

Strategic Master Plan

for Environmental Remediation of
Uranium Legacy Sites in Central Asia

Second Edition
Revised and Updated

Presented at a Side Event of the 65th IAEA General Conference
Vienna, Austria 21 September 2021



IAEA
International Atomic Energy Agency



PREFACE

The revised and updated edition of the Strategic Master Plan for Environmental Remediation of Uranium Legacy Sites (SMP) was developed by the CGULS Secretariat in 2019-2021. The SMP is an information and reference document that provides potential donors and other interested parties with an overview of the current status of uranium legacy sites in Central Asia, progress achieved, and a range of practical measures aimed at safely and sustainably remediating these sites.

The strategic and integrated approach set out in the SMP provides confidence that remediation of uranium legacy sites in Central Asia will be undertaken in a timely, coordinated, cost-effective, and sustainable manner, in accordance with international standards and good practice. The approach will reduce the risks to people and the environment to acceptable levels and contribute to improved health and socioeconomic conditions and amenity in the affected areas.

The SMP focuses on uranium legacy sites in Kyrgyzstan, Tajikistan and Uzbekistan. The main objective of the SMP is to demonstrate a sustainable and shared approach to remediation in Central Asia to the international community by collating information on the ongoing projects, required actions and funds. This helps avoid duplication of effort, demonstrates progress, and raises awareness for the funding gap which requires further solidarity by the international community.

The SMP specifically focuses on clearly distinguishing activities under the EBRD's Environmental Remediation Account (ERA) and the Commonwealth of Independent States (CIS) Inter-State Targeted Programme on Remediation of Member State Territories affected by Uranium Mining Industries (CIS Programme). Both programmes adhere to the principles of non-interference and complementarity.

The SMP timeline for remediation in Central Asia is based on the approved CIS Programme schedule, as well as schedules established by the EBRD's ERA for its projects, which are dependent on the EBRD's ERA Assembly of Contributors decisions and availability of funds.

The undersigned reiterate their commitment to continue supporting, subject to their respective regulations, rules, standards, policies and procedures, the coordinated approach to remediation of uranium legacy sites in Central Asia to achieve safe and sustainable outcomes for the region.

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Place: Vienna, Austria

EDITORIAL NOTE

This Plan provides a framework of activities and schedules (with specific dates) that were established throughout 2021 and agreed by the core group of CGULS in May 2021.

This document has been produced with co-funding from the European Union and Germany. The views expressed herein can in no way be taken to reflect the official opinion of the European Union and/or Germany and/or the IAEA.

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List of abbreviations

ASSIST	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe (Federal Institute for Geosciences and Natural Resources), Germany
BMBF	Bundesministerium für Bildung und Forschung (Federal Ministry of Education and Research), Germany
CGULS	Coordination Group for Uranium Legacy Sites
CIS	Commonwealth of Independent States
DSA	Direktoratet for strålevern og atomtryggleik (Radiation and Nuclear Safety Authority), Norway
DUB-GEM	Development of a UAV-based Gamma Spectrometry for the Exploration and Monitoring of Uranium Mining Legacies
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EIA and FS	Environmental impact assessment and feasibility studies (EIA and FS)
EIMS	Environmental information management system
ENVIRONET	Network on Environmental Management and Remediation
ENVSEC	Environment and Security Initiative
ERA	Environmental Remediation Account
EU	European Union
EuCAS	European and Central Asian Safety Network
FA	Framework Agreement
FSD	Fondation Suisse de Déminage (Swiss Foundation for Mine Action), Switzerland
GDP	Gross domestic product
GSG	General Safety Guide
GSR	General Safety requirements
IAEA	International Atomic Energy Agency
IAN	Industrial Accident Notification System
ISTC	International Science and Technology Center
MES	Ministry of Emergency Situations
NOT	Convention on Early Notification of a Nuclear Accident
NRSA	Nuclear and Radiation Safety Authority, Tajikistan
OSCE	Organization for Security and cooperation in Europe
PMU	Project Management Unit
ROSATOM	State Atomic Energy Corporation ROSATOM, Russian Federation
RSLs	International Forum on the Regulatory Supervision of Legacy Sites
RTA	Regulatory threat assessment
RTC	Regional Training Centre
SDG	Sustainable Development Goals
SMP	Strategic Master Plan for Environmental Remediation of Uranium Legacy Sites in Central Asia

TAJREDMET	State Unitary Enterprise “Tajik Rare Metals”, Tajikistan
TMA	Tailings Management Agency under the Ministry of Emergency Situations, Kyrgyzstan
TRANSPOND	Transboundary Pollution after Natural Disasters
TSO	Technical support organization
UAV	Unmanned aerial vehicle
UIMS	Unified Information Management System for Disaster and Crises Settings
ULS	Uranium legacy site
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme

Executive Summary

Uranium Legacy Sites in Central Asia: the Challenge

Uranium mining and processing activities have been carried out in Central Asia since mid-1940s. However, with the creation of the new independent states in the 1990s, many of the former uranium mining and milling facilities, as well as associated waste (dumps and tailings) were left abandoned.

Some of the uranium legacy sites (ULS)¹ are located in seismically active areas and in close proximity to the regional waterways, and all ULS pose risks for the population and the environment. These include physical hazards to people and animals, elevated exposure to radioactive and toxic material of communities living in proximity to ULS, negative impact on public health and socio-economic well-being, as well as potential for transboundary contamination.

The release of radioactive and toxic contaminants is inevitable as long as the sites in Central Asia remain unremediated: it is not a question of 'if' but of 'when'. At the same time, Central Asian Member States generally do not have the means to address this challenge, so several international initiatives were launched to support remediation in the region.

The present document is an updated and revised Strategic Master Plan for Environmental Remediation of Uranium Legacy Sites in Central Asia (SMP), covering ULS in Kyrgyzstan, Tajikistan, and Uzbekistan. This edition was prepared by the CGULS Secretariat throughout 2019-2021 in cooperation with the European Bank for Reconstruction and Development (EBRD), European Union (EU), Kyrgyzstan, Norway, Organization for Security and Cooperation in Europe (OSCE), the Russian Federation, Tajikistan, United Nations Development Programme (UNDP), United Nations Economic Commission for Europe (UNECE) and Uzbekistan.

Purpose, Objectives, Guiding Principles and Scope of the Strategic Master Plan

The SMP is an information and reference document that sets forth a fully integrated, coherent, systematic, transparent framework for environmental remediation of ULS in Central Asia that makes best use of available resources.

The Strategic Master Plan sets forth the following strategic objectives:

- 1) To remediate uranium legacy sites in Central Asia in accordance with international standards and good practice;
- 2) To reduce the risks to people and the environment to tolerable and sustainable levels;
- 3) To contribute to improved health and socioeconomic conditions and amenity in the affected areas;
- 4) To establish, through regional cooperation, a larger and more sustainable critical mass of knowledge and expertise within Central Asia for undertaking remediation and regulating its safety.

¹ For the purposes of the Strategic Master Plan, a uranium legacy site (ULS) is a site that fulfils the following criteria:

- (a) Where uranium mining and/or processing has been carried out in the past but has ceased, or where waste from these operations has been disposed of;
- (b) Where there is a need for remediation or continued monitoring to ensure the safety of the site;
- (c) Where the State has had to assume responsibility for the safety of the site in the absence of a private owner.

The strategic objectives are supported by the guiding principles, namely aligning remediation activities with explicitly stated and commonly agreed sustainable long-term goals and addressing the risks on a systematic and consistent basis across the whole region.

The SMP promotes a step-by-step approach to remediation in the region, focusing first on those uranium legacy sites described in the Technical Baseline Document [1] to present the highest risks and included in the scope of the active remediation programmes – the EBRD’s Environmental Remediation Account for Central Asia (ERA) and the Commonwealth of Independent States (CIS) Inter-State Targeted Programme on Remediation of Member State Territories affected by Uranium Mining Industries (CIS Programme).

Considering the respective scopes and plans of EBRD’s ERA and those of the CIS Programme², as well as the completion of systematic and comprehensive evaluations of the risks and remediation options (including costs) for the seven priority sites included in these remediation programmes, the second edition of the SMP covers the following ULS:

Table 1. Priority uranium legacy sites included in the scope of the second edition of the Strategic Master Plan

Kyrgyzstan	Tajikistan	Uzbekistan
Mailuu-Suu	Degmay	Charkesar
Min-Kush ^a	Istiklol ^a	Yangiabad
Shekaftar		

^a (a) Min-Kush in Kyrgyzstan and Istiklol in Tajikistan are the two sites where remediation works are conducted by both CIS and EBRD’s ERA remediation programmes, focusing on different objects at each site. Each programme uses separate funds and follows its own administrative, financial, and operational procedures.

Other ULS in the region, which still lack comprehensive evaluations of the risks and remediation options (including costs) and have not as of 2020 been included in either the CIS or EBRD’s ERA programmes, should be addressed once remediation of the priority sites has been completed. These sites include Kyzyl-Djar and Tuja-Moyun in Kyrgyzstan; and Adrasman, Karta 1-9, Khujand and Samgar mines and Ismoil waste rock dumps in Tajikistan. An overview of these sites is presented in Appendix I.

The application of the strategic approach coupled with the well-defined scope will ensure confidence – in particular among affected Member States and potential donors – that remediation is conducted in a timely, coordinated, cost-effective and sustainable manner, and in accordance with international good practice.

Progress Towards Implementing the Strategic Master Plan

Steady progress is being made towards remediating priority sites in Central Asia.

Kadji-Say site in Kyrgyzstan is the first uranium legacy site included in the SMP to be remediated within the scope of the CIS Programme. In 2017 remediation started at Min-Kush tailings and is expected to be completed at the end of 2023. Funding to remediate Yellow Hill and tailings 1-4 at Istiklol, Tajikistan, was approved in 2018 and works are expected to commence in 2022.

² The EBRD’s ERA programme covers Mailuu-Suu, Min-Kush and Shekaftar in Kyrgyzstan, Istiklol and Degmay in Tajikistan, and Charkesar and Yangiabad in Uzbekistan. The CIS Programme covers Min-Kush (tailing ponds) in Kyrgyzstan, and Istiklol (“Yellow Hill” and tailings 1-4) in Tajikistan. Kadji-Say, Kyrgyzstan, another site within the scope of the CIS Programme, has already been remediated.

The EBRD's ERA programme is making steady progress. Following EBRD's delivery model, Framework Agreements came into force with Kyrgyzstan (2018), Tajikistan (2020) and Uzbekistan (2017). ERA is fully operational in Kyrgyzstan and Uzbekistan, while preparatory work is underway in Tajikistan to enable ERA operations.

Comprehensive evaluations of the risks and remediation options (including costs) for the seven ERA priority sites are complete. The feasibility studies and environmental impact assessments for the sites were completed with support from the EU's Instrument for Nuclear Safety Cooperation (INSC) and have been peer reviewed by independent IAEA experts, as coordinated by the CGULS Secretariat.

EBRD's ERA-supported remediation of Shekaftar commenced in July 2020 and Min-Kush (all objects, other than tailings) in October 2020. Remediation of the Mailuu-Suu site will be approved in 2022. Decisions on funding remediation works at Mailuu-Suu in Kyrgyzstan, Istiklol (all objects other than Yellow Hill and tailings) and Degmay in Tajikistan, and Charkesar and Yangiabad in Uzbekistan are made by the ERA Assembly of Contributors based on fulfilment of the necessary Framework Agreement requirements and availability of funds.

Remediation Costs

Funding for the remediation of all the CIS Programme sites has already been approved, with CIS Member States undertaking to finance it from their respective budgets. It includes the financing of studies and assessments that were completed within the first phase of the CIS programme and amounted approximately €3.2 million³, and funding for the physical remediation with a total cost of €32.2 million.

With the support of EU's INSC, a suite of environmental impact assessment and feasibility studies (EIA and FS) was completed by 2020, forming a portfolio of implementation-ready projects. The total costs of EIA and FS for the seven EBRD's ERA priority sites amounted to €8 million.

