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DSA Regulatory Support to Kazakhstan, Kyrgyzstan and Tajikistan, 2017–2020

DSA
Norwegian Radiation and Nuclear Safety Authority

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Regulatory threat assessment, central Asia, roadmap

Abstract
This report was written as a part of the bilateral collaboration between the regulatory authorities in Central Asian countries and Norway. The report includes a regulatory threat assessment (RTA2) in the field of nuclear and radiation safety and covers a comprehensive revision of the regulations: organization and general principles of the regulatory body, radioactive waste management, transport of radioactive materials, emergency preparedness and response and safety of nuclear installations.
The findings of the RTA2 recognizes existing gaps in the regulations in each country and provides information on current and planned activities aimed at addressing the identified threats. The new threats/gaps have been prioritized and described in a "Roadmap" for future cooperation. The "Roadmap" provides a solid and comprehensive basis for further long-term cooperation, not only bilaterally, but that could serve as a platform for wider international regulatory cooperation.

Referanse
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Emneord
Regulatorisk trusselvurdering, atom- og strålingssikkerhet og veikart.

Resymé
Denne rapporten ble skrevet som en del av det bilaterale samarbeidet mellom tilsynsmyndighetene i ulike land i sentral Asia og Norge. Rapporten inkluderer en regulatorisk trusselvurdering (RTA2) innen atomsikkerhet og dekker en omfattende revisjon av regelverket og generelle prinsipper for regulering og håndtering av radioaktivt avfall, transport av radioaktivt materiale, beredskap og sikkerhet av kjernefysiske installasjoner. Trusselvurdering i RTA2 har avdekket eksisterende mangler i regelverket i hvert land og gir informasjon om nåværende og planlagte aktiviteter rettet mot å løse de identifiserte truslene. De nye truslene/mangler har blitt prioritert og beskrevet i en "veikart" for fremtidig samarbeid. "Veikartet" gir et solid og omfattende grunnlag for videre langsiktig samarbeid, ikke bare bilateralt, men som kan tjene som en plattform for bredere internasjonalt samarbeid om regulering.

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Preface

This report describes work carried out between 2017 and 2020 within the regulatory cooperation program of the Norwegian Radiation and Nuclear Safety Authority (DSA) and the corresponding regulatory authorities in Kazakhstan, Kyrgyzstan and Tajikistan. The work is set into the context of the long-term regulatory cooperation program in central Asia that began in 2008, with support of the Norwegian Ministry of Foreign Affairs.

The significant progress made to date demonstrates the advantages of a stable long-term policy of hazard reduction and a strategy to implement it, in line with the Norwegian Government's Action Plan on Nuclear and Radiation Safety (Action Plan). However, as the current report demonstrates, there is significant work still to be done.

Regulatory support is a vital contribution to international projects to maintain and improve nuclear and radiation safety and security in the region. Working within a robust, independent and adequately resourced legislative and regulatory framework makes it possible to address newly recognized challenges while still maintaining strict control over all risks, in line with international conventions, treaties and standards, and corresponding recommendations and guidance.

The work presented here is closely coordinated with parallel work of international organizations and other national authorities. Sharing of the experience internationally has been of significant mutual benefit and I should like to commend all colleagues within the program that have contributed so effectively.

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Executive Summary

The functions of the Norwegian Radiation and Nuclear Safety Authority (DSA) include activities concerning the implementation of the Action Plan The promotion of improved regulation of nuclear and radiation safety and security in northwest Russia have been long-standing and effective components of the Action Plan. In 2008, the Norwegian Ministry of Foreign Affairs extended the Action Plan to support regulatory authorities in central Asian countries. In a first phase implemented from 2009 to 2011, the DSA assisted authorities in Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan with the development of initial Regulatory Threat Assessment (RTA1) reports. The focus was primarily on identifying priorities for policy and strategy development in the field of radioactive waste and legacy management. During a second phase of bilateral work, which ran from 2012 to 2015, the regulatory authorities and their technical support organizations, with support from DSA, carried out a review and update of the regulations concerned with radioactive waste management, remediation and related improvement of legislation.

The bilateral cooperation between DSA and the regulatory authorities in Kazakhstan, Tajikistan and Kyrgyzstan entered a third phase in 2018 with a comprehensive, more broadly scoped and updated regulatory threat assessment (RTA2) in seven main areas, including:

1. organization and general principles of the regulatory body
2. safety of installations
3. transport of radioactive materials
4. radiation safety
5. emergency preparedness and response
6. radioactive waste management, including decommissioning and remediation
7. radiation and nuclear security.

The basis for assessment was comparison with:

- relevant international treaties, conventions and standards
- corresponding recommendations and guidance
- and shared experience of their application at the national level.

The analysis has documented considerable progress in the development and improvement of the legislative and regulatory frameworks for nuclear and radiation safety and security since the completion of RTA1 in 2011. The bilateral regulatory cooperation between DSA and the authorities in each country, as supported by engagement with operators and the wider international community, has resulted in significant improvements in the regulatory basis for practical projects to improve safety and security. This includes the drafting and official approval of a wide range of regulatory documents that address specific practical regulatory issues, including training, inspection, monitoring and emergency preparedness, and actions to improve the safety and security of radioactive wastes and legacy sites and facilities. However, a number of continuing, new and newly recognized threats have been identified and a significant number of challenges remain to be addressed.

Kazakhstan has all types of legacies linked to a long history of development of nuclear technologies, as well as plans for continued and new activities in this area. There were also difficulties obtaining official approval of crucial regulatory documents that had been drafted as part of the regulatory support program. These difficulties occurred due to reorganizations in the structure of the Ministry of Energy of the Republic of Kazakhstan, and factors connected with staff turnover. Also noted were duplications of functions and misunderstanding between the different authorities involved in the approval process.

However, in February 2021, relevant amendments were approved to the Law on the Use of Atomic Energy in the Republic of Kazakhstan, revising the powers, responsibilities and functions of state bodies concerned with nuclear energy use. This will substantially eliminate duplication among government agencies and expedite progress, at the same time bringing aspects of domestic legislation into line with the international safety standards, and clarify the interpretation of aspects of the laws "On the Use of Atomic Energy" and "On Radiation Safety of the Population". The RTA2 has identified activities for future cooperation through which these amendments can be implemented and put into practice.

In Kyrgyzstan, while organisational arrangements continue to evolve, important progress in the approval of the regulatory documents has been made. Between 2009 and 2012, two normative documents were approved by the Parliament: “Technical requirements for a systematic radiation monitoring scheme around the RW tailings dumps in Kyrgyz Republic” and “Regulatory guidance document on management of radioactive waste, including RW tailings piles and dumps”. However, in general, the position of regulatory bodies remains weak, and their individual roles and responsibilities are not optimally arranged. For example, according to the resolution of the Government of the Kyrgyz Republic of February 12, 2021 No. 38 “On organizational measures in connection with the approval of the new structure of the Government of the Kyrgyz Republic and the reform of the executive authorities of the Kyrgyz Republic”, the State Agency for Environmental Protection and Forestry” under the Government of the Kyrgyz Republic, were divided into State Ecological and Technical Inspection, placed under the Ministry of Emergency Situations of the Kyrgyz Republic and State Forestry Agency were transferred to the Ministry of Agriculture, Water and Regional Development of the Kyrgyz Republic. The Ministry of Emergency Situations of the Kyrgyz Republic combine now responsibility for the remediation of uranium legacy sites. as well as functions in the field of ecological and environmental protection and supervision.

In Tajikistan, several improvements to laws, regulations and corresponding guidance have been officially approved and implemented. In addition, Nuclear and Radiation Safety Agency has provided additional quality control on the application of these documents, with support from the International Atomic Energy Agency (IAEA). This has strengthened the position of the regulatory body and improved staff competence. However, continuing threats have been identified in RTA2.

Detailed understanding of these threats, and the scope and methods to address them, have been developed as part of the RTA2 process. This understanding has allowed the preparation of Roadmaps for further work in each country. These Roadmaps, presented as appendices to this report, are considered as the basis for discussion of future regulatory support from DSA while accounting for wider international programs such as those of the IAEA, the Nuclear Energy Agency, the European Union and the IAEA European and Central Asia Safety Network. The long-term objective is to promote robust, independent and adequately resourced legislative and regulatory frameworks to address the continuing and newly recognized threats.

Alongside the country and site-specific circumstances, common factors to be addressed in meeting the overall challenge include:

- the lack of information about historic events and practices that make it difficult to adequately characterize the current situation
- the typically limited involvement of stakeholders in the process of regulatory development, and the continuing lack of resources available to support a robust and effective regulatory system.

Similar issues have been noted in wider international forums and recommendations from shared experience can be applicable in central Asia.

In situations where there are very limited resources, scheduling of a staged approach to an appropriate solution and careful attention to optimization should be especially useful, to identify what is really feasible on a realistic timescale. The application of the process of optimization of protection and recognition that

regulatory flexibility and adaptability can be helpful in reaching the optimum solution in different circumstances, especially when the circumstances are initially not fully understood. A holistic approach to optimization is suggested that considers all aspects of risk management in a proportionate and graded manner.

The role of government includes a substantial set of responsibilities that have to be allocated as part of, or within, a regulatory framework. Implementation of projects that do not confirm to an up-to-date regulatory framework are only likely to create future legacies. However, it can be difficult to implement responsibilities until the current situation has been adequately characterized. Part of the strategy, therefore, has to be allocation of responsibility to investigate possible legacies.

The steps to achieving an appropriate solution should typically be supported by a safety case. Development of a safety case is an iterative process, ongoing through the steps in programme implementation, with each step accounting for improved source term data, understanding of the site and stakeholder interests, development of design options and wider planning issues.

A key issue is to put in place from the very beginning the organisational responsibilities, targets and resources so that impacted parties can see the direction being taken and their respective roles within it. The process of developing an effective plan is itself a subject for further international cooperation, based on shared experience of case specific and generic circumstances. An important part of that international cooperation is the implementation of the IAEA “Strategic Master Plan” for Environmental Remediation of Uranium Legacy Sites in Central Asia, currently under revision and update. A key strategic objective is to establish, through regional cooperation and wider international support, a larger and more sustainable critical mass of knowledge and expertise within central Asia for undertaking remediation and regulating its safety and resolve the problem and threats arising from uranium legacy. It is appropriate for consideration to be given to address regulatory issues and corresponding support to national regulatory bodies in solving the problem, but also to prevent creation of new legacy problems in the future. An important mechanism to coordinate such efforts is provided through the IAEA Coordination Group for Uranium Legacy Sites (CGULS).

It is anticipated that further opportunities for sharing of international experience will occur, extending beyond uranium related issues, from the activities of the recently set up NEA Committee on Decommissioning and Legacy Management. Such activities are due to include conduct of international peer reviews and providing expert feedback to ensure that best practices in regulatory and technical methodologies are adopted in decommissioning and legacy management, which includes uranium legacy challenges. Given the need to manage and optimize limited regulatory resources, the work of the NEA Expert Group on development of a Holistic Process for Decision Making on Decommissioning and Management of Complex Sites will also be of significant interest.

Abbreviations and Acronyms

AS RT	Academy of Sciences of the Republic of Tajikistan
BSS	Basic Safety Standards
CA	Central Asian
CAESC	Committee of Atomic and Energy Supervision and Control of the Republic of Kazakhstan
CES	Committee for Emergency Situation of the Ministry of Internal Affairs of the Republic of Kazakhstan
CES CD	Committee for Emergency Situations and Civil Defence
CGULS	Coordination Group for Uranium Legacy Sites
CHMP	Chemical Hydrometallurgical Plant
CIS	Commonwealth of Independent States
CT	Computed tomography
D&D	Decommissioning and demolition
DDPSSES	Division of Radiation Safety of the Department of Disease Prevention and Public Sanitary Surveillance under the Ministry of Health
DGKR	Decree of the Government of the Kyrgyz Republic
DPPT	Department for Protection of the Public and Territories
DRL	Diagnostic Reference Level
DSA	Norwegian Radiation and Nuclear Safety Authority
DSRS	Disused sealed radiation sources
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EPR	Emergency Preparedness and Response
ERA	Environmental Remediation Account
ETSS	Education and Training Services Section
EuCAS	European and Central Asia Nuclear Safety Network
GNSSN	Global Nuclear Safety and Security Network
IAEA	International Atomic Energy Agency
IAE NNC	Institute of Atomic Energy of National Nuclear Centre
ICRP	International Commission on Radiological Protection
IEC	Incident and Emergency Centre
INES	International Nuclear and Radiological Event Scale
INIR	Integrated Nuclear Infrastructure Review
INP	Institute of Nuclear Physics
INSC	Instrument for Nuclear Safety Cooperation
ISTC	International Science and Technology Center
JSC	Joint Stock Company
LEU	Low Enriched Uranium
LID	Licensing and Inspection Department
LTSF	Long term storage facility
ME RK	Ministry of Energy of the Republic of Kazakhstan
MEGNR	Ministry of Ecology, Geology and Natural Resources
MES	Ministry of Emergency Situations
MFA	Ministry of Foreign Affairs, Norway
MINT	Ministry of Industry and New Technologies of the Republic of Kazakhstan
MoU	Memorandum of Understanding
NCO	National Oncology Centre
NNC RK	National Nuclear Centre of the Republic of Kazakhstan
NORM	Naturally occurring radioactive material
NPP	Nuclear power plant

NPP FS MS	Marketing Section of the Feasibility Study for the Construction of a Nuclear Power Plant in the Republic of Kazakhstan
NRB	Standards of Radiation Safety
NRB-06	Norms of Radiation Safety
NRP	National Response Plan
NRPA	Norwegian Radiation Protection Authority
NRSA	Nuclear and Radiation Safety Agency
NTSC	Nuclear Technologies Safety Centre
OECSS	Occupational Exposure Control Services Sector
OIL	Operational intervention levels
PAIRD	Public Awareness and International relations Department
PPS	Physical protection system
RASOD	Regulatory Authority Software Database
RCCO	Republican clinical centre of oncology
RIA	Regulatory Impact Analysis
RK	Republic of Kazakhstan
RPO	Radiation Protection Officer
RSE INP	Republican State Enterprise “Institute of Nuclear Physics”
TC	Technical Cooperation
RIA	Regulatory impact analysis
RT	Republic of Tajikistan
RTA	Regulatory Threat Assessment
RM	Radioactive material
RW	Radioactive waste
RWDS	Radioactive waste disposal site
RWSF	Radioactive waste storage facility
RWM	Radioactive waste management
SAEPF	State Agency for Environmental Protection and Forestry
SAR	Safety Analysis Report
SCIES	State Committee for Industry, Energy and Subsoil Use
SCPS	State Civil Protection System
SIETS	State Inspectorate for Environmental and Technical Safety
SIR	Source of Ionizing Radiation
SMP	Strategic Master Plan
SNF	Spent nuclear fuel
SODESCO	Society for Development of Scientific Cooperation
SPPS	State Physical Protection System
SRCEPES	State Regulation Centre of the Environmental Protection and Ecological Safety (former CES)
TC	Technical Cooperation
TLD	Thermoluminescent dosimeter
TSO	Technical Support Organization
UMP	Ulba Metallurgical Plant
UN	United Nations
UNDP	United Nations Development Programme
US DOE	United States Department of Energy
US NRC	United States Nuclear Regulatory Commission
US NNSA	Unites States National Nuclear Security Administration
USA	Unites States of America
USEPES	Uniform State Emergency Prevention and Elimination System
USSR	Union of Soviet Socialistic Republics

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1 Introduction

The Norwegian Radiation and Nuclear Safety Authority (DSA), formerly Norwegian Radiation Protection Authority (NRPA), is a governmental organization that carries out assignments on behalf of the Norwegian Ministry of Foreign Affairs (MFA), the Ministry of Health and Care Services, and the Ministry of Climate and Environment. In addition to its national mandate for safety, security, and safeguards, DSA has activities related to improving radiation protection, nuclear safety and security, and non-proliferation internationally. These include *inter alia* activities concerning the implementation of the Action Plan. The promotion of improved regulation of radiation and nuclear safety in northwest Russia and Ukraine are major parts of the nuclear action plan, implemented through the DSA's regulatory cooperation program with sister regulatory authorities in other countries. Projects developed within the bilateral Regulatory Cooperation Program have been helping to reduce the risk of nuclear accidents and radioactive contamination for many years. Recent progress is described in reference [1] for Russia and reference [2] for Ukraine.

In 2008, the MFA extended the scope of the Action Plan to support Central Asian (CA) countries in the field of radiation and nuclear safety. The DSA, with the support of the MFA, assisted authorities in Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan during 2009 – 2011 with the development of Regulatory Threat Assessment (RTA) reports, focusing primarily on identifying priorities for policy and strategy development in the field of radioactive waste and uranium legacy management. The results of the first RTA (RTA1) were published in 2011 [3].

During a second phase of bilateral cooperation, which ran from 2012 to 2015, the regulatory authorities[1] from Kazakhstan, Tajikistan and Kyrgyzstan, along with their technical support organizations (TSOs), carried out a review and update of the regulations in each country in the field of radioactive waste management. Many of the resultant documents have been approved by the governments of Tajikistan, Kyrgyzstan and Uzbekistan and are in use. The results of this second phase of cooperation were published in 2016 [2].

The bilateral cooperation between DSA and the regulatory bodies in Kazakhstan, Tajikistan and Kyrgyzstan entered its third phase in 2018 with a comprehensive updated regulatory threat assessment (RTA2) in seven main areas, including:

1. organization and general principles of the regulatory body
2. safety of installations
3. transport of radioactive materials
4. radiation safety
5. emergency preparedness and response
6. radioactive waste management, including decommissioning and remediation and
7. radiation and nuclear security.

The main purpose of RTA2 was to obtain an up-to-date view of new and continuing gaps existing in the regulation of radiation and nuclear safety and security. The scope of the RTA2 was to focus on key challenges to the regulatory bodies within their respective roles of regulating radiation and nuclear safety of workers, members of the public and the environment. It comprised a qualitative review and analysis of radiation and nuclear safety and security hazards in sufficient detail to enable prioritization of regulatory resources in areas that most require regulatory supervision and, in the case of identified gaps, further regulatory and legislative developments. This included the need for new regulatory safety requirements,

[1] The Committee of Atomic and Energy Supervision and Control of the Ministry of Energy of the Republic of Kazakhstan (CAESC ME RK)), the Nuclear and Radiation Safety Agency (NRSA) of Tajikistan, and the State Agency for Environmental Protection and Forestry (SAEPF) of Kyrgyzstan.

guidance on how to comply with those requirements and procedures such as licensing procedures, radiological and nuclear safety assessment and regulatory review procedures.

The RTA2 was intended to help the regulatory bodies to gain an overview of the current situation in radiation and nuclear safety legislation, regulations, guidance and procedures, and the related major challenges. Based on the updated RTA2, a “Roadmap” has been developed for each country (Kazakhstan, Tajikistan, and Kyrgyzstan). Each “Roadmap” provides a solid and comprehensive basis for further long term bilateral regulatory cooperation between DSA as well as supporting other countries in the region.

This report sets out the results of this third phase of bilateral regulatory cooperation between DSA and CA countries and the findings of the RTA2 in each of the seven areas relating to nuclear and radiation safety and security as set out above for Kazakhstan (Chapter 2), Tajikistan (Chapter 3) and Kyrgyzstan (Chapter 4). References are listed at the end of each section. Overall conclusions and discussion of the wider international context are provided in Chapter 5. Roadmaps for future regulatory cooperation between DSA and each of the countries respectively are presented in Appendices 1-3.

1.1 References for Section 1

[1] Siegien K, Sneve M K, Strand P, Shandala N K, Romanov V. Semenova M. Regulatory Cooperation Program between the Norwegian Radiation and Nuclear Safety Authority and the Federal Medical Biological Agency of Russian Federation. Results and Review of Progress from 2015 to 2019. DSA Report 2020:9. Østerås: Norwegian Radiation and Nuclear Safety Authority, 2020.

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[3] Zhunussova T., Sneve M., Romanenko O., Solomatina A., Mirsaidov I. Threat Assessment Report Regulatory Aspects of the Remediation and Rehabilitation of Nuclear Legacy in Kazakhstan, Kyrgyzstan and Tajikistan. Stra ° levernRapport 2011:5. Østera ° s: Statens stra ° levern, 2011.

[4] Siegien-Iwaniuk K, Sneve K M, Zhunussova T, Tazhibayeva I, Kim A, Romanenko O, Tolongutov B, Solomatina A, Mirsaidov I, Kuldjanov B, Radjuk R I, Schandala N K, Titov A V. Regulatory support in radiation safety and radioactive waste management in Central Asia. Results of project completed in 2015. Stra ° levernRapport 2016:7. Østera ° s: Statens stra ° levern, 2016.

2 Regulatory framework for Nuclear and Radiation Safety in Kazakhstan

In the period 2009-2011 the bilateral cooperation program between DSA and CAESC focused on identifying gaps in regulations related to radioactive waste (RW) management in Kazakhstan and development of the regulations needed to address those gaps. The second phase of the program, that ran from 2012 to 2015, focused on the development of the following draft regulatory documents.

- → National Strategy for radioactive waste management in the Republic of Kazakhstan.
- → Radioactive waste classification in the Republic of Kazakhstan.
- → Law of the Republic of Kazakhstan on radioactive waste management.
- → The Rules on safe management of radioactive waste prior to its disposal in the Republic of Kazakhstan.
- → Concept of the strategy of radioactive waste management in the Republic of Kazakhstan and proposal on introduction of a new classification of radioactive waste in the Republic of Kazakhstan.
- → Draft Regulatory Document “Requirements for Predisposal Management of Radioactive Waste in the Republic of Kazakhstan”.
- → Draft Regulations on Radiological Protection and Radioactive Waste Management in the Extractive and Processing Industries of Kazakhstan.
- → Draft Regulations on Radioactive Waste Disposal in the Republic of Kazakhstan. Basic Criteria and Safety Requirements.

The documents were developed taking into consideration international requirements and recommendations in the field of radioactive waste management and drawing on experience from developed countries. It is important to note that, despite these documents being developed, they were not yet approved by the Government of Kazakhstan due to reorganizations in the structure of the Ministry of Energy of the Republic of Kazakhstan (ME RK). Nonetheless, they remain of crucial importance for updating the legal and regulatory framework of Kazakhstan, in compliance with the Joint Convention on Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and the latest International Atomic Energy Agency (IAEA) safety standards and requirements.

Preparation of these documents was preceded by elaboration of the technical requirements for the development of a draft law on radioactive waste management and associated draft rules. The draft law defines the competencies and responsibilities of state bodies involved in the regulation on safety of radioactive waste management and considers the mechanisms of their interaction in fulfillment of licensing procedures and implementation of state supervision and control. The draft law for the first time introduced a concept of the RW National Operator, i.e., it recognized, at a legislative level, the need for a specialized organization, responsible for all stages of RW management, to be established. It furthermore recognized the need for a state cadaster of RW to be established and maintained, as well as for RW classification, etc. to be updated.

In accordance with the specifics of legislation in the field of the use of atomic energy in the Republic of Kazakhstan, the draft law reflects the main directions for regulating public relations in this area, and the regulation is implemented through a series of relevant by-laws. A list of key bylaws is being drawn up aimed at implementing the provisions of the draft law on RW management and work is underway to put into effect the prepared regulatory documents. To implement the draft law in accordance with the new rules, it was necessary to develop the “Concept of the Law of the Republic of Kazakhstan “On RW management” [1] and conduct a regulatory impact analysis (RIA), which is one of the tools for improving the quality of regulation and, as a result, increasing the efficiency and effectiveness of government operations. RIA is

considered as an essential element of rulemaking, contributing to the comprehensive improvement of its quality.

The draft Concept of the Law of the Republic of Kazakhstan “On RW management” was developed and sent for approval to the ministries and specialized organizations and departments and comments were addressed in a revised draft Concept. There have been several attempts to move forward the review and acceptance procedure of the Law, with the last one being initiated in March-April 2019. A new approach is now being considered. For example, it is proposed that part of the main provisions of the draft Concept of the Law (e.g., that relating to provisions on the National RW Operator and on the fund for financing the management of RW) be introduced within a planned new version of the Environmental Code.

2.1 Comprehensive Update of the Regulatory Threat Assessment, 2018-2020

Progress on each of the seven areas relating to nuclear and radiation safety and security within the RTA2 is described below.

2.1.1 Organization and general principles for activities of the Regulatory Authority

Functions specific to the nuclear regulator are currently assigned to the ME RK whose responsibilities in the field of atomic energy use were previously assigned to the Ministry of Industry and New Technologies of the Republic of Kazakhstan. The Committee for Atomic and Energy Supervision and Control of ME RK (CAESC), formerly Atomic Energy Committee of the Ministry of Industry and New Technologies of the Republic of Kazakhstan (MINT), is the agency carrying out regulatory control and realization functions in the field of atomic energy use within the competence of the ME RK. The Department of Nuclear Energy and Industry, which is also part of the ME RK structure is at the same time responsible for promoting nuclear energy. The CAESC is hereinafter referred to as the "competent authority" in accordance with the legal definitions of the legislation of the Republic of Kazakhstan. The functions of the CAESC include:

- → implementation of state policy in the field of electric energy and atomic energy use
- → carrying out regulatory, realization and control-supervision functions and participating in the implementation of the strategic functions of the central executive body within its competence
- → approving legal acts on the matters within its competence and, if it has direct competence, for their approval in the ministry’s acts, except for the normative legal acts concerning human and civil rights and freedoms
- → exercising control and supervision of the activities of individuals and legal entities within its competence
- → exercising control and supervisory functions over the activities of local executive bodies on the issues relating to the responsibilities of the Committee
- → implementing international cooperation within its competence
- → performing a permissive control
- → conducting inspections related to the execution of its responsibilities in the field of atomic energy
- → exercising state control in the field of atomic energy use
- → monitoring compliance with the standards and rules of radiation safety and license conditions
- → carrying out the state control in the field of radiation safety of the population

- → exercising control over the export, import, movement, transit and placement of nuclear materials and other ionizing radiation sources
- → carrying out export control in the field of atomic energy use
- → maintaining state accounting of nuclear materials
- → performing state accounting of sources of ionizing radiation
- → coordinating the issuance of a license by an authorized state body exercising state regulation in the field of export control for the export and import of nuclear and special non-nuclear materials, equipment, facilities, technologies, sources of ionizing radiation, equipment and relevant dual-use technologies (assignments), works, and services related to their production
- → carrying out licensing and licensing procedures within the competence stipulated by the legislation of the Republic of Kazakhstan
- → deciding on the state registration or removal from the state register of nuclear materials and sources of ionizing radiation
- → coordinating the calculation techniques related to ensuring nuclear, radiation and nuclear security provided by the expert organization
- → approving the design of transport packaging sets, as well as extending the validity of certificates-permits for them, approved by the authorized bodies of other countries, at territory of the Republic of Kazakhstan
- → organizing research on radiation and nuclear safety and security, ensuring the regime of non-proliferation of nuclear weapons and monitoring of nuclear tests
- → developing and approving methodological recommendations for individuals and legal entities carrying out activities in the field of atomic energy use regarding methods and techniques for confirming compliance of a facility using atomic energy with radiation and nuclear safety and security requirements established by the legislation of the Republic of Kazakhstan in the field of atomic energy use
- → setting the values of the threshold activity for various radioisotopes
- → carrying out analysis and verification of received information about the availability, location and movement of ionizing radiation sources and entering it into the register of ionizing radiation sources
- → conducting certification of personnel employed at nuclear facilities
- → conducting accreditation of organizations carrying out expertise of on radiation and nuclear safety and security keeping a register of accredited organizations carrying outon radiation and nuclear safety and security expertise
- → developing, coordinating, and approving, within its competence, regulatory technical acts of the Republic of Kazakhstan, instructions, guidelines for the electric power industry and the use of atomic energy
- → within its competence, participating in the development and implementation of strategic and program documents, proposals to the Strategic and Operational Plans of the ME RK and
- → exercising other powers stipulated by the laws of the Republic of Kazakhstan, acts of the President of the Republic of Kazakhstan and the Government of the Republic of Kazakhstan.

In accordance with the Laws on Atomic Energy Use and on Permits and Notification, CAESC provides licensing and regulatory oversight of activities in the field of atomic energy use in the following areas:

- → work related to the stages of the life cycle of nuclear facilities

- → radioactive waste management
- → special training of personnel responsible for ensuring nuclear and radiation safety
- → activities undertaken in the territories of former nuclear test sites and territories contaminated as a result of nuclear tests
- → provision of services in the field of atomic energy use
- → management of devices and installations that generate ionizing radiation
- → management of radioactive substances, devices and installations containing radioactive substances
- → transportation, including transit, of nuclear materials, radioactive substances, radioisotope sources of ionizing radiation, and radioactive waste within the territory of the Republic of Kazakhstan
- → physical protection of nuclear installations and nuclear materials and
- → nuclear materials management.

The CAESC realizes the state control of licensee's compliance with license conditions and in case of failure, it imposes sanctions within its competence.

Regulatory functions in the field of atomic energy use in the Republic of Kazakhstan are also performed by the Ministry of Ecology, Geology and Natural Resources (environmental protection), the Committee for control of quality and safety of goods and services of the Ministry of Health of the Republic of Kazakhstan (functions of state authority in the field of sanitary and epidemiological welfare of the population), the Ministry of the Interior affairs (issue of authorization and protection of objects), the Committee of industrial development and industrial safety of the Ministry of Industry and Infrastructural Development of the Republic of Kazakhstan (control and supervision in the field of industrial safety), and the Committee for Emergency Situations (CES) of the Ministry of Internal affairs of the Republic of Kazakhstan (elimination of the consequences of man-made accidents).

The Ministry of Ecology, Geology and Natural Resources (MEGNR), responsible for environmental protection functions, replaced the Committee of Ecological Regulations and Control. The MEGNR is responsible for setting limits for discharges and emissions, including radioactive ones, reviewing and approving environmental impact assessments (EIA) at all the stages of design and operation of nuclear and radiation facilities and provides for other environmental protection functions, including the field of atomic energy use. The main goals of the MEGNR are as follows:

- → to provide for the implementation of state policy within its competence
- → to carry out the regulatory, realization and control-supervision functions and participate in the implementation of the strategic functions of the central executive body within its competence
- → to approve legal acts on the matters within its competence and if it has direct competence for their approval in the ministry's acts, except for the normative legal acts concerning human and civil rights and freedoms
- → to exercise control and supervision of the activities of individuals and legal entities within its competence
- → to carry out control and supervisory functions over the activities of local executive bodies on the matters relating to the responsibilities of the Committee
- → to implement international cooperation within its competence
- → to perform licensing and permissive procedures and controls
- → to carry out state surveillance of the environment within its competence, and coordinate the implementation of EIA in the Republic of Kazakhstan and carry out its methodological guidance

- → to maintain the State Register of natural resources users and sources of environmental pollution
- → to provide access to environmental information within their competence in accordance with the legislation of the Republic of Kazakhstan and
- → to carry out state ecological control over the observance of environmental legislation of the Republic of Kazakhstan, environmental quality standards and environmental requirements.

The MEGNR also performs other functions in accordance with the laws of the Republic of Kazakhstan and Acts of the President and Government of Republic of Kazakhstan.

The Ministry of Health is responsible for radiation monitoring of the population and control of public exposure and was previously responsible for remediation activity, but this responsibility was recently transferred to local authorities. The MEGNR is responsible for control of remediation activities.

There are no strictly determined coordination procedures that establish interactions between CAESC, the Ministry of Health and MEGNR. The Ministry of Health performs radiation control inside the radiation protection zone (i.e., for personnel) whereas the MEGNR performs measurements outside it (i.e., for the population). The CAESC does not perform any measurements and has no equipment for this. Training in this area is required for the CAESC.

The Committee for quality control and safety of goods and services of the Ministry of Health, responsible for functions of the state authority in the field of sanitary and epidemiological welfare of the population, replaced Committee of Public Health Protection of the Ministry of Health, and performs the following functions:

- → issuance of the sanitary-epidemiological conclusions based on check results, and other forms of control and sanitary-epidemiological examination, in accordance with the legislation of the Republic of Kazakhstan
- → inspections of vehicles within its competence on compliance with legal and regulatory documentation in the field of sanitary and epidemiological welfare of the population, which are used for the transportation of passengers, food products, food raw materials, technical and drinking water, radioactive, hazardous, chemical and toxic substances, conditions of carriage passengers and cargo;
- → development of hygienic standards and sanitary regulations regulating the radiation safety of the population, the organization of sanitation and educational activities aimed at the protection of public health
- → implementation of the unified state accounting and control of individual and collective doses of the citizens of the Republic of Kazakhstan
- → implementation of state supervision and control within their competence on the territory of the State in accordance with the legislation of the Republic of Kazakhstan
- → approval of the import of X-ray equipment and devices and equipment using radioactive substances and isotopes
- → control within its competence in the form of inspections and other forms of control in accordance with the current legislation of the Republic of Kazakhstan
- → implementation of radiation monitoring in the field of sanitary and epidemiological welfare of the population on the territory of the Republic of Kazakhstan
- → the suspension of certain types of work, operation of existing, new or renovated facilities to eliminate violations of normative legal acts in the field of sanitary and epidemiological welfare of the population and hygienic standards in accordance with the legislation of the Republic of Kazakhstan on administrative violations and

→ establishing and changing of the size of the sanitary protection zones.

The Committee of industrial development and industrial safety is responsible for control and supervision in the field of industrial safety and is responsible for compliance with the statements of the Law # 188-V “On Civil Protection” dated on April 11, 2014 [2]. The Committee forms and implements the state policy in the field of industrial safety, while performing the following functions:

→ develops and ensures the implementation of the main directions of state policy in the field of industrial safety

→ issues a permit for the use of technologies, technical devices, materials used at hazardous production facilities, and hazardous technical devices

→ develops semi-annual schedules for conducting inspections in the field of industrial safety in accordance with the Entrepreneurial Code of the Republic of Kazakhstan

→ suspends or prohibits, in exceptional cases that pose a threat to human life and health, and without a court decision, activities of individual entrepreneurs or organizations related to the operation of hazardous production facilities or technical devices, for a period of not more than three days with a mandatory presentation to the specified term of the statement of claim to court;

→ carries out proceedings on administrative offenses in regulated areas

→ develops a procedure for passing exams and testing the knowledge of heads of legal entities declaring industrial safety, as well as members of permanent examination boards of these legal entities

→ carries out certification of legal entities for the right to carry out work in the field of industrial safety

→ coordinates design documentation for the construction, expansion, reconstruction, modernization, conservation and liquidation of hazardous production facilities in the manner prescribed by the Law of the Republic of Kazakhstan "On Civil Protection" and the legislation of the Republic of Kazakhstan on architectural, urban planning and construction activities;

→ registers industrial safety declarations of a hazardous production facility

→ organizes and conducts, together with interested state bodies, within the scope of their competence, the investigation of accidents and accidents resulting from accidents at hazardous production facilities

→ participates in the conduct of training alarms and emergency training at a hazardous production facility

→ participates in acceptance tests, technical surveys of a hazardous production facility during its commissioning

→ conducts a knowledge test (exams) of the heads of legal entities of hazardous production facilities declaring industrial safety, as well as members of permanent examination commissions of these legal entities

→ carries out state supervision of compliance by legal entities and individuals, and organizations operating hazardous technical devices, with the requirements of the Law of the Republic of Kazakhstan "On Civil Protection" in terms of ensuring industrial safety

→ carries out state supervision of the preparedness of hazardous production facilities and organizations operating hazardous technical devices for the liquidation and localization of accidents and their consequences

→ carries out state supervision of the timeliness of technical surveys of industrial buildings, technological structures and technical devices of hazardous production facilities, and dangerous technical devices and

→ exercises other powers provided for by the laws of the Republic of Kazakhstan.

In accordance with the legislation of the Republic, the CES performs functions in the field of civil protection and defense, in the prevention and elimination of natural and man-made emergencies, ensuring fire safety and providing emergency medical and psychological assistance to the population of the Republic of Kazakhstan. The Committee's tasks are as follows:

→ formation and implementation of state policy in the field of civil protection

→ ensuring the functioning and further development of the state civil protection system

→ implementation of interdepartmental coordination in the field of civil protection and

→ implementation of state control in the field of fire without danger and civil defense.

2.1.2 General Organizational Aspects of CAESC Activities

In accordance with the Decree of the President of the Republic of Kazakhstan No. 779 of May 15, 1992, the Atomic Energy Agency of the Republic of Kazakhstan was established and defined as the central state authority in the field of the safe use of atomic energy. At present, these functions are performed by the ME RK, and particularly the CAESC department. It should be noted that the area of competence of the regulator is much broader than the area of the ME RK competence, as it applies not only to nuclear power, but also to a very large number of practical applications of nuclear technology - what is defined as the use of nuclear energy in the Republic of Kazakhstan legislation.

The CAESC is headed by a Chairman who is appointed and dismissed by the order of the ME RK. The Chairman of the Committee directs and is personally responsible for the implementation of the tasks assigned to the Committee and for the performance of its functions within the limits of the authority.

Interaction of CAESC with other state executive bodies, as well as with the organizations responsible for atomic energy use is conducted in accordance with applicable laws and other normative legal acts of the Republic of Kazakhstan. As the competent authority, the CAESC is provided with human, financial and technical resources to ensure its functions are performed.

The structure of CAESC is presented in Figure 1. In accordance with the provision of CAESC, it performs the functions of a supervisory authority both in the atomic and energy spheres; therefore, the structure of the CAESC includes subdivisions responsible for providing atomic supervision and energy supervision. The management of the Committee is carried out by the Chairman and Deputy Chairmen who are responsible for the organization and execution of work within the areas of the Committee's activities. There are 20 members of staff within the CAESC. Staff are required to have a university degree in the field of physics, energy or chemistry.

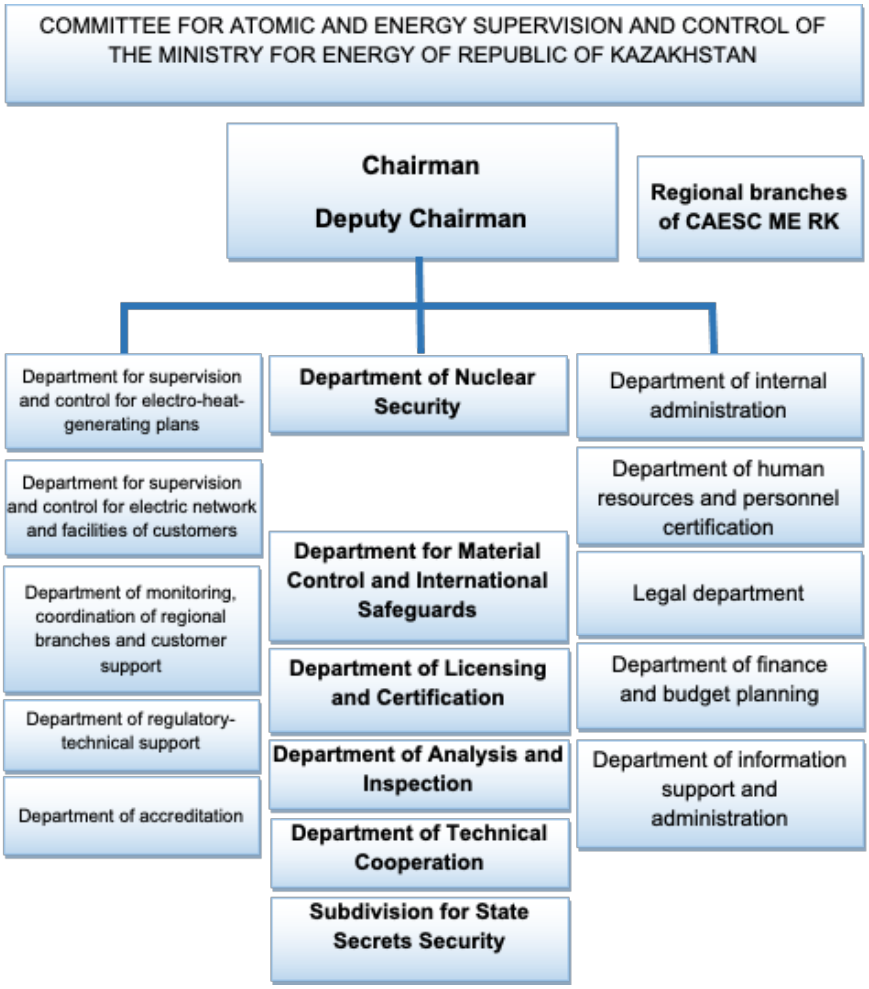

Figure 1 Structure of CAESC (in bold are the departments of CAESC responsible for the work in the nuclear field)

State supervision and control in the field of atomic energy use, is achieved through licensing and conducting inspections in accordance with state legislation. All legal entities and individuals carrying out activities in the field of atomic energy use are required to have a state license in accordance with the provisions of the current legislation and the requirements of the rules and regulations in this area. Legal entities and individuals to which these requirements apply include enterprises and organizations:

- → operating in the field of nuclear energy and industry
- → operating industrial and research nuclear facilities
- → using sources of ionizing radiation in various branches of medicine and agriculture
- → conducting scientific research or investigations in the nuclear field
- → providing services for the transport of nuclear and radioactive materials and radioactive waste
- → accounting nuclear and radioactive materials and sources of ionizing radiation and/or
- → carrying out educational and training work and other activities in the nuclear field.

When the CAESC makes decisions on issuing licenses, the decisive factor is the applicant's willingness and possibility to carry out the declared activities, as evidenced by the availability of the necessary technical base, including equipment and modern methodology and qualified personnel capable of performing the work, as well as material demonstrating compliance of the legal entities or individuals with the applicable legislation. The CAESC exercises state control over the licensee's compliance with the regulation in force and the conditions of licenses through inspections and, in case of non-compliance, applies sanctions within its competence. According to the Code of the Republic of Kazakhstan "On Administrative Offenses", administrative fines can be imposed, and licenses revoked where there are violations of the

established safety standards and the rules on management of nuclear materials and radioactive substances.

The work of CAESC is organized in such a way as to eliminate the difficulties associated with the small number of staff. In the process of licensing enterprises and organizations carrying out activities in the field of atomic energy use, the divisions responsible for licensing, certification, and inspection, and ensuring nuclear and radiation safety participate in the process of examining the applicant's materials. The special CAESC internal regulation standing order of licensing defines the procedure for the participation of the departments involved in the procedure for reviewing application materials and agreeing on its results.

The Department of Licensing and Certification provides for registration of applications for licenses, control over the passage of materials and observance of the consideration terms, preparation and issuance of a license, placement of information about licensees and issued licenses on the CAESC website. It organizes and conducts an examination of the knowledge of persons responsible at enterprises and organizations for ensuring nuclear and radiation safety and nuclear security, according to programs prepared in accordance with their duties. The computerized certification system EXAMINER, created with the support of the IAEA in the framework of technical cooperation programs, has been used for more than 15 years in conducting certification.

The Department of Analysis and Inspection is responsible for organizing and conducting inspections of enterprises of the Republic, both as part of the licensing process and in the process of state supervision and control. In order to save time and manpower resources for inspections, inspection work planning is carried out taking into account the number of atomic energy facilities to be inspected in the region and by applying graded approach to every inspection. As a result, it is possible to verify a greater number of enterprises and organizations by one inspection team. All employees of CAESC are involved in the inspection work.

The Division of Radiation and Nuclear Safety analyzes the materials of the application for compliance with the requirements of licensing legislation, as well as the requirements of current regulations in the field of safe use of atomic energy. Depending on the specifics of the declared activity, employees of the Department for Material Control and International Safeguards and the Division of Nuclear Security may be involved in the analysis of the application materials.

In addition to licensing, conducting inspections at enterprises of the republic and certifying personnel of organizations operating in the field of atomic energy use, CAESC is the state body responsible for maintaining the non-proliferation regime. The Department for Material Control and International Safeguards controls the fulfillment of international obligations to which the enterprises of the Republic of Kazakhstan participate. In accordance with the provisions of the Agreement between the Republic of Kazakhstan and the IAEA on the application of safeguards [3], with the support of CAESC, regular inspections of atomic energy use facilities in the Republic are conducted by the IAEA to check the availability, movement and preservation of nuclear materials. In accordance with the provisions of the Additional Protocol to the Agreement on the application of guarantees by the organization [4], CAESC informs the IAEA of all operations for the extraction, shipment and transportation of uranium, the periods of transportation and the recipients of the products of the organizations, as well as research, design and engineering work carried out at enterprises and divisions of companies that are subject to the protocol.

CAESC is defined as the state body of the Republic of Kazakhstan authorized to interact with the IAEA and other international organizations. The Technical Cooperation Department organizes and coordinates work within the framework of the IAEA Technical Cooperation (TC) programs to which Kazakhstan is a member. The Office coordinates the participation of Kazakhstani representatives in the work of regional nuclear safety networks, such as the Asian Nuclear Safety Network and the Europe and Central Asia Nuclear Safety Network (EuCAS), as well as in the framework of bilateral cooperation of the oversight

bodies of Kazakhstan and the United States, Kazakhstan and Norway. CAESC has the right to sign agreements with the regulatory bodies of other countries for cooperation on behalf from Republic of Kazakhstan.

2.1.3 CAESC Independent Status

In accordance with the Decree of the President of the Republic of Kazakhstan No. 779 of May 15, 1992, the Atomic Energy Agency of the Republic of Kazakhstan was established and defined as the central state authority in the field of the safe use of atomic energy. It was a part of Government of the Republic of Kazakhstan and it was administratively and financially independent. In 1995, the Atomic Energy Agency became a part of the Ministry of Science and New Technologies. At present, the main state body in the field of atomic energy use is the Ministry of Energy (ME). CAESC is the regulatory body in the field of nuclear safety and security I Kazakhstan and organized as the department in the ME RK.

CAESC is a financially independent agency within the ME RK. CAESC has its own budget, which is used for the realization of their functions such as licensing, inspection and attestation of personnel of enterprises within the nuclear sector of Kazakhstan. The budget is approved by the Budget Committee separately from the budget of the ME RK. Thus, in practice, the independence of the regulator from the authorities responsible for the development of the nuclear sector is realized.

In accordance with regulation, decisions of the CAESC in the field of safety regulation are final and not subject to agreement with the ME RK. These decisions can only be challenged in court. Therefore, in practice, the independence of CAESC regulatory actions and the absence of conflicts of interest and control of the Ministry is provided.

2.2 Safety of Existing Nuclear Installations

There are currently six nuclear installations present in the Republic of Kazakhstan:

- → The only commercial nuclear power plant (NPP), BN-350, is located in Aktau-city (western Kazakhstan).
- → Three research reactors are located in the territory of the former Semipalatinsk test site in eastern Kazakhstan. A fourth is located near Almaty city in southeast Kazakhstan.
- → The Ulba Metallurgical Plant (UMP JSC), a uranium fuel fabrication plant located in eastern Kazakhstan.

The territory of the Ulba Metallurgical Plant JSC is also the chosen location of the IAEA International Bank of Low-Enriched Uranium.

2.2.1 The BN-350 NPP

BN-350 (Figure 2) was the world's first fast breeder reactor with liquid metal coolant. During its operation, BN-350 was used for the generation of heat and electricity and the desalination of seawater. It was shut down in 1999 after 26 years of operation and is now being decommissioned. Work of the first stage of decommissioning was carried out in the period 1999–2010 and included the preparation and placement of spent nuclear fuel (SNF) for long-term storage within the territory of the former Semipalatinsk test site. All SNF has been discharged from the reactor and transported to the long-term storage facility (LTSF) at the Baikal-1 site of the National Nuclear Center of the Republic of Kazakhstan (NNC RK) for long-term storage.

Figure 2 NPP BN-350

The concept for BN-350 RW management, regardless of the origin and characteristics of the RW, is based on the principle of excluding the possibility of environmental contamination from radionuclides and other toxic substances within the waste stream for the entire period of their potential danger.

2.2.2 Research Reactors

The Institute of Atomic Energy of National Nuclear Centre (IAE NNC) was established in 1992. The main activities of the IAE NNC are research and development work in support of the nuclear energy development program in the Republic of Kazakhstan, conducting a feasibility study on the construction of nuclear power plants in specific regions, safety of nuclear and thermonuclear energy, space nuclear power plants, solid state radiation physics and reactor materials science. The IGR, IVG-1M and RA research reactors are under IAE NNC operation.

The IGR Reactor (Figure 3) is one of the oldest research reactors in the world. There is no decommissioning and demolition (D&D) plan for the reactor yet, but a budget request has been submitted to the ME RK for main provisions for decommissioning the reactor.

The IVG.1M (Figure 4) reactor is an upgrade of the IVG.1 reactor used to test fuel assemblies and the cores of high-temperature gas-cooled reactors, including nuclear rocket engine reactors and nuclear electric propulsion systems. Reactor IVG.1M allows research to be conducted in relation to:

- → testing of various types of the fuel assemblies in different modes of operation
- → reactor tests of the fuel assembly structural materials
- → testing of the fuel assembly structures and their elements; and,
- → study of possible emergencies and investigating preventative measures.

At present, in the framework of the contracts between the Argonne National Laboratory (USA), the Federal State Unitary Enterprise "Scientific-Research Institute of Scientific and Industrial Association "Luch" (Russia), and a branch of the IAE NNC, work is underway to analyze the technical possibility of reducing fuel enrichment in the IVG.1M research reactors. No decommissioning plan for this reactor has been developed yet.

During the Soviet Union period, Research reactor RA (Figure 5) was designed as a prototype of space propulsion with nuclear reactor that was used to test space propulsion nuclear fuel for radiation resistance. The reactor has shut down and nuclear fuel has been extracted and moved to the Russian Federation. The D&D plan for the RA reactor has been developed and approved by CAESC.

Figure 3 Research reactor IGR

Figure 4 IVG.1M reactor

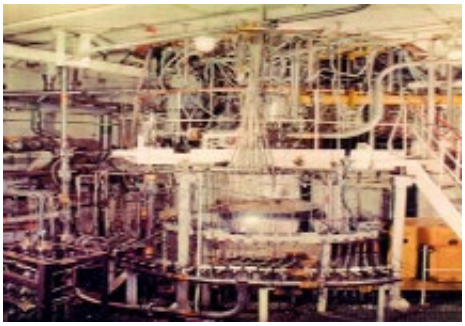

Figure 5 Research Reactor RA

Figure 6 Research Reactor WWR-K

Research Reactor WWR-K (Figure 6) is a thermal-neutron pool-type reactor that was commissioned in 1967. The reactor has been used for fundamental nuclear physics and materials science studies and in-reactor tests, production of radioisotopes for medicine and industry, gamma sources, neutron doping of silicon and neutron activation analysis. From 2003 to 2008 the Republican State Enterprise “Institute of Nuclear Physics” (RSE INP), with the financial support of the United States Nuclear Threat Initiative, conducted studies on the transfer of WWR-K reactor to a low enrichment fuel. On March 31, 2016, the core of reactor WWR-K was loaded with the first fuel assemblies of low enrichment fuel and the power start-up of the reactor took place in May of 2016. The commissioning date was September 01, 2016. Scientific research continues to be implemented at WWR-K within the framework of the republican budget programs, as well as within the contracts with international organizations and companies both in the Republic of Kazakhstan, and abroad.

As part of the training program of physical/power startups, a safety analysis report (SAR) was developed for the WWR-K reactor with low-enriched reactor core. In 2016, the SAR was agreed and approved by CAESC. In accordance with the regulatory requirements, the research reactor SAR was adjusted in accordance with results of the power start-up and agreed by CAESC in 2018. There is no decommissioning plan for this reactor, but a preliminary plan is being drafted and it is expected that a budget request for the complete decommissioning plan will be submitted to ME RK in 2021.

2.2.3 Fuel Fabrication Plant

The Joint Stock Company, Ulba Metallurgical Plant (JSC UMP), is a part of the National Atomic Company Kazatomprom (JSC NAC “Kazatomprom”). For almost 40 years, JSC UMP has provided reconversion and production of uranium dioxide pellets for the former Soviet and then Russian designed reactors. UMP JSC is the only uranium processing enterprise in the Republic of Kazakhstan.

JSC NAC “Kazatomprom”, together with China General Nuclear Energy Corporation, is implementing a project based on JSC UMP for the construction of a plant to produce fuel assemblies for use at nuclear power plants in China. The production of fuel assemblies was anticipated to commence at the end of 2020.

2.2.4 International Bank of Low Enriched Uranium

The territory of JSC UMP, Ust-Kamenogorsk, was chosen by the IAEA to host the International Low-Enriched Uranium (LEU) Bank. The official results of the tender for 90 metric tons of enriched uranium product in the form of LEU were published on the IAEA website on November 20, 2018; delivery was planned for the end of 2019. The tender was won by JSC NAC “Kazatomprom”, Kazakhstan (42 tons) and Orano SA, France (48 tons).

The implementation of the project for placement of the LEU Bank in Kazakhstan continues in accordance with the Plan of specific measures adopted within the framework of the Technical Agreement between the ME RK and the IAEA. The implementation of the Action Plan is reviewed at meetings of the Joint Coordinating Committee established in accordance with this Technical Agreement. At present, organizational and legislative measures are being taken to ensure the functioning of the LEU Bank, in particular, the resolution of taxation issues, and the customs regime for temporary admission and civil liability for nuclear damage [38].

2.2.5 Construction of New Nuclear Power Plant

Construction of a new NPP in the Republic of Kazakhstan has been planned for more than 20 years, but no decision on construction has been made so far and neither the type of the NPP, its capacity, nor the place of construction have been determined. However, a certain path has already been traversed and there are some developments that can be used if a decision on NPP construction is made.

In 2018 - 2019, the Nuclear Technologies Safety Center (NTSC) developed “The Marketing Section of the Feasibility Study for the Construction of a Nuclear Power Plant in the Republic of Kazakhstan” document (hereafter referred to as the NPP FS MS) in collaboration with the NNC and Energy System Research company. The purpose of the NPP FS MS was to support the selection of the optimal location area of the new NPP with an assessment of the possible range of installed power of the NPP, facilities for outputting of power and the applicability of unit capacity of the most reference units for deciding on the feasibility study. Two location areas were considered in the NPP FS MS: the area of Ulken settlement near Balkhash Lake and the area near Kurchatov City. In terms of the technical and economic comparison of options, including formation of the balance of electricity and base capacity, the construction of a NPP is recommended in the Southern zone (the area of Ulken settlement). Based on a comparative analysis, the most promising designs are the VVER-1200 reactors and the AP-1000, ATMEA1, APR1400 and HPR-1000 reactors, the vendors of which have shown interest in construction of their plants in the Republic of Kazakhstan. The VVER-1200, AP-1000, APR1400 reactors have reference blocks, which are under construction in the country of the manufacturer and abroad.

The IAEA has developed a number of documents that help its member states to create a modern infrastructure for the development of a nuclear program. The development and introduction of appropriate infrastructure for the successful development of nuclear power engineering and its safe, peaceful and sustainable use is an important issue for countries that intend to build and commission their first NPP. The IAEA also conducts special missions for countries wishing to embark on nuclear energy programs, i.e., construction of NPP to generate electricity. These Integrated Nuclear Infrastructure Review (INIR) missions contribute to the early establishment of a nuclear infrastructure, considering the rich international experience and with the help of IAEA experts. In the Republic of Kazakhstan, an INIR mission on stage (phase) one was conducted from October 31 to November 7, 2016. Based on the recommendations and suggestions, key areas for further action were identified.

At present, the following main documents determine the need for building a new NPP in Kazakhstan:

- → Decree of the President of the Republic of Kazakhstan dated February 1, 2010 No. 922 "On the Strategic Development Plan of the Republic of Kazakhstan until 2020".
- → Order of the Prime Minister of the Republic of Kazakhstan dated May 4, 2014 No. 60-p “On approval of “Plan of priority measures for construction of nuclear power plants in the Republic of Kazakhstan” with amendments and additions dated November 02, 2016 No. 110-p.
- → Concept of development of the fuel and energy complex of the Republic of Kazakhstan until 2030 dated June 28, 2014.
- → The concept of the transition of the Republic of Kazakhstan to the "green economy", approved by Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577.
- → Strategic Plan of the Ministry of Energy of the Republic of Kazakhstan for 2017-2021.

