United Nations Convention to Combat Desertification

State Forestry and Grassland Administration of the People's Republic of China

THE CHANGWON INITIATIVE

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REGIONAL STRATEGY FOR SAND AND DUST STORMS MANAGEMENT IN CENTRAL ASIA 2021–2030

REGIONAL SDS STRATEGY

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Cover and layout: Marina Bazarevskaya
Cover photo: Konstantin Kikvidze. Sand and dust storm in a Central Asian village

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This document was produced with the financial support of the United Nations Convention to Combat Desertification (UNCCD) in the framework of «Regional Approaches for Combating Sand and Dust Storms (SDS) and Drought in Central Asia» implemented by the Regional Environmental Centre for Central Asia (CAREC) with the support of the Interstate Commission on Sustainable Development(ICSD). It may contain advice, opinions and statements of various information sources.

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Important

The data used to develop the national context of sand and dust storms (SDS) processes in Central Asian countries were obtained from each country's national action plan to mitigate and prevent SDS, which were developed by appointed national institutions and national working groups as part of the implementation of the national part of the second component of the UNCCD pilot project Regional Approaches for Combating Sand and Dust Storms (SDS) and Drought in Central Asia.

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REGIONAL SDS STRATEGY

Content

Overview

Recognizing the increased risk of droughts and sand and dust storms (SDS), Parties to the United Nations Convention to Combat Desertification (UNCCD) adopted decisions to tackle the negative impacts of droughts and SDS[1]. In collaboration with key partners, the UNCCD Secretariat has provided affected countries with methodological and technical assistance to implement these decisions to strengthen preparedness and resilience to droughts and SDS. The UNCCD Secretariat also initiated a pilot project on Regional Approaches for Combating Sand and Dust Storms (SDS) and Drought in Central Asia in 2020, which was implemented by the Regional Environmental Centre for Central Asia (CAREC) between 2020 and 2021.

More than 80 per cent of about 400 million ha of the territory of Central Asia is covered by deserts and steppes, which coupled with climate change and lasting droughts, represent a natural source of SDS. Unsustainable practices of irrigation farming and livestock grazing, mining and other construction activities create conditions for the formation of anthropogenic SDS sources. The drying up of the Aral Sea led to the development of 5.5 million ha of salty desert, which is a source of 100 million tons of dust and poisonous salt.

The impacts of SDS are multifaceted, intersectoral and often transnational. It is suggested that salts from the Aral Sea region are being detected along the coast of the Antarctic, on glaciers in Greenland, in Norwegian woods and other regions around the globe (O'Hara et al. 2000). Despite the increasing frequency of SDS in the region and their growing economic impact, Central Asian countries do not have fully operational national SDS forecasting, early warning and monitoring systems. This hinders data exchange between SDS source and destination countries and undermines coordinated preparedness and mitigation efforts.

1 Decisions 29/COP.13 and 23/COP.14.

Central Asian countries are prone and vulnerable to the risk of SDS, with nearly 6.5 million people or 9 per cent of their total population living in areas at highest risk. The total area in Central Asia that is prone to a medium and high risk of SDS occurrence totals 85 million ha. SDS, as well as salt and toxic substances, cause respiratory diseases and eye disorders, and are especially harmful to pregnant women, young children and people over 65 years. Dust transfers also affect glaciers, causing an increase in ice melt in Central Asia, especially in Tian Shan and the Pamir Mountains, the glaciers of which experience very high levels of exposure to dust deposition (Asian and Pacific Centre for the Development of Disaster Information Management [APDIM] 2021).

The Central Asian countries have ratified key international environmental conventions and framework agreements, which are the universal instruments to address environmental and socioeconomic risks and threats. National action plans have been developed and implemented to fulfil commitments under these international agreements, but with minimal regional cooperation.

A long-term vision of the Regional Strategy for Sand and Dust Storms Management in Central Asia for 2021–2030 (hereafter the Regional Strategy) is to reduce the vulnerability of Central Asian countries and communities to the effects of SDS by mitigating active sources and planning for proactive measures in destination areas.

The Regional Strategy addresses challenges that countries in the region face (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan), which are associated with climate change and human activities that aggravate the negative impacts of SDS. Experts in these Central Asian countries also note with concern the impact of the Aral Sea disaster and the formation of the Aralkum Desert on the increased frequency of SDS and droughts in the region.

The objective and priorities of this Regional Strategy have been drawn from the analytical research organized in each of the countries, as well as from national and regional consultations with the participation of key stakeholders.

A midterm goal of the Regional Strategy is to build systematic and institutional capacity for the effective and sustainable management of SDS sources and natural resources in the Central Asian countries.

The key priorities are:

- ***Area 1. Strengthening SDS knowledge,*** which will help reduce SDS-associated risks. Awareness of potential harms, risks and related mitigation measures will be increased and better communicated. Strengthened knowledge will also help inform integrated and synergistic interventions and stimulate knowledge and technology transfer.

- ***Area 2. Mitigating the impact of anthropogenic sources of SDS,*** which is aimed at eliminating the environmental and socioeconomic causes of desertification, land degradation and drought (DLDD), as well as at understanding the impact of SDS on various sectors of the economy in both source and destination areas.

- ***Area 3. Ensuring regional cooperation and joint action.*** This would provide the necessary basis for solving environmental problems in Central Asia through coordinated and joint actions, especially in the Aral Sea basin.

The Regional Strategy will be integrated into the Regional Environmental Programme for Sustainable Development in Central Asia (REP4SD-CA) 2021–2030, which was developed by the Interstate Commission on Sustainable Development (ICSD).

ICSD, as a custodian of the Regional Strategy, will be responsible for implementation, monitoring and reporting, within the framework of its mandates and REP4SD-CA.


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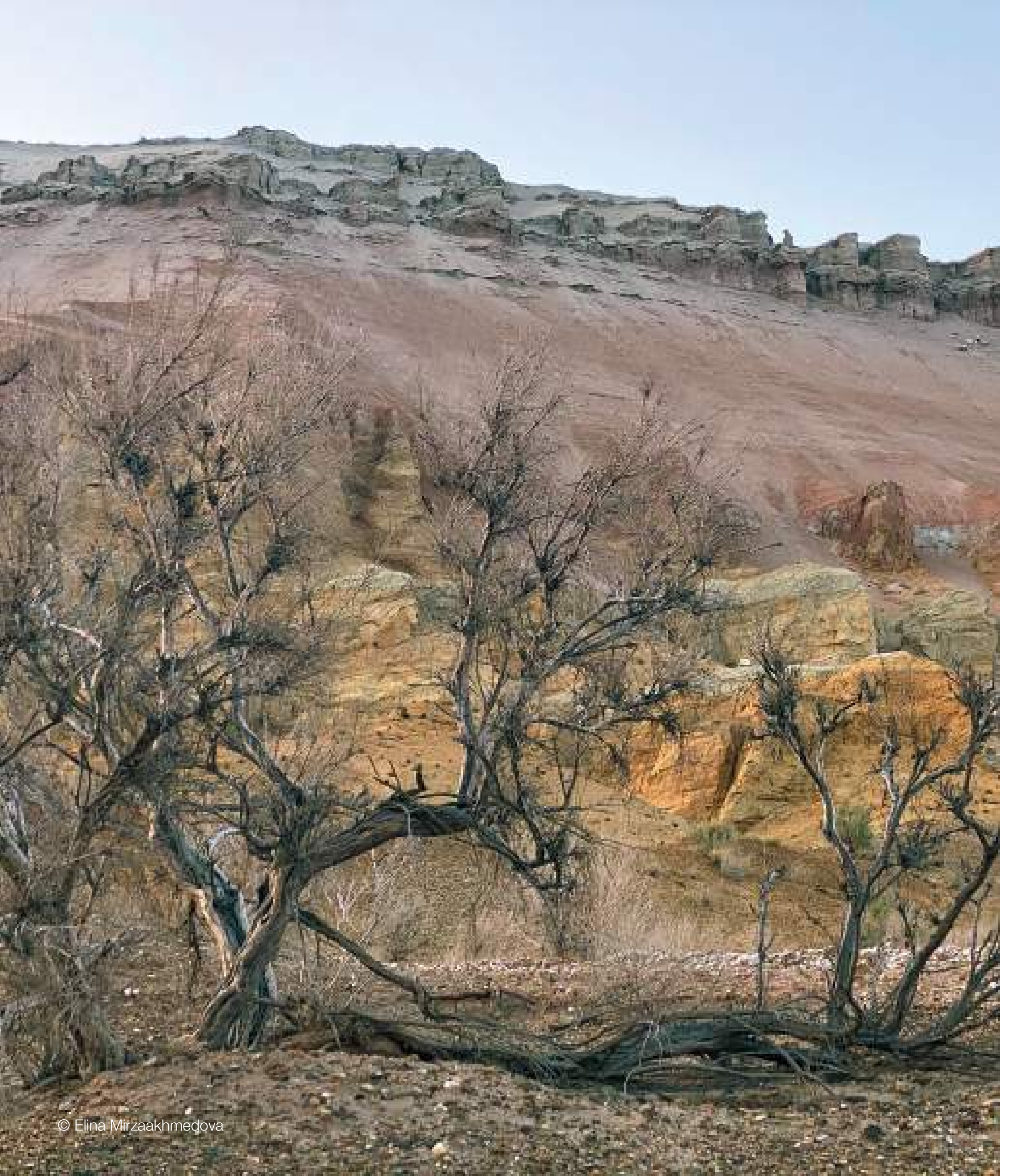
Introduction

SDS are atmospheric phenomena during which wind carries large amounts of dust (soil particles, grains of sand) from the Earth's surface to a height of several metres, causing significant deterioration of lateral visibility (World Meteorological Organization [WMO] no date). At the same time, dust (sand) can rise into the air, move over thousands of kilometres and settle on a large territory. Although this phenomenon is meteorological, it is associated with the state of soil structure, moisture, cover and terrain. About 40 per cent of solid or liquid particles that are suspended in the troposphere are dust particles resulting from wind erosion. Simulation modelling indicates that emissions of dust into the atmosphere caused by the combined impact of land use and climate change have increased by 25–50 per cent since 1900 globally (United Nations Environment Programme [UNEP] 2017).