The total cost of EBRD's ERA Programme amounts to €85 million, which includes project estimates and other programme costs. EBRD's ERA currently holds €46 million, leaving a funding gap to remediate all priority sites included in its scope. Addressing this gap is critical for the sustainability of the region-wide remediation.

³ Here and elsewhere in the document: the CIS Programme costs in Russian Roubles were converted, for the ease of reference, at the rate of 90 Russian Roubles for 1 Euro (as of May 2021) and are provided in Euros.

1. Introduction



1. Introduction

1.1 Background

Uranium mining and processing activities have been carried out in Central Asia since the mid-1940s, particularly in the mountainous and seismically active areas above the Syr Darya river and the Ferghana valley, where the Kyrgyz Republic, the Republic of Kazakhstan, the Republic of Tajikistan and the Republic of Uzbekistan⁴ intersect.

Many of these activities ceased in the 1990s, leaving a legacy of uranium mining and milling sites, together with associated waste rock and low-grade ore dumps, tailings piles and ponds. These uranium legacy sites (ULS) pose risks to the environment and public health – including physical risks to people and animals, and radiological and toxicological risks from living in close proximity to the contaminated material remaining in the facilities. Erosion, floods, earthquakes, landslides or mudflows may also lead to a transboundary dispersion of the contaminated material with implications for public health and economic well-being.

The release of contaminants is inevitable as long as ULS in Central Asia remain unremediated: it is not a question of ‘if’ but of ‘when’. Faced with these challenge, Kyrgyzstan, Tajikistan and Uzbekistan generally do not have the means to remediate uranium legacy sites in a sustainable manner. The 2018 United Nations General Assembly Resolution⁵ and several IAEA General Conference resolutions⁶ call on the international community to support Central Asia Member States in remediating legacy sites.

To support efficient and coordinated approach to remediation, the Coordination Group for Uranium Legacy Sites (CGULS) was established in 2012 to facilitate cooperation among IAEA Member States affected by uranium legacies⁷ and national and international organizations involved in the management, remediation, or regulatory oversight of ULS.

Building on the Technical Baseline Document [1], the first edition of the Strategic Master Plan for Environmental Remediation of Uranium Legacy Sites in Central Asia (SMP) [2] was developed in 2017 on behalf of the Central Asia Member States by the core group of CGULS. The core group comprised representatives of the European Bank for Reconstruction and Development (EBRD), the European Union (EU), the IAEA, Kyrgyzstan, the Russian Federation, Tajikistan and Uzbekistan. The first edition of the SMP was officially endorsed by EU, EBRD, Kyrgyzstan, Tajikistan, and Uzbekistan at a signing ceremony in Vienna, Austria, on 18 September 2017 at a side event of the 61st IAEA General Conference. The SMP was then submitted to the Economic Council of the Commonwealth of Independent States (CIS) for consideration and received formal endorsement on 22 March 2018.

This document is the updated and revised edition of the SMP. It covers uranium legacy sites in three Central Asia Member States, namely the Kyrgyz Republic, the Republic of Tajikistan and the Republic of Uzbekistan. This edition was prepared by the CGULS Secretariat throughout 2019-2021 in cooperation with the European Bank for Reconstruction and Development (EBRD), European Union (EU), Kyrgyzstan, Norway, Organization for Security and Cooperation in Europe (OSCE), the Russian Federation, Tajikistan, United Nations Development Programme (UNDP), United Nations Economic Commission for Europe (UNECE) and Uzbekistan.

⁴ Referred to as Kyrgyzstan, Kazakhstan, Tajikistan and Uzbekistan in the remainder of this document.

⁵ The role of the international community in the prevention of the radiation threat in Central Asia, Resolution A/RES/73/238, United Nations, New York (2018); the resolution was co-sponsored by 41 United Nations Member States.

⁶ IAEA General Conference Resolutions (2009-14): GC(53)/RES/10, para. 65; GC(54)/RES/7, para. 54; GC(55)/RES/9, para. 66; GC(56)/RES/9, para. 64; GC(57)/RES/9, para 86; and GC(58)/RES/10, para. 90.

⁷ As per the CGULS Terms of Reference, CGULS members are Kazakhstan, Kyrgyzstan, Tajikistan, Ukraine and Uzbekistan.



Signing ceremony on the side event during the 65th General Conference, the VIC, Vienna, Austria.

The revised and updated the revised and updated SMP was signed and endorsed by the representatives of the EBRD, EU, IAEA, Kyrgyzstan, ROSATOM, Tajikistan and Uzbekistan at a Side Event of the 65th IAEA General Conference in Vienna, Austria on 21 September 2021.

1.2. Key Definitions

For the purposes of the SMP, a uranium legacy site (ULS) is a site that fulfils the following criteria:

- (a) Where uranium mining and/or processing has been carried out in the past but has ceased, or where waste from these operations has been disposed of;
- (b) Where there is a need for remediation or continued monitoring to ensure the safety of the site;
- (c) Where the State has had to assume responsibility for the safety of the site in the absence of a private owner.

A uranium legacy site may also include various “objects”. In the context of the SMP, an “object” is the term used to denote something located on a ULS that presents a risk requiring remediation (e.g. an open mine shaft or adit, a waste dump, a tailings pile, contaminated land, contaminated water, facilities/installations involved in the processing of uranium ore).

1.3. Purpose and Scope of the Strategic Master Plan

The purpose of the SMP is to set forth a fully integrated, coherent, systematic, transparent framework for environmental remediation of ULS in Central Asia that makes best use of available resources. It is aimed at providing the Central Asia Member States and the potential donors with the confidence that the risks and problems posed by ULS in Central Asia are being addressed in a timely, coordinated, cost-effective and sustainable manner.

The SMP is aligned with relevant international agreements as well as the United Nations 2030 Agenda for Sustainable Development⁸. The SMP contributes to the achievement of several Sustainable Development Goals (SDGs), and namely to the SDG-3 (good health and well-being), SDG-6 (clean water and sanitation), and SDG-15 (life on land).



The shared strategic vision is expressed in the Section 2 of this document. Aligning remediation activities with explicitly stated and commonly agreed sustainable long-term goals and addressing the risks on a systematic and consistent basis across the whole region ensures equity in meeting the development and environmental needs of present and future generations. Involving communities and individuals in transparent decision-making processes provides a platform for promoting best international practices and supports an inclusive process for incorporating diverse recommendations to achieve sustainable remediation.

The SMP promotes a step-by-step approach to remediation in the region, focusing first on those uranium legacy sites judged to present the highest risks and included in the scope of the active remediation programmes. The Technical Baseline Document [1] provided rankings of risks and relative priorities for remediation while two major international remediation programmes are active in the region – EBRD’s Environmental Remediation Account (ERA) and the Inter-State Targeted Programme on Remediation of Member State Territories affected by Uranium Mining Industries (CIS Programme) [3].

The EBRD’s ERA programme covers Mailuu-Suu, Min-Kush and Shekaftar in Kyrgyzstan, Istiklol and Degmay in Tajikistan, and Charkesar and Yangiabad in Uzbekistan. The CIS Programme covers Min-Kush (tailings) in Kyrgyzstan, and Istiklol (Yellow Hill and tailings 1-4) in Tajikistan. At the Kadji-Say site in Kyrgyzstan remediation has already been completed under the CIS Programme.

Considering the respective scopes and plans of EBRD’s ERA and those of the CIS Programme, as well as the completion of systematic and comprehensive evaluations of the risks and remediation options (including costs) for the seven priority sites included in these remediation programmes, the scope of this edition of the SMP covers the following priority ULS in Central Asia:

⁸ Transforming Our World: the 2030 Agenda for Sustainable Development, Resolution A/RES/70/1, United Nations, New York (2015).



Locations of uranium legacy sites in Central Asia covered by the second edition of the SMP.

Adapted from maps provided by the UN Geospatial Information Section.

Table 1. Priority uranium legacy sites included in the scope of the second edition of the Strategic Master Plan

Kyrgyzstan	Tajikistan	Uzbekistan
Mailuu-Suu	Degmay	Charkesar
Min-Kush ^a	Istiklol ^a	Yangiabad
Shekaftar		

^a (a) Min-Kush in Kyrgyzstan and Istiklol in Tajikistan are the two sites where remediation works are conducted by both CIS and EBRD’s ERA remediation programmes, focusing on different objects at each site. Each programme uses separate funds and follows its own administrative, financial, and operational procedures.

Other sites, include Kyzyl-Djar and Tuja-Moyun in Kyrgyzstan; Adrasman, Karta 1-9, Khujand and Samgar mines and Ismoil waste rock dumps in Tajikistan await systematic and comprehensive evaluations of the risks and remediation options (including costs) and should be addressed once remediation of the priority sites has been completed. An overview of these sites is presented in Appendix I.

Central Asia Member States also face challenges associated with sites and objects presenting only chemical or toxicological risks⁹. While those sites remain outside of the scope and primary focus of the present document, a holistic approach to remediation effort and integration of those sites into a broader approach to the environmental safety in the region would be beneficial.

⁹ These include, among other, three tailings located near the Sumsar village and two tailings near the Kan village in Kyrgyzstan.

1.4. Institutional Arrangements for Implementing the Strategic Master Plan

Institutional and organizational arrangements have been established to ensure the effective implementation of the SMP and coordination between interested parties. The CGULS Secretariat performs an overall coordination function for the implementation of the SMP, which involves overseeing its implementation and facilitating information exchange and knowledge transfer. Actual remediation work is supported by the EBRD's ERA and the CIS Programme.

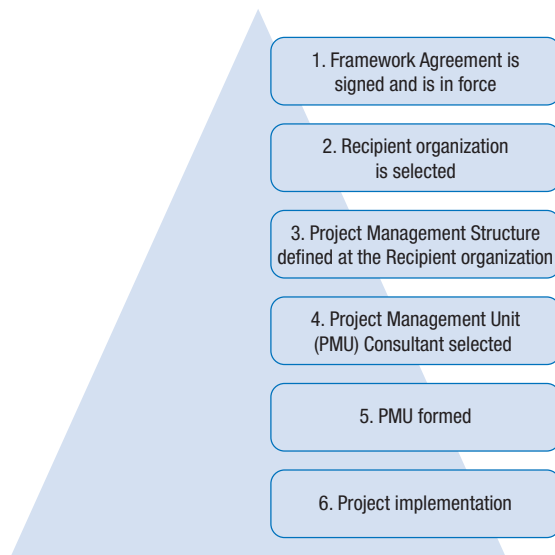


Figure 1: EBRD's ERA project delivery model

The EBRD established the ERA for Central Asia in 2015 and it became operational following an initial contribution from the European Union. The first meeting of its Assembly of Contributors was held in July 2016. The SMP and the EU's INSC-supported systematic and comprehensive evaluations of risks and remediation options (including costs) for the seven priority uranium legacy sites, provide the strategic underpinning for ERA and enable informed decisions on the allocation of ERA resources by its Assembly of Contributors.

ERA support is provided on the basis of Framework Agreements (in force in Uzbekistan, Kyrgyzstan and Tajikistan since 2017, 2018 and 2020 respectively). Framework Agreements provide a legal basis for ERA operations and establish a set of obligations for Member States primarily aimed at ensuring long-term sustainability of remediation efforts. All ERA projects follow the same delivery model (see: Fig. 1), which includes selecting a recipient organization, identifying a project management structure within this selected organization, selecting a Project Management Unit (PMU) Consultant (an organization or an entity) and forming the PMU, comprised of the representatives of the recipient organization and a Consultant. The PMU assumes responsibility for the implementation of remediation projects funded by ERA.

The CIS Programme for remediation of uranium legacy sites in Kyrgyzstan and Tajikistan is based on a concept developed during the period 2008–2012 for the remediation of the territories of EurAsian Economic Community (EurAsEC) Member States affected by uranium mining industries. It was approved by a decision of the EurAsEC Interstate Council in 2012. Funding is being provided by those CIS Member States participating in the programme, namely the Russian Federation (75%), Kazakhstan (15%), Kyrgyzstan (5%) and Tajikistan (5%); their contributions take account of a number of socioeconomic indicators, including GDP.