2.3 Transport of Radioactive Materials

Transportation of RM in Kazakhstan is carried out by road, rail and air transport:

- → Rail transport is currently used to transport raw materials for, and finished products from, uranium production. For example, uranium produced in Kazakhstan enterprise is transported to uranium enrichment enterprises in the Russian Federation and the enriched uranium products are then transported to the Kazakhstan nuclear fuel fabrication plant (JSC “Ulba metallurgical plant”) in Eastern Kazakhstan.
- → Road transport is mostly used for moving RM between enterprises of the uranium industry within the country, and to transport small amount of RW arising from medical, scientific and industrial applications.
- → Air transport is used for the transportation of nuclear fuel for research reactors.

2.3.1 Review of Legislation on Radioactive Material Transport

Radioactive material (RM) transport activity in Kazakhstan is managed through a set of organizational and technical measures that include preparation, loading, shipment, transport (including transit storage), unloading and acceptance of RM consignment sand packages at the final destination point. To regulate the process of RM transportation, the following laws and regulations are in force:

- → Law on the Use of Atomic Energy (January 12, 2016 No. 442-V) [6].
- → Law on Permits and Notifications (May 16, 2014 No. 202 V) [7].
- → Technical Regulations "Nuclear and Radiation Safety" (Order of the Minister of Energy of the Republic of Kazakhstan dated February 20, 2017 No. 58) [5].
- → National regulations on transport of radioactive substances were developed in accordance with the requirements of the IAEA Safety Standards: TS-R-1 “Rules for the Safe Transport of Radioactive Materials”.

CAESC has developed a list of Rules on RM transport for realization of the provisions of the Law on Atomic Energy Use. These include:

- → Rules for approval of designs of transport packaging kits (Order of the Minister of Energy of the Republic of Kazakhstan dated February 9, 2016 No. 51) [8].

- → Rules for the transport of nuclear materials (Order of the Minister of Energy of the Republic of Kazakhstan dated February 22, 2016 No. 76) [9].
- → Rules for the transport of radioactive substances and radioactive waste (Order of the Minister of Energy of the Republic of Kazakhstan dated February 22, 2016 No. 75) [10].

In addition to CAESC, a number of other State agencies and national companies are involved in the transportation of RM. These include the Ministry of Health (previously responsible for issuing sanitary passports for transportation vehicles, right now its function is not clear), the Ministry of Internal Affairs (approval of transportation routes and elimination of accident consequences) and the Ministry of Industry and Infrastructure Development (currently in the process of transformation into independent Ministry of Emergency Situations and merging with the Emergency Committee of the Ministry of Internal Affairs, functions are not clear yet). Each uses their own departmental regulations.

State agencies and national companies involved in the transportation of RM are guided by the Rules for the transport of dangerous goods developed and implemented by the Ministry of Transportation. The carrier must agree on the time schedule and transport route with the Ministry of Internal Affairs.

During transportation of RM by road, the carrier must ensure all conditions for safety, such as:

- → Transportation routes should not pass through populated areas, or near industrial facilities, water protection zones and lanes, recreation areas, nature reserves or architectural monuments;
- → In the case of transportation of dangerous goods within large populated areas, the transportation route should not pass near cultural, educational or preschool buildings, medical institutions, markets, etc., and a route map of the vehicle must be drawn up detailing the roads and streets, which it should follow;
- → Transportation routes should include places for parking and fueling stations and indicate dangerous sections of roads (dangerous sections of roads are indicated by the subdivision of the Ministry of Internal Affairs, with which the route is coordinated).

To obtain confirmation of the route, the carrier sends the following information to the Ministry of Internal Affairs:

- → Technical name of the transported dangerous goods
- → Class, subclass of dangerous goods
- → Flammable, explosive. Danger to living organisms
- → Emergency code and hazard number
- → Deadline for shipments (start and end dates)
- → The mass of dangerous goods transported on a single vehicle; the number of vehicles carrying cargo at the same time
- → Start, main intermediate and final locations of the route
- → Maximum allowable travel speed
- → Having a car cover and backup car
- → Whether transportation is allowed in difficult road conditions
- → Places alleged stops, parking, refueling.

Within 10 working days upon receipt of this information, the competent authority sends to the carrier a confirmation of the route of transportation, which should contain the following information:

- → Name of settlements and their streets, which vehicles with dangerous goods can follow.
- → The name of the roads outside the settlements, which vehicles with dangerous goods can proceed along.
- → Limits on movement speed.
- → Restrictions on stops and parking.
- → Other driving conditions.
- → The validity of the route of transportation.

Based on the data contained in the confirmation, the carrier then fills in the form of the route of carriage. A completed and agreed route form must be kept by the driver.

If it is necessary, the Ministry of Internal Affairs determines the need and type of escort for special vehicles. Accompaniment can be carried out by a patrol car of the Ministry of Internal Affairs or a car of cover.

Any company which provides a RM transport service is required to have a license issued by CAESC for the transport of RM. License conditions include:

- → Requirements for laboratories carrying out dosimetry studies (competence, independence, availability of qualified knowledge about dose loads)
- → Requirements for the level of knowledge of the personnel of the Ministry of Internal Affairs engaged in obtaining permits for the transport of RM
- → Requirements for monitoring the driver's workplace
- → Labeling requirements for cargo
- → Requirements for the level of personnel knowledge (shipper, driver) in case of an emergency
- → Emergency plan
- → Management system.

2.3.2 CAESC Functions and Tasks in Radioactive Material Transport

According to the general provision determined by the Government of the Republic of Kazakhstan, CAESC is the central executive body in the field of atomic energy use (i.e., the Regulatory body). One of the main functions of CAESC is licensing of all types of activity in the field of atomic energy use, including transport of radioactive substances. In accordance with provisions of the Law on Permits and Notifications [7] all institutions, organizations, private companies and individuals involved in the process of transport of RM should have an appropriate license, issued by the regulatory body.

The procedure for obtaining a license for the transport of RM and RW is conducted in accordance with the internal standing order of CAESC. All appropriate divisions of the Committee are involved in this procedure. An applicant presents all licensing materials determined by the Law and the procedure then involves consideration of the presented materials, and the preparation and approval of the decision for obtaining the license. The time for completion of the license procedure is 30 working days.

In addition, CAESC performs the following functions in relation to the transport of RM and RW:

- → conducting inspections related to the execution of their powers in the field of transport of RM and RW

→ conducting control of compliance with the rules and regulations in the field transport of RM and RW

→ conducting control of compliance with the regulations and standards on transport and licenses conditions

→ participation in interdepartmental commissions on development, coordination and approval of regulatory technical acts, instructions and guidelines in the field of transport of RM and RW within its competence.

Regarding a permit for the international transportation of RM, CAESC considers the materials and a certificate of transport container presented by an applicant. In the case of a positive conclusion and approval, CAESC distributes information to all interested parties. A certificate of transport container is valid for 5 Years.

2.3.3 State Oversight of Transport Safety

According to the Law on Atomic Energy Use [6], CAESC provides State control over compliance with the requirements for nuclear and radiation safety during transportation of RM and RW. For this purpose, CAESC has control of compliance with the regulations and standards and license conditions during transportation. Provisions set out in the Law on Permits and Notifications [7] are used in support of this function.

CAESC is also responsible for planning, organizing and conducting inspections at transport enterprises throughout the republic, both as part of the licensing process and in the process of state supervision and control of compliance with the requirements of rules for the transport of radioactive substances, RW, and nuclear materials. All CAESC employees are involved in the inspection work.

CAESC organizes and conducts examinations of the knowledge of persons responsible at enterprises and organizations involved in the transport sector for ensuring nuclear, radiation and nuclear security, according to the computerized certification system EXAMINER. The EXAMINER system was created with the support of the IAEA within the framework of technical cooperation programs and has been used for more than 15 years in conducting certification.

2.4 Radiation Safety

The large enterprises of Kazakhstan in the field of atomic energy use, such as NAC “Kazatomprom, NNC RK and RSE INP carry out almost all areas of activity in the field of atomic energy use. Radiation safety is an important element of their activities.

There are also numerous groups of enterprises and organizations (state and private) in the Republic that carry out certain types of activities that are subject to state regulation on radiation safety. These are primarily medical institutions and hospitals using X-ray diagnostic equipment, radioactive sources for medical diagnosis and treatment of patients (radiochemistry, nuclear medicine), and particle accelerators in oncological centers of the republic, but also include institutions and organizations that use ionizing radiation sources for different applications in industry, research and agriculture etc. that are also subject to radiation safety requirements.

2.4.1 Radiation Safety Regulations on the Use of Radiation Sources

Regulatory control of radiation safety is realized through the sanitary regulations of hygienic standards "Sanitary and epidemiological requirements for ensuring radiation safety" [11] and Sanitary rules “Sanitary

and epidemiological requirements for ensuring radiation safety" [12] and "Sanitary and epidemiological requirements for radiation-hazardous facilities [13]. The sanitary-epidemiological service of the Ministry of Health is the responsible institution for this matter.

2.4.2 Radiation Protection of Personnel and Dosimetry Services

Personnel working with ionizing radiation sources should be protected against negative effects of radiation. The large enterprises of Kazakhstan such as the NAC "Kazatomprom, NNC RK and RSE INP, some large medical centers and hospitals, and large enterprises have internal divisions for the dosimetry control of personnel. Other companies, institutions and organizations use dosimetry services provided by specialized companies under licenses issued by CAESC.

Radiation protection is regulated by provisions of the Law on Atomic Energy Use [6] and the Law on Permits and Notification [7] and by the Ministry of Health through the Hygienic Standards "Sanitary and epidemiological requirements for ensuring radiation safety" [11] and "Sanitary and epidemiological requirements for ensuring radiation safety" [12]. At present it is not considered necessary to develop any new regulations in this area.

2.5 Emergency Preparedness and Response

2.5.1 General Principles on Operation of State Civil Protection System

Work on creating an emergency response system in the field of atomic energy use in the Republic of Kazakhstan began in 2000. During this period, international requirements and standards have changed, in connection with Kazakhstan's participation in international treaties, conventions and agreements, which imposed additional obligations on the republic, and it was necessary to maintain security requirements consistent with those new requirements and standards.

The legal base for activity on emergency preparedness and response in Kazakhstan is the Law on Civil Protection (April 11, 2014, No 188-V) [2]. This Law regulates public relations arising in the course of civil protection measures and is aimed at preventing and eliminating natural and man-made emergencies and their consequences, providing emergency medical and psychological assistance to the population in the emergency zone, and ensuring fire and industrial safety.

The main objectives of civil protection in the Republic of Kazakhstan are:

1. prevention and liquidation of emergency situations and their consequences
2. rescue and evacuation of people in case of an emergency through emergency rescue and evacuation work in peacetime and wartime
3. the creation of civil protection forces, their training and maintenance in constant readiness
4. training of specialists of central and local executive bodies, organizations and population education
5. the accumulation and maintenance in readiness of the necessary fund of protective structures, stocks of personal protective equipment and other property of civil defense
6. informing and alerting the public, civil protection authorities in advance if there is a forecast about the threat of an emergency and (or) promptly in case of an emergency

7. protection of food, water sources (water intake points for household and drinking purposes), food raw materials, fodder, animals and plants from radioactive, chemical, bacteriological (biological) infection, epizootics and epiphytotic
8. ensuring industrial and fire safety
9. creation, development and maintenance in constant readiness of warning and communication systems
10. development, implementation and monitoring of measures to reduce the impact or eliminate hazardous factors of modern means of destruction
11. ensuring the formation, storage and use of the state reserve.

The main principles of civil protection are:

1. the organization of a civil protection system on a territorial-sectoral basis
2. minimization of threats and damage to citizens and society from emergency situations
3. the constant readiness of forces and means of civil protection for prompt response to emergency situations, civil defense and emergency rescue and urgent work
4. publicity and informing the population and organizations about predicted and emerged emergency situations and measures taken to prevent and eliminate them, including the elimination of their consequences
5. justified risk and ensuring safety during emergency rescue and emergency operations.

In accordance with paragraph 7 of Article 5 of the Law of the Republic of Kazakhstan "On the Use of Atomic Energy" [6], CAESC as the central executive State agency in the field of atomic energy use prepared a National Plan for response to nuclear and radiation accidents. After consideration and approval of a draft of the National Plan by all Kazakhstan state bodies involved in the process of emergency preparedness and response (EPR), the Government of the Republic of Kazakhstan adopted this Plan by the Decree of 19 August 2016 No 467 [14].

2.5.2 Functional Subsystem for the Safety of Nuclear Facilities.

The state civil protection system consists of territorial and sectorial subsystems. Territorial subsystems are created at the regional, city and district levels on their territories to prevent and eliminate emergency situations and their consequences. Sectorial subsystems are created by the central executive bodies to organize work on the implementation of civil protection measures within their competence. The state civil protection system has three levels: republican, territorial and entity.

Republican and territorial levels include:

→ civil protection authorities

→ control points and operational duty services

→ emergency prevention and response commissions

→ forces and means of civil defense

→ communication systems, alerts and information support.

Nuclear installations have special teams for the prevention nuclear or radiation accidents and to eliminate emergency situations and their consequences.

2.5.3 Information and Emergency Center

The management of the state civil protection system is carried out by:

- → the Government of the Republic of Kazakhstan at the republican level
- → Governors of the respective administrative-territorial units at the territorial level
- → heads of organizations at the entity level and,
- → the heads of central executive bodies for industry subsystems.

The central executive body in EPR in the Republic of Kazakhstan is the Committee for Emergency Situation of the Ministry of Internal Affairs (CES). The CES is responsible for implementation of the National Plan for the response to nuclear and radiation accidents [14] and for the preparation and participation of rescue services in the aftermath of a nuclear or radiation accident or incident. The CES is also responsible for carrying out work to protect the population in such cases, as well as ensuring fire safety.

The structure of the CES includes an Information and Emergency Center (IEC). The IEC assists the CES with:

- → emergency forecasting
- → collection, processing and exchange of information on the protection of the population, facilities and territories from emergency situations
- → development of emergency response plans
- → development and implementation of emergency prevention measures
- → planning the actions of governing bodies and civil defense forces and organizing the preparation and provision of their activities
- → preparing the population for emergency response; and
- → providing knowledge in the field of civil protection.

Representatives of CAESC participate in the work of the interdepartmental commission on EPR and provides to CES and IEC specific information regarding emergencies and shares information from international organizations and regulatory bodies from other countries.

2.5.4 Emergency exercise

The Government of the Republic of Kazakhstan organizes and conducts a special training on EPR on an annual basis in the CES Training Center for representatives at all levels of the State Civil Protection System. The duration of the training course is usually one week. The course is mandatory for staff and personnel of state bodies, local authorities and enterprises responsible for EPR matters. The course program includes a one-day practical exercise with modeling of any type of emergency, including natural events such as earthquakes or floods. On the final day of the training course, all students are examined.

If an emergency was to occur in Eastern or South Kazakhstan where nuclear installations are present, it would be possible for emergencies to be accompanied by a nuclear or radiation accident. In this case, the training includes a full scope exercise involving all levels of the State civil protection system. They are represented by: Government of the Republic of Kazakhstan; Ministry of Internal Affairs; Ministry of Health; ME RK; MEGNR; Ministry of Infrastructure Development; CES; CAESC; and Local Authorities. Forces of

civil protection are also involved, including special teams for EPR from the nuclear installations of NNC RK, JSC NAC “Kazatomprom”, INP and the Disaster Medicine Center.

At the international level, representatives of Kazakhstan State bodies, companies and institutions have participated in events on EPR under IAEA support since 1994. Cooperation between the regulatory body of Kazakhstan and the United States Nuclear Regulatory Commission (US NRC) and the United States Department of Defense began in 1994. Part of this cooperation was, and remains, training activities in the area of EPR.

2.5.5 Automated IEC Systems

The IEC working schedule is 24 hours per day, 365 days a year. The center collects and maintains information received from all parties involved in the EPR process: regional commissions for civil protection; State bodies involved in EPR activities; departmental laboratories conducting radiation monitoring; and institutions and organizations conducting radiation monitoring. Information received is processed and used as data for:

- → forecasting emergencies and their consequences
- → adjustment of emergency response plans
- → introduction, if necessary, of round-the-clock duty of heads and officials of governing bodies and civil protection forces at control points
- → collection, processing and transmission of data on predicted emergencies to the governing bodies and civil protection forces, informing state bodies and the public about ways to protect against them
- → taking operational measures to prevent the occurrence and liquidation of emergencies, reduce the amount of damage and losses in case of their occurrence, as well as increase the stability and safety of the operation of facilities in emergency situations
- → replenishment of the necessary reserves of material resources created to eliminate emergency situations and their consequences; and,
- → carrying out evacuation measures if necessary.

2.5.6 Radiation monitoring

Radiation monitoring is an important part of EPR in the field of atomic energy use. There are a number of enterprises and organizations in Kazakhstan carrying out monitoring activities on radiation safety and providing information to the CES and CAESC regarding EPR:

- → NAC “Kazatomprom” conducts radiation monitoring at enterprises of the uranium industry and carries out activities for the remediation of territories contaminated by radioactive waste from this industry.
- → IAE NNC RK and RSE INP control the radiation situation in the nuclear installations and research reactors IGR, IVG-1M and WWR-K.
- → The Institute of Radiation Safety and Ecology of the NNC RK was established in 1993 on the basis of research units of military unit 52605 and radioecological units of NNC RK. The main activities are radioecology and radiation monitoring of the regions of the Republic of Kazakhstan where nuclear tests were conducted or there are radiation-hazardous objects; remediation of radiation-contaminated territories; and investigation of medical and biological aspects of radiation effects on environmental objects.

- → RSE INP also conducts radiation monitoring on the territories where nuclear tests were carried out and measures concentrations of radionuclides in water and soil (Western Kazakhstan).
- → The state enterprise “Kazhydromet” monitors the level of global fallout of radioactive substances on the territory of the country.
- → Special laboratories of the Ministry of Health, Ministry of Agriculture and various scientific and research institutes and laboratories of the relevant profile also carry out control of external doses and measuring levels of radionuclides in soil, water, food and other products.

2.5.7 INES application

According to international practice, the International Nuclear and Radiological Event Scale (INES) is applied in assessment and communication of nuclear and radiation events and situations of public interest. The Republic of Kazakhstan joined with INES activities in 2008 with the INES User’s Manual 2008 Edition being used for the classification of all events in the Republic of Kazakhstan since this time. CAESC is the national coordinator of INES.

2.6 Radioactive Waste Management and Decommissioning

The radiation situation on the territory of the Republic of Kazakhstan is currently determined by the following main factors [1]:

- → activities of uranium mining and milling industry enterprises and related geological works
- → activities of enterprises producing nuclear fuel for nuclear power plants and research reactors
- → activities of mining and milling enterprises, whose raw materials are characterized by a high content of radioactive elements
- → nuclear explosions conducted for military and peaceful purposes at test sites located on the territory of Kazakhstan during the Soviet Union time
- → operation of energy and research nuclear installations; and
- → use of radioisotope products in industry, medicine, agriculture and research.

Based on the analysis carried out within the framework of the cooperation program of the CAESC, NTSC and the DSA under the project "Regulation of radioactive waste management during their long term storage and disposal in the Republic of Kazakhstan” for the period 2009–2011 (Contract No. M12-09 / 18), it was concluded that activities of personnel working with radioactive materials, including RW, at the time of the first regulatory threat assessment [15], were rather strictly regulated in terms of safety and were well controlled by the Law on Civil Protection [2]. However, the regulatory threats to the population living near territories contaminated with radionuclides are considerable. The main factors affecting their occurrence are:

- → Spent and abandoned objects and uranium industry entities, including those that have been partially rehabilitated as well as those that have not yet begun remediation activities.
- → Radioactive waste accumulated at the enterprises of the uranium industry during the long period of their previous activities.
- → RW produced as a result of nuclear tests carried out in Kazakhstan, the largest test area being the Semipalatinsk test site with an area of around 1,800 km^2 within which the individual annual dose can exceed 1 mSv. In addition, there are risks associated with the migration of radionuclides in groundwater.

- → Territories on which entities of the oil and gas industry are located and on which the soils are contaminated by oil and natural radionuclides. The territories are also sites where radionuclide-contaminated pipes and other production equipment are stored.
- → Lack of full monitoring of the behavior of radionuclides at sites where RW is located, which leads to insufficient data on the quantities of radionuclides in drinking water and food, and, consequently, to the difficulty of estimating the actual doses received by the local population.
- → Problems associated with long-term storage and disposal of RW and the extent of institutional control not being defined.

Significant amounts of RW have therefore been generated and accumulated from all types of industries related to the use of atomic energy ranging from low level to high level RW [1]. For example, the uranium industry has generated more than 200 million tons of RW. Geographically, the main quantity of RW related to the uranium mining industry, is in the Mangistau (Pre-Caspian mining and smelting Combine), North Kazakhstan, Akmola (Tselinny Mining chemical Combine), Karaganda, Zhambyl, South Kazakhstan, Kyzylorda (mine group of former Kyrgyz GRK) and East Kazakhstan (Ulba Metallurgical Plant and Irtysh chemical-metallurgical plant) areas.

As noted above, there are five nuclear reactors in the Republic of Kazakhstan: one NPP is located in Aktau, three research reactors are located at the Semipalatinsk test site and one research reactor is in Almaty. Operation of all five reactors has resulted in the generation and accumulation of 14 500 tons of low and intermediate level RW with a total activity of $1{,}56*10^{16}$ Bq.

Kazakhstan enterprises using radioisotope products in industry, medicine and in scientific research mainly use sealed sources of ionizing radiation. According to the CAESC ME RK Registry for radionuclide sources with activity above the seizure level, as of July 1, 2017, there were a total of 9444 radionuclide sources in circulation in the Republic of Kazakhstan. The total number of radionuclide sources transferred for long-term storage in five specialized storage facilities in the Republic of Kazakhstan was 124,407, as of July 1, 2014. The radionuclide composition of sources ranges from tritium to americium-241.

Given their volume and activity, radioactive wastes are a significant factor in terms of radiation safety and environmental protection in the Republic of Kazakhstan. Due to the potential danger from ionizing radiation emitted by RW, it is necessary to regulate the safety of RW handling and to ensure protection of personnel, the public and the environment from the potential harmful effects of radiation.

Almost all enterprises of the atomic-industrial complex of the Republic of Kazakhstan have RW storage facilities. Current storage facilities include:

- → The storage facility of the Institute of Nuclear Physics in the Alatau settlement – 80% full.
- → The storage facility of the Institute of Atomic Energy of the RSE NNC RK, located in Kurchatov at the site of the Baikal-1 reactor complex on the territory of the former Semipalatinsk test site – 0.01% full.
- → The Republican long-term storage facility of ampoule ionizing radiation sources is also located at the site of "Baikal-1" complex.
- → A storage facility for solid RW and a storage facility for liquid RW, consisting of extractants and oils with low-enriched uranium of group B with a total volume of about 82.4 m^3, that are located at the Ulba metallurgical plant in Ust-Kamenogorsk.
- → The storage facility for solid RW at the site of the BN-350 reactor of the Mangyshlak nuclear power complex in Aktau is filled with 6 064.5 tons of RW with a total activity of $5{,}35*10^{14}$ Bq.
- → A storage facility for liquid radioactive waste with a capacity of 6000 m^3 at MAEC-Kazatomprom LLP which is almost 90% full.

- Three storage facilities for radiation sources at the territory of the Nitrogen-fertilizer Plant, Chemical-Hydrometallurgical Plant (CHMP), Sulfuric Acid Plant, which are part of Aktal LTD in the Mangistau region.
- A storage facility for gypsum rare-earth concentrate with an area of 7.55 hectares outside the territory of CHMP Aktal LTD, where a concentrate with a volume of 3 900 tons and a total activity of $7{,}4*10^{13}$ is placed into concrete trenches with waterproofing.

All these storage facilities were constructed in accordance with the sanitary-epidemiological and technical standards that were in force at the time of construction and are in a satisfactory condition, ensuring an acceptable level of environmental and radiation safety, which is controlled by the sanitary and environmental services of the Republic and RSE NNC RK. No harmful effects on the environment or public health have been identified during more than 20 years of operation. The main existing problems when dealing with RW leads to threats arising from:

- Unjustified risks of exposure to ionizing radiation on the population and the environment associated with RW already accumulated in Kazakhstan.
- Potential increase in radiation risks in the future, associated with an increase in the amount of RW not managed in a proper way, and possible increase in social tensions in society.
- Risks to the sustainable development of society and the risks of increasing the economic burden of RW management for future generations.

From the analysis of the current situation in the field of atomic energy use, including the sphere of RW management it follows that there are serious gaps in the regulatory framework in this area. Continuing work to improve the regulatory framework is the most important area of work to tackle the challenges and reduce existing threats. Such work should be aimed at developing missing documents related to the activities of state bodies involved in the regulation process and improving the work of the supervisory authority in the field of atomic energy and regulatory documents related to RW management.

2.6.1 Regulation on Safety in Management of Radioactive Waste

Existing regulatory documents relating to the safe management of RW in Kazakhstan are as follows:

- Laws on the Use of Atomic Energy (January 12, 2016 No. 442-V) and on Permits and Notifications (May 16, 2014 No. 202 V), Ecology Code (January 9, 2007) [6, 7, 16];
- Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management (February 3, 2010 No. 246-IV) [17];
- Technical Regulations "Nuclear and Radiation Safety" [18];
- Rules for the transport of nuclear materials, radioactive substances and radioactive waste [9, 10];
- Rules for certification of personnel employed at nuclear facilities (Order of the Minister of Energy of the Republic of Kazakhstan dated January 20, 2016 No. 12) [19];
- Rules for organizing the collection, storage and disposal of radioactive waste and spent nuclear fuel [20];
- Sanitary rules "Sanitary and epidemiological requirements for ensuring radiation safety", “Sanitary and epidemiological requirements for ensuring radiation safety” and “Sanitary and epidemiological requirements for radiation-hazardous facilities [40 - 42]; and
- Rules of conservation and liquidation during the exploration and production of hydrocarbons and uranium mining [21].

The presented list of existing documents is incomplete for solving the tasks of regulating the activities on RW management related to the rehabilitation of territories contaminated as a result of the activities of uranium mining and processing industries, and for the radiation protection of personnel during rehabilitation and decommissioning of the company's facilities. To eliminate some gaps in the regulatory framework, the following documents need to be developed:

- → Criteria and requirements for the rehabilitation of uranium legacy territories considering the climatic conditions of the region.
- → Ensuring the radiation safety of personnel and the public during the subsequent use of the territory, buildings and structures after rehabilitation.
- → Dose constraints to prevent undue exposure of the population in areas with radioactive contamination.
- → Rules for the decontamination of premises, equipment and materials.
- → Rules for Licensing of activity within programs of uranium mines rehabilitation.
- → Guidelines for the allocation of responsibility between government agencies, operator and contractor during work on uranium legacy territories remediation.

2.6.2 Regulation on Safety in Management of Disused Sealed Radiation Sources Declared as Radioactive Waste

The list of existing regulatory documents for the management of disused sealed radiation sources declared as RW is consistent with that detailed in section 2.6.1. The new classification of RW in Kazakhstan that was developed during the previous cooperation program between CAESC and DSA still needs to be adopted.

2.6.3 Release of Radioactive Materials from Regulatory Control

The release of radioactive materials from regulatory control is realized through the Hygiene Standard "Sanitary and epidemiological requirements for ensuring radiation safety", Sanitary rules “Sanitary and epidemiological requirements for ensuring radiation safety” and “Sanitary and epidemiological requirements for radiation-hazardous facilities [40 - 42] by the Ministry of Health. At present, it is not considered necessary to develop any new regulations in this area.

2.6.4 Management of Spent Nuclear Fuel

A decision has not yet been made in the Republic of Kazakhstan as to whether SNF is a valuable resource or RW. SNF management currently consists of long-term storage under surveillance at specialized storage sites, in compliance with government decisions in this area. Nevertheless, long-term storage is not considered an “end point” in SNF management, it is only a temporary decision. The real endpoint may be SNF reprocessing or disposal.

In order to reach a final decision, it is planned to develop a strategy of future SNF management for the BN-350 NPP and for research reactor SNF. To develop this strategy, all possible management options will be considered with the aim of selecting the optimal variant meeting different criteria, such as political acceptance, technical and economic feasibility, etc. Considering the anticipated decision of the President and the Government of the Republic of Kazakhstan on the construction of a new NPP, as well as the

availability of research reactors, a general concept will be developed on the safe management of SNF, including both industrial and research reactors.

The management of SNF is carried out by the license holder for nuclear installation operations, in accordance with the provisions of:

- → Laws on the Use of Atomic Energy (January 12, 2016 No. 442-V) and on Permits and Notifications (May 16, 2014 No. 202 V), Ecology Code (January 9, 2007). [6, 7, 16];
- → Conventions on Nuclear Safety (February 3, 2010 No. 246-IV) [22], on Physical Protection of Nuclear Material (December 22, 2004) [23] and Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management (February 3, 2010 No. 246-IV) [17], Agreement between the Republic of Kazakhstan and the IAEA on the application of safeguards (August 11, 1995) [3];
- → Qualification requirements for the provision of services in the field of atomic energy use [24];
- → Technical Regulations "Nuclear and Radiation Safety" and "Nuclear and Radiation Safety of Nuclear Research Installation" [5, 18];
- → Rules for the physical protection of nuclear materials and nuclear facilities, Physical Protection of Ionizing Radiation Sources and Storage Facilities, State Accounting of Nuclear Materials and Ionizing Radiation Sources [25 - 28];
- → Rules for the transport of nuclear materials, radioactive substances and radioactive waste [9, 10];
- → Rules for certification of personnel employed at nuclear facilities [19];
- → Rules for collection, storage and disposal of radioactive waste and spent nuclear fuel [20]; and
- → Sanitary rules "Sanitary and epidemiological requirements for ensuring radiation safety", “Sanitary and epidemiological requirements for ensuring radiation safety” and “Sanitary and epidemiological requirements for radiation-hazardous facilities [11 - 13].

SNF Management of BN-350 reactor

Following its shutdown, all SNF from the BN-350 reactor has been unloaded and transported to the LTSF in Kurchatov city. Installation of the SNF at the LTSF site was completed in November 2010.

The structure of the SNF LTSF site includes a storage area and a reloading site. The storage area is an open area of 62.6 x 62.21 m in size that consists of a concrete platform on which the containers are placed in a vertical position in four rows. To perform transshipment operations, the storage facility is equipped with a gantry crane with a lifting capacity of 150 tons, which makes it possible to carry out all lifting operations necessary for receiving and unloading containers, as well as lifting operations performed during storage operations. In total, 60 containers containing SNF from the BN-350 reactors are stored. Containers were sealed by IAEA inspectors and are under the safeguards and control of the IAEA. The SNF storage area is equipped with a physical protection system. The reloading site is a 28 m x 21 m area designed for unloading containers from car trailers and loading empty protective over-packs onto car trailers.

CAESC approved the storage of BN-350 SNF in dry metal-concrete containers, for which a detailed safety analysis was carried out and a high level of safety was confirmed in various emergency situations and natural disaster scenarios, such as flood, earthquake, hurricanes, extreme external temperatures, etc. The efficiency of a passive cooling system for SNF has been confirmed. Over time, the temperature of the fuel in the containers gradually decreases, which increases the level of safety during long-term storage. The main document substantiating the safety of operation of long-term storage of spent fuel is the report "Long-term container storage for spent nuclear fuel RF BN-350 at the complex of the research reactors

"Baikal -1" and a reloading site in Kurchatov", which was developed in 2008 and agreed with the CAE MINT RK.

Containers are subject to mandatory certification every 5 years of storage with the assistance of expert organizations, operator and developer of containers JSC "KBSM", the Russian Federation and following approval by the CAESC. Currently the certificate for storage of the containers with SNF of RF BN-350 was prorogated by the order of April 18, 2019 and will be valid until December 31, 2023.

SNF management of IGR reactor

The rate of accumulation of SNF at the IGR reactor is determined by the amount of fuel in the experimental devices tested (irradiated). Defueling has not been performed since 1968.

Experimental devices with fuel tested in the IGR reactor are placed in the storage facility for nuclear materials for aging for a duration of 3 to 5 months prior to transporting to the radiation-protective chamber on "Baikal-1" for post-reactor examination. After examination the fuel is placed for long-term storage. The total activity as of May 1, 2017 was $6{,}85*10^{12}$ Bq.

SNF Management of IVG.1M reactor

Three SNF assemblies have been placed in long-term storage within the IVG reactor storage facility. The SNF is stored in a container in a specially designed storage facility (premise 140 of building 101) supplied with biological protection and reloading mechanisms. The amount of SNF accumulated in the single assembly is 506 grams of uranium. The total activity as of May 1, 2017 was $1{,}4*10^{12}$ Bq.

SNF Management of RA reactor

All nuclear fuel, including SNF unloaded from the reactor, was transported to the Russian Federation between 1997 and 1998.

SNF Management of IGR reactor

All SNF from the WWR-K reactor was transported to the Russian Federation for reprocessing between 2008 and 2017. Radioactive waste associated with reprocessing of the SNF will be returned to the Republic of Kazakhstan in 20 years. New nuclear fuel, in the form of fuel assemblies was, in return, supplied to Kazakhstan.

2.6.5 Decommissioning

The following regulations for decommissioning have been developed and are applied in Kazakhstan:

- → Decommissioning rules for nuclear and radiation facilities (Approved by Government Decree No. 287 of May 12, 2016) [29].
- → Rules of conservation and liquidation during the exploration and production of hydrocarbons and uranium mining (Order of the Minister of Energy Republic of Kazakhstan on May 22, 2018 number 200) [21].

These existing documents are very general, short and formal and do not contain any details or criteria to support decisions on decommissioning. The development of more detailed regulatory documents, based on the existing documents, is proposed.

2.6.6 Remediation of Legacy Sites and Radiation Sources, including Uranium Mining and Processing Enterprises

Reducing the risks associated with RW is a complex, long-term process. For example, there may be some changes in existing threats over time, and the appearance of new ones. In Kazakhstan, along with uranium industry facilities requiring remediation work, there are a number of uranium mines at which remediation has already been carried out as part of 2001-2010 State Program for the conservation of uranium mining enterprises and eliminating the consequences of the uranium deposits development.

During Soviet times, about 20 uranium mines were developed in Kazakhstan, from which approximately 40% of uranium of the former USSR was mined. The development of mines was mainly carried out by the shaft method. As a result of mining activities, the total area exposed to RW from uranium industry enterprises is estimated at 10 000 hectares and the total activity is approximately $9{,}25*10^{15}$ Bq. Since the 1950s, about 170 million m^3 of RW has accumulated in the form of enrichment plants tailings, heap leaching piles, hydrometallurgical plants tailings, dumps of waste (off-balance) ore and unprocessed commercial (balanced) ore, which should be utilized or disposed (conserved). Addressing these wastes was the main task of the State Program. The programs goals were to be achieved by:

- → conservation of uranium mining enterprises, the production of which was discontinued due to the economic inexpediency of ore mining method; and,
- → liquidation of uranium mining enterprises, the production of which was discontinued due to the full mining of balance reserves of ore.

Considering the risks associated with the mines, experts identified the following priority objects for improvement of the environmental situation: open mine workings (quarries, dips, mines); spoil dumps of heap leaching, off-balance ores and waste rock; filtration fields; industrial sites; and ionizing radiation sources belonging to 342 enterprises and organizations throughout Kazakhstan.

Former uranium facilities were analyzed in relation to the most radiation-hazardous factors and 13 units were identified as requiring urgent remediation measures. The facilities are located at: Ulba Metallurgical Plant (Ust-Kamenogorsk); Tselinnyi Mining and Chemical Combine (Zavodskoy settl., Akmola region); and Caspian Mining and Chemical Combine (lake Koshkar-Ata, Aktau). The total RW volume associated with these sites is 14 770.4 thousand m^3 and remediation was required for surrounding contaminated territories with a combined RW volume of 168 640.4 thousand m^3.

During implementation of the Program, the distribution of responsibilities of state bodies for the disposal of radioactive waste was determined by Decree No. 1283 of the Government of the Republic of Kazakhstan of October 18, 1996 “Regulations on the procedure for the disposal of radioactive waste in the Republic of Kazakhstan”. In accordance with this regulation, permits for disposal were issued by the Ministry of Environment and Water Resources in coordination with other authorized bodies. However, the functions of nuclear regulatory body were not clearly defined. Nonetheless, all the work on the program was completed within the planned program timescale although, due to a lack of coordination of the work of the state bodies that exercised safety oversight during the project, important points were missed. Issues of institutional control over the restored objects and long-term radiological monitoring after the completion of the work were not discussed, and the corresponding funding was not provided. In addition, after the reorganization of the structure of the Government of the Republic of Kazakhstan, the agency responsible for the execution of work under the Program was abolished. As a result, for several years the situation at the restored objects was not controlled sufficiently.

In 2014 and 2015 the IAEA conducted missions to survey the radiation situation at the remediated uranium industry sites in northern and southern Kazakhstan [30, 31]. As a result of the missions, it was found that over the period of only 4-5 years, most of the previously remediated objects were sources of new threats

to the population living near the territories contaminated with RW. The main reason for this situation was the lack of a clear legal basis for planning and organizing work on the management of RW and, as a result, the lack of institutional control and long-term radiological monitoring after the completion of remediation works.

In the case of improper remediation of uranium legacy sites, there is a high risk of isotopes migrating outside the monitoring zone, and entering livestock grazing areas where they then enter food products. Given the fact that such facilities are dangerous for a long time, it is necessary at the legislative level to determine the requirements for long-term safety assessment and institutional control, including when long-term monitoring of such facilities is needed. In addition, it is necessary to consider risks from underground leaching at uranium mining sites, as well as risks from natural radionuclides released to the environment during the extraction of other minerals. Kazakhstan has since adopted a new regulation "Rules of remediation during the exploration and production of hydrocarbons and uranium mining (Order of the Minister of Energy Republic of Kazakhstan on May 22, 2018 number 200)" [21], but this does not contain enough details to support knowledgeable decision-making by operators or regulators.

2.6.7 Management of contaminated areas

In Kazakhstan, there are not currently regulations that are detailed enough to support remediation of contaminated areas, including exploration and production sites for naturally occurring radioactive materials (NORM) and sites of former nuclear explosions and dirty bomb testing. This subject is regulated by some provisions of Ecology Code of the Republic of Kazakhstan [16] and Sanitary rules on Radiation safety [12], but these provisions are not considered sufficient by CAESC as to support effective regulation and decision-making.

2.7 Nuclear Security - CAESC Activities in State Physical Protection System

2.7.1 Structure and Functions of the State Physical Protection System

The State physical protection system (SPPS) was implemented in accordance with the 1997 Law of Kazakhstan "On Atomic Energy Use" [6].

The main SPPS tasks are to:

- → provide regulatory and legal framework for physical protection issues
- → provide security of nuclear facilities, nuclear materials, radioactive waste and other radiation sources considering design-basis threat
- → maintain physical protection regime in nuclear installations in the republic
- → perform state oversight and monitoring of physical protection.

The SPPS includes CAESC, the Ministry of Internal Affairs, the Committee of National Security, nuclear facilities, organizations ensuring physical protection of specific facilities and transport and organizations providing services on ensuring physical protection.

All SPPS activities are governed by the provisions of national legislation in the atomic sphere. Effective SPPS functioning is achieved by assessing a threat of sabotage, theft or any other illegal seizure of radioactive materials. Threat assessments are performed periodically for nuclear installations, nuclear materials, RW and other radiation sources. According to national regulations on physical protection [25,

26], operating organizations and licensees define facility-level design-basis threats and establish and maintain physical protection systems for facilities and materials. Thus, the physical protection regime is maintained at a facility level. In order to meet the demand for highly skilled experts in physical protection, a state system of professional training, retraining and skill improvement for experts on physical protection, accounting for and control of nuclear materials was established.

2.7.2 CAESC Functions and Tasks in SPPS

The CAESC is the competent body within the SPPS as granted by legislation. As such, CAESC:

- → participates in developing state policy in the field of physical protection and develops a mechanism for its implementation
- → inspects activities of system entities when they perform system tasks, including activities to form and ensure functioning of the unified system of secure communication
- → participates in the functioning of the state system for professional training, retraining and skill improvement
- → participates in assessing the threat of sabotage, theft or any other illegal seizure of radioactive materials, as well as in defining the design-basis threat
- → arranges scientific and technical studies in the area of physical protection
- → coordinates activities of entities on improving the level of security culture and participates in ensuring security of facilities
- → establishes requirements for quality management systems of physical protection of facilities
- → receives information from relevant government agencies on threats to facilities and informs licensees of such threats
- → develops and approves standards and rules on physical protection of facilities, makes proposals on physical protection legislation to the government and agrees regulatory documents on physical protection, from ministries and other central executive bodies
- → develops conclusions on the state of physical protection in case of export/import and transit of radioactive materials through the territory of Kazakhstan
- → establishes the minimum allowable operational characteristics for physical protection systems of facilities, and permissible risk of sabotage against facilities depending on their categories and possible radiation consequences of sabotage
- → licenses activities on ensuring physical protection and participates in licensing activities in the field of atomic energy use
- → performs state reviews of the projects for establishment, reconstruction and technical re-equipment of physical protection systems of facilities including systems for transport of radioactive materials
- → performs state oversight of compliance with the requirements of the legislation on physical protection systems and fulfilling licensing conditions
- → conducts state inspection of physical protection systems of facilities and plans of interaction in case of sabotage and takes enforcement measures against licensees in case of incompliance with the requirements of the legislation on physical protection and licensing conditions
- → cooperates with the IAEA, other international organizations and relevant bodies of foreign states in the field of physical protection and informs relevant state authorities on the state of providing physical protection of facilities and

→ is a participant of the state plan on the interaction of central and local executive authorities in the event of sabotage.

2.7.3 CAESC Activities within SPPS

According to the Law on Permits and Notifications [7], it is mandatory for activities relating to the physical protection of nuclear installations and nuclear materials to be licensed by CAESC. During the licensing procedure, CAESC reviews and analyzes information presented by the operating organizations on the state and efficiency of physical protection systems of their facilities. The physical protection systems (PPS) of nuclear facilities and nuclear materials have recently been upgraded in accordance with established procedures under projects approved by the CAESC. PPS projects for new facilities are developed before their construction. All projects for establishment, upgrade or reconstruction of PPS are subject to state review of nuclear and radiation safety and physical protection. Review is performed by the CAESC and involves other members of the SPPS. The state supervision of compliance with physical protection requirements is implemented according to the Provision of the "Committee of Atomic and Energy Supervision and Control of the Ministry of Energy of the Republic of Kazakhstan" [32] and regulations on physical protection [25, 26]. CAESC conducts both scheduled inspections envisaged in annual plans and unscheduled inspections.

CAESC, as the central executive State body in the field of atomic energy use, has organized and conducted IAEA events on physical protection in Kazakhstan, including two international physical protection advisory service missions in 2004 and 2006. During 2012 – 2017, CAESC conducted work of the Kazakhstan interdepartmental commission and IAEA experts on upgrading of the nuclear security system of the International LEU Bank in Ust-Kamanogorsk city in Eastern Kazakhstan. The building of the LEU Bank with a modern PPS was opened in Kazakhstan on August 29, 2017.

The CAESC has also organized international and national training on physical protection for staff and personnel of nuclear installations and organizations involved in activity on physical protection and, in May 2017, the Nuclear Safety Training Center, based at the RSE INP, was opened. The main directions of training in the center are:

1. Physical protection of nuclear materials and nuclear facilities
2. Accounting and control of nuclear materials
3. Combating illicit trafficking in nuclear materials
4. Radiation safety and radiation monitoring
5. Information security.

The center has specially equipped rooms for conducting lectures and practical exercises. In the course of training, an educational transport checkpoint, a landfill installed with equipment used at real facilities, full-scale simulators, and the various models and presentation stands installed in physical protection and nuclear materials accounting and control class are used. The training programs are intended to be representatives of nuclear facilities, government agencies, border and customs services, ensuring the implementation of the non-proliferation regime and countering the illicit trafficking of nuclear and radioactive materials. This is the only specialized training center for such specialists in Kazakhstan.

2.8 Main identified threats and proposals for their elimination

This section contains a list of threats and challenges that currently exist and adversely affect nuclear and radiation safety in Kazakhstan. Measures to address the threats and challenges are set out in a 'Roadmap', detailed in Appendix 1.

2.8.1 Organization and general principles of the regulatory body

All state bodies carry out regulatory activities in the field of atomic energy use of within their competence and depending on the tasks assigned. However, at present, there is no strictly defined mechanism of interaction between all state bodies involved in the regulatory process. The different state bodies carry out numerous procedures and various activities but there is little coordination and often information on the actions of the various state bodies with regard to regulatory oversight in the field of atomic energy use is lacking. This is a serious gap in the system of state regulation and can be considered as one of the key threats at present.

To solve this problem, it will be necessary to develop and put into effect a document defining the mechanism for the interaction of state bodies in the field of regulating the safe use of atomic energy, as well as local executive bodies. The document should reflect the competencies and responsibilities of all state bodies involved in the regulatory process, and the order of their interaction, to include requirements for procedures, order and level of coordination of documents, and requirements for maintaining documentation and mutual information on activities. The use of such a regulatory document will make it possible to eliminate duplication of functions of certain state bodies, as well as provide a unified vision of the organization and performance of procedures in the implementation of state regulation in the field of atomic energy use. However, it will be very difficult at the present time to gain approval of such a document from the different ministries and to enforce it. Development of this document is not, therefore, planned in the near future as part of the cooperation program between the CAESC and DSA. It is, nonetheless, a serious threat for the whole system of management of activities in the field of atomic energy use.

CAESC is defined as a regulatory body and its functions to a large extent correspond to its structural divisions. However, an insufficient number of highly skilled experts because of significant staff turnover could have a negative impact on its ability to address the gaps in the regulations.

The Republic of Kazakhstan has plans for the development of nuclear energy and the construction of a nuclear power plant. However, existing staff of CAESC have no experience in regulating the activities of such facilities. Therefore, if the Government decides on the construction of a nuclear power plant, it will be necessary to increase the number of nuclear regulator personnel in accordance with the experience of countries with developed nuclear energy. To achieve this, it will be necessary to prepare proposals for increasing the number of personnel and, considering international requirements and recommendations, prepare qualification requirements for the staff of the regulatory body in the light of new tasks. There is also a need for the development and approval by the Government of an integrated human resources program, which should include not only the number of the staff needed, but also their qualification requirements. There is a need to establish also a TSO for the technical support of the regulatory body.

The regulatory framework, regulatory processes and procedures should also be revised and updated in accordance with IAEA recommendations and international good practice.

2.8.2 Safety of Nuclear Installations

Considering regulation of the activities of such large and diversified enterprises as the JSC NAC "Kazatomprom", NNC RK and RSE INP, it can be concluded that the existing safety infrastructure is sufficiently effective to protect personnel and the public in the operation of current nuclear facilities. The regulation of activities of a significant number of other enterprises and organizations operating in various areas of atomic energy use also supports this. Nevertheless, there is currently a problem with regulator inspections at nuclear installations, because of the turnover of CAESC staff and the inexperience of newer young personnel working as inspectors.

One proposed measure to resolve the situation of insufficient staff qualifications is to develop "Guidelines for conducting inspections of nuclear and radiation hazardous facilities". CAESC currently has a regulatory document "System of risks estimations", which is a formal checklist of items to be reviewed and assessed. It does not have any specific features for different types of nuclear and radiation facilities. The document, proposed for development in collaboration with DSA, will eliminate this regulatory gap and assist in carrying out inspections of Kazakhstan nuclear and radiation facilities at a higher safety-oriented level.

A very important task for updating regulations to reflect recent changes in the Law on Atomic energy use [3] is the review of Technical Regulation for Nuclear and Radiation Safety [5]. Some items, related to accounting, control and reporting of radioactive waste, should be amended, and the whole document should be reviewed and edited.

During the process of review of the NPP FS MS document and its discussion with invited foreign experts, it was found out that there are possible regulatory threats as a result of some gaps or deficiencies in regulatory items and procedures. For example, documents on the rules for site selection and requirements for SAR for NPP construction are required. The most important and urgent document may be the one related to site selection. If the decision to start NPP FS development is made, it will be necessary to develop and issue this document. All these documents have been proposed for collaborative development with DSA in the section on Safety of Existing Nuclear Installations. It is intended to develop site selection rules/guidance and guidelines for safety case and safety assessment report content documents in a general form that will be applicable for any type of nuclear or radiation facility, including RW disposal site construction.

2.8.3 Radioactive Material Transport

Transport regulations have been updated and developed over the last decade to meet the requirements for SNF transportation and the transportation of RW and sealed radioactive sources. Nevertheless, because of some obscurities in the functions of state bodies, existing regulations should be updated. Furthermore, CAESC considers that it is necessary to develop joint rules for the transportation of nuclear and radioactive materials (including RW) with the general approach to physical protection and emergency response.

2.8.4 Emergency Preparedness and Response

At present the legislative and regulatory framework on EPR includes appropriate provisions provided by the Law on Civil Protection [2], the Law on Atomic Energy Use [6] and the National Plan on Response for the Nuclear and Radiation Accidents [14]. Other regulations used during emergency response are departmental regulations of the Committee on Emergency, the Ministry of Health, the Ministry of Internal Affairs, and the Ministry of Industry and Infrastructure Development. However, CAESC needs to develop a

joint interdepartmental document on interactions between all interested parties involved in the EPR process in accordance with IAEA Safety Standards.

A gap in the EPR system in Kazakhstan is the special training of physicians and other medical personnel for work in the case of a nuclear emergency or radiation accident, as well as special training for general purpose emergency response teams in case of a radiation accident. The program of appropriate training should be developed on the basis of IAEA recommendations.

2.8.5 Radioactive Waste Management, Decommissioning and Remediation

Currently, the Republic of Kazakhstan is actively working on processing the existing Environmental Code and the adoption of a new version of Code. At the same time, the process of consideration and adoption of the draft new Law on RW Management has been slow and difficult and is currently suspended. In this regard, the NTSC, in collaboration with DSA, has prepared proposals for amending the draft Environmental Code to incorporate the most important provisions from the draft Law on RW Management. If the Environmental Code, the adoption of which is most likely since the process is under the control of the Office of the President of the Republic of Kazakhstan, fully incorporates the proposals for RW management, then these provisions may be excluded from the draft Law on RW Management. Provisions of the draft Law on RW Management can then be issued in the form of separate normative acts (rules, instructions), approved by orders of the respective ministries.

Orphan sources, i.e. sealed radioactive sources which are out of regulatory control, are a remaining threat in Kazakhstan. A search and secure strategy have been developed for sealed orphan sources and search activities were carried out between 2012-2013 at some abandoned sites. Orphan sources discovered during the survey were returned under regulatory control. The program was funded at that time by the US Department of Energy (US DOE) through the Unites States National Nuclear Security Administration (US NNSA), but is not currently funded, which is considered a threat. The program needs some updating and it is necessary to continue the physical search for orphan sources.

The handling of radioactive scrap metal is also an issue in the Republic of Kazakhstan. The processing of scrap metal can lead to irradiation of personnel of transport companies, collection sites, smelters, and the possibility of subsequent contact with metal products, followed by exposure of the population. For example, there are known cases in the world where scrap metal was used to produce building reinforcements, leading to increased doses to building residents. To address this problem, it is necessary to:

- → Develop a procedure for scrap metal handling, including appropriate monitoring of enterprises working with scrap metal, as well as importing/exporting scrap metal
- → Conduct training seminars for all categories of personnel working with scrap metal to familiarize with signs of radiation hazard and typical containers, detection and safe handling of detected sources
- → Work with the largest scrap metal processing enterprises, to check availability and/or convince them of the need to purchase and install radiation monitoring equipment.

Even though the problem of radioactive scrap metal handling needs to be resolved, it is not currently clear what kind of special document should be developed. However, some provisions of requirements for radioactive scrap metal handling may be included in the general documents for RW management.

As for SNF, a decision has not yet been made as to whether SNF is a valuable resource or waste. SNF management is represented currently by long-term storage under surveillance at specialized storage sites, in compliance with government decisions in this area.

The absence of a final management strategy for SNF may be considered as one of the main threats for future SNF management and for new NPP construction decision making. Some developed countries have special laws on SNF management but, with relatively low amounts of research reactor SNF and with a temporary storage solution for BN-350 SNF, a final solution is not urgent. Nonetheless, taking into account the long-term procedures for decisions and their approval in this area, plans should be made over the next few years. In the absence of regulatory documents on SNF strategy in Kazakhstan, the provisions for SNF management and safety should be included into a law or rules document for the government position on this subject to be accepted and approved.

In order to eliminate remaining regulatory gaps in RW management, it is proposed to develop and to approve the following documents:

- → Update existing document “Rules of collection, storage and disposal of radioactive waste” [20] and to split it into two separate documents: 1) Rules of SNF storage and 2) update of RW management provisions considering provisions of RW related documents, developed in collaboration with DSA.
- → Guidelines to create an effective mechanism of RW management funding in Kazakhstan.
- → Methodical guide for remediation of nuclear testing sites.
- → Guidelines for RW acceptance for long-term storage.

In order to give more guidance for operators involved in the decommissioning process, it is also proposed to develop the document “Guidelines for the decontamination of premises, equipment and materials”.

As identified above with regard to remediation of legacy sites, current gaps in the regulations for remediation works may represent a potential threat. Experience over the last few years on the initiated works for nuclear sites and contaminated areas remediation, has shown that development of regulatory documents is required to address remaining safety issues in these regulatory areas. To resolve the problem, it will be necessary to develop a program on elaboration of the following new regulations in cooperation with the MEGNR, the Ministry of Health and CAESC:

- → Guidelines to establish criteria and requirements for remediation of uranium legacy sites; and
- → Rules for licensing of activity within programs of uranium mines remediation.

2.8.6 Radiation and Nuclear Security

Recently, Kazakhstan developed and accepted several regulatory documents related to physical protection (nuclear security), but issues remain. One of the identified issues is the absence of regulations for physical protection of sealed sources during transportation and the procedure to include them into the transport regulation is ongoing. Meanwhile CAESC is developing the document “Methodical Recommendations for Physical Protection of Ionizing Radiation Sources during Transportation”.

The development of regulations for physical protection in the area of atomic energy use (nuclear security) in Kazakhstan is currently being supported by the US National Nuclear Security Administration (US NNSA).

2.9 Overview and status of international projects and efforts to eliminate regulatory threats identified in the 2011 RTA

2.9.1 Cooperation between CAESC and DSA

The elimination of regulatory threats has been the main activity for cooperation in the field of radiation and nuclear safety between Norway and Kazakhstan, which was carried out in accordance with the Memorandum of Understanding signed on November 27, 2008 in Oslo [33], by the NRPA (DSA from 01.01.2019) and the Atomic Energy Committee of the Republic of Kazakhstan. The main areas of joint work within the framework of the Memorandum were:

- → Review of the existing framework for regulation of radiation and nuclear safety, including exposures and risks and other relevant matters from uranium mining and ore processing, RW management and remediation of contaminated land.
- → Review of corresponding international recommendations from the IAEA and other relevant bodies, and their application in other countries.
- → Review of information on RW and contaminated land management in relevant nuclear legacy sites in Kazakhstan.
- → Completion of a Threat Assessment to determine the priority areas for regulatory development.
- → Assistance in preparation of methodological guidance and assessment of performance for agreed activities in the scope of cooperation.
- → Development of regulatory documents, including norms, standards and other guidance documents.
- → Providing support to develop wider understanding of the issues by regulators, operators and other stakeholders through workshops and information exchange activities.