The United Nations General Assembly resolutions on combating SDS adopted in 2015 (A/RES/70/195) and 2016 (A/RES/71/219) recognize that SDS pose serious challenges to the sustainable development of affected developing countries and the well-being of their people.

In preparation for the United Nations Conference on Sustainable Development (Rio+20), the UNCCD Secretariat issued a report for a United Nations General Assembly high-level meeting, which takes a broad perspective on issues of land degradation, desertification and linkages between the Sustainable Development Goals (SDGs) and the socioeconomic development of the countries.

As a result of unsustainable agricultural practices, which is the most significant factor in the increase in dust storms, large areas of arid and semi-arid regions of America, Africa, Australia, the Middle East and Central Asia continue to degrade. This has led to land degradation and desertification over a large area, reducing the ability of ecosystems to withstand even short periods of drought, which in turn reduces trowel cover. Under favourable conditions, these dry and bare lands become an active anthropogenic source of SDS, which combined with the increase in mean annual temperature and occasional peaks of extreme temperatures, are seeing SDS in Central Asia becoming more frequent and significant. It is worth noting that this has led to the formation of a new active SDS hotspot in the Aral Sea basin, with previously stable ecosystems already destroyed (Sivakumar 2005).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As previously noted, a new salt desert occupying 5.5 million ha has emerged in the dried section of the Aral Sea. Dust storms rage over this desert for more than 90 days a year, scattering over 100 million tons of dust and poisonous salts many thousands of kilometres into the atmosphere every year (Babayev 2008). Dust raised from the dried Aral seabed spreads up to 400 km in length and 40 km in width. Poisonous salts from the Aral Sea region have been detected along the coast of the Antarctic, on glaciers in Greenland, in Norwegian woods and many other parts of the world. Addressing the devastating impact of the Aral Sea crisis on the environment and the livelihoods of millions of people living in the Aral Sea region is the most important task at present (O'Hara et al. 2000).

Water sector reforms in Central Asia should not be limited to new strategies and initiatives, revision of the legal framework or the creation of new institutes. Rather, the main objective should be to achieve a regular, strong, high-level interaction among all Aral Sea basin countries, with inclusive stakeholder engagement, as well as technical and financial support. Many water-related issues in the Aral Sea basin should be addressed jointly by all basin countries as part of this Regional Strategy, as well as energy and food security issues. The main interests of geopolitical and economic development unite the Central Asian countries towards closer regional cooperation to effectively overcome pressing challenges of environmental protection, which meets their common interests (Xenarios et al. 2019).

Regional context

1.1 Natural and anthropogenic factors of sand and dust storms occurrences and sources

When discussing SDS mitigation measures, their spatial and temporal distribution, frequency of occurrence and severity must be considered along with other contributing factors. For example, according to the results of satellite imagery analysis for 2003–2009 and similar research for other periods, Australia, Central Asia and plains in the United States of America are prone to frequent high-intensity SDS of both natural and anthropogenic origin, with the situation having changed little in Northern Africa, the Middle East and South America (Ginoux et al. 2012).

Figure 1 Sources of dust emissions into the atmosphere (tonnes/year)

Natural sources *(such as deserts, depresions in arid land)*
Anthropolgenic sources *(such as land use changes, agricultural practices,water diversion*

Data source: Ginoux et al. (2012).

Source: UNEP (2017).

The main reason for dust storm occurrence is turbulence over a loose and unstable surface, conditioned by wind structure, which contributes to the rise of dust and sand particles from the soil surface. Dust storms in most regions start when the wind speed reaches 10–12 m/s. According to observations of the Institute of Deserts, Flora and Fauna of Turkmenistan, dust storms in the Central Asia region are usually observed during summer months when the wind is particularly active and its direction contributes to the transportation of dust and sand from active SDS sources. However, in southern regions, dust storms can also develop in winter months, as snow cover is very unstable and soil surfaces dry quickly in the absence of precipitation (Rodin *et al.* 2014).

Natural factors of SDS occurrence in Central Asia include high temperatures, long-lasting droughts, a small amount of precipitation, the presence of vast territories of sand and clay deserts with thinned out and degraded vegetation cover and frequent and strong winds throughout the whole year. More than 80 per cent of the region's territory is occupied by deserts and steppes, namely the Karakum Desert, the Kyzylkum Desert and the Muyunkum Desert, along with others, the sands of which were deposited by ancient rivers, and from where sand and dust materials are blown to mountainous territories, for example. Desert plains, in turn, are characterized by deflation (erosion by wind) processes, which result in the generation of large masses of blown sands and strong salt and dust flow. The Karakum and Kyzylkum Deserts are the largest source of dust storms, where they occur 40–110 days a year (Fedorovich 1954).

Anthropogenic factors that affect or contribute to the occurrence of SDS, which account for about 25 per cent of global dust emissions, can include unsustainable methods of land use, excessive water uptake, secondary use of water and soil salinization, deforestation and unsustainable farming practices that contribute to soil erosion (UNEP 2017).

Climate change and more frequent and intensive droughts exacerbate the risk of SDS. The Intergovernmental Panel on Climate Change (IPCC) forecasts that the hydrological behaviour of rivers in Central Asia will change, while the shallowest rivers will dry out completely. River flow anomalies will progress year on year and will be characterized by periods of drought and flooding for the next several decades (World Bank 2006). This will lead to even stronger interlinkages between factors of SDS occurrence and droughts.

According to the 2018 report Sand and Dust Storms in Asia and the Pacific: Opportunities for Regional Cooperation and Action prepared by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), there are two main factors of SDS occurrence associated with climate change (United Nations Economic and Social Commission for Asia and the Pacific [ESCAP] 2018):

- **Wind behaviour change:** i) a share of surface winds that increase an erosion threshold determined by terrain characteristics; ii) a more frequent manifestation of extreme weather events; and iii) a change in wind direction.

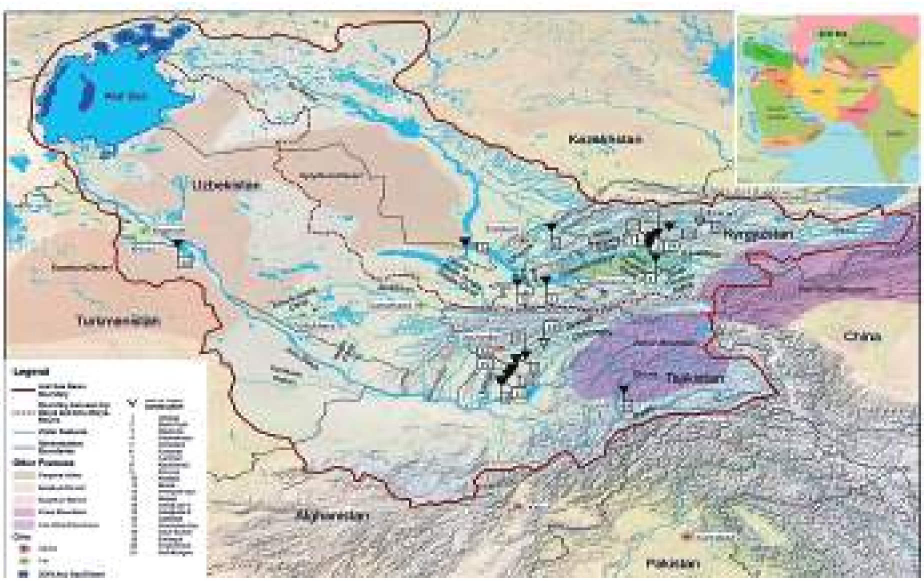
- **Expansion of zones of sand and dust sources:** i) an increased frequency of droughts and hot winds in arid basins; ii) limited vegetation; iii) unsustainable land use and land degradation; and 4) erosion of the upper soil structure.

The World Meteorological Organization (WMO) emphasizes the impact of SDS on the climate, noting that aerosols, particularly mineral dust, affect the weather and both global and local climates (WMO no date). Dust particles, especially if they are covered with pollutants, act as both a condensation nucleus to form warm clouds and as effective agents of an icy nucleus for cold cloud formation. Dust particles also influence the growth of cloud droplets and ice crystals, thus affecting the quantity and location of precipitation. This suggests that SDS occurring in Central Asian countries are extremely dangerous processes caused by natural and anthropogenic factors, which also trigger a chain reaction of processes that affect the climate.

Agricultural practices and the development of vast steppe areas have gradually led to the depletion of natural resources and a decrease in the regenerative capacity of ecosystems. The traditional tillage practice also leads to a massive reduction of soil in the steppes, where sand previously accumulated. In addition, overgrazing around small settlements has led to the emergence of sporadic anthropogenic sources of dust storms.

Intensive irrigation development in the Aral Sea basin in the early 1960s along with the irrational use of water resources led to the emergence of significant areas of secondary saline soils and secondary solonchak, which are sources of salt transportation. The Aral Sea crisis area includes territories of Kazakhstan, Turkmenistan and Uzbekistan, and indirectly affects Kyrgyzstan and Tajikistan. The Aral Sea disaster is one of the most severe global ecological disasters in modern history, resulting in an anthropogenic SDS source in Central Asia that emits more than 100 million tons of dust and poisonous salts every year. This currently affects 73 million Central Asian residents and poses a threat to the sustainable development of the region, as well as the health, genetic pool and future of those living there. Dramatic climate change that can be felt not only in Central Asia but also in other regions has become a direct consequence of the drying up of the Aral Sea (Republic of Kazakhstan 2012).

Figure 2 Competition over resources in the Aral Sea basin



Source: United Nations University Institute for Water, Environment and Health (UNU-INWEH).

According to a 2001 assessment (O'Hara *et al*.), the rate of dust deposition in Karakalpakstan is quite high, especially in the northern part of the Aral Sea estuary. The Amu Darya delta is a significant local source of dust, with the drying up of the delta having resulted in active dust transfer in recent years. The dust deposition rate in the Karakalpakstan section of the Aral Sea basin is one of the highest in the world, and although systematic pesticide application is no longer carried out due to economic constraints, there is significant airborne dust contamination with the organophosphorus substance phosalone (O'Hara *et al.* 2001).

The intensive industrial development of Central Asia's arid plains, including the construction of transportation and water management infrastructure, as well as oil and gas extraction, are among the key drivers behind the formation of the anthropogenic SDS sources that are intensifying desertification and drought processes.

About 600 ha of sand drifts are formed around just one natural gas deposit, which must be fixed, since sand deposits and leakage processes reduce the effectiveness of the work of these facilities significantly.