The coordination between the EBRD's ERA and CIS Programme is supported by two mechanisms. These mechanisms are i) the Memorandum of Understanding between ROSATOM and EBRD on cooperation in the remediation of former uranium production sites, signed in November 2018, and, ii) implementation of joint activities pursuant to the Action plan on public awareness raising in regions with ongoing and expected ULS remediation projects in the Kyrgyz Republic, the first version of which was signed in July 2020 by the Ministry of Emergency Situations of the Kyrgyz Republic, ROSATOM, OSCE, UNDP and the ERA-supported PMU in Kyrgyzstan. The Action plan on public awareness is updated annually.

The European Union, through the EU's INSC, has focused on capacity building, evaluations of the risks and remediation options for the seven priority legacy sites, and the establishment of ERA (managed by the EBRD), and has made a contribution to addressing the risks from contaminated water at the Istiklol site, Tajikistan, and to the establishment of the landslide monitoring system at the Mailuu-Suu site, Kyrgyzstan.

2. Strategy for environmental remediation of uranium legacy sites in Central Asia



2. Strategy for environmental remediation of uranium legacy sites in Central Asia

2.1. Strategic Objectives

The strategic objectives for remediation are:

- To remediate uranium legacy sites (ULS) in Central Asia in accordance with international standards and good practice;
- To reduce the risks to people and the environment to tolerable and sustainable levels;
- To contribute to improved health and socioeconomic conditions and amenity in the affected areas;
- To contribute to the minimization of the risk of radioactive and/or toxic material being dispersed across national borders (e.g., via rivers or other water bodies);
- To establish, through regional cooperation, a larger and more sustainable critical mass of knowledge and expertise within Central Asia for undertaking remediation and regulating its safety.

2.2. Guiding Principles

The guiding principles for achieving the strategic objectives are as follows:

- Adopt a systematic, integrated and coordinated approach to environmental remediation of ULS in Central Asia that is cost effective, is in line with international standards and good practice, contributes towards stability and sustainable development in the region, and avoids potential duplication by different donors;
- Ensure, through cooperation, partnership and the involvement of interested parties, that the Strategic Master Plan and national strategies and plans for remediating ULS, and the implementation of the national strategies and plans, are and remain aligned;
- Ensure that local and national decision-makers, and community members understand the remediation process and its impact on people, livelihoods and the environment;
- Ensure that the scale, nature and timing of remediation activities (i.e. including evaluation of remediation options and implementation of the preferred option) are compatible with the capacities of the site owners and the regulatory body and other authorities, including the regulatory framework for remediation of uranium legacy sites, noting that capacity building activities may be necessary in advance of and during remediation activities;
- Adopt a step-by-step approach to remediation in the region, focusing first on the seven priority sites identified in the scope of this document, and when remediation of these sites is complete, progressing to those of a lower priority, on the following timescale:

- Subject to available funding and necessary regulatory approvals, remediate, within the next 10 years and in accordance with international standards and good practice, the seven priority sites;
- Subject to available funding and necessary regulatory approvals, remediate, within the next 10 to 20 years and in accordance with international standards and good practice, other sites, currently not identified as high priority.
- When developing environmental remediation plans for ULS:
 - Select sustainable remedial actions that address the risks of legacy sites as a whole and in an integrated manner;
 - Give consideration to the remediation of objects presenting only a chemical or toxicological risk (in addition to those presenting a radiological risk);
 - Provide information to relevant interested parties, including local communities to engage them in decision-making for remediation planning;
 - Give preference to the use of remediation options that minimize the need for long-term human intervention to maintain their efficacy.

2.3. Applicable National Policies and Strategies

The Strategic Master Plan takes into account and, where applicable, supports implementation of the following national policies and strategies:

- CIS Framework Programme for Cooperation in the Peaceful Uses of Atomic Energy until 2030 [4];
- Programme of Actions on Preparation for Emergency Situations and Responses on Risks of Natural Disasters and Radiation and Environmental Safety in the Kyrgyz Republic and Transboundary Areas within Central Asian Countries for 2005–2015 [5], the Action Plan on Managing Issues in the Field of Radiation Safety of the Kyrgyz Republic [6], and the National Programme for Stakeholders Engagement on Uranium Legacy Sites Remediation in Kyrgyzstan for 2021-2024 [7];
- The National Concept of the Republic of Tajikistan for the Rehabilitation of Tailings from the Processing of Uranium Ores for 2016-2024 [8];
- The Concept of the Republic of Uzbekistan for the Environmental Protection until 2030 [9].

2.4. Specific Activities

Specific activities aimed at achieving strategic objectives are outlined in the Section 3 of the SMP and may need to be reviewed and updated periodically, as appropriate, throughout implementation, and reflected as such in any future periodic reports by the CGULS Secretariat.

2.5. Benefits of the Strategic and Integrated Approach

Coordination of activities in accordance with the Strategic Master Plan brings the following benefits:

- Direct improvement in the quality of life of those affected by the ULS, both by reducing the actual risks posed (physical, radiological, toxicological, short and long term, continuous and accidental) to levels that are in line with internationally accepted norms and sustainable over the long term;
- Reduced potential for the uncontrolled dispersion or transfer of radioactive and toxic materials across national borders;
- Prevention of the further dispersion of radioactive and toxic materials as a consequence of human activities or natural events, which has the potential to substantially increase the area of contamination and the costs of environmental remediation to the point where it may become unaffordable;
- Enhanced stakeholder engagement and coordinated approach to public awareness-raising for remediation of ULS;
- Facilitation of sustainable development by improving amenity and the natural environment, and by bringing land back into productive use for agricultural and human habitation or other purposes.

The strategic and integrated approach set forth in this document enables the best use of the limited financial and human resources available for environmental remediation at the national, regional and international levels. The approach allows to:

- Coordinate remediation activities with explicitly stated and commonly agreed goals that are sustainable over the long term;
- Address the risks on a systematic and consistent basis across the whole region;
- Address the risks on a step-by-step basis, taking full advantage of potential economies of scale, while remaining within the limits of the funding, capabilities and capacities that can be provided;
- Strengthen cooperation and common understanding among the affected Member States on the need for a regional approach and regional solution to address the uranium legacy issue;
- Promote the use of harmonized and compatible infrastructure, methods, databases, etc., where appropriate;
- Mobilize wider international efforts and capabilities for the environmental remediation of ULS in Central Asia;
- Further develop and enhance capacities at a national level, and across the region, so that risks posed by ULS can be managed over the long term without a need for external support;
- Develop and implement comprehensive outreach campaigns targeting local populations on remediation of ULS and the impact on the environment and human health;
- Contribute to sustainable socioeconomic development in the affected areas.

2.6. Role of the CGULS Secretariat

The CGULS Secretariat, in consultation with Member States and interested parties, undertakes the following activities in relation to the SMP:

- Promotes the application of a systematic, integrated, and coherent approach to environmental remediation of ULS in Central Asia, based on the strategic objectives and guiding principles set forth in the SMP, applicable international standards and best practice;
- Monitors implementation of the SMP and reports to the Annual Meeting of CGULS on the implementation progress;
- Prepares and disseminates among interested parties a biennial report on the progress towards implementing the SMP;
- Maintains and periodically updates a space on the CGULS CONNECT Platform, dedicated to the SMP and the progress towards its implementation;
- When and if necessary, reviews and updates the SMP;
- Supports coordination between the EBRD's ERA and CIS Programme in implementation of environmental remediation;
- Supports national regulatory body and other authorities in carrying out reviews of the safety and environmental aspects of any proposed remediation project;
- Facilitates the sharing of information among all interested parties;
- Upon request and in consultation with Member States, facilitates expert missions to review remediation process and its results against IAEA Safety Standards and related international standards.

3. Progress towards remediating uranium legacy sites in Central Asia



3. Progress towards remediating uranium legacy sites in Central Asia

3.1. CIS Programme

All preparatory work, including relevant studies and assessments (similar to environmental impact assessment and feasibility studies) were completed within the first phase of the CIS programme by 2017. The total costs of these evaluations amounted to €3.2 million. The second phase (2017-2023) is focused on the physical remediation. The Kadji-Say site in Kyrgyzstan became the first uranium legacy site to be remediated within the scope of the CIS Programme. Remediation, with the total cost of €1 million, commenced in 2017 and was completed in 2019. In 2017 remediation started at Min-Kush tailings (total cost €23 million) and is expected to be completed at the end of 2023. Funding (approximately €9.2 million) to remediate Yellow Hill and tailings 1-4 at Istiklol, Tajikistan, was approved in 2018 and works are expected to commence in 2022.

3.2. EU'S Instrument for Nuclear Safety Cooperation (INSC)

EU's INSC supported systematic and comprehensive evaluations of the risks and remediation options (including costs) for the seven priority sites in the purview of EBRD's ERA. With the conclusion of the final study in 2020, a suite of environmental impact assessment and feasibility studies (EIA and FS) was completed, forming a portfolio of implementation-ready projects.

The first EU's INSC-supported EIA and FS was completed in 2015 for Charkesar and Yangiabad sites (Uzbekistan) [10], followed by Min-Kush and Shekaftar (Kyrgyzstan) in 2016 [11], Istiklol and Degmay (Tajikistan) in 2018 [12] and Mailuu-Suu (Kyrgyzstan) in 2020 [13]. The EIA and FS for each site focused on objects presenting significant risk at each site, identification of preferred remediation options and quantification of remediation costs. The combined costs of EU's INSC-supported EIA and FS amounted to approximately €8 million.

Based on the official request from the European Union, CGULS organized peer reviews of EU's INSC-supported environmental impact assessments and feasibility studies by independent international experts [14, 15, 16, 17]. Peer review findings were subsequently incorporated into the final reports and shared with relevant national authorities, including regulators and site operators.

3.3. EBRD's Environmental Remediation Account for Central Asia (ERA)

The EBRD's Environmental Remediation Account for Central Asia (ERA) remediation programme is making steady progress. In accordance with the EBRD's delivery model, Framework Agreements (FA) were signed with and entered into force in Uzbekistan (2017), Kyrgyzstan (2018) and Tajikistan (2020). Recipient organizations were selected in Kyrgyzstan (Tailings Management Agency under the Ministry for Emergency Situations of the Kyrgyz Republic), Tajikistan (Ministry of Industry and New Technologies), and in Uzbekistan (Directorate for Buildings Management and Capital Construction under the State Committee for Ecology and Environmental Protection). In line with the Framework Agreement requirements, the Project Management Unit (PMU) has been operational in Kyrgyzstan since 2019, in Uzbekistan since September 2021 and necessary preparatory work to establish respective PMU is underway in Tajikistan.

In 2019, funding was approved by the EBRD's ERA Assembly of Contributors for the remediation of Min-Kush (€3 million for all objects other than tailings) and Shekaftar (€3 million) in Kyrgyzstan. Remediation works at the Shekaftar site commenced in July 2020 and at the Min-Kush site in October 2020. Remediation of the Mailuu-Suu site, estimated to cost €26 million, depends on the availability of ERA funds. A decision of the Assembly of Contributors on funding Mailuu-Suu remediation is expected in 2022.

Subject to the fulfilment of the necessary FA requirements and availability of funds in the ERA, decisions by the EBRD's ERA Assembly of Contributors on funding remediation works at Istiklol (estimated cost of remediating all objects other than Yellow Hill and tailings 1-4 is €13 million) and Degmay (estimated cost of €28 million) in Tajikistan, and Charkesar (estimated cost €0.8 million) and Yangiabad (estimated cost of €7.2 million) in Uzbekistan are expected not earlier than 2022. A decision of the Assembly of Contributors on funding Charkesar and Yangiabad remediation is expected in 2022.

