%20Yarullina_Uzbekistan_.pdf
- Zaredinov D., Halilov H., Sadykov K., Baimirzaev A., Kodirov U. (2010). Uranium legacies in Uzbekistan. Presentation for international conference on uranium mining waste in Central Asia.

Other information sources:

- Aki-Press (2015). News article “Bishkek waste dump”: <http://kg.akipress.org/news:628080>
- Atameken Business Channel (2016). News article “Kazakhstan waste recyclers cannot survive without subsidies”: <http://abctv.kz/ru/news/zhan-nurbekov-my-predlagaem-osvobodit-musoropererabatyvayus>
- Biom (2008). Transforming waste into profits. Information leaflet and popular guide.
- Bortsova S., Pechenyuk O., et al (2008). Analysis of the waste regulatory framework in Kyrgyzstan.
- Center on Sustainable Development (CSD, 2012). Analysis of the waste management system for electronic and electrical equipment in Kazakhstan.
- Center on Sustainable Development (CSD, 2013). Analysis of the situation in the field of municipal solid waste management in 14 selected cities of Kazakhstan.
- Center on Sustainable Development (CSD, 2014). Report on Legal, Institutional and Financial Mechanisms and Methods of Municipal Solid Waste Management in Kazakhstan.
- Damu (2011). Overview of the collection and recycling market of non-hazardous waste in Kazakhstan. Prepared by Business Media Group.
- Kapital (2014). News article by Baikonova A. “Recycle or not in Kazakhstan?”: <https://kapital.kz/business/33575/pererabotat-ili-predat-zabveniyu.html>
- Kazakhstan Green Economy TV: <http://24.kz/ru/tv-projects/zelenaya-ekonomika>
- KazInform (2016). News article “Money from paper: how the paper recycling business works in Kazakhstan?” http://www.inform.kz/ru/den-gi-iz-kartona-kak-ustroen-makulaturnyy-biznes-v-kazahstane_a2931284
- LivingAsia environmental blog and news portal: <http://livingasia.online/>
- UzReport (2016). News article “Media tour for journalists to e-waste processing plant in Tashkent”: http://news.uzreport.uz/news_3_r_145494.html
- UzReport (2017). News article “More than 1 billion Uzbek sums will be allocated to waste management system in Uzbekistan”: http://news.uzreport.uz/news_4_r_150999.html



**United Nations
Environment Programme**

P.O. Box 30552 Nairobi, 00100 Kenya

Tel: +254 20 762 1234

Fax: +254 20 762 3927

E-mail: unep@unep.org

web: www.unep.org

For more information, please contact:

**Economy Division
International Environmental Technology Centre**

2-110, Ryokuchi koen, Tsurumi-ku, Osaka
538-0036, Japan

Tel: +81 6 6915 4581

Fax: +81 6 6915 0304

E-mail: ietc@unep.org

Web: www.unep.org/ietc