Circular economy: How far or close are the Central Asian Republics (CARs) to transition to circular economy?

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Introduction

The concept of circular economy, which originates from, and was narrowly defined through the agenda of waste management and ecological concern, is a recently emerged systemic approach to economic development attracting policy attention both in developing and developed countries. While resource and space constraints, facing the Western Europe and some countries of East Asia, have been major driving forces for taking on circularity principles (Joe, 2018; Franco-Garcia et al., 2019), the motivations behind transitioning to a regenerative economy for developing countries noticeably vary given a different nature of challenges they have. The case of developing countries in Central Asia (CA) is particularly interesting as they are undergoing two simultaneous transitions: shift to a market-based development path from a centrally planned economy, and tackling consequences of the Soviet-inherited extractive linear economy (Meyer et al., 2019; Pukhnyuk et al., 2017). Kazakhstan and Uzbekistan's cases deserve special attention, as the former is characterized by the most dynamic economic growth and income, often exceeding the average socio-economic indicators for CA region, showing a noticeable leap in terms of smart development as well. Uzbekistan, 2nd largest economy of the region, has been chosen as a 2nd case since the country is the most populous country among five CARs, with accelerating problems of land degradation, water scarcity, resource deployment (*ibid.*).

Thus, this paper aims to identify where Kazakhstan and Uzbekistan are at the present, where they need to be, and how they reach to where they aim to be in terms of sustainable development in the light of intensifying socio-economic, environmental challenges. Specifically, once the current status-quo of circular economy is reviewed, major sectors, which may potentially benefit from embedding sustainability principles, are analysed, which untimely leads us to develop policy recommendations with respect to a successful transition to restorative and closed cycle business models in certain areas.

Where are Kazakhstan and Uzbekistan now? — Setting up the base for circularity

Review of the relevant literature, policy documents, and data suggests that, current stage of circular economy, maturity levels and motivations behind adopting circularity principles in post-soviet countries are similar (Hoogzaad et al., 2019; Erlan, 2019). Green economy and green infrastructure (they do not necessarily mean closed cycle, restorative business practices) is what Central Asian countries define circular economy and strive for in the light of the recent global shift towards more sustainable practices (Hoogzaad et al., 2019). In Kazakhstan and Uzbekistan agriculture, energy consumption, water and waste management are the areas where greening and regeneration plans are mostly targeted at (Erlan, 2019; ПП-4477). Nevertheless, circularity, and its adoption by industrial sectors and individual businesses is in its infancy in these countries, heavily being confined to waste

management and energy consumption in practice. In spite of persisting problems with agriculture, water scarcity, and rapid urbanization, circular economy principles have not yet successfully implemented into these areas. Transition into more sustainable and restorative business models in both countries are undertaken at a state level through a top-down approach (Erlan, 2019). “National concept of transitioning to green economy”, which sets out a map of actions to shift from old linear business models to a new sustainable, regenerative principles, was introduced back in 2013 in Kazakhstan. The concept clearly identifies housing and communal services, energy, agriculture, air quality and water sectors as priority areas, into which sustainable circular practices should be implemented. Despite having similar concerns with Kazakhstan, Uzbekistan’s “Strategy of transition to green economy for 2019-2030”, which was adopted in 2019, primarily focuses on greening energy sectors, without detailed action plan on other areas. It is the execution problem, rather than absence of relevant legal and policy base, that is halting green transition in Kazakhstan and Uzbekistan (See Appendix 1 for the list of sustainability relevant legal and policy documents).

The current level of attained circular economy in Kazakhstan and Uzbekistan can be attributed to the following reasons:

- Upgrading economy through circular economy principles is occurring in tandem with structural system change from a planned economy to a market economy in these countries which doubles the burden. In the case of most European, or Asian countries, circular economy transition is a gradual systematic change enabled by previous experience and technological growth, rather than being a simultaneous and a new path with other conflicting goals in the case of developing transition economies (Pukhnyuk et al., 2017).
- Similarity of the sectors where sustainability principles are being introduced is due to the interlinked economies of CARs along with shared problems. Issues such as water scarcity, and energy resource consumption are intertangled and require a joint solution. For example, the matters of upgrading irrigation systems and water management through circularity principles would benefit all countries as the region is mutually interdependent in terms of water resources, and subsequently exchange of other resources (Meyer et al, 2019).
- Availability of soft (knowledge, skills and expertise on circular economy) and hard (smart technologies, infrastructure and capital) capacity is another explanatory factor which is hampering the process of redesigning the current way how economy works (Legro and Zeman, 2017, 2019; Lacy et al., 2019; Meyer, et al., 2019).