Within the framework of cooperation, regular workshops were organized by the DSA in Norway and in the participating countries of the program. Such meetings are an important element of the program, as they facilitate the exchange of information between the participating countries, the assessment of problems and the possibility for their joint solution.

During the period 2016-2017 funding for the program was suspended, but Kazakhstan continued to work on improving the regulatory framework in the field of atomic energy use, in particular in the field of RW management. The CAESC developed and enacted Rules for Organizing the Collection, Storage and Disposal of Radioactive Waste and Spent Nuclear Fuel (Order of the Minister of Energy of the Republic of Kazakhstan No. 39 of February 8, 2016) [20] and Rules for the Conservation and Liquidation of Hydrocarbons and uranium mining (Order of the Minister of Energy of the Republic of Kazakhstan of May 22, 2018, No. 200) [21].

This important work must be continued. First, it is necessary to finalize the Law on Radioactive Waste Management. Currently, the rules for the development of laws in Kazakhstan have changed in accordance with the “Rules for the organization of legislative work in the authorized bodies of the Republic of Kazakhstan, approved by the Government of the Republic of Kazakhstan of December 29, 2016 No. 907 [34]. In this regard, it was necessary to develop a Concept of the Law “On Radioactive waste management” and conduct a RIA, which is one of the tools for improving the quality of regulation and increasing the efficiency and effectiveness of government operations. The law should establish clear limits for regulating activities in the field of RW management, which will establish unambiguous regulatory requirements for facilities and entities, which ultimately will contribute to ensuring compliance with international treaties, creating conditions for organizing an accounting system and control of RW. The existence of a law on RW

management is necessary but will not solve all the problems in this area. For the effective operation of the law, it is necessary to define and develop all the necessary documents aimed at implementing its provisions. This work must be completed before the Bill is submitted to the Parliament of the Republic of Kazakhstan. Some of these documents were developed earlier and were applied in the field of RW management but require some processing to take into account modern requirements for the development of regulatory legal documents and the implementation of appropriate procedures for re-registration and enforcement.

A draft Concept of the Law of the Republic of Kazakhstan "On RW management" was developed with support from DSA and sent most recently for approval to the ministries and specialized organizations and departments in April 2019. Comments have been worked out and considered in a revised draft Concept. The draft Concept was presented at the meeting of the Atomic Energy Commission of the Public Council of the ME RK. The analysis of the regulatory impact is at the stage of development and coordination with the legal department of the Ministry of Economy.

Other documents must be developed in accordance with the provisions of the law. These should include documents related to the remediation of uranium legacy sites and the decommissioning of nuclear and radiation facilities, including:

- → Criteria and requirements for the remediation of uranium legacy territories considering the climatic conditions of the region.
- → Ensuring the radiation safety of personnel and the public during the subsequent use of the territory, buildings and structures after rehabilitation.
- → Reference levels to optimize exposure of the population in areas with radioactive contamination.
- → Rules for the decontamination of premises, equipment and materials.
- → Rules for licensing of activities within programs of uranium mines remediation.
- → Guidelines for the allocation of responsibility between government agencies, operator and contractor during work on uranium legacy territories remediation.
- → Guidelines for conducting regulatory review and assessment of the applications, authorization and inspections of remediation of uranium legacy sites and uranium mines.

It is also necessary to develop regulatory documents for work on the remediation of nuclear testing sites and criteria and hygienic standards for the remediation of territories contaminated with radionuclides. In addition, documents are required that define procedures for interaction of state regulatory bodies in the field of RW management and for establishment of an effective financing mechanism for RW management in the Republic of Kazakhstan.

2.9.2 Cooperation with other international organizations

<u>IAEA</u>

The Republic of Kazakhstan became a member of the IAEA in 1994 and subsequently joined a number of important international conventions, such as the Convention on Nuclear Safety [22], the Convention on Early Notification of a Nuclear Accident [35], the Convention on Assistance in the Case of a Nuclear Accident or Radiation Emergency [36], Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management [17], and the Convention on the Physical Protection of Nuclear Material and its Amendment [23, 37]. Participation in the International Conventions imposes certain obligations on the participating countries. In order to fulfill such obligations under the Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management, a member state must have an appropriate regulatory and legal framework for the safe

management of SNF and RW. This implies the creation of the necessary regulatory documents and mechanisms.

At present, under the auspice of the IAEA, four national projects, selected for a five-year period (2016-2020), are being implemented within the framework of RK-IAEA Technical Cooperation:

1. "Scientific and technical support of the work on the land transfer from the former Semipalatinsk test site for economic use." The (KAZ9014) project developer is the Institute of Radiation Safety and Ecology, NNC RK. The goal of the project includes expert's support and strengthening of analytical, and production capabilities during environmental radiological studies to assess the possibility of transferring of lands from former Semipalatinsk Test Site for economic use.
2. "Creation of high-tech centers of nuclear medicine (KAZ6011) in the Republic of Kazakhstan". The project developer is the Ministry of Health of the Republic of Kazakhstan. The goal of the project is the introduction of high-tech methods of radiation therapy and nuclear medicine in five oncological centers of Kazakhstan (Astana, Almaty, Aktobe, Karaganda, and Semey).
3. KAZ2008 Project - "Support in organization of nuclear power plants construction in the Republic of Kazakhstan". The project developer is the Department of Atomic Energy and Industry of the ME RK. The goal is to support the IAEA in development of nuclear energy infrastructure in Kazakhstan.
4. (KAZ1004) Project - Development of an information-measuring system for a reactor installation. The project developer is the Institute of Atomic Energy, NNC RK. Project goal: increasing the reliability indicators of the IVG.1M reactor installation by modernizing of the information-measuring system.

In addition, under the auspices of the IAEA, Kazakhstan is implementing a project on deployment of the LEU Bank, which opened in Kazakhstan in 2017, to ensure guaranteed supplies of nuclear fuel to NPPs of IAEA Member States.

<u>INIR mission</u>

In 2016 the IAEA conducted an INIR mission in the Republic of Kazakhstan. The mission was required by the Kazakhstan Government and its main purpose was evaluation of the infrastructure of the regulatory system regarding the state plan on building a new NPP. RW management is one of the important directions of this process. For example, In the report of the INIR mission, recommendation No. R-17.1.1 was made: "*Kazakhstan should assess the increased requirements for the management of spent nuclear fuel and radioactive waste, which will be formed as a result of the implementation of the nuclear energy program and consider a common approach to their management, including organizational and financial resources, taking into account the available radioactive waste from existing facilities*."

<u>Coordination Group for the Uranium Legacy Sites (CGULS)</u>

The Republic of Kazakhstan joined CGULS in 2013. The CGULS, coordinated by the IAEA, supports affected IAEA Member States by assisting them to develop projects that will provide solutions for remediation of their legacy uranium production sites and give confidence to potential donors to invest. The CGULS will serve as a forum for collaboration, discussion, and exchange of information on plans and programs to be implemented under national and international initiatives, with the objective of effectively and efficiently addressing legacy wastes at uranium production sites. In this regard, CGULS members will assist in monitoring and facilitating progress of pre-defined projects and works, taking into account the technical baseline document (Assessment and Way Forward for Legacy Uranium Production sites in Central Asia: An International Approach), the Strategic Master Plan for remediation of uranium legacy sites in Central Asia (draft) and other documents as appropriate and as agreed upon by the CGULS.

EuCAS

At the end of 2016 the Republic of Kazakhstan become a member of the EuCAS network, which was created as a part of the IAEA Global Nuclear Safety and Security Network (GNSSN). Participation in EuCAS presents a good opportunity to share information and experience with other countries regarding safety infrastructure, RW management, environmental remediation and decommissioning, and education and training in this area. The activities of EuCAS are carried out through specialized Working Groups created within the network. At the First Steering Committee Meeting of EuCAS in December 2016 in Vienna, Austria, the Republic of Kazakhstan was identified as a leader of the Working Group on Environmental Remediation and Decommissioning (WG 3).

During the period of 2017 - 2018, representatives from Kazakhstan participated in a series of events under EuCAS. The Republic of Kazakhstan was represented in these events by CAESC, NNC RK and NTSC staff.

International Workshop on the Regulatory Supervision of Legacy Sites

The Republic of Kazakhstan participated in an international workshop on "Regulatory Supervision of Legacy Sites: The Process from Recognition to Resolution" that was held from 21 - 23 November 2017 in Lillehammer, Norway. The workshop was organized by the NRPA/DSA in cooperation with the IAEA, International Commission on Radiological Protection (ICRP) and the Organization for Economic Co-operation and Development Nuclear Energy Agency. The main topics of the workshop were:

- → International perspectives and current activities in regulatory supervision of legacies
- → methodologies for legacy regulation and management including long term site management and on-site disposal
- → Scientific, technical and regulatory aspects for remediation (including safety and environmental assessments, remediation and environmental monitoring)
- → Social and ethical issues: uncertainties, risk communication and engagement of stakeholders.

Representatives from NTSC, CAESC and NNC RK attended the workshop.

Studying the experience of other countries with developed nuclear energy and industry, as well as significant experience in dealing with radioactive waste from past activities, shows that the presence of legislative mechanisms is the most effective and expedient condition for solving problems of RW management.

In view of the above, there is a clear need for strengthening the legislative regulation of activities for the management of RW in the Republic of Kazakhstan, which is an important element of the peaceful use of atomic energy.

A list of completed, ongoing and future international projects is provided in Table 1.

Table 1 List of completed, ongoing and future international projects

	TITLE OF THE PROJECT	PERIOD OF PERFORMANCE
NORWAY- KAZAKHSTAN		
1	Regulation of radioactive waste management under its long-term storage and disposal in the Republic of Kazakhstan.	2009-2011
2	Development of draft law on radioactive waste management and draft regulatory document on requirements for predisposal management of radioactive waste in the Republic of Kazakhstan	2012-2016
3	Regulation of activity in the field of atomic energy use in the Republic of Kazakhstan	2018-2019
IAEA – KAZAKHSTAN (TECHNICAL COOPERATION) National and regional projects carried out under the TC program with IAEA in Kazakhstan over the past 20 years		

1	Scientific and technical support of the work on the land transfer from the former Semipalatinsk test site for economic use, KAZ9014	2016-2020
2	Creation of high-tech centers of nuclear medicine (KAZ6011) in the Republic of Kazakhstan, KAZ6011	2016-2020
3	Support in organization of nuclear power plants construction in the Republic of Kazakhstan, KAZ2008	2016-2020
4	Development of an information-measuring system for a reactor installation, KAZ1004	2016-2020
5	Deployment of Low Enriched Uranium Bank (BNOU)	Since 2015
6	INIR mission in the Republic of Kazakhstan	2016
7	Coordination Group for the Uranium Legacy Sites (CGULS)	Since 2013
European and Central Asia Safety Network (EuCAS)		
1	A part of the IAEA GNSSN with activities carried out through specialized Working Groups.	Since 2016

2.10 Conclusions

The bilateral cooperation program between DSA and the CAESC has resulted in a number of regulatory threats being addressed, particularly with regard to RW management, through the development of the regulations needed to address identified gaps. However, a number of challenges remain to be addressed. For example:

- → Procedures and activities carried out by state bodies involved in the regulation of the use of atomic energy are not coordinated and often there is a lack of sharing of information about the actions of the various state bodies involved in supervision and control. This can be considered as one of the key regulatory threats at present. It would be helpful to develop and put into effect a Government document defining the mechanism of interaction between state bodies and local executive bodies to eliminate duplication of functions, as well as provide a unified vision of the organization and performance of procedures in the implementation of state regulations. The implementation of such a step is recognized as challenging.
- → Turnover of staff at CAESC and inadequately small human resources has led to inexperience of staff involved in regulatory activities and inspections at facilities. To help address this issue, the development of “Guidelines for conducting inspections of nuclear and radiation hazardous facilities” is proposed in collaboration with DSA, which will assist inspectors in carrying out inspections of Kazakhstan nuclear and radiation facilities at a higher safety-oriented level.
- → The process of consideration and adoption of a new draft Law on RW Management has been difficult and is currently suspended, but proposals for amending the draft Environmental Code, incorporating the most important provisions from the draft Law on RW Management, have been developed in collaboration with DSA. Remaining provisions of the draft Law on RW Management could then be issued in the form of separate normative acts (rules, instructions), approved by orders of the respective Ministries. in order to eliminate identified regulation gaps in RW management, it is also proposed a new set of documents be developed and approved to update RW management provisions. Guidance around decontamination of premises, equipment and materials is also needed for those involved in decommissioning.
- → Currently, no decision has been made with regard to a final SNF management strategy. Currently, SNF management is comprised of long-term storage under surveillance at specialized storage sites., but the final end point may be SNF processing or disposal. The absence of a final decision is considered as one of the major issues requiring resolution.
- → Transport regulations have been considerably improved over the last decade to meet requirements for SNF transportation and the transportation of RW and sealed radioactive sources, but further updating of existing regulations is required. Furthermore, CAESC considers that it is necessary to develop

joined rules for the transportation of nuclear and radioactive materials (including RW) with the general approach to physical protection and emergency response. This is under active development.

→ Gap analyses has also revealed that remediation issues have not been adequately covered by regulations, and the absence of such regulation may represent a potential threat. Experience gained over the last few years has illustrated a need to develop some regulatory documents to cover safety issues in these regulatory areas. To resolve the problem, it is necessary develop a program on the elaboration of regulations for remediation in cooperation with the MEGNR, the Ministry of Health and CAESC.

→ The legislative and regulatory framework on EPR includes provisions in the Law on Civil Protection [2] and the Law on the Use of Atomic Energy [6] and the National plan on response for nuclear and radiation accidents [14]. Other regulations used during EPR are the departmental regulations of the Committee on Emergency, the Ministry of Health, the Ministry of Internal Affairs, and the Ministry of Industry and Infrastructure Development. A Joint interdepartmental document on interactions is needed involving all interested parties involved in the EPR process in accordance with IAEA Safety Standards. There has also been a gap in the EPR system in the special training of emergency responders for which an appropriate training program needs to be developed, consistent with IAEA recommendations. An interdepartmental document on the interaction between all interested parties involved in the EPR process also needs to be developed jointly with other relevant state bodies.

In February 2021, relevant amendments were approved to the Law on the Use of Atomic Energy [6], revising the powers, responsibilities and functions of state bodies concerned with nuclear energy use. This will substantially eliminate duplication among government agencies and expedite progress, at the same time bringing aspects of domestic legislation into line with the international safety standards and clarifying the interpretation of aspects of the laws "On the Use of Atomic Energy" and "On Radiation Safety of the Population". The RTA2 has identified activities for future cooperation through which these changes can be implemented and put into practice. Experience gained from study of international recommendations and the experience of other countries and continued international cooperation in this field will help in achieving a successful solution of the challenges recognized. Based on identified threats, a prioritized roadmap for future regulatory cooperation has been developed, presented in Appendix 1.

2.11 References for section 2

[1] The concept of the disposal of radioactive waste of the Republic of Kazakhstan. Atomic Energy Agency of the Republic of Kazakhstan, Almaty, 1993.

[2] Law on Civil Protection (April 11, 2014 No 188 V).

[3] Agreement between the Republic of Kazakhstan and the IAEA on the application of safeguards (entered into force on August 11, 1995).

[4] Additional Protocol to the Agreement between the Republic of Kazakhstan and the IAEA on the application of safeguards (signed in 2004, entered into force on February 19, 2007).

[5] Technical Regulations "Nuclear and Radiation Safety" (Order of the Minister of Energy of the Republic of Kazakhstan dated February 20, 2017 No. 58).

[6] Law on the Use of Atomic Energy (January 12, 2016 No. 442-V)

[7] Law on Permits and Notifications (May 16, 2014 No. 202 V).

[8] Rules for approval of designs of transport packaging kits (Order of the Minister of Energy of the Republic of Kazakhstan dated February 9, 2016 No. 51).

[9] Rules for the transport of nuclear materials (Order of the Minister of Energy of the Republic of Kazakhstan dated February 22, 2016 No. 76).

[10] Rules for the transport of radioactive substances and radioactive waste (Order of the Minister of Energy of the Republic of Kazakhstan dated February 22, 2016 No. 75).

[11] Hygienic standards "Sanitary and epidemiological requirements for ensuring radiation safety" (Order of the Minister of National Economy of the Republic of Kazakhstan dated February 27, 2015 No. 155).

[12] Sanitary rules “Sanitary and epidemiological requirements for ensuring radiation safety” (Order of Acting Minister of National Economy of the Republic of Kazakhstan dated March 27, 2015 No. 261).

[13] Sanitary rules "Sanitary and epidemiological requirements for radiation-hazardous facilities (Order of the Acting Minister of National Economy of the Republic of Kazakhstan dated March 27 No. 260).

[14] National plan on response for the Nuclear and radiation accidents (Approved by the Government of the Republic of Kazakhstan No. 467 of 19 August 2016).

[15} Report on Contract No. M12-09/18 (June 2009 - June 2011). The project “Regulation of the management of radioactive waste during their long-term storage and disposal in the Republic of Kazakhstan. Task 2. Threat assessment.

[16] Ecology Code (January 9, 2007).

[17] The Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management (Law of the Republic of Kazakhstan dated February 3, 2010 No. 246-IV, entered into force on June 8, 2010).

[18] Technical Regulations "Nuclear and Radiation Safety of Nuclear Power Plants" (Order of the Minister of Energy of the Republic of Kazakhstan dated February 20, 2017 No. 60).

[19] Rules for certification of personnel employed at nuclear facilities (Order of the Minister of Energy of the Republic of Kazakhstan dated January 20, 2016 No. 12).

[20] Rules for organizing the collection, storage and disposal of radioactive waste and spent nuclear fuel (Order of the Minister of Energy of the Republic of Kazakhstan dated February 8, 2016 No. 39).

[21] Rules of conservation and liquidation during the exploration and production of hydrocarbons and uranium mining (Order of the Minister of Energy Republic of Kazakhstan on May 22, 2018 number 200).

[22] Convention on Nuclear Safety (Law of the Republic of Kazakhstan dated February 3, 2010 No. 246-IV, entered into force on June 8, 2010).

[23] Convention on the Physical Protection of Nuclear Material (Law of the Republic of Kazakhstan No. 17-III of December 22, 2004).

[24] Qualification requirements for the provision of services in the field of the use of atomic energy (Approved by the Government of the Republic of Kazakhstan No. 716 of July 10, 2013).

[25] Rules for the physical protection of nuclear materials and nuclear facilities (Order of the Minister of Energy of the Republic of Kazakhstan dated February 8, 2016 No. 40).

[26] The Rules of Physical Protection of Ionizing Radiation Sources and Storage Facilities (Order of the Minister of Energy of the Republic of Kazakhstan dated February 9, 2016 No. 52).

[27] Rules of State Accounting of Nuclear Materials (Order of the Minister of Energy of the Republic of Kazakhstan dated February 9, 2016 No. 44).

[28] Rules of State Accounting for Ionizing Radiation Sources (Order of Acting Minister of Energy of the Republic of Kazakhstan dated February 12, 2016 No. 59).

[29] Decommissioning rules for nuclear and radiation facilities (Approved by Government Decree No. 287 of May 12, 2016).

[30] IAEA Expert Mission Report. Assessment of the Current Post-Remediation Status of Uranium Legacy Sites in Kazakhstan (Astana, Kokchetau, Aktau). 28 September 2014 – 3 October 2014. 45

[31] IAEA End-of-Mission Report. Assessment of the status of former uranium production sites in Southern Kazakhstan (Almaty, Korday, Aksuek, Mirnyi, Astana). 19 - 23 October 2015. 46

[32] The provision of the state institution "Committee of Atomic and Energy Supervision and Control of the Ministry of Energy of the Republic of Kazakhstan" (Approved by the order of the Minister of Energy of the Republic of Kazakhstan of October 7, 2014 No. 42).

[33] Memorandum of Understanding between the Norwegian Agency for Radiation Protection and the Atomic Energy Committee of the Republic of Kazakhstan (November 27, 2008, Oslo). 44

[34] Rules of the organization of the bills of law work in the authorized bodies of the Republic of Kazakhstan, (Decree of the Government of the Republic of Kazakhstan dated December 29, 2016 No. 907).

[35] The Convention on Early Notification of Nuclear Accident (Law of the Republic of Kazakhstan of February 3, 2010 No. 243-IV, entered into force on April 9, 2010).

[36] Convention on Assistance in the Case of a Nuclear Accident or Radiation Emergency (Law of the Republic of Kazakhstan dated February 3, 2010 No. 244-IV, entered into force on April 9, 2010).

[37] Amendment to the Convention on the Physical Protection of Nuclear Material (Law of the Republic of Kazakhstan dated March 19, 2011 No. 416-IV).

[38] Vienna Convention on Civil Liability for Nuclear Damage (Law of the Republic of Kazakhstan No. 405-IV dated February 10, 2011).

3 Regulatory framework for Nuclear and Radiation Safety in Tajikistan

In 1999, the Government of the Republic of Tajikistan approved Governmental Decree № 338 from 04.08.1999 “About Commission formation on interaction with IAEA”. The Decree paved the way for the Republic of Tajikistan to become a member of the IAEA; to become a signatory to the Agreement on the Application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons; and to become a signatory to the Central Asia region Nuclear Free Zone Treaty.

Once the IAEA statute was ratified and Tajikistan became a member of IAEA, it was necessary to establish the legislative basis in the field of radiation safety. On 26 June 2003, Parliament approved Law №42 “On radiation safety” [1], which defined the regulatory relationships related to ensuring radiation safety and the protection of life, health, property, and the environment against harmful impacts of ionizing radiation. The law describes, in detail, the regulations in the field of radiation safety, including ensuring radiation safety during emergencies, setting out the rights and obligations of citizens and public unions in the field of radiation safety, and ensuring responsibility for non-compliance with the requirement on radiation safety, etc. This was followed, in 2004, by the Tajikistan Parliament issuing Decree №219 of 10 November 2004 approving the Law “About Use of Atomic Energy” [2]. This defined the legal basis and regulation principles on public relationships related to atomic energy use, ensuring the regime of nuclear weapon non-proliferation, and nuclear and radiation safety. The law also facilitated atomic science and technology development, strengthening the international security regime of atomic energy use. A Safeguards Agreement and Additional Protocol, earlier signed by the Government of the Republic of Tajikistan, was also ratified by Parliament in November 2004. Other important milestones in the development of legal acts in Tajikistan were the Governmental Decree №482 of 3 December 2004 on “Regulation on state control in the field of ensuring radiation safety” and Decree №471 of 2 December 2005 “On approving regulation on Inter-agency council on ensuring radiation safety”.

In accordance with article 6 of the Law “On radiation safety” [1], the Nuclear and Radiation Safety Agency (NRSA) under the Academy of Sciences of the Republic of Tajikistan (AS RT) was designated as the state regulatory authority. The NRSA is, therefore, the main authority in the Republic of Tajikistan for regulating, authorizing and inspecting activities related to the use of radioactive substances and facilitating the peaceful use of atomic energy for the benefit of the population.

A Memorandum of Understanding between NRPA (now DSA) and NRSA was signed in Oslo on 27 November 2008 with the understanding that the Society for Development of Scientific Cooperation (SODESCO), operating as a Technical Support Organization (TSO) for NRSA, should follow this Memorandum. In February 2019, NRSA and DSA signed a contract on cooperation in the sphere of nuclear and radiation safety. One of the first projects implemented under this contract was “Revision of the Regulatory Threat Assessment in the Republic of Tajikistan”. The NRSA experts, with support from DSA, analyzed threats in RTA2 nuclear and radiation safety areas and proposed ways and methods to minimize and/or eliminate the associated threats, thus enabling NRSA and DSA to plan their cooperation activities in a well-grounded and efficient manner.

The RTA2 therefore provides DSA, and the wider international community, a clear view of the existing issues adversely affecting regulation of nuclear and radiation safety in the Republic of Tajikistan, which can be solved within the framework of continued DSA and NRSA cooperation. This chapter describes the output of the RTA2 project in the Republic of Tajikistan. A ‘Roadmap’ with prioritized activities for further cooperation, is provided in Appendix 2.

3.1 Organization and general principles for activities of the Regulatory Authority

As the regulatory body, NRSA is responsible for carrying out state policy on radiation safety and security and for coordinating the activities of other authorized bodies. Under the Law “On radiation safety” [1] NRSA:

- → carries out different licensing activities related to the use of radioactive materials
- → approves regulations, and guidance related to radiation safety, physical protection, EPR, accounting and control of nuclear materials and sources of ionizing radiation (SIR), including management of radioactive waste, remediation and decommissioning
- → oversees compliance with regulations and guidance on radiation safety and license conditions; and,
- → determines qualification requirements for employees on sites with SIR.

In parallel with its regulatory activities, NRSA also undertakes activities in relation to scientific investigations in the field of nuclear and radiation safety, environmental monitoring and complex re-processing of uranium ores and waste.

3.1.1 General Organizational Aspects of NRSA Activities

The organizational structure for the NRSA is given in Figure 7.

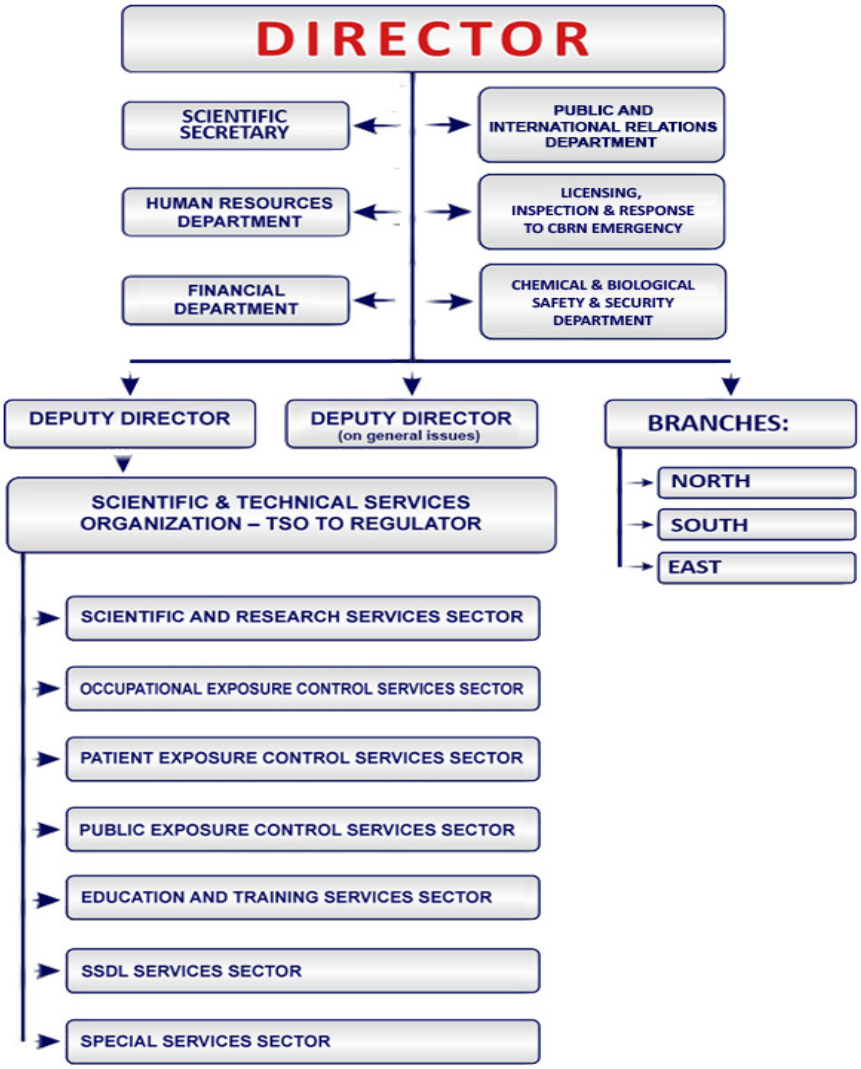

Figure 7 Structure of the NRSA.

LICENSING AND INSPECTION DEPARTMENT (LID)

A major task of the LID is to strengthen the legal basis in the field of radiation safety through the drafting of provisions for the basic regulations, including the law “On radiation safety” [1], the law “About atomic energy use” [2] and Governmental decrees. As such, the LID has elaborated the following documents:

- → Governmental Decree (No. 482), adopted 3 December 2004, making provisions for State regulation in the area of radiation safety
- → Governmental Decree (No. 337), adopted 1 September 2005 (amended in 2009), making provisions for licensing of specific types of activities
- → Governmental Decree (No. 471), adopted 2 December 2005, making provisions for activities of inter-agency Council on Radiation Safety
- → Norms of radiation safety (NRB-06) SP 2.6.1.001-06 (No. 237)- registered in the Ministry of Justice from 16 January 2007 [3]

- → Hygienic requirements for facilities and X-ray rooms operations, apparatus and carrying out X-ray examinations (No. 257) - registered in the Ministry of Justice from 16 April 2007
- → Requirements for ensuring the radiation safety (PORB-08) (No. 402) – registered in the Ministry of Justice from 18 June 2008 [4]
- → Order of registration, review, examination of applications and documents set submitted for obtaining of license for activities related to sources of ionizing radiation and radioactive substances use, internal document approved in 2009
- → Commissions' regulation under NRSA "On different activities licensing related to sources of ionizing radiation use", internal document approved in 2006
- → Requirements for carrying out inspections of business entities' activities in the Republic of Tajikistan by Nuclear and Radiation Safety Agency (No. 529) - registered in the Ministry of Justice from 19 June 2009
- → Checklists for carrying out inspections. Elaborated in compliance with IAEA recommendations, covering 7 areas of activity (№457), registered in the Ministry of Justice from 26 November 2008
- → Requirements for carrying out quality control in medical X-ray diagnostics (No. 573) - registered in the Ministry of Justice from 23 April 2010
- → Requirements for ensuring radiation safety during transportation of radioactive materials (No. 599) - registered in the Ministry of Justice from 26 January 2011 [5]
- → NP 01.001-11 Requirements for ensuring physical protection of facilities and storages with radioactive sources and wastes (No. 601) - registered in the Ministry of Justice from 09 February 2011 [6];
- → NP 01.002-11 Ionizing radiation sources categorization and requirements for their determination (No. 602) - registered in the Ministry of Justice from 09 February 2011
- → NP 03.004-11 Requirements for ensuring radiation safety during scrap metal collection and its sale (613) - registered in the Ministry of Justice from 17 June 2011
- → NP 03.003-11 Requirements on radioactive waste management (608) registered in the Ministry of Justice in 11 April 2011

Based on the Law "On radiation safety" the following regulations are in also the process of approval by Parliament:

- → Requirements for liquidated, conserved and changed the line of business enterprises on extraction and reprocessing of radioactive ores.
- → Requirements for facilities and radioisotope equipment operation.
- → Order on state accounting for and control of radioactive substances and radioactive waste.

The Law of the Republic of Tajikistan "On radioactive waste management" [7] was also drafted by the LID.

The LID is comprised of two sections: an inspection section and a licensing section.

<u>Inspection Section</u>

The basic tasks of the inspection section include carrying out inspections at organizations and enterprises that use sources of ionizing radiation. Organization and enterprise inspections are carried out in accordance with the laws "On radiation safety" [1], "On carrying out inspections of commercial entities activities in the Republic of Tajikistan" [8], "About atomic energy use" [2], and "On licensing of separate types of activities", regulations "On state control in the field of radiation safety" and "About licensing of separate kinds of activities" [9] as well as requirements and rules "Rules on carrying out inspections of commercial entities in the Republic of Tajikistan by Nuclear and Radiation Safety Agency under the Academy of Sciences of the Republic of Tajikistan" and other legal acts.

The inspection section began activities after elaboration and state approval of “Rules on carrying out inspections of commercial entities in the Republic of Tajikistan by Nuclear and radiation safety agency under the Academy of Sciences of the Republic of Tajikistan” and “Different checklists” for users of ionizing radiation sources in different fields. Each checklist, depending on type of ionizing radiation source used, is handed to the users before carrying out an inspection according to “Rules on carrying out inspections of commercial entities in the Republic of Tajikistan by Nuclear and radiation safety agency under the Academy of Sciences of the Republic of Tajikistan” and inspections are undertaken on the basis of this checklist.

Staff of the inspection section carry out dosimetry measurements and X-ray apparatus quality control during inspections of X-ray rooms. The X-ray apparatus and compliance of protective measures with requirements are examined. Measurement of dose rates at different distances, radionuclide identification, preliminary spectrometry and other actions related to ionizing radiation sources are also carried out during inspections of radioactive sources.

The staff of the inspection section have also been involved in compiling an inventory of ionizing radiation sources within the territory of the republic. They completed an inventory of sealed and unsealed radioactive sources, X-ray apparatus and nuclear materials and the data collected has input to the Regulatory Authority Software Database (RASOD), a national database for all radioactive sources in the country.

In general, the inspection section inspects all users dealing with ionizing radiation sources. Inspectors carry out workplace monitoring and dosimetry measurements and examine the fulfillment of quality assurance programs, physical protection of ionizing radiation sources and EPR plans as well as compliance with legal acts in the field of radiation safety/security and license requirements.

Licensing Section

The main tasks of the licensing section are carrying out licensing activities in the field of radiation safety in compliance with Tajikistan’s legislation requirements, including: the Law “On radiation safety” [1]; Law “About atomic energy use” [2]; Law “On licensing of separate types of activities” [9]; regulation “On state control in the field of ensuring the radiation safety” approved by RT Governmental Decree № 482 from 3 December 2004; regulation “About licensing specifications for separate types of activities” approved by RT Governmental Decree № 337 from 1 September 2005; as well as legal basis strengthening in the field of radiation safety.

The following legal documents have been elaborated by the licensing section and are currently under review:

- → Requirements for facilities and radioisotope equipment operation
- → Requirements for accounting and control of public exposure received by citizens while working with ionizing radiation sources, while passing through the X-ray examinations, as well as conditioned to radiation background
- → Organization requirements for accounting and control over radioactive substances and radioactive waste
- → Memorandum of understanding (MoU) between NRSA AS RT and RT Ministry of Health
- → MoU between NRSA AS RT and the Customs Service, to control import, export and transit of all nuclear and other radioactive materials.

The Licensing Section also carries out technical evaluation of documents, applications submitted for licenses, and prepares documentation for license issuance.

Public Awareness and International Relations Department (PAIRD)

The main tasks of the PAIRD are to provide information related to radiation safety to scientific and research institutions, professionals working with SIR, as well as the public and to correspond with international organizations and countries with which cooperation agreements in the field of "peaceful use of atomic energy" have been signed. PAIRD organizes different national and international events (seminars, workshops, conferences, training courses, etc.) to raise awareness in the field of nuclear and radiation safety and security as well as to increase the scientific, methodological and technical competencies in the country on radiation safety.

PAIRD created the NRSA's website (www.nrsa.tj) which is constantly maintained and updated from a range of different informational resources. High-speed optical fiber internet has been installed and is operational in PAIRD under a bilateral project with the USA. This arrangement allows for updating the website informational resources efficiently and operating a high-quality website design. PAIRD is also equipped with modern and up-to-date communications equipment.

The library and Tajik National INIS Center are operated under PAIRD. The library has in its possession all IAEA publications covering different areas issued from 1970 as well as national books of Tajikistan's scientists in the current field and other natural sciences. PAIRD staff have undertaken training in a number of IAEA advanced member states in the field of operating the National INIS Center and library and are involved in providing information to scientists in the Republic that are engaged in the fields of nuclear physics, radiochemistry, radiation safety, radiation ecology, etc. Staff at the INIS center also ensure data input to the INIS Secretariat at IAEA Headquarters in Vienna. Those inputs cover publications on the above-mentioned areas within the Republic of Tajikistan.

PAIRD staff have also been professionally trained by the IAEA on software and online platforms, such as In-touch; TC-Pride; TC-Country Profile; PCMF; CPF's, available from the IAEA website: http://www-tc.iaea.org/tcweb/default.asp, to undertake activities associated with the following process:

- → National and regional projects are submitted by Tajikistan to the IAEA
- → Candidates are submitted for undertaking training courses, fellowships, scientific visits, seminars, workshops, technical meetings, conferences and other events under IAEA national, regional, inter-regional and international projects
- → Required equipment for the country under national and regional projects is requested
- → Project work-plans are compiled
- → The profile of the country is maintained and updated, and many other activities are carried out.

PAIRD carries out correspondence with IAEA TC Department's Program Management Officers and IAEA Technical Officers from other departments, for example with Technical Officers for different IAEA national projects, on progress achieved under the specific projects undertaken in the country. The department actively participates in the IAEA TC Departments' process of planning, policy and strategy formation and actively interacts with beneficiaries of IAEA projects in Tajikistan. Staff of PAIRD assist IAEA national and regional projects' counterparts in the preparation and submission of projects, work-plans, request for necessary equipment, and in completing forms for undertaking training, fellowships, scientific visits, technical meetings, seminars and other events with its final submission to IAEA.

PAIRD also carries out correspondence and negotiations with the United Nations Development Program (UNDP), other united nations (UN) and international organizations, regulatory authorities of IAEA member states, IAEA counterparts of different regional projects, donors and non-government organization representatives.

National INIS Center in Tajikistan

The National INIS Center in Tajikistan was established in 2003 through IAEA national project TAD/0/002 "Establishment of INIS Center". The basic objective of the project was to establish a national INIS center capable of providing the relevant information services in all aspects of the peaceful application of nuclear sciences and technology in support of the national nuclear program. Necessary modern equipment for appropriate INIS Center operation was delivered to Tajikistan through the IAEA project. Four employees from NRSA also undertook fellowships in the national INIS centers of Iran and the Russian Federation under this project and a scientific visit was arranged for NRSA management for familiarization with the infrastructure of those centers. National training courses for NRSA AS RT employees were also conducted in Dushanbe by INIS experts from Belorussia and Syria in 2002 and 2004 under the project that covered all issues related to the appropriate operation of the National INIS Center.

Currently, the National INIS Center actively participates in the elaboration of recommendations by INIS Secretariat and has the following functions:

- → Selecting the relevant nuclear literature produced within the country and preparing the associated input under INIS rules and submitting it to the IAEA, which includes cataloging, indexing, and input of hard to access literature, and providing a copy of the full text of those items of literature (excluding items towards which juridical and regime limitations are applied) that are not available through normal commercial channels.
- → Providing consultations and recommendations to the INIS Secretariat regarding INIS system operation and development.
- → Providing INIS information and products to national stakeholders (scientists, post-graduate-students, scientists, etc.) within the country and keeping contacts with them and informing the INIS Secretariat regarding their opinions and proposals.
- → Promotion of INIS products at meetings and conferences.
- → Information exchange with the INIS Center in Vienna.

Technical Support Organization to NRSA

The TSO implements comprehensive and complicated international projects on behalf of the NRSA and promotes the activities of the NRSA by organizing exhibitions, shows, seminars, and different negotiations. It has a key role in arranging logistics for different events organized by the NRSA such as training courses, seminars, workshops, meetings, and other activities, and in this regard actively cooperates with the IAEA, International Science and Technology Center (ISTC), European Commission, USA DOE and US NNSA, SLD, Pacific Northwest National Laboratory, DSA and other international organizations.

The TSO is responsible for the safe delivery of equipment supplied under IAEA TC projects through the UNDP office in Tajikistan and other international organizations and carries out customs clearance. The TSO can carry out maintenance on nuclear and radiation safety equipment and is responsible for analyzing and summarizing procured materials and equipment, compiling relevant documentation and preparing informational and technical reports. The TSO also has active interaction with international organizations on issues related to procured equipment and materials for different national and regional projects and their delivery to the final beneficiary.

The TSO consists of the following seven sectors that provide different technical services to the NRSA:

- → Scientific and research services sector carries out investigations in the fields of environmental monitoring of Tajikistan and uranium ores and waste reprocessing. The characteristics of mine and uranium industry process waters have been studied and sorption process kinetics for different sorbents for uranium extraction investigated in order to establish optimal sorption processes. Studies

on optimization of sulfuric acid leaching of uranium-bearing ores of some deposits have also been performed, identifying that preliminary water washing of ores prior to acid leaching optimizes uranium extraction. Environmental investigations have also been performed within the territory of Northern Tajikistan with results being used to compile a radio-ecological map of Northern Tajikistan.

- Occupational exposure control services sector (OECSS) is responsible for external occupational exposure control, through the external monitoring of individuals as well as workplace monitoring and maintaining a database of monitoring results. Internal exposure monitoring is planned to take place in the future. External exposure monitoring is one of the important system elements for ensuring radiation safety for professionals working with SIR. The occupational exposure control service is currently provided to 400 professionals, with occupational exposure control and accounting being carried out every 3 months. These professionals are from different hospitals of the Ministry of Health, the Committee of Emergency Situations and Civil Defense, Customs service under the Government of the Republic of Tajikistan, the State Enterprise "Radioactive Waste Disposal Site" in Faizabad city, Aluminum plant, and private companies. Activities of the OECSS are based on the NRSA AS RT statute, Regulation "About OECSS", Regulation "On state control in the field of ensuring radiation safety", approved by RT Governmental Decree №482 from 3.12.2004 г., and RT law "on radiation safety" №42 [1] and occupational exposure control is carried out in compliance with Radiation Safety Norms requirements (NRB-06) SP 2.6.1.001-06 [11]. OECSS personnel are specialists who graduated from Tajik National University and have undertaken IAEA fellowships on the subject in Lithuania and Armenia.
- Patient exposure control services sector is equipped with modern and up-to-date equipment (Unfors Xi) and its staff have been trained by IAEA experts.
- Public exposure control services sector is equipped with modern, up-to-date equipment and its staff have been trained by IAEA experts. It cooperates closely with the NRSA branch in the Northern Tajikistan on uranium tailings monitoring and is currently preparing Tajikistan's radiation map for which environmental measurements for different regions of Tajikistan are ongoing.
- Education and training services sector (ETSS) is responsible for operating and maintaining the recently established National Educational and Training Centre on Radiation Protection for the development of enough human resources to strengthen the radiation safety and radiation protection infrastructure in Tajikistan. The ETSS provides different training courses, workshops, and seminars for radiation workers and radiation protection officers (RPOs) as well as for representatives of law enforcement agencies. These cover different topics on ensuring radiation safety in medicine, industry, agriculture, science & education, as well as courses on nuclear and radiation security. The ETSS closely cooperates with the IAEA on conducting different national and regional events in its center and the training syllabus has been elaborated in cooperation with the IAEA. A national strategy of education and training in the field of radiation safety and security has been prepared and is currently awaiting parliamentary approval.
- Secondary standard dosimetry laboratory services sector has been operational since March 2019 and provides calibration services (dosimeter calibration) to all institutions making use of radiation measuring equipment. All modern equipment is delivered, and training is provided by the IAEA to the staff of this section.
- Specific services sector tasks include transport of radioactive material, EPR services, nuclear forensics and installation of physical protection elements for sites with high-activity radioactive sources (Figure 8). The section is also responsible for searching for orphan sources and staff have carried out searches throughout the whole territory of Tajikistan, resulting in more than 736 orphan and disused radioactive sources being discovered. Recently a new service was initiated on the maintenance of mobile detection systems.

Figure 8 Specific Services Section tasks, including transport of radioactive material, emergency preparation and response services, searching for orphan sources, nuclear forensics and installation of physical protection elements for sites with high-activity radioactive sources, etc.

NRSA BRANCH OFFICES IN DIFFERENT REGIONS

The basic tasks of NRSA branches are:

- → Environmental monitoring within the relevant region due to the location of a huge amount of uranium tailings
- → Accounting for, inventory and control of nuclear and other radioactive materials in the relevant region
- → Application review and documentation preparation for license issuance by NRSA Headquarters in Dushanbe for types of activities with the use of SIR in the relevant region
- → Carrying out inspection of compliance with license conditions and radiation safety/security requirements of national legislation for activities with the use of SIR in the relevant region.

Sughd branch staff compile passports for all uranium tailings from northern Tajikistan. Engineer and geological conditions, as well as radionuclides composition in different uranium tailings, are also investigated by Sughd branch staff. With the exception of research, similar activities are carried out by other NRSA branches in other parts of Tajikistan.

3.1.2 NRSA Independent Status

The government, in accordance with Governmental Decree №482 dated 3 December 2004, approved the regulation on the state regulatory authority in the field of radiation safety which authorizes only NRSA, as the regulatory body, to perform all activities related to ensuring radiation safety in the country. Radiation safety is ensured by NRSA performing regulatory control through licensing, inspection and enforcement and coordinating the activity of all authorized bodies. Authorized bodies do not have functions of licensing, inspection and enforcement in the field of radiation safety.

NRSA is guided by the Constitution of the Republic of Tajikistan, the Law of the Republic of Tajikistan “About radiation safety” [1], other laws and legal acts of the Republic of Tajikistan, international law acts recognized by the Republic of Tajikistan and, specifically, by Governmental Decree №482.

NRSA implements its activities in cooperation with other bodies (i.e. ministries, authorities and executive bodies of state in different regions, cities, and villages) by means of:

- → implementation of state policy in the field of radiation safety

- development of measures on radiation safety, undertaking measures on radiation safety during emergency situations, coordination of implementation and control over their realization, assessment submission on the basis of radiation situation, necessary data for taking decisions on measures leading to reduction or prevention of exposure in case of radiation accidents;
- licensing of different types of activities related to the use of radiation sources; [9, 11]
- inspections of licensees' premises and other sites where radioactive materials are present
- enforcing the legal and regulatory framework on radiation safety
- approval in established order the construction norms and rules, rules on labor protection, organizational and administrative, instructive, methodical and other documents on issues of radiation safety
- accounting for and control of individual exposure doses
- defining size and limits of control of surveillance zones for sites using radioactive sources
- control over ensuring the security of radioactive materials
- elaboration and approval of legal acts, standards, regulations, instructions and recommendations on issues of radiation safety and their approval in established order
- introduction of scientific and technical achievements to the practice in the field of ensuring radiation safety
- priority directions identification and scientific investigation programs in the field of ensuring radiation safety, including programs on specialists training, refreshing and advanced training
- requirements identification for users on ensuring EPR and control over their implementation, assessment, and limitation of occupational exposure
- activity coordination of the national radiation monitoring network, and international exchange of information on radiation situations
- establishing state specialized commissions for examination of radiation workers and radiation protection officers in the field of radiation safety and identification of activity types having direct impact on radiation safety
- research and scientific project coordination and work related to the use of sources of ionizing radiation (SIR)
- guidance on the state system for account of licensees, licensees importing and exporting SIR, public and occupational exposure
- providing information to the public and communities about results of its activities (where not a subject of state, service or commercial secret), and compiling an annual report about its activities and its submission to the Government
- in case of necessity, establishing independent consultative councils and attraction of specialists for rendering assistance to NRSA, legal and physical persons whose activity is related to the use of SIR
- collection system (fee) justification for its regulatory activity which goes to the state budget
- international treaties and recommendations introductions to legislative documents and to the practice of SIR licensees in this field; and
- attraction of consultants and specialists for rendering expert assistance during ensuring NRSA's licensing and inspection activity, during preparations for training and during emergency situations.

NRSA, during the implementation of its functions as the regulatory body in the field of radiation safety, has a right to:

- → request from other states authorized bodies and organizations the necessary information in the field of ensuring the radiation safety
- → attract in an established manner, specialists of other state bodies and organizations for participation in carrying out the expertise of scientific and technical programs, as well as for inspections
- → take urgent actions in case of danger or occurrence of aggressive situations from a radiation safety point of view and emergency preparedness, obliging a licensee to suspend operations with SIR, radioactive wastes or to change operations; and,
- → introduce proposals on activity suspension, changing or cancellation or cancellation of their decisions relating to issues taking in violation of the Law of the Republic of Tajikistan "About radiation safety" in an established manner to ministries and authorities, executive bodies of state in different regions, cities and villages, and other organizations.

Being under AS RT does not compromise the effective independence of the NRSA. Only one research institute under AS RT is a user of SIRs under regulation by NRSA. NRSA is also responsible for the promotion of the safe and secure use of SIRs.

In case of occurrence of any major problems in the field of radiation safety among all relevant ministries, authorities and the NRSA, all disputes are solved within the *Council for Radiation Safety,* established by Decree 471 from 2 December 2005. The *Council for Radiation Safety* meets at least twice annually, and extra meetings can be called as required. It functions as the coordinator of the activities of most bodies having relevance to radiation safety and the security of sources, including the NRSA, and solves all kinds of disputes among relevant ministries, authorities, and the NRSA. The Council comprises 12 members, chaired by the Deputy Prime Minister. The Deputy Chair is the NRSA Director and the Secretary is the Scientific Secretary of the NRSA. The remaining members are Deputy Ministers of 9 Ministries. Since the council solves only radiation safety issues, the Ministry of Internal Affairs is not represented since its dealing with the security of sources.

The Law on “Use of Atomic Energy” [2] requires that Government bodies be financially and administratively independent of other executive agencies and organizations having activities associated with the use of atomic energy and Law 42 “on Radiation Safety” [1] states that the NRSA is established under AS RT. The Government has instructed AS RT to allocate funds to NRSA in a unique manner to fund salaries and regulatory activities but allows AS RT to vary funds for administrative items such as the premises, furnishing, transport, etc.

The organizational structure of the NRSA includes technical service departments that provide technical services within NRSA and regulated licensees. Initially, it was established to provide technical services to NRSA only, but due to the absence of experienced companies in the country on providing technical services to regulated licensees which is an obligatory condition for getting a license for any activity connected with SIR, it was decided to arrange such a technical service for users as well. NRSA's technical services department activities are separated from its regulatory functions by legislative documents, staff, and practically, by location in a separate building, so that the effective independence of the NRSA is not compromised. The budget for AS RT is considered inadequate, but NRSA plans its budget for its regulatory functions within its own limitations. All funds allocated to AS RT are fully applied to its functions.

3.2 Safety of Nuclear Installations

There are no nuclear installations in Tajikistan, with the exception of a small research reactor that has not been commissioned and has not been loaded with fuel.

3.2.1 Research Reactors

Tajikistan intends to restore the nuclear research reactor Argus, a 20kW homogeneous molten salt reactor, which was installed at the Umarov Physical and Technical Institute in Dushanbe in the late 1980's. The installation of the reactor was completed at the time of the collapse of the Soviet Union but was never put into operation. The Government supports initiatives of the National Academy of Sciences by way of approving of the State Program on "Renovation and Further Use of ARGUS-PhTI Nuclear Research Reactor for 2016-2020" which was approved on 2 November 2015. It is planned that the work to restore the Argus research reactor will be undertaken with technical assistance from the Russian Federation.

The first stage of the national program is directed to the training of staff, design and survey activities, and production of project documentation. The second stage will involve the refurbishment of the reactor and construction of facilities to produce radioisotopes and radiopharmaceuticals, as well as for neutron activation analysis.

The current regulatory framework does not include all aspects related to the safe operation of research reactors, such as nuclear and radiation safety, licensing and inspection, risk assessment etc., as well as licensing activities during the whole lifetime of the research reactor. Currently, the draft law "On Licensing of Individual Types of Activity" is in the parliament for approval and will stipulate the licensing of activities for the whole lifecycle of the research reactor (including site selection, feasibility study, planning, construction, commissioning, operation, and decommissioning). After approval by parliament, the Government will order the regulatory body to develop new documents and requirements related to the process of licensing activities related to each element of the research reactor's lifetime. Since this area is new for NRSA, international assistance and support is needed to develop the regulations according to IAEA recommendations and international best practice.

Finally, the lack of qualified staff for the regulation of research reactors requires the organization of on-the-job training. NRSA does not have experience in regulating such activities and needs to train its staff, in addition to drafting regulations in this area.

3.3 Radioactive Material Transport

3.3.1 Review of Legislation on Radioactive material Transport

Tajikistan has developed and approved several laws and regulations regarding transport safety that implement international recommendations and obligations and NRSA, together with other relevant authorities and transport companies, aims to implement all safety requirements in a graded approach to ensure transport safety.

GENERAL PROVISIONS

Safety rules during transportation of radioactive materials (No.599) [5], registered in the Ministry of Justice from 26 January 2011 describes all types of packages that are used in the country. The current document was developed based on IAEA document TS-R-1 (ST-1 revised, IAEA, 2000) [18] and fully includes all its provisions. It is planned to update this document in accordance with the SSR-6 [12]. As for the type of transport operations which are performed in the country, Tajikistan makes use of road, rail and air for transportation of radioactive materials.

The approval process of packages or material designs is clearly outlined in document No.599 [5]. Usually, sources are imported to Tajikistan within the framework of IAEA cooperation, as well as by some private

companies from the Russian Federation. In practice, transport package certificates issued by the Russian Federation, USA, and European countries are accepted by NRSA.

The TSO to NRSA, and specifically the specific services section, oversees package design assessments. The TSO is independent of applicants. From time to time, staff of the TSO are trained via special courses organized by the IAEA or USA DoE as well as national training events organized by NRSA. Generally, the TSO has good technical competence, but in specific fields may request assistance from the IAEA.

Assessments of packages not requiring approval by the competent authority are clearly outlined in Chapter 17 of Document No.599 [5]. National legislation requires that all applicants, despite their use of packages not requiring approval by the competent authority, should obtain a license for transportation activity. The department of licensing and inspection carefully checks upon and carries out inspections to verify that containers are in compliance with national legislation.

Appropriate testing during the design assessment process is clearly outlined in Chapters 8 to 11 of Document No.599 [5]. This service is performed by the TSO to NRSA. However, no companies in Tajikistan are currently dealing with the manufacture of containers.

National legislation, as well as Document No.599 [5], stipulate that all activities related to transportation of radioactive materials cannot be carried out without a relevant license. The use and application of transitional arrangements are ensured in national legislation and regulated while applying for a license from NRSA.

PROCEDURES FOR OBTAINING LICENSES/PERMITS

Manufacture of materials and packaging

Certificates issued by the Russian Federation, USA and European countries for the manufacture of materials and packaging, after careful inspection by the TSO (the Specific Services Section) to ensure they meet design specifications, are accepted by NRSA, even if it is the first shipment.

Examination of maintenance and servicing arrangements

Safety rules during transportation of radioactive materials (No.599) [5] provides clear requirements on examination of maintenance and servicing arrangements, although there are currently no companies in the country dealing with examination of maintenance and servicing arrangements. Regulatory requirements developed by NRSA oblige all users engaged in transportation activities to arrange contracts on examination of maintenance and servicing arrangements with the country from which they are importing the container (e.g. Russian Federation, USA or European countries). In addition, national legislation, as well as Document No.599, stipulate that activities related to transportation of radioactive materials cannot be carried out without a relevant license issued by the Licensing and Inspection Department of NRSA. License provisions require that users inform NRSA immediately of any safety deviations as well as any significant damage noted during the use of packages since these could give rise to an emergency situation. The Licensing and Inspection Department also carries out regular inspections of activities related to transportation to identify any safety deviations or significant damage to packages. Staff of the TSO are trained in identifying safety deviations or significant damage to packages via special courses organized by IAEA, USA DoE as well as national training events organized by NRSA.

3.3.2 State Oversight of Transport Safety

The Department of License and Inspection of NRSA checks the availability of a radiation protection program, based on legislation provisions, before issuing a license for transport activities. Radiation protection programs for transport need to consider radiation doses for all modes of transport. Inspections

are carried out by NRSA inspectors prior to issuing licenses to check that radiation protection programs declared by applicants are operational and in accordance with requirements.

The TSO to NRSA regularly carries out training in its regional training center on radiation safety and security. This includes explaining to applicants about the provisions of newly published IAEA Requirements, ensuring their radiation protection program training is up to date and effective.

Appropriate workplace or individual monitoring is conducted for transport workers by relevant companies. NRSA inspectors ensure they are consistent with national legislation requirements during regular inspections.

3.4 Radiation Safety

Tajikistan has no nuclear reactors. SIRs are used throughout the country for medical (e.g. X-ray diagnostics and radiotherapy) and in industrial, research and education applications. Uranium mining and ore processing facilities have shut down, but tailings associated with the facilities continue to pose a radiation safety issue in the country.