According to the average monthly data of the National Centers for Environmental Prediction (NCEP) and reanalysis for 1981–2010 (National Oceanic and Atmospheric Administration [NOAA], Physical Sciences Laboratory no date), and based on the hypsometric terrain of the region, seasonal wind indicators were determined that contribute to the formation and accumulation of SDS in Central Asia (Table 1).

Table 1 Wind speed and direction by country in winter and summer periods

Country	Winter	Summer
Kazakhstan	South: SE & S – 3.58–3.8 м/c Southeast: E – 3.58–5.06 м/c Centre: E – 5.06–6.54 м/c North: NE – 5.06–6.4 м/c	W – 3.64–5.05 м/c *Exception:* Southeast: N & W – 2.24–4.35 м/c North: SW – 2.94–4.35 м/c
Kyrgyzstan	E & SE – 3.58–5.8 м/c	W & SW – 2.24–3.64 м/c
Tajikistan	NE – 5.06–5.8 м/c	W – 2.24–3.64 м/c
Turkmenistan	E & SE – 2.84–5.06 м/c	North and East.: SW & W – 3.64–5.05 м/c Centre: S – 4.35–5.05 м/c
Uzbekistan	SE & S – 3.58–5.8 м/c	W – 3.64–5.05 м/c

Note: Wind direction

South: (S); southeast: (SE); southwest: (SW); east: (E); west: (W); north: (N); northeast: (NE); northwest: (NW).

Figure 3 Spatial distribution of soil textures prone to dust storms in Central Asia

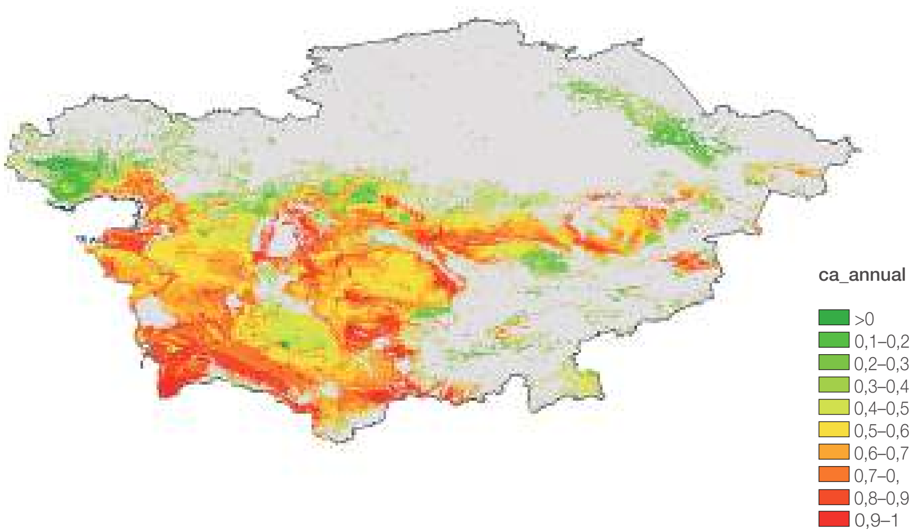
The data from the daily meteorological observations of 144 meteorological stations in Kazakhstan and 29 meteorological stations in Turkmenistan and Uzbekistan were sampled to study the spatial and temporal distribution of dust storms in Central Asia. Based on these data and according to the characteristics defined by Semenov and Tulina (1978), the number of days of dangerous and especially dangerous dust storms was determined for Central Asia. Across a large area of the Ili River valley and the Karakum and central Kyzylkum deserts, dangerous and extremely dangerous dust storms are often observed.

In Central Asia, the number of days that have dust storms is increasing from the northwest to the southeast. In the southern part of the region, the number of days that have dust storms is high in sandy deserts and river valleys. The overall number of dust storm days per year is 20–38 in a steppe zone and 55–60 in a desert zone (near the Aral Sea and the Lake Balkhash regions) (World Bank 2005). Territories with more frequent dust storms (20 days a year) are located in areas with a high wind speed, with light-textured soils, that are used extensively or that are sandy with rare vegetation.

One of the main objectives in reducing vulnerability to SDS is to provide access to timely and reliable information to all stakeholders to take measures to prevent and eliminate SDS consequences.

To tackle this problem, the UNCCD Secretariat developed the Sand and Dust Storms Source Base-map, which uses publicly available global data on the Earth's surface to identify potential SDS sources at a global scale (United Nations Convention to Combat Desertification [UNCCD] no date a). Data over five years, from 2014 to 2018, were used to develop the global map (Figure 4).

Figure 4 Annual index of potential territories of sand and dust storms in Central Asia – global map of sand and dust storms sources

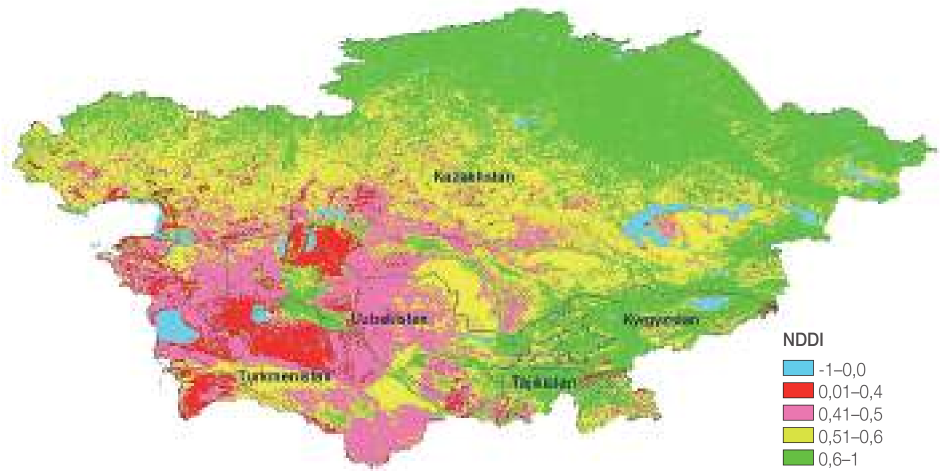


Source: UNCCD (2019).

Along with the previously described approach, the normalized difference dust index (NDDI) and the brightness temperature difference (BTD) are currently widely used in the Asia region (Kazakhstan, Mongolia and northern China) and in Arab countries to decipher dust storms. The use of these indices enables information to be obtained that characterizes an area according to the spread of a storm and storm frequency (Albugami *et al.* 2018). To determine SDS sources and sand and dust accumulation areas in Central Asia, the ground measurements of Kazakhstan's national hydrometeorological service, Kazhydromet, were used and later extrapolated for the entire Central Asian territory. Since data have been calibrated only for Kazakhstan, there may be a certain error level for other countries in the region, given large climatic and geographical differences.

For the analysis of SDS occurrence in the region, the data obtained from the Advanced Very High Resolution Radiometer (AVHRR) of the National Oceanic and Atmospheric Administration (NOAA), and the Moderate Resolution Imaging Spectroradiometer (MODIS) have been utilized to determine: i) an SDS direction; ii) a dust tail length; iii) a storm distribution area; and iv) a number and area of SDS sources.

Figure 5 Possible areas of sand and dust storms occurrence in Central Asia (July 2018) based on AVHRR and MODIS



The analysis of the obtained data presented both on the global overview map of SDS sources (Figure 4) and the results of the NDDI for Central Asia (Figure 5) confirm that the territories that are highly prone to SDS formation are located in the southeast of the region, which also coincides with the "dust belt", as determined by WMO based on many years of empirical data (WMO 2020).

1.2 Sand and dust storms monitoring, early warning and preparedness

The detection of SDS at their source along with their formation monitoring and forecasting contribute to the reduction of negative socioeconomic impacts through actions aimed at eliminating DLDD anthropogenic factors both in source and destination areas.

An SDS early warning system for the region is currently in an early stage of development. At present, only regulatory acts have been adopted for the organization and operation of the system in some countries, with a foundation formed for regional collaboration via global initiatives and conventions. Current and emerging SDS research and monitoring systems are available as follows:

- Kazakhstan and Uzbekistan are working to create a monitoring system that will analyse air quality and identify SDS based on geographic information system (GIS) technology.
- Work is being conducted in Kyrgyzstan (Bishkek) to monitor air concentrations of particulate matter.
- The National Institute of Deserts, Flora and Fauna in Turkmenistan and the Institute of Geography and Water Security in Kazakhstan are engaged in research activities to study SDS.

To date, the available scientific database of SDS processes is based largely on the research conducted during the Soviet era.

The Central Asia region experiences certain challenges in accessing raw data required for the monitoring and calibration of an SDS detection system. Information on soil moisture and river flows is particularly difficult to obtain. The process of SDS registration itself is non-systematic and sporadic, even in metropolitan areas, which makes it impossible to calculate the economic loss from a given natural phenomenon.

The countries in the region are active parties to global agreements on the exchange of meteorological data as well as environment and climate monitoring initiatives. These agreements could become the foundation for further regional actions and the creation of a regional database of hydrometeorological and climate data. Such initiatives include the following:

- The WMO SDS project was initiated in 2004, with the associated **Sand and Dust Storms Warning Advisory and Assessment System (SDS-WAS)** launched by the fifteenth World Meteorological Congress in 2007. The SDS-WAS expands countries' ability to provide stakeholders with timely and high-quality SDS forecasts, observations, information and knowledge through international partnerships between research and operational communities. It is run by the SDS-WAS Global Steering Committee and three regional nodes. To date, Kazakhstan is the only country in the region that is a participant of WMO's SDS-WAS regional centre for the Asia node.[2]

- In accordance with the joint action plan to implement the **Commonwealth of Independent States (CIS) Hydrometeorological Security Concept**, all countries in the region support the collaborative exchange of information on dangerous hydrometeorological events. This plan specifies that dust storms, along with other listed natural phenomena, are dangerous hydrometeorological and heliogeophysical events (Commonwealth of Independent States [CIS] Council of Heads of States 2004).

- As members of **WMO**, national hydrometeorological services of the region's countries provide the international meteorological community with access to data generated by national meteorological monitoring networks.