Which sectors do they need circularity principles most?

Major industries, which necessitate transfer to circularity presenting biggest challenges, as well as opportunities, are agriculture and agri-food industry, water management systems, city planning in our target countries, Kazakhstan and Uzbekistan.

Agriculture

Agriculture, being one of the most significant ecosystems for employment and food production in both countries, needs closer scrutiny in terms of sustainability (Table 1). In Uzbekistan, accounting for 50 % of the total population, agriculture provides quarter of the total employment in the country

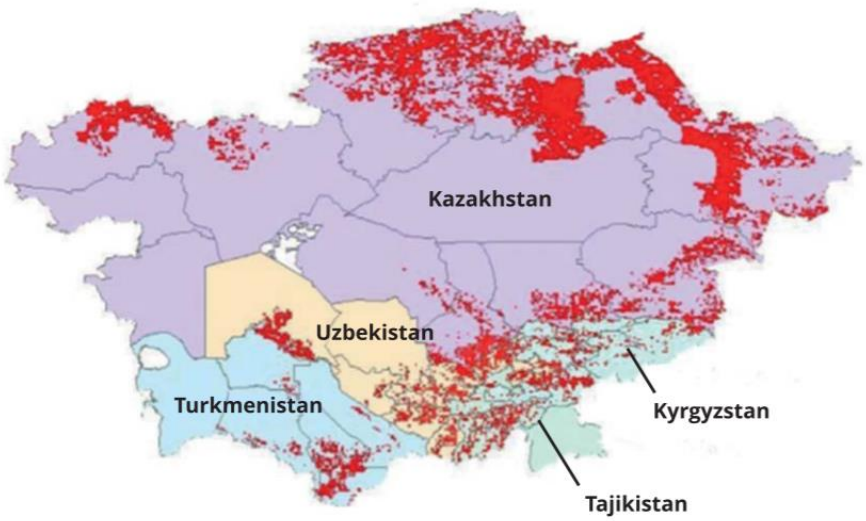
(farmers, field workers, agricultural mechanisation workers etc.), generating 26 % of GDP in Uzbekistan (highest share among CARs). Unlike, Kazakhstan is the country with the tiniest share of agriculture in GDP (around 5 % of GDP) among CARs, with approximately 60 % of the population being settled in urban areas. Nevertheless, application of circularity principles in agriculture is worth pursuing since it is the biggest consumer of freshwater withdrawals in the country (60 % of total fresh water withdrawals) (Table 1).

Table 1. Indicators for agriculture in terms of employment, income and water consumption in Central Asia (%).

	Kazakhstan	Kyrgyz Republic	Tajikistan	Turkmenistan	Uzbekistan
Agriculture in total employment (2019)	14.86	19.12	44.72	20.68	25.71
Value added by agriculture in GDP (2020)	4.4	13.5	23	10.7	26
Rural population as % of total population (2020)	42.3	63.1	72.4	47.4	49.5
Annual freshwater withdrawal by agriculture as % of total	61.8	92.6	90.8	94.2	92.2

Source: Compiled through https://data.worldbank.org/indicator/.

Figure 1. Map of land degradation hotspots in Central Asia.



Source: Mirzabaev et al., 2016

One of the perpetuating issues in agriculture is land degradation. Although all CARs face land deterioration to certain extent, it is particularly concerning in Kazakhstan and Uzbekistan (see Figure 1). In Uzbekistan alone, inappropriate irrigation practices, including excessive watering, improper drainage water discharges caused salinisation of irrigated land (2.2 million ha in 2007). In hotspots,

salinisation rates reach from 50 up to 100 % of total irrigated land (Quillérou et al., 2016, p.17). In Kazakhstan, over 48 million ha of land, including up to 36 % of forests have undergone degradation. This has led to 30-60 % decline in soil fertility due to wind, water erosion, strong dust storms that have stretched up to 9 million hectares (*ibid.*).

Circularity principles in agriculture builds on agricultural production through minimising external input, reducing damaging environmental emissions (waste and carbon emission) and introducing closed loop agricultural practices (Ward, 2017). Implementing these principles into the current agricultural practices in Kazakhstan and Uzbekistan would enable to reduce the lost values caused by land degradation which was estimated to be around 3 percent of GDP (Mirzabaev et.al, 2016, p.275). It is also estimated that reduction in carbon emissions in soil through altering fertilizer use can potentially eliminate 16.6 million tonnes of carbon per year out of atmosphere (Hoogzaad et al., 2019, p.37; Ward, 2017).