As of 2021, EBRD's ERA holds approximately €46 million, leaving a significant funding gap to remediate all priority sites included in the scope of EBRD's ERA programme. Addressing this gap is critical for the long-lasting positive impact and region-wide sustainability of coordinated remediation efforts.

3.4. Remediated Sites

Since the publication of the first edition of the Strategic Master Plan in 2017, Kadji-Say in Kyrgyzstan became the first uranium legacy site, included in the SMP, remediated under the CIS Programme. The Gafurov site in Tajikistan, remediated with Tajik government funding before 2017, is also included in this section.

With remediation works underway at several other priority sites, the experience gained through completed remediation projects is invaluable to support informed decision-making among the international donor community and help both international and national programmes to implement remediation projects in a holistic and comprehensive manner.

At the same time, additional challenges arise as Central Asia Member States need to develop robust remediation licensing and site release regulations, post-remediation long-term stewardship and monitoring programmes and fulfil other international commitments. These challenges will need to be addressed in a holistic manner to ensure that remediation results across the region are harmonious and sustainable.

3.4.1. Kadji-Say, Kyrgyzstan

Kadji-Say is located on the southern shore of Lake Issyk-Kul, a popular resort destination. Kadji-Say tailings mainly contained a mixture of mill waste, coal ash from the former thermal plant, waste rock and the residues of coal ash processed for uranium extraction. Prior to remediation, risks associated with the site included free access to the tailings and wide-spread use of scrap metal found on the site.

A systematic and comprehensive evaluation of the risks and remediation options (including costs) for Kadji-Say has been carried out as part of the first phase (2012-2016) of the CIS Programme. Kadji-Say remediation project underwent a review by the competent Kyrgyz authorities and received approval at a public hearing.

In October 2016, the CIS Council approved funding of the project, allocating approximately €1 million for the remediation of Kadji-Say. Remediation works started in October 2017 and were completed in October 2019.



Tailing dump in Kadji-Sai village, after remediation, September 2020.

Works included the construction of a protective screen and restoring the fence around the site to prevent unrestricted access, relocation of contaminated tailings material to the newly built tailings facility, changing the existing riverbed to prevent erosion of the sides of the tailings, as well as construction of two protective dams. Tailings slopes were reinforced, and five wells were drilled to support post-remediation monitoring.

3.4.2. Gafurov, Tajikistan

Gafurov legacy site, covering a total area of more than 5 hectares, contains some 400 thousand tons of waste, including tailings, waste rock, scrap metal and decommissioned industrial machines. The main risks associated with the site stemmed from its proximity to the population – a main road with apartment blocks is located less than 50 meters away and a railways station is within 150 meters from the site.



Gafurov site after remediation by the government of Tajikistan.

Gafurov's remediation was funded by the Government of Tajikistan. The site was covered with a layer of sedimentary material, comprising gravel and cobble-sized stones and sand in a silt-clay matrix. The heap was constructed on the natural land surface without any special site preparation.

Remediation already carried out at Gafurov was judged by the Nuclear and Radiation Safety Agency (NRSA), Tajikistan's regulatory body, to be sufficient and broadly in accord with good international practice [2]. Nonetheless, confirmation of this judgment by an independent evaluation would further enhance public confidence.

4. Master Plan for implementing the strategy



4. Master Plan for implementing the strategy

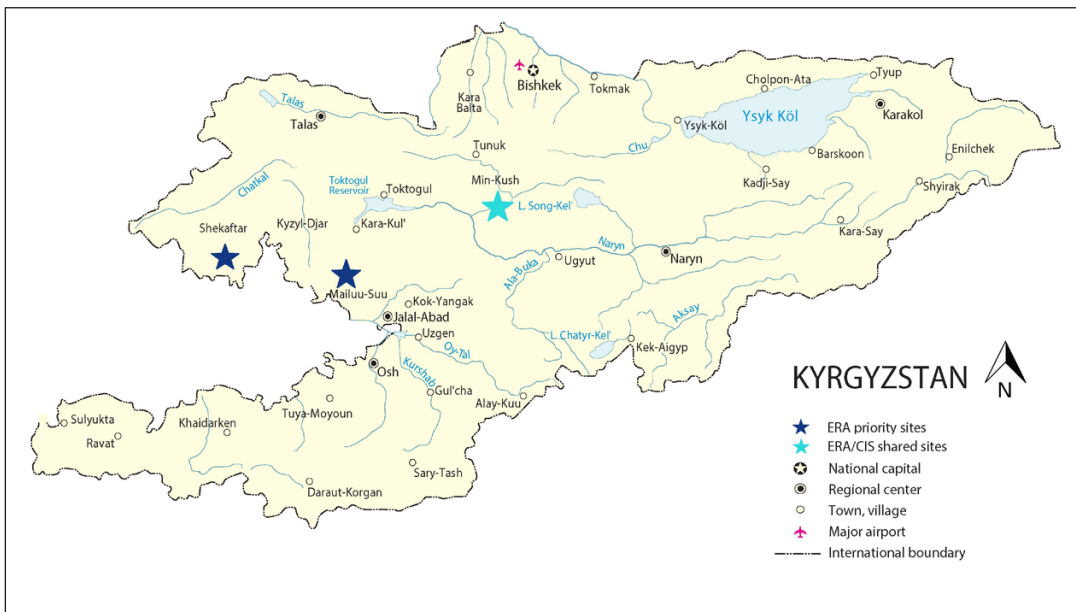
The Strategic Master Plan provides a sound technical and financial framework for the implementation of the strategy and enables the international community and potential donors to make well-founded decisions on supporting environmental remediation.

4.1. Environmental Remediation of Uranium Legacy Sites

Prioritization of the seven sites in Kyrgyzstan (Mailuu-Suu, Min-Kush and Shekaftar), Tajikistan (Istiklol and Degmay) and Uzbekistan (Charkesar and Yangiabad) is based on the risk and priority rankings attributed to each site in the IAEA Technical Baseline Document on uranium legacy sites in Central Asia [1], evaluations of risks and remediation options undertaken with the support from EU's INSC and under the CIS Programme, and were included in the national concepts, strategies and plans for environmental remediation.

The plan and road map, including the results of comprehensive evaluations of risks and remediation options (including costs), preferred remediation options, availability of funds and the current status of remediation projects are described below. Figures are provided illustrating the locations of the ULS in each country, as well as photographs of sites.

4.1.1. Kyrgyzstan



Locations of uranium legacy sites in Kyrgyzstan.

Adapted from maps provided by the UN Geospatial Information Section.

4.1.1.1. Shekaftar

The Shekaftar site in the Jalalabad region is one of the seven EBRD's ERA priority sites. The site comprises three closed mines and eight mining waste disposal areas situated alongside Sumsar river in the vicinity of Shekaftar and Sumsar villages. These objects contain about 700 thousand cubic meters of waste rock and low-grade ores.

The main risks at Shekaftar stem from the exposure of the population to radon and gamma-radiation from easily accessible waste material. Waste disposal sites on the banks of the Sumsar river have been intensively eroded by the river. The continuous and uncontrolled release of radioactive contaminants into the river causes significant pollution downstream and results in deposition of contaminated sediments at the shoreline.



Transport of waste material from Shekaftar to remote waste repository.

In November 2019, the ERA Assembly of Contributors approved the funding for remediating Shekaftar. Remediation costing €3 million began in July 2020 and is expected to be completed by the end of 2021.

Works at Shekaftar include closure of six shafts by demolishing remaining above-ground structures and closing shaft openings with concrete. Material from waste rock dumps, including five dumps near schools and other buildings and one dump on the banks of the Sumsar river will be relocated to a more remote dump site and covered with a layer of soil. A new pipeline will provide Shekaftar village with a source of clean drinking water.

4.1.1.2. Mailuu-Suu



View on the former uranium processing plant alongside Mailuu-Suu river.

The Mailuu-Suu legacy site is one of the seven EBRD's ERA priority sites, situated in the mountainous Jalalabad region and prone to earthquake activity, landslides and floods. More than 2 million cubic meters of tailings are disposed at 23 locations with a total area of almost 50 hectares, scattered along riverbanks of the Mailuu-Suu river and its tributaries. The town of Mailuu-Suu is in direct proximity to the tailings and waste rock dumps with some houses less than 500 meters away.

The main risk associated with Mailuu-Suu legacy site is linked to the highly active seismic conditions in the region. An earthquake or an extreme weather event may result in the release of large quantities of radioactively contaminated tailings material into the river, causing transboundary contamination. In the recent years, Mailuu-Suu has experienced several adverse natural events, most recently – a landslide in 2019.

The preferred remediation options identified by the EU's INSC-supported EIA and FS include relocation, soil cover and additional channels for tailings ponds, demolition and cover of buildings, closure of open shafts with concrete slabs, closure and filling of adits with concrete plugs, crushed rock and waste rock, and installation of warning signs. Objects considered in the EU's INSC-supported EIA and FS included 39 waste rock dumps of various sizes, 20 tailings ponds, six shafts and 49 adits, two former ore processing plants and 83 former mine building or ruins that remain on the site.

The total cost of remediating Mailuu-Suu is estimated at €26 million. Remediation works will take seven years to complete. The ERA Assembly of Contributors will approve to remediate Mailuu-Suu in 2022.

4.1.1.3. Min-Kush



Sunlight through summer rainfall in Min Kush.

The Min-Kush mining and milling site is located in the mountainous region some 130 km south of Bishkek on the bank of the Min-Kush river. The mine and mill site comprises four closed mines, four waste rock piles and tailings ponds, including Tuyuk-Suu, Taldy-Bulak, Kak and Dalnee. Risks associated with the site include the use of contaminated water for drinking and irrigation as well as physical hazards from dilapidated infrastructure and facilities.

Close proximity of Tuyuk-Suu to the Min-Kush river, coupled with a constant threat of landslide activity increase the risk of transborder contamination, as the river is a tributary of the Syr-Darya river. Given complexity of Min-Kush and costs, required to remediate this site sustainably, it is the focus of both the CIS Programme and EBRD's ERA.

CIS Programme: remediation of tailings ponds

In October 2016, the CIS Council approved funding of the remediation project. Remediation works with the total cost of €23 million started in 2017 and are expected to be completed by the end of 2023. Works comprise preparing Dalnee tailings pond to receive relocated material from Tuyuk-Suu and Taldy-Bulak tailings (including building protective screens and a new drainage system), building new transportation roads, and in-situ remediation



Demolishing of building infrastructure in Min-Kush under the ERA Programme

of Kak tailings. Relocation of the Tuyuk-Suu is the highest priority owing to its insufficient geotechnical stability, and recent landslide activity (detected in 2018) in the proximity of Tuyuk-Suu tailings, which may have consequences for the dam stability.