2 For more information, please refer to: *https://public.wmo.int/en/our-mandate/focus-areas/ environment/SDS/ warnings.*

1.3 Vulnerability of the region to sand and dust storms

SDS vulnerability and risk assessments allow decision makers and local communities to plan measures that reduce and prevent negative SDS impacts. This type of analytical assessment should become part of a decision-making process and be integrated into budget planning and climate change adaptation initiatives, implemented in each country.

Social risks

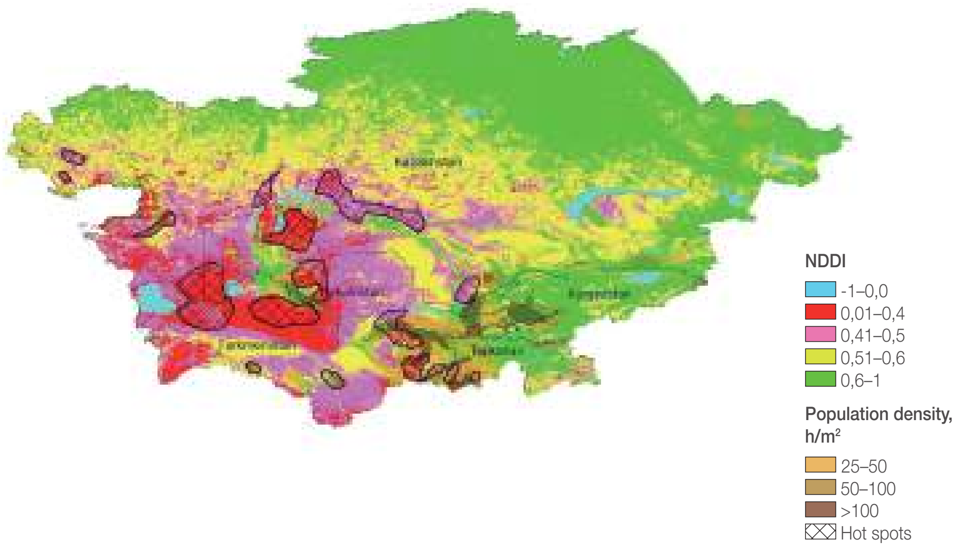
An estimated 1,500 million tons of dust are released into the atmosphere annually worldwide. Most sand and dust are formed as a result of natural processes, though human activities related to unsustainable natural resource use also contribute significantly to SDS formation processes.

SDS negatively affect road and rail transport, industrial plants, power and communication lines, pipelines, irrigated land, settlements and other infrastructure.

As part of the situational analysis developed within the scope of the project,[3] an SDS occurrence probability map was created to identify territories in Central Asia that are socially vulnerable to SDS. Mapping populations' exposure to SDS in the region provides governments, local communities, practitioners and donor organizations with spatial information on where potential development interventions should consider SDS mitigation measures. In the event of frequent and extended SDS occurrence, populations are subjected to high risks of morbidity and mortality, with part of the population possibly choosing to migrate away from areas, which could negatively impact territories' socioeconomic stability.

3 For more information, please refer to: *https://carececo.org/main/activity/projects/droughtSDS/*

Figure 6 Sand and dust storms high-vulnerability hotspots



Analysing the map of satellite monitoring of the potential occurrence of dust storms in Central Asia enables SDS-prone areas to be determined by country (Table 2).

Table 2 Areas prone to sand and dust storms by country

Countries	SDS – high grade, %	SDS – high grade, ha	SDS – medium grade, %	SDS – medium grade, ha
Kazakhstan	3.1	8,381,605	15.0	40,076,474
Kyrgyzstan	0.3	51,561	3.4	649,042
Tajikistan	4.1	560,409	11.6	1,588,088
Turkmenistan	30.9	3,218,485	42.9	4,465,587
Uzbekistan	15.7	6,615,802	44.2	18,633,897
Total for Central Asia		**18,827,862**		**65,413,088**

Table 3 Central Asian population prone to sand and dust storms by country

Country	Share of employment in agriculture, %*	Rural population, %*	Gini coefficient*	Hotspot area, %	Hotspot area, million ha	Average population density, people/km^2 residing in hotspots	Average number of people residing in hotspots
Kazakhstan	14.8	42.5	27.5	2.8	7.3	40	2,935,586
Kyrgyzstan	26.3	63.6	27.7	0.7	0.1	39	51,733
Tajikistan	44.9	72.8	34	1.8	0.2	47	113,855
Turkmenistan	22.6	48.4	40.7	14.7	1.5	20	308,314
Uzbekistan	33.2	49.5	35.1	14.8	6.2	50	3,149,665
Total					**15.3**		**6,559,153**

The hotspot analysis (Table 3) demonstrates that each country is prone and vulnerable to SDS. Hotspots include sand masses of the Mangyshlak Peninsula (Bostamkum, Tuyusuv, Karanzharyk, Aralkum, Moyunkum) in Kazakhstan, most of the Kyzylkum Desert and the Aral Sea region in Uzbekistan, and Zaunguz Karakum and the west and northwest parts of the Karakum Desert in Turkmenistan.

Kazakhstan, Turkmenistan and Uzbekistan have the highest risk of SDS occurrence, while Kyrgyzstan and Tajikistan are less at risk. Based on the mapping of SDS high-vulnerability hotspots, around 6.5 million people in the region reside in areas with the highest risk of SDS, which is approximately 9 per cent of the total population in Central Asia. It is important to note that this is a conservative estimate, as SDS can cover significant areas and cross the national borders, meaning the number of people that are indirectly affected by SDS processes is in fact much higher.

SDS have a significant impact on agriculture and rural populations that depend on land resources through subsistence farming or engagement in agricultural production. As climate change worsens, the intensity and frequency of SDS will increase, thereby affecting agriculture and impacting both the economy and human development.

Impact of sand and dust storms on health

The environmental disaster of the Aral Sea region has led to the displacement of more than 100,000 people and has affected the health of over 5 million people throughout the whole of Central Asia, with a sharp increase observed in the incidence of anaemia, brucellosis, bronchial asthma and typhoid, exceeding the national averages of Kazakhstan and Uzbekistan eightfold, as well as the incidence of tuberculosis (TB). The infant mortality rate of these countries is also highest in the Aral Sea region, where acute respiratory infections account for almost half of all paediatric deaths. Diseases such as ischaemic heart disease as well as respiratory, renal and nervous system diseases will continue to increase. Any increase in temperature will also cause additional concerns, as hotter weather will result in the emergence of more infectious diseases due to a deterioration in water quality , stress in desert areas or the high level of salt in some regions. In Kazakhstan's Kyzylorda oblast, average life expectancy has decreased from 64 years to 51 years (Conant 2006).

Women and children are most vulnerable to the impact of hazardous environmental substances. Maternal and infant morbidity and mortality in Karakalpakstan and Kyzylorda oblast – the two regions near the sources of dust and toxic salt transfer from the dried Aral seabed – are significantly higher than in other regions of Kazakhstan and Uzbekistan. Currently, anaemia is the largest problem for health-care systems of countries in the Aral Sea region, with around 70 per cent of all pregnant women in Karakalpakstan, for example, exhibiting a severe form of anaemia by the third trimester, compared with 17–20 per cent of pregnant women in the 1980s. The blood plasma of pregnant women in this area also contains significantly high levels of organochlorine pesticides such as hexachlorobenzene (HCB), hexachlorocyclohexane (- HCH), p,p'-dichlorodiphenyldichloroethylene (DDE) and p.p'-dichlorodiphenyltrichloroethane (DDT), which are much higher than those of pregnant women in European countries. This is associated both with the leakage of salts into water supply systems and wells and the presence of salts in the air that the population breathes (Conant 2006; APDIM 2021).

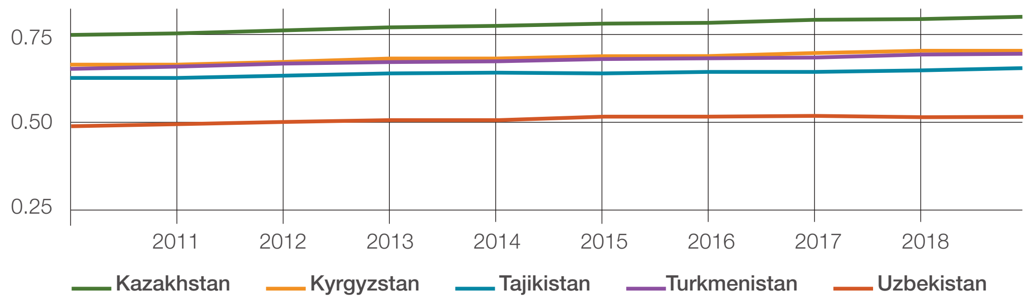
Socially vulnerable populations and gender policy

The effective implementation of the SDGs in the interests of women and girls is required for the creation and strengthening of an enabling environment for achieving gender equality. Although the region overall is characterized by an officially high level of equality between men and women, and all Central Asian countries have ratified the Convention on the Elimination of All Forms of Discrimination against Women, the persistence of discriminatory laws, social norms, practices and inequalities faced by the most marginalized groups of women and girls are the causes of gender inequality.

Women, particularly in rural regions, are particularly vulnerable to all socioeconomic variabilities. Analysis by United Nations Development Programme (UNDP) experts shows that the impact of the COVID-19 pandemic on household revenues has three aspects: i) a loss of income from salaries and revenues from informal activities; ii) a loss of money transfers; and iii) inflation of prices, particularly food prices (Bouma and Marnie 2020).

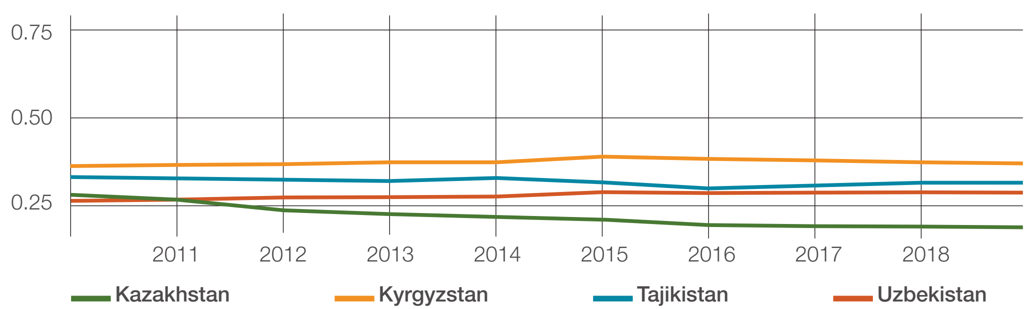
In Central Asia, the loss of income has a significant impact on households and causes a series of concomitant negative consequences, including increased household debt, the inability to pay medical bills from own funds and reduced access to health and education services. Aggravating factors such as child malnutrition due to a loss of access to school meals and an increased risk of home violence play an important role. Surveys show that a disproportionate impact on households will lead to a growth in inequality and an increase in poverty.