Water management systems

Water systems are closely interlinked with agricultural sector, thus presenting a need for application of circularity principles. Kazakhstan and Uzbekistan, being downstream countries face chronic issues of water shortage which puts enormous strain on agriculture (irrigation, difficulty in leaching saline soil), power sector (hydroelectric power generation) and household consumption.

Kazakhstan and Uzbekistan have the largest area fit for irrigated agriculture among five CA countries (Table 2). While Uzbekistan has reached the full potential of exploiting the total irrigated land in agriculture, only roughly 2 percent of the available agricultural land is actually irrigated in Kazakhstan. Despite having the largest area of power-irrigated lands among CARs (27 % of total irrigated lands), Uzbekistan hugely lagging behind in terms of water productivity[1] when compared to the world average and to the case Kazakhstan (see Table 2 and Figure 2). This points to the pressing need for adopting circularity principles in water system management especially in Uzbekistan.

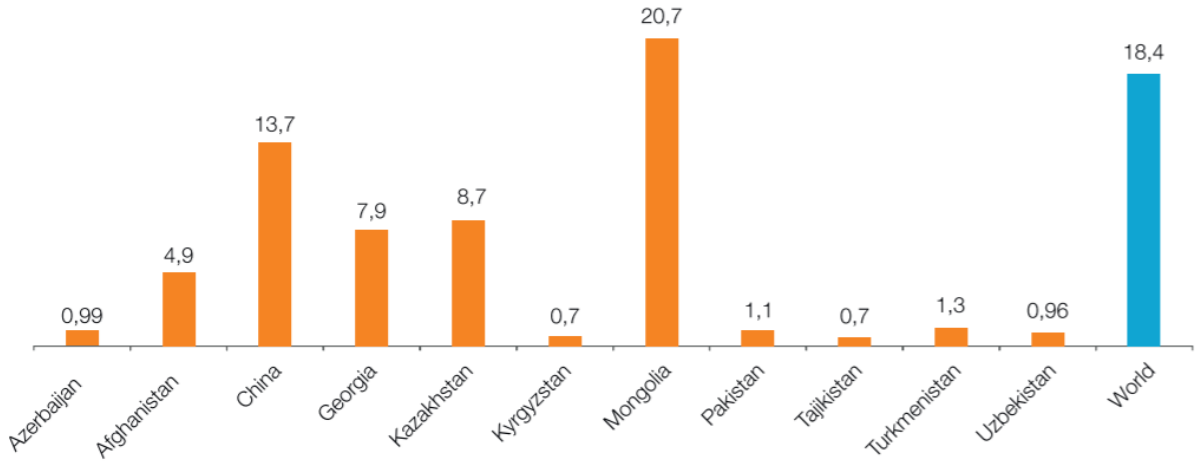
Table 2. Irrigated agricultural land in Central Asia.

Country	Total area fit for irrigation ('000ha)	Actual irrigation ('000ha)	Total power-irrigated area ('000ha)	Share of power irrigated lands (%)	Share of area irrigated by groundwater (%)
Kazakhstan	2,066	1,265	41	2	0,1
Kyrgyz Republic	1,023	1,021	51	5	1
Tajikistan	742	674	296	40	4
Turkmenistan	1,991	1,991	318	16	0,5
Uzbekistan	4,199	3,700	1,133	27	6

Source: World Bank, 2019 (https://data.worldbank.org/indicator/).

[1] Water productivity is a measure of total output or total value, divided by the amount of a single input used in production. Here water productivity is calculated as GDP in constant prices divided by annual total water withdrawal (Meyer et al., 2019).

Figure 2. Water productivity across Central Asia and neighbouring countries. Constant 2010 US$/m³ of total freshwater withdrawal.



Source: World Bank, 2019 (https://data.worldbank.org/indicator/).

Upgrading water management system in agriculture through effective waste water treatment and water stream control. Being one of the largest water consumers, upgraded irrigation practices through applying water saving technologies in the agriculture would enable CA countries to tackle not only water shortage problem, but also increase control over water quality.