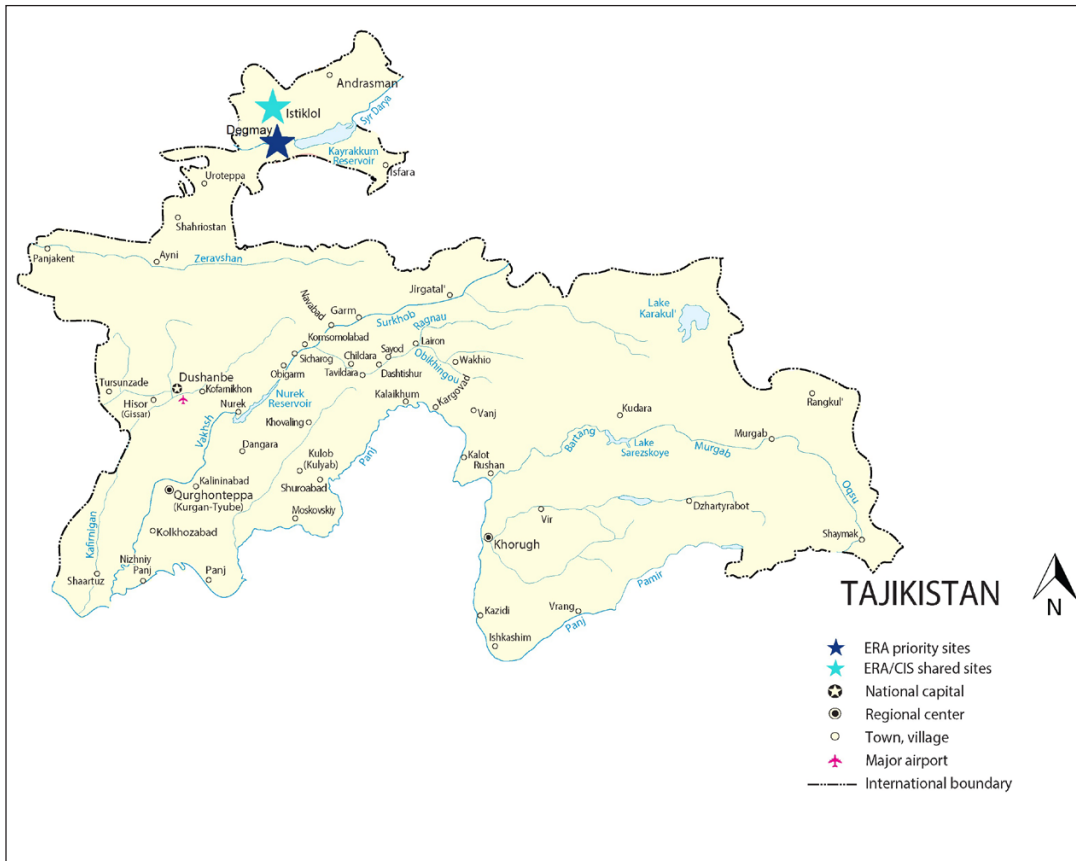
EBRD's ERA: remediation of shafts, adits, sinkholes, buildings, and waste rock dumps

The EU's INSC-supported EIA and FS identified 24 uranium waste rock dumps covering approximately 13.5 hectares with an estimated total volume of approximately 0.9 million cubic meters, 23 visible mine openings, 3 open shafts, 11 adits (some of which are partially opened and some partially collapsed) and 9 sinkholes. In addition, the abandoned processing site covers an area of approximately 10 hectares. These objects are concentrated at Ploschadka 17 and 21, Ak-Ulak and Rudny Sklad 6.

In November 2019, the ERA Assembly of Contributors approved funding for remediating Min-Kush. The costs amount to approximately €3 million. Remediation works in Min-Kush began in October 2020 and should be completed in February 2022.

The scope of EBRD's ERA-supported works at the Min-Kush site includes closing shafts, adits and sinkholes with concrete plugs, slabs and crushed rock (depending on specific conditions of each high-risk object), building or reconstructing water drainage systems at waste rock dumps, building a new protective cover for Rudny Sklad 6, as well as a new drinking water pipeline. Processing facilities remaining on site, including bunkers, processing buildings and a chimney, will be demolished and provided with a layer of protective cover.

4.1.2. Tajikistan



Locations of uranium legacy sites in Tajikistan.

Adapted from maps provided by the UN Geospatial Information Section.

4.1.2.1. Istiklol (former Taboshar)



Yellow Hill - a pile of ground low grade ore remaining after leaching.

Istiklol (formerly Taboshar) is a complex site extending over some 400 hectares, located close to both the Tajik-Uzbek border and mountainous water courses that provide water supply for drinking and irrigation. Risks associated with the site include the discharge of radiologically and chemically contaminated mine water as well as radiological and physical risks for the local population and grazing animals, including open mine shafts, adits, and sinkholes. Various objects located at Istiklol are planned to be separately remediated with the support from CIS Programme, EBRD's ERA and EU's INSC.

CIS Programme: remediation of Yellow Hill and tailings 1-4

The selected option is to re-contour and cover Yellow Hill, improve the existing covers of tailings 1–4, dismantle building structures where heap leaching took place, and decontaminate adjacent areas. Yellow Hill will be re-contoured, significantly reduced in height and covered with an outer protective layer. The foot of the slopes will be reinforced with crude rock to prevent water erosion. Dismantled buildings will be disposed of in-situ, then covered with a layer of uncontaminated soil and levelled to the ground. Tailings 1-4 will have protective covers installed and new drainage ditches will be built.

In November 2018, the CIS Council approved funding of the remediation project, allocating approximately €9.2 million for the remediation of Yellow Hill and tailings 1-4. Remediation is expected to begin in 2022 and be completed in 2024.

EBRD's ERA: remediation of objects other than Yellow Hill and tailings 1-4: waste rock dumps, open shafts, adits and sinkholes, demolition of contaminated buildings

Objects considered in the EU's INSC-supported EIA and FS included areas with elevated ambient dose rates, open shafts, sinkholes, areas of small-scale surface mining, adits, exploration shafts and contaminated buildings remaining on the site. Remediation of Yellow Hill and tailings 1-4 was subsequently excluded from the scope of the project, as Tajikistan decided to proceed with remediation of these objects with the support from the CIS Programme. The preferred remediation options identified in EU's INSC-supported EIA and FS for the remaining objects include closure of shafts, adits and sinkholes, demolition of contaminated infrastructure and other legacy facilities, as well as relocation of waste rock dumps.

The total cost of remediating these objects is estimated at €13 million. Remediation works will take five years to complete. A decision on if and when to complete this scope of remediation works is subject to the availability of funds in the EBRD's ERA and the fulfilment of the Framework Agreement requirements by Tajikistan.

EU: addressing risks from contaminated mining water discharged from the site

A separate project to address the risks from contaminated mining water discharged from the site is planned to be implemented on the Istiklol site with support from the EU's INSC [18]. The project aim is to design a system that both protects the local population from the risk of the free-flowing contaminated mine water and supplies them with fresh water. It is also designed to be sustainable solution in the long term (including low maintenance costs, simple and safe to operate). The overall budget is about €3.6 million. The detailed design and costing of the optimised simplified system will be completed by 2022; construction of the system is scheduled for 2022, with commissioning and operation foreseen early in mid-2024.

4.1.2.2. Degmay



Partially covered tailing pond in Degmay.

Degmay, with the largest concentrated volume of tailings material from uranium ore processing in Central Asia, is one of the seven EBRD's ERA priority sites. It is located close to the Syr Daria river and the local capital Khujand. The radon exhalation rate from the cracked tailings body is high, while its dry exposed surface creates radioactive dust emissions. Contaminated infrastructure, including former tailings pipelines, remains on the site.

The scope of the EU's INSC-supported EIA and FS for Degmay included tailings pond, tailings pipes, and two abandoned pump stations. The preferred remediation option for the tailings pond is in-situ remediation. An erosion protection cover and runoff diversion of the south-eastern catchment area around the site are proposed. The tailings and dam area are to be covered with a layer of soil and crude rock (riprap), which will prevent grazing and resulting exposure. Additionally, a ditch along the southwest side is planned for the water run-off. Proposed remediation of the tailings pond will require minimal long-term care and maintenance work. The preferred option for the tailing pipes is removal with disposal on the Degmay tailings pond. Pump stations F1 and F2 are planned to be demolished. The debris and waste will be disposed of in the Degmay tailings.

The total cost of Degmay remediation is estimated at €28 million. Remediation works will take six years to complete. A decision on if and when to complete this scope of remediation work is subject to the availability of funds in the EBRD's ERA and the fulfilment of the Framework Agreement requirements by Tajikistan.

4.1.3. Uzbekistan



Locations of uranium legacy sites in Uzbekistan.

Adapted from maps provided by the UN Geospatial Information Section.

4.1.3.1. Charkesar

Charkesar comprises two mines (Charkesar-1 and Charkesar-2) located 140 km east of Tashkent. Charkesar-1 extends about 1.5 km along an arid, highland valley and Charkesar-2 is close to a small mountain river (Ingichka river). Risks associated with the Charkesar site include contaminated mine water, which is being used for livestock and irrigation, as well as physical risks to the local population from open shafts and adits. Charkesar-1 is one of the seven EBRD ERA's priority sites, while Charkesar-2 is being remediated by the Government of Uzbekistan.

EBRD's ERA: Charkesar-1 remediation

The preferred remediation option identified by the EU's INSC-supported EIA and FS is closure of two shafts with a reinforced concrete plate, closure of five sinkholes with surface concrete plugs, and closure of one adit with waste rock. Small heaps of leached ore found along roadsides will be cleaned-up, removed and provided with cover. The Government of Uzbekistan undertook some measures in 2019-2020, including levelling the site and covering it with a layer of neutral soil, and diverting a drainage creek to the underground well.

The total cost of Charkesar-1 remediation is estimated at €0.8 million, with the remediation work expected to take a year to be completed. The decision to fund remediation will be made in 2022.

4.1.3.2. Yangiabad



Abandoned infrastructure in Yangiabad.

The Yangiabad site is one of the seven EBRD's ERA priority sites. It is extensive, covering about 5000 hectares, and incorporates separate mines (Alatanga, Razveduchastok, Kattasay, Dzhekindek, Rudny Dvor) and central dumps of waste rock and low-grade ore. Waste rock dumps on riverbanks pose risks, as contaminated material is eroded and transported downstream. Open shafts, adits and sinkholes remain as a physical hazard for the local population.

The preferred remediation option identified by the EU's INSC-supported EIA and FS is closure of four shafts, 23 adits and eight sinkholes; demolition of contaminated buildings and/or processing facilities that have been abandoned, with debris transferred to central waste dumps or a storage cell; constructing discharge channels for surface water at five locations; reinforcement of the riverbanks at four locations and relocation of several waste rock dumps at Kattasay to a central dump that would be covered. Kattasay remediation accounts for over a half of estimated total costs. A facility also needs to be built to store contaminated material (e.g., metal), in particular from demolition of buildings and/or facilities at Rudny Dvor.

The total cost of Yangiabad remediation is estimated at €7.7 million. Remediation works will take two years to complete. The decision to fund remediation will be made in 2022.

4.2. Supporting Activities

Environmental remediation is supported with an array of capacity-building and training activities. The support for capacity-building as well as regional cooperation are key elements of the strategy for remediating uranium legacy sites in Central Asia.

Supporting activities, at both national and regional levels, need to be implemented in parallel with physical remediation works in Central Asia Member States. With the progress towards remediating priority sites, post-remediation and stewardship of remediated sites, including inspection, monitoring, maintenance and corrective measures further become increasingly important.

The Strategic Master Plan focuses on encouraging participation of Central Asia Member States in regional and international networks and cooperation mechanisms, providing assistance to further enhance legal and regulatory frameworks, implement continuous training programmes for site operators, and building capacity of regulatory bodies and other authorities to carry out their functions in accordance with good international practice.

The extent and nature of support for further capacity-building and regional cooperation to be provided in the Strategic Master Plan will enable site owners and regulatory bodies and other authorities to move towards acting in a largely autonomous manner when developing future remediation and post-remediation plans, regulating the safety of the sites, and engaging with interested parties, while actively supporting ongoing and planned remediation works at the priority sites.

4.2.1.1. Participation in international and regional networks

Cooperation of the many interested parties in environmental remediation of uranium legacy sites and in regulating their safety brings a multitude of benefits. Such benefits include transfer and sharing of knowledge and experience within and outside the Central Asia region, interacting with the leading experts in the field as well as creating informal and formal mechanisms that support site operators and national regulatory bodies in exercising their duties.

The IAEA facilitates cooperation among Central Asia Member States and with other IAEA Member States. Central Asia Member States participate in various professional networks, as established by the IAEA, to support knowledge transfer, information exchange and capacity-building. Participation in such professional networks connects IAEA experts with its Member States while offering access to a broad range of topical resources.

Each of these networks currently maintains a dedicated space on the IAEA CONNECT platform [19], where members of a network can access relevant information about planned events and activities, specific thematic resources, including publications, training materials and modules, meeting materials and can participate in a collaborative development of various outputs.

Among these networks are the Coordination Group for Uranium Legacy Sites (CGULS) [20]; International Forum on the Regulatory Supervision of Legacy Sites (RSLs) [21]; Network on Environmental Management and Remediation (ENVIRONET) [22]; and European and Central Asian Safety Network (EuCAS) [23].