Figure 7 Human Development Index



Source: United Nations Development Programme (UNDP) (2020).

Figure 8 Gender Inequality Index



Source: United Nations Development Programme (UNDP) (2020).

This information is also supported by data published on the website of the United Nations Multi-Partner Human Security Trust Fund for the Aral Sea Region in Uzbekistan, where water pollution and a large volume of dust and salt blown from the dried Aral seabed play a defining role in the country's increased rate of morbidity among people overall and paediatric mortality specifically. Such pollution and dust and salt have also resulted in high incidence rates of some somatic diseases, including anaemia and renal and digestive tract diseases, as well as an increased level of respiratory, blood, gallstone, cardiovascular and oncological diseases. In Karakalpakstan, average paediatric mortality in the last decade exceeded the rate in Uzbekistan by 13 per cent, with maternal mortality in Karakalpakstan 17 per cent higher. TB-related mortality in Karakalpakstan remains the highest in the country (18.4 per 100,000 people) and is almost three times higher than the average mortality rate in Uzbekistan. The incidence of acute gastrointestinal infection in Karakalpakstan reached 188 per 100,000 people in the last decade, which is 1.4 times higher than the average for Uzbekistan. With regard to respiratory tract diseases, the chronic bronchitis incidence rate is 2.5–3 times higher than the national average rate. Children are subject to particularly strong and quick negative impacts, which presents a particular threat to the genetic pool of the Aral Sea region's population, and in turn will have irreversible consequences (United Nations Multi-Partner Human Security Trust Fund for the Aral Sea Region in Uzbekistan no date).

Central Asian countries are taking measures to offset the negative consequences of SDS processes and the Aral Sea disaster, which include amendments to relevant legislation, wide-scale afforestation of territories and the creation of protective forest belts. Based on the research conducted, drought-resistant plants are being introduced and novel agricultural technologies are being developed, which, when used appropriately, will allow land users in Central Asia to minimize the risks of agricultural crop losses. Freshwater supply conditions are improving, particularly in the Aral Sea region, and preventive medical activities are being carried out to prevent SDS-related diseases. Despite such measures, more active and comprehensive regional actions are needed to ensure that the frequency and severity of SDS are reduced and that their negative impacts are mitigated across Central Asia.

Economic risks

Due to the low recognition of SDS as a disaster risk, no country in Central Asia calculates direct economic losses from SDS. In many cases, no significant direct human losses or financial costs could be attributed directly to SDS and no compensation schemes are in place for their impact. There is also limited documented information available on the long-term consequences of this phenomenon on health, the economy and agriculture. A common methodology to assess the costs of negative SDS impacts, both direct and indirect, as well as the long-term cost of inaction on infrastructure, transportation, the population, agriculture and other sectors should be developed and applied in the region.

Central Asian economies continue to significantly depend on agriculture (including animal husbandry), which accounts for **10–38 per cent of gross domestic product (GDP) and provides 18–65 per cent of jobs.** Such economies are therefore vulnerable to droughts, since they result in reduced agricultural production, which adversely impacts food prices, trade and access to markets, leading to decreased revenue and unemployment for farmers (Food and Agriculture Organization of the United Nations [FAO] 2019). SDS also directly impacts agriculture through reducing crop productivity as a result of reduced biomass photosynthetic activities and soil erosion. Approximately 60 per cent of the Central Asian population lives in rural areas, with most dependent on agricultural revenues. The nominal personal income of rural residents accounts for about half of the overall revenues of urban residents. Most rural residents rely not only on cash revenues from agricultural products, but also on in-kind revenues from their land and the use of natural resources such as fish, game and firewood.

The range of indirect SDS impacts in Central Asia is large, and specifically includes:

- excessive sedimentation in irrigation canals and watercourses
- disrupted transportation (road, railways, air)
- deteriorated surface-water quality
- reduced visibility and associated incidents
- reduced energy supply from solar panels.

Activities that aim to increase the productivity of agricultural land and the introduction of economic mechanisms to tackle land degradation and drought could help effectively avoid the development of new SDS sources while also reducing existing sources.

1.4 SDS mitigation at source

To date, appropriate measures for sustainable land resource management along with comprehensive approaches for land and water use have been developed and are being implemented at the national and regional levels. Many methods are based on research and technical developments as well as on the Central Asian countries' traditional local knowledge, such as:

- the stabilization of drifting sands and protection of engineering structures from drifting and blown sand
- phytomelioration, afforestation and the creation of windbreaks
- increased productivity of desert pasture
- desert crop development using local run-off
- the creation of underground freshwater reservoirs by collecting and accumulating precipitation
- the use of solar energy for small-scale consumers in the desert.

Studies conducted by the Central Asian Forestry Research Institute show that protective forest belts reduce wind speed by 60–65 per cent at 15 times tree height, by 50–55 per cent at 20 times tree height and by 30–40 per cent at 25 times tree height. The relative humidity of air under the influence of protective forest strips increases by 10–15 per cent.

Works to rehabilitate the dried Aral seabed are currently under way in both Kazakhstan's and Uzbekistan's parts of the Aral Sea basin. According to Uzbekistan's State Forestry Committee, over 1.5 million ha of the plantation was created over three years as part of the State Programme on the Development of the Aral Sea Region for 2017–2021 (Gazeta.uz 2021). To date, Kazakhstan has planted about 1.8 million haloxylon nurslings in around 1,000 ha of its Aral Sea territory. According to the programme, Kazakhstan will plant 2 billion such trees on 213,000 ha by 2025 (KazInform 2021). As part of the implementation of the Green Belt Project along the eastern coast of the Aral Sea region, green belts will be created around settlements and multi-cluster and multilevel phytomelioration works will be carried out, with the introduction of local and non-native psammophyte flora species considered a potential source of windblown salt and dust transportation.

This should contribute to the preservation of the natural resource capacity of the ecosystem in Kazakhstan's part of the Aral Sea region, while also fostering the local population's well-being (Executive Directorate of the International Fund for Saving the Aral Sea [IFAS] in the Republic of Kazakhstan 2021). According to the Executive Directorate of the International Fund for Saving the Aral Sea (IFAS) in the Republic of Kazakhstan, forest reclamation is needed on an area of 1,757,000 ha in Kazakhstan's part of the dried Aral seabed.

Three countries (Kazakhstan, Kyrgyzstan and Uzbekistan) have set voluntary land degradation neutrality (LDN) targets and it is expected that Tajikistan and Turkmenistan will follow suit and formulate such targets in 2022. The following commitments contribute to mitigating SDS sources (UNCCD no date b):

- ***Kazakhstan:*** Increase land-use effectiveness overall and increase irrigated lands by 40 per cent, expanding the total irrigated area to 2 million ha.

- ***Kyrgyzstan:*** Improve the ecological condition of pastures by introducing a pasture rotation system and improve access to 10,000 ha of pastures by strengthening pasture infrastructure (bridges/roads, watering points). Introduce the practice of sustainable land resource management on 100,000 ha of land (including pastures and forests) and carry out reclamation works on 10,000 ha of agricultural land.

- ***Uzbekistan:*** Implement activities to tackle desertification by 2030, and restore degraded lands and soils, including lands affected by desertification, drought and floods.

1.5 Country situation analysis

Kazakhstan

Sources and monitoring

The east coast of the Aral Sea and the Amu Darya estuary are sources of strong salt and dust emissions. Satellite data analysis shows that in August 2011 the dried Aral seabed occupied 57,529 km^2, making it one of the largest sources of SDS in Central Asia. SDS have also been registered in the Balkhash and Balkhash-Alakol districts of the country.

The volume of salts blown from the dried Aral seabed amount to 15–75 tons/year, causing serious concerns about human health (Saiko and Zonn 2000). Other estimates show that the total volume of blown matter from the dried Aral seabed ranges from 40 to 150 million tons (Miclin 2010). Deflation processes from SDS also occur on a large territory of desert pastures located mainly in southern Kazakhstan (Medeu 2010).

Risk and vulnerability assessment

According to the National Action Plan to Combat Sand and Dust Storms in Kazakhstan, the country's total amount of economic losses from desertification is estimated at KZT 93 billion. Land degradation particularly affects poor farms. According to preliminary estimates, the loss of pasture degradation in Kazakhstan is US$963.2 million per year, while losses from cropland erosion are estimated at US$779 million per year. Secondary salinization, swamping and other causes lead to a loss of US$375 million in revenue, with losses from reduced amounts of humus totalling an estimated US$2.5 billion.

Strategic framework and impact mitigation work

In 2008, Kazakhstan adopted a national midterm environmental programme. A new strategy and action plan included coordination of and financial support for programmes that aim to protect the environment. The President adopted the Kazakhstan 2050 Strategy to tackle issues related to sustainable development and environmental projects, among others.

© Anna Tikhonina. Rusted ships

It is worth noting that the country planted new forests on 61,000 ha of the dried Aral seabed in 2007 and 2015.

According to UNDP Kazakhstan, 61 per cent of SDG targets are already covered by national strategic documents, including, to some extent, issues related to environmental protection, improvements in the population’s well-being and ecosystem restoration (UNDP Kazakhstan no date).

Kyrgyzstan

Sources and monitoring

Kyrgyzstan's territory is vulnerable to droughts and SDS because it is surrounded by countries with prevailing arid and semi-arid terrains, with the main constant sources of dust located in a large dust belt. An increased frequency of storms transports 43 million tons of dust and sand from the dried Aral seabed every year.

Risk and vulnerability assessment

SDS processes harm Kyrgyzstan, particularly its socioeconomic conditions and population health. However, the country does not account for SDS-related losses, with the concentration of dust and other particles measured only in the city of Bishkek.