Circularity for liveable cities

Economic expansion, population growth, and accelerating urbanization processes impose an array of challenges on Kazakhstan and Uzbekistan's urban areas, which are characterized by aging infrastructure and improper development of urban services (ADB, 2016).

Biggest cities in these countries are now experiencing deterioration of environment, and overall public health[2]. Deterioration of liveability in cities are provoked by a number of factors such as inappropriate urban waste management, fossil fuel powered vehicles, reduction in urban green spaces which is crucial for retaining moisture and cool air mass (Demir & Grigoryan, 2021). According to IQAir's annual report based on particulate matter (PM2.5) concentration in the atmosphere[3], Tashkent ranked 18th among 92 world capital cities in 2020 following Dushanbe (16th) and North Macedonia's Skopje (17th), which points to a serious concern with acute air pollution, triggered by the above-mentioned sources (Table 3).

Along with air quality, waste treatment is considered as one of the core urban services which is lacking quality management in the cities of the reviewed countries. UNEP study suggests that urban population, which is usually considered as the biggest generator of waste, is not fully covered by waste collection services (Figure 3); Recycling is in its infancy, and recycling efficiencies are estimated as less

[2] Years of potential life loss in Central Asia due to environmental pollution is estimated to be 20 % higher than Western Europe (Demir & Grigoryan, 2021). See: https://www.eurasia.undp.org/content/rbec/en/home/blog/2021/air-pollution-other-public-health-emergency.html

[3] PM2.5 is defined as ambient airborne particulates that measure up to 2.5 microns in size. The most common human-made sources of their chemical makeup include fossil-fuel powered motor vehicles, power generation, industrial activity, agriculture and biomass burning (IQAir, 2020, p.5).

than 10% in Uzbekistan (ADB, 2017) and around 12 % in Kazakhstan (UNEP, 2017) in urban areas, with little to no coverage of rural and peri-urban population with waste collection services.

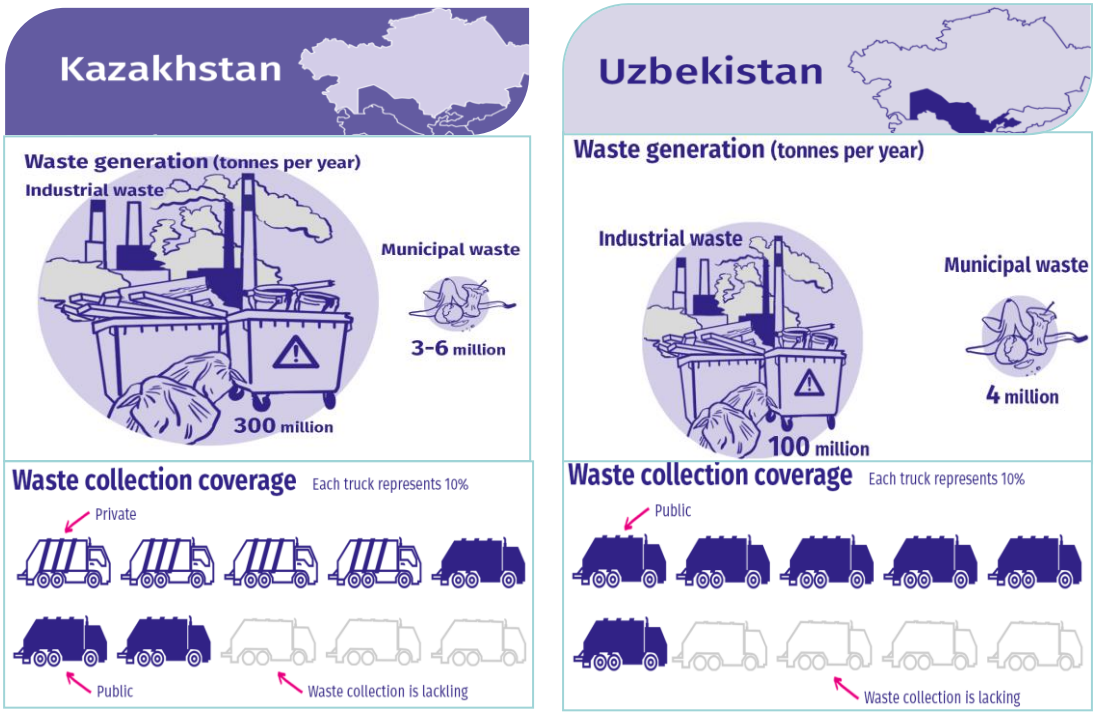
Table 3. Central Asian cities in the IQAir World capital city ranking, 2020.