CGULS was established in 2012 and promotes cooperation among its Member States (Kazakhstan, Kyrgyzstan, Tajikistan, Ukraine, and Uzbekistan), other IAEA Member States and national and international organizations involved in the management, remediation, or regulatory oversight of ULS, assist CGULS Member States with developing regulatory infrastructure, organize capacity-building activities and promote application of the IAEA safety standards. CGULS aims to facilitate coordination among its members in a way that maximizes synergies and helps avoid duplication of effort.

RSLs was established in 2010 and promotes the effective and efficient regulatory supervision of legacy sites, consistent with IAEA safety standards and good practice. It operates mainly through a series of technical meetings and workshops at which experience is exchanged on good practices, lessons learned, the conduct of safety and environmental assessments, licensing, inspection, as well as on compliance monitoring and enforcement.

ENVIRONET was established in 2010 to facilitate Member States' access to relevant knowledge, skills, and expertise in the area of environmental management and remediation, organize training and demonstration activities, support information sharing and serve as a platform for seeking expert advice and technical guidance. ENVIRONET focuses on site operators, responsible for environmental remediation.

EuCAS was established by the IAEA in September 2016. It aims to strengthen nuclear and radiation safety in Europe and Central Asia by facilitating dialogue and knowledge exchange between Member States in these regions. Working Group 3 (WG3) of EuCAS is dedicated to environmental remediation and decommissioning.

Cooperation helps achieve greater critical mass, make best use of skills, knowledge, and experience in the region, and promote the adoption of common standards and approaches to remediation, information and data exchange and the regulation of safety. With a global shift towards online-based capacity building, information exchange and training activities, the SMP continues to encourage participation of the Central Asia Member States in the relevant international professional networks and communities of practice.

4.2.1.2. Participation in relevant international conventions, agreements, and related support programmes

Joint Convention on the Safety of Spent Fuel Management and on the Safety of the Radioactive Waste Management

Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan are Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of the Radioactive Waste Management [24] (since 2010, 2007, 2008 and 2009, respectively) and fulfil the requirement to submit national reports to review meetings, the latest of which was held in 2018.

The IAEA provides continuous support to these Contracting Parties to ensure their full compliance with relevant obligations under the Joint Convention and preparation and submission of national reports to the upcoming review meeting in 2021.

Convention on Early Notification of a Nuclear Accident (NOT)

The Convention on Early Notification of a Nuclear Accident (NOT) [25] was established following the Chernobyl accident in 1986. The NOT provides a robust, effective, and well-tested means for a Member State to notify neighbouring countries and the IAEA of the potential for transboundary consequences following a radiological or nuclear emergency or accident on its territory. Accidents or emergencies at ULS with potential transboundary consequences fall within the scope and provisions of this Convention.

Given the proximity of several ULS in Central Asia to the borders of a neighbouring country, in the event of an accident or emergency at a ULS there is a significant risk of radioactive material being dispersed across national borders via rivers and/or other water bodies. In such circumstances, it would be prudent to use the provisions of the Convention to provide early notification to neighbouring countries. However, Kyrgyzstan and Uzbekistan have yet to accede to or ratify the NOT. Support will be provided by the IAEA upon request to Kyrgyzstan and Uzbekistan to take steps towards acceding to the Convention and in the practical application of its provisions once it enters into force in each of these Member States.

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (ASSIST)

The Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency (ASSIST) [26] was adopted in 1986 after the Chernobyl nuclear plant accident. The ASSIST establishes an international framework and mechanisms to request and render prompt assistance in the event of nuclear or radiological emergencies, as well as to communicate information on available assistance capabilities to the IAEA.

Potential transboundary contamination following an uncontrolled release of radioactively contaminated material from tailings due to disruptive seismic events or extreme weather conditions may require coordinated regional response and mutual assistance. Kazakhstan and Tajikistan have acceded in 2010 and 2011 respectively; Kyrgyzstan and Uzbekistan have yet to accede to or ratify the ASSIST. Given major benefits from the participation in the Convention, support will be provided upon request, in line with the IAEA recommendations, to prepare Kyrgyzstan and Uzbekistan to join the ASSIST and fulfil its provisions once it enters into force in each of these Member States.

United Nations Economic Commission for Europe (UNECE) Convention on the Transboundary Effects of Industrial Accidents and its Assistance and Cooperation Programme

The UNECE Convention on the Transboundary Effects of Industrial Accidents (Industrial Accidents Convention) [27], adopted in 1992, sets a framework for the prevention of, preparedness for and response to industrial accidents with transboundary effects. The Convention currently has 41 Contracting Parties among UNECE Member States, including Kazakhstan, and applies, among other, to the tailings management facilities with uranium tailings. Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan are among the beneficiaries of the Assistance and Cooperation Programme of the Industrial Accidents Convention [28].

Parties to the Industrial Accident Convention and beneficiaries of its Assistance and Cooperation Programme also have access to the UNECE Industrial Accident Notification System (IAN). The UNECE IAN System provides a means for countries to send early warning notifications to the potentially affected countries in case of an accident, to provide further information about the accident and to request or provide mutual assistance. Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan have all nominated Points of Contact (national responsible institutions) for the UNECE IAN System.

4.2.1.3. Participation in the regional agreements and related support programmes

An agreement on the cooperation among the CIS Member States for the nuclear accident or radiological emergency preparedness and mutual assistance in responding to their consequences was developed under the auspices of the CIS Nuclear Commission [29]. Kyrgyzstan, Tajikistan and Uzbekistan have joined this agreement.

The implementation of this agreement is supported by a set of practical measures, including the establishment of a rapid communication for radiation and nuclear safety, providing or receiving assistance in the event of a nuclear accident or radiological emergency, enhancing nuclear accident or radiological emergency preparedness and response.

In 2017, an agreement to further harmonise legal and regulatory framework to safety in the peaceful uses of nuclear energy entered into force between the CIS Member States. The Development of national waste management strategies in line with agreed principles under the auspices of the CIS Nuclear Commission will lead to further improvements in the legislative and regulatory framework.

Unified notification format, priority entry and unimpeded transit of emergency response units, as well as harmonization of relevant legislation are expected to be part of the implementation of the agreement. The agreement will simplify procedures for the movement of experts, special equipment and vehicles across borders in the event of a crisis, thus reducing response times.

Central Asian Member States also participate in the Basic Organisation of the CIS Member States for the Management of Spent Nuclear Fuel, Radioactive Waste and Decommissioning of Nuclear and Radiation Hazardous Facilities. Under the auspices of the organization, assistance is provided to develop national waste management strategies in accordance

with agreed principles, which will lead to greater consistency across national strategies and plans.

Under the auspices of the Basic Organisation of the CIS Member States for Training, Retraining and Professional Development in the Peaceful Uses of Atomic Energy, a master's degree course on remediating uranium legacy sites is being developed at the Biology and Soil Institute of the National Academy of Sciences of the Kyrgyz Republic. Implementation of the course will be subject to the availability of funds.

4.2.1.4. Supporting national regulatory bodies

CGULS: support to the Tajik national regulatory body to draft regulations for radiation safety

In response to a direct request from the Member State in 2020, CGULS assisted the Nuclear and Radiation Safety Agency (NRSA) of the Academy of Sciences to draft regulatory requirements on ensuring radiation safety during remediation of uranium legacy sites in Tajikistan. The regulations were adopted at the end of 2020 [30] and, once remediation starts in Tajikistan, will ensure its compliance with the IAEA Safety Standards and good international practice.

ISTC: support to the Tajik national regulatory body to enhance the regulatory framework

A project of the International Science and Technology Center (ISTC) supports development and enhancement of various regulatory documents in Tajikistan [31] in the areas of radioactive waste management and environmental remediation of uranium legacy sites. Within the scope of this project, several regulations and amendments, including on licensing, inspections and regulatory body organization have already been developed, with several more underway. The project will result in further enhancement of the national regulatory framework and its compliance with the IAEA safety standards and good international practice.

Nuclear and Radiation Safety Agency (NRSA): Regional Training Centre

In 2018, the Government of Tajikistan supported the establishment of the Regional Training Centre (RTC) under the Nuclear and Radiation Safety Agency (NRSA). The RTC regularly hosts courses on nuclear and radiation safety, including on environmental remediation, which are open to the representatives of regulatory bodies and other authorities, as well as site operators from Central Asia. The Government of Tajikistan allocated additional €0.8 million towards the construction of a modern complex comprised of 16 laboratories, including environmental monitoring laboratories, under the RTC. The laboratory complex is expected to be commissioned in 2022.

The Norwegian Radiation and Nuclear Safety Authority (DSA) Regulatory Cooperation Programme

The Norwegian Radiation and Nuclear Safety Authority (DSA)¹⁰ has been actively cooperating with Central Asia Member States since 2008, assisting in the review and development of regulations in the areas of radiation protection, radioactive waste management and remediation. In 2011, DSA produced the first regulatory threat assessment (RTA) report [32] for the region, which served as a basis for 2013-2015 Regulatory Cooperation Programme for Central Asia Member States. Under the programme, numerous laws, regulations, and guidelines were developed and brought into force in Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan [33, 34].

In 2018-2019, DSA conducted a new round of RTA. Preparation of RTA-2 took into account the current situation in Kyrgyzstan, Tajikistan and Kazakhstan, while Uzbekistan did not

¹⁰ Before January 2019 – the Norwegian Radiation Protection Authority (NRPA).

participate fully in the regulatory cooperation dialogue (this has been compensated by the signing of a new memorandum of understanding between DSA and the State Committee of Industrial Safety of the Republic of Uzbekistan on cooperation in the field of nuclear and radiation safety in 2020). Bilateral projects related to the preparation of RTA-2 with Kazakhstan, Tajikistan and Kyrgyzstan were completed in the second and third quarters of 2020.

The main findings of the new RTA-2 were presented in 2019 in Bishkek and include the absence of criteria and requirements for remediation of ULS, the lack of requirements for post-remediation monitoring which takes specific local climatic conditions into account, the absence of clear guidance or requirements for the supervision of remediation works, and ambiguity of procedures for evaluating remediation project documentation for licensing as well as site inspection purposes. A full RTA-2 report, along with the roadmap as a basis for long-term comprehensive bilateral and international cooperation was published in May 2021 [35].

In 2019, DSA joined an ISTC-led project to develop legal acts and regulations related to remediation of the territories contaminated by uranium production in Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan [36]. The project aims at addressing gaps in the regulations covering inspections and supervision of remediation activities. DSA further expects to continue providing assistance to Central Asia Member States based on the RTA-2 findings, with activities to begin in 2021.

The EU's INSC Training and Tutoring Initiative

The EU's INSC Training and Tutoring Initiative (INSC T&T) provides a broad range of training in nuclear and radiation safety (including on remediation of uranium mines and mills), as well as more customized tutoring on a diverse range of topics. The training and tutoring are directed at regulatory bodies and other authorities and their technical support organizations (TSO) [37].

IAEA Safety Guidance on remediation

Revision of the IAEA's safety guidance applicable to remediation of uranium legacy sites is complete. GSG-15 Remediation Strategy and Process for Areas Affected by Past Activities of Events (in preparation) [38] provides recommendations on the planning and implementation of remediation of sites and areas affected by past activities and events, to meet the requirements of General Safety Requirements (GSR) Part 3. The Safety Guide, expected to be published in early 2022, is intended to be used by governments, national authorities, regulatory bodies, operating organizations, and other parties involved in the remediation of sites or areas and contributing to the recovery process for areas affected by past activities or events.

4.2.1.5. Supporting site operators

EU's INSC Regional Projects

With the support from EU's INSC, a regional project on establishment of a legislative and regulatory framework, regional watershed monitoring system and capacity-building for remediation of uranium legacy sites in Central Asia [39], was completed in 2017. The project produced a concept of a regional water monitoring system and an assessment of the required laboratory and monitoring capabilities. Under the project, an analysis of legislative and regulatory frameworks was undertaken, along with training activities on analytical techniques. A prototype instrument for regional information exchange of environmental data was developed under the regional project.