3.4.1 Use of Radiation Sources

RADIATION SAFETY REGULATIONS

Tajikistan has expressed its support to the Code of Conduct on the Safety and Security of Radioactive Sources and the Supplementary Guidance on the Import and Export of Radioactive Sources. A number of radiation safety regulations have also been developed and implemented. For example, Tajikistan has:

- → Ensured source categorization through the Norms and Rules NP 01.002-11 “Category of danger of sources of ionizing radiation and rules on their identification”, registered at the Ministry of Justice, Number 602 on 9 February 2011, which was developed in line with IAEA Safety Standard No. RS-G-1.9 [13].
- → Ensured a Graded approach to security of sources through Norms and Rules NP 01.001-11 “Requirements on ensuring physical protection of radiation sources, storages and radioactive substances”, registered at the Ministry of Justice, Number 601 on 9 February 2011 [6].
- → Made compulsory the radiation monitoring of recycled metal facilities using the Norms and Rules NP 03.004-11 “Requirements on ensuring the radiation safety during preparation and realization of scrap metal” approved in 2011" for which practical measures are being implemented.

NRSA has also responded to IAEA recommendations and implemented sufficient infrastructure for the safety and security of radioactive sources and aims to continuously improve the situation. Tajikistan will take into consideration also “Guidance on Managing Disused Radioactive Sources” belonging to the Code of Conduct.

NRSA together with the Committee of Emergency Situations and Civil Defense, based on the IAEA document GS-R-2 [14], elaborated the "National Response Plan" (NRP). The objective of the NRP is to ensure a prompt and integrated response of the executive bodies, forces and functional means and territorial subsystems of the single state system for prevention and liquidation of emergency situations of the Republic of Tajikistan in case of threat and occurrence of a radiological accident. Procedures, including emergency plans, which address the actions to be taken in respect of sources that have been found or lost from authorized control, are covered by the NRP. It is planned to review this plan according to GSR Part 7 [15].

Export import and security of radioactive sources are regulated according to the Law on licensing of separate types of activities [9]. In addition to this Law there is a Regulation "On the specification of licensing separate types of activities", approved by Governmental Decree # 337 from 2005, which requires specific documents to be provided when applying for a license to export or import radioactive sources. Furthermore, Article 18 of the Law on Use of Atomic Energy [2] requires control of the export and import of goods in the field of atomic energy use by the competent authority, according to the national legislation and international agreements. The scope of regulatory control established collectively by the Law on Use of Atomic Energy encompasses all management of radioactive materials from initial production or import to final disposal or export (i.e. a cradle-to-grave approach).

Article 15 of the Law on Use of Atomic Energy required a state system of account and control of nuclear materials and radioactive sources to be established and, under that system, to create a State registry for nuclear materials and radioactive sources [16].

The process for assessing transport safety and security arrangements for sources while in transit from the State to another destination are ensured through two requirements: 1) Safety rules during transportation of radioactive materials (No. 599) - registered in the Ministry of Justice from 26 January 2011 [5] and 2) Norms and Rules NP 01.001-11 “Requirements on ensuring physical protection of radiation sources, storages and radioactive substances”, registered at the Ministry of Justice, Number 601 on 9 February 2011 as amended of 2012 (namely by clauses from 18 till 27 [6]) as well as through a Draft Law on Export Control. Procedures for safe and secure storage for radioactive sources routinely stored on vehicles or at field sites or that are held pending import or export are covered by legislative documents mentioned in Norms and Rules NP 01.001-11 [6].

Article 4 of the Law on "Radioactive Waste Management" [7] ensures the safety and security of radioactive sources when a licensee ceases operation. It is ensured by means of establishing a special guarantee fund were regulated licensees transfer funds during operations. These funds are then used later in ensuring the safety and security of radioactive sources.

INSPECTION

An inspection program for radiation safety and the security of radioactive sources has been in place since 2005. Inspections are carried out NRSA's inspectors in line with requirements set out in the Law "About radiation safety" [1] and the Law "On inspection of business activity" [8].

Provisions from the Governmental Decree 482 dated 3 December 2004 on state control in the field of radiation safety in relation to inspections are as follows:

→ Clause 8. NRSA’s staff who carry out control of organizations that are using in their activity’s sources of ionizing radiation and generators are called inspectors. A juridical competent person with a high education of relevant field and practical work experience not less than three years can be assigned as an inspector. An inspector should be professionally trained in the field they are planning to carry out inspections and strictly fulfill the requirements of the legislation.

→ Clause 9. Inspectors are assigned by the Director of NRSA.

→ Clause 10. Director of NRSA and inspectors within their inspection activities, along with other rights, can:

- inspect for compliance with requirements, limits, and conditions of radiation safety and emergency preparedness
- require implementation of radiation safety requirements and emergency preparedness during operation of equipment with SIR

- carry out measurements and take samples from licensees' site which are necessary for inspection of radiation safety requirements implementation
- carry out SIR physical control, including their account's control
- examine special professional knowledge of responsible persons who are working with SIR
- enter any organization without hindrance and obstructions despite their property form where any kind of activity with the use of SIR is implemented or kind of activity which leads to exposure; and
- receive from them within their competence necessary information in the field of ensuring radiation safety.

Based on above-mentioned two laws and Governmental Decree 482, NRSA's internal document "Rules on carrying out inspections of business activity which are using SIR" was elaborated. The document includes checklists for different kinds of activities using SIR, which were elaborated based on the IAEA's checklists.

Annual inspection plans are compiled and approved by the Director of the NRSA and inspection procedures are in place. Annual inspections plans are available for users in advance. Licensees are notified in advance about forthcoming inspections although NRSA's inspectors also have a right to carry out unannounced inspections. Inspection reports are generated after each inspection. Specific findings are communicated to licensees and required corrections need to be applied.

There are twelve NRSA inspectors in Dushanbe and five in NRSA regional offices, which is sufficient to cover the country’s needs. Inspectors have been trained through various IAEA activities, fellowships and post-graduate education courses.

ENFORCEMENT

Governmental Decree 482 makes provision for enforcement of regulatory actions. Some detailed provisions from this Decree are provided below:

→ Clause 10. Director of NRSA and inspectors within their inspection activities, along with other rights, can:

- suspend user's license with the use of SIR in case of incompliance with radiation safety standards and norms
- prohibit SIR use until necessary measures have been carried out and written authorization from the Regulatory authority obtained
- oblige licensees to carry out technical examinations, supervisions, and tests on equipment operation, their accessories, systems or complexes, where it is necessary for proving radiation safety
- submits instructions on deprivation of a responsible person's authority who violated his obligations or who is not suitable for activity due to its health condition and professional skills to fulfill his obligations
- compile reports on violations of radiation safety requirements' norms and rules.

→ Clause 11. Besides items mentioned in Clause 10, the Director of NRSA additionally has the following authority:

- in case of violation of legal acts in the field of ensuring radiation safety, to set a penalty and/or suspend the operation of the site in order to take prompt actions to restore an adequate level of safety in situations deemed to pose an imminent radiological hazard to the life and health of the public as well as the environment.

→ Clause 13. For legal acts' violation in the field of radiation safety, NRSA's Director handles all materials to law-enforcement agencies for attraction to administrative, material and criminal responsibility.

→ Clause 14. Penalties go to income of the State budget of the Republic of Tajikistan

The basic document for penalties and suspension is the Code of the Republic of Tajikistan about administrative violations.

Enforcement is implemented through NRSA and the enforcement regime is well developed. The NRSA inspectors follow up on correction requests issued during inspections. Corrections must be implemented in a timely manner otherwise legal prosecution measures are applied. The NRSA has established formal arrangements with relevant government agencies where enforcement requires the involvement of the police, justice ministry or other authorities.

3.4.2 Radiation Protection of Personnel and Dosimetry Services

RADIOLOGICAL PROTECTION IN OCCUPATIONAL EXPOSURE

The regulatory infrastructure in Tajikistan specifies the responsibilities of employers, registrants, licensees, and workers, in compliance with the IAEA safety standards. Provisions from laws, regulations, and requirements related to occupational exposure require the implementation, by licensee's management, of radiation protection programs according to IAEA safety standards. There are also requirements for the authorization of technical services related to occupational radiation protection according to the IAEA safety standards.

In compliance with current legislation, all end-users must maintain a radiation protection program in accordance with IAEA standards. However, an appropriate management commitment to safety does not yet exist for all practices in the country.

Under a joint project of NRSA and the United States Nuclear Regulatory Commission (US NRC), a database of all radioactive sources has been established. The database is called RASOD and it contains information on sealed sources, unsealed sources, generators of ionizing radiation; and, facilities, containing sources (sources which are located inside the facilities). RASOD was created considering the structure of the IAEA database RAIS to provide maximum opportunity for the easy exchange of information between RAIS and RASOD. RASOD automatically calculates the current activity and categorization of a source (categorization is made in accordance with IAEA-Safety Guide-No RS-G-1.9 [13]).

NRSA's inspectors have completed an inventory of SIR in all regions of Tajikistan as input to RASOD. Information from RASOD is used by inspectors from the License and Inspection Department of NRSA when establishing their annual inspection plan. RASOD also provides an opportunity to identify the number of personnel involved in activities with those sources. All individuals who require dosimetry services are identified and obliged to make use of external dosimetry services.

Occupational exposure control is one of the services provided by the TSO to NRSA and operates as a separate section (the OECSS). The management of staff requiring dosimetry services, as identified through RASOD, are obliged under legislation to ensure their staff undertake occupational exposure control every quarter (3 months). Thermoluminescent dosimeters (TLD) are issued to all identified staff at organizations making use of SIR.

The basic tasks and functions of the OECSS include:

→ accounting for, and control of, occupational exposure of staff whose activity is related to the use of SIR

- → submission to the public of information on the results of its activities where these are not a subject of state, service or commercial secret, and preparation of an annual report about its activities
- → facilitation of knowledge in the field of radiation safety
- → dose record keeping services.

In carrying out these tasks, the OECSS undertakes the following activities:

- → Quarterly accounting for and control of occupational exposure.
- → Analysis of received data and drawing conclusions.
- → If an abnormal occupational exposure is identified, immediately contacting the Licensing and Inspection Department under NRSA and, together with their inspectors, participate in further case investigation and implementing actions if exposure limits are exceeded.
- → Within its competence, supports direct communication with interested organizations and authorities (stakeholders).

A Secondary Standard Dosimetry Laboratory has been established as a calibration laboratory through the IAEA national project TAD/6/004 "Establishment of Radiation Protection Calibration Service in Tajikistan". Personnel have been properly trained, and the equipment delivered.

As of June 2019, dose recording is required through PORB-08, Rules on ensuring the radiation safety, registered at the Ministry of Justice, No. 402 on 18 July 2008 [4]. This is referred to in Chapter 2.13 “Organizational control during the works with sources of ionizing radiation”, Item 2. Since this time, almost all potentially exposed workers in the medical sector have been provided with personal dosimeters. Over 800 workers in the country are covered by the personal dosimetry service (250 organizations).

There is only one external dosimetry service provided by the TSO of NRSA. Its dosimetry capacity was upgraded through the IAEA national project TAD/9/004. The extension of the system with the development of other centers in another region is being considered due to transportation problems and in-time delivery.

INDIVIDUAL MONITORING FOR INTAKE OF RADIONUCLIDES

The Nuclear Medicine Department under the Institute of Gastroenterology, the Ministry of Health is the only user of unsealed sources of radioactivity in Tajikistan. The Nuclear Medicine Department was established through the IAEA National project TAD/6/002 "Upgrading Nuclear Medicine Services" in order to improve technical capabilities in providing nuclear medicine for better patient care and treatment. It has been equipped and upgraded through different international projects and is considered to be one of the leading providers of nuclear medicine in the Central Asia region.

With only one user of unsealed sources of radioactivity in the country, no internal dosimetry service capacity has, as yet, been developed in the country for monitoring the intake of radionuclides in individuals. Such a capacity should be established to provide an adequate internal dosimetry service to all occupationally exposed workers of practices using unsealed sources in medical (nuclear medicine, radiopharmacy) and other applications. The internal dosimetry service should be provided according to the IAEA safety standards.

WORKPLACE MONITORING

Requirements for workplace monitoring are specified in PORB-08, Rules on Ensuring the Radiation Safety [4]. This is referred to specifically in Chapter 2.13 “Organizational control during the works with sources of ionizing radiation”, items 2.13.1; 2.13.3 – 2.13.5. All workplace monitoring services should use proper operational quantities. When required, equipment calibration should be done on an appropriate phantom and calibrations should be documented and traceable to primary or secondary standards. The equipment

should be type-tested and suitable for the purposes for which it is being used. Required performance testing should be carried out according to the IAEA standards and overall uncertainty should be assessed and meet the requirements of the IAEA standards.

According to the latest international recommendations [17], workplace monitoring is the responsibility of the licensee. However, since most organizations do not have the necessary equipment to carry out workplace monitoring, they ask the TSO to perform this service. All workplace monitoring services are provided by the Technical Services Laboratory under NRSA. The IAEA has provided equipment for the quality control of X-ray generators as well as a hand-held multi-channel analyzer with full accessories. The department has been further equipped and upgraded through different bilateral and multilateral projects with the UK, USA ISTC, UNDP and the Organization for Security and Cooperation in Europe, etc. and currently possesses modern up to date equipment with trained staff.

There are practice-specific codes on workplace monitoring that cover X-ray diagnosis and radiotherapy. A practice-specific code for nuclear medicine is currently in the approval process. Regulations covering workplace monitoring in nuclear medicine and radiotherapy are in the process of development.

Provisions for workplace monitoring in X-ray diagnostics are provided in hygienic requirements to facilities and operation of X-ray rooms, apparatus and carrying out X-ray examinations sanitary norms and rules, San Pin 2.6.1.007-07 registered at the Ministry of Justice, No. 257 on 16 April 2007 – Attachment 11, and workplace monitoring is fully provided throughout the country. The Technical Services Department under NRSA has a full set of appropriate instrumentation for carrying out this service.

SERVICES PROVIDERS

The purpose built National Educational and Training Center on radiation safety and security provides the appropriate facilities for the development of sufficient human resources to strengthen the radiation safety and radiation protection infrastructure in Tajikistan both for regulators and licensees. It also ensures all technical service support is in place both for the regulator and licensees.

National training courses for regulators, radiation workers, radiation protection officers, law-enforcement agencies and others are conducted in these newly constructed premises. Theoretical sessions are conducted in the Training Center and practical sessions are conducted in the Technical Services Laboratory. A number of MoU's are signed with different ministries, authorities, and universities to train their staff in the field of radiation safety and security.

In the future, the Technical Services Department will be enhanced to provide equipment maintenance and repair services. Currently there are no repair services in the country now and implementation of the requirements falls to end users.

All non-exempt practices are licensed, and end users are obliged to implement all legislative documents with compliance being examined during NRSA inspections. End users sign agreements with the Technical Services Department of NRSA for all necessary technical services for getting a license or maintaining it and in order to be in compliance with end user requirements.

3.4.3 Radiological protection in medical exposure

Medical uses of radiation sources in Tajikistan include 1828 diagnostic X-ray devices (150 not operational), one Co-60 radiotherapy unit, one Co-60 brachytherapy after-loader, and one gamma-camera within a nuclear medicine department. A register of all radiation sources is held by the NRSA.

Laws and Regulations related to radiological protection in medical exposure have been drafted with the help of the IAEA and NRPA (DSA) experts to be in conformity with IAEA Safety Standards. Drafts of regulations related to medical exposure (diagnostic radiology, interventional radiology, nuclear medicine and radiotherapy), as well as on education and training for radiation protection of patients and medical physicist's education and training are due to be finalized. Codes of Practice have been issued for both X-ray diagnostics and radiotherapy and a code of practice for nuclear medicine is under development. Licensing, inspection and enforcement activities are in place in compliance with IAEA recommendations.

Qualified experts are available in the field of medical physics (diagnostic radiology) and radiotherapy to implement radiation protection programs and medical and paramedical staff receive appropriate radiation protection training. A formal procedure is in place for recognizing qualified experts in medical physics.

In order to establish systematic training program for medical physicists, medical and paramedical personnel performing radiotherapy procedures, a national project was implemented TAD/0/003 "Establishing a National Educational and Training Centre on Radiation Protection". The aim of the project was to establish a National Educational and Training Centre on Radiation Protection for the development of sufficient human resources to strengthen the radiation safety and radiation protection infrastructure in Tajikistan. Three national courses have already been held on train-the-trainers. Instructors and lecturers for this training center were trained through IAEA fellowships.

A national strategy for education and training in the field of radiation safety has been elaborated and agreed with all ministries and authorities and is currently in the Parliament of the Republic of Tajikistan for approval. A set of legal documents on education and training in the field of radiation safety and security have also been elaborated. A training syllabus has been developed on Radiation Protection for systematic training of qualified experts in diagnostic radiology. A training syllabus for appropriate medical physicists, medical and paramedical personnel performing radiotherapy procedures has also been elaborated which is in full compliance with IAEA standards. The center also promotes awareness about the potential for radiation injuries in interventional procedures using X-rays. Master's degree courses on radiation safety have also been introduced that cover topics related to medical exposure and an annual syllabus for training students from medical universities, radiation workers and RPOs has been developed. There are also short-term courses focused on physicians performing interventional procedures and refresher training for medical physicists in diagnostic radiology is provided. Medical physicists are also regularly trained through the IAEA regional training events related to medical exposure. Special training software was installed at the training center in 2017 by experts from Belarus State University that enables the knowledge of the students and physicians undertaking training to be evaluated and an appraisal of the training infrastructure was undertaken as part of an IAEA EduTA mission in 2018.

Two new IAEA National Projects have been implemented and submitted:

- → TAD/6/006 "Providing Radiotherapy Services in the Sugd Regional Cancer Centre" for 2014-2015 with further extension to 2017
- → A new project concept for 2018-2021 cycles "Upgrading Capabilities of the Central and Northern Oncology Centers in Tajikistan".

The objectives of these projects are to upgrade radiotherapy and brachytherapy services, particularly in the Sugd region of northern Tajikistan through the provision of modern equipment, training and expert advice on relevant technical and clinical aspects, and to establish a regional radiotherapy service in the north and strengthen the capacity of the central radiotherapy service in Tajikistan. Through these projects' oncologists, technologists and medical physicists of both centers have been trained.

OPTIMIZATION IN DIAGNOSTIC RADIOLOGY

Reject/retake analysis in diagnostic radiology facilities and measurement of patient doses are governed by Rules of Ensuring Radiation Safety (PORB-08) [4], specifically chapter 3 "Radiation protection of patients and population during medical exposure". However, not all hospitals have the necessary infrastructure for monitoring patient doses to be in compliance with this legislation.

Diagnostic Reference Levels (DRLs) have been adopted but, due to the fact that the X-ray apparatus used in all hospitals is too old, it has not been possible to implement the DRLs. Currently activities are ongoing to monitor the average doses released by all X-ray apparatus in the country and to issue new average DRLs based on these data. The new DRL values will be reflected in new Norms of Radiation Safety.

In accordance with Appendix 10 of “hygienic requirements to facilities and operation of X-ray rooms, apparatus and carrying out X-ray examinations” (No. 257), registered in the Ministry of Justice from 16 April 2007, and “requirements for carrying out quality control in medical X-ray diagnostics” (No. 573), registered in the Ministry of Justice from 23 April 2010, surveys on image quality is an obligation of users which should be fulfilled. Diagnostic radiology quality assurance services are provided by different companies, including NRSA's Technical Services Department that regulated licensees can make use of. The format and content of quality assurance programs are regulated by the above-mentioned documents and regulated by NRSA's inspection checklists. Common protocols have been adopted and introduced.

Earth screens are primarily only used in private hospitals since there is limited budget available for providing rare earth screens to governmental hospitals. However, some screens are provided to governmental hospitals by support of international donors. With the use of rate earth screens being primarily by private companies, doses have not been confirmed although from the limited use in governmental hospitals doses appear to be reduced by changing to rare earth screens for diagnostic radiology.

OPTIMIZATION IN RADIOGRAPHY, FLUOROSCOPY, MAMMOGRAPHY, COMPUTED TOMOGRAPHY (CT) AND INTERVENTIONAL PROCEDURES USING X-RAYS

Some digital radiography units delivered by private companies have started to operate under license. Old direct-viewing fluoroscopic units are no longer used in Tajikistan; fluoroscopic units are used only with X-ray image amplifiers. There are four modern mammography units in the country, as well as 40 CT units (in 2019), most of which are modern. Special low dose protocols haven't been introduced for CT units, but special protocols for pediatric examinations have been developed and introduced. Four interventional X-ray units are also present in the country that, with support from the IAEA, have dose monitors installed.

All the requirements and provisions stated in the hygienic requirements to facilities and operation of X-ray rooms, apparatus and carrying out X-ray examinations (No. 257) and the requirements for carrying out quality control in medical X-ray diagnostics (No. 573) are applied to digital radiography, fluoroscopic, mammography, CT and interventional procedures using X-rays. The requirements ensure optimization in each field. The format and content of quality assurance programs are also regulated by these requirements and are regulated by NRSA's inspection checklists. Common protocols have been adopted and introduced.

The TSO to NRSA provides technical services to users which covers also quality control and quality assurance programs for fluoroscopic systems, mammography and CT. Regulated licensees make use of these services on a regular basis to fulfil their obligations under the requirements for carrying out quality control in medical X-ray diagnostics (No. 573), which are in full compliance with IAEA standards.

Currently there is no program approved by the Ministry of Health on changing old fluoroscopic units and other X-ray apparatus to new ones. Delivery of new units is taking place mostly in private hospitals. Some

funds have been allocated from the State budget to change old units, but mostly this occurs through international donors.

OPTIMIZATION IN NUCLEAR MEDICINE AND RADIOTHERAPY

There is only one nuclear medicine department for the whole of Tajikistan, which is under the Institute of Gastroenterology of the Ministry of Health. There is also only one oncology center with a radiotherapy unit separate from nuclear medicine center, which is in Dushanbe. Under the IAEA national project TAD/6/003 "Upgrading Radiotherapy Services at the Republican Clinical Centre of Oncology", the center was upgraded to provide radiotherapy services for the treatment of cancer at the Republican Clinical Centre of Oncology (RCCO). The radiotherapy unit is staffed by qualified experts that are available to implement radiation protection programs, and appropriately qualified medical and paramedical staff with appropriate radiation protection training. All staff of the radiotherapy unit have been trained via several IAEA training courses, fellowships and scientific visits and continue to refresh their knowledge by means of IAEA regional training courses, workshops and attendance in technical meetings. RCCO's staff have, to date, undertaken 11 fellowships and 1 scientific visit in very experienced hospitals in Europe.

There are no companies in Tajikistan for the maintenance and servicing of nuclear medicine/radiotherapy equipment and radiation measuring instruments of regulated licensees are not calibrated by an accredited organization.

Protocols for calibration and radiation protection quality assurance programs in the nuclear medicine facility and for optimization of radiation protection in nuclear medicine are under elaboration. The protocols are fully completed and have been checked by IAEA experts although approval is pending since Law 42 [1] is currently under revision in order to bring it in full compliance with IAEA GSR Part 3 [10]. National procedures require that the Law should be approved first and, based on the Law provisions, the secondary legislation will be approved.

Guidance levels for radiopharmaceutical activities have been adopted from the BSS [10] and checked by NRSA's inspectors. Guidelines for the release of patients after radionuclide therapy are being developed, but meanwhile the Nuclear Medicine Department is making use of IAEA standards since this department was established by IAEA project TAD/6/002 "Upgrading Nuclear Medicine Services". This project helped improve the technical capabilities of the Institute of Gastroenterology in providing nuclear medicine for better patient care and treatment and currently they are making use of all IAEA standards in their area, despite of the fact that there are no requirements issued by NRSA.

Mechanisms for reporting the misadministration of therapeutic amounts of radiopharmaceuticals and for reporting accidental medical exposures in radiotherapy are under elaboration.

3.4.4 Management of Naturally Occurring Radioactive materials

ENVIRONMENTAL MONITORING PROGRAM FOR AUTHORIZED PRACTICES

Currently, there is no environmental monitoring program associated with authorized practices for public radiation protection purposes in Tajikistan that would meet the requirements of the BSS [10] regarding public exposure.

Quarterly environmental samples such as grass, soil and surface water are collected from around the Faizabad Radioactive Waste Facility and sent to the Epidemiology Centre for analysis. All results have been near background and there has not been any indication of radionuclide migration from the facility. However, groundwater monitoring has not been performed to date although the necessary monitoring equipment has recently been provided. Equipment is needed to enable monitoring of the radiological

conditions at the facility to be undertaken, however, conditions appear to be in compliance with internationally acceptable standards.

CONTROL OF FOODSTUFFS AND SELECTED COMMODITIES.

In order to implement a national monitoring program for the control of levels of radioactivity in foodstuffs and selected commodities, a national project was submitted by Tajikistan to the IAEA and was funded for the cycle 2009-2011. The project was TAD/5/004 "Improving Laboratory Capacity for Food Safety". The objective was to provide assistance in establishing a central laboratory for the analysis of contaminants and residues in food and agricultural products as well as satellite laboratories at the border with neighboring countries. The established laboratories network in Dushanbe and other regions of Tajikistan is now providing comprehensive control of foodstuffs and selected commodities.

CONTROL OF CHRONIC EXPOSURES (RADON, NORM AND PAST PRACTICES).

There are a considerable number of former uranium mining and ore reprocessing sites within Syr Darya river basin. Wind and rain transport residues from dumps into the Syr Darya River, which is used for irrigation, swimming, and for drinking water by citizens of northern Tajikistan. The river also flows through the densely populated regions of Ferghana valleys with a population of more than 20 million. Sheep, goats, and cattle also have open access to uranium legacy sites and some members of the public obtain their harvest from these sites. Water, which is used for irrigation in these areas, is contaminated and exceeds the norms several times over.

Remediation of uranium legacy sites is therefore required, and some mitigation activities have already been undertaken to reduce risks associated with radiation exposure at such sites. For example, an information campaign has been undertaken involving both training and raising awareness:

- From 2003 to 2012 in Taboshar city, a youth environmental movement "Green Patrol" was established. This movement, which has more than 120 members, has evolved to cover all six schools in the city. Lessons have been conducted on radiation safety in Tajik, Russian and Uzbek and guides for radiation safety, themed banners, posters, banners were developed, published and distributed to students and adults. Discussions, lectures, ecological weeks and films were also held in the schools of the city.
- Two educational films "Salvation through action" and "Action for Life" have been produced, based on accumulated information on radioactive waste in Taboshar, and aired on Soghd Regional TV. Environmental experts were consulted and explained the rules of behavior in the vicinity of uranium tailings within the films.

In addition to raising awareness, some more practical mitigation measures have also been undertaken. For example, a fence has been restored around the so-called "acid lake" to prevent public access to potentially dangerous areas. Citizens were involved in the operation and gained personal experience of the issues. Events were also organized to clean mudflow dumps and partial works were performed to cover uranium waste tailings with soil to prevent flushing of the tailings. In 2012, as part of an information campaign on water sanitation in terms of radiation protection, the following activities were undertaken:

- Work was carried out on the territory of school No.5 to ensure water supply for drinking and irrigation.
- A metal mesh fence was constructed along the perimeter of the school to allow a future gardening campaign to be carried out.
- Three public clean-up works were undertaken with the involvement of citizens.

OCCUPATIONAL EXPOSURE TO NATURAL SOURCES OF IONIZING ACTIVITY

Uranium ore processing facilities in Tajikistan are no longer operational. However, uranium tailings remain and only those close to human settlements have been subject to any form of remediation. Several IAEA regional and national projects have been implemented to monitor the tailings' and a new project will soon

be implemented with the European Commission on the purification of mine, technical and drainage waters against uranium as well as for physical remediation of uranium tailings in Taboshar and Degmay. The owner of uranium tailings, the State Enterprise "Vostokredmet", has established through these projects a monitoring laboratory and trained its staff. They are operating software "ECOLEGO" recommended by IAEA which has a capacity to evaluate occupational doses.

CONTROL OF RADIOACTIVITY IN MATERIALS FOR RECYCLING.
Since 2007, several scrap metal recycling facilities have operated in Tajikistan. In this regard, NRSA elaborated and approved "Requirements for ensuring radiation safety during collection (blank) of scrap metal and wastes of ferrous and nonferrous metals", registered in the Ministry of Justice (613) from 17 June 2011. Physical and juridical persons dealing with collection of scrap metal and wastes of ferrous and nonferrous metals are obligated to fulfil these requirements. The requirements set out provisions to ensure radiation safety during collection of scrap metal and wastes of ferrous and nonferrous metals, including organizing and carrying out radiation control of scrap metal, carrying out a survey of transportation (equipment) intended for scrap metal cutting, as well as compiling radiation sampling / survey results.

3.5 Emergency Preparedness and Response

3.5.1 General Principles on Operation of State Civil Protection System

BASIC RESPONSIBILITIES.
In 2011, the Republic of Tajikistan ratified: 1) Convention on early notification of a Nuclear Accident and 2) Convention in assistance in case of a Nuclear Accident or Radiological Emergency.

As the regulatory body for all radiation safety and security matters, NRSA is responsible for approval of norms and rules in radiological emergency planning. The functions and responsibilities of users (licensees) for ensuring the protection of workers and the public in the event of radiological emergencies are clearly defined by the Law on Radiation Protection (Article 23) [1] and in the updated regulation. Requirements on measures which should be taken in emergencies during transportation of radioactive materials are detailed in chapter 22 of the safety rules during transportation of radioactive materials (No.599) [5] that were developed based on IAEA document TS-R-1 (ST-1 revised, IAEA, 2000) [18] and fully includes all its provisions.

NRSA works in good cooperation with the Committee for Emergency Situations and Civil Defense (CES CD) under the Government of the Republic of Tajikistan. Under existing legislation, the CES CD acts as a national co-coordinating authority and is the executive body of the Uniform State Emergency Prevention and Elimination System (USEPES). The USEPES unites governmental bodies, local executive and administrative bodies, enterprises and institutions authorized to take preventive and elimination measures in the event of any emergency or accident of natural and man-made character including radiation and nuclear emergencies. It consists of permanent functional (branch) and territorial subsystems, including state, regional, local, and enterprise (operator) levels, each coordinated by the CES CD.

The USEPES is established based on an all-hazard concept, and the management staff and procedures will depend on the specific emergency. Accidents and abnormal events with radioactive sources are coordinated by the Department for Protection of the Public and Territories (DPPT) under the CES CD. There is a national 24 hours/day and 7 days per week point of contact established at the Emergency Management Center at the CES CD to receive notifications of any actual or potential emergencies.

The roles, functions, authorities, and responsibilities of the off-site response organizations acting within the framework of USEPES are to be documented as part of the appropriate national and local emergency response plans that are in the process of preparation. To properly organize an emergency response management system, procedures/instructions for the coordination of organizations involved in nuclear and radiological emergencies need to be established.

The Education and Training Service section under the TSO to NRSA regularly provides courses for transport workers and other involved individuals and organizations on the relevant emergency preparedness and response provisions and how to apply them at a regional training center. This training facility also regularly conducts emergency exercises with law-enforcement agencies as well as enterprises involved in transportation activity to ensure that an effective and smooth mechanism is in place for any emergencies that may arise in the future.

ASSESSMENT OF THREATS

A threat assessment and categorization of facilities/practices in accordance with the five threat categories of GSR Part 7 [15] has not been done by Tajikistan authorities. A brief assessment conducted by the Emergency Preparedness Review Service mission in December 2007, in accordance with Table I of the GS-R-2 [14] identified facilities/practices in threat categories III, IV, and V.

Notably, there is a facility-oriented approach to categorizing radiation-related hazards established by the "National Basic Sanitary Rules for Ensuring Radiation Safety" (PORB-08) [4]. The four facility categories specified in this document are utilized to implement a graded approach to regulatory requirements for the design, siting, and construction of radiation facilities, including the requirements for emergency response actions within the design documentation.

NSRA maintains a register of all facilities and radioactive sources used or stored throughout Tajikistan.

PROTECTING EMERGENCY WORKERS

Requirements on protection for emergency workers are determined by the National Safety Standards (NRB-06) [3] and other subordinate regulations. NRB-06 defines the maximum single year dose limit for occupational exposure in case of emergency situations (50 mSv), with the exception of saving lives and/or preventing overexposure of people. Operators are required to ensure the availability of radiation control devices and individual dosimeters and to have emergency stock of protective equipment.

Practical arrangements are in place for handling emergencies involving uncontrolled sources: the CES CD first responders team has individual direct-reading electronic dosimeters, TLDs and protection equipment. First responders have also been trained to undertake emergency response actions under hazardous conditions.

The NRSA has the capacity and qualified personnel to assess and record the external doses received by emergency workers as well as by other personnel who can be involved in undertaking response actions. However, a formal procedure for record-keeping and controlling the doses received by emergency workers has not yet been established.

ASSESSING THE INITIAL PHASE

The National Safety Standards (NRB-06) [3] established default operational intervention levels (OILs) of dose for acute exposure by organ or tissue and generic action levels for foodstuffs which are consistent with those given in Annex II and III of GS-R-2 [14]. These levels will be updated according GSR Part 3 [10]and GSR Part 7 [15].

MANAGING THE MEDICAL RESPONSE

No special services or procedures are in place for the medical response to a radiological emergency. However, a standard procedure may be provided to overexposed people in the National Burn Management Center with the support of radiologists from the National oncology center. Efforts are being made to improve the situation.

TAKING AGRICULTURAL COUNTERMEASURES AGAINST INGESTION AND LONGER-TERM PROTECTIVE ACTIONS

A group of experts from the Ministry of Agriculture, the Ministry of Irrigation, the Ministry of Emergency and Civil Defense, Sanitary and Epidemiological Service, Veterinary Service, and the NRSA is responsible for planning and implementing agricultural countermeasures. The group of experts was assigned by the Interagency Council on Radiation Safety.

Officially established procedures for restricting consumption of locally produced foods are in place. The responsibility for implementing this measure is assigned to the Sanitary and Epidemiological Service and Veterinary Service. General rules for implementing countermeasures are also in place. Procedures to implement countermeasures for specific areas (e.g. food production including livestock, gardening, forest products, fishing and water supplies) are under development.

The Radiation Safety Standards (NRB-2006) established intervention levels for environmental measurements (dose rates, levels of soil contamination) and generic action levels above which foodstuffs must be restricted for general consumption for one year after an emergency, which are in full compliance with the international recommendations. The generic action levels for drinking water are established in NRB-06, Annex II-2.

Procedures on the management of radioactive waste arising as a result of agricultural countermeasures being implemented are under development. The development of procedures/guidance concerning agricultural countermeasures, including the establishment of OILs, will take into consideration new recommendations of IAEA established in new BSS [10] or GSG-2 [19].

MITIGATING THE NON-RADIOLOGICAL CONSEQUENCES OF THE EMERGENCY AND THE RESPONSE.

In accordance with their statute, the NRSA and the CES CD media center are responsible for communication with the public to explain health risks and which measures can reduce the risks from radiation exposure. Press-centers established in the Ministry of Internal Affairs and the Ministry of Emergency and Civil Defense are ready around the clock to advise the population about risks, rules of conduct and about medical establishments available to help them. The NRSA annually issues information leaflets to the public about radiation that helps to keep them informed and avoid inappropriate actions in case of a nuclear or radiological emergency.

There are 14 established civil defense services which include units of the Ministry of Internal Affairs, the Ministry of Health, community services and special unit of the Ministry of Emergency and Civil Defense. One of the tasks of these services is the prevention of panic in emergency situations.

3.5.2 Functional Subsystem for the Safety of Nuclear Facilities

1) General Provisions

ESTABLISHING EMERGENCY MANAGEMENT AND OPERATIONS.

The NRSA implements an authorization and inspection program, which includes control of EPR arrangements at all facilities and practices dealing with radioactive and nuclear materials. According to ‘The Regulation on Procedures for Registration, Execution, and Issuing of Licenses’ (January 2006), a plan

for responding to a potential radiological emergency or accident is a prerequisite for issuing an authorization (license) for any practice or source which could give rise to a radiological accident or emergency. The command and control system for local and national response to any emergency is realized through the USEPES.

IDENTIFYING, NOTIFYING AND ACTIVATING.

There is a national 24 hours per day and 7 days per week point of contact established at the Emergency Management Center at the CES CD to receive notifications of any actual or potential emergencies.

Owners of scrap metal shipments across the border into Tajikistan are required to provide clearance from NRSA to a customs officer, confirming that the shipment does not contain radioactive materials. To get the clearance the shipment owners must invite an NRSA worker to measure radioactivity of the cargo. No written regulations currently exist on notification of a suspected emergency, but personnel of scrap metal collection facilities and custom officers, as well as local officials, know unofficially of the necessity to notify the CES CD and the NRSA. The process of equipping Tajikistan borders with portal monitors is underway and the NRSA is developing special regulations.

The USEPES provides for prompt notification and initiation of an off-site response in the event of a conventional emergency which seems to be functioning adequately in the event of radiological hazards. Potentially available off-site first responders include local medical and fire brigades, emergency service personnel, and local officials who should support the early response. Most of these responders are trained based on an all-hazard approach and are not given special instructions concerning radiation indicators and immediate actions warranted if radiological consequences are suspected. For events involving uncontrolled (orphan), radioactive sources and their illicit trafficking, a dominant role in initiating and performance of response actions are allocated to the DPPT and staff of the Radioactive Waste Storage Facility. The DPPT has experienced staff trained in radiation protection.

TAKING MITIGATING ACTION.

Expertise and professional radiological assessment can be provided promptly in the case of a nuclear or radiological emergency by the Research Department of NRSA, Republican Chemical and Radiometric Laboratory of CES CD, and the Physics and Technical Institute of the AS RT. Some other institutions are also available, in which radiation professionals are skilled in measuring radiation levels and contamination. However, in most cases, the expertise and services in question are provided by the DPPT and its Republican Chemical and Radiometric Laboratory whose capabilities are not yet sufficient but are being upgraded.

Existing regulations require all operators to elaborate and agree upon with the relevant state authorities a special “instruction on the prevention of accident and fire and actions to be taken for the mitigation of their consequences”. Most operators have these instructions in place, and they are updated through the ongoing licensing process. Under the Law on Radiation Protection (article 23) [1], licensees are required, in the event of a radiation accident, to make arrangements to localize the source of the radioactive contamination, prevent releases of radioactive materials, and make arrangements to return the radiation situation to a normal safety state. However, the capabilities of operators to meet this requirement may be insufficient. The consistency is checked during the ongoing licensing process.

In the CES CD there is a team of radiologists trained for searching for lost sources. The CES CD and NRSA are equipped with several sets of searching detectors and staff are trained in performing this task. More than 200 orphan sources have been discovered within the framework of the international Global Search and Secure Program.

TAKING URGENT PROTECTIVE ACTION

Seemingly there are neither facilities nor practices in Tajikistan that would warrant urgent protective action off-site. The appropriate arrangements for effectively making decisions on urgent protective actions may be related to some exclusive situations, e.g. large scale radionuclide contamination of the area owing to a large transport accident or terrorist attack. Nevertheless, national legislation and national safety standards (NRB-06 [3]) addresses this issue, and the USEPES structure is prepared for implementing protective actions in case of large-scale radionuclide contamination. Within the framework of the USEPES, the decision on implementation of urgent protection actions will be taken by the local and/or regional officials according to the local/regional off-site emergency plan. The CES CD is a major body responsible for taking and implementing decisions.

The National Radiation Standards (NRB-06) [3] establish national intervention levels which are generally consistent with international standards.

The arrangements to ensure the safety of all persons on the site is the responsibility of the operator, and this requirement is included in the Law on Radiation Safety [1]. The facilities in threat categories III and IV have instructions on actions of personnel in the case of a radiation accident. However, there is no substantial information on how these instructions are implemented in practice.

2) NRSA Information and Emergency Center

PROVIDING INFORMATION AND ISSUING INSTRUCTIONS AND WARNINGS TO THE PUBLIC.

This requirement contains specific guidance on providing instructions to the population within the emergency planning zones around facilities in threat categories I and II. In Tajikistan, this requirement may be applicable only to some exclusive radiation emergencies (e.g., a large transport accident, a fire involving a source, or large-scale contamination). Notification of the endangered population in the event of such emergencies is addressed in the Law on Radiation Safety [1], but no practical arrangements are currently in place.

KEEPING THE PUBLIC INFORMED

The CES CD has a 24/7 press-center which is the single point for informing the public and mass media regarding any emergency occurring in the territory of Tajikistan. It organizes press conferences for the mass media on a regular basis and is responsible for keeping the public informed about any emergency situation in the country. However, at present, information being presented on this subject is not sufficient.

3) Emergency training

Several training courses have been organized by IAEA on EPR to nuclear and radiological accidents in the country, where a number of participants from the CES CD have participated.

4) Automated Incident and Emergency Centre (IEC) Systems

There is currently no automated IEC system established in Tajikistan, but there is a national 24 hours/day and 7 days per week point of contact established at the Emergency Management Center at the CES CD to receive notifications of any actual or potential emergencies.

3.5.3 Radiation monitoring

Tajikistan is not a member of the INES Platform.

NRSA, in cooperation with the CES CD, elaborated a National Plan (Program) on EPR (Approved by Government on 2013 #770) in compliance with IAEA standards. Under this program, it is planned to develop several legislative documents to implement IAEA Safety Standards on EPR.

Currently, radiation monitoring for the detection of nuclear and radiological emergency situations in the country is carried out manually by the CES CD on a local basis.

3.6 Radioactive Waste Management, Including Decommissioning and Remediation

3.6.1 Regulation on Safety in Management of Radioactive Waste

The legislative framework for radioactive waste management (RWM)is provided primarily through three main laws:

- Law on Radiation Safety (Law 42), issued 1 August 2003 [1].
- Law on Use of Atomic Energy (Law 69), issued 9 December 2004 [2].
- Law on Radioactive Waste Management (Law 1002), issued 22 July 2013 [7].

In addition, other laws, Governmental decrees, regulations, requirements, rules, norms and other legislative documents have a direct impact on the legislative framework for RWM:

- Law on Licensing of Specific Types of Activities (Law 37), issued 17 May 2004 [9] (new edition in 2009).
- Law on the Protection of the Environment (Law 760), issued 2 August 2011.
- Law on Civil Defense (Law 6), issued 28 February 2004.
- Law on Protection of the Public and Territories from Emergency Situations of Natural and Man-made Radiation (Law 53), issued 15 July 2004.
- Law on Emergency Rescue Services, Emergency Rescue Forces and Status of Rescuers (Law 83), issued 1 March 2005.
- Law on Inspection of business entities' activities in the Republic of Tajikistan (Law 194), issued 28 July 2006.
- Decree of the Government of Tajikistan (No. 482), adopted 3 December 2004, making provision for State regulation in the area of radiation safety.
- Decree of the Government of Tajikistan (No. 172), adopted 3 April 2007 (new edition in 2009), making provision for licensing of specific types of activities [11].
- Decree of the Government of Tajikistan (No. 471), adopted 2 December 2005, making provision for the inter-agency Council on Radiation Safety.
- Decree of the Government of Tajikistan (No. 479), adopted 27 November 1999, on the relevant responsibilities of the Ministry of Emergency Situations and Civil Defense of the Republic of Tajikistan.
- Norms on radiation safety (NRB-06) SP 2.6.1.001-06 (No. 237)- registered in the Ministry of Justice from 16 January 2007 [3].
- Rules of ensuring radiation safety (PORB-08) (No. 402)- registered in the Ministry of Justice from 18 June 2008 [4].
- Different inspection checklists based on IAEA's recommendations developed for X-ray diagnostics, computed tomography, radiotherapy, brachytherapy, X-ray therapy, radiopharmaceuticals, nuclear medicine departments, industrial organizations which are using sources of ionizing radiation, industrial radiography; radioisotope facilities, sources of ionizing radiation used in education and research, and radioactive wastes (No. 457) - registered in the Ministry of Justice from 26 November 2008.

- → Rules on carrying out inspections of business entities' activities in the Republic of Tajikistan by Nuclear and Radiation Safety Agency (No. 529) - registered in the Ministry of Justice from 19 June 2009.
- → Safety rules during transportation of radioactive materials (No. 599) - registered in the Ministry of Justice from 26 January 2011 [5].
- → Requirements for ensuring the physical protection of facilities and storages with radioactive sources and wastes (No. 601) - registered in the Ministry of Justice from 09 February 2011 [6].
- → Rules on radioactive waste management (No. 608) - registered in the Ministry of Justice from 11 April 2011.
- → Requirements for ensuring radiation safety during collection (blank) of scrap metal and wastes of ferrous and nonferrous metals (613) - registered in the Ministry of Justice from 17 June 2011.

These documents will be updated in according with IAEA GSR Part 3 [10].

3.6.2 National Waste Management Policy and Strategy

The overall policy and strategy for RWM are provided in a set of documents, namely the Law on "Radioactive Waste Management" [7] and "Requirements on radioactive waste management" [20]. In addition, for solving the problem of uranium industry wastes in northern Tajikistan a National Strategy on remediation of uranium tailings for the years 2014-2024 has been approved [21].

3.6.3 Management and Disposal of Radioactive Waste

The only long-term storage facility in the country is the Faizabad Radioactive Waste Repository which has been in existence since 1962. It is a former Soviet Union Radon prototype II facility located in a mountainous area about 45 km east of Dushanbe, near the town of Faizabad. The facility was fully upgraded and reconstructed in 1982 through bilateral projects with the USA and UK, and currently it has modern equipment and facilities for the handling, transport and temporary storage of radioactive sources following the recovery of an orphan or vulnerable source. The facility is under the control of the City of Dushanbe but is secured by the forces of the Ministry of Interior.

The facility consists of a buffer area and a restricted area (6 hectares) where radioactive material is stored, partly in above-ground buildings and partly in underground disposal sites. Features of note at the repository are as follows:

- → Sealed sources for disposal are placed in underground concrete vaults and then covered. The facility contains about 4.6 PBq of activity. Two wells in the rear of the facility are used for high activity sources.
- → There is one underground, steel-lined, concrete tank that contains approximately 130 m^3 of liquid radioactive waste. There are indications that the tank has been breached, with groundwater moving freely in and out of the tank.
- → There are two locations at the facility where radioactive waste has been directly buried in the ground. One location contains a high activity Cs-137 source mixed with concrete. The other has been used for the disposal of animals used for medical experiments.
- → There is a further series of concrete vaults that have been filled with radioactive waste other than sources.

Records are maintained at the repository site. A number of technical problems have been identified, including:

→ Improvement of the old storage facility to meet more modern standards.

→ Management of 120 m^3 of liquid radioactive waste.

→ Management of 4 radioisotope thermoelectric generators.

→ To solve the problem of long-term and sustainable energy and water supply.

→ To change existing radio-dosimeter units of 1972-1987 to the new and modern ones.

→ To solve the issue of creating the own laboratory of RWDS for investigation of water, soil, and plants.

3.6.4 Release of Radioactive Materials from Regulatory Control

The Norm on Radiation Safety (NRB-06) [3] requires a licensee to control radioactive discharges. Criteria for discharges and requirements based on optimization are provided in Rules of Ensuring Radiation Safety (PORB-08) (No. 402) [4]. Provisions to prevent unplanned or uncontrolled releases are provided in Rules on Radioactive Waste Management (PORO-11) (No.608) [11], which also establishes criteria for radioactive discharges in accordance with WS-G-2. Further development of criteria to regulate discharges may be required. The annual effective dose for the population is 1 mSv.

3.6.5 Decommissioning

The overall national policy and strategy for decommissioning of nuclear and other facilities are provided in a set of documents, namely in the Laws of the Republic of Tajikistan on "Radiation Safety" [1] and "Use of atomic energy" [2].

3.6.6 Remediation of Legacy Sites and Radiation Sources, including Uranium Mining and Processing Enterprises

Tajikistan remained an important supplier of uranium ores to the Soviet Union during the second half of the 20th century, with more than 20% of Soviet Union uranium ores being produced in Tajikistan. As a result of the uranium industry in the country, several uranium mining and processing tailings require remediation: in the last 45 years in six regions of Soghd Oblast, 55 million tons of uranium waste have accumulated in 10 uranium tailing dumps. In 1991, during the collapse of former Soviet Union, the hydrometallurgical plant of Chkalovsk city, mechanical plant and other infrastructure of SE “VOSTOKREDMET” stopped activity at once. During the Civil War in Tajikistan (1992-1997), the uranium tailing dumps remained without any control.

Remediation measures have only been carried out only in small areas of sites that are located in districts close to large human settlements. For example, in the densely populated district of Gafurov city, a uranium tailings dump has been covered by a compact soil layer of one-meter thickness that reduced considerably both uranium exhalation and gamma dose rate on the surface of the dump although dumps continue to pose a risk since they are located just 50 m from neighboring residential houses. In contrast, the Degmay tailing site is located at a distance of 2 km from human settlements and remains largely uncovered and readily accessible to the public. Cattle also graze on vegetation growing on the surface of the uranium tailings.

The main legacy sites and their remediation requirements are as follows.

- **Istiklol**. A systematic and comprehensive evaluation of the risks and remediation options (including costs) for the two objects presenting the highest risks on the Istiklol (formerly Taboshar) site, i.e. Yellow Hill and tailings piles 1–4, has been carried out as part of the Commonwealth of Independent States (CIS) Program. The preferred option is to re-contour and cover Yellow Hill, improve the existing covers of tailings piles 1–4, dismantle building structures and leached heaps, and decontaminate adjacent areas. A preliminary estimate for the cost of the proposed remediation is R 780 million (€12 million) but there are indications that the final costs may be somewhat higher.

  Tajikistan has decided to proceed with the remediation of Yellow Hill and tailings ponds 1–4 with support from the CIS Program. The detailed design and specification of the proposed remediation started in 2017 and was evaluated and approved by NRSA. Following NRSA approval, the CIS Council approved funding for the proposed remediation in the fourth quarter of 2018. Remediation works began in 2019 and are expected to take five to ten years to complete, although the exact duration will depend on the availability of funds.

  With support from the EU's Instrument for Nuclear Safety Cooperation (INSC), an evaluation is also being made of the risks and remediation options for the whole of the Istiklol site — i.e. Yellow Hill and tailings piles 1–4, plus other objects presenting significant risk. An initial indicative estimate of about €20 million has been made for the cost of remediating Yellow Hill and tailings piles 1–4 on the Istiklol site, and about €13 million for the remediation of all other objects but excluding construction of a water treatment facility that is currently being designed and constructed with support from the EU's INSC at an expected cost of about €2.5 million. The water treatment facility will be used to treat contaminated mine waters discharging from adits (horizontal mine shafts) of an obsolete uranium mine on the Istiklol site. The aim is to treat the mine water so that it is safe to use for crop irrigation and consumption by people and livestock. The detailed design, costing and safety assessment is not finalized yet, but it is anticipated that commissioning and operation of the facility could take place in 2020.

- **Buston industrial complex**. The Buston (formerly Chkalovsk) industrial complex contains a number of dispersed uranium legacy sites, in particular, those located in Buston itself, at Degmay, Khujand and Gafurov. All four of these sites are included as priorities for remediation in the national concept, although some changes were made in their relative importance or ranking in the national plan for realization of the concept.

- **Degmay.** With resources from local and national budgets, about 20 ha of the overall tailings area (about 90 ha) of the Degmay tailings site has been covered with soil between 0.5 m and 1 m thick. This cover is being provided as an intermediate and short-term measure, solely to respond quickly to increasing public concern over the risk from inhalation of radioactive tailings dust resuspended by the relatively high wind speeds in the area. Full remediation of the Degmay tailings piles will subsequently be required and is the subject of a systematic and comprehensive evaluation of the risks and remediation options (including costs) for each object presenting a significant risk on the site. This evaluation is being carried out with support from the EU's INSC. An initial indicative estimate of about €25 million has been made for the cost of remediating the Degmay site. A decision on whether, and if so, when to remediate the site is indicatively foreseen for the third quarter of 2020, subject to the availability of funds and competing priorities.

- **Karta 1–9 (also known as Chkalovsk or Buston tailings dumps).** In 2013/14 a concrete wall about 1.8 km in length was constructed around the Karta 1–9 waste tailing dumps with funding from the Swiss Foundation for Mine Action, as an emergency measure to limit public access. These dumps occupy an area of about 18 ha and contain more than 3 million tons of radioactive wastes containing uranium as well as arsenic and vanadium.

  The site should be remediated based on funds availability.

- **Khujand and Gafurov.** Khujand and Gafurov were identified as priorities for remediation in the national concept for remediation.

In the program for the realization of the concept, remediation activities already carried out at Gafurov have been judged by the NRSA to be sufficient and broadly in accordance with good international practice. Nonetheless, confirmation of this judgment by an independent evaluation would further enhance public confidence.

Khujand was initially ranked as a high priority in the national concept for remediation but has since been downgraded in the program for realizing the concept, largely due to a decision to recommission, with national funding, a water treatment facility for mine waters that were being used for irrigation and human consumption. New ion exchange resins will be installed, and when the facility is brought back into operation, water quality will again be compliant with national standards. In addition, uranium will be recovered during the periodic regeneration of the ion exchange resins, the commercial value of which will compensate, at least partially, for the cost of operating the water treatment facility. The need for remediation of other objects on the Khujand site, in particular, waste rock piles, has yet to be fully evaluated.

→ **Adrasman.** The Adrasman site and objects on it were assigned a medium priority in the national concept for remediation, ranking seventh out of nine sites. However, in the program for realization of the concept it has been assigned a higher priority and is now ranked third, below only the Istiklol and Degmay sites.

The covers and slopes of the tailings at the Adrasman site are not stable and, in 2010, there was washout and carry-over of tailings material along the hillside that was subsequently dispersed over adjacent areas. Further dispersion of this material continued with the risk of it reaching nearby rivers. Emergency measures therefore had to be taken in 2013 to remedy the situation and constrain the further dispersion of the released material.

Given the increased risk and higher priority now given to this site, it is planned to carry out an evaluation of risks and remediation options for this site as a whole, taking account of the availability of funds and competing priorities.

Development of a strategy that specifically addressed the remediation of former uranium industry sites in Tajikistan was therefore a high priority, and a ten-year national strategy was published in 2014 [21]. An important limitation for carrying out the remediation activities is a lack of appropriate infrastructure. In this regard, the NRSA is faced with a number of problems and tasks to be solved, including:

→ development of the legislative basis for remediation of former uranium industry sites

→ assessment of radiological consequences of uranium industry sites

→ assessment of the condition of remediation controls

→ compliance analysis to determine the extent to which international standards and recommendations have been fulfilled

→ development of an action plan to minimize the impact of uranium industry sites on the environment; and,

→ procurement of analytical equipment for monitoring sites.

Some additional legislative documents have already been developed by NRSA and approved by the Government [22-25] to implement a national strategy for remediation, but further elaboration of the regulatory control mechanism by means of regulations and requirements on radiation protection during remediation activities is still required. Specific support for the development of regulatory documents in this area has been provided by the DSA.

During the establishment of enterprises on extraction and processing of uranium ores, evaluation of the initial environmental condition was not required. As such, there are no data allowing comparison of the initial and current ecological conditions in areas where uranium extraction and processing sites are

located. Several IAEA regional (RER3010, RER9122, RER9086) and national projects (TAD9002, TAD9003) have been implemented for the above-mentioned tailings' monitoring. Detailed information on these projects is available from IAEA Regional Technical Cooperation Project RER/9/086 Report, which provides is detailed information on environmental monitoring, expert missions, fellowships, scientific visits, training, regulatory and licensee infrastructures. In addition, a new project will soon be implemented (in 2021) with the European Commission on purification of mine, technical and drainage waters to remove uranium and for the physical remediation of uranium tailings in Taboshar and Degmay.

Financial support is required in order to start remediation activities at uranium mining sites in Tajikistan.