City	Rank	PM2.5 concentration (µg/m³), annual average	Air pollution level
Bishkek, Kyrgyz Republic	6	43.5	Unhealthy for sensitive groups
Dushanbe, Tajikistan	16	30.9	Moderate
Tashkent, Uzbekistan	18	29.9	Moderate
Nur-Sultan, Kazakhstan	30	21.9	Moderate
Ashgabat, Turkmenistan	46	17.0	Moderate

Source: IQAir, 2020, p.12.

Note: The higher the PM2.5 concentration, the worse the air quality is.

Figure 3. Waste Management overview for Kazakhstan and Uzbekistan.



Source: Waste Management Outlook for Central Asia, UNEP, 2017

Low rates of waste recycling are mostly explained by low levels competition among waste manging enterprises, disincentivizing levels of tariffs for treating municipal waste (Khavratova & Alikhan, 2021). For example, tariffs for collecting solid municipal waste for enterprises is around 13 USD per tonne in Kazakhstan[4], while the rate does not exceed 7 USD in Uzbekistan[5]. For comparison, average tariffs for solid municipal waste collection for the same amount is around 70 USD per tonne in Russian

[4] See https://adilet.zan.kz/rus/docs/V17R0001405 for current tariffs for waste collection in Kazakhstan.
[5] See https://maxsustrans.uz/price for current tariffs for waste collection in Uzbekistan.

Federation (tariffs vary by regions)[6], which offers huge incentive for state and private waste managing companies to recycle waste.

Increase in the tariffs for waste treatment, allowing private players in the waste market, adopting ICT technologies to collect, sort and classify, then recycling would enable to a huge leap in waste management system, which would also reduce soil erosion, air and water quality deterioration, and public health issues.

How to get there? – Impetus for transition

Taking into account the infancy of circular economy practices, as well as the current state of the identified key sectors, where circularity principles potentially enable to tackle the challenges in Kazakhstan and Uzbekistan, the following policy trajectories are proposed:

- Managing waste through precision agriculture and ICT technologies would allow to reduce emissions from fertilizers, hugely contributing to general reduction in carbon emissions.
- Introducing sustainable packaging in agri-food industry using organic residues. In other words, new practices of reusing agricultural waste for packaging or other purposes in food industry should be introduced. It would open new avenues for trade expansion into European and Asian markets, where sustainable principles are already in practice and have become a part of environmental policies (Abdullaev & Strikelev, 2020; Hoogzaad et al., 2019).
- Successful application of circularity into rapidly urbanizing cities can be undertaken through transition to more mature and deeper level waste management practices, along with the greening residual areas, introduction of eco-friendlier modes of mobility such as eco-friendly vehicles and car sharing schemes.

All above mentioned elements of circular economy transition would not be viable and tangible if the following ecosystem or enabling environment are not created:

- Regional level institutional coordination and collaboration in terms of R&D are needed in Central Asia (Meyer et al., 2019; Qullerou et al., 2016). While joint institutional actions would be holding each party accountable and compliant with sustainability practices, circular economy related knowledge and innovation exchange would lower the costs associated with adoption of circular economy.
- Along with solidifying national strategies, institutional and legal base, further actions are needed to harmonize their execution at individual, business, local and national levels. These attempts should be accompanied with creation of strong motivation and incentives for individual businesses to go green and take on circular thinking. Raising awareness and achieving cultural shift towards sustainability transition among population is another crucial factor to change and phase out businesses-as-usual models.
- Expansion of finance and investment into sustainable businesses, projects and practices through encouraging private sector to actively take part is crucial. Currently majority of strategic sustainable projects in waste management, renewable energy, environmental protection is government dominated. Introduction of tax incentives for private sector would bring more

[6] See https://rg.ru/2019/03/04/zhiteli-36-rossijskih-gorodov-platiat-za-vyvoz-musora-dvazhdy.html.

players, thus finance into the sector which is critical for technology and infrastructure development.

Conclusions and future perspectives

This study has shed light on the circular economy practices in some transition economies, namely in Kazakhstan and Uzbekistan. With a sightly varying level of socio-economic development, and progress in phasing out business-as usual model, circularity and sustainability practices are in their infancy, and national strategies are set at a state level in these countries. Even though a legal and policy base for circularity transition are well established, further actions to successfully execute them and involve all actors (private sector, individuals) into this process are essential.