Strategic framework and impact mitigation work

In Kyrgyzstan, issues of environmental protection and adaptation to climate change are reflected in key national and sector-specific strategic documents. The country is already experiencing the consequences of climate change, which is harming ecosystems, population health and areas of economic activities and is increasing vulnerability to emergencies. Despite this, there is no programme to prevent and tackle SDS. In fact, attention to SDS has weakened, with SDS risks and increasing vulnerabilities underestimated at all levels of society nationwide.

The State Agency for Land Resources is responsible for the development and implementation of a coordinated policy of rational land planning and use, as well as for water supply services for farmland and protective forest belt irrigation (forest belts are part of internal farmland tenure).

The Ministry of Emergency Situations together with the interdepartmental Agency of Hydrometeorology forecast and mitigate the consequences of natural disasters, including droughts, water scarcity and hurricane winds, and carry out emergency monitoring and assessments. However, specialized regulations on SDS are not available in the country's database, with SDS-related issues instead considered in conjunction with issues related to tackling land degradation and emergencies.

In 2011, a unified information management system for emergencies and crises was implemented, the purpose of which is to automate the activities of the governing bodies of the State system of civil protection and to increase the efficiency, reliability and quality of management decision-making, including decisions on early emergency warning and the implementation of protective measures. The 2018–2030 Concept of Comprehensive Protection of the Population and Territory of the Kyrgyz Republic from Emergencies was adopted in 2018 along with the Action Plan Implementation Concept and the Emergency Response Plan (Kyrgyz Republic, Ministry of Emergency Situations 2018).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Tajikistan

Sources and monitoring

The main sources of SDS in Tajikistan include estuaries of the Vakhsh and Kafirnigan Rivers in the southwest of the country, as well as an intermediate estuary of the Syr Darya that flows into the Kayrakum reservoir. For Tajikistan, the dangers of SDS are primarily reflected in the health of its people, agricultural efficiency and the safety of air and land transport. In the country's geological past, SDS played a role in its soil formation, with loess species in southwestern Tajikistan of aeolian origin, for example.

The number of SDS in Tajikistan has increased more than tenfold in the last 30 years. In the early 1990s only 2–3 SDS cases were recorded, with more than 35 now recorded yearly in the past several years. Strong winds raise dust and sand from deserts in Afghanistan and transport them over almost 1,000 km to the north (Republic of Tajikistan 2021). According to experts, climate change, stronger droughts and dust and salt leakages from the dried Aral seabed are responsible for the increased frequency of SDS.

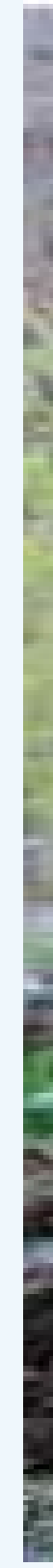
Tajikistan also has local sources of SDS. For example, significant deforestation around some settlements in the Eastern Pamir Mountains has triggered desertification and the formation of sand massifs, along with the mobility of these sand massifs, with around 1,000 ha of gardens, farmlands, individual settlements and home grounds covered by a heavy layer of sand and dust.

Risk and vulnerability assessment

Climate change impacts include melting glaciers, increased average annual temperatures, desertification, precipitation changes, more frequent periods of extreme weather conditions, and in recent years, droughts. An equally related problem is the increase in dust storms in the country, though dust hazes are becoming a less important priority in the list of high-priority tasks to tackle climate change.

Drought contributes to the deterioration of the country's socioeconomic and environmental factors and population development. When water supplies are insufficient, the population resorts to irrational water use and agricultural practices. During the drought of 2000–2001, around 3 million people suffered in Tajikistan, with damages estimated at US$100 million (4.8 per cent of GDP). It also resulted in a loss of income and increased unemployment in southern regions of the country.

The 2011 drought affected around 2 million people and damages to the agricultural sector were estimated at around US$63 million. The droughts also had a significant negative impact on the water level of the Nurek reservoir, which affected the country's energy security, with insufficient precipitation leading to decreased wheat, barley and rice production by at least 75 per cent compared with previous years.



Strategic framework and impact mitigation work

The Committee of Emergency Situations and Civil Defense and its local branches are directly responsible for the development of activities to prevent, reduce and eliminate the impacts of disasters and to provide assistance to emergency committees at all levels.

Although the National Disaster Mitigation Strategy of the Republic of Tajikistan for 2019–2030 includes a disaster risk management system, it is important to note that SDS are not included in the country's list of natural disasters.

Turkmenistan

Sources and monitoring

Turkmenistan's extreme continental climate increases the risk of SDS occurrence and subsequently increases the number of dust particles in the air. Studies show that each cubic metre of air contains more than 300–400 mg of dust particles.

Risk and vulnerability assessment

As the negative impact of climate change increases, the number and scale of SDS events will also increase in the country. Heavy drought, which was observed in Turkmenistan in 2000–2001, 2005–2006 and 2008, led to significant reductions of crop yields of pasture grass and eventually resulted in reduced livestock numbers. Livestock owners were forced to sell about 20–40 per cent of sheep, 17–34 per cent of goats and 10–13 per cent of camels during arid years. In 2001, a direct economic loss from growing crops on degraded and salinized lands amounted to approximately US$140 million.[4]

Strategic framework and impact mitigation work

The Law on Nature Protection (1991), amended in 2014, has become a core document that regulates socioeconomic and environmental regulatory norms in Turkmenistan. It is now aimed at climate change risk reduction and, to a certain extent, SDS-related management issues in the country. As noted in the statement of the President at the seventy-fifth session of the United Nations General Assembly, "air masses forming in the area of the environmental disaster caused by the drying of the Aral Sea […] have an extremely negative impact on the nature, climate and health of people living in this region and adjacent to the Aral Sea and far beyond. Dust and salt storms carrying especially harmful substances from the bed of the dried-up Aral Sea propagate for thousands of kilometers and present a real danger to human lives" (Embassy of Turkmenistan 2020).

4 Determined as the sum of lost products.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A significant number of adaptation measures has already been integrated into the sectoral plans of ministries and agencies. At present, the country is working on its fourth national communication on climate change to be submitted at the next session of the UNFCCC. The National Climate Change Strategy of Turkmenistan was adopted in 2012 and an intersectoral committee on environmental issues was created in 2019, which considers the relationships between climate change, SDS and other climatic negative natural phenomena.

Uzbekistan

Sources and monitoring

Strong desertification processes are observed on the dried Aral seabed. One factor contributing to the country's ecological tension is soil erosion from wind and water, soil salinization and the subsequent development of desertification processes (Kurbanov 2019).

Risk and vulnerability assessment

Uzbekistan experts noted that the deterioration in the country's ecological situation is linked to climate change and has direct and indirect negative impacts on the quality of life of the Aral Sea basin's residents. The morbidity of the population is 72.3 per cent in the Khorezm oblast and 70 per cent in Karakalpakstan. The incidence of TB, oesophageal cancer, blood and haematopoietic system diseases and digestive system diseases are several times higher than the national average incidence rate.

Uzbekistan has experienced several extreme hydrological droughts in the last decade, which destroyed 50–75 per cent of crops in drought-affected regions. Damages caused by droughts in 2000–2001 are estimated at approximately US$130 mln. The share of the population residing in territories at risk of drought is 76.3 per cent. According to surveys, 94% of farmers experienced a drought-related shock (World Bank 2005).

According to Uzbekistan scientists, the fallout of salts from the atmosphere is reducing farmland bioproductivity by 5–10% and pastures by 20–30% (Republic of Uzbekistan, Cabinet of Ministers, Main Administration of Hydrometeorology 1999). In Uzbekistan, 70% of arid and semi-arid areas, which are prone to natural salinization, the spread of drifting sand, dust storms and dry, hot winds, also face drought issues and SDS. Tackling such issues are a priority to ensure the country's sustainable development.

About 10 mln ha of pastures need to be drastically improved. Overgrazing and deforestation for fuel and other purposes have led to a significant reduction of tree and shrubbery vegetation in the desert zone. The total forest area in the country has decreased by half compared with 1965. National forestry authorities restored a total of 1.56 mln ha of forests between 2011 and 2020.

According to data from the United Nations Multi-Partner Human Security Trust Fund for the Aral Sea Region in Uzbekistan (no date), more than 75% of the total grazing land in the country is located in Karakalpakstan and the Navoi and Bukhara region. Areas of degraded grazing land account for more than 83% in Karakalpakstan, more than 59% in the Bukhara oblast and more than 90 per cent in the Navoi oblast. Salt fallout during dust storms, increased irrigation water mineralization and rising levels of underground waters have all contributed to decreased crop yields (corn yields decreased threefold, rice yields twofold, cotton yields by 1.6 times the average, and potatoes and vegetables by 1.5–2.5 times). High evaporability and the low level of precipitation (90–120 mm/year) on initially salinized soils have resulted in the need to increase irrigation frequencies (6–10 times) and soil washing (2–4 times). The highest water-use rates for irrigation are recorded in the Khoresm oblast, Karakalpakstan and the Bukhara oblast, where they are almost 1.5–2 times higher than similar levels in the Samarkand, Jizzakh and Syrdaryo regions (United Nations Multi-Partner Human Security Trust Fund for the Aral Sea Region in Uzbekistan no date).

Strategic framework and impact mitigation work

The Law on Nature Protection (1992) is the fundamental legislative measure that establishes a legal, economic and organizational basis for the preservation of the natural environment and rational use of its resources. To ensure the vital interests of the individual, society and the State, Uzbekistan adopted laws on the protection of its population and territories from natural and human-made emergencies and on civil protection, as well as a series of resolutions of its Cabinet of Ministers. The Constitution and environmental regulations define legislative, State and executive authorities, in addition to businesses and organizations that are responsible for environmental protection and the use of natural resources.

To offset the negative consequences of the Aral Sea crisis, Uzbekistan is working on improving socio-economic conditions and the ecological state of the region. Respective legislative acts have therefore been amended. The Government of Uzbekistan has allocated UZS 100 billion for afforestation of the dried Aral seabed, which should be implemented within 10–12 years.

The country has developed a State Emergency Prevention and Response System (SEPRS), which unites management bodies, forces, republican and local authorities, companies and organizations, whose mandate includes the organization of emergency response measures, including those related to meteorological conditions. Main SEPRS activities include undertaking assessments and forecasting in real time based on information received from the Centre of Hydrometeorological Service at the Ministry of Emergency Situations (Uzhydromet). Currently, Uzbekistan has specific requirements for forecasting, warning the population about SDS and taking active mitigation measures.