3.7 NRSA Activities in State Physical Protection System (SPPS)

Some competent authorities in the Republic of Tajikistan in the field of Nuclear security are identified by different Laws and Governmental Decrees:

- → State Committee on National Security - the main authority which is responsible for all aspects of state and national security including nuclear security.
- → Ministry of Internal Affairs - responsible for practical implementation of physical protection as providing staff in the state nuclear and radiological facilities; investigation of criminal acts related to the radioactive sources in the country; and response to radiological accidents.
- → CES CD - responsible for preventing, and response to, nuclear and radiological accidents and incidents.
- → Custom Services - responsible for controlling export, import, and transit of goods, including nuclear materials and radioactive sources, i.e. border control.
- → NRSA - regulatory body on ensuring radiation safety and security.

As the regulatory body, NRSA plays the coordinator's role in the system of nuclear security in Tajikistan and cooperates with other competent authorities according to the Memorandums of Understanding and present legislation. The other competent authorities carry out their activities related to nuclear security in the framework of their own competence. In Tajikistan, the authorization process for nuclear security is not a separate activity; it is part of the authorization of nuclear and radiation safety. NRSA therefore has the legal authority to issue regulatory requirements for nuclear security.

LEGISLATIVE FRAMEWORK FOR RADIATION SECURITY

The legislative framework for radiation safety and the security of sources is provided primarily through the Law on Radiation Safety [1] and the Law on Use of Atomic Energy [2]. The scope of regulatory control established by the Law on Use of Atomic Energy [2], encompasses the management of radioactive materials from initial production or import to final disposal or export. Other laws, Governmental decrees, regulations, requirements, rules, norms and other legislative documents also have a direct impact on the legislative framework for radiation safety and source security.

The export and import of radioactive sources, and the overall authorization of nuclear security of such sources, is regulated according to the Law on licensing of separate types of activities (#37 from 2004) [9]. In addition to this Law there is a Regulation "On the specification of licensing separate types of activities", approved by Governmental Decree # 337 from 2005, which requires specific documents to be provided when applying for a license to export or import radioactive sources. Furthermore, Article 18 of the Law on Use of Atomic Energy [2] requires control of the export and import of goods in the field of atomic energy use by the competent authority, according to the national legislation and international agreements.

Article 15 of the Law on Use of Atomic Energy [2] required a state system of account and control of nuclear materials and radioactive sources to be established and, under that system, to create a State registry for nuclear materials and for radioactive sources [16]. Tracking the movement of any high-activity sources is ensured through Norms and Rules NP 01.001-11 “Requirements on ensuring physical protection of radiation sources, storages and radioactive substances”, registered at the Ministry of Justice, Number 601 on 9 February 2011 as amended of 2012 [9], namely by clauses from 18 till 27.

The process for assessing transport safety and security arrangements for sources while in transit from the State to another destination are ensured through two requirements: 1) Safety rules during transportation of radioactive materials (No. 599) [5] and 2) Norms and Rules NP 01.001-11 “Requirements on ensuring physical protection of radiation sources, storages and radioactive substances”, registered at the Ministry of Justice, Number 601 on 9 February 2011 as amended of 2012 (namely by clauses from 18 till 27 [6]) as well as through a Draft Law on Export Control. Procedures for safe and secure storage for radioactive sources routinely stored on vehicles or at field sites or that are held pending import or export are covered by legislative documents mentioned in Norms and Rules NP 01.001-11 “Requirements on ensuring physical protection of radiation sources, storages and radioactive substances” [6].

Article 4 of the Law on "Radioactive Waste Management" [7] ensures the safety and security of radioactive sources when a licensee ceases operation. It is ensured by means of establishing a special guarantee fund were regulated licensees transfer funds during operations. These funds are then used later in ensuring the safety and security of radioactive sources.

Tajikistan has expressed its support to the Code of Conduct on the Safety and Security of Radioactive Sources and to the Supplementary Guidance on the Import and Export of Radioactive Sources. Furthermore, Tajikistan has:

- → Ensured source categorization through the Norms and Rules NP 01.002-11 “Category of danger of sources of ionizing radiation and rules on their identification”, registered at the Ministry of Justice, Number 602 on 9 February 2011, which was developed in line with IAEA Safety Standard No. RS-G-1.9.
- → Ensured a graded approach to security of sources through Norms and Rules NP 01.001-11 “Requirements on ensuring physical protection of radiation sources, storages and radioactive substances”, registered at the Ministry of Justice, Number 601 on 9 February 2011.
- → Made compulsory the radiation monitoring of recycled metal facilities by means of the Norms and Rules NP 03.004-11 “Requirements on ensuring the radiation safety during preparation and realization of scrap metal” approved in 2011". Practical measures are being implemented.

ACTIVITIES

NRSA, together with the CES CD, elaborated an NRP, based on the IAEA document - GSR-R-2. The objective of the NRP is to ensure a prompt and integrated response of the executive bodies, forces and functional means and territorial subsystems of the single state system for prevention and liquidation of emergency situations of the Republic of Tajikistan in case of the threat or occurrence of a radiological accident. Procedures, including emergency plans, which address the actions to be taken in respect of sources that have been found or lost from authorized control, are covered by the NRP. It is planned to review this plan according to GSR Part 7 [15].

Through bilateral projects with USA and the UK Government, the State Institution "Radioactive Waste Disposal Site" has been fully upgraded and reconstructed. The site now has modern equipment and facilities for the handling, transport and temporary storage of radioactive sources following the recovery orphaned or vulnerable sources.

NRSA has responded to IAEA recommendations from the past and implemented sufficient infrastructure for the safety and security of radioactive sources and aims to continuously improve the situation. Tajikistan will take into consideration also “Guidance on Managing Disused Radioactive Sources” belonging to the Code of Conduct.

3.8 Main identified threats and proposals for their elimination

This section contains a list of threats and challenges that currently exist and adversely affect nuclear and radiation safety in Tajikistan and the activities of NRSA as the central executive body for state regulation of nuclear and radiation safety. Measures to address the threats and challenges are set out in a ‘Roadmap’, detailed in Appendix 2.

3.8.1 Organization and general principles of the regulatory body (including physical protection)

- → Currently, the Law “On Use of Atomic Energy” [2] describes activities and facilities which are under state regulation and identifies general requirements for them. Unfortunately, it does not describe a full lifecycle approach to activities belonging to nuclear and radiological facilities, including research reactors. As a result, there are lot of uncertainties associated with activities for both operators and the regulatory body.
- → The Law “On licensing of separate types of activities” [9] includes activities associated with “use of atomic energy” and “radioactive waste management”, similarly fails to consider all activities associated with nuclear and radiological facilities in a full lifecycle approach. As such, the regulatory body does not have the appropriate rights to regulate the full lifecycle of facilities.
- → There is a general law on inspection in Tajikistan, namely the Law “On Inspection of business entities” [8]. It identifies and describes all provisions related to inspection. In 2014 there was an amendment to the law which listed inspection bodies with the right to carry out inspections in Tajikistan. NRSA, along with other regulatory bodies, was not included on the list of inspection bodies. As a result, NRSA has only limited rights to carry out inspections. These rights are restricted to only pre-licensing inspections and inspections in the case of accidents or emergency situations. Therefore, most facilities with nuclear materials and high activity radioactive sources are not currently subject to inspection.
- → The new Law “On Legal and regulatory documents” identifies the ministries and organizations that have rights to develop regulatory documents. Currently the NRSA is not included, which makes the development of new regulations in the field of radiation safety and nuclear security difficult.
- → NRSA is in the system of Academy of Sciences. However, the Academy of Sciences does not hold any regulatory function, such as inspection, licensing and enforcement, under Tajikistan legislation, but the NRSA does have the competency and rights as the national regulatory body. This situation creates difficulties for the process of high-level decision making.
- → Decree of Government of the Republic of Tajikistan “On regulation on licensing specifics of separate kinds of activities” [11] does not include a list of necessary documents for applying for a license on activities related to RWM (including remediation activities) and the full lifecycle of nuclear facilities. This causes difficulties with the licensing process for these activities.
- → Decree of Government of the Republic of Tajikistan “On state regulation in the field of ensuring radiation safety” describes the functions, responsibilities and rights of the regulatory body and its inspectors. This document was developed in 2004. It does not fully cover all aspects of the functions and responsibilities of the regulatory body and, as a result, NRSA does not have all required competencies for regulation.

- → There is currently no procedure in place describing how project documentation submitted for the issuance of licenses for remediation activities related to territories contaminated by uranium production should be evaluated and local experts do not have experience in this field. As such, there are difficulties associated with issuing licenses.
- → There is no procedure on how to carry out inspection activities related to the remediation of territories contaminated by uranium production and local experts lack experience in this field, giving rise to difficulties in carrying out inspections.
- → The TSO to NRSA has a building with limited territories, rooms, and capacity for carrying out monitoring. Additional space and capacity are required to support monitoring during remediation activities and analysis of samples.
- → There is no single Information System supporting functioning of the regulatory body. Separate databases are used that are not harmonized which causes difficulties when undertaking regulatory functions such as analyzing the current situation or planning inspections.
- → The NRSA as an organization does not have Quality Management Accreditation which makes it difficult to check the quality of the system and provided services.
- → Currently, to apply for a license, applicants are required to collect required documents from different organizations and places. To make it easier for applicants, the Government of Tajikistan has started an initiative to establish a “single window” system where applicants can collect and submit documents in one place or through a web portal. The NRSA is not yet in a position to establish such a system.
- → New staff at the NRSA and its TSO lack experience in regulatory functions.
- → There is no building for the north branch of the NRSA which greatly impacts its regulatory functions such as licensing, inspection and enforcement measures. During remediation works at uranium legacy sites NRSA staff currently reside temporarily at the operators’ site, which creates a conflict of interest.
- → Tajikistan authorities have not yet undertaken a threat assessment and categorization of facilities/practices in accordance with the five threat categories of GSR Part 7 [15].

3.8.2 Safety of Nuclear Installations

- → The Law “On Use of Atomic Energy” [2] describes activities and facilities which are under state regulation and identifies general requirements for them but does not describe the full lifecycle of activities relating to nuclear and radiological facilities. As a result, there are lot of uncertainties associated with activities for both operators and the regulatory body.
- → Currently, the draft law “On Licensing of Individual Types of Activity" is in the parliament for approval and will stipulate the licensing of activities for the whole lifecycle of the research reactor (including site selection, feasibility study, planning, construction, commissioning, operation, and decommissioning). After approval by parliament, NRSA will be required to develop new documents and requirements related to the process of licensing activities related to each element of the research reactor’s lifetime. Since this area is new for NRSA, international assistance and support is needed to develop the regulations according to IAEA recommendations and international best practice.
- → There is currently a lack of inspectors and experts in the field of research reactors in the country.

3.8.3 Radioactive Material Transport

- → In Tajikistan there are a limited number of transport and storage companies that can transport or store radioactive materials. Establishing a protected building for storing radioactive sources and

procuring specialized transport vehicles requires high-level qualifications and funds. As a result, many transport and storage companies do not want to work with radioactive materials.

→ Only limited courses are organized to provide appropriate training on radiation protection to transport and storage companies in the country.

3.8.4 Radiation Safety

→ Currently, article 17 of the Law “On Radiation Safety” [1] requires individual doses received by citizens to be controlled and accounting for, but no rules have yet been developed.

→ There is only a general requirement for radiation protection in medicine. Specific requirements are required for nuclear medicine and teletherapy in order to ensure radiation protection.

→ A national database, held and maintained by NRSA, is required to record information on workers throughout the country that are working with sources of ionizing radiation and the doses they receive.

→ Equipment used by the TSO to NRSA for radiation dose monitoring of personnel working with sources of ionizing radiation is old and often in need of repair. Capacity is also limited. There is also no internal dosimetry service in the country. Therefore, internal dosimetry services are not provided to workers that may be occupationally exposed as a result of practices using unsealed sources in medical and other applications.

→ Diagnostic Reference Levels (DRL) for medical exposure have not been established in Tajikistan, which are needed for the control and optimization of patient exposures.

→ A national database of doses received by patients as a result of medical examinations is also required to allow medical exposures to be reviewed.

→ No program has yet been approved by the Ministry of Health to upgrade old fluoroscopic units and other X-ray equipment.

→ In computed tomography, special low dose protocols haven't been introduced.

→ There are no companies in Tajikistan for the maintenance and servicing of nuclear medicine and radiotherapy equipment.

→ Legislation is in place requiring patient doses to be measured, but not all hospitals have the necessary infrastructure to follow this legislation.

→ Only limited measurements have been carried out on the impact of radon on the population so the situation throughout the country is not clear. Furthermore, requirements on radon in national legislation are not consistent with IAEA GSR Part 3 [10].

→ There is growth nationally in the construction of new buildings. Construction materials from different natural sources can contain high concentrations of natural radionuclides that can impact public exposure. Requirements on use of construction materials in legislation are not consistent with IAEA GSR Part 3 [10].

→ There is no national plan or program in the country for environmental monitoring to establish the radiation background situation and identify any natural radiation hot spots in the country.

→ Not all border crossing points in Tajikistan are equipped with portal monitors to detect radiation sources.

→ Facilities using sources of radioactive sources are required to have in place physical protection plans. An example plan has been developed based on the requirements, but it is necessary to help facilities develop their own plans.

→ In the Law “On Use of Atomic Energy” [2] there is a requirement for the education of the personnel working with ionizing radiation sources, but there is no clear requirement for professionally recognized qualifications, e.g. RPO, medical physicist and qualified expert.

→ There is no national register of how many personnel are working with ionizing radiation sources or of their qualifications and training needs. Training syllabuses are available only in some areas of radiation protection but, in the absence of a register of training requirements, it is not clear what further training courses for personnel should be organized.

→ A National program for training and education in the field of radiation protection has been developed, but an action plan on how to implement it is needed.

There are only limited courses organized nationally for RPOs, medical staff on radiation protection and medical exposures, staff of stations responsible for monitoring the radiation situation throughout the country, and users of radioactive sources in the country on radiation safety and security.

Similarly, there are only limited courses and informative events organizing for the population on radiation safety in the country.

→ The NRSA regional training center on radiation protection is functioning, but there are not enough instructors to conduct training.

3.8.5 Emergency Preparedness and Response

→ Tajikistan authorities have not yet undertaken a threat assessment and categorization of facilities/practices in accordance with the five threat categories of GSR Part 7 [15].

→ Formal procedures for record-keeping and controlling doses received by the emergency workers have not been established.

→ The National Safety Standards (NRB-06) [3] established default operational intervention levels (OILs) of dose for acute exposure by organs or tissues and generic action levels for foodstuffs. However, these levels are not consistent with those given in GSR Part 3 [10] and GSR part 7 [15].

→ No specialist services or procedures for medical responses to radiological emergencies are in place.

→ There are no procedures in place on the management of radioactive waste arising from the implementation of agricultural countermeasures.

→ There is no automated 24-hour radiation monitoring network to measure dose rates across the territory and transmit data to the central station. Only a few stations across the territory have equipment to measure radiation background dose rates and measurements must be made manually.

→ There is a requirement for internal emergency response plans to be in place for facilities using radioactive sources. However, facility operators lack the knowledge and skills to develop emergency response plans themselves.

→ There is a general requirement for first responders to respond to nuclear and radiological accidents, but there is no guidance on how they should respond to emergencies.

→ Only limited courses are organized for first responders on responding to radiological accidents in the country and no joint training exercises have been organized for the different first responders involved in responding to nuclear and radiological accidents.

→ The National Plan (Program) on EPR (Approved by Government on 2013 #770), in compliance with IAEA standards, was finished in 2018 and currently via IAEA TC, a national Project Crisis Center on responding to nuclear and radiological accidents in the country is establishing with the CES CD playing a leading role.

→ There is a requirement to keep the public informed about any emergency situation in the country but, at present, information being presented on this subject is not sufficient.

3.8.6 Radioactive Waste Management, Decommissioning and Remediation

→ Currently the Law "On Radioactive waste management" [7] and the "Rules on Radioactive waste management" [20] identify requirements for RWM and the roles and responsibilities of operators, but these are not in compliance with IAEA GSR Part 3 [10], GSR Part 5 [26] or GSR Part 6 [27], leading to difficulties in implementing radiation safety requirements during RWM.

→ No safety assessment has been undertaken of the RWDS to understand the main risks and threats.

→ The RWDS has limited capacity for long term storage of RW. Urgent action is required to address issues with the storage of liquid RW to prevent release to the environment.

→ Only limited courses are available around radiation safety and RWM for operators.

→ Currently in Tajikistan, specialized organizations for RWM, such as RWDS, and operators of uranium legacy sites, as well as the TSO to NRSA have limited equipment for carrying out workplace monitoring and environmental monitoring. This leads to difficulties in analyzing the current radiological situation in facilities and at legacy sites.

→ There are limited staff in NRSA with the necessary experience and expertise to inspect remediation activities and projects.

→ The Law "On Radioactive waste management" [7] required a State Registry of radioactive waste storage facilities and radioactive wastes to be established and operated by NRSA, with NRSA requesting operators to provide the necessary information. However, no tool has yet been developed to support and operate such a registry. Furthermore, there is currently no database for collecting and analyzing information regarding uranium legacy sites in the country, such as environmental monitoring data for these sites.

→ Some uranium legacy sites have been studied and environmental impact assessment and feasibility studies prepared for further remediation actions [28]. Other sites require assessments to be undertaken to evaluate risks and to develop remediation plans.

→ Currently, the Taboshar, Degmay, Chkalovsk and Gafurov uranium legacy sites are in a bad radiological situation and urgent remediation actions are needed.

→ Currently, the TSO to NRSA has a building with limited territories, rooms, and capacity. Additional space and capacity are required to carry out monitoring during remediation activities and to analyze monitoring samples.

→ Another important limitation for carrying out remediation activities is a lack of appropriate infrastructure. In this regard NRSA is faced with a number of problems and tasks to be solved, including: development of the legislative basis for remediation of former uranium industry sites; assessment of radiological consequences of uranium industry sites; assessment of the condition of remediation controls; compliance analysis to determine the extent to which international standards and recommendations have been fulfilled; development of an action plan to minimize the impact of uranium industry sites on the environment; and, procurement of analytical equipment for monitoring sites. These documents and activities should take account of IAEA recommendations [17, 29-36] as incorporated, or due to be incorporated, in the Tajik legal framework.

→ Criteria to regulate radioactive discharges require further development, in line with IAEA recommendations.

3.9 Overview and status of international projects and efforts to eliminate regulatory threats identified in 2011 RTA

3.9.1 Cooperation between NRSA and DSA

There is an ongoing project between NRSA and DSA on enhancing the infrastructure of the regulatory body in the field of RWM from former mining and milling activities. The objective of the project is to elaborate a set of legislative requirements on ensuring occupational, public and environmental safety during the planning and implementation of remediation works on contaminated territories. Under this project the following legislative documents have been developed:

- → RT Law on "Radioactive Waste Management"
- → Regulatory requirements on "Radioactive waste management"
- → Regulatory requirements for carrying out monitoring during mining facility decommissioning or territories remediation contaminated by radioactive waste.

3.9.2 Cooperation with other international organizations

IAEA

After becoming an IAEA Member State in 2001, the Republic of Tajikistan implemented 16 projects and an additional 4 projects were submitted for the new 2014-2015 cycle. To date, 8 of the original 16 projects have been completed, and 8 others are still active. The 4 additional projects for the 2014-15 cycle are also ongoing. The Republic of Tajikistan has also participated in more than 40 regional projects of which 16 have been completed and the others remain active.

Beneficiaries of IAEA national projects in Tajikistan include different hospitals of the Ministry of Health, the Ministry of Energy and Industry, the AS RT, the Academy of Agricultural Sciences, Tajik State Medical University, the Customs Service, the State Committee of National Security, and the Ministry of Interior.

US NRC

Two projects were implemented in 2011 and have been completed. The first focused on introducing amendments and additions to legislation in the field of nuclear and radiation safety/security with the purpose of its improvement and harmonization with international and IAEA standards. The second focused on carrying out an inventory of all SIR in Tajikistan with the purpose of having comprehensive data on all types of SIR within the country. Under this project, the RASOD database was established to record data on all radioactive sources throughout all regions of Tajikistan.

US DOE

The following projects have been implemented:

- → Searching for orphan sources and disused radioactive sources not under regulatory control. As a result of this project more than 500 orphan and disused sources were discovered in the northern Sughd region, 178 in the southern Khatlon region, and 76 in the central Nohiyahoi Tobei Jumhur region. No sources were discovered in the eastern part (GBAO-Pamir). Discovered sources were safely transported to the RWDS.
- → Physical protection systems are being established on sites with high-activity radioactive sources such as the State RWDS, State Institution "Research Center Oncology" and Gamma laboratory of Tajik National University.

→ A project was undertaken to connect the above-mentioned sites containing high-risk radioactive sources to off-site monitoring that is connected to a control panel of the Ministry of Interior.

→ Several joint training courses and workshops have been, and continue to be, conducted.

European Commission

→ A project on equipping border crossing points of Tajikistan by Radiation Portal Monitors began in 2013. Seven sites are to be covered.

→ A project to undertake a feasibility study and environmental impact assessment of two high-risk sites contaminated by radioactive wastes (Degmay and Taboshar) was also implemented in 2013.

→ A project on the training staff of the regulatory body and its TSO is ongoing.

Germany

→ In cooperation with the Gesellschaft für Anlagen- und Reaktorsicherheit, project FZK 3607I09180 "Scientifically technical experience exchange in the field of nuclear safety with regulatory authorities of Central and Eastern Europe, as well as Central Asia" has been implemented.

United Kingdom

→ A project on upgrading the State RWDS by using new building construction for radioisotope thermoelectric generators, new building construction for security personnel (Central Alarm Station - CAS), making a barrier (2 m concrete wall) around the controlled area, separate electricity line supply, separate water-supply line, physical protection elements installation along the perimeter of controlled zone (CCTV, motion sensors, infra-red and microwaves sensors, etc.), diesel generator installation in case of electricity cut and a number of other upgrades has been completed.

Turkish Atomic Energy Commission

→ A project on rendering assistance utilizing of training and equipment delivery within ongoing IAEA national project in Tajikistan has been implemented.

International Science and Technology Center

→ A project on "Developing manufacturing basis for Tajikistan's uranium industry waste reprocessing in ongoing. The objective of the project is development of basic process flow diagram for uranium industry waste reprocessing to produce uranium oxide. The project is directed at establishing conditions for weapon scientists' reorientation and their involvement in solution of problems related to technology development for raw materials reprocessing and industrial waste. Project covers issues of physic-chemical study of Tajikistan's uranium waste reprocessing processes.

UNDP

→ A project "Enhancing coordination for projects development and resources mobilization for sustainable radioactive waste management in Central Asia" is ongoing. The objective of the project is to render support to the Governments of the region in the formation of agreed lists of projects directed to the elimination or mitigation of different aspects of radioactive and toxic waste impact on the environment and public health. Works have been performed on criteria identification, and in compliance with them, avoiding duplication with other donors and project proposals prioritization which were listed in Framework document (High-level International Forum, Geneva, Switzerland, 29 June 2009).

3.9.3 Coordination of efforts

Faced with very challenging inherited problems, the Central Asian Republics do not have the means to sustainably remediate uranium legacy sites in the foreseeable future. As has been formally recognized in

Through the adoption of the Strategic Master Plan (SMP), the proposed pooling of funds through the Environmental Remediation Account (ERA) of the European Bank for Reconstruction and Development (EBRD), and the coordination of activities with those of the remediation program of the CIS, are intended to provide access to the larger sums needed to support actual remediation work. A Core Group of CGULS has developed the SMP [28], will monitor its implementation and oversee its periodic updating. Tajikistan formally approved the Plan in 2017. The Plan has been submitted for consideration and approval by the Economic Council 6 of the CIS countries and was approved in 2018. It was also presented to the ERA Assembly of Contributors in the second half of 2017, with a request to endorse it as the basis for ERA operations in Central Asia.

3.10 Conclusion

In the last 15 years, the regulatory infrastructure in the field of radiation safety and security of radioactive sources in Tajikistan has been well established under the leadership of NRSA and with Governmental support and international cooperation. Nonetheless, several areas still need improvement. Currently, the Republic of Tajikistan is planning to work on implementing existing laws and the adoption of new versions of several laws and regulations in the field atomic energy use and radiation safety. A working group has been established at NRSA to develop draft legal acts.

To support ongoing activities, construction of the NRSA Branch administration and TSO laboratory buildings are very urgent needs for NRSA. Human resources activities are also planned in this area.

One particular area where action is needed is in the occupational exposure of staff working with radioactive sources and x-ray generators. Rules on controlling and accounting of individual doses of radiation received by workers when working with ionizing radiation sources, conducting medical X-ray radiological procedures, and other artificial radioactive sources need to be developed to help implement the requirement of the Law “On Radiation Safety” [1]. Procurement of TLD readers for controlling individual doses is also in the plan.

Radiation protection of patients is another problem in the country. New technologies and modern digital equipment have large impacts on doses receiving by patients during medical diagnostic and treatment procedures. Development of Requirements on radiation protection in teletherapy and nuclear medicine is one of the urgent actions required to optimize this area. Investigation and monitoring of exposure of patients undergoing diagnosis and treatment in hospitals and clinics will help in establishing DRLs in Tajikistan that can be used to control medical exposures. Establishing a database on doses received by patients during medical examination is one of the actions in the roadmap.

As always, the safety and security of radiation sources is always a priority area for the regulatory body and there is a plan to carry out a new inventory of radiation sources in the country and update the national registry. Developing physical protection plans for facilities is one of the actions of the roadmap.

Currently, in Tajikistan there are only a limited number of transport and storage companies that can transport or store radioactive materials. Establishing a protected building for storing radioactive sources and procurement of specialized vehicles needs qualifications and funds. As such, many transport companies, as well as cargo storage companies, do not want to work with radioactive materials, which impacts on the economy of Tajikistan. Strengthening transportation and storage capabilities of local companies to improve the level of import, transit, and export of radioactive sources in the country is one a priority area.

The National Plan on Emergency Preparedness and response (Approved by Government on 2013 #770) in compliance with IAEA standards was completed in 2018. Development of a new National Plan (Program) on

EPR for nuclear and radiological events is one of the actions of the roadmap, along with establishing a crisis center to coordinate all response activities in case of an emergency situation.

A working group has been established at NRSA for developing legislative documents, as well as amending current laws, on radioactive waste management, primarily in relation to the management of uranium legacy sites. During the development of documents, the working group will focus on regulatory aspects of uranium legacy sites, including the expertise needed for projects and inspection procedures.

All actions related to education and training are carried out based on the national program for training and education in the field of Radiation Protection but, currently, not all activities and responsible organizations have been identified for implementation within this program. The development of an action plan, as well as making amendments to the law on radiation safety, are priorities in this area.

Currently in Tajikistan there is great interest among the population to know more about the possible impacts of exposure to natural radionuclides, especially radon. Investigation of the impact of radon on the public will help in developing new standards for radon and construction materials. Additional to this, it is necessary to develop a national environmental monitoring plan for radioactivity, with regular monitoring being carried out by the responsible authority.

Based on identified threats a Roadmap for improvement of the regulatory situation in Tajikistan has been developed, and directions for future regulatory cooperation proposed, as detailed in Appendix 2.

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4 Regulatory Framework for Nuclear and Radiation Safety in Kyrgyzstan

Regulatory cooperation between the State Agency for Environmental Protection and Forestry (SAEPF) and the DSA in the field of radiation safety has been ongoing for more than a decade. The first project in the cooperation program was implemented from 2009 to 2012, resulting in a first regulatory threat assessment (RTA1) report [1] that identified weaknesses to be addressed and the regulatory documents required in the field of nuclear and radiation safety related to radioactive waste management. The RTA identified 54 threats categorized in the areas of: radiation and nuclear safety; radioactive waste management and decommissioning; emergency preparedness and response, and organizational and general principles.

A second phase of bilateral cooperation took place from 2013 to 2015 during which regulatory documents in the field of radioactive waste management, prioritized as a result of the RTA, were developed. This resulted in an amendment to the Law on Licensing [2], development of new licensing requirements and amendment of the Law on Radiation Safety [3]. Previously, the Law on Licensing did not require operators to license activities related to radioactive sources and materials. This absence weakened regulatory supervision in the field of nuclear and radiation safety in Kyrgyzstan and failed to ensure operators met their responsibilities on radiation safety issues. Amendments to the law also ensured that other changes necessary for improving the regulatory structure and for harmonizing the legislative and regulatory documentation would be more accessible for the regulatory body. Furthermore, as part of the improvement of the regulatory structure, it was planned that the State Regulation Centre of the Environmental Protection and Ecological Safety (SRCEPES SAEPF) would issue licenses, supervise licensing conditions, consider radiation risks in the country, account for materials falling under the Safeguards (additional protocol on non-proliferation), develop the legislative and regulatory framework, and create a unified RW management system etc. The amended Law of the Kyrgyz Republic “On Radiation Safety” [3] transferred the main priority in regulating radiation safety to a main regulatory body in the field of radiation safety.

As a result of the projects implemented between 2009 and 2015, considerable progress was achieved in understanding of the regulatory threats associated with radioactive waste and materials in Kyrgyzstan, as well as how to effectively use the knowledge of threats in setting national policy in the field of radioactive waste management and formation of appropriate strategies. In the framework of the projects between 2009 and 2015, eight regulatory documents were approved by the Government Decree (№558 05.08.2015), and four draft by-laws were prepared.

In February 2019, SRCEPES SAEPF and DSA signed Contract № M22-19/06 [4] on cooperation in the sphere of nuclear and radiation safety and, in March 2019, a revision of the RTA1 began with the guidance and support of DSA experts. The project “Improvement of the regulatory body for radiation and nuclear safety in the Kyrgyz Republic” was a logical continuation to the previous two DSA and SAEPF cooperation projects.

The findings of the updated regulatory threat assessment for Kyrgyzstan are reported in this section. Gaps and priorities for regulatory attention are identified and information provided on SRCEPES SAEPF activities to address challenges and minimize and/or eliminate the related threats. The RTA2 will enable, SRCEPES SAEPF and DSA to plan their common cooperation activities for 2020-2025 in a well-grounded and efficient manner. The new RTA will be submitted to the Parliament and Government of the Kyrgyz Republic, and will provide the international community with a clear view of existing issues adversely affecting the regulation of nuclear and radiation safety in the Kyrgyz Republic, that can be solved in the frame of continued DSA and SRCEPES SAEPF cooperation. The Roadmap for further cooperation, with prioritized activities, is included in Appendix 3.

4.1 Organization and General Principles for Work of the Regulatory Authority.

The RTA1 report [1] describes in detail the basic principles of state nuclear and radiation safety regulation in the Kyrgyz Republic, as well as obligations and tasks entrusted to SRCEPES SAEPF in accordance with the current legislation. A Summary of the current information on organizational aspects of SRCEPES SAEPF and other state bodies involved in the regulatory process activities is presented below.

Government bodies in the Kyrgyz Republic include various ministries, departments, committees and associations that participate in one way or another in the management and handling of toxic and radioactive substances (Table 2). State bodies, within their competencies, develop regulatory documents and government and industry programs to ensure the safety of toxic and radioactive substances at various stages of their life cycle. They also conduct research in the relevant field within their competencies and cooperate with international stakeholders. The ministries and departments include:

Table 2. General regulatory framework for nuclear and radiation safety in the Kyrgyz Republic

	Name of state bodies	**Appointment/Responsibilities**
Highest level	Government	The apparatus, which distributes responsibility between state bodies and approves their authority
1st level	SAEPF	The main state body designated by the Government as responsible for the regulatory system
	SRCEPES SAEPF	The organization, which is part of the SAEPF, is vested with the main powers of the regulatory body, including: • Regulation in the field of environmental protection (including EIA), ecological, nuclear and radiation safety. • Issuance of licenses (currently only for RW management). • Communication and consultation with interested parties. • Analysis of regulatory acts of the Kyrgyz Republic in the field of radiation safety and the development of draft regulations. • Coordination of cooperation activities with the IAEA in the field of radiation safety in the Kyrgyz Republic.
*2nd level	Division of Radiation Safety of the Department of Disease Prevention and Public Sanitary Surveillance under the Ministry of Health (DDPSSES)	• Issues in the field of preserving the health of the population and personnel (issuing sanitary conclusions as part of the control of medical and industrial radiation sources, maintaining a register of quality control of food products, drinking water and building materials). • Communication and consultation with interested parties. • Opening of a training center (plan) for medical workers.
	State Inspectorate for Environmental and Technical Safety (SIETS)	Inspection. This state organization is responsible for the enforcement of the legal and regulatory framework on radiation safety and radioactive waste management to identify and document their nature and require corrective actions to be taken by authorized parties.

	Name of state bodies	Appointment/Responsibilities
**3rd level	State Committee for Industry, Energy and Subsoil Use (SCIES)	Industrial safety issues and the issuance of mining and development licenses, including thorium-uranium deposits.
	Ministry of Economic Development	Issuance of licenses for the import and export of radiation sources and radioactive materials.

* Level 2 - their main functions are carried out independently, but part of the decisions can only be carried out jointly with the regulatory body (issues of developing new regulatory acts, issuing permits, cooperation with the IAEA).
** Level 3 - solving issues related to radiation safety and issuing licenses only with the participation of other state bodies.

- State Committee on Industry, Energy and Subsoil Use. The central state executive body pursuing the state policy on the development of the fuel and energy complex and industry on electricity, gas, oil, coal, oil and gas pipelines and their products, and renewable energy sources, and carrying out licensing of the subsoil user and state control over the rational use of mineral resources and the protection of subsoil resources, including of uranium-thorium ores.
- Ministry of Labor and Social Development. Conducts a unified state policy on labor protection when dealing with harmful factors, including ionizing radiation.
- Ministry of Economic Development. Maintains the National Information Fund of the Kyrgyz Republic of technical regulations and standards, as well as carries out export-import accounting for the SIR.
- Ministry of the Internal Affairs. Within its competence, the Ministry of Internal Affairs is obliged to monitor compliance with the rules for the acquisition, storage, transportation of explosive, potent chemicals, toxic and other substances and the opening and operation of facilities according to the lists defined by the legislation of the Kyrgyz Republic.
- Ministry of Emergency Situations (MES). Maintains a register of tailings and dumps containing waste from the mining production complex. It also develops and implements a unified policy in the field of prevention and warning of industrial accidents and in the management of highly toxic substances and other toxic substances.
- Ministry of Transport and Roads. Conducts the necessary measures and develops the rules for the transport of substances from the National Control List for any type of transport.
- Ministry of Agriculture, Food Industry and Land Reclamation. Pursues a unified policy and exercises control over the content of chemical and radioactive substances in food products, protection of water bodies from pollution by chemicals.
- State Committee on Defense. Organizes and carries out the necessary measures to control the production and use of chemical and radioactive substances in the defense industries and the processing of waste.
- Ministry of Justice. Carries out state registration of all regulatory legal acts in the field of chemical and radioactive substances management.
- Ministry of Finance. Provides funding for all activities at the national level on the management of chemical and radioactive substances.
- State Customs Service. Promotes the implementation of measures to protect state security, life and health of citizens, protect animals and plants, protect the environment and protect the interests of domestic consumers when importing goods into the Kyrgyz Republic (at the borders with Tajikistan, Uzbekistan and China). Performs state regulation of the export and import of chemical and radioactive substances, including the procedure for the import and export of hazardous waste and their use.
- State Border Service. Performs the same functions as the State Customs Service, only at the border with Kazakhstan (within the Customs Union).

- State Inspectorate of Veterinary and Phytosanitary Security. A state executive body that carries out state supervision and control in the field of veterinary and phytosanitary security. The purpose of the State Inspectorate is to monitor and control the safety of life and health of the population and the protection of flora and fauna.
- Service supervision and regulation of the financial market. A licensor of insurance companies engaged in compulsory and voluntary types of insurance of companies' liability - sources of increased danger, including damage to the environment.
- Agency for Hydrometeorology. A subordinate unit of the MES, carrying out activities in the field of hydrometeorology and observations of the level of environmental pollution. Also participates in the prescribed manner in the work of state and departmental commissions for the prevention and elimination of the consequences of natural disasters, accidents and catastrophes caused by hazardous and natural hydro-meteorological phenomena or pollution of air, water, or soil. The Agency conducts systematic observations of meteorological, hydrological, avalanche, glaciological and agro-meteorological conditions, the condition of crops and pasture vegetation, pollution of surface waters, soil, atmospheric air, including from radioactivity, and provides for the collection, analysis, synthesis of this information.
- State Agency of Architecture, Construction and Housing and Communal Services under the Government of the Kyrgyz. An administrative department that performs the functions of an executive authority in the field of architecture, construction and housing and communal services. Tasks include development and implementation of a unified state policy in the field of architectural and town planning activities, implementation of intersectoral coordination and regulation in the development of state technical regulations, and development and approval of building codes and regulations, including such objects as radioactive tailings dams and storage facilities RW. The Agency is also engaged in issuing qualification licenses and certificates, including in the field of environmental protection (in terms of design and engineering surveys).
- National Statistical Committee. A state body that carries out state statistical activities on the principles of professional independence and independence and coordinates activities in the field of accounting and statistics throughout the entire Kyrgyz Republic.
- Local governments. Under Article 10 of the Law “On Local Self-Government” of July 15, 2011 No. 101, local authorities have control over the activities of enterprises, organizations and institutions, other economic entities for the implementation of environmental protection legislation, for use of land and natural resources, compliance with the norms and rules of town planning and architecture, sanitary standards, carrying out environmental measures in the manner prescribed by law. They are also responsible for the development and implementation of measures to protect the environment and protect consumer rights. For the implementation of these powers, they report to the authorities at the state level.

With a significant number of state bodies having functions involving the management of radioactive substances and ionizing radiation, there are not clear boundaries of responsibility for all aspects of radiation safety. Insufficient interdepartmental interactions affect can result in conflicting legislative initiatives that in turn has a negative impact on the effectiveness of regulation and oversight of security. The main problems for an effective interdepartmental interaction policy in managing ionizing radiation are the lack of:

- unified policy in the field of radioactive substances management
- interdepartmental coordination of government bodies
- an integrated approach to decision-making and monitoring in the field of radiation safety
- sufficient funding for environmental monitoring
- unified information radioactive management systems

→ qualified and experienced managers on nuclear and radiation safety issues.

Many different sources of ionizing radiation are used in medicine and industry. Activities related to the use of ionizing radiation sources, including storage, transportation within the country, transfer to another user, and predisposal (hereinafter referred to as “handling”) are not licensed. The concept of “authorization” does not currently exist in the existing legislative framework of the Kyrgyz Republic. Enterprises and organizations that are new to the use of radiation sources or the handling of radioactive materials, unfortunately, often learn about all the rules and requirements only at the stage of use or application for a license, and not during planning stages. Entrepreneurs are obliged to apply for permission to several state bodies at once, while official information on the order and priority is not given on any electronic portal. Inexperienced entrepreneurs and organizations often seek advice from friends who work in non-governmental organizations and private firms, etc.

By 2019, the heads of state bodies of the Kyrgyz Republic developed and signed the Order of Interaction of State Executive Bodies in Implementing Radiation Safety Functions in the Kyrgyz Republic. This document is currently not agreed with the Emergencies Ministry but is already in force between the signatories.

The radioecological monitoring system is imperfect and at the same time distributed between individual departments that cannot carry out the full amount of work required for an objective assessment of the level of radioactive contamination. The country still does not have a Radon Monitoring Program, accounting for radon inhalation in residential, public buildings and workplaces, and radon emanation measurements are not made when choosing sites for the construction of residential and public buildings and structures, or in buildings after their construction. There are no regulatory requirements for measuring radon to protect the public and medical personnel, including hospitals and sanatoriums where radon treatment is used.

There is a practical need to take measures to integrate statistical data collected by various government ministries and departments on individual dosimetry and environmental monitoring into a single database. Currently, such information is available at the Hydrometeorology Agency, the National Statistical Committee, SRCEPES, DDPSSES, SIETS, Agency for RW Management at the MES, Ministry of Agriculture, SCIES and National Academy of Sciences of the Kyrgyz Republic.

There is a need to improve the land management system in the area of radioactive waste storages and tailings, including defining the owner in historical territories, defining rules and requirements for sanitary zones, conducting remediation, institutional monitoring and creating funds to finance safety measures. It is necessary to establish a network of radioecological monitoring of environmental pollution by radioactive substances at uranium heritage sites of the Kyrgyz Republic, accounting for radon inhalation in residential and public buildings, in workplaces and in medical organizations.

It is important to note that some of the main safety requirements established in the IAEA Safety Standards Series on governmental, legal and regulatory framework for safety, e.g. GSR Part 1 [5] are not fully established in the country:

→ Requirement 2: Establishment of a framework for safety

→ Requirement 3: Establishment of a regulatory body

→ Requirement 4: Independence of the regulatory body

→ Requirement 7: Coordination of different authorities with responsibilities for safety within the regulatory framework for safety.

Thus, to build an effective and reliable control system in the field of nuclear and radiation safety, it is necessary to carry out the following:

- → Improve the system of regulation of radiation and nuclear safety in the country, which will include increasing the capacity of the regulatory body and empowering it with licensing, inspection and enforcement powers.
- → Improve the licensing system for sources of ionizing radiation, nuclear and radioactive materials, to include introduction of the concept of "authorization" within the legislative framework in accordance with the IAEA standards and implementing a unified policy between ministries and departments on radiation safety issues.
- → Implement a common policy between ministries and departments on emergency response and emergency situations, transportation of radioactive substances, departmental supervision and control, rule-making initiatives, accounting and control of sources, radioactive materials and radioactive waste, management training, security and safety of sources, and other issues related to radiation safety.

Historically there has been a lack of stability and clear coordination in the field of radiation safety, which has affected the country's image in the international arena. In order to resolve issues related to the coordination and regulation of radiation safety in the country, the IAEA initiated an expert advisory mission to review the national regulatory infrastructure for monitoring radiation sources in Kyrgyzstan. Based on the results of this mission, the Government was recommended to consider the appointment of one authorized body as a contact center with the IAEA on all issues related to nuclear and radiation safety, as required by the requirements and standards of the IAEA: "Governmental, Legal and Regulatory framework for safety", GSR, part 1 "Legislative and state responsibility, general provisions ": Independence of the regulatory body (*Requirement 4. GSR Part 1*) [5]. It was further recommended that the Government review nuclear and radiation safety legislation and, as far as possible, include all relevant radiation safety provisions contained in various laws, government regulations and decrees, in one Nuclear Safety Law, compatible with international requirements and GSR Part-1 [5]. Such a comprehensive Nuclear Safety Law should include provisions that would provide the regulatory body with the competencies and resources necessary to fulfill its obligations to monitor radiation safety. The Government was also recommended to consider measures to bring government regulations and decrees into line with existing laws.

Furthermore, in connection with the accession of the Kyrgyz Republic to the Treaty on the Eurasian Economic Union dated May 29, 2014, the country faces challenges in analyzing and working through a variety of complex issues for developing economic cooperation in the context of Eurasian economic integration to adapt the economy of the Kyrgyz Republic to the terms of the contractual legal base of the Customs Union. The Kyrgyz Republic is harmonizing the national legal framework in the field of tariff and non-tariff regulation with the legal framework of the Customs Union to ensure the application of uniform measures of customs and tariff regulation in goods trade with third countries in order to protect the domestic market and the interests of domestic producers, to ensure safety for life and health, the environment, products imported into the Kyrgyz Republic, including radioactive materials and sources.

In 2019, the heads of state bodies of the Kyrgyz Republic developed and signed the Order of Interaction of State Executive Bodies in Implementing Radiation Safety Functions in the Kyrgyz Republic. This document has not currently been agreed with the Emergencies Ministry but is in force between the signatories.

4.1.1 General Organizational Aspects of SRCEPES SAEPF activities

In accordance with the provisions approved by the Decree of the Government of the Kyrgyz Republic No. 123 of February 20, 2012 and the Decree of the Government of the Kyrgyz Republic No. 817 of December 2, 2015, the SAEPF is responsible for ensuring radiation safety in the Kyrgyz Republic and for ensuring effective cooperation with the IAEA. The nuclear safety regulatory authority is entrusted with the task of ensuring the proper level of cooperation among relevant organizations. As part of the implementation of the functions for ensuring radiation safety in the country, on the part of the SAEPF, "The plan of measures to regulate issues in the field of radiation safety" was developed and approved on January 21, 2017. The

plan is aimed at effectively ensuring radiation safety of the population. Since 2017, SAEPF has paid off the debt on national participation and membership fees, launched six national projects, signed several strategic documents aimed at effective cooperation and implemented 98% of national projects.

The Comprehensive Plan for Supporting Nuclear and Radiation Safety of the Kyrgyz Republic for the Period 2019-2024 was developed and submitted for consideration by the Government of the Kyrgyz Republic. It was developed with the aim of ensuring environmental safety, protecting human health and the environment from the harmful effects of sources of ionizing radiation (SIR), and preventing malicious and unlawful actions in relation to SIR, strengthening control and response measures in relation to SIR during their transportation and storage on the territory of the Kyrgyz Republic, improving the material base of physical security of facilities and sites with an increased risk of the presence of vulnerable sources of ionizing radiation, increasing the capacity of the relevant state bodies. This result was ensured by the fact that the SAEPF has a high personnel potential with deep technical knowledge in the field of radioecology. In SAEPF, regulatory functions were transferred to the SRCEPES. In 2019, there were 13 employees in the SRCEPES. All specialists regularly improve their qualifications in the field of nuclear and radiation safety. Structurally, SRCEPES consists of two sectors: Radiation Safety, and Chemical and Biosafety (Figure 9).

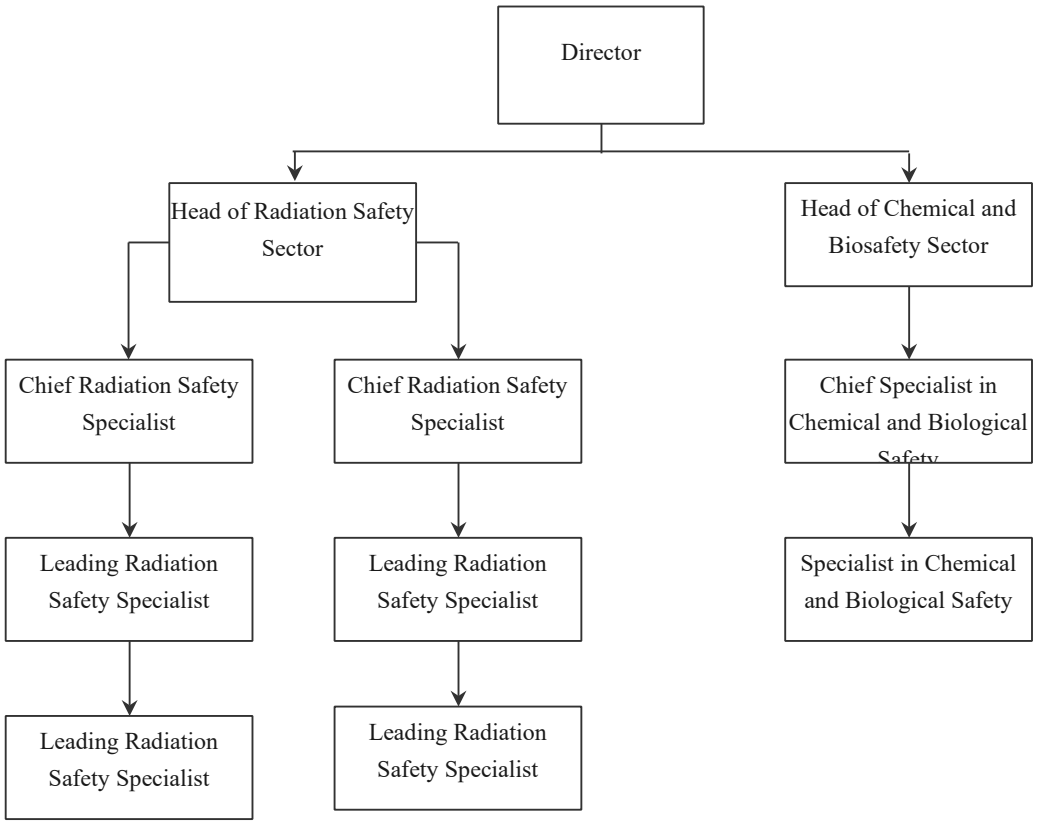

Figure 9. SRCEPES SAEPF structure.

The main SRCEPES SAEPF functions are to:

- → make proposals on the improvement and implementation of the state policy on integrated management of environmental protection and environmental management
- → participate in capacity building (regulatory and institutional) in the field of environmental protection to ensure the environmental safety of the Kyrgyz Republic
- → determine priority areas for action to ensure environmental safety

- → improve regulatory mechanisms in the field of environmental protection (including chemical, biological and radiation safety)
- → participate in the development, adoption and implementation of national and regional programs in the field of environmental safety (including chemical, biological and radiation safety)
- → carry out international cooperation in the field of ensuring chemical, biological, radiation safety and fulfillment of obligations under international treaties
- → carry out technical cooperation with the IAEA
- → participate in the coordination and monitoring of activities to ensure environmental safety
- → participate in the development of proposals for a strategic approach to the safe management of radioactive, toxic and chemical substances
- → organize the promotion and dissemination of knowledge about the environment, and conduct campaigns to raise awareness of the population and industry.

The main SRCEPES SAEPF tasks are:

- → implementation of state regulation in the field of environmental protection and environmental safety, including chemical, biological and radiation safety; and
- → coordination and implementation of international projects carried out at the Center.

Since the end of 2016, the SRCEPES SAEPF has conducted state regulation of nuclear and radiation safety of:

- → radioactive waste storage/disposal facilities and radioactive waste management enterprises
- → one specialized storage facility for radiation sources and waste
- → temporary confinement sites for radiation sources
- → uranium processing plants and uranium-thorium sites
- → radioactive material transport through the Kyrgyz Republic
- → use of radiation sources and radiation technologies, including their application in medicine, industry and research etc.

SRCEPES, within its functions established between 2010 to 2019, should perform the following actions:

- → develops regulatory documents, rules and guidelines in the field of nuclear and radiation safety
- → reviews and evaluates radiation and nuclear safety reports submitted by operators, observation reports and other notifications before issuing official permits (currently such reports are provided if the operator needs permission from the regulator or an expert opinion);
- → carries out the issuance, change, suspension or cancellation of issued official permits
- → ensures the adoption of corrective measures in case of detection of unsafe or potentially dangerous conditions when issuing permits and reviewing reports
- → together with SIETS, conducts inspections for regulatory purposes, takes the necessary measures to apply sanctions in case of violation of safety requirements
- → together with the Ministry of Economic Development and other state bodies, coordinates licenses for the import / export of radioactive sources and materials
- → cooperates with the Government of the Kyrgyz Republic on the issues of harmonization of regulatory acts, providing the Government with information on the promotion of the Priority Action Plan in the field of radiation safety

- → cooperates with the IAEA on issues of nominating employees of organizations to participate in the activities of the IAEA, on the promotion of national projects supported by the IAEA Technical Cooperation (TC) program, and on the accounting of nuclear and radioactive materials on IAEA inspections; and
- → carries out (together with other departments of the SAEPF) reviews of projects and EIAs developed for radiation hazardous facilities.

SRCEPES SAEPF has recently developed a new regulation, in accordance with the requirements of the IAEA GSR Part-1 [5], on the structure and powers of the main regulatory body in the field of nuclear and radiation safety. The regulation is subject to approval by the Government of the Kyrgyz Republic.

The main factor that has hindered regulatory activities is the lack of requirements for licensing activities related to the management of any radioactive sources and materials in the country's legislative base. So far, only two types of licenses related to radiation are issued: license for management of toxic waste, including radioactive waste (license issued by SAEPF); and license for import and export of SIR that are included in the National Control List (license issued by the Ministry of Economic Development).

In order to fulfill Kyrgyzstan's international obligations, as well as harmonize legislation in the field of radiation safety in accordance with the requirements of the IAEA international standards, amendments have been made to the laws of the Kyrgyzstan "On the licensing system in the Kyrgyz Republic" and "On the radiation safety of the population of the Kyrgyz Republic".

Thus, the main tasks of the SRCEPES SAEPF on-going through 2019 and 2020 have included:

- → to introduce amendments to the Law on licensing and permitting system (amended law submitted to Parliament)
- → to introduce of amendments to the regulation on licensing conditions
- → to approve by the Government of the new provision SRCEPES SAEPF, as the regulatory body in the field of nuclear and radiation safety
- → to adjust of the Priority Action Plan in the field of radiation safety [6] considering amendments to the Law on the licensing system
- → to create of a coordination council
- → to make changes and amendments to existing laws, regulations and rules and regulatory guidelines in the field of radiation safety, which consider international requirements and recommendations, as well as the positive experience of various countries
- → to develop a general procedure for planning and organizing regulatory inspections of facilities using SIR, including institutional control
- → to develop a policy and make amendments to legislative acts on the responsibility of the executive bodies for non-compliance with regulatory requirements
- → to address gaps and weaknesses in current regulations; and
- → to develop a mechanism for improving the skills of civil servants.

The SRCEPES radiation safety strategy for the public and the environment in 2019-2021 includes the following intentions:

- → modernization of nuclear medicine and improvement of the radiotherapy service
- → supply and installation of new equipment for the National Oncology Center for the treatment of cancer, as well as the modernization of radionuclide diagnostics

- → establishment of a network of radioecological monitoring at uranium legacy sites in the Kyrgyz Republic
- → assessment of the radiological situation and exposure of the population living in the vicinity of former mining sites (legacy sites: Mailuu-Suu, Min-Kush, Kaji-Sai, Ak-Tyuz, Shekaftar, etc.) and mining complex OJSC "KGRK"; and
- → development and improvement of the radioactive waste management system.

To ensure the implementation of the above work, the SRCEPES SAEPF communicates and consults with international organizations, advises the Government on the need to attract donor assistance, provides expert review of reports of the Ministry of Emergencies provided as part of the remediation of legacy sites, and organizes round table discussions of accumulated information and problems encountered.

Technical Support Organizations (TSOs) are currently not defined. The SAEPF's own centers and laboratories do not fully provide adequate analytical, scientific, expert, technical, engineering, information, consulting and methodological support to the regulatory body in the field of nuclear and radiation safety. Therefore, the SRCEPES SAEPF is not currently a self-sufficient organization and there is a need either to develop the Center to achieve the desired capabilities or to connect a technical support body.

The public council, whose task is to supervise the activities of SRCEPES SAEPF, is currently absent. However, it should be noted that public opinion is necessarily considered by the SAEPF at the level of decision-making during the state environmental review of planned projects of enterprises.

SRCEPES SAEPF does not currently issue annual reports on nuclear and radiation safety in the Kyrgyz Republic, so the public and third-party organizations receive information about the radiation safety activities of the state body only from social networks and the media. It should be noted that this applies to all state bodies of the Kyrgyz Republic; there is very little information on the specific activities of these organizations on the websites of ministries, committees, centers, offices and departments. Usually, information is limited to contact information, organization structure, news from the spokesperson and the main regulatory and legal documents that are relevant to the activities of the state body. Thus, in the future, the main regulatory body will need to solve the following tasks:

- → Create a proper regulatory framework and infrastructure according to the GSR part 1 [5].
- → Develop a quality management system (conducting internal audits in the first place).
- → Create a structure for more flexible public participation in the field of radiation safety.
- → Develop an annual reporting system.
- → Develop an informative internet site.
- → Create a new or adjust an existing organization for the purposes of technical support of the regulatory body (TSO).

4.1.2 Interdepartmental commissions, working groups and experts joining the process

Currently, SRCEPES SAEPF is actively discussing current plans, problematic issues and draft regulations in working groups created from representatives of other government agencies and local experts (their design organizations, laboratories, etc.) and inviting experts on a temporary basis to point assignments necessary for the development of strategic programs and projects supported and developed by SRCEPES. Interdepartmental commissions are a form of interaction of several state bodies, fixed in several regulatory documents (Government Decisions). The main reasons that serve to create an interdepartmental commission are:

- → detection of sources of ionizing radiation or radioactive materials at the state border
- → preparing for emergency situations that could entail the spread of radioactive contamination of goods, property and land in the territory of the Kyrgyz Republic; and
- → evaluation of the effectiveness of major project activities or assessment of the feasibility of their implementation (for example, at the end of recovery measures at tailing dumps, at the end of decontamination of contaminated Japanese cars, or when discussing a moratorium on uranium mining in the country).