It is also concluded that given the current conflicting priorities of economic development and limited state capacity, it is reasonable for both countries to be selective and quite specific as to which sector or area circular economy principles should be integrated to, with a clear vision of scaling up to other sectors in the long run. Given the weight of agriculture in the economy, severity of water related issues, and rapid urbanisation in cities, transition to more sustainable and regenerative business models in these sectors in the short run would be beneficial not only from environmental point of view, but also from socio-economic perspective, as new adjacent sectors and jobs will start to form.

Not to mention the accelerated climate change and environmental deterioration, the Covid-19 pandemic has also laid an extra burden and pressure for all countries to move towards more sustainable economic models of post pandemic restoration. Therefore, the shift of CA countries towards circular economy will also speed up due to internal need to upgrade the old-fashioned unsustainable business models from one hand, and external pressure to go green to become a part of global movement of sustainable development from the other hand.

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Appendices

Appendix 1. Policy and legislative base relevant to sustainability transition in Kazakhstan and Uzbekistan

	Legislative and policy documents	Year of adoption	Description
Kazakhstan	Land code	June 20, 2003	
	Environmental Code	January 02, 2021	New version of the Code focuses on the environmental pollution, emissions, environmental permits and introduction of the latest technologies by the enterprises. The most important point to highlight is that the Code outlines extended producer responsibility (EPR), which obligations for Importers and Exporters in terms of product design and realization.
	Concept for Transition of the Republic of Kazakhstan to “Green Economy”	May 30, 2013	Includes a strategic road map for a broader agenda including efficiency in resources utilization, measures for modernization of existing infrastructure, protection of the environment, and enhancing the energy security until 2050
	Resolution by the Ministry of Economy “On Approval of the Model Rules for the Maintenance and Protection of Green Spaces, the Rules for the Improvement of Territories of Cities and Towns, and the Rules for Provision of the Public Service “Issue of the Deforestation Permit”	March 20, 2015	Determines rules and regulations on protecting green spaces, improvement on public spaces and settlements, sets out compensation for the infringement of these norms
Uzbekistan	Law “On Atmospheric Air Protection”	1996	Specifies standards, requirements on fuels, production and operation of vehicles and other transport means and equipment, ozone layer protection requirements, obligations of enterprises, institutions and organizations

			toward atmospheric protection, and compensations for damages from atmospheric pollutions
	Land code	April 30, 1998	Creates conditions for equitable development of all forms of management, the protection of individuals and legal entities' rights for land, as well as strengthening the rule of law in this area
	Law "On waste"	April 5, 2002	Addresses waste management, exclusive of emissions and air and water pollution, and specifies authority concerning inspections, coordination, ecological expertise and establishing certain parameters with regard to the locations where waste may be processed
	Law "On the environmental audit"	December 26, 2020	The law has not yet ben enforced
	Strategy of transition to "Green Economy" for 2019-2030	October 5, 2019	Identifies strategies and tasks on transitioning into renewable energy sources, and upgrading energy production and reducing emissions, water utilization
	Resolution of the President on the approval of the strategy for the management of solid household waste in the Republic of Uzbekistan for the period 2019-2028	April 17, 2019	Determines main steps towards upgrading waste management system, identifies key targets of waste recycling with respect to all forms of waste
	Decree of the President of the Republic of Uzbekistan "On measures to further improve the management of handling household and construction waste" from. https://www.standart.uz/ru/news/view?id=2437	September 30, 2020	Outlines the tasks on further improvement of waste handling system for both household waste and construction waste

Source: compiled through the database of legislative and policy documents.

Appendix 2. Municipal solid waste management in Kazakhstan and Uzbekistan.

	Kazakhstan	Uzbekistan
Population (2020)	18 million	32 million
Urban population (2020)	67 %	50%
Percentage of waste recycled (2018)	11.5% of Municipal solid waste, 23 % industrial waste	5-10 % of Municipal solid waste
Vision	Increase recycling rate of MSW up to 40 % until 2030, 50 % by 2050[7].	Increase recycling rate of MSW up to 60 %; particular types of MSW up to 25 %; increase alternative enrgy use up to 35 % in recycling until 2028.

Source: Complied through World Bank data & UNEP, 2017 & policy documents of Kazakh and Uzbek governments.

[7] See https://astanatimes.com/2019/01/kazakhstan-increases-municipal-solid-waste-recycling-by-3-percent/.