1.6 Existing regional mechanisms

The countries in the Central Asia region are committed to sustainable development policy. Since independence in 1991, the countries have adopted fundamental regulations, national strategies and programmes that comprise the legal framework for sustainable development and environmental protection. In the decades that followed, the countries have signed more than 29 international environmental conventions and more than 20 treaties, which have laid the foundation for regional cooperation. Among the most relevant for SDS are the UNCCD, the UNFCCC, the Sendai Framework for Disaster Risk Reduction (2015–2030), the Convention on Biological Diversity, the Center for Emergency Situations and Disaster Risk Reduction (CESDRR) and IFAS (Interstate Commission on Sustainable Development [ICSD] no date).

The conventions and treaties provide an international legal framework for partnership between the countries on environmental protection and the use of the region's natural resources, including open-air protection, conservation of biodiversity, water quality, desertification and the human-induced impact of natural resource usage. However, coordination between international partners and conventions is largely manifested only at the national level and is practically non-existent at the regional level. While this creates certain barriers for regional cooperation, there are untapped opportunities for joint research, experience and data-sharing, as well as the formulation of a common position on international and intergovernmental processes.

Regional organizations and agreements related to sand and dust storms

There are few regional organizations for SDS in Central Asia that act as a collaboration platform within their scopes and mandates, and that could be considered a mechanism to leverage the SDS agenda at the regional policy level.

IFAS and its working bodies, the Interstate Commission for Water Coordination of Central Asia (ICWC) and ICSD act as a basis for regional cooperation on issues relating to the environment and transboundary natural resource use in Central Asia. IFAS is a high-level regional organization authorized to foster regional cooperation and the development of an intersectoral dialogue around environmental protection and sustainable development.

REP4SD-CA 2021–2030 is one of the most recent regional documents developed under the auspices of ICSD. This document is the basis for regional cooperation and the achievement of regional sustainable development through the implementation of national tasks within the framework of environmental SDGs. REP4SD-CA combines the main environmental conventions and treaties from a regional perspective to achieve synergy and form proactive and coordinated actions.

In 2014, the Central Asian countries signed the **Agreement on Cooperation in the Field of Environmental Protection among the Member States of the Commonwealth of Independent States** to strengthen regional cooperation on the protection and use of the countries' lands, soils, forests, waters, air, flora and fauna. This agreement is therefore a mechanism that creates and establishes effective institutional and legal requirements for improving the region's ecological situation, through regulating a set of measures on issues of a transboundary nature, such as the restoration and conservation of lands, data exchanges on unfavourable natural phenomena and neighbouring State emergency notification procedures (Adilet no date).

In 2018, a regional forum took place among the heads of the Central Asian countries' emergency agencies, during which **CESDRR** received the status of the Regional Forum Secretariat. Although the Central Asian countries are prone to destructive natural disasters (earthquakes, floods, drought, SDS) that cause multiple casualties and large economic losses, they record emergencies and the resulting losses independently, which makes it impossible to conduct adequate comparisons and to assess the situations in the countries along with the consequences of previous disasters (Center for Emergency Situations and Disaster Risk Reduction [CESDRR] 2021). At present, CESDRR is developing a Regional Disaster Risk Mitigation Strategy for 2022–2030.

Given the mandate and the political level of ICSD, it is recommended that the tasks and priorities of the Regional Strategy be integrated under REP4SD-CA. Such integration would contribute to the improvement of socioeconomic and ecological conditions in the Aral Sea basin region, as well as to the sustainable use of its natural resources to achieve the SDGs.

The South-South partnership is an important aspect of regional development in the Asia-Pacific region. The volume of direct investments and technology transfer has increased in recent years, along with their applicability to situations in Central Asia. China, Japan and South Korea have accumulated significant knowledge, experience, technologies and capabilities, all of which can be shared with the Central Asian countries for use in their various programmes and projects related to the environment, policy development, sustainable production and consumption practices and the development of nature-based solutions.

Collaboration with ESCAP's Asian and Pacific Centre for the Development of Disaster Information Management (APDIM) offers opportunities for capacity-building, technical assistance and the establishment of a platform for connecting to a network of experts in the Asia region, while also fostering regional cooperation and action for disaster risk reduction.


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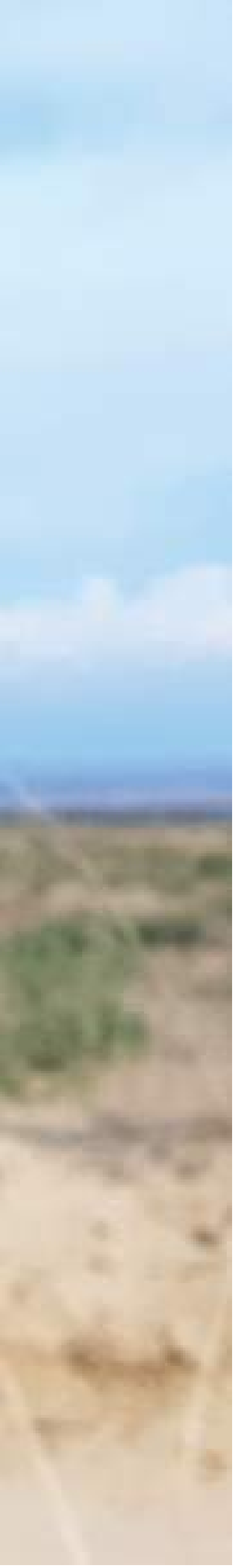

Regional Strategy for Sand and Dust Storms Management in Central Asia 2021–2030

Vision. A long-term vision of the Regional Strategy is the reduction of social vulnerabilities of Central Asian countries and communities to SDS using mitigation in source and destination areas. Socioeconomic aspects of land degradation and SDS occurrence require special attention, with focus given to DLDD and in particular the residents of territories at high risk of SDS and land degradation and whose well-being depends on their area's natural resources.

Strategic goals. **The midterm goal of the Regional Strategy is to increase system and institutional capacities for the effective and sustainable management of SDS and natural resources in the Central Asian countries.** This will help improve interactions and cooperation between organizations and communities in mitigating the negative impacts of SDS and DLDD processes, and will also serve as a basis for joint work at the subregional level.


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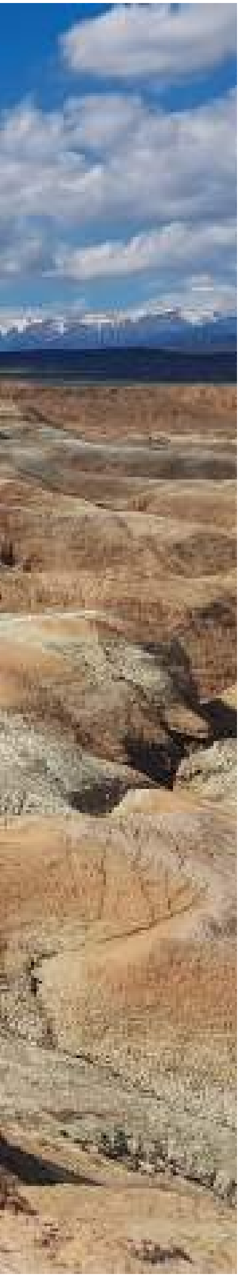

2.1 Key priority areas

Area 1 Strengthening SDS knowledge

Understanding the multidimensional impact of SDS on various economic sectors in countries and the region in general will help effectively address the environmental and socioeconomic causes of SDS and DLDD both locally and regionally. If properly approached, this will lead to a global change in sand and dust emissions, contribute to biodiversity conservation and help reduce anthropogenic impacts contributing to climate change.

This could be achieved through facilitated SDS data and knowledge generation at the national and regional levels, the inclusion of SDS in a natural disaster registry and the organization of training courses for diverse stakeholder groups.

Improved coordination between governments, the private sector and local communities to reduce the risks associated with SDS, raise awareness of their potential impacts and risks, and increase the capacity of decision makers to take integrated and synergistic action across sectors will strengthen intersectoral and transnational cooperation.

Capacity-building for women and other socially vulnerable groups in the most relevant areas, such as early warning and information dissemination, could help the population prepare for and cope with the effects of SDS. Awareness-raising is an important way to inform people about the risks that exist, how such risks can affect them and what proactive measures people can take to mitigate impacts and reduce the negative consequences of SDS. Overall, this will help reduce the vulnerability of people who are most at risk.

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Area 2 Mitigating the impact of anthropogenic sources of SDS

Reducing anthropogenic factors that cause SDS and mitigating their negative impact on human well-being and the environment is an important premise of the Regional Strategy. DLDD, combined with climate change, exponentially increases the consequences of SDS and stimulates an increase in their sources.

Mitigation measures must be designed at the community and farm levels, which are quite often at the greatest risk. For this purpose, active participation of the leading agricultural and natural resources management universities is important, as they hold a plethora of knowledge and historic statistical information that could play a crucial role.

SDS source mitigation should be considered during the development of the national and regional action programmes to combat desertification, national and regional climate change adaptation and mitigation plans and ecosystem restoration programmes and initiatives in the region.

Area 3   Ensuring regional cooperation and joint actions

The Central Asian countries are committed to regional cooperation, especially in the field of environmental protection, and have established solid platforms for regional cooperation over the years. The countries are part of the international community working together to solve environmental problems both globally and regionally, especially in the Aral Sea basin.

Joint SDS advocacy and programming will strengthen partnership-building, resource mobilization and technology transfer, highlighting the Central Asian experience and connecting the region to global SDS scientific and technical communities.

The regional cooperation process for eliminating the negative consequences of SDS and DLDD causes will stimulate socioeconomic growth and lead to the strengthening of the market economy, thus creating a new foundation for joint work on transboundary environmental problems. The success of such actions will depend on the ability and readiness of government institutions and regional and international organizations to act together and finance activities aimed at resolving ecological problems.