The second phase of the regional project will be implemented by the International Science and Technology Centre (ISTC), which will review and adapt the original scope of the project in 2021. Given several implementation delays, the activities under this project are expected to commence not earlier than 2023.

TRANSPOND: Transboundary Pollution after Natural Disasters

A three-year research project titled “Transboundary Pollution after Natural Disasters” (TRANSPOND) funded by the German Federal Ministry of Education and Research (BMBF) and coordinated by IAF-Radioökologie GmbH, with a total budget of over €1 million was implemented from 2017 to 2020 to support site operators in Kyrgyzstan and Uzbekistan with monitoring, mitigation and management of environmental risks stemming from potential transboundary water contamination [40]. The TRANSPOND project facilitated a close collaboration on laboratory work and environmental information management between Kyrgyz and Uzbek experts, and resulted in the development of the new Standard Operating Procedures (SOPs) for simple, robust, and accurate environmental sampling and analytical laboratory methods, a fully functional test version of an environmental information management system (EIMS) and a data model for the radionuclide transport in the transboundary Mailuu-Suu river.

DUB-GEM: Development of a UAV-based Gamma Spectrometry for the Exploration and Monitoring of Uranium Mining Legacies



Training of the Kyrgyz experts as a part of the Dub-Gem project

A German-supported research project titled “Development of a UAV-based Gamma Spectrometry for the Exploration and Monitoring of Uranium Mining Legacies” (DUB-GEM) was launched in 2019 and is expected to continue until 2022 [41]. The DUB-GEM project, coordinated by the German Federal Institute for Geosciences and Natural Resources (BGR), with a total budget of approximately €1 million, also funded by the German Federal Ministry of Education and Research (BMBF), is focused on development of an unmanned aerial vehicle (UAV)-based gamma spectrometry method with proven applicability in

the Central Asia region. Through DUB-GEM, site operators in Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan will develop increased capacity to fulfil their remediation and monitoring commitments by utilizing a modern gamma-spectrometry method, which lowers occupational exposure and financial costs, as well as drastically simplifies logistics in the mountainous regions.

Both research projects, TRANSPOND and DUB-GEM, rely on scientific methods to develop robust, tailored solutions that consider specific national contexts. Support has been provided through CGULS for Central Asia experts and counterparts to participate in the meetings and events, organized under TRANSPOND and DUB-GEM projects.

CGULS: support to site operators in developing monitoring capacity, organization of independent peer reviews

With the support from CGULS, several training activities for the Kyrgyz site operators were organized by WISMUT GmbH in 2019. The Tailings Management Agency (TMA) under the Ministry of Emergency Situations in Kyrgyzstan received support in completing inventory and operationalization of laboratory and field analysis equipment delivered through the IAEA Technical Cooperation department. Kyrgyz experts further participated in knowledge-transfer activities at WISMUT sites in Chemnitz, Germany. Further support is envisaged, subject to the specific needs and requests from Member States and availability of funding.

Support provided through the IAEA Technical Cooperation Department

Within the framework of the IAEA's Technical Cooperation regional project on building capacity for developing and implementing integrated programmes for remediation of the areas affected by uranium mining [42], four training courses were held in Russia between 2014-2015. Training courses were implemented cooperatively by Rosatom Technical Academy and the IAEA. Fifty-seven participants, including representatives from Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan attended these courses.

Between 2016 and 2019, an IAEA Technical Cooperation Department regional project was implemented by the IAEA in cooperation with Rosatom Technical Academy [43]. The project, with a total budget of over €300 thousand, focused on supporting human resource capacity building for developing and implementing integrated programmes for remediation of the areas affected by uranium mining by providing nine regional training courses throughout the project. A total of 148 participants attended trainings in Russia, as well as in Kyrgyzstan and Tajikistan. The regional training courses covered a variety of topics, including stakeholder engagement, project planning and management, safety of waste disposal as well as regulatory aspects of remediation and technologies.

Rosatom Technical Academy plans to continue delivering training courses, focusing on ensuring safe tailings management during commissioning and long-term supervision. Materials will be developed in 2021, while courses are planned for 2022-2023, provided that the necessary funds are available.

Within the framework of the IAEA's Technical Cooperation programme, a four-year national project with a budget of approximately €140 thousand on improving the system of monitoring and control over uranium legacy sites according to international safety standards is being implemented in Kyrgyzstan since 2018 [44]. The scope of the project includes developing guidelines on inventory and certification of uranium legacy objects and procurement and commissioning of an information management system with available data on uranium legacy sites.

UNDP: commissioning of the disaster monitoring and forecasting system and supporting enhanced community resilience to the ULS risks.

UNDP supported installation and commissioning of the Unified Information Management System for Disaster and Crises Settings (UIMS) [45]. The system allows enhanced

management and response to a broad range of potential emergencies. Implemented in two phases, the support comprised of the establishment of crisis management centres, operationalization of the national early warning system and expansion of coverage for the single emergency telephone number.

With the support from Sweden, UNDP is implementing a project in Kyrgyzstan under the second phase of the Environment Governance Programme. Among other, the project activities will support enhanced community resilience to the risks posed by the uranium legacy sites and increased community participation in environmental monitoring [46].

EU: landslide monitoring at Mailuu-Suu site

With support from the EU's INSC [47], a project on designing, supplying, and installing fixed and mobile equipment for risk assessment and landslide monitoring was implemented in 2018-2021. The project with a total budget of approximately €0.5 million focused on supplying the Kyrgyz Ministry of Emergency Situations with equipment to monitor movements and provide risk prediction of landslides and mudslides in the mountainous areas.

4.2.1.6. Stakeholder engagement

The first phase of the project “Stakeholder Engagement for Uranium Legacy Remediation in Central Asia” ran from 2015 to 2018 and was jointly implemented under the Environment and Security Initiative (ENVSEC) by OSCE, UNDP and UNEP with the financial support from the EU's INSC and the United States [48]. Activities of the first phase focused on establishing new information centres in the region as well as conducting outreach and advocacy campaigns.

The OSCE-supported Aarhus Centres¹¹ in Osh (Kyrgyzstan) and Khujand (Tajikistan) continued to implement public awareness-raising and outreach activities. New Public Environmental Information Centres (PEICs) were established and operationalized in Kyrgyzstan (Min-Kush, Shekaftar and Mailuu-Suu) and Uzbekistan (Tashkent and Charkesar regions). The activities of these Centres include awareness-raising, public outreach, dissemination of information on ULS and how they may be safely remediated, as well as on any planned or



Townhall meeting with the locals from Min-Kush

¹¹ The Aarhus Centres provide platforms to engage citizens, governments, and the private sector in a dialogue on environmental challenges. They assist governments in implementing the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters and assist citizens in understanding and exercising their rights under the Convention.

ongoing remediation works in the area. The Centres actively cooperate with organisations implementing remediation projects (notably ROSATOM and the ERA-supported PMU in Kyrgyzstan) and conduct joint public information campaigns.

In 2019, the project on stakeholder engagement on ULS remediation in Central Asia, implemented by UNDP and OSCE, was extended until 2022 [49]. The second phase of the project, which commenced in August 2019 focuses on increasing understanding of ULS-related risks and their impact on communities and the environment among national decision-makers and affected communities; supporting implementation of legal and regulatory frameworks by facilitating community engagement in the safe management of ULS; implementing gender-sensitive development projects to reduce ULS-related risks in target communities; disbursing small grants to civil society organizations to support socio-economic development of affected communities; and enhancing regional cooperation.

In 2020 the OSCE Programme office in Bishkek supported the Ministry of Emergency Situations of the Kyrgyz Republic in developing the National Program for Stakeholder Engagement on Uranium Legacy Sites Remediation in Kyrgyzstan (2021-2024), which was adopted in 2020.

4.3. Implementation of the Strategic Master Plan, Costs and Milestones

Table 3 provides an overview of progress and timeframe for remediating the seven priority uranium legacy sites. Decisions by the EBRD's ERA Assembly of Contributors on funding remediation projects will depend on the availability of funds in ERA (currently, additional €40 million are required to fund remediation of all EBRD's ERA priority sites). Funding of all CIS Programme priority sites has already been approved.

Table 3: Progress and timeframe for remediating priority uranium legacy sites in Central Asia

Member State	Legacy site (remediation programme)	EIA and FS ^a Completed	Funding approved / Decision expected	Remediation start date	Remediation completed / Expected completion
KYG	Kadji-Say (CIS) b	2016	2016	2017	2019 ✓
	Mailuu-Suu (EBRD's ERA)	2020	2022 ☹		
	Min-Kush (CIS)	2016	2016	2017	2023 ☹
	Min-Kush (EBRD's ERA)	2016	2019	2020	2022 ☹
	Shekaftar (EBRD's ERA)	2016	2019	2020	2021
TAJ	Degmay (EBRD's ERA)	2018	2022 ☹		
	Istiklol (EBRD's ERA)	2018	2023 ☹		
	Istiklol (CIS)	2016	2018	2022 ☹	
UZB	Charkesar (EBRD's ERA)	2015	2022 ☹	2023 ☹	
	Yangiabad (EBRD's ERA)	2015	2022 ☹		

Legend: ✓ – date completed; ☹ – date expected.

- (a) EIA and FS – feasibility study and environmental impact assessment, referred to in this document as systematic and comprehensive evaluations of the risks and remediation options (including costs); EIA and FS for seven EBRD's ERA priority sites were completed with support from EU's INSC and peer-reviewed by independent IAEA experts.
- (b) Kadji-Say in Kyrgyzstan is not included in the list of priority sites (see Table 2) as it has already been remediated.

Funding for the remediation of all the CIS Programme sites has already been approved, with CIS Member States undertaking to finance it from their respective budgets. It includes the financing of studies and assessments that were completed within the first phase of the CIS programme and amounted approximately €3.2 million, and funding for the physical remediation with a total cost of €32.2 million.

With the support of EU's INSC, a suite of environmental impact assessment and feasibility studies (EIA and FS) was completed by 2020, forming a portfolio of implementation-ready projects. The total costs of EIA and FS for the seven EBRD's ERA priority sites amounted to €8 million.

The total cost of EBRD's ERA Programme amounts to €85 million, which includes project estimates and other programme costs. EBRD's ERA currently holds €46 million, leaving a funding gap to remediate all priority sites included in its scope. Addressing this gap is critical for the sustainability of the region-wide remediation.

Table 4: Summary of the overall costs of remediating seven priority uranium legacy sites^a

Member State	ULS (funding source)	Remediation funding status	Remediation costs, approx. (€, millions)	EIA and FS costs - spent (€, millions)	Totals	
KYG	Mailuu-Suu (ERA)	Pending	26	2.5		
	Min-Kush (CIS)	Approved	23	1 ^b		
	Min-Kush (ERA)	Approved	3	2 ^c		
	Shekaftar (ERA)	Approved	3			
					Committed/spent	34.5
					Required	26
Sub-total, KYG					60.5	
TAJ	Degmay (ERA)	Pending	28	2.2		
	Istiklol (ERA)	Pending	13			
	Istiklol (CIS)	Approved	9.2	1 ^b		
	Istiklol (EU)	Approved	3	0.6		
					Committed/spent	16
					Required	41
Sub-total, TAJ					57	
UZB	Charkesar (ERA)	Pending	0.8	1.3		
	Yangiabad (ERA)	Pending	7.7			
					Committed/spent	1.3
				Required	8.5	
Sub-total, UZB					9.8	
				Committed/spent	51.8	
				Required	75.5	
Total KYG, TAJ, UZB (CIS, ERA)					127.3	

^(a) Costs quantification in the second edition of the Strategic Master Plan is limited only to the costs of physical remediation at the seven priority sites (as estimated by EU's INSC-supported EIA and FS for the EBRD's ERA programme and by CIS Programme's own estimates), plus the costs of EU's INSC-supported EIA and FS and CIS Programme's estimates.