The following state bodies are established participants in the interdepartmental commissions: MES, SAEPF, Ministry of Health, Customs, SIETS, the Ministry of Internal Affairs and the Ministry of Economic Development (although the latter do not frequently attend meetings).

Interdepartmental commissions have been used regularly as a mechanism of interaction between government agencies following two large-scale situations that occurred in 2011:

- → import of radioactive coal into the territory of the Kyrgyz Republic, the volume of which was the annual supply of coal to municipal thermal power plants and boilers in Bishkek and Chui regions; and
- → import into the territory of the Kyrgyz Republic of radioactively contaminated vehicles from the Fukushima emergency zone in Japan.

The tasks associated with managing the issue of radioactive coal were completed in 2012 with work on solving problems related to imported Japanese cars continuing until the end of 2017. The Government and the state bodies involved in solving the problems managed to implement measures at the expense of budget funds and the SAEPF environmental fund, i.e. without attracting external grants. Work on these issues helped to establish interactions between the state bodies more effectively than the efforts undertaken in previous years. These incidents drew the Government's attention to this area of security.

4.1.3 Other important participants in the regulatory and supervisory framework

Two other state organizations, whose powers are narrower and more specific than those of SRCEPES SAEPF, participate in the system of regulation and supervision in the field of radiation safety; these powers complement the general system of regulation and supervision in the Kyrgyz Republic. These are the SIETS (www.geti.gov.kg) and DDPSSES (www.dgsen.kg).

The SIETS was created in 2015 and is comprised of three sectors (administrative, environmental and technical) and several departments (Table 3). The main objectives of the SIETS are:

- → supervision and control over compliance with the requirements of regulatory legal acts and technical regulations (inspections)
- → supervision of the enforcement of labor rights of citizens, as well as labor protection requirements
- → participating in interdepartmental commissions for the investigation of intersystem, system and local accidents and technological violations; and
- → conducting examination of managers and personnel of a hazardous production facility.

Whilst the SIETS is responsible for supervisory functions and inspections, it has not been possible so far to completely remove the supervisory functions from all other bodies, e.g. DDPSSES, have retained some oversight functions.

In September 2019, there were 7 employees in SIETS and one of the main tasks now for management is to increase the capacity of personnel and develop the necessary working instructions for this state body.

Over the period 2016-2018, the SIETS carried out 130 inspections (for all types of organizations, with little input from organizations related to radiation hazards), 130 acts have been drawn up, 59 decisions have been made and 59 administrative entities have been brought to administrative responsibility.

Table 3. The SIETS organizational structure.

Administrative sector	**Environmental sector** ***(subordination of the entire sector occurs to the deputy director)***	**Technical sector** ***(subordination of the entire sector occurs to the deputy director)***
Financial and Economic Management	Department of Industrial Safety, Mining and Mineral Protection	Office of Architectural and Construction Supervision
Management of Organizational and Analytical Work	Environmental Safety Department	Labor Protection and Labor Relations Department
International Cooperation Department	Department of Supervision, Control of Use and Protection of Land	Energy Supervision Authority
Common department	Office of Nuclear and Radiation Safety	Fire Department
Human Resource Management	Office of Control and Supervision of Water Resources and Facilities	Metrological Supervision Department
Anti-Corruption Sector		Department for control and supervision in the field of transport security
Legal Department		

The DDPSSES is comprised of several departments, including a radiation safety department (Table 4). The main objectives of the DDPSSES are coordination of the activities of state bodies and economic entities on the issues of ensuring the sanitary and epidemiological welfare of the population and study and assessment of the impact of adverse factors on the health of the population and workers.

Table 4. The DDPSSES organizational structure

DDPSSES (units and departments are directly subordinate to the director)
Department of technical regulation and work with the EAEU
Accounting Department
Management of Prevention of Infectious, Parasitic Diseases and Epidemiological Surveillance
Department of No-communicable Diseases Prevention and Sanitation
Department of Sanitary and Epidemiological Expertise and Services
Organizational and methodological department
Procurement sector
Administrative department
Sector of Metrology and Standardization
Center for Laboratory Research
Radiation Safety Department

The main functions of the DDPSSES are connected to sectoral policy and regulation with regard to public health. Concerning radiation safety, this includes:

- → state registration of sources and generators of ionizing radiation
- → instrumental study, examination of documents and the issuance of a sanitary certificate for organizations operating sources and ionizing radiation generators
- → laboratory examination of drinking water, foodstuffs, building materials, territories and premises
- → development of legal documents in the field of health and sanitation
- → supervision of territorial sanitary laboratories located in all districts of the republic; and
- → processing of statistical data obtained by all sanitary laboratories of the republic.

Within the Radiation Safety Division of DDPSSES, including the laboratory of radiological research, there are seven employees. The main tasks of the division are to increase the capacity of employees of sanitary units and laboratories, and to develop sanitary regulations and hygienic standards to ensure the safety of the population.

4.1.4 SRCEPES SAEPF Independent Status

The government ensures the independence of the regulatory body in making decisions related to radiation safety and security, and its functional separation from organizations having duties or interests that may have an inappropriate effect on its decisions.

In connection with the need to strengthen the status of the main regulatory body in the field of nuclear and radiation safety, two laws of the Kyrgyz Republic have been amended, but as of early 2020 the amendments had not yet been adopted in force. The amendments relate to the State Radiation Safety Administration, as well as to licensing and supervision:

- → The new edition of the Law “On the licensing system” [2] provides that any activity in the field of the management of the SIR, radioactive materials, including RW, is subject to licensing. Amendments to this law will allow a more harmonious development of regulatory documents in the field of radiation safety, including the Regulation on the State Regulatory Body of the Kyrgyz Republic.
- → The new edition of the Law “On Radiation Safety” [3] (as amended in 2014) provides that the main priority in regulating radiation safety is transferred to the Government in terms of the distribution of powers and the main regulatory body in the field of radiation safety. Amendments to this law will avoid conflicting contradictions of the main regulator with the MES and with other state bodies that exist in the country in recent years.

The next step in the development of the regulatory system will be the enactment of the new Law “On Nuclear and Radiation Safety”, developed in accordance with international requirements and with the help of the IAEA. This law will establish the following basic organizational measures:

- → planning, development and implementation of state radiation safety programs
- → the creation and operation of a unified state accounting system (registry) of radioactive sources and nuclear materials
- → monitoring and accounting of individual doses of radiation to personnel of radiation facilities with man-made sources, including medical supplies

- → planning activities aimed at ensuring the minimum level of generation of radioactive waste
- → organization of the safe handling of radioactive waste (collection, processing, storage) until the transfer of radioactive waste for disposal
- → the creation of a state system for preparedness for the elimination of accidents at radiation facilities
- → creation, planning and coordination of the training system
- → implementation of the national targeted environmental radioactive waste management program
- → the creation and operation of a unified state system for recording radioactive waste, as well as their storage facilities
- → coordination of work on the creation of new radioactive waste storage facilities
- → coordination of research and development activities
- → installation, repair and adjustment of devices, installations and apparatus, the action of which is based on the use of ionizing radiation
- → mining and processing of uranium and thorium ores and uranium and thorium-containing materials
- → decommissioning and waste disposal
- → control over the fulfillment of obligations to ban the development or acquisition of nuclear weapons or other nuclear explosive devices
- → implementation of international treaties, development of international cooperation in the field of radiation safety and strengthening the international security regime and radiation protection of the population
- → state licensing and inspections, establishing the frequency of supervision of objects in various industries, depending on the degree of risk of their activities
- → restoration of control over radioactive sources that were left unattended, lost, put in the wrong place, stolen or transferred without proper official permission.

Based on the amendments to the existing laws, work will begin on updating the Priority Action Plan in the field of radiation safety and the development of new strategic programs. The new regulatory documents will then set clear requirements for the applicant, for example, requirements for: the organizational structure; staff competency; physical protection; material and financial resources; radiation protection of personnel, the public and the environment, etc.

4.2 Safety of nuclear installations

There are no NPP or research reactors in Kyrgyzstan and no new nuclear installations are planned.

4.3 Radioactive Material Transport

4.3.1 Review of Legislation on Radioactive Material Transport

Radioactive material transport is a complex activity from both an organizational and technical point of view, consisting of many stages: preparation, loading, shipment, transport (including transit storage), unloading and acceptance of radioactive material consignments and packages at the destination point. At the same time, radioactive material must remain under continuous regulatory control whenever outside nuclear facilities or other stationary facilities designed to handle radioactive waste and other radiation sources and being moved over considerable distances.

Currently, the following regulatory documents are in force in the Kyrgyz Republic to manage the process of transporting radioactive materials:

- → Law of the Kyrgyz Republic Technical Regulations “On Radiation Safety” [3]
- → Regulation on the procedure for exercising export control over controlled products in the Kyrgyz Republic. Resolution of the Government of the Kyrgyz Republic dated October 27, 2010 No. 257 [7]
- → Law on state regulation of foreign trade activities in the Kyrgyz Republic, dated July 2, 1997 N 41 [8]
- → Qualification requirements for activities on the transportation of nuclear materials, radioactive substances, radioisotope sources of ionizing radiation, radioactive waste, in Annex 6 of the Decree of the Government of the Kyrgyz Republic (DGKR) dated August 05, 2015 No. 558 [9]
- → Requirements for radiation safety instructions for organizations engaged in the management of radionuclide sources and radioactive materials, as well as devices that generate ionizing radiation, in Annex 7 of the DGKR dated August 05, 2015 No. 558 [10]
- → Rules for the transport of dangerous goods by road, DGKR dated April 11, 2016 №198 [11].

For transport it is important to follow the IAEA Safety Standard “Regulations for the Safe Transport of Radioactive Material, SSR-6, 2018 Edition” which is binding for Member States. Thus, the existing regulatory framework in the field of transport must comply with requirements that are periodically reviewed and updated by the international community. The regulatory framework that is relevant to nuclear and radiation safety (Government Decree No. 558 of 08/05/2015 [10] and the Technical Regulation on Radiation Safety [12]) should be revised in any case, since amendments will be made to the basic laws for this area of radiation safety. There is also a need to develop regulatory documents meeting international requirements (i.e. SSR-6 [13]), including:

- → Rules for “Fundamentals of the Safe Transport of Radioactive Substances in the Kyrgyz Republic”
- → Procedure for the transport of radioactive materials through the territory of the Kyrgyz Republic
- → Regulation on planning measures and actions in case of accidents during the transport of radioactive materials
- → Procedure for issuing certificates for the safe transport of radioactive materials
- → Safety requirements and conditions (licensing conditions) for the transport of radioactive materials; and
- → Reference material for the Nuclear and Radiation Safety Regulations for the transport of radioactive materials.

In addition to the qualification requirements for transportation activities [9] and containing a brief basic list of requirements necessary to determine the situation, a more detailed regulatory document is needed to implement all aspects of safety in accordance with international requirements. The new Rules “Basics of the Safe Transport of Radioactive Substances in the Kyrgyz Republic” are necessary in order to establish the functions and responsibilities of organizations involved in the transport of radioactive materials and government and regulatory authorities, and their interaction. It is also necessary to establish emergency response and intervention requirements to ensure the emergency preparedness of organizations involved in the transport of radioactive materials and rules of liability insurance of legal entities engaged in the transport of dangerous goods in the event of adverse effects during the transport of dangerous goods.

Transportation of radioactive materials in the Kyrgyz Republic is carried out by rail, road and air transport. The following organizations are responsible for compliance with the standards for the transport of radioactive goods: shippers (packaging and control of radiation levels in accordance with IAEA requirements for transportation across the border, obtaining permits) and cargo carriers (cargo protection, personnel protection during transportation), as well as:

- → Ministry of Economic Development (issuance of a license for the import of radioactive materials, approval of a checklist of hazardous substances, export control of controlled products, statistics on HS codes);
- → SRCEPES (issuance of a permit for registration of an import license);
- → Ministry of Internal Affairs (issuance of permits for the transport of dangerous goods);
- → The customs authority / border service when crossing goods across the border (primary control of the radiation level);
- → Interdepartmental commission in case of detection of violations during cargo transportation (SRCEPES, DDPSSES, SIETS, Ministry of Emergencies, customs authority, Ministry of Internal Affairs, etc. in essence).

Rail transport is currently used to transport raw materials and finished products associated with uranium production. For example, until 2015, OJSC "Kara-Balta Mining Plant" carried out transportation from the Republic of Kazakhstan to Kyrgyzstan and back of uranium-containing leaching products in 5-ton containers and uranium oxide in 0.5-ton barrels loaded in 20 tons sea container. Transportation, labeling and radiation monitoring were carried out in accordance with the requirements of the IAEA Safety Standards: TS-R-1 "Rules for the Safe Transport of Radioactive Materials" (superseded in 2018 by SSR-6 [13]). The requirement to comply with the Rules for the Safe Transport of Radioactive Materials when transferring radioactive goods across the state border is established in the Law of the Kyrgyz Republic Technical Regulations "On Radiation Safety". At the beginning of 2019, OJSC "Kara-Balta Mining Plant" considered the possibility of using railway transport to move the uranium-thorium ore concentrate from the Kyzyl-Ompul deposit throughout the territory of the Kyrgyz Republic. However, as a result of negative public opinion within the population of the Issyk-Kul region, a bill was approved in December 2019 by the Parliament and President of the Kyrgyz Republic banning the development of uranium deposits and their export and the processing of ore containing uranium.

The current Rules for the transport of dangerous goods by road [11] establish the procedure for transporting all dangerous goods, including radioactive materials, on the roads of the Republic, requiring the carrier to agree on the transport route with the Ministry of Internal Affairs (General Directorate of the patrol police). The following are to be taken into account when choosing a transportation route:

- → If possible, the transportation route should not pass through populated areas, near industrial facilities, water protection zones and lanes, recreation areas, nature reserves and architectural monuments.
- → In the case of transportation of dangerous goods within large populated areas, routes should not pass near spectacular, cultural, educational, educational, preschool, medical institutions, markets, etc. A vehicle route map is drawn up showing the roads and streets the vehicle should follow.
- → In the scheme of the transportation route, parking places, fueling stations and dangerous sections of roads are indicated (dangerous sections of roads are indicated by the subdivision of the Ministry of Internal Affairs, with which the route is coordinated).

The main condition for ensuring safety during transportation of radioactive materials in accordance with Article 18 of the Law "On Radiation Safety" [3] is to limit radiation levels from packages and vehicles arising from radioactive contamination of surfaces and release of radioactive substances from packages. However, the Law does not establish that the shipper is directly responsible for the safe transport of radioactive materials. Prior to transporting radioactive materials, the shipper is required to contact laboratories to determine the dosimetry characteristics of the radioactive goods / materials to be loaded into transport vehicles. The requirements for dosimetry measurement points are set out in the Technical Regulations [12] and are consistent with the IAEA requirements. Laboratory test forms provided by the shipper must be with the driver or the person responsible for transportation.

Regarding dosimetry studies, the radiation safety regulatory authority should establish the following requirements:

- → Requirements for laboratories carrying out dosimetry studies (competence, independence, availability of qualified knowledge about dose loads).
- → Requirements for the level of knowledge of the personnel of the Ministry of Internal Affairs engaged in obtaining permits for the transport of radioactive materials.
- → Requirements for monitoring the driver's workplace.
- → Labeling requirements for cargo.
- → Requirements for the level of knowledge of personnel (shipper, driver) in case of an emergency.

Liability insurance of a carrier of dangerous goods is compulsory according to the Law of the Kyrgyz Republic of 04.08.2008 No. 188). Insurance policies can be purchased at the border.

Certificates for the approval of the vehicle and driver are also required in accordance with the Rules [11], along with the coordination of the route and conditions of safe transportation. There is also information that during transportation of explosive materials and highly toxic and radioactive substances, it is necessary to register the vehicle with an authorized state body in the field of environmental and technical safety. Appendix 9 to the Rules [11] provides the format of an emergency information system card, which is required to be on board transport vehicles.

4.3.2 SRCEPES SAEPF Functions and Tasks in Radioactive Material Transport

After the adoption of amendments to the Law "On the licensing system" [2] and new licensing conditions, the Government of the Kyrgyz Republic will continue procedures to agree on a new regulation on the regulatory body in the field of nuclear and radiation safety. In accordance with that future regulation, SRCEPES SAEPF will be responsible for:

- → developing and implementing the principles, provisions and guidelines
- → issuing official permits (licenses for the transport of radioactive materials, permits for the international transport of radioactive materials certificates of approval)
- → regular inspections and assessments; and
- → inspections and compliance measures for the safe transport of radioactive materials.

Currently, SRCEPES SAEPF:

- → issues permit for the import / export of SIR and industrial generators and participates jointly with the Ministry of Economic Development in issuing a license for the import / export of radioactive sources
- → participates in the work of the interdepartmental commission in case of detection by the customs and border services of exceeding the permissible limits established for goods transported across the state border
- → considers radiation safety instructions developed by organizations whose activities fall under the regulation of SRCEPES SAEPF
- → considers routes for the transport of radioactive materials and issues a permit for them
- → develops requirements for quality control of the transport of radioactive materials in terms of nuclear and radiation safety

- → develops requirements and conditions (licensing conditions) and determines the list of documents submitted for obtaining a license for the transport of radioactive materials (since SRCEPES is the initiator of amendments to the Law on Licensing [2], then SRCEPES must also develop licensing conditions); and
- → issues permit for the international transport of radioactive materials.

In the future, SRCEPES is planning:

- → to issue conclusions on compliance with the requirements of nuclear and radiation safety and physical protection of transport operations in the case of export, import, temporary export, temporary import, re-export and transit of radioactive materials that can be used to manufacture nuclear weapons
- → to license the transport of radioactive materials
- → to organize specialized training; and
- → to carry out supervision and inspection of transport operations (together with SIETS).

A graded approach is the basis for the transport of radioactive materials. It comprises:

- → Classification of radioactive materials
- → Use of appropriate packaging; and
- → Placement of appropriate warning signs and markings.

It is applied in the case of uranium oxide of JSC “KGRK” and during the transportation of SIR.

1.3.3 Procedures for Obtaining Licenses/Permits

Currently in the Kyrgyz Republic, licenses are issued only for the transportation of radioactive waste. Licenses for the transport of radioactive materials and SIR are not currently issued. In case of successful amendments to the Law [2], the Center will issue such licenses in the future. The order of consideration of the application, issuing a license, and making changes to the license is established in the Law “On the licensing system” [2], the license conditions will be established by the same Law after it is updated. It is assumed that new amendments to the Law will be approved in 2021.

In order to obtain a permit for the transport of radioactive material and SIR, a permit for the international transportation of radioactive material and a certificate of approval, applicants will be required to submit the application and documents in accordance with the established requirements established in Decree GKR No. 559 of 05.08.15 [9, 10]. SRCEPES SAEPF when issuing permits draws up letters on the letterhead of the organization. These are official documents that record the decisions taken.

Prior to transporting radioactive materials, the shipper is required to contact laboratories to determine the dosimetry characteristics of the radioactive goods / materials to be loaded into transport vehicles and carriers are required to agree the transport route with the Ministry of Internal Affairs. To obtain confirmation of the route, the carrier sends the following information to the Ministry of Internal Affairs:

- → Technical name of the dangerous goods transported
- → Class, subclass of dangerous goods
- → Flammable, explosive. Danger to living organisms
- → Emergency code and hazard number
- → Deadline for shipments (start and end dates)

- → The mass of dangerous goods transported on a single vehicle; the number of vehicles carrying cargo at the same time
- → Start, main intermediate and final locations of the route
- → Maximum allowable travel speed
- → Having a car cover and backup car
- → Whether transportation is allowed in difficult road conditions
- → Places for alleged stops, parking and refueling.

Within 10 working days upon receipt of this information, the competent authority sends to the carrier a confirmation of the route of transportation, which should contain the following information:

- → Name of settlements and their streets, which vehicles with dangerous goods can follow
- → The name of the roads outside the settlements, which vehicles with dangerous goods can proceed along
- → Maximum movement speed
- → Restrictions on stops and parking
- → Other driving conditions
- → The validity of the route of transportation.

Based on the data contained in the confirmation, the carrier fills in a form of the route of carriage. A completed and agreed route form must be kept by the driver.

When coordinating the route, the Ministry of Internal Affairs determines the need and type of escort for special vehicles. Accompaniment can be carried out by a patrol car of the Ministry of Internal Affairs or a suitable alternative. When transporting certain classes of dangerous goods, including radioactive substances, the carrier must also develop conditions for the safe carriage in accordance with Annex 10 to the Rules [11]. The conditions are approved by the carrier in coordination with the Kyrgyz authorities. For the transport of radioactive substances with a specific activity of more than 7.4×10^3 Bq/kg or 0.002 μCi/g, this includes the authorized bodies in the field of road safety, health, environmental protection and civil protection. In addition, for the transport of explosive and highly toxic substances, which are defined in Appendix 2 to the Rules, a special permit from the Ministry of Internal Affairs is required. The permit is issued for one or several identical shipments, as well as for a batch of dangerous goods transported along a certain route, for a period of not more than 6 months. For its execution, the carrier presents the agreed route scheme and conditions for safe transportation. A copy of the permit must be with the driver.

4.3.4 State Oversight of Transport Safety

State control over compliance with the requirements for nuclear and radiation safety during transportation of radioactive materials and SIR will be conducted by SRCEPES in accordance with the Law “On the licensing and authorization system” [2] and new licensing conditions.

At present, checkpoints for state supervision are the sites and warehouses of organizations where loading and unloading of radioactive materials take place, and checkpoints at the state border and at the international airport. The state supervision in these cases is carried out by the SIETS, based on the requirements of the Law of the Kyrgyz Republic Technical Regulations on Radiation Safety [12].

4.4 Radiation Safety

4.4.1 Radiation Safety Regulations on the Use of Radiation Sources

In the Kyrgyz Republic, the use of radiation sources in industry, agriculture, medicine, education and scientific research is subject to state regulation (the Law of the Kyrgyz Republic Technical Regulations "On Radiation Safety" [12]). The following deficiencies are noted with regard to this Technical Regulation [12]:

- → Classification of radioactive sources is not detailed and there is no reference provided to a document where such classification is provided.
- → There is no provision for the separation of exposure situations to the categories of planned, emergency and existing exposure.
- → There is no requirement for parties responsible for ensuring protection and safety to ensure the application of radiation protection principles in all exposure situations.
- → There are no requirements to ensure the control of radioactive sources that were left unattended, lost, misplaced, stolen or transferred without official permission.
- → There is no information on practical activities and sources of ionizing radiation to which the requirements relating to planned exposure situations apply.
- → There are no requirements for a differentiated (commensurate with radiation risks) approach to ensuring radiation safety and the optimization of protection.
- → There is no requirement for licensing activities when dealing with sources of ionizing radiation.
- → The terms “out of control” and “release from control” are not used and the criteria for removal and release do not fully comply with the recommendations in IAEA Basic Safety Standards, GSR Part 3 [14]. The IAEA removal criteria for unlikely scenarios are not considered in Annex I.
- → There are no provisions for exclusion, exemption or exemption of sources, or related activities from regulatory control.
- → There is no requirement for registered persons and licensees to be responsible for the implementation of emergency plans drawn up by them and for ensuring readiness to take all necessary actions to ensure an effective response.
- → Requirements for ensuring the safety of radiation generators during production, supply and use are not given.
- → There is no requirement that the use of a protection and safety system be extended to the use of ionizing radiation for visualizing a person for purposes other than medical diagnosis, treatment or biomedical research.
- → There are no requirements placed on employers, registered persons and licensees to protect staff from occupational exposure, to optimize radiation protection and safety and to ensure dose limits set for occupational exposure are not exceeded.
- → There is no requirement for diagnostic reference levels, dose constraints, and patient discharge criteria and guidelines to be established.
- → There is no requirement for the justification of medical exposure of patients to be carried out through consultations between the radiologist and the attending physician in appropriate cases, and especially in the case of pregnant patients or breastfeeding women and their children, taking into account:
  - → expediency of a request for radiation exposure

- → the urgency of the radiological procedure
- → characteristics of medical exposure
- → characteristics of the patient; and
- → relevant information about the patient's previous radiological procedures.

→ There is no requirement to take measures to protect members of the public and family members of patients undergoing a course of treatment using radionuclides prior to their discharge, in particular, for the patient or legal guardian of the patient to be given information on radiation risks and specifically written instructions for preventing the spread of radioactive contamination and for limiting contact with other persons to a reasonably achievable low level.

→ There is no requirement to take all practical measures to minimize the likelihood of unintentional or accidental medical exposure.

→ There is no requirement for periodic inspections at medical exposure facilities or for the maintenance of records.

One of the priority tasks within the standard-setting activities of the SAEPF, together with the DDPSSES, is the development and approval of regulatory sanitary documents for the regulation of medical sources, examinations and equipment for patient diagnostics and the provisions on the procedures for registering sources, including:

→ Sanitary rules and regulations. Requirements for ensuring radiation safety during radiation therapy with closed radionuclide sources.

→ Sanitary rules and regulations. Requirements for ensuring radiation safety during radionuclide diagnostics using radiopharmaceutical preparations.

→ Sanitary rules and regulations. Requirements for the placement and operation of electron accelerators with an energy of up to 100 MeV.

→ Sanitary rules and regulations. Requirements for ensuring radiation safety when handling radiation inspection installations.

→ Regulation "On the National Register of Ionizing Radiation Sources".

These rules and regulations need to be developed and approved only after the main and basic policies (laws) on radiation protection and radiation safety standards (updated in line with the IAEA Basic Safety Standards [14] instead of the technical regulation) have been developed and approved. This is necessary to ensure that the new documents do not contradict the basic provisions on radiation protection.

In the field of radiation safety of the population and personnel, the regulatory bodies (SAEPF and DDPSSES) need to take the following actions:

→ to increase the level of radiation protection of personnel and the public through the introduction of basic safety requirements for handling radiation sources based on current IAEA standards

→ to optimize personnel exposure by establishing dose restrictions and a unified state system for recording and monitoring individual doses from occupational exposure

→ introduce criteria and systems for the recognition of experts on radiation protection, and also provide for training courses to improve the skills of specialists in the field of protection

→ to improve the system for the safe handling of radiation sources before their transfer to specialized enterprises for the management of radioactive waste

→ implement programs for the radiation protection of personnel of enterprises associated with naturally occurring radionuclide material (e.g. coal mines and quarries, oil refineries, etc.) and aircraft crew

- develop and implement an action plan to reduce the impact of radon and its decay products on the population, to minimize the long-term risks of spreading radon in residential and non-residential buildings, and in the workplace from any source of radon penetration from soil, building materials or water
- develop safety standards for radiation sources used for inspection and non-medical imaging.

The Kyrgyz Republic is a party to the Code of Conduct for the Safety and Security of Radioactive Sources [15], having sent to the IAEA notification No. 254m of June 6, 2016 on joining this Code.

4.4.2 Radiation Protection of Personnel and Dosimetry Services

In the Kyrgyz Republic, the basic principles of radiation protection: justification, limitation and optimization are established in the Law "On Radiation Safety" [3] and the Law of the Kyrgyz Republic Technical Regulations "On Radiation Safety" [12]. There are no expensive technical dosimetry services available (full-body counters and dosimeters for individual organs), which is largely due to the lack of nuclear facilities in the country, and there are no relevant regulatory documents that oblige operators to monitor the effective radiation dose of personnel. Regarding internal exposure, there are no manuals or technical means of monitoring, and there is also no competence of personnel of state bodies and operators about this type of exposure monitoring for personnel.

The following shortcomings are noted in the Law of the Kyrgyz Republic Technical Regulation "On Radiation Safety" [12] with respect to radiation protection of personnel and dosimetry services:

- There is no requirement for employers, registered persons and licensees to be liable for protecting staff from occupational exposure, for optimizing protection and safety and for not exceeding the dose limits set for occupational exposure.
- There are no requirements for the regulatory body to establish requirements for monitoring and recording occupational exposure under planned exposure situations and to ensure compliance with these requirements.
- There are no requirements, with the exception of medical care, for employers of workers employed in jobs during which they are, or may be, exposed to occupational exposure:
  - to control occupational exposures and ensure the relevant dose limits for occupational exposure specified in Appendix III of the GSR Part 3 [14] are not exceeded
  - to optimize protection and safety in accordance with the requirements of GSR Part 3 [14] and to document decisions taken on measures to ensure protection and safety, and to transfer of information about them in appropriate cases to the relevant parties through their representatives, as determined by the regulatory body;
  - to apply policies, procedures and organizational measures aimed at ensuring protection and safety in order to fulfill relevant requirements, with a focus on design and technical measures to control occupational exposure
  - to have acceptable and adequate facilities, equipment and services designed to ensure protection and safety available, which by type and scale correspond to the expected probability and magnitude of occupational exposure
  - to ensure the availability of appropriate monitoring instruments and personal protective equipment and to adopt appropriate measures for their proper use, calibration, testing and maintenance; and

- → to ensure the availability of adequate human resources and to provide adequate training in safety and security, as well as periodic retraining of personnel as necessary to ensure the necessary level of competence.

- → There is no requirement for employees to fulfill their obligations with regard to ensuring protection and safety, including: compliance with all applicable rules and procedures to ensure protection and safety established by the employer, a registered person or the licensee; using their monitoring equipment and personal protective equipment properly; and cooperating with an employer, a registered person or a licensee in matters of protection and safety, as well as in connection with the implementation of health monitoring programs and employee dose assessment programs.
- → There is no requirement for organizational, procedural and technical measures to be established and implemented by employers, registered persons and licensees in order to define controlled zones (and not only the sanitary protection zone) and observation zones, to introduce local rules and monitor workplaces as part of a radiation protection program as applied to occupational exposure.
- → There is no relevant information on procedures and personal protective equipment.
- → There are no requirements to minimize the need to apply administrative measures and personal protective equipment using well-developed engineering measures and ensuring satisfactory working conditions in accordance with the following hierarchical order of preventive measures:
  - → engineering measures
  - → administrative measures
  - → personal protective equipment.
- → There is no requirement to provide workers with acceptable and adequate personal protective equipment that meets relevant standards or specifications, including protective clothing. respiratory protection (the characteristics of which must be communicated to users) or protective aprons, protective gloves, mittens and screens to protect individual organs.
- → There is no requirement that employees receive appropriate instructions on the proper use of respiratory protection, including checking the individual fit of these products.
- → There is no requirement for the development and implementation of a workplace monitoring program by registered persons and licensees.
- → There is no requirement for employers, registered persons and licensees to be responsible for taking measures to assess and register occupational exposure to conduct individual dosimetry monitoring.

It is necessary to create a TSO, whose competence will include consulting, technical and methodological support for determining occupational exposures. It is also necessary to create national registries of occupational doses for medical workers, for personnel at factories and fields with natural radionuclide content and for exposure of aircraft crews, etc. However, it should be noted that, since 2012, control of occupational exposures has been carried out for medical personnel (whole body and skin exposure) using TLDs. Individual dose control for personnel in the economic sectors exposed to NORM is not carried out; and for flight staff and staff of prisons and military units such monitoring is currently outside of regulatory control.

According to international standards, the licensing and accreditation of laboratories in accordance with ISO / IEC 17025 “Basic requirements for testing and calibration of laboratories” [16] should be implemented in the country. This will be difficult, however, as currently there is no calibration laboratory present in the country to provide metrological services or services for interlaboratory comparisons. At the present time, all work in this field is conducted in collaboration with laboratories in neighboring Kazakhstan. Working groups organized by SRCEPES SAEPF and DDPSSES are however discussing plans for the development of laboratories. The creation of a dose register to record information on the exposure of personnel and the population is also under discussion.

Thus, in the Kyrgyz Republic it is considered appropriate:

- → to improve national legislation by revising the radiation safety standards in the implementation of such concepts as planned, existing and emergency exposure situations
- → to develop a regulation on a unified state system for recording doses of radiation under planned exposure situations
- → to develop a national interface for the exchange of dosimetric information of established quality between manufacturers (laboratory of individual dose control), depository (registry) and licensees (i.e. the users of data on individual doses); and
- → to strive to create a national calibration laboratory and repair base for metrological service testing laboratories.

During a visit of the Deputy Director General of the IAEA to the Kyrgyz Republic on 19-21 June 2019, it was noted that draft regulatory documents aimed at harmonizing Kyrgyz legislation with the requirements of IAEA safety standards would need to be approved to prevent problems with ongoing and future national projects aimed at restoring the use of nuclear medicine, improving radiation therapy and developing brachytherapy of the National Oncology Center (NCO). It was also noted that, for the IAEA, the situation with the stagnation of the work of the SPECT-CT device in the Department of Nuclear Medicine of the NCO since 2011 is an indicator of ineffective management and low control and that the Ministry of Health needed to increase its work in personnel training and other support for the Department. The supply of a TC-99m generator, under the guarantee of the regulator of the Kyrgyz Republic, has been approved. However, the threat of a device launch failure may occur not only due to the lack of a technetium generator, as happened in 2011, but also due to a lack of trained personnel. Due to poor management and the difficult economic situation in the country, retaining competent staff is one of the most important problems for the NCO.

4.5 Emergency preparedness and response

4.5.1 General Principles on Operation of the State Civil Protection System

Planning and implementation of civil protection measures are carried out by the civil protection authorities, considering economic, natural and other characteristics, as well as demographic, gender, and cultural characteristics of various population groups, territories, and the degree of danger of emergency situations.

The plan of measures for civil protection is determined by the Government based on the principle of the necessary sufficiency and use of available forces and means. Civil protection activities are carried out by the forces and means of state bodies, local state administrations, local governments and organizations.

The state system of civil protection (SCPS) is established by the Law “On Civil Protection” [17]. The territorial subsystems of the unified SCPS and their units are created within the territorial-administrative units. Depending on the scale and characteristics of the predicted or arising emergency, the state system operates in the following modes according to the Law on Civil Protection [17]:

- → Daily operation
- → Increased readiness
- → Emergency
- → State of emergency.

The tasks of the SCPS are as follows:

- development and implementation of legal norms to ensure the protection of the population from emergency situations, considering the demographic and gender characteristics of various groups, and the territory
- implementation of targeted and scientific-technical programs aimed at preventing emergency situations and improving the sustainability of the functioning of industrial and social facilities in emergency situations
- ensuring the readiness of the civil protection authorities, and the forces and means of state bodies, local self-government bodies and organizations
- forecasting and assessing the socio-economic consequences of emergency situations
- collection, processing, exchange and provision of information in the field of civil protection
- training and professional development of managers and employees of state bodies, bodies of local self-government at all levels and organizations
- training of the population in emergency situations
- conducting emergency prevention and disaster risk reduction measures; and
- provision of financial and material reserves for the prevention, liquidation of consequences of emergency situations.

The procedure for attracting and reimbursement of expenses for rescue and other urgent work is determined by the Government.

4.5.2 Functional Subsystem for hazardous facilities within SCPS

There are no nuclear facilities in the Kyrgyz Republic (nuclear power plants, fuel, etc.). From the point of view of SCPS, the most dangerous objects in the Kyrgyz Republic at present are:

- Radioactive tailings and dumps
- Facilities of mining complex OJSC “KGRK” (warehouses of radioactive and chemical substances, pipelines with a uranium product and chemicals); and
- A RW burial site (storage of SIR).

In future actions, SRCEPES together with the DDPSSES, MES and the SCPS Office for Nuclear and Radiation Safety should:

- develop regulations on the prevention of radiation hazardous emergencies and the protection of the population and territories from their consequences
- ensure the readiness of SRCEPES SAEPF, the Ministry of Health, the MES and its subordinate forces and their means to undertake actions aimed at preventing and responding to emergency situations
- Ratify of the Convention on Early Notification of Nuclear Accidents and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- develop a prompt notification means through the media of radiation accidents in the Kyrgyz Republic and abroad in the event of probable transboundary movement of radioactive substances; and
- create a single national communications center of the national competent authority in accordance with the Conventions referred to above.

Activities within the functional safety subsystem of hazardous facilities are regulated by the corresponding Action Plan for the implementation of the Concept for Integrated Protection of the Population and Territory of the Kyrgyz Republic [18] and the response plan [19]. The current mode of operation is established by the Government Decree on the Concept for Integrated Protection [20].

On the occurrence of an accident, the authorities and the units within the SCPS are notified by a signal that is transmitted through all means of communication. Workers, employees and the rest of the population are notified by means of a centralized warning system, electric sirens, loudspeakers and mobile warning devices, through which voice messages are transmitted about the course of action to be taken with respect to the situation. After an emergency assessment of the radiation situation using real meteorological data and the preparation of proposals, a decision is taken on measures to protect the population, farm animals and eliminate the consequences of the accident.

Radiation monitoring is organized by the departments and divisions of the MES, the Ministry of Internal Affairs, the Department of Disease Prevention and State Sanitary and Epidemiological Supervision of the Ministry of Health, the Center for State Regulation of Environmental Protection and Ecological Safety of the State Agency for Environmental Protection and Forestry and the State Inspectorate for Environmental and Technical Safety. The Ministry of Defense also has a mobile response platoon. In addition, the European and Central Asian Safety Network (EuCAS), to which the Kyrgyz Republic is a member, is developing common rules for mobilizing member countries.

In order to conduct qualitative and quantitative analysis of various samples and objects of the external environment following a radiation emergency, civil defense units of cities and regions establish an observation and laboratory control network, involving institutions of veterinary laboratories and site laboratories. Monitoring is carried out by specialized territorial intelligence units within the SCPS, and through the use of static monitoring posts.

To eliminate the consequences of an accident at radiation hazardous facilities, the following measures are taken:

- → Existing protective structures are brought into readiness, and ground-based buildings and structures are sealed to cover the population in them.
- → A partial resettlement of the population from areas of possible radiation contamination is carried out.
- → Consolidated mobile detachments of special protection response units such as ambulance crews are alerted, and medical institutions are deployed to receive those affected by radioactive substances.
- → Preparations are made for accident-free production shutdown in the event of an emergency.
- → Additional loudspeakers and street sirens are installed, and mobile warning devices are prepared.
- → There is an accelerated execution of works to localize possible areas of contamination (e.g. construction of device / tank embankments, dams and gutters, etc.).

The deployment of forces and means of civil protection involved in rescue and other urgent work is carried out in accordance with the plan to bring them into readiness. The groups of forces and means of civil protection to eliminate the consequences of accidents and to conduct rescue operations at radiation hazardous facilities in areas in the cities Bishkek and Osh are determined by the respective heads of civil protection in accordance with the plans and a range of countermeasures can be implemented in an emergency situation.

When conducting rescue and other urgent work, the focus is on: removing victims from the rubble that resulted from the destruction of buildings and structures, providing them with medical assistance and evacuation to medical institutions; blocking or jamming sources of ionizing radiation; localizing and

extinguishing fires; and localizing and eliminating accidents on utilities networks. Measures to protect the affected population are organized by local state administrations and local governments with the involvement of civil protection services. The management of measures to eliminate the consequences of the accident at radiation hazardous facilities is carried out by the relevant territorial and sectoral authorities of civil protection. To provide communications and control, a mobile communications center of the MES is deployed, and departmental communications are also used.

4.5.3 SRCEPES SAEPF Information and Emergency Center

In accordance with the Decree of the Government, dated January 28, 2019, No. 16 “On Civil Protection Services of the Kyrgyz Republic” [21], the “Radiation and Chemical Protection Service” falls within the functions of the SAEPF. However, there is currently no information center in the SRCEPES SAEPF.

4.5.4 Emergency Training

Personnel included in SRCEPES, SIETS, DDPSSES, MES and other government agencies undergo special training by taking part in regular EPR training held by the IAEA. Training courses on emergency response are also periodically held at the training center of the MES. As a rule, such courses are organized on a paid basis and are only for staff of state bodies. Staff of private organizations whose activities are related to radioactive materials and sources, currently do not receive any training in emergency response. Improved interaction and coordination between private organizations and the MES in the field of EPR is needed.

Requirements for materials and training on the subject of “Emergency preparedness at radiation hazardous facilities” are not established under current regulations.

4.5.5 Radiation Monitoring Using Mobile Laboratory

The MES has the ability to undertake radiation monitoring using a mobile laboratory. As part of a national project supported by the IAEA in 2014, the MES received one mobile laboratory in order to respond to emergencies with the threat of radiation exposure or events of public interest, as well as to monitor the current status of radioactive tailings. There are no other mobile laboratories in the republic. The laboratory is at the disposal of the Tailings Management Agency under the MES. The MES does not provide any reports on its activities to the Government, nor to SRCEPES, SIETS and DDPSSES. However, it is understood that, between 2014 and 2019, the laboratory had not been used and no monitoring observations have been made by the laboratory. At present, any monitoring at radioactive waste tailings is carried out only within the framework of interdepartmental commissions or within international projects.

Until 2015, routine departmental monitoring was carried out only in the town Kara-Balta town. Since 2015, due to financial problems, monitoring of facilities has been further limited.

4.5.6 INES Application

According to international practices, nuclear and radiological events are assessed and communicated to the public according to the International Nuclear and Radiological Event Scale (INES). The Kyrgyz Republic became a member of INES activities in 2008. The National Coordinator of INES is SRCEPES. SRCEPES should consider whether there are sufficient mechanisms by which operators can inform the regulatory body about events and whether the operator or SRCEPES, as the INES national coordinator, should be responsible for the classification of such events.

4.5.7 Harmonization of Legislative and Regulatory Framework on Emergency Preparedness and Response with IAEA Safety Standards and Commonwealth of Independent States CIS) rules

Together with the DDPSSES and MES, the SRCEPES needs to do the following with regard to the harmonization of the legislative and regulatory framework on EPR with the IAEA Safety Standards and CIS rules:

→ Revise regulatory documents and other interdepartmental documents

→ Establish regulatory requirements for the emergency plans of operators in accordance with the classification of GSR Part 7 [22]; and

→ Develop a radiation protection strategy in accordance with the requirements of GSR Part 7 [22].

It should be noted that in the current Law of the Kyrgyz Republic Technical Regulations on Radiation Safety [12] have the following disadvantages:

→ There is no requirement to create and maintain an integrated and coordinated emergency management system that is integrated into the overall management system for all emergency situations.

→ EPR objectives are not clearly defined.

→ There is no requirement for the implementation of measures to ensure a prompt emergency response at a sites and to manage the response without prejudice to the implementation of long-term operational safety and physical security functions both the affected facility and at any other facilities at the site.

→ There is no requirement to conduct emergency response coordination activities between response organizations (including organizations of other states) as well as to provide mutual support.

→ There is no requirement to conduct, based on a hazard assessment, an operational classification of a nuclear or radiological emergency.

→ There is no requirement for the introduction of emergency planning zones and emergency planning distances, within which measures must be taken at the readiness stage in order to effectively take protective measures and other response measures. These emergency planning areas and emergency planning distances should, as appropriate, not be interrupted at national borders.

→ There is no requirement to establish reference levels to optimize the protection and safety of the public in emergency exposure situations.

→ There is no requirement to ensure a response in an emergency exposure situation through the timely implementation of emergency response measures, including (but not limited to) the prompt implementation of protective measures in order to avoid serious deterministic effects, considering the observed conditions and, if possible, before exposure will occur.

→ In emergency situations, the requirements for occupational exposure under planned exposure situations are not applied to emergency workers. The Law of the Kyrgyz Republic "Technical Regulations on Radiation Safety " provides for requirements to limit exposure of the public as a result of radiation accidents. The accumulated effective dose of technogenic radiation exposure of the personnel of group A for the period of labor activity (50 years), including the dose of emergency and planned increased exposure, should not exceed 1000 mSv, and for personnel of group B - 250 mSv. Emergency exposure of the public is limited by introducing intervention levels. Upon the fact of a radiation accident or upon detection of radioactive contamination, intervention in order to limit the exposure of the population is carried out in the form of protective measures applied to the

environment and (or) to humans. Mandatory urgent intervention is carried out in the form of measures aimed at preventing acute radiation injury.

- For emergency and rescue operations in the radiation accident zone, only persons assigned to the personnel of group A, primarily members of specialized emergency teams, can be involved. If necessary, for the performance of these works, persons, preferably from personnel over 30 years of age, who do not have medical contraindications, may be involved, with their voluntary written consent after being informed about possible radiation doses and health risks. The planned increased exposure in an effective dose of up to 100 mSv per year and in equivalent doses up to two times the values of the main dose limit is allowed with the permission of the authorized state body in the field of health
- There is no requirement to provide the affected population in the event of a nuclear or radiological emergency with information that is necessary for its protection, and to promptly warn and instruct that population on the measures to be taken.
- There is no requirement to ensure proper medical examination and provision of medical care, treatment and long-term medical measures for people who may have suffered as a result of a nuclear or radiological emergency.
- There is no requirement to ensure the safe and efficient handling of radioactive waste generated as a result of a nuclear or radiological emergency.
- There is no requirement to ensure the development and implementation of an emergency response mechanism with due regard for the need to resume socio-economic activities or the development and application of measures to move from an emergency exposure situation to an existing exposure situation.

4.6 Radioactive waste management, decommissioning and remediation.

As part of the initial 2008-2011 RTA1 [1], the following activities were undertaken with regard to radioactive RW and decommissioning:

- review of information and regulatory materials in the field of RW management
- assessment of threats in the field of radiation safety in the management of RW
- development of new regulatory documents in the field of safe handling of RW; and
- coordination in the Government of draft regulatory documents prepared within the framework of the bilateral cooperation project with DSA.

Government Decree No. 558 of August 5, 2015 approved two guidelines:

- Environmental monitoring guidelines around radioactive waste storage facilities [23]; and
- Guidance on radioactive waste management [24].

Within the framework of the project, the following additional regulatory documents were prepared, but their approval was suspended until the Laws of the Kyrgyz Republic [2, 3 and 12] are updated:

- Law on the management of radioactive waste
- The regulation on remediation measures on disturbed lands of enterprises producing and processing uranium and thorium ores in the Kyrgyz Republic; and
- The regulation on radiation protection in occupational exposure.

A regulation on radioactive waste management in small organizations will also be prepared for consideration.

The main RW and decommissioning threats identified in RTA1 were as follows:

1. The legislative and regulatory framework in the field of radiation safety was not sufficiently developed or was outdated. Harmonization with international standards and requirements was also insufficient.
2. A main regulatory body in the field of radiation safety was absent and a matrix of interaction between government agencies involved in the process of regulating and handling sources of radiation hazard had not been developed.
3. Many old repositories of waste from the mining and processing of uranium ores are located in environmentally sensitive areas, and in places with a high degree of mudslides and landslides.
4. The qualifications of personnel involved in regulation and implementation of radiation safety is insufficient.
5. Equipment used in the areas of operation of radiation hazardous objects is insufficient.

Since 2015, the following developments have occurred. In the field of radiation safety, 9 regulatory documents have been developed and approved [8, 9, 23 - 29]:

- → Qualification requirements for activities on transportation of nuclear materials, radioactive substances, radioisotope sources of ionizing radiation and radioactive waste.
- → Requirements for the radiation safety instructions for organizations engaged in the management of radionuclide sources and radioactive materials, as well as devices that generate ionizing radiation.
- → Environmental Monitoring Guidelines for Radioactive Waste Storage.
- → Radioactive Waste Management Guide.
- → Qualification requirements for handling instruments and installations that generate ionizing radiation.
- → Qualification requirements for the handling of radioactive substances, devices and installations containing radioactive substances.
- → Qualification requirements for radioactive waste management activities.
- → Requirements for the content of the program on quality in the field of radiation safety for organizations engaged in the management of ionizing radiation sources and radioactive materials, as well as devices that generate ionizing radiation.
- → DGKR № 605 of 26.11.2016. “On decontamination of vehicles with increased background radiation imported from Japan”.

Three international agreements have been ratified [30-32]:

- → Additional Protocol to the agreement between the Kyrgyz Republic and the International Atomic Energy Agency on the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons, signed on January 29, 2007 in Vienna
- → IAEA Advisory Mission to Review the National Regulatory Infrastructure for the Control of Radiation Sources in Kyrgyzstan 19-23 August 2013; and,
- → Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management of 5 September 1997.

In 2013, the World Bank completed a project to remediate tailings N3 and N6 and 4 dumps in the town of Mailuu-Suu. The final conclusions on the effectiveness of the measures taken have not yet been made; for example, the stability of the constructed dams has not been assessed. In 2017, with the help of the Russian Federation, the design of remediation of 4 tailing pits was completed. Minkush and 1 tailing dump

in Kadzhisay settlement has been remediated. Also, in 2017, the EU Strategic Master Plan was approved jointly with the IAEA for the remediation of uranium legacies in Central Asia and, possibly, for the remediation of the tailings in Kara-Balta. The Kyrgyz Republic has ratified the European Bank for Reconstruction and Development (EBRD) Donor Assistance Decree No. 412.

In 2018, a European Commission project began to study the issue of remediation of uranium production facilities in Mailuu-Suu (all other objects), Shekaftar and Minkush (dumps, settlement). The comprehensive assessment includes evaluating the state of the environment at the facilities, study of normative acts of the Kyrgyz Republic on the topic of remediation, protection of the population and the environment, and the development of a feasibility study on the remediation of facilities in Shekaftar and Minkush.

Regarding training, the situation has not changed at present and there remains an insufficient number of qualified personnel in the field. The lack of qualified personnel leads to delays in the development of secondary legislation, instructions, plans, programs and reports, etc. At the same time, an insufficient number of qualified personnel in the field leads to poor knowledge of the existing regulations, rules and instructions.

As a result of an IAEA project and the assistance of the Russian Federation in the framework of the development of the Customs Union in 2018-2019, there is an opportunity to increase the capacity of 3 large sanitary centers of the Kyrgyz Republic (in Bishkek, Osh and Mailuu-Suu).

Equipment in the areas of operation of radiation hazardous objects (sites of the remediation and operation of objects of the uranium and non-ferrous industry) is currently unchanged. Radiation control of workplaces, territories, air and water is not carried out and there are no elements of physical protection at most sites.

Gaps in the legislative and regulatory framework lead to the manipulation and substitution of concepts upon presentation of requirements to organizations and to an insufficient assessment of the quality of remediation work. A lack of permits and licenses for the handling radioactive sources, RW and radioactive materials leads to negligence, lack of institutional control and regulatory supervision over organizations.

4.6.1 Regulation of Safety in Management of Legacy Radioactive Waste

The land management system in the area of radioactive waste storages and tailings requires improvement, including identifying the owner of legacy facilities and wastes, defining rules and requirements for sanitary zones, conducting remediation, institutional monitoring and creating funds to finance safety measures. It is also necessary to establish a network of radioecological monitoring of environmental pollution by radioactive substances at uranium heritage sites. Inherited RW in the Kyrgyz Republic is comprised of the following:

- → A radioactive waste storage facility in Bishkek (RWSF); and
- → Thorium- uranium-tailings and mining dumps, which are under the responsibility of the MES, «KGRK» OJSC, «Astra KCHMZ» and «TK Geo Resource» CJSC in Orlovka. In total there are 38 tailing piles and 37 dumps of rocks, of which the MES is responsible for 33 tailing piles and 27 dumps of rock.

The RWSF specializes in the storage of orphan and spent or waste SIR. There is no disposal facility in the country. Between 2012-2018 there were 584 SIR stored in the RWSF. According to the Priority Action Plan [6], the RWSF began work in 2018 on the transfer of archive records of sources to electronic form.

In the current Technical Regulations on Radiation Safety [12], there is no provision on the need to develop a national policy and strategy for RW management. Thus, regarding the legacy RW remaining after the closure of the former USSR uranium production facilities, the main tasks of the SRCEPES are:

- development of a strategy for managing sites with RW, which will take into account the threats identified in the country for the period 2009-2019 (i.e., increasing the capacity of sites, increasing the capabilities of personnel, developing local programs for each site, developing anti-radon protection programs, creating a single monitoring base, management of sanitary protection zones etc.); and

Figure 10. Completion of the remediation at Kaji-Sai tailing pond (strengthening of the slopes of the storage, construction of a new dam, construction of a mudflow allotment, surface restoration), March 2019

- development of a Regulation on the Unified State System of Radioactive Waste Management (considered in the draft of the new Law “On Nuclear and Radiation Safety”).

The main concerns of the MES in relation to the jurisdictional tailings and mining dumps are currently:

- measures to prevent emergency situations [18-20]; and
- remediation of uranium legacy sites see example in figure 10.

It should be noted that the Technical Regulations on Radiation Safety [12] have the following disadvantages in the context of radioactive waste management:

- There are no safety requirements that apply to existing exposure situations and specifically irradiation caused by radioactive contamination of territories with residual radioactive material resulting from activities in the past that have never been under regulatory control or that have been covered by regulatory control but not in accordance with the requirements of current regulations.
- There are no safety requirements that apply to nuclear or radiation emergencies after the announcement of the end of the emergency exposure situation.
- There is no list of practices and sources for which exposure is classed as an existing exposure situation.
- There are no requirements on assessing identified existing exposure situations in order to determine the types of occupational exposure and public exposure requiring attention from the point of view of radiation protection.
- There are no safety requirements that apply to existing exposure situations and:
  - conducting justification of protective measures and their optimization

- → carrying out remediation work, including the removal of sources of contamination / alteration of exposure pathways and management of radioactive waste generated
- → identifying the person or organization responsible for any control measures after the completion of remediation activities
- → introducing, if necessary, certain restrictions on the remediated territory in order to control access by unauthorized persons, removal of radioactive material or use of such material, including its use in consumer goods, or future use of the territory, including the use of water resources and its use to produce products or animal feed, as well as the consumption of food products produced in the territory.

→ There is no requirement to provide justification for remedial and protective measures and to optimize the protection and safety of the population in situations of existing exposure.

→ There is no requirement for the Government to ensure that measures are taken to identify persons or organizations responsible for territories with residual radioactive material, to develop and implement remediation programs, and, where appropriate, to take control measures after remediation; for implementing a proper radioactive waste management strategy.

→ There is no requirement for the persons or organizations responsible for the implementation of remediation measures:

- → to be responsible for all aspects of protection and safety, including conducting a safety assessment
- → to prepare and submit to the regulatory body or other relevant competent authority for approval a remediation action plan supported by the results of safety assessments
- → to ensure that work is carried out, including the management of the generated radioactive waste, in accordance with the remediation plan
- → to regularly monitor the territory during the implementation of remediation measures to check levels of radioactive contamination, check compliance with the requirements for radioactive waste management and detect any unforeseen radiation levels and make appropriate adjustments to the recovery plan after they are approved by the regulatory body or other relevant competent authority;
- → to conduct radiological surveys after the completion of remediation measures in order to confirm the fulfillment of the conditions for achieving the final goals defined in the recovery plan; or
- → to prepare a final report on the implementation of remediation measures and submit it to the regulatory body or other relevant competent authority.

→ There is no requirement that, after completion of remedial actions, the regulatory body or other relevant competent authority:

- → considers, makes changes as necessary and formally establishes the type, scope and duration of any measures after remediation control, previously defined in the plan of remediation measures, with due regard for residual radiation risks; and
- → periodically reviews the conditions in the remediated area and in appropriate cases alters or cancels any restrictions.

→ There is no requirement, after completion of remediation measures, to ensure the development and implementation, within the period of time required by the regulatory body or other relevant competent authority, of an appropriate program providing for any necessary monitoring measures to verify the long-term effectiveness of the remediation measures taken in territories requiring the application of control measures after remedial measures have been completed.

4.6.2 Regulation of Safety in Management of Disused Sealed Radiation Sources Declared as Radioactive Waste

Many disused sealed radiation sources (DSRS) do not have certificates. Most of the sources are stored in the RWSF waste storage site located in Bishkek, where DSRS are placed in containers and then placed in special pits. A large emplacement program for more than 1,000 DSRSs was conducted in 2001. Between 2016-2018, over 150 additional DSRS were stored at the RWSF.