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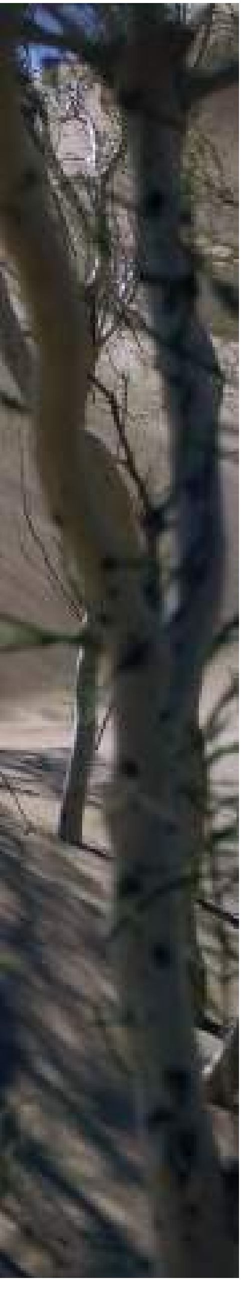

2.2 Strategy implementation monitoring

According to its mandate, ICSD, created in 1994, coordinates regional cooperation in the field of environmental protection and the sustainable development of the Central Asian countries. ICSD's main objectives include the development of a sustainable development strategy, the management of regional programmes, action plans and environmental and sustainable development projects and the coordination of actions to fulfil the Central Asian countries' commitments to implement environmental conventions of a transboundary nature.

Integration of the Regional Strategy into REP4SD-CA and its implementation will benefit the countries in the region in the future, as it will be aimed at improving socioeconomic and environmental conditions in the Aral Sea basin region along with the sustainable use of its natural resources to achieve the SDGs. Given the coordinated actions to be carried out within the framework of ICSD's mandate and REP4SD-CA, objectives will be achieved in a transparent and sustainable manner. ICSD will be responsible for implementation, monitoring and reporting within the framework of its mandate and capacity to report to Central Asian countries at no additional financial costs.

2.3 Implementation mechanisms

The Regional Strategy will be implemented using the national budgets of the Central Asian countries , within the framework of national programmes and strategies for socioeconomic development and environmental protection that focus on achieving the priority areas and tasks either already financed or to be financed in the next five years.

It is expected that most of the Regional Strategy's activities will be implemented through partnership programmes and initiatives of regional and international development partners. The UNCCD Secretariat and CAREC will engage actively in attracting grant and other external funds, as well as projects that contribute to the achievement of the objectives set out in the following action plan and the priority areas of REAP4SD-CA.

Action Plan

Priority area 1 Strengthening SDS knowledge				
No.	**Activity**	**Action**	**Expected outcome**	**SDGs**
1	Establish a regional platform and data centre for the regular exchange of information between the hydrometeorological services of Central Asia on monitoring drought and SDS.	Create a regional platform and data centre for regional information exchange on drought and SDS.	Raised awareness and expanded cooperation between the Central Asian countries on exchanging information to tackle drought and developing SDS processes.	SDG 9 SDG 11 SDG 13 SDG 14 SDG 15 SDG 17
2	Contribute to the inclusion of the Central Asian countries into the SDS-WAS to build their capacity in the field of SDS monitoring and forecasting, research and exchange of experiences and technologies within regional and global networks.	Ensure that national hydrometeorological services join WMO's SDS-WAS.	Strengthened capacity of the Central Asian countries in the field of forecasting and monitoring of SDS process development.	SDG 9 SDG 11 SDG 13 SDG 14 SDG 15 SDG 17
3	Develop basic principles of inclusion of SDS development processes into the natural disaster registry.	Ensure that national hydrometeorological service and Ministry of Emergency Situations representatives have developed a plan to include SDS development processes into the natural disaster registry.	Inclusion of SDS development processes in the natural disaster registry.	SDG 3 SDG 5 SDG 6 SDG 10
4	Develop a methodology and conduct an SDS impact assessment including direct, indirect, short- and long-term impact costs.	Establish and maintain effective partnerships with the key agencies (ESCAP APDIM, UNCCD, WMO, the United Nations Office for Disaster Risk Reduction (UNDRR), the World Overview of Conservation Approaches and Technologies (WOCAT) and others) to customize global or regional methodologies.	SDS impact assessment report conducted for Central Asia.	SDG 8 SDG 9 SDG 11

No.	Activity	Action	Expected outcome	SDGs
5	Develop an SDS atlas (source and deposition areas).	Ensure that national research institutes, including the National Institute of Deserts, Flora and Fauna (Turkmenistan), the Institute of Geography of the Ministry of Education and Science of the Republic of Kazakhstan and Uzhydromet determine methods to identify and map SDS leakage and accumulation zones.	Creation of an SDS atlas.	SDG 13 SDG 14 SDG 15
6	Disseminate information on SDS among wide circles of stakeholders (decision makers, the public, local communities, etc.)	Develop an information campaign to raise awareness at all levels.	Central Asian countries' populations informed about SDS.	SDG 13 SDG 14 SDG 15 SDG 17
7	Conduct training courses for leading universities in the Central Asian countries on the development of curriculum to train SDS experts.	Identify the best international and regional practices to tackle SDS and develop a training course to form a foundation of regional activities based on local knowledge.	Experts enabled to apply measures to tackle SDS.	SDG 9

Priority area 2	Mitigating the impact of SDS anthropogenic sources			
No.	**Activity**	**Action**	**Expected outcome**	**SDGs**
8	Develop programmes and projects for agricultural producers affected by negative processes of drought and SDS to improve their socioeconomic conditions.	Develop innovation-based programmes to assist the agro-industrial complex in partnership with leading ministries and agencies in the Central Asian countries that work in the field of environmental protection.	Farmers enabled to use innovative approaches to reduce the negative impact of SDS.	SDG 2 SDG 3 SDG 6 SDG 9
9	Consider SDS source mitigation in the development of new national and regional projects to restore ecosystems, in updated commitments within the framework of achieving LDN targets and within the framework of the Paris Agreement.	Ensure cooperation between the UNCCD and UNFCCC for joint actions to restore ecosystems and mitigate any SDS impacts on them.	Multisectoral and multilateral planning carried out to develop balanced and sustainable actions.	SDG 17
10	Strengthen the engagement of non-governmental organizations (NGOs) and local communities in national and regional programmes on drought and SDS process management.	With the support of international development partners, prepare plans to engage NGOs and local communities in work to reduce the negative impact of drought and SDS processes.	Enhanced participation of NGOs in the dissemination of information about the danger of the spread of drought and SDS processes.	SDG 11 SDG 17

Priority area 3 Ensuring regional cooperation and joint actions				
No.	**Activity**	**Action**	**Expected outcome**	**SDGs**
11	Integrate the Regional Strategy into appropriate national and regional programmes of Central Asian countries.	With the support of the UNCCD national focal points in the countries, find entry points to introduce the Regional Strategy into national and regional programmes, where appropriate.	Implementation of the Regional Strategy in the Central Asian countries.	SDG 9 SDG 11 SDG 13 SDG 14 SDG 15 SDG 17
12	Develop a single regional action plan to address gender issues in the Central Asian countries in the field of drought and SDS development.	With the support of international development partners, contribute to the development of an integrated gender plan.	Equal access and participation in addressing the issues of tackling SDS processes in Central Asia.	SDG 5
13	Improve cooperation on SDS processes at the regional and international levels.	Build institutional capacity by establishing a training centre to train staff, organize scientific conferences, inform the public and develop recommendations for Central Asian governments as part of strengthening efforts to tackle SDS.	Training provided to national experts and support provided for national policies to roll out regional integration actions.	SDG 17
14	Determine priority areas to combat SDS processes for each Central Asian country.	Develop a comprehensive priority action plan in each Central Asian country to tackle SDS development processes.	Gradual reduction of negative impacts of SDS processes in each Central Asian country.	SDG 9 SDG 11 SDG 13 SDG 14 SDG 15 SDG 17


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Acknowledgements

This Regional Strategy for Sand and Dust Storms Management in Central Asia for 2021–2030 was the collaborative effort of a diverse and experienced team of national and regional experts. The stakeholder interviews, literature review and analysis of national sand and dust storms (SDS) action plans and reports were led by Sultan Veysov, Doctor of Science in Geography and regional SDS expert, with the support of the appointed national institutions in Kazakhstan (the Institute of Ecology and Sustainable Development) led by Kuralay Karibayeva, in Kyrgyzstan (the American University of Central Asia) led by Kanat Sultanaliev and in Uzbekistan (Green World Future) led by Alizhon Ravshanov. In Tajikistan and Turkmenistan, this work was carried out by national working teams led by Mirzo Saidov and Nazar Allaberdiyev, respectively. Geographic information system (GIS) support to prepare the report's maps was provided by Nurlan Bekmagambetov and Nikolay Nikolayev.

The authors extend their gratitude to the Secretariat of the United Nations Convention to Combat Desertification (UNCCD) for financial and technical support, namely Jamal Annagylyjova, Regional Liaison Officer for Central and Eastern Europe and Utchang Kang, Programme Officer, as well as UNCCD national focal points in the Central Asia countries for political support, representatives of ministries, agencies and organizations working in the fields of climate change, land degradation and sustainable use of natural resources for information provided, international and regional donor communities for their technical advice, the Regional Environmental Centre for Central Asia (CAREC), and especially Rustam Issakhojayev, environmental specialist, for technical support in the preparation of this document.

List of acronyms

APDIM	Asian and Pacific Centre for the Development of Disaster Information Management
AVHRR	Advanced Very High Resolution Radiometer
BTD	Brightness temperature difference
CAREC	Regional Environmental Centre for Central Asia
CESDRR	Center for Emergency Situations and Disaster Risk Reduction
CIS	Commonwealth of Independent States
COVID-19	Coronavirus disease 2019
DLDD	Desertification, land degradation and drought
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GIS	Geographic information systems
ICSD	Interstate Commission on Sustainable Development
ICWC	Interstate Commission for Water Coordination
IFAS	International Fund for Saving the Aral Sea
IPCC	Intergovernmental Panel on Climate Change
LDN	Land Degradation Neutrality
MODIS	Moderate Resolution Imaging Spectroradiometer
NCEP	National Centers for Environmental Prediction
NDDI	Normalized Difference Dust Index
NOAA	National Oceanic and Atmospheric Administration
REP4SD-CA	Regional Environmental Programme for Sustainable Development in Central Asia
SDG	Sustainable Development Goal
SDS	Sand and Dust Storms
SDS-WAS	Sand and Dust Storms Warning Advisory and Assessment System
SEPRS	State Emergency Prevention and Response System
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organization
WOCAT	World Overview of Conservation Approaches and Technologies

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