^(b) The total costs of CIS studies for Kadji-Say (already remediated; excluded from this table), Min-Kush and Istiklol amounted to €3.2 million and is equally divided between the three sites.

^(c) The EU's INSC-supported EIA and FS for the EBRD's ERA programme were delivered as packages for Min-Kush and Shekaftar, Mailuu-Suu, Degmay and Istiklol, and Charkesar and Yangiabad. As such, costs are not split between the sites.

The Strategic Master Plan sets the following milestones until 2023:

- 1) In accordance with the decision adopted by the CIS Council, commence remediation at Istiklol (Yellow Hill and tailings 1-4) under the CIS Programme in 2022;
- 2) Set up and operationalize Project Management Units under the EBRD's ERA programme in Tajikistan by 2023 subject to availability of funds;
- 3) Subject to the availability of funds, reach a decision on funding remediation of Mailuu-Suu at EBRD's ERA Assembly of Contributors in 2022;
- 4) Subject to availability of funds, reach a decision on funding remediation of Charkesar and Yangiabad at EBRD's ERA Assembly of Contributors in 2022;
- 5) Subject to availability of funds, reach a decision on funding remediation of Degmay and Istiklol at the EBRD's ERA Assembly of Contributors by 2023;
- 6) Complete EBRD's ERA-funded remediation at Min-Kush in 2022;
- 7) Complete EBRD's ERA-funded remediation at Shekaftar in 2021;
- 8) In accordance with the decision adopted by the CIS Council, complete CIS-funded remediation at Min-Kush in 2023.

Appendices

Appendix I.

Other uranium legacy sites in Central Asia

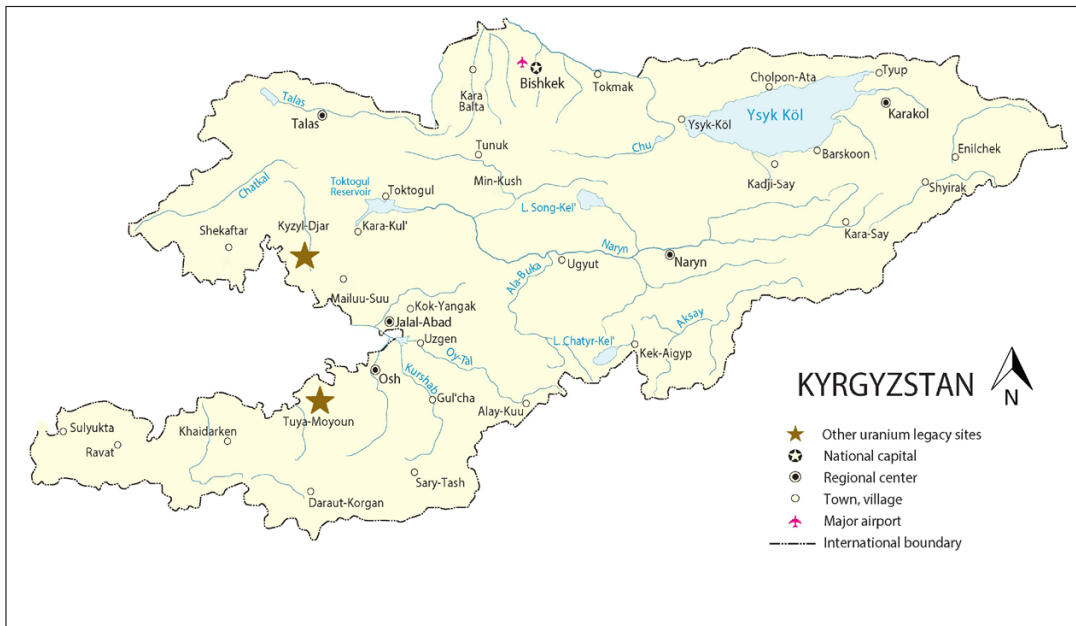
In line with a step-by-step approach to remediation in Central Asia, the primary focus of the Strategic Master Plan is on the seven priority sites for which systematic and comprehensive evaluations of the risks and remediation options (including costs) have been already completed or where funding for remediation works has already been allocated.

Subject to available funding and necessary regulatory approvals, the seven priority sites should be remediated within the next 10 years in accordance with international standards and good practice. Once remediation of the seven priority sites is complete, the focus should then shift to the sites presenting lower risk to people and the environment and are therefore of lower priority for remediation as well as those posing higher risk but lacking a completed systematic and comprehensive evaluation of the risks and remediation options (including costs), and funding to complete remediation.

These include numerous locations where uranium developments took place in the past and, as with the priority sites, have left a legacy of radioactive and toxic waste. Such locations include Kyzyl-Djar and Tuya-Moyun in Kyrgyzstan; and Adrasman, Karta 1-9, Khujand, and Samgar mines and Ismoil waste rock dumps in Tajikistan.

This Appendix presents a brief overview of these sites and recommends undertaking systematic and comprehensive evaluations of the risks and remediation options (including costs), considering a step-by-step approach, availability of funds and the nature of environmental risks posed by these sites.

I.1. Kyrgyzstan

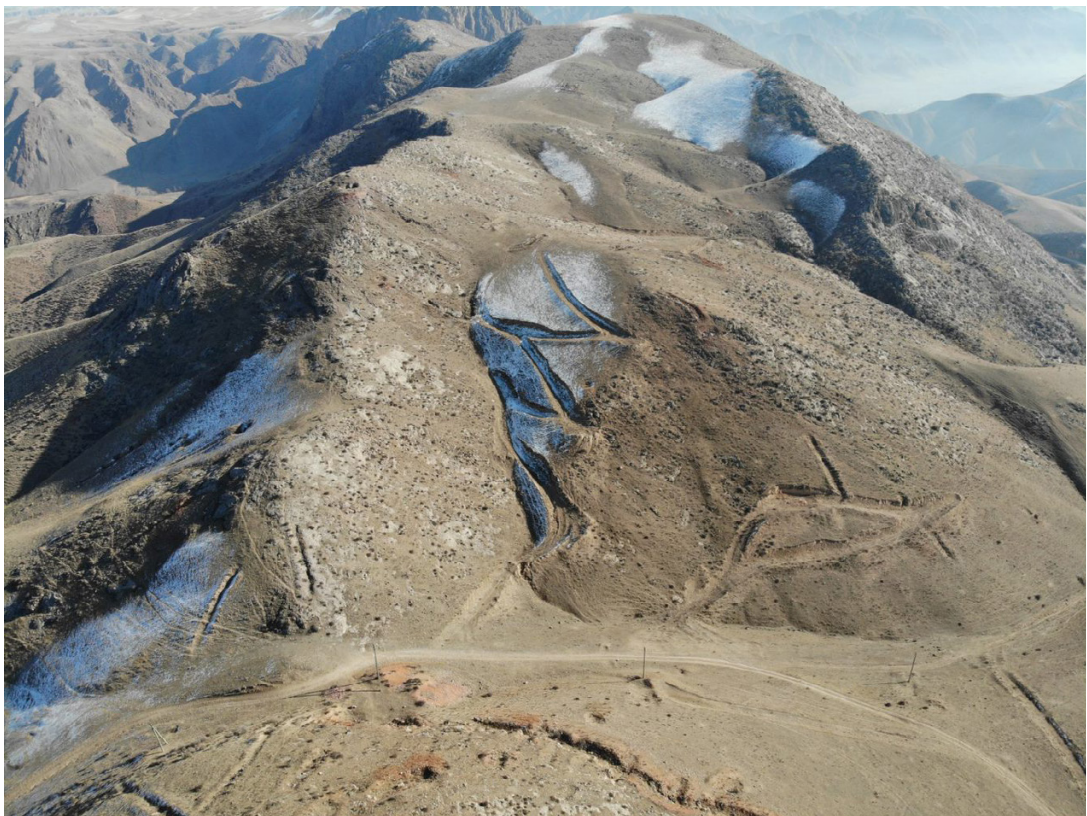


I.1.1. Kyzyl-Djar and Tuya-Moyun



Kyzyl-Djar, abandoned mining infrastructure.

The two legacy sites (waste dumps) at Kyzyl-Djar and Tuya-Moyun were identified in the first edition of the SMP as having lower priority as the volumes of waste are smaller compared with those at other legacy sites. In 2018, these sites were transferred to the ownership of the Ministry of Emergency Situations (MES) of the Kyrgyz Republic. In 2019, CGULS organized a mission to assist MES to conduct a preliminary evaluation of Kyzyl-Djar and Tuya-Moyun. Additional evaluations may be necessary but should only be undertaken after remediation of all priority sites has been completed.



Tuya-Moyun arid landscape.

I.2. Tajikistan



I.2.1. Adrasman

Objects at the Adrasman site were assigned a high priority in the Tajik national concept for remediation [8] primarily due to the covers and slopes of the tailings being unstable. In 2010 a washout and carry-over of tailings material along the hillside subsequently dispersed over adjacent areas. Further dispersion of this material continues with the risk of it reaching nearby rivers as the tailings dam continues to be damaged by frequent mudslides.

Emergency measures were taken in 2013 to remedy the situation and constrain the further dispersion of the released material. A water-diverting channel was built; however, it does not efficiently protect the tailings from washouts and water erosion.

Given that the environmental risks have remained consistently high, carrying out a systematic and comprehensive evaluations of the risks and remediation options (including costs) at the earliest opportunity will be beneficial.

I.2.2. Karta 1-9



Construction of the concrete wall around Karta 1-9.

In 2013–2014, a concrete wall approximately 1.8 km in length was constructed around the Karta 1–9 waste tailing dumps with funding from the Fondation Suisse de Déminage (Swiss Foundation for Mine Action, FSD), as an emergency measure to limit public access. These dumps occupy an area of about 18 ha and hold more than 3 million tons of radioactive wastes containing uranium as well as arsenic and vanadium.

Given the size, radioactive and toxic hazards of the tailings dumps at Karta 1-9, as well as hazards posed by other high-risk objects in the vicinity of the TAJREDMET hydrometallurgical plant, a systematic and comprehensive evaluations of the risks and remediation options (including costs) should be carried out once remediation of the priority sites in Tajikistan is completed.

I.2.3. Khujand

Khujand was ranked as a high priority in the national concept for remediation but has since been downgraded in the associated implementation programme. This is largely due to a decision to recommission (with national funding) a water treatment facility for mine waters that were being used, untreated, for irrigation and human consumption.

A sorption column with ion exchange resins was installed and the facility was brought back into operation. Treated water quality is constantly monitored at TAJREDMET laboratories to ensure compliance with the national standards. In 2019, new ion exchange resins costing €150 thousand were procured from Ukraine from the national funds allocated to the programme for realization of the concept on remediation of ULS. The need for remediation of other objects on the Khujand site, in particular waste rock piles, remains to be evaluated once higher priority sites have been remediated.

I.2.4. Samgar mines and Ismoil waste rock dumps

In 2019, two new sites were discovered by the northern branch of the NRSA while conducting environmental radiological survey in the Sughd Region. Samgar mines and Ismoil (Oktyabrskaya) waste rock dumps are believed to be connected with uranium mining and milling activities in Adrasman, and are located some 20 kilometres north to the Guliston town (formerly known as Kairakum) along the Guliston-Adrasman motorway in the vicinity of the Kairakum Reservoir – one of the largest fresh water reservoirs in Tajikistan fed by the transboundary Syr Darya river.



Open shaft hazard in Samgar.

In 2019, NRSA performed initial evaluations at each site. The preliminary survey suggests that there are several open shafts and a total of 500 thousand cubic meters of waste material. No historical evidence or proper documentation is available related to Samgar mines and Ismoil waste rock dumps to indicate when these objects were in use or if any measures were taken previously to ensure safety of the waste material and physical infrastructure.

As of @@@2021, Tajikistan is clarifying the precise status of the new sites to determine the responsibility. Based on the outcome, a decision should be taken to carry out a more detailed evaluation at each site and determine potential remediation options and costs.

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