Currently, there is a lack of regulation on the safe management of DSRS declared as radioactive waste, including:

- → Criteria of DSRS acceptance for processing
- → DSRS characterization and sorting for further storage/disposal
- → Management of damaged and unidentified DSRS
- → Reliable control over DSRS activities and their accounting
- → Requirements for DSRS packages and control of their state during long-term storage, and coordination and data exchange between DSRS suppliers and the operator of the storage facility, etc.

4.6.3 Release of Radioactive Materials from Regulatory Control

Currently, there is no specialized document that would regulate the release of radioactive materials from regulatory control. Thus, in the republic, no specific methodological and procedural requirements for developing criteria have been established and there are no requirements for procedures for measuring the radiation characteristics of radioactive materials or for the transfer of radioactive materials from one person to another. For the purpose of releasing radioactive material or a site affected by radioactive contamination from regulatory control, the Law of the Kyrgyz Republic Technical Regulations “On Radiation Safety” [12] is currently used. Experience from using the Technical Regulations [12] shows that the document has certain disadvantages and does not cover certain issues important to safety. Requirements are also established, but not in sufficient detail.

4.6.4 Decommissioning

There are currently concerns in the Kyrgyz Republic about the development of procedures for decommissioning uranium production facilities. In December 2019, Parliament and the President of the Kyrgyz Republic approved a bill to ban the development of uranium deposits and processing of ores containing uranium [33] as a result of the negative attitude of the population of Balykchi city in the Issyk-Kul region to the exploitation of a new uranium deposit. The approval of a long-term moratorium on the development of uranium deposits will require the decommissioning and full closure of the facilities of OJSC «KGRK», as this enterprise is unlikely to be able to find other raw materials to continue operating, and the moratorium may affect the processing process itself. The Parliament considers that decontamination of the enterprise and its reprofiling requires a simple set of actions. No assumptions have been made about what to do with the tailings pond in the future. There has been little activity in terms of decontamination and reprofiling of the enterprise since 2019.

4.6.5 Remediation of Legacy Sites and Radiation Sources, Including Uranium Mining and Processing Enterprises

Uranium ores have been mined in the Kyrgyz Republic since 1925. The largest legacy sites of the Kyrgyz Republic (Minkush, Kadzhisay and Mailuu-Suu) were formed during the mining and processing of uranium ores mainly in the period 1941-1960. For mining sites, in accordance with the Decree of the Government of the Kyrgyz Republic No. 517 of 08/18/2017 [34], the procedure and conditions for the remediation of land violated during the use of subsoil resources are determined. The regulation establishes only general requirements without considering the specifics of the radiation component.

At the end of May 2019, an order was issued to ban mining at uranium deposits and a law was approved by Parliament in December 2019 [33] “on the prohibition of activities related to the geological exploration of mineral resources for the purpose of prospecting, exploration and development of uranium and thorium deposits in the Kyrgyz Republic”

The ban on mining uranium deposits has led to investment losses being incurred. In total there are 90 deposits in the Kyrgyz Republic that potentially contain uranium and thorium. Many of these deposits are complex, i.e. in addition to uranium they contain rare earth metals such as, zirconium, tungsten and gold. Work at these sites may therefore be considered not connected with uranium and thorium.

In light of the moratorium on both the mining and processing of uranium ores it will be necessary for the SRCEPES SAEPF to develop further regulatory documents and a strategy for decommissioning and remediation of factory facilities and territories of “KGRK” OJSC. It will be important in the main law to consider issues related to labor protection, certification of personnel, environmental protection, protection of mineral resources, water resources, management of the sanitary protection zone, remediation measures and institutional control. This is due to the fact that the country has radioactive natural resources and a large former uranium industry legacy, which needs to be maintained in a state that is safe for the population.

A Strategic Master Plan has been signed, involving donor funds of 100 million Euros to finance measures for the transfer and remediation of uranium legacy sites in Central Asia, including the Kyrgyz Republic. The plan was approved by the order of the Government of the Kyrgyz Republic No. 406-p dated September 18, 2017. The plan sets out a strategic plan for the remediation of uranium legacy sites, including: Kaji-Sai, Kara-Balta, Mailuu-Suu, Min-Kush, Kyzyl-Dzhar, Tuya-Muyun and Shekaftar. Three radioactive tailings facilities in Kyrgyzstan (Min-Kush, Mailuu-Suu, Shekaftar) were each allocated 12.0 million Euros in 2017 and 16.5 million Euros in 2018 by the European Union. In addition, 2 million Euros were transferred to pay for the consulting services of the project management team. The grant beneficiary in the Kyrgyz Republic is the MES [35].

4.6.6 Management of Naturally Occurring Radioactive Materials

Currently, exposure to radionuclides of natural origin is not controlled by the regulatory authorities and institutional control is also absent. There is information available about territories and objects with a high content of natural radionuclides, with periodic studies of these objects being reported, usually in the framework of projects. Requirements to limit the impact of natural sources of exposure are presented in the Law of the Kyrgyz Republic Technical Regulations "On Radiation Safety" [12].

Sometimes the radiation risks associated with exposure to radionuclides of natural origin are significant. For example, there are some cases where high radon-222 activity concentrations in the air of residential premises (from 200 to 7000 Bq/m^3) have been recorded and there are also a number of clinics using thermal waters with a high content of radon. Several coal deposits have a high uranium content and the

burning of such coal by the population at home often leads to areas around the house having radiation dose rates of up to 2 μSv/h as a result of ash deposits, etc. However, assessment of the radiation exposure on representative persons in various prevailing real circumstances has not been carried out, so there is still no understanding of what specific radiation protection measures may be needed in each case. Currently, there are only general recommendations.

The radioecological monitoring system in the country is incomplete and distributed between different departments that are unable to carry out the full amount of work required for an objective assessment of the level of radioactive contamination across the Republic. There is also no radon monitoring program in the country, accounting for radon inhalation in residential and public buildings and workplaces. Radon emanation measurements are not made when choosing sites for the construction of residential and public buildings and structures, or in buildings after their construction. There are also no regulatory requirements for measuring radon to protect the public and medical personnel, including hospitals and sanatoriums where radon treatment is used. Measures are needed to integrate statistical data collected by the various government ministries and departments on individual dosimetry and environmental monitoring into a single database. Currently, such information is available at the Hydrometeorology Agency, the National Statistical Committee, SRCEPES, DDPSSES, SIETS, Agency for RW Management at the MES, Ministry of Agriculture, SCIES and National Academy of Sciences.

Considering the above, it can be stated that exposure to radionuclides of natural origin may be hazardous for the population and SRCEPES SAEPF should, together with the Ministry of Health:

- → carry out an in-depth analysis of radiation risks in enterprises that in their activities face higher levels of natural radiation in order to identify relevant professional and social risks
- → identify the signs and criteria by which radiation from natural sources relates to planned exposure situations or existing exposure situations
- → develop general safety provisions for dealing with natural sources in both planned and existing exposure situations
- → take measurements and compile radon maps to determine areas with the highest radon concentrations (e.g. areas adjacent to uranium objects, coal deposits, etc.); and
- → develop a program to reduce the concentration of radon in homes and workplaces to the appropriate control levels established by law.

All these measures should not contradict the main Law “On Radiation Safety” [3] and the updated radiation safety standards.

4.7 SRCEPES SAEPF Activities in the State Physical Protection System

4.7.1 Structure and Functions of State Physical Protection System

Currently, as a result of the threat assessment analysis, it was established that the Law “Technical Regulations on Radiation Safety” [12] and the Law on Radiation Safety [3] only partially comply with the provisions of international standards and recommendations on physical protection and safety. For example, the law does not cover:

- → provision for the development of a national security policy and strategy on physical protection
- → provision that radiation safety and physical protection measures should be designed and implemented in an integrated manner so that physical protection measures are not implemented to the detriment of

radiation safety, and vice versa (there is only one mention of physical protection in paragraph 6 of Article 3 “Objects of technical regulation Types of activity "Technical Regulations”);

- → classification of radioactive waste is required but there is no reference to the document where such classification is given.
- → requirement for the Regulator to create a regulatory system to ensure protection and safety, which includes: the use of notifications and official authorizations; consideration and assessment of facilities and activities; inspection of facilities and activities; ensuring compliance (enforcement) of regulatory requirements; performing regulatory functions related to the physical safety and security of sources; and providing information and advice to parties affected by their decisions;
- → requirements to ensure control of radioactive sources that have been left unattended, lost, placed in the wrong place, stolen or transferred without proper official permission
- → requirement that the person or organization responsible for the facilities or activities associated with radiation risks has the primary responsibility for ensuring protection and safety.

The new regulation on the regulatory authority (SRCEPES) [36], which is currently being approved by the Government, following approval of amendments to the Law “On the licensing system” [2] to start licensing activities related to the treatment of ionizing radiation, includes regulatory supervision and control of physical protection. Also, it is assumed that the main provisions will be established in a new Law on Nuclear and Radiation Safety, and will contain the following articles:

- → Ensuring the physical protection of nuclear facilities, radiation sources, storage facilities, nuclear materials and radioactive substances.
- → Requirements for ensuring the physical protection of nuclear facilities, radiation sources, storage facilities, nuclear materials and radioactive substance.
- → Access control for facilities handling nuclear materials or radioactive substances.

The Kyrgyz Republic has passed laws “On Accession to the Convention on the Physical Protection of Nuclear Material” of July 14, 2015 № 155 and Law “On ratification of the Amendment to the Convention on the Physical Protection of Nuclear Material of October 26, 1979, adopted on July 8, 2005 in the city of Vienna”.

There is a significant challenge with the physical protection of SIR located in the warehouse of the Kara-Balta Certification and Metrology Center and OJSC KGRK in Kara-Balta. The isotope store of the metrological service does not currently have reliable financing and supervision, nor adequate control from the KGRK OJSC security departmental. In the event of downtime or bankruptcy of the plant, the question arises as to how to ensure the safety of isotope storage located on the territory of KGRK OJSC. Due to the lack of relevant requirements and financial resources, no actions had been taken by 2019 to improve the status of the isotope storage.

4.7.2 SRCEPES SAEPF Functions and Tasks

According to the National Action Plan [6], after ratification of the Amendment to the Convention on the Physical Protection of Nuclear Material [37], the future tasks and efforts of the Government, SRCEPES, DDPSSES and SIETS will be as follows:

- → provide a regulatory framework for physical protection issues
- → provide the requirements and internal structure for assessing the security of installed or projected protection

- → ensure the radiation safety of facilities where radioactive waste and other radiation sources are operated and stored, considering the design basis threat
- → create a system of professional training, retraining and advanced training of specialists in physical protection, accounting and control of nuclear materials
- → license physical protection activities
- → undertake timely inspections in addition to establishing licensing requirements and increasing the capacity of personnel and physical resources to support the regime of physical protection in the state
- → exercise state control and monitoring of the state of physical protection
- → conduct periodic assessments of the threat of sabotage, theft or any other illegal seizure of radioactive materials to further enhance the functioning of the State system of physical protection
- → carry out state expert appraisal of projects for the creation, reconstruction, and technical re-equipment of systems for the physical protection of facilities, including systems for the transport of radioactive materials
- → maintain the physical protection mode at the facility level to ensure that the operating organizations and licensees (responsible for installations and facilities) determine the design threats at the facility level, and create and maintain physical protection systems for facilities and radioactive materials
- → increase the level of radiation safety and security culture of the subjects by taking coercive measures against licensees in the event of non-compliance with the requirements of legislation on physical protection and licensing conditions
- → cooperate in the field of physical protection with the IAEA, other international organizations and relevant bodies of foreign states
- → inform the relevant state bodies on the state of ensuring the physical protection of objects
- → interact with republican and local executive authorities in case of sabotage; and
- → create and ensure the functioning of a unified system of safe interaction between government bodies and legal entities, whose powers include the functions of physical protection.

4.7.3 Basic Areas of SRCEPES SAEPF Activities

Currently, the following main objects are identified for which it is necessary to develop a system of physical protection:

- → National Center for Oncology and Hematology in Bishkek
- → Storage facility for radioactive waste in Bishkek
- → SIR warehouse in Kara-Balta
- → OJSC KGRK in Kara-Balta (storage of sources and materials falling under the Non-Proliferation Guarantee, transportation of uranium-containing materials);
- → Several mining and processing plants for gold mining (LTD “Altynken”, CJSC Kumtor Gold Company, since 2020 LTD “KAZ Minerals Bozymchak”) and several combinations of building products in the Osh and Dzhalal-Abad regions (SIR operation to control the density bulk materials and soil density during the construction of dams);
- → Uranium-thorium tailings and dams, which are under the responsibility of the MES, JSC “KGRK”, Chemical Production Plant “Astra” and CJSC “TK Geo Resource” in Orlovka; and

→ Other owners of SIR registered in the National Registry for accounting of sources (the power of ionizing radiation from their sources is significantly lower than that of the organizations mentioned above).

The following objects are also involved in the system of physical protection:

→ Checkpoints for inspection at the state border

→ Checkpoints at the international airports in Bishkek and in Osh

→ Objects such as the Oncology Center in Osh and diagnostic nuclear centers in Bishkek that are in development.

State control over compliance with the requirements of physical protection is currently carried out by the SRCEPES as part of a cooperation project with the US Department of State, and SIETS within the framework of national control and accounting for SIR. Requirements for conducting routine and unscheduled inspections of physical protection, requirements for the periodicity of inspections of physical protection, and the basis, procedure and criteria for assessing the degree of risk for activities involving the transport of radioactive materials, and for recording the results of inspections are not currently developed. There is also no list of offenses in the field of physical protection.

Inspections of physical protection systems at specified entities, other than those registered in the national registry, organizations operating SIR and radiation generators, are carried out without a defined system, more often as part of inter-agency commissions and design works organized by international organizations or other governments. Such facilities include RWSF in Bishkek, a warehouse of sources in Kara-Balta and the Oncology Center.

During 2017-2018, a number of meetings and training courses on radiation and physical protection during the use and storage of sources and generators of ionizing radiation were held with the assistance of the IAEA and the US State Department.

4.8 Main identified threats and proposals for their elimination

4.8.1 Organization and General Principles for Activities of the Regulatory Authority

Key threats identified:

→ Threat to the status of independence of the regulatory body.

→ Restrictions on the organization of activities of the regulatory body.

→ Limited functioning of the physical protection system.

→ A limited number of qualified personnel in the field of nuclear and radiation safety.

→ Weak inspection supervision.

→ Lack of a complete database in the field of radiation safety and physical protection.

Ways to solve:

→ Need for extension and improvement of the legal and regulatory framework for radiation safety and nuclear security.

→ Need for governmental support of the SRCEPES SAEPF in the harmonization of national regulatory requirements on nuclear and radiation safety with IAEA standards.

→ Need for support of the SRCEPES SAEPF through Government approval of the new provisions for SRCEPES SAEPF as the regulatory body in the field of radiation safety.

→ Need for adjustment of the Priority Action Plan in the field of radiation safety [6] taking into account anticipated amendments to the existing Laws on “On Radiation Safety” [3] and the licensing system [2].

→ Need for creation of a coordination council and TSOs. This is important for the development and support of a national plan for the use of radiation sources in different fields and the control of existing exposure situations.

Need for the development of a government-agreed matrix of interaction between all state bodies involved in the sphere of activities around nuclear and radiation safety. This task is partially completed (see

→ Table 5) but it remains necessary to strengthen the agreement after making amendments to the legislation and getting all the necessary approvals.

→ Need to develop a mechanism for improving the understanding of radiation and nuclear safety issues and the corresponding skills of relevant civil servants, including municipal employees, and inspectors.

Table 5. Ministries and departments carrying out monitoring in accordance with the scope of their responsibility

Agency	**Responsibility**
SAEPF	Regulation in the field of environmental protection, ecological, nuclear and radiation safety
DDPSSES	Maintaining a register of radiation sources, monitoring the health of the population living near the tailings, radiation safety in medical institutions, drinking water supply facilities
MES (Tailings Management Agency)	Monitoring and handling of tailings and waste dumps
SIETS	Control and supervision in terms of industrial ecology and radiation safety
State Customs Service /State Border Service	Prevention of illegal import / export of radioactive materials, radiation sources, nuclear material, radioactive waste

→ Need for development and improvement of the strategy and system for radioactive waste management.

→ Need for assessment of the radiological situation and the existing exposure situation of the population living in the vicinity of former mining sites and for regular assessment of the radiological situation of legacy sites.

→ Need to integrate statistical data collected by various government ministries and departments on individual dosimetry and environmental monitoring into a single database. It is necessary to work out a mechanism for financing the tasks of expertise, monitoring and the development of various types of individual dosimetry.

→ Need for the development of a national security policy and strategy, in particular with regard to physical protection of radioactive materials.

→ Need for further support to the SRCEPES SAEPF to enable it to carry out its functions, including

  → the use of notifications and official authorizations

  → consideration and assessment of facilities and activities

- → inspection of facilities and activities
- → ensuring compliance (enforcement) of regulatory requirements
- → performing regulatory functions related to the physical safety and security of sources
- → providing information and advice to parties affected by their decisions, and

→ Creation of an annual reporting system and internet site that would take into account the creation of a structure for more flexible public participation in the field of radiation safety (publications for the public, independent public expertise, making contacts).

→ Need to create a national system of professional training, retraining and advanced training of specialists in physical protection, accounting and control of nuclear materials.

→ Need for enhancing the functioning of the State system of physical protection by conducting a periodic assessment of the threat of sabotage, theft or any other illegal seizure of radioactive materials. Need for set requirement to the operating organizations and licensees (responsible for installations and facilities) to determine the design threats at the facility level, and to create and maintain physical protection systems for facilities and radioactive materials.

→ Need to increase the level of safety culture of relevant organizations and their staff, including the SRCEPES SAEPF.

Regarding physical protection, at present inspections of physical protection systems at entities are carried out without a national system, more often as part of inter-agency commissions and design works organized by international organizations or other governments. State control over compliance with the requirements of physical protection is currently carried out by the SIETS together with SRCEPES and DDPSSES as part of a project to cooperate with the US Department of State, and within the framework of national control and accounting for the SIR.

Risks:

→ The low level of radiation and physical safety and regulatory supervision in the country not only presents risks for the health of the population and personnel but can also lead to reputational damage to organizations and reduction in the pace of development of technologies involving the handling of ionizing radiation.

→ Violation of international obligations under ratified conventions.

→ Losing opportunities for technical assistance and cooperation from the IAEA as a result of failure to fulfill the country's obligations and the lack of development of policies and strategies affected by the IAEA.

→ Delay in time or inability by state bodies to develop and agree on regulatory documents and instructions in the field of radiation safety.

→ Due to inconsistency of powers in various state organizations and the lack of coordination between the authorities, licensing requirements in the field of radiation safety have not yet been approved. As such, there are risks of non-compliance with existing regulatory requirements.

→ The absence or loss of trained and competent personnel in the regulatory body in the event that in the future the regulatory functions in the country could again be transferred from one state body to another state body.

4.8.2 Radioactive Material Transport

Key threats identified:

→ Limited number of regulatory requirements and lack of updating of requirements in accordance with the latest IAEA requirements in this field (i.e. GSR part 2 [38], SSR-6 [13]).

→ Lack of a licensing mechanism for the transport of radioactive materials within the country.

→ Lack of qualified personnel involved in the processes of regulation, supervision, organization and implementation of the transport of radioactive materials.

Ways to solve:

→ Need for improvement of legislation for regulation of nuclear and radiation safety in radioactive material transport incompliance with IAEA standards (GSR part 2 [38], SSR-6 [13]).

→ Need for improvement of the regulatory framework for compliance with rules for radioactive material transport.

→ Need for improvement of the regulatory framework for management systems for radioactive material transport.

The main condition for ensuring safety during transportation of radioactive materials in accordance with Article 18 of the Law of the Kyrgyz Republic Technical Regulations “On Radiation Safety” [12] is to limit radiation levels from packages and vehicles, and to prevent radioactive contamination of their surfaces and release of radioactive substances from packages. However, the Law does not establish that the shipper is directly responsible for the safe transport of radioactive materials. Currently, in accordance with the Law Technical Regulations [12], the IAEA standards are adhered to when transporting radioactive materials of the II-White and III-Yellow categories across the border.

There are currently no national regulatory requirements, rules and criteria regarding the transportation of radioactive sources, materials and waste throughout the country and licenses for the transport of radioactive materials are not currently issued. For the safety of dangerous goods during transportation, rules are established, but there is a low level of competence of the personnel of the state bodies responsible for transportation safety. Thus, the country needs to develop a legislative base in accordance with international requirements (IAEA GSR part 2 [38]) and increase the level of competence and equipment of the organizations involved in the process of transporting radioactive materials.

Risks:

→ The low level of radiation safety during the transport of radioactive materials can lead to risks of accidents during transportation and environmental pollution and exposure of personnel above the established limits.

→ An increase in the volume of radioactive waste requiring transport to authorized places and lack of state funding for the elimination of accidental consequences during the transportation of radioactive materials.

→ Possibility of local radioactive contamination occurring in the country that may not be immediately detected.

4.8.3 Radiation Safety

Key threats identified:

→ Limited number of regulatory requirements.

→ Lack of a licensing mechanism and conditions for any process requiring the handling of radioactive materials.

- → Lack of qualified personnel involved in the processes of regulation, supervision, organization and implementation when dealing with ionizing radiation.
- → A limited number of programs to protect personnel and the public from radiation risks.
- → Lack of safety and security assessment in organizations where there is either many SIR or hazardous SIR, including OJSC "KGRK", a source warehouse in the city of Kara-Balta, Oncology Center and Radioactive Waste Storage Site
- → Lack of qualified personnel for working with Tc-99m generators in medical organizations.
- → Lack of quality control programs in X-ray rooms and for CT installations.
- → Lack of a program for monitoring internal exposure of individuals in the country (by any methods).
- → Increased mortality rate among cancer patients due to the low level of service in the country's only oncology center.
- → There are no requirements to provide workers with acceptable and adequate personal protective equipment that meet IAEA standards or specifications and no requirements for employees to receive appropriate instruction on the proper use of protective clothing, respiratory protection, and protective aprons, gloves, mittens and screens.
- → There are no requirements for the development and implementation of a workplace monitoring program by registered persons and licensees.
- → Lack of calibration laboratory in the country, which would provide metrological services and provide services for interlaboratory comparisons.
- → Individual dose control of occupational exposure is currently carried out mainly for medical personnel (whole body and skin), whereas individual dose control for personnel in the economic sectors, such as uranium mining and processing, is not carried out. Similarly, monitoring of flight staff and staff of prisons and military units is outside regulatory control.
- → There are difficulties associated with the availability of the required number of dosimeters for medical staff, including dosimeters to determine the dose to the eye lens and hand, clinical dosimeters, and Albedo TLDs.
- → The presence of uranium legacy sites and sites and materials with a high content of NORM is a strain for the Government since there is often social discontent within the population due to fear of radiation. Currently there are few monitoring tools for detailing the situation, helping to highlight insufficient management of the situation.

Ways to solve:

- → Development of a regulatory document with modern safety requirements for management of radiation sources in compliance with IAEA basic international safety requirements. Addressing compliance of the legal and regulatory framework with the latest IAEA requirements on radiation safety (GSR Part 3 [14]) is needed prior to addressing the lack of a classification scheme for radioactive sources.
- → Development of a national system for accounting and control of personnel exposure doses that includes provision for the separation of planned, emergency and existing exposure situations.
- → Development of a comprehensive approach to ensuring radiation protection for medical exposure that includes requirements for all practical measures to be taken to minimize the likelihood of unintentional or accidental medical exposure and to undertake periodic inspections at facilities for medical exposure, as well as to maintain records.
- → Need to improve legislation in the field of state registration of radiation sources.

- → Development of radiation safety requirements for remediation of uranium (and thorium) legacy sites, including uranium and thorium mining and processing enterprises.
- → Need for a regulatory system for radiation safety and radiation protection of personnel and the public at enterprises managing NORM.
- → Need for regulatory support in the modernization of nuclear medicine and improvement of the radiotherapy service, and for supply new equipment for the National Oncology Center.
- → Need to support the state policy to limit public exposure to radon.
- → Need to improve legislation governing nuclear and radiation safety in compliance with IAEA standards.
- → It is important to develop and adopt an environment monitoring program or strategy in compliance with international safety standards. Harmonization of regulatory documents of the country with the standards of the IAEA is one of the priorities of the Kyrgyz Republic in the framework of an agreement with the IAEA. It is necessary that the monitoring program, regardless of the form of ownership of the object, be carried out regularly. At present, any monitoring at tailings with radioactive waste is carried out only within the framework of interdepartmental commissions or within international projects.
- → For new regulatory documents on licensing there is a need to set clear requirements for applicants including, for example, requirements for the organizational structure, staff competency, physical protection, material and financial resources, and radiation protection of personnel, the public and the environment, etc.
- → Need for a requirement to be set for the establishment of reference levels to optimize the protection and safety of the public in existing and emergency exposure situations.
- → Development of procedures to minimize the need to apply administrative measures and personal protective equipment through the use of well-developed engineering measures and ensuring satisfactory working conditions in accordance with the hierarchical order of preventive measures.
- → Need to establish training and capacity building of personnel working with Tc-99m generators in medical organizations.

Risks:

- → Exceedance of the reference levels for natural radionuclides in residential premises.
- → Due to the absence of appropriate regulations and technical support, there is a lack of quality control of X-ray rooms, tomography centers and other medical radiation sources.
- → Due to the increased radiation doses due to the absence of certain requirements for licensees and employers and the lack of personnel protection programs, there is a risk of damage to the health of personnel of medical organizations, industrial organizations and government organizations working in any way with radiation sources.
- → Preventive measures are not taken due to the lack of awareness of dose loads for the population and personnel in the country due to limited technical, financial and regulatory requirements for accounting for internal and external doses of human exposure.
- → The failure to identify radiation pollution risks in populated areas and in working rooms due to an incomplete monitoring system, both departmental and state. The unsatisfactory pace of development of laboratory services is due to the lack of consumers of such services, which happens due to the insufficient number of regulatory pressure mechanisms on organizations using ionizing radiation. The quality of laboratory services also suffers due to the lack of training centers, repair, calibration and other metrological services in the country and, accordingly, due to the increased financial costs for providing laboratories with services outside the country.
- → Increased mortality of cancer patients due to low level of service at the Cancer Center.

→ Lack of a quality algorithm for the provision of medical and preventive care in case of burns from over-exposure and as a result of relapse.

→ Damage to the health of personnel of medical organizations and the population who will receive services in these organizations.

4.8.4 Emergency Preparedness and Response

Key threats identified:

→ Regulatory framework is not in accordance with the latest IAEA requirements (i.e. GSR part 3 [14] and GSR Part 7 [22]).

→ Limited emergency response capabilities.

→ Limited ability to detect the consequences of emergencies occurring both domestically and in neighboring countries.

→ Lack of qualified personnel for training and for emergency work.

→ Lack of proper conditions for using the mobile radiological laboratory as an instrument for independent radiation assessment of the environment for emergency response purposes.

Ways to solve:

→ Review and approval of new standard provisions on functional and territorial SCPS sub system, as well as provisions on notification about a threat or emergency and communication in the area of civil protection.

→ Need for set requirements for materials and trainings on the subject of “Emergency preparedness at radiation hazardous facilities”.

→ Need for the objectives of emergency preparedness and response to be defined.

→ Need to set requirement for the implementation of measures to ensure the prompt implementation of emergency response at a site and to manage it without prejudice to the implementation of long-term operational safety and physical security functions both at the facility and at any other facilities at the site.

→ Need for set classification of a nuclear or radiological emergency and requirements for the introduction of emergency planning zones and emergency planning distances.

→ Need to set requirements for emergency workers, organizations and employers in emergency situations, including ensuring requirements on proper medical examination and the provision of medical care, treatment and long-term medical measures for people who may have suffered in a nuclear or radiological emergency.

→ There is a need to develop a regulatory framework and infrastructure for monitoring, alerts and emergency response, stemming from plans for the construction of NPP in neighboring republics.

Risks:

→ Deterioration of the radiation situation in the country in case of an emergency.

→ Damage to the health of personnel due to lack of requirements for emergency workers, incompetence and negligence of personnel involved in the emergency preparedness and response process.

→ Untimely response to emergency situations.

→ Damage to the health of personnel of medical organizations and the population receiving services in these organizations.

→ Deterioration of public health due to environmental pollution in emergency situations that can happen both on the territory of the Kyrgyz Republic and outside the country.

4.8.5 Radioactive Waste Management, Decommissioning and Remediation

Key threats identified:

→ Limited number of regulatory requirements and lack of updating of the regulatory framework in accordance with the latest IAEA requirements (i.e. GSR part 5 [39] and GSR Part 6 [40]).

→ Lack of a licensing mechanism and conditions for the decommissioning of facilities and uranium-thorium mining complexes and complexes for the processing of radioactive materials.

→ Lack of qualified personnel involved in the processes of regulation, supervision, organization and management of radioactive waste and obsolete sources.

Ways to solve:

→ Bring the legal and regulatory framework in accordance with the latest IAEA requirements (i.e. GSR Part 5 [39] and GSR Part 6 [40]).

→ Need for a classification scheme for radioactive waste to be set in accordance with international standards in the policy and strategy of the Kyrgyz Republic (laws and requirements), including the establishment of an operational categorization system that will help in the predisposal management of radioactive waste.

→ Need for a comprehensive approach to ensure safety of RW management considering consistency of individual RW management stages up to final disposal. Lack of clear and unambiguous criteria for RW sorting taking into account waste classification in accordance with acceptable disposal concepts and specific requirements and rules for RW management stages.

→ Need for regulatory requirements for remediation of interim RW confinement sites in the exclusion zone and legacy waste disposal facilities taking in to account modern approaches to the regulation of existing exposure situations and management of radioactive waste consistent with the IAEA Basic Safety Standards.

→ Need for systemized requirements for safety assessment and safety justification of RW management facilities and activities and improvement of regulatory requirements for the development of safety justifications (safety cases).

→ Need for requirements for the management of disused sealed radiation sources declared as RW.

→ Need for requirements for the release of radioactive materials from regulatory control.

→ Need to improve the land management system in the area of legacy RW storage and tailings, including defining the owner in historical territories, defining rules and requirements for sanitary zones, conducting remediation, institutional monitoring and creating funds to finance safety measures.

→ Need to set requirements for preparing and submitting to the regulatory body or other relevant competent authority for approval a remediation action plan supported by the results of a safety assessment.

→ Need to set requirements for conducting monitoring during the implementation of remediation measures and to conduct a radiological survey after the completion of activities to confirm the fulfillment of the conditions for achieving the final goals defined in the remediation plan.

- → Need to set requirements to introduce certain restrictions on remediated territories to control and minimize public exposure.
- → Need for regulations governing historical legacy sites of the uranium industry and radioactive material processing facilities as well as requirements for the Government, the regulatory body, licensees and persons or organizations responsible for the implementation of remediation measures (optimization of radiation protection, decommissioning of KGRK OJSC, cost optimization and limitation for the use of remediated territories and factories, land control in sanitary protection zones of radiation facilities, monitoring, etc.).
- → In addition to the development of legislative and regulatory requirements, it is necessary to ensure that the level of equipment of state bodies and organizations is adequate for threats for supervision, examination, training, operational control, laboratory analysis and metrological services.

Risks:

- → Deterioration of the radiation situation in places of storage and disposal of RW.
- → Damage to the health of personnel involved in the management of RW and SIR associated with the decommissioning of facilities and remediation of places of RW stores.
- → Inappropriate use of territories due to lack of clear requirements and long-term control of lands after the remediation of RW disposal sites.
- → Social problems with the population living directly next to areas affected by RW.
- → Unauthorized use of RW, for example, for construction purposes, and the unauthorized use of other materials (radioactively contaminated coal, ash, scrap metal, etc.).
- → The risk of accidental pollution of premises and the environment due to the lack of control over SIR with expired life or due to untimely decommissioning of SIR.
- → Preventive measures are not taken due to the lack of information on the situation at the sites of storage and disposal of RW and SIR.

4.8.6 State Physical Protection System

Key threats identified:

- → Lack of a national security policy and strategy on physical protection.
- → Lack of provision that radiation safety and physical protection measures should be designed and implemented in an integrated manner so that physical protection measures are not implemented to the detriment of radiation safety, and vice versa.
- → Lack of requirements to ensure control of SIR that have been left unattended, lost, placed in the wrong place, stolen or transferred without proper official permission.

Ways to solve:

- → Provision of necessary support in preparing regulations according to international requirements for the physical protection of sources (protection, transportation, storage and burial) and distinction from regulatory control.
- → Create a system of professional training, retraining and advanced training of specialists in physical protection, accounting and control of nuclear materials to increase the capacity of personnel and physical resources to support the regime of physical protection in the state.

→ Establish licensing requirements for physical protection activities and establish a program of inspections.

→ Exercise state control and monitoring of the state of physical protection, including the need for periodic assessments of the threat of sabotage, theft or any other illegal seizure of radioactive materials to be undertaken.

→ Need for requirements to maintain the physical protection mode at the facility level to ensure that the operating organizations and licensees (responsible for installations and facilities) determine the design threats at the facility level and create and maintain physical protection systems for facilities and radioactive materials.

→ Create and ensure the functioning of a unified system of safe interaction between government bodies and legal entities, whose powers include the functions of physical protection.

Risks:

→ Criminal use of radioactive materials for the intentional harm to human health due to easy access to SIR and the lack of necessary control and accounting of radioactive materials in the country.

4.9 Overview and status of international projects

4.9.1 Regulatory cooperation between SRCEPES SAEPF and DSA

Cooperation between SAEPF and DSA began in 2009. During project implementation in 2009-2015, considerable progress was achieved in understanding of threats posed by ionizing radiation in areas where RW and radionuclide materials are located, as well as in understanding how to effectively use the knowledge of these threats in setting national policy in the field of RW management and formation of appropriate strategies. Between 2009 and 2012, two normative documents were approved by the Parliament: “Technical requirements for a systematic radiation monitoring scheme around the RW tailings dumps in Kyrgyz Republic” and “Regulatory guidance document on management of radioactive waste, including RW tailings piles and dumps”. In 2013-2016 six regulatory documents were prepared, which contained the basic elements for the management of RW in a safe and responsible manner, as well as addressing remediation and protection of personnel issues. New guidelines were harmonized with the existing regulatory documents and with international standards. The new regulations will be applied to RW management, mining and processing of uranium ores, storage of SIR, as well as to reclaimed areas previously contaminated by radioactive material. After the introduction of amendments to the existing laws and approval of a new Law in the field of radiation safety, the developed regulatory documents will be submitted for approval to the Parliament.

4.9.2 Cooperation with the IAEA

On 24 May 2018, Kyrgyzstan submitted to the IAEA the “National Report of the Kyrgyz Republic under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management”. Subsequent discussions have focused on the following issues:

→ Operator of the storage facility for SIR

→ Contamination of imported cars due to the accident at the Fukushima Daiichi NPP

→ Technical and financial problems concerning the remediation of uranium mining legacies

→ Uranium mines and facilities still in operation

→ Legal provisions preventing import of RW

→ Training courses in radiological safety for licensees and regulators

→ Comprehensiveness of the national register for radioactive sources.

The main challenges identified for Kyrgyzstan during the discussion were:

→ Establishment of a radiological monitoring network at the uranium legacy sites.

→ Evaluation of the radiological situation and the exposure of the population living in the vicinity of former mining sites (Min-Kush, Kaji-Sai, Ak-Tuz, Mailu-Suu, Shekaftar, etc.).

→ Development of a RW management policy and strategy.

→ Development of the regulatory structure for RW management.

Discussions concluded that radioactive substances in the Republic are related mainly to uranium mining facilities, waste dumps and SIR used in medicine and industry, and that international cooperation projects have helped strengthen nuclear and radiation safety, RW management and reclamation of uranium legacy facilities. There is, however, a need for further strengthening of the regulatory system and legislation.

The following results have been achieved within the framework of technical cooperation with the IAEA:

→ The report on the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [32] was prepared and submitted.

→ The “Strategic Master Plan for the Rehabilitation of Uranium Legacy Sites in Central Asia” was approved and signed.

→ A Country Cooperation Framework with the IAEA for 2018-2023 has been approved and signed (Order of the Government of the Kyrgyz Republic No. 316-p dated 12.09.2018 [41]), which defines the framework for planning technical cooperation for the period 2018-2023 and reflects a complete understanding of the priorities established in the request for technical cooperation from the IAEA in this period. This document is very important for the Kyrgyz Republic in the implementation of national projects of the IAEA and their promotion for approval.

→ A Comprehensive Plan for Supporting Nuclear and Radiation Safety in the Kyrgyz Republic has been developed and is under approval by the Government.

→ Continuous advanced training of government officials in the field of radiation safety is being carried out.

→ Preparations for delivery of technetium-99m generators.

As a result of a visit of the Deputy Director General of the IAEA to the Kyrgyz Republic on 19-21 June 2019, the success of the regulator in the field of radiation safety since 2016 was acknowledged and continued development of the regulatory system in the country was called for.

IAEA Advisory Mission 2013 – progress on addressing recommendations.

The last IAEA Advisory mission to the Kyrgyz Republic took place in 2013. As a result of the mission, IAEA experts provided the report “IAEA Advisory Mission to Review the National Regulatory Infrastructure for the Control of Radiation Sources in the Republic of Kyrgyzstan. 19-24.08.2013” [31], which had the following recommendations:

1. In accordance with Law No.58 of 17 June 1999 on ‘Radiation Safety of the Population of Kyrgyzstan’ Article 10, the government of Kyrgyzstan should consider establishing state policy in the field of radiation safety, the implementation of which should be subject to a

graded approach in accordance with national circumstances and with the radiation risks associated with facilities and activities.

2. The government should urgently consider a review of legislation and, to the extent possible, include all relevant provisions on radiation safety contained in various laws, Governmental Decisions and Orders, in a single Nuclear Law compatible with international requirements and GSR Part-1 [5] in particular. More generally, the government should also consider measures to ensure that Governmental Decisions and Orders will be in full compliance with existing laws.
3. As a first step, the government should consider including in the current draft law before parliament, dealing with the distribution of regulatory functions and responsibilities, the necessary provisions to establish a national regulatory body for nuclear and radiation safety in accordance with GSR Part-1 [5] and ensure that all regulatory functions and responsibilities are precisely assigned to this (and any other bodies as appropriate) such that there are no duplications or gaps. (Note: this refers to the amendment, which was subsequently adopted on March 28, 2014 No. 53).
4. In due course, a comprehensive Nuclear Law should be promulgated, addressing the requirements of GSR Part-1 (including the establishment of an effectively independent regulatory body) together with other international requirements and conventions to which Kyrgyzstan is a party.
5. The Nuclear Law should include provisions to ensure the regulatory body is provided with the competences and other resources necessary to implement its statutory obligations for the regulatory control of radiation safety.
6. The government should consider establishing a sustainable national training program for persons engaged in ensuring radiation safety.
7. The Government, by outgoing notification No. 22-4157 dated March 28, 2016, committed itself to comply with the requirements of the Code of Conduct on the Safety and Security of Radioactive Sources [42] and related Guidelines for the Import and Export of Radioactive Sources [43].
8. The government should consider mechanisms to formally coordinate the activities of all authorized governmental bodies working in the field of radiation safety.
9. The government should consider designating one authorized body as the IAEA point of contact on all matters regarding nuclear and radiation safety.

By 2020, the recommendations noted under paragraphs 3, 6, 7, and 9 had been implemented although further actions may be required to ensure their full implementation.

IAEA Expert Mission 2018. Conclusions and recommendations

An important IAEA expert mission to the Kyrgyz Republic on regulatory and communication issues took place in 2018. The IAEA experts, after visiting the SAEPF, the Ministry of Emergencies, the DDPSSES MoH KR and the SIETS, provided the report “Expert mission to inform the national competent authorities and stakeholders about the creation of a government, legal and regulatory framework for radiation safety. 12-16.11.2018” [44]. The following are the conclusions and recommendations that were given as part of the 2018 IAEA report.

Expert Conclusions:

1. The main purpose of the Expert Mission was to sensitize national competent authorities and stakeholders on the establishment of the governmental, legal and regulatory framework for radiation safety.

2. The Expert Mission was very important at the time when draft Ecological Code was going to be approved as well as when reorganization of the Government was expected and the draft regulation on State regulation in the field of radiation, nuclear, chemical and biological safety was going to be discussed and approved by the Government of Kyrgyz Republic.
3. The SAEPF has been legally assigned to regulate radiation safety in Kyrgyzstan but has not been given all the necessary legal framework and resources to carry out its regulatory functions in line with IAEA standards.
4. Existing laws and regulations as well as structure and functions of different stakeholders result in duplications and gaps in such important regulatory functions as approval of norms, state control and licensing and do not meet some important requirements of IAEA standards, i.e. GSR Part1 [5] and GSR Part3 [14].
5. Kyrgyzstan is not a part of some important international treaties for the country, such as the Convention on Nuclear Safety, Convention on Early Notification in a case of Nuclear Accident, Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency, Code of Conduct on the Safety and Security of Radioactive Sources and Guidance on the Import and Export of Radioactive Sources.

IAEA Expert Mission Recommendations for the Government of Kyrgyz Republic:

1. Support of the SAEPF in promoting the Ecological Code, draft regulation on State regulation in the field of radiation, nuclear, chemical and biological safety and other legal framework governing radiation safety in the Kyrgyz Republic includes laws, ordinances and sanitary rules, but does not adequately address a number of issues.
2. Support consolidation of available human and financial resources in the country into one independent regulatory authority, to provide it with required competencies and enable it to fulfil its duties according to IAEA standards. In the case of more than one regulatory authority being established, the responsibilities and functions of each authority should be clearly specified, and any omissions or duplications should be avoided.
3. Adherence of Kyrgyzstan to IAEA conventions on Nuclear Safety, on Early Notification in a case of a Nuclear Accident, Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency, and the Vienna Convention on Civil Liability for Nuclear Damage would be welcomed.
4. Making of a commitment to the Code of Conduct on the Safety and Security of Radioactive Sources [42] and to the Guidance on the Import and Export of Radioactive Sources [43] would significantly facilitate the import and export of radioactive sources and their safe use.
5. It was recommended to establish a TSO to provide services to the regulatory authority such as individual dosimetry, maintaining a register of radioactive sources, testing of equipment emitting ionizing radiation, acceptance and constancy tests of medical x-ray equipment. If, due to a lack of experts, a TSO would provide assistance to both licensee and regulator, measures should be taken to avoid potential conflicts of interest.

4.9.3 SRCEPES SAEPF activities in other international groups

Kyrgyzstan does not have any nuclear facilities on its territory. Thus, at present, the country does not need to participate in specific groups related to the safety of nuclear energy management. The Kyrgyz Republic is, however, a member of several union formations, such as the CIS, the Customs Union and the Eurasian Economic Union.

Within the framework of union agreements, work has begun on the harmonization of technical regulations and uniform requirements for the international transportation of radioactive substances and the certification of food products and consumer goods. For example, within the framework of the Company “Atom-CIS”, since 2018, work has been carried out in the group “Implementation of the Agreement on Informational Interaction between the CIS Member States in Moving Radioactive Sources”. The product of this work is the draft document “Uniform procedure and forms for exchanging information on the movement of radioactive sources”, which is currently being finalized in the participating countries.

In collaboration with the Government of the USA measures are planned for the design and assessment of physical protection systems in order to ensure radiation safety in the framework of the implementation of the Law “On joining the Convention on the Physical Protection of Nuclear Material” dated July 14, 2015 No. 155 [45]. Kyrgyzstan is also collaborating with multiple international organizations in the field of radiation security. International bilateral technical and regulatory cooperation play a significant role in a broad effort to address security concerns and ensuring customs control to prevent illicit trafficking in nuclear materials.

4.10 Conclusions

4.10.1 Current status

Comparing the threat assessment results of 2008 and 2019, differences have been identified, demonstrating that positive steps have been taken and a number of international cooperation projects for the period 2018-2021 are ongoing to further address regulatory threats in the country (see Table 6). A key difference between the 2008 and 2019 threat assessments is that in 2015, the Kyrgyz Republic managed to consolidate and unify the regulatory authority in radiation safety (SRCEPES SAEPF). It should be noted, however, that the overall nature of the identified problems in the system of regulation, supervision and safe management in the field of radiation both in 2008 and in 2019 remains the same. Many of these problems are related to the economic crisis in the country, the intensity of which has remained almost unchanged since 2008. The lack of funding affects the staffing levels in state bodies and the equipment of supervisory and control bodies, laboratories and training centers. The equipment of laboratories and research facilities of the former uranium industry are mainly directly dependent on participation in international projects.

It is necessary to regularly analyze the internal capabilities of the main regulatory body in the field of radiation safety and state bodies and external factors. It is also necessary to continue the search for ways to best use the internal capabilities of the republic, considering external constraints and the compliance of existing reserves with the requirements of the environment and to introduce an assessment of the effectiveness of the regulatory system in order to correlate the plans and the actual development of the situation. It is extremely important to continue to evaluate the existing legislative base and institutional structure in the Republic and the extent to which it complies with international standards and meets the requirements for nuclear and radiation safety and security.

At present, the inspection body, which was created separately from the regulatory body, is not efficient for the situation that currently exists in the country. At the Government level and at the level of interdepartmental meetings, the inspection body does not provide information on the number of violations in the field of radiation safety, and the number of corrective actions taken by organizations to correct violations. Practical work and a survey of enterprises shows that the inspection body is not interested in introducing corrective measures for identified violations. The work carried out by the inspection body in interdepartmental commissions shows that supervision takes place mainly in the field of environmental and

fire safety, and radiation safety supervision does not cover all the requirements of the IAEA GSR Part 3 [14].

In the country, many different SIR are used in medicine and industry. Activities related to the use or management of ionizing radiation sources, including storage, transportation within the country, transfer to another user, and disposal are not licensed: the concept of “authorization” does not currently exist in the existing legislative framework. Furthermore, the control and supervision of SIR handling is not carried out at the appropriate level, since the supervision and control bodies lack appropriately qualified personnel. Due to gaps in the regulatory framework and regulatory system in the field of nuclear and radiation safety, supplies of SIR and equipment to the NCO, planned as part of technical cooperation with the IAEA, may be stopped.

In addition to SIR, activities relating to the handling of radioactive materials and RW are not licensed and supervision and control over activities are not carried out. This is due to the lack of key functions of the regulatory body, as well as the incomplete legislative basis in the Republic. A lack of qualified staff and the current structure of the regulatory authorities also prevents full inspections of activities related to the handling of radioactive materials, SIR and RW. As a result, operators do not fully meet their responsibilities with regard to ensuring radiation safety. Furthermore, due to the lack of relevant requirements in the current legislation, the Personnel Protection Optimization Program and Safety Assessment are not implemented in organizations, safety instructions are not followed, and individual monitoring is not fully implemented.

Table 6. International Projects with Government of the Kyrgyz Republic as Beneficiary for 2018–2021

No.	Project title	Donor	Recipient	Performance period
1.	Nuclear Medicine Recovery KIG6007	IAEA	Ministry of Health of the Kyrgyz Republic	2018-2019
2.	Strengthening the capacity of radiological laboratories of the sanitary-epidemiological service of the Ministry of Health of the Kyrgyz Republic KIG7004	IAEA	Ministry of Health of the Kyrgyz Republic	2018-2021
3	Improving the system for monitoring and controlling the locations of legacy uranium in accordance with international safety standards KIG9007	IAEA	MES	2018-2021
4	Improving regulatory infrastructure in the field of nuclear and radiation safety in the Kyrgyz Republic KIG9006	IAEA	SIST, DDPSSES MoH KR, SAEP&F	2018-2021
5	European Union project under the Instrument for Cooperation in Nuclear Safety INSC 4.01 / 11-12 “Conducting a Comprehensive Environmental Impact Assessment and Feasibility Study for the Management and Remediation of the Former Min-Kush and Shekaftar	EU	MES	2017-2019

No.	Project title	Donor	Recipient	Performance period
	Uranium Mines in the Kyrgyz Republic" EuropeAid / 135725 / DH / SER / KG.			
6	EU project "Management and remediation of high-risk uranium legacy sites in Central Asia (Mailuu-Suu)", "Conducting a Comprehensive Environmental Impact Assessment and Feasibility Study for the Management and Remediation of the Mailuu-Suu Former Uranium Mines in the Kyrgyz Republic" EuropeAid / 135725 / DH / SER / KG.	EU	MES	2017-2019
7	Interstate Target Program "Reclamation of the territories of the EurAsEC member states affected by uranium mining".	RF	MES	2017-2023

The radioecological monitoring system in the country is not efficient. Monitoring is distributed between individual departments that cannot carry out the full amount of work for an objective assessment of the state of radioactive contamination. Also, operators do not monitor environmental objects to objectively assess the state of the level of radioactive contamination. Furthermore, Kyrgyzstan does not currently carry out an assessment of radioecological safety for natural objects and natural resources (e.g. coal) with a high content of naturally occurring radionuclides.

Due to a lack of relevant legislation and regulatory requirements, the country still does not have a radon monitoring program, accounting for radon inhalation in residential and public buildings, in workplaces and in hospitals and sanatoriums where radon waters are used for treatment. No measurements of radon escalation are made when choosing sites for the construction of residential and public buildings and structures. Similarly, no radon escalation measurements are made in buildings after their construction.

A "Strategic Master Plan for Restoring the Environment at Uranium Heritage Sites in Central Asia" was approved in 2017 by the order of the Government of the Kyrgyz Republic No. 406-r dated September 18, 2017, which provides for the restoration of uranium heritage objects at the following sites: Kaji-Sai, Mailuu-Suu, Min-Kush and Shekaftar. However, the assistance provided by the European Union within the framework of the Strategic Master Plan for the remediation of uranium heritage sites is at risk of being curtailed as a result of ongoing gaps in the regulatory framework and regulatory system in the field of nuclear and radiation safety in Kyrgyzstan.

The physical protection of SIR by law enforcement agencies is also not fully provided. Currently, law enforcement agencies do not have the ability to quickly respond to emergency situations related to SIR, since there is no departmental protection of facilities using SIR, or this protection is unnecessarily commercial in nature. As such, ensuring physical protection is difficult for enterprises, who are in an economic crisis, and for state organizations with a small budget. Thus, there is an imperfect system of interaction between the Ministry of Internal Affairs, state bodies and organizations.

4.10.2 Plans for continued cooperation and activities to address regulatory threats

Based on the amendments to the existing laws, work will begin on updating the Priority Action Plan in the field of radiation safety in the Kyrgyz Republic and the development of new strategic programs. A number

of international collaboration projects have been undertaken since 2018 (see Table 6), some of which are ongoing. A Country Cooperation Program has been signed with the IAEA for the period 2018-2023, the coordination of the implementation of which, according to Government Order No. 316-r of September 12, 2018 [41], is entrusted to the SAEPF. Within the framework of this Country Cooperation Program, the position of the Kyrgyz Republic with regard to future technical cooperation with the IAEA, results achieved in completed tasks, as well as the status of implementation of ongoing projects was discussed. Further development and improvement of the legal and regulatory framework on radiation safety, RW management and decommissioning is required to meet the latest international recommendations and the commitments linked to international agreements. There is also a need to a define a national policy and strategy for remediation and the safe management of RW.

Within the framework of its obligations, the Kyrgyz Republic intends to ratify and approve the following conventions and treaties:

- → Agreement on privileges and immunities of the IAEA
- → Vienna Convention on Civil Liability for Nuclear Damage
- → Convention on Early Warning of a Nuclear Accident
- → Convention on Assistance in the Case of a Nuclear Accident or Radiation Emergency
- → Protocol on small quantities to the Agreement between the Kyrgyz Republic and the IAEA on the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons; and
- → Harmonization of Kyrgyz legislation with the requirements of the IAEA safety standards.

Changes and additions will soon be made to the regulatory enactments in the field of nuclear and radiation safety such that the regulatory body will have all the necessary powers of a regulator. As part of the development of cooperation with the DSA project, a Roadmap for future regulatory cooperation for 2020-2025 has been developed (see Appendix 3).

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5 Overall Conclusions and Discussion

Updated regulatory threat assessments (RTA2) have been completed by the regulatory authorities in Kazakhstan, Tajikistan and Kyrgyzstan, with support from their TSOs and strong involvement of DSA experts. The basis for assessment was comparison with relevant international treaties, conventions and standards, corresponding recommendations and guidance, and shared experience of their application at the national level. The process of completing the RTA2 has helped the regulatory bodies to gain an overview of the current situation in each country concerning radiation and nuclear safety and security legislation and corresponding regulations, guidance and procedures.

Considerable progress has been made in the development and improvement of the legislative and regulatory frameworks for nuclear and radiation safety and security since the completion of RTA1 in 2011. The bilateral regulatory cooperation between DSA and the authorities in each country, as supported by engagement with operator-oriented projects and the wider international community, has resulted in significant improvements in the regulatory basis for practical work to improve safety and security. This includes the drafting and official approval of a wide range of regulatory documents that address specific practical regulatory issues, including training, inspection, monitoring and emergency preparedness, and actions to improve the safety and security of radioactive wastes and legacy sites and facilities.

However, a significant number of continuing, new and newly recognized threats have been identified and important challenges remain to be addressed. Figure 11 summarizes these threats in each topical area in each country. The distribution of these threats and the priorities for their resolution have emerged from discussions among the relevant stakeholder organizations in each country and should not be compared between countries.

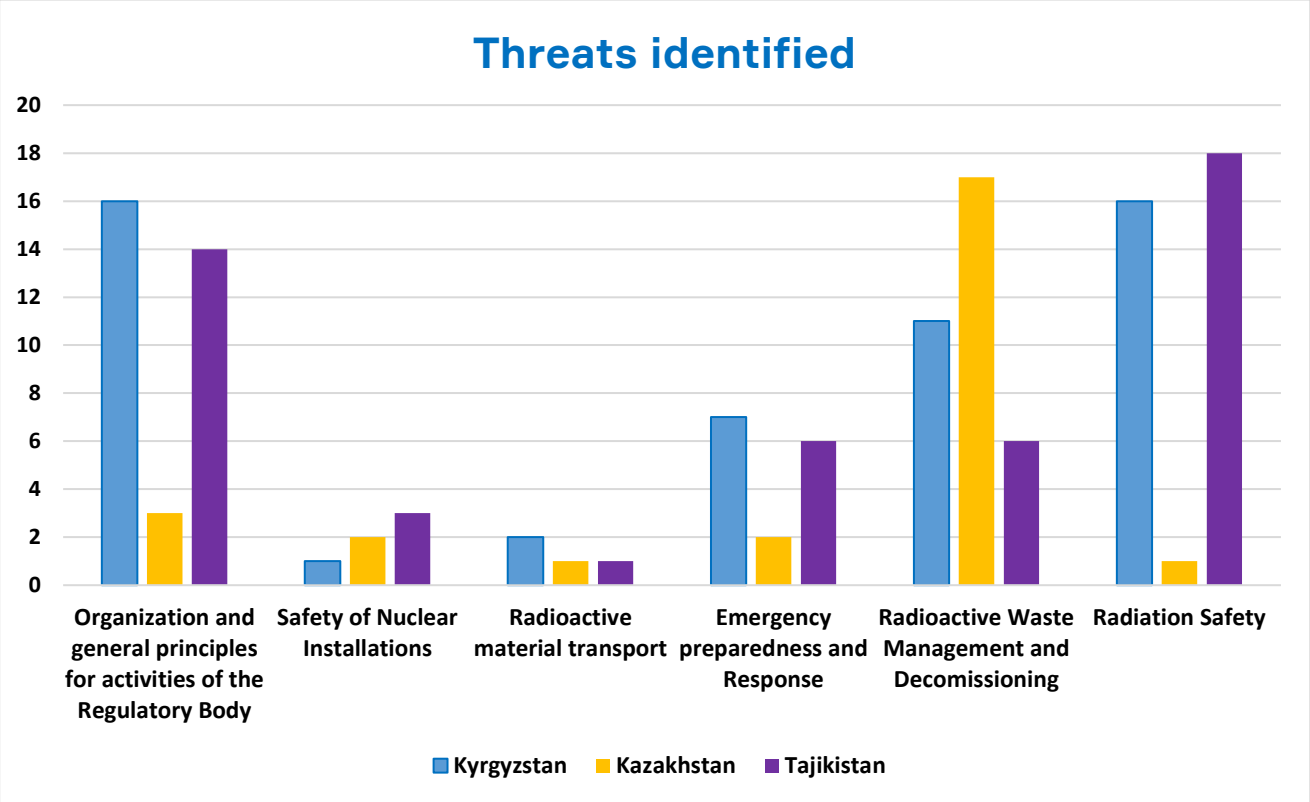

Figure 11 Summary of identified threats in each area in each country

It is important to note that Kazakhstan has all types of legacies linked to a long history of development of nuclear technologies, as well as plans for continued and new activities in this area. In addition, there have been difficulties with obtaining official approval of crucial regulatory documents that were drafted as part of the regulatory support program. These difficulties occurred apparently due to reorganizations in the structure of the ME RK, and factors connected with staff turnover. However, in February 2021, relevant amendments were approved to the Law on the Use of Atomic Energy in the Republic of Kazakhstan, revising the powers, responsibilities and functions of state bodies concerned with nuclear energy use. This will substantially eliminate duplication among government agencies and expedite progress, at the same time bringing aspects of domestic legislation into line with the international safety standards, and clarify the interpretation of aspects of the laws "On the Use of Atomic Energy" and "On Radiation Safety of the Population".

In order to implement these amendments and put them into practice, the CAESC has identified the need to develop a document explaining the mechanism for the interaction of state bodies and local executive bodies concerned with the use of atomic energy. The document should set out: the competencies and responsibilities of all state bodies involved in the regulatory process; the order of their interaction; requirements for development of procedures; the order and level of coordination of documents, and requirements for maintaining documentation and sharing of information. The use of such a document will make it possible to optimize the functioning and provide a unified vision for the organization and implementation of state regulation.

In Kyrgyzstan, while organisational arrangements continue to evolve, some important progress in the approval of the regulatory documents has been made. Between 2009 and 2012, two normative documents were approved by the Parliament: “Technical requirements for a systematic radiation monitoring scheme around the RW tailings dumps in Kyrgyz Republic” and “Regulatory guidance document on management of radioactive waste, including RW tailings piles and dumps”. However, in general, the position of regulatory bodies remains weak, and their individual roles and responsibilities are not optimally arranged. For example, according to the resolution of the Government of the Kyrgyz Republic of February 12, 2021 No. 38 “On organizational measures in connection with the approval of the new structure of the Government of the Kyrgyz Republic and the reform of the executive authorities of the Kyrgyz Republic” the State Agency for Environmental Protection and Forestry” under the Government of the Kyrgyz Republic, were divided into State Ecological and Technical Inspection, placed under the Ministry of Emergency Situations, and State Forestry Agency were transferred to the Ministry of Agriculture, Water and Regional Development. The Ministry of Emergency Situations of the Kyrgyz Republic combine now responsibility for the remediation of uranium legacy sites as well as functions in the field of ecological and environmental protection and supervision.

In Tajikistan, several improvements to laws, regulations and corresponding guidance have been officially approved and implemented. In addition, NRSA provided additional quality control on the application of these documents, with support from IAEA. This has strengthened the position of the regulatory body and improved staff competence. However, continuing threats have been identified in RTA2.

Detailed understanding of the threats, and the scope and methods to address them, have been developed as part of the RTA2 process. This understanding has been presented as Roadmaps for future regulatory cooperation in each country, see appendices 1, 2 and 3. These Roadmaps are considered as the basis for discussion of future regulatory support from DSA, while accounting for wider international programs such as those of the IAEA, the European Union and the European and Central Asia Safety Network (EUCAS). For Kazakhstan and Kyrgyzstan, the Roadmaps are set out under the headings of:

→ Organization and general principles of the regulatory body

→ Safety of installations

→ Radioactive waste management and decommissioning

→ Transportation of radioactive materials

→ Radiation safety

→ Emergency preparedness and response.

The following factors are considered under each heading:

→ Identified threats

→ Priority

→ DSA collaboration events

→ Stakeholder organizations

→ Proposed actions in the framework of cooperation

→ Costs

→ Risk indicators in the absence of activities

→ Success Indicators for Event Execution

→ Timing.

In the case of Tajikistan, the Roadmap has been developed under the different headings:

→ Regulatory Infrastructure

→ Radiological Protection in Occupational Exposure

→ Radiological Protection in Medical Exposure

→ Public and Environmental Radiological Protection

→ Safety and security of radiation sources

→ Education and Training in Radiological Protection

→ Transport Safety

→ Radioactive Waste Management and Uranium Legacy Sites

The different headings reflect the different priorities in the different countries, in turn, reflecting the different circumstances in each country.

Alongside the country and site specific circumstances, common factors to be addressed in meeting the overall challenge include: the lack of information about historic events and practices that make it difficult to adequately characterize the current situation; the typically limited involvement of stakeholders in the process of regulatory development, and the continuing lack of resources available to support a robust and effective regulatory system. Similar challenges have been noted in wider international forums [1], [2].

The NEA's Expert Group on Legacy Management concluded [1] that the allocation of responsibilities is a key issue, but responsibilities cannot be effectively managed without corresponding adequate allocation of resources. In situations where there are very limited resources, scheduling of a staged approach to the desired end-state and careful attention to optimization might be especially useful, to identify what is really feasible on a realistic timescale. As part of the government's role, there is a substantial set of responsibilities that have to be allocated as part of, or within, a regulatory framework. One of the challenges is that it can be difficult to implement responsibilities, until the current situation has been characterized. Part of the strategy, therefore, has to be allocation of responsibility to investigate possible

legacies. The steps to achieving an identified end-state should typically be supported by a safety case. Development of a safety case is an iterative process, ongoing through the steps in remediation, with each step accounting for improved source term data, understanding of the site and stakeholder interests, design options and wider planning issues. The emphasis is on developing an effective process from the very beginning so that impacted parties can see the direction being taken and their respective roles within it. Figure 12 attempts to describe that process as a preliminary framework in the context of legacy management.

The international workshop reported in reference [2] concluded that further international guidance on addressing challenges associated with decommissioning, legacy sites and radioactive wastes would be beneficial. This includes application of the process of optimization of protection, recognizing that regulatory flexibility and adaptability can be helpful in reaching the optimum solution in different circumstances, especially when the circumstances are initially not fully understood. The shared experience from the workshop presentations and discussions during the workshop may be useful input to the development of such guidance, potentially providing the basis for prioritization of issues and needs and highlight the value of international cooperation.

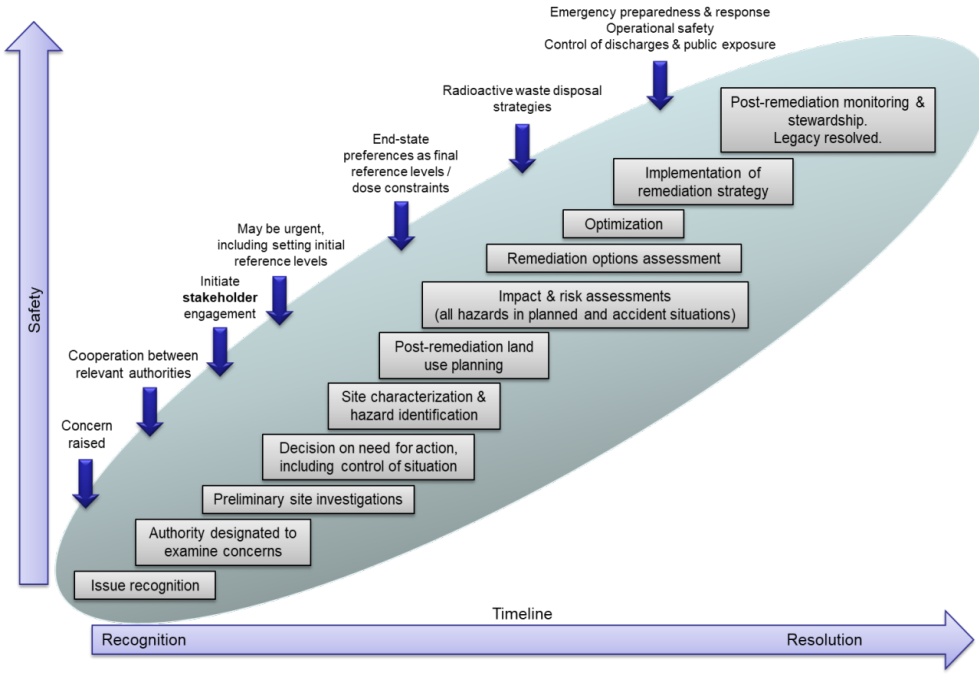

Figure 12. Preliminary framework for a logical progression to the appropriate end-state [1]

An important part of that international cooperation is the implementation of the strategic master plan: environmental remediation of uranium legacy sites in central Asia [2]. This plan is currently under revision and update. A key strategic objective is 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. It is appropriate for consideration to be given to address regulatory issues and corresponding support to national regulatory bodies. An important mechanism to coordinate such efforts is provided through the IAEA Coordination Group for Uranium Legacy Sites[2].

It is anticipated that further opportunities for sharing of experience will occur, extending beyond uranium related issues, from the activities of the recently set up NEA Committee on Nuclear Installations and

[2] https://nucleus.iaea.org/sites/connect/CGULSpublic/Pages/default.aspx.

Legacy Management[3]. Such activities are due to include conduct of international peer reviews and providing expert feedback to ensure that best practices in regulatory and technical methodologies are adopted in decommissioning and legacy management. Given the need to manage and optimize limited regulatory resources, the work of the NEA Expert Group on development of a Holistic Process for Decision Making on Decommissioning and Management of Complex Sites will also be of significant interest.

5.1 References for section 5

[1] NEA. Challenges in Nuclear and Radiological Site Management: Towards a Common Regulatory Framework, NEA No.7419, Nuclear Energy Agency-OECD, Paris, 2019.

[2] DSA. Regulatory Framework of Decommissioning, Legacy Sites and Wastes from Recognition to Resolution: Building Optimization into the Process Report of an international workshop, held in Tromsø, November 2019, organised by the Norwegian Radiation and Nuclear Safety Authority and the Nuclear Energy Agency, published as DSA 2020:5, 2020.

[3] IAEA. Strategic Master Plan: Environmental Remediation of Uranium Legacy Sites in Central Asia (first ed.), International Atomic Energy Agency, Vienna, 2017.

[3] https://www.oecd-nea.org/jcms/pl_25186/committee-on-decommissioning-of-nuclear-installations-and-legacy-management-cdlm

Appendix 1. Kazakhstan Roadmap for Future Regulatory Cooperation

	Organization and general principles of the regulatory body	
	Cooperation structure	
1	Identified threats	• Staff turnover and, as a result, insufficient number of highly skilled experts • Formal independent status of regulatory body of the Republic of Kazakhstan – some Regulator specific functions are the Ministry of Energy responsibility • Absence of document for responsibility sharing in the area of atomic energy use between ministries and state bodies
2	Priority	Highest
3	DSA Collaboration Events	1) International workshops and training with the participation of experts from DSA, IAEA and other international organizations 2) Scientific and study visits for RK decision makers to IAEA headquarters in Vienna and to countries with a well-developed regulatory structure 3) DSA comments on RK documents to ensure independent regulatory status and compliance with IAEA recommendations and Joint Convention requirements
4	Stakeholders in the Republic of Kazakhstan	• Parliament of the Republic of Kazakhstan (Senate and Mazhilis) • Committee of atomic and energy supervision and control (CAESC) of Ministry of Energy RK • Department of Nuclear Energy and Industry of Ministry of Energy RK • Ministry of Ecology, Geology and Natural Resources (MEGNR) of RK • Committee for control of quality and safety of goods and services (CCQSGS) of the Ministry of Health • Ministry of Health • Ministry of Internal Affairs • Ministry of Foreign Affairs • Representatives of other ministries and state bodies
5	The list of regulatory documents to be developed in the framework of cooperation with DSA for 2020-2024 The list of actions that are proposed in the framework of cooperation with DSA for 2020-2024	It is necessary to develop a government document for atomic energy use responsibility sharing between ministries and state bodies, but it is very unlikely that this document may be approved in near future Training for CAESC staff, specifically younger staff, in the following areas of activity: • Licensing and methods for conducting inspections of those types of facilities and activities using atomic energy that exist in the Republic of Kazakhstan, including research and development, uranium mining and processing enterprises, and radioactive waste management • Nuclear, radiation and nuclear physical safety during the transportation of nuclear materials and radioactive substances.
6	Event Costs	Costs associated with: • Organization of workshops and trainings • Development of draft regulatory documents • Organization of travel to events for decision makers • Translation of documents and meetings from English into Russian and Kazakh languages
7	Risk indicators in the absence of activities	1) Lack of progress in coordination and approval of new regulatory acts, developed in the framework of cooperation with the DSA 2) Insufficient level of supervision of facilities, enterprises and organizations – objects of atomic energy use 3) Deterioration of radiation and nuclear safety in the Republic of Kazakhstan due to lack of responsibility of entities and operators
8	Success Indicators for Event Execution	1) Adoption of the document, which defines the sharing of responsibilities between state bodies in the field of atomic energy use 2) Support of the regulatory body from the Government and the Parliament on the development of regulatory infrastructure
9	Timing	2020-2021

	Safety of installations	
	Cooperation structure	
1	Identified threats	• Insufficient number of regulatory requirements • Lack of qualified personnel involved in the processes of regulation and supervision
2	Priority	High
3	DSA Collaboration Events	1) Development of new regulatory documents drafts 2) DSA comments on the document drafts 3) Information gathering and discussions at workshops, meetings and trainings
4	Stakeholders in the Republic of Kazakhstan	• Parliament of the Republic of Kazakhstan (Senate and Mazhilis) • CAESC of Ministry of Energy RK • Department of Nuclear Energy and Industry of Ministry of Energy RK • MEGNR of RK • CCQSGS of the Ministry of Health • Ministry of Health • Ministry of Internal Affairs • Ministry of Foreign Affairs • Representatives of other ministries and state bodies
5	The list of regulatory documents that are proposed for development in the framework of cooperation with DSA	• Guidelines for conducting inspections of nuclear and radiation hazardous facilities. • Updated Technical Regulation for Nuclear and Radiation Safety • Site selection for nuclear/radiation or disposal facility, including new NPP • Guidelines for NPP safety analysis report content
6	Event Costs	Costs associated with: • Organization of workshops and trainings • Collecting information inside the country • Organization of round tables for the presentation and discussion of new regulatory acts within the country • Development of draft regulatory documents • Translation of documents and meetings from English into Russian and Kazakh languages
7	Risk indicators in the absence of activities	1) Insufficient level of supervision of facilities, enterprises and organizations – objects of atomic energy use 2) Deterioration of nuclear and radiation safety
8	Success Indicators for Event Execution	1) Development and adoption of new regulatory documents in the country 2) Providing sufficient level of regulatory supervision and control
9	Timing	2020-2024
	Radioactive waste management and decommissioning	
	Cooperation structure	
1	Identified threats	• Limited number of regulatory requirements, for example, the Law of RW handling or corresponding provisions in the Ecology Code, followed by a set of sub-Law or Sub-Code regulations (first priority), lack of detailed documents with requirements for facilities decommissioning, for orphan sources and scrap metal handling, etc. • Absence of strategy for Spent Fuel final destination • Absence of sites for final radioactive waste disposals and plans for their design and construction • Lack of qualified personnel involved in the processes of regulation, supervision, organization and management of radioactive waste
2	Priority	High
3	DSA Collaboration Events	• Development of new regulatory documents • DSA comments on documents of the Republic of Kazakhstan • Information gathering, discussion and discussions at workshops
4	Stakeholders in the Republic of Kazakhstan	• Parliament of the Republic of Kazakhstan (Senate and Mazhilis) • CAESC of Ministry of Energy RK • Department of Nuclear Energy and Industry of Ministry of Energy RK

		• MEGNR of RK • CCQSGS of the Ministry of Health • Ministry of Health • Ministry of Internal Affairs • Ministry of Foreign Affairs • Representatives of other ministries and state bodies
5	The list of regulatory documents that are proposed for development in the framework of cooperation with DSA	• Update existing document “Rules of collection, storage and disposal of radioactive waste” and to split it into two separate documents: 1) Rules of Spent Fuel storage and 2) update of RW management provisions taking into account provisions of RW related documents, developed in collaboration with DSA • Requirements for decontamination of premises, equipment and materials • Safety requirements for remediation of former nuclear testing sites • Guidelines for radioactive waste acceptance for long-term storage.
6	Event Costs	Costs associated with: • Organization of workshops and trainings • Collecting information inside the country • Organization of round tables for the presentation and discussion of new regulatory acts within the country • Development of draft regulatory documents • Translation of documents and meetings from English into Russian and Kazakh languages
7	Risk indicators in the absence of activities	• Deterioration of the radiation situation in places of storage and disposal of radioactive waste. • Damage to the health of personnel involved into the treatment of radioactive waste and in the processes of decommissioning facilities and remediation of places of storage and disposal of radioactive waste. • Inappropriate use of territories due to lack of insufficient requirements and long-term monitoring of lands after remediation of radioactive waste disposal sites or contaminated territories • Social problems of people living next to affected areas • Unauthorized use of radioactive materials, for example, for construction purposes, and the use of other materials (radioactively contaminated coal, ash, scrap metal, etc.) • The risk of accidental pollution of premises and the environment due to the lack of control over sources with expired life or due to untimely decommissioning of radiation sources • Preventive measures are not taken due to the lack of information on the situation at the sites of storage and disposal of radioactive waste
8	Success Indicators for Event Execution	• Adoption of the Law “On Radioactive Waste Handling in the Republic of Kazakhstan and all by-laws to it or corresponding provisions and corrections into Ecology Code • Providing sufficient level of regulatory supervision and control
9	Timing	2020-2024
10	Notes: Existing Acts of RK: • The Joint Convention on the Safety of Spent Nuclear Fuel Management and the Safety of Radioactive Waste Management (Law of the Republic of Kazakhstan dated February 3, 2010 No. 246-IV, entered into force on June 8, 2010). • Convention on Nuclear Safety (Law of the Republic of Kazakhstan dated February 3, 2010 No. 246-IV, entered into force on June 8, 2010). • Decommissioning rules for nuclear and radiation facilities (Approved by Government Decree No. 287 of May 12, 2016). • Technical Regulations "Nuclear and Radiation Safety" (Order of the Minister of Energy of the Republic of Kazakhstan dated February 20, 2017 No. 58). Following draft documents have been developed for the Republic of Kazakhstan in collaboration with DSA: • Law of the Republic of Kazakhstan on radioactive waste management. • Concept of the strategy of RW management in RK and proposal on introduction of a new classification of RW in RK • Draft Regulatory Document “Requirements for Predisposal Management of Radioactive Waste in the Republic of Kazakhstan”. • Draft Regulations on Radiological Protection and Radioactive Waste Management in the Extractive and Processing Industries of Kazakhstan. • Draft Regulations on Radioactive Waste Disposal in RK. Basic Criteria and Safety Requirements. Drafts of the developed documents were submitted to the CAE MINT RK in 2014. In connection with the restructuring of the Government and other ministries and state bodies the process of the document approval has been suspended. With the formation of CAESC ME RK, the right of legislative initiative, i.e. the opportunity to develop and submit draft legal acts for consideration and approval by the Government, was transferred to	

	the Department of the Ministry of Energy RK for Atomic Energy and Industry, which required the new management and personnel of the Department to familiarize themselves with the concept and the need to introduce new regulatory acts. A Working Group, formed from representatives of various interested ministries and departments, stopped working which led to a halt of the draft law promotion for a long time. In 2017, NTSC made efforts to resume work on promoting the law draft, but by that time new requirements were formulated for the submission of draft legal acts and the development of an additional document - analysis of regulatory impact (ARI) was required. Two versions of the ARI were developed, as well as the Concept of the Law on RW, and the Law on RW was re-submitted to the Ministry of Energy for consideration. The draft Concept, ARI and Law draft were agreed within the Ministry of Energy and were submitted for consideration to interested organizations and departments. The Public Council of the Ministry of Energy approved draft law, but recommendations were received from other departments, including the National Chamber of Entrepreneurs, Atamiken, on the inappropriateness of developing a separate law on radioactive waste and the proposal to introduce the provisions of the draft Law into a new edition of the Environmental Code, the development of which had begun at this point. After this, efforts to promote the draft law in the form of a separate law ceased and all proposals for radioactive waste management were redirected from the Department of Atomic Energy of the Ministry of Energy to the Committee of Ecology of the Ministry of Energy. At the same time, work began on introducing amendments to the Law on the Use of Atomic Energy and NTSC together with CAESC ME RK also submitted proposals on introducing into the draft of this Law a part of the provisions on radioactive waste management. Since neither the new edition of the Ecology Code nor the new Law on Atomic Energy have been adopted; the Rules and Requirements for the management of radioactive waste developed in conjunction with the DSA cannot be put into effect either, because they are by-laws and should follow from the provisions of the new editions of the EC and the Law on AE.	
	Transportation of radioactive materials	
	Cooperation structure	
1	Identified threats	• Insufficient number of regulatory requirements • Lack of physical security regulation during transportation • Lack of qualified personnel involved in the processes of regulation, supervision, organization and implementation of radioactive materials transport
2	Priority	Highest
3	DSA Collaboration Events	• Development of new regulatory documents • DSA comments on documents of the Republic of Kazakhstan • Information gathering, discussion and discussions at workshops
4	Stakeholders in the Republic of Kazakhstan	• Parliament of the Republic of Kazakhstan (Senate and Mazhilis) • CAESC of Ministry of Energy RK • Department of Nuclear Energy and Industry of Ministry of Energy RK • MEGNR of RK • CCQSGS of the Ministry of Health • Ministry of Health • Ministry of Internal Affairs • Ministry of Foreign Affairs • Representatives of other ministries and state bodies
5	The list of regulatory documents that are proposed for development in the framework of cooperation with DSA	• Rules of Nuclear and Radioactive Materials and Radioactive waste transportation
6	Event Costs	Costs associated with: • Organization of workshops and trainings • Collecting information inside the country • Organization of round tables for the presentation and discussion of new regulatory acts within the country • Development of draft regulatory documents • Translation of documents and meetings from English into Russian and Kazakh languages
7	Risk indicators in the absence of activities	• The low level of radiation safety during the transport of radioactive materials can lead to risks of environmental pollution and exposure of personnel above the established limits. • The need to avoid the possibility of using radioactive materials and orphan sources of ionizing radiation to create "dirty bombs" • To avoid the risk of nuclear and radioactive terrorism. • The probability of the chaotic occurrence of local radioactive contamination in the country with the risk of late detection

		• Threats of sabotage, theft or any other illegal seizure of radioactive materials during transportation. • Irradiation of the population and personnel due to loss, theft and other unauthorized actions with radiation sources.
8	Success Indicators for Event Execution	• Development and adoption of new regulatory documents in the country • Providing sufficient level of regulatory supervision and control
9	Timing	2020-2021
10	Notes: The country has plans to cooperate with the US Government (DoE) to strengthen physical protection during transportation of radioactive sources and nuclear and radiative materials.	
	Radiation safety	
	Cooperation structure	
1	Identified threats	• Insufficient number of regulatory requirements • Lack of qualified personnel involved in the processes of regulation and supervision
2	Priority	High
3	DSA Collaboration Events	• Development of new regulatory documents • DSA comments on documents • Information gathering, discussion and discussions at workshops
4	Stakeholders in the Republic of Kazakhstan	• Parliament of the Republic of Kazakhstan (Senate and Mazhilis) • CAESC of Ministry of Energy RK • Department of Nuclear Energy and Industry of Ministry of Energy RK • MEGNR of RK • CCQSGS of the Ministry of Health • Ministry of Health • Ministry of Internal Affairs • Ministry of Foreign Affairs • Representatives of other ministries and state bodies • Operators: NAK Kazatomprom, LTD MAEC Kazatomprom, NNC RK, INP RK, Oncology centers, Centers of Nuclear Medicine.
5	The list of regulatory documents that will be developed in the framework of cooperation with DSA	<u>To be supported by ISTC project with DSA collaboration</u> • Rules “Criteria and requirements for the rehabilitation of uranium legacy territories”. • Rules “Requirements for post-remediation monitoring of the legacy uranium territory taking into account the climatic conditions of the region. Rules for licensing work in the framework of rehabilitation programs for uranium mines. The procedure for inspection of remediation process of territories contaminated by uranium production.” It is proposed additionally to develop regulations for other contaminated areas remediation, including NORM of oil and coal industry, sites of former nuclear explosions and dirty bombs testing.
6	Event Costs	Costs associated with: • Organization of workshops and trainings • Collecting information inside the country • Organization of round tables for the presentation and discussion of new regulatory acts within the country • Development of draft regulatory documents • Translation of documents and meetings from English into Russian and Kazakh languages
7	Risk indicators in the absence of activities	• Damage to the health of personnel involved into remediation activity and population living next to affected areas • Social problems of people living next to affected areas • Unauthorized use of radioactive materials, for example, for construction purposes, as well as use of other materials (radioactively contaminated coal, ash, scrap metal, etc.)
8	Success Indicators for Event Execution	• Development and adoption of new regulatory documents in the country • Providing sufficient level of regulatory supervision and control
9	Timing	2020-2024

	Emergency preparedness and response	
	Cooperation structure	
1	Identified threats	• Lack of coordination between ministries and state bodies in case of radiation accident • Insufficient training of emergency response personnel • Lack of qualified medical personnel for emergency response
2	Priority	High
3	DSA Collaboration Events	• Development of new regulatory documents • DSA comments on documents • Information gathering, discussion and discussions at workshops
4	Stakeholders in the Republic of Kazakhstan	• Parliament of the Republic of Kazakhstan (Senate and Mazhilis) • CAESC of Ministry of Energy RK • Department of Nuclear Energy and Industry of Ministry of Energy RK • MEGNR of RK • CCQSGS of the Ministry of Health • Ministry of Health • Ministry of Internal Affairs • Ministry of Foreign Affairs • Representatives of other ministries, agencies and committees
5	The list of regulatory documents that are proposed for development in the framework of cooperation with DSA The list of actions that are proposed in the framework of cooperation with DSA for 2020-2024	• Interdepartmental document on interaction between all interested parties involved in EPR process in accordance with IAEA Safety Standards (to be agreed with the Ministry of Emergency situations, when its creation is completed) • Special trainings for emergency response personnel • Special training of physicians and other medical personnel for work in the case of nuclear emergency or radiation accident. The program of appropriate training should be developed on the basis of IAEA recommendations.
6	Event Costs	Costs associated with: • Organization of workshops and trainings • Development of draft regulatory documents • Translation of documents and meetings from English into Russian and Kazakh languages
7	Risk indicators in the absence of activities	• Absence of coordination to prevent and eliminate consequences of emergency situations • Untimely response to emergency situations • Damage to the health of personnel and population due to lack of requirements for emergency workers, incompetence and negligence of personnel involved in the emergency preparedness and response process
8	Success Indicators for Event Execution	• Development and adoption of new regulatory documents in the country (interdepartmental interaction and special training programs in case of radiation accident) • Completed trainings for emergency response personnel
9	Timing	2020-2024

Appendix 2. Tajikistan Roadmap for Future Regulatory Cooperation

	Identified and described threats	Regulations to be developed	Priority action	Time of execu-tion	Resp. org.	Source of funding
	Regulatory Infrastructure					
1.	The Law “On Use of Atomic Energy” does not describe site selection, designing, construction, commissioning, operation, decommissioning, remediation, post monitoring, etc.	Development of Draft of Amendments to the Law Republic of Tajikistan “On Use of Atomic Energy” and requirements for them.	First	2021	NRSA	Internatio nal partners
2.	The Law “On licensing of separate types of activities” does not include site selection, designing, construction, commissioning, operation, decommissioning, remediation, post monitoring, etc.	Development of Draft of Amendments to the Law of Republic of Tajikistan “On licensing of separate types of activities”	First	2020	NRSA	Internatio nal partners
3.	There is a general law on inspection in Tajikistan namely Law Republic of Tajikistan “On Inspection of business entities”. NRSA was not included to the list of inspection bodies and therefore has limited rights to carry out only pre-licensing inspections and in case of accidents or emergency situations. Facilities with nuclear materials and high activity radioactive sources are not currently subject to inspection.	Development of Draft of Amendments to the Law Republic of Tajikistan “On Inspection of business entities” to include NRSA to the list of inspection bodies, allowing NRSA to carry out full inspections in the country.	First	2021	NRSA	Internatio nal partners
4.	New Law “On Legal and regulatory documents” identifies Ministries and organizations which has rights to develop regulatory documents. Currently, NRSA is not on this list. This situation brings difficulties to develop new regulations in the field of radiation safety and nuclear security.	Development of Draft of Amendments to the Law Republic of Tajikistan “On Legal and regulatory documents” to include NRSA on the list, giving NRSA rights to develop new regulations in the field of radiation safety and nuclear security.	First	2020	NRSA	Internatio nal partners
5.	Currently, NRSA sits within the Academy of sciences. In the legislation of Tajikistan, the Academy of Sciences has no regulatory function, such as inspection, licensing and enforcement whereas NRSA has competencies and rights as a regulatory body (inspection, licensing and enforcement, etc.). This situation brings difficulties during deciding in the high level.	Development of Draft of Amendments to the Law Republic of Tajikistan “On Academy of Sciences” giving competency and rights to the Academy of Sciences on inspection, licensing and enforcement will support compliance with legislation related to regulatory body competence.	First	2021	NRSA	Internatio nal partners
6.	The Decree “On regulation on licensing specifics of separate kinds of activities” does not include a list of necessary documents to apply for the license on activities related to radioactive waste management (including remediation activities) and the full lifecycle of nuclear facilities. It makes difficulties to issue a license for these activities.	Development of Draft of Amendments to the Decree of Government of the Republic of Tajikistan “On regulation on licensing specifics of separate kinds of activities” to include a list of necessary documents to apply for licenses on activities related to radioactive waste management (including	First	2022	NRSA	Internatio nal partners

		remediation activities) and the full lifecycle of nuclear facilities.				
7.	The Decree “On state regulation in the field of ensuring radiation safety” describes functions, responsibilities, and rights of NRSA and its inspectors. It was developed in 2004 and does not fully cover all aspects of regulatory body functions and responsibilities. The regulatory body does not, therefore have all competency for regulation which gives difficulties in this area.	Development of Draft of Amendments to the Decree of Government of the Republic of Tajikistan “On state regulation in the field of ensuring radiation safety” with updating functions and responsibilities of the regulatory body.	Second	2024	NRSA	International partners
8.	Currently, there is no procedure on how to evaluate project documentation submitted for the issuance of licenses to activities related to remediation of territories contaminated by uranium production. Local experts do not have experience in this field which is giving difficulties on issuing a license.	Development of Draft of the procedure for project documentation evaluation for the issuance of licenses to activities related to remediation of territories contaminated by uranium production will help local experts evaluate project documentation and issue licenses.	FIRST	2021	NRSA	International partners
9.	Currently, there is no procedure on how to carry out inspection activities related to the remediation of territories contaminated by uranium production. Local experts do not experience in this field which is giving difficulties on carrying out inspection.	Development of Draft of the procedure for inspection of the remediation process of territories contaminated by uranium production will help local experts to inspect in this field.	FIRST	2021	NRSA	International partners
10.	Currently, the TSO to NRSA has a building with limited territories, rooms, and capacity. To carry out monitoring during remediation activities and analyzing token samples the TSO needs additional space and capacity.	Construction of a new building for TSO will facilitate monitoring and analysis during remediation activities.	First	2020	Government of Tajikistan	Expected grant from Government of Tajikistan of 1 million US Dollars
11.	Currently, there is no single Information System for Regulatory body functioning. Some separate databases are working without harmonization which gives difficulties to analyze the current situation, planning of inspections and other functions of NRSA.	Establishment of a single Information System of Regulatory body will help administration for planning, coordination, and planning of regulatory body tasks.	Third	2021	NRSA	International partners
12.	NRSA does not have Accreditation on Quality Management of its organization which makes it difficult to check the quality of the system and services provided.	Establishment of the basis for NRSA Accreditation on Quality Management will help Administration to check the quality of the system, personal and services.	Third	2023	NRSA	International partners
13.	Currently to apply for a license, applicants collect documents from different organizations and places. To make it easier, the Government started an initiative to establish a “single window” system where applicants collect and submit documents in one place or through a web portal. NRSA currently is not ready to establish such kind of system.	Prepare basis and establish possibilities to join a “single window” system.	Third	2024	NRSA Government	International partners

14.	Currently, NRSA and its TSO have new personnel who have no experience in regulatory functions.	Organization of trainings for new personnel to develop knowledge and experience on regulatory functions	Third	2022	NRSA	International partners
15.	Current legislation does not describe the full lifecycle of activities of research reactors, such as site selection, designing, construction, commissioning, operation, decommissioning, remediation, post monitoring, etc. This situation brings a lot of uncertainties for the activities of operators and NRSA.	Development of new legislation will identify the full lifecycle of these activities of research reactors and requirements for them.	First	2021	NRSA	IAEA, International partners
16.	Currently, the Branch of NRSA in the North has no building to implement regulatory functions, especially for controlling and monitoring of uranium production legacy sites.	Construction of a new building for the Branch of NRSA in the North, involving international donors, will facilitate the implementation of the regulatory functions in the north of Tajikistan.	First	2020	NRSA	International partners
Radiological Protection in Occupational Exposure						
17.	Currently, article 17 of the Law "On Radiation Safety" requires controlling and accounting of individual doses of radiation received by citizens, but there are no rules developed at the moment.	Development of Rules on controlling and accounting of individual doses of radiation received by citizens when working with ionizing radiation sources, conducting medical X-ray radiological procedures, as well as due to man-made radiation background.	FIRST	2021	NRSA	International partners
18.	Currently, a simple paper database of some workers using SIR in NRSA. It is unclear how many workers use SIR in the country and what is their dose receiving history.	Establishing an occupational exposure database will help to manage accounting and control of personal who work with SIR.	Second	2021	NRSA	International partners
19.	Currently, the TSO of NRSA has old equipment for checking doses received by personal who works with SIR by TLD methods, which has low capacity and often need repair.	Procurement of new TLD reader with new detectors will improve service in the country.	Third	2021	NRSA	International partners
20.	There is no internal dosimetry service in the country, and it is not provided to occupationally exposed workers of practices with unsealed sources in medical (Nuclear Medicine, Radiopharmacy) and other applications.	Establishing an adequate internal dosimetry service and providing to occupationally exposed workers of practices with unsealed sources in medical (Nuclear Medicine, Radiopharmacy) and other applications.	Third	2021	NRSA	International partners
21.	Currently, limited courses are organized for radiation protection officers (RPO) in the country.	Organization of training courses for RPO in the country will improve radiation protection in organizations.	Third	2022	NRSA	US NRC, Intern. Part.
Radiological Protection in Medical Exposure						
22.	Currently, there are only general requirements on radiation protection in medicine and no specific requirements for teletherapy. It is difficult to ensure medical exposure without this specific requirement.	Development of Requirements on radiation protection in teletherapy will identify actions to be taken to ensure correct medical exposure during teletherapy examinations.	First	2020	NRSA	International partners

23.	Currently, there are only general requirements on radiation protection in medicine and no specific requirements for nuclear medicine. It is difficult to ensure medical exposure without this specific requirement.	Development of Requirements on radiation protection in nuclear medicine will identify actions to be taken to ensure correct medical exposure during nuclear medicine examinations.	Second	2020	NRSA	International partners
24.	Dose Referent Levels (DRL) for medical exposure have nto been developed andit is not possible to control exposures to patients.	Investigation and carrying out testing of exposures to patients in the hospitals and clinics will help to establish DRL to control medical exposure.	Third	2021	NRSAMinistry of health	International partners
25.	There is no database of doses received by patients during medical examinations, so it is not possible to check them.	Establishing of a database of doses received by patients during medical examinations will help develop understanding of the situation with medical exposure. Data collected by health organizations will be sent to NRSA.	Third	2021	NRSAMinistry of health	International partners
26.	Currently, limited courses are organized for medical staff on radiation protection and medical exposure in the country.	Organization of training courses for medical staff in the country.	Third	2022	NRSA	International partners
27.	Measurement of patient doses is included in Rules of ensuring the radiation safety (PORB-08) (No. 402) and namely by chapter 3 "Radiation protection of patients and population during medical exposure" but not all hospitals have the necessary infrastructure to comply with this legislation.	Organization of measurement of patient doses in coordination with Ministry of health, at least by using DRLs.	First	2020	NRSAMinistry of Health	International partners
28.	There is no program approved by the Ministry of Health on changing the old fluoroscopic units and other X-ray apparatus by new ones.	Organization of national program in medical diagnostic with periodically replacing of old X-ray unites to new ones.	Second	2021	NRSAMinistry of Health	International partners
29.	Currently, in computed tomography, special low dose protocols haven't been introduced in the country.	Introduction of special low dose protocols for computed tomography with support of international experts.	Second	2021	NRSAMinistry of Health	International partners
30.	No companies are present in the country for the maintenance of nuclear medicine and radiotherapy equipment.	Organization of special trainings for personnel of state companies working on maintenance of medical equipment and on maintenance and servicing of nuclear medicine and radiotherapy equipment.	Second	2021	NRSAMinistry of Health	International partners
Public and Environmental Radiological Protection						
31.	Limited measurements were carried out on the impact of radon to the population and the full picture is not clear.	Investigation of the effects of radon on the population will show the current situation and the full picture will help to develop new requirements.	Second	2021	NRSA	International partners
32.	Requirements on radon in legislation are not according to new IAEA GSR Part 3.	Development of new radon requirements will help to control public exposure from radon.	Third	2022	NRSA	International partners

33.	Construction of new buildings using materials from different natural sources, which can contain high concentration of natural radionuclides, can impact public exposure.	Study of building materials to determine the content of natural radionuclides will show their impact on the population.	Second	2021	NRSA	International partners
34.	Requirements on construction materials are not according to new IAEA GSR Part 3.	Development of new requirements for building materials.	Third	2022	NRSA	International partners
35.	Currently, there is no national plan or program in the country for radio-environmental monitoring to understand the situation with radiation background and natural hot spots in the country.	The development of a national radio-environmental monitoring plan for Tajikistan will identify what actions should be taken and who will be responsible.	Second	2021	NRSA	International partners
36.	Currently, limited courses and informative events are organized for the population on radiation safety in the country.	Conducting training courses and informative events for the public will raise awareness of radiation safety.	Third	2022	NRSA	International partners
37.	Currently, limited courses are organizing for the staff of stations monitoring the radiation situation in the country.	Conducting training courses for radiation safety monitoring services will upgrade the level of monitoring service in the country.	Third	2022	NRSA	International partners
38.	Currently, Tajikistan has a weak indication on having adequate criteria to regulate their discharges.	Establishing national criteria for discharges by support of international experts.	Third	2022	NRSA	International partners
Safety and security of radiation sources						
39.	The last inventory of radioactive sources in the country was carried out more than 10 years ago.	Carrying out repeated inventory of radioactive sources and update database.	First	2020	NRSA	US NRC
40.	Currently, an example of a physical protection plan was developed based on requirements and it is necessary to help facilities with radioactive sources to develop their physical protection plans.	Developing a plan for the physical protection of facilities will upgrade the security level in the country.	Second	2021	NRSAAll users	US DoE
41.	Currently, limited courses are organized for the users of radioactive sources in the country on radiation safety and security.	Conducting workshops for the users of radioactive sources on radiation safety and security will help them properly implement their responsibilities.	Third	2022	NRSA	International partners
42.	Currently not all border crossing points of Tajikistan are equipped with portal monitors.	Equipping all border crossing points with portal monitors with support of international donors.	Second	2021	NRSA, Customs	US DoE, Intern.tional part.
Emergency Preparedness and Response						
43.	Currently, the threat assessment and categorization of facilities/practices following the five threat categories of GSR Part 7 has not been done by Tajikistan authorities.	Create a working group to carry out threat assessment and categorization of facilities/practices following the five threat categories of GSR Part 7.	Second	2021	CES CD, NRSA	International partners
44.	Currently, a formal procedure for record-keeping and controlling the doses received by emergency workers has not been established.	Develop procedure for record0 keeping and controlling doses received by emergency workers.	Second	2021	CES CD, NRSA	International partners

45.	Currently, the National Safety Standards (NRB-06) establish default operational intervention levels (OILs) of dose for acute exposure by organ or tissue and generic action levels for foodstuffs which are not consistent with those given in GSR Part 3 and GSR part 7.	Update National Safety Standards (NRB-06) to follow GSR Part 3 and GSR part 7.	Second	2021	CES CD, NRSA	International partners
46.	Currently, there are no special services or procedures for medical response to radiological emergencies in place.	Develop a procedure for medical response to radiological emergencies.	Second	2021	CES CD, MoH, NRSA	International partners
47.	Currently, there are no procedures (instructions) on the management of radioactive waste arising while taking agricultural countermeasures.	Developing a procedure on the management of radioactive waste arising as a result of agricultural countermeasures.	Second	2021	CES CD, Min.of agriculture, NRSA	International partners
48.	Currently, there is no crisis center on responding to nuclear and radiological accidents in the country ensuring a coordinated activity response. The CES CD plays a leading role in this area.	Creating a crisis center will coordinate all responding activities in case of an emergency situation.	First	2020	CES CD, NRSA	International partners
49.	Currently, there is no 24-hour automatic radiation monitor network that sends data about the dose rate in the territory to the central station. Only a few stations have the equipment to measure radiation background and measurements are done manually.	Creating a network of radiation monitors will show the radiation situation in the country and will give the possibility for immediate response to nuclear and radiological accidents.	Second	2022	CES CD, NRSA	International partners
50.	Currently, there is a requirement to have an internal emergency response plan for facilities using radioactive sources, but users have difficulties developing emergency response plans themselves.	Developing radiological emergency response plans for each facility will clearly identify the responding activities and responsible persons during emergency situation in the facilities.	Third	2021	CES CD, NRSA	International partners
41.	Currently, there is a general requirement for responding to nuclear and radiological accidents by first responders, but there is no guidance on how to respond to emergency situations.	Development of guidelines and SOPs for first responders will help them to properly implement their responsibility and avoid mistakes.	Second	2021	CES CD, NRSA	International partners
52.	Currently, limited courses are organized for first responders to radiological accidents in the country.	Conduct training courses for first responders to nuclear and radiological accidents to improve awareness and skills.	Third	2022	CES CD, NRSA	International partners
53.	Currently, there is no joint exercise of responders to nuclear and radiological accidents.	Conducting joint exercises of first responders to nuclear and radiological accidents will show a level of coordination of ministries and agencies during emergencies.	Third	2021	CES CD, NRSA	International partners
54.	The National Plan (Program) on Emergency Preparedness and Response (Approved by Government on 2013 #770) in compliance with IAEA standards was been finished in 2018. Currently, there are no actions undertaking for Emergency Preparedness and response for nuclear and radiological events.	Developing of new National Plan (Program) on Emergency Preparedness and response for nuclear and radiological events will facilitate to undertake new emergency preparedness, and response actions in the country.	First	2021	CES CD, NRSA	Government of Tajikistan, International partners

55.	Threat assessment and categorization of facilities/ practices in accordance with the five threat categories of GSR Part 7 has not been done by authorities.	Carry out threat assessment and categorization of facilities/ practices in accordance with the five threat categories of GSR Part 7 with support of international experts.	Second	2021	NRSA	International partners
Education and Training in Radiological Protection						
56.	Currently, in the Law "On Use of Atomic Energy" there is a requirement for the education of staff working with ionizing radiation sources, but there is no clear requirement for their qualification, especially for radiation protection officers, medical physicists and qualified experts.	Development of Draft of Amendments to the Law Republic of Tajikistan "On Use of Atomic Energy" with requirements for qualifications of staff working with ionizing radiation sources, especially for radiation protection officers, medical physicists and qualified experts will help control of personnel by NRSA and strengthen radiation protection in facilities.	First	2020	NRSA	International partners
57.	Currently, a National program for training and education in the field of Radiation Protection has been developed, but an action plan on how to implement it is needed.	Development of an action plan for implementation of the National program for training and education in the field of Radiation Protection will identify actions and responsible organizations for implementation of this program.	Second	2020	NRSA	International partners
58.	Currently, NRSA does not have full information on how many personnel in the country are working with ionizing radiation sources and what is their level of qualification.	Performing training needs analysis for the staff of organizations working with ionizing radiation sources will identify number and type of trainings needs to be perform.	Second	2021	NRSA	International partners
59.	Currently, syllabuses for training are available only in some areas of radiation protection and it is not clear which programs organize training courses for personnel working in different areas of radiation protection.	Development of syllabuses for various training courses will help to conduct them.	Third	2022	NRSA	International partners
60.	NRSA has a regional training center on radiation protection functioning, but there are not enough instructors to conduct training.	Training instructors for the training center will help to organize courses in different areas of radiation protection.	Third	2021	NRSA	International partners
Transport Safety						
63.	Safety rules during transportation of radioactive materials (No.599) - registered in the Ministry of Justice from 26 January 2011 were developed based on IAEA document TS-R-1 (ST-1 revised, IAEA, 2000) and do not fully include all of SSR-6 requirements.	Update Safety rules during transportation of radioactive materials based on IAEA document SSR-6.	Second	2021	NRSA	International partners
64.	Limited number of transport and storage companies with the capacity to transport or store radioactive materials. To establish a protected building for storage radioactive sources and procurement of specialized vehicles needs high qualification and funds. That's why many transport companies, as well as cargo storages, do not want to	Strengthening transportation, and storage capabilities of local companies will upgrade the level of import, transit and export of radioactive sources in the country.	Second	2022	Transport companies, NRSA	International partners

	work with radioactive materials which gives problems to the economy of Tajikistan.					
65.	Limited courses are organized for transport and storage companies in the country.	Conduct training courses for transport companies and storage companies will upgrade the knowledge of their personal on ensuring radiation protection in the country	Third	2022	Transport companies, NRSA	International partners
Radioactive Waste Management and Uranium Legacy Sites						
66.	The Law "On Radioactive waste management" as well as "Rules on Radioactive waste management" identifies requirements for RWM, roles, and responsibilities of operators, but they are not in compliance with IAEA GSR Part 3. This situation brings difficulties to implement radiation safety requirements during RWM.	Development of Draft of Amendments to the Law "On Radioactive waste management" as well as Draft of Amendments to "Rules on Radioactive waste management" including new requirements from GSR Part 3 will bring new conditions to implement radiation safety requirements during RWM.	First	2020	MINT, NRSA	International partners
67.	There is not a safety assessment of RWDS to understand the main risks and threats	By support of national and international experts, carry out a safety assessment of the RWDS to understand the main risks and threats.	Second	2021	RWDSN RSA	International partners
68.	RWDS has limited capacity for long term storage of RW, especially storage for liquid RW needs urgent actions to prevent release to the environment.	Enhancing RWDS infrastructure as well as the construction of new storage for liquid RW will help to prevent environmental contamination.	Second	2021	RWDSN RSA	International partners
69.	Limited courses are organized for operators of radioactive waste management in the country.	Organizing workshops, training, and fellowships for personnel of operators and regulators will improve human resources capabilities on RWM as well as remediation of uranium production legacy sites.	Third	2022	MINT, NRSA	International partners
70.	Specialized organization for RWM (like RWDS), operators of ULS, as well as TSO of NRSA, have limited equipment for workplace and environmental monitoring, which causes difficulties for analyzing the radiological situation in facilities and legacy sites.	The procurement of modern equipment for workplace monitoring and environmental monitoring will help to monitor and control the current radiological situation in the facilities and legacy sites.	Second	2021	MINT, RWDSN RSA	International partners
71.	Limited staff in the regulatory body, who can inspect remediation activities and supervise remediation projects.	Training of NRSA staff will help provide expertise for remediation projects and inspections during remediation activities.	Third	2021	NRSA	International partners
72.	Law "On Radioactive waste management" required to establish and operate the State Registry of radioactive waste storage facilities and radioactive wastes. The Regulatory body is responsible for that and should request operators to send necessary information, but there is no tool developed to make a registry and operate it. There is also no database for collecting and analyzing information regarding uranium legacy sites in the	Establish a national registry of radioactive waste storage facilities, radioactive waste, and a database of uranium legacy sites and environmental monitoring.	Second	2021	MINT, NRSA	International partners

	country, including information on the environmental monitoring of these sites.					
73.	ULS were studied and EIA and FS prepared for further remediation actions. Other sites, which also have risks, need complex assessments to be undertaken.	The organization of complex assessments will help identify the main risks from sites and give options for further remediation.	Second	2021	MINT, NRSA	International partners
74.	Lack of appropriate infrastructure. In this regard the regulatory authority faced a number of problems and tasks to be solved related to development of legislative basis, assessment of radiological consequences on ULS, assessment of remediation activities, analysis of the extent of compliance with international standards and recommendations, action plan development on minimization of uranium industry sites influence on environment, procurement of analytical equipment for monitoring	Based on the action plan for implementation of National strategy for remediation of ULS in Tajikistan, create small separate projects for each problem by involving international support.	First	2020	MINT, NRSA	International partners
75.	Taboshar, Degmay, Chkalovsk and Gafurov ULS are in bad radiological situation and urgent remediation actions are needed.	As priority sites organization of remediation actions for them by international support	First	2020	MINT, NRSA	International partners

Appendix 3. Kyrgyzstan Roadmap for Future Regulatory Cooperation

Organization and general principles of the regulatory body (including physical protection)		
Cooperation structure		
1	Identified threats	• Incomplete legal framework, infrastructure and qualification of the new regulatory body in the field of radiation safety. • Restrictions on the organization of activities and the lack of key functions of the regulatory body due to the incomplete legislative framework of the Republic. Currently, due to the lack of relevant articles in the Law on Licensing and Permitting Activities, the regulatory body (SAEPF) does not issue licenses related to the handling of radioactive materials and sources and, due to the lack of authority, it does not oversee the implementation of the current regulatory framework and established licensing conditions. The existing state system of distribution of powers leads to the fact that neither SAEPF, nor the inspection body (SIETS) fully comply with the requirements of the IAEA GSR 1. In the event that SAEPF does not get all necessary licensing and inspection functions, there is a threat that improvement in the system of safe management in the field of radiation safety will not be achieved. • Staff turnover (loss) and low qualification in state bodies involved in the field of radiation safety. • Low qualification of personnel and the incomplete structure in SIETS currently leads to incomplete inspection coverage of organizations working with radiation sources. • Threat to the status of independence of the SAEPF, the activities of which are regularly intervened by other interested state bodies that, pursuing their narrow and specific goals, do not understand the full range of obstacles created by them in other areas where they have no personal interest. *Findings and conclusions identified by the IAEA expert Mission 2018:* The SAEPF has been legally assigned to regulate radiation safety in Kyrgyzstan, but it is not given all necessary legal framework and resources to carry out its regulatory functions in line with IAEA standards. Existing laws and regulations as well as structure and functions of different stakeholders admit duplications and gaps in such important regulatory functions as approval of norms, state control and licensing and do not meet some important requirements of IAEA standards, i.e. GSR Part1 and GSR Part3. Kyrgyzstan is not a part of some important for the country international treaties such as Convention on Nuclear Safety, Convention on Early Notification in a case of Nuclear Accident, Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency, Guidance on the Import and Export of Radioactive Sources.
2	Priority	Highest
3	DSA Collaboration Events	• Elaboration of a human resource program where the qualification needs will be identified along with measures to be taken in the short and medium term for the preparation of personnel. • Clear identification of the differences between the legal and regulatory framework in force against the GSR Part 1 and GSR Part 3 as well as with International Conventions and Code of Conducts to which the country is party. • Workshops with the participation of experts from DSA, IAEA and other international organizations. • Scientific and study visits for decision-makers in the Kyrgyz Republic (members of the Government and MPs from specialized committees) to the IAEA headquarters in Vienna and to countries with a well-developed regulatory structure in the field of nuclear and radiation safety. • DSA comments on KR documents to ensure independent regulatory status.
4	Stakeholders in the Kyrgyz Republic	*Main* • The Parliament of the Kyrgyz Republic (Jogorku Kenesh) - initiation of laws and legislative acts, discussion, legal processing • The Government of the Kyrgyz Republic - discussion of the legal acts, legal processing, approval of resolutions and decisions, distribution of functions between state bodies • SRCEPES SAEPF - the responsible body for cooperation with DSA • SAEPF under Government of the Kyrgyz Republic - discussion in working groups, involvement of specialists and lawyers of the Agency

		Responsibility in accordance with the functions performed: • DHPSSES under the Ministry of Health - discussion of new policies, NAPs and development programs, assistance in the field of medical supervision • SIETS - a discussion in the working order of new regulations and programs, assistance in the field of inspection • Ministry of Economic Development - discussion in a working order of new normative legal acts and programs, assistance in the field of export / import of goods and cargo • The Ministry of Foreign Affairs - a discussion in the working order of new regulatory acts and programs, assistance in the field of international cooperation • Ministry of Emergencies - a discussion in the working order of new normative acts and programs, assistance in the field of response in emergency situations • Representatives of other ministries, agencies and committees - discussion in a working order of new NAPs and programs, assistance in the field of interest of each organization
5	The list of legal and regulatory documents that will be reviewed or developed in the framework of cooperation with DSA	• Amendments to the Law on Radiation Safety in the Kyrgyz Republic (version of 2014), which remove the conflict between state bodies in the field of separation of regulatory powers. • Amendments to the Law on licensing and development of licensing conditions. In this case, the regulatory body issues licenses and oversees the implementation of the legal and regulatory framework in force and established licensing conditions.
6	Event Costs	Costs associated with: • Holding workshops and conferences • Distribution of the documents (print outs) to the Government and Parliament • Translation of documents and meetings from English into Russian and vice versa
7	Risk indicators in the absence of activities and the regulatory documents	• Lack of progress in the framework of cooperation with the DSA in the development, coordination and approval of new regulatory acts. • Suspension of IAEA technical assistance in the event that regulatory responsibilities identified in the IAEA safety Standards (mainly GSR Part 1 and GSR Part 3) are not implemented. • Lack of development of a licensing mechanism for any activity related to radiation sources and radioactive materials including radioactive waste. • Increase in emergency radiation situations related to the lack of strong regulatory control, responsibility of economic entities and operators involved in the management of radiation sources and radioactive materials including radioactive waste. • Incomplete and weak regulatory oversight of medical and industrial organizations using sources and generators of ionizing radiation. • Incomplete and weak regulatory oversight of industrial enterprises for the extraction and processing of raw materials containing uranium and thorium. • Incomplete and weak regulatory oversight of organizations carrying out Incomplete measures at uranium heritage sites. • Increased concern of the population with the actions of the Government and ministries at large facilities of the uranium and thorium industry. • The absence or loss of trained and competent personnel in the regulatory body in the event that in the future the regulatory functions in the country will again be transferred from one state body to another.
8	Expected outcomes and results	• Adoption of amendments to the Law on Radiation Safety (version of 2014), which remove the conflict between state bodies in the field of separation of regulatory powers. • Adoption of amendments to the Law on Licensing and development of licensing conditions. In this case, SAEPF issues licenses and oversees the implementation of the legal and regulatory framework in force and established licensing conditions. • Development, improvement and wide informative support of the regulatory authority's website. • Coordination between all interested parties of the Government's decree "On the procedure for interaction between state executive bodies in the implementation of functions to ensure radiation safety in the Kyrgyz Republic" • Support of SAEPF from the Government and the Parliament on the development of the legislative and regulatory framework, the creation of a unified radioactive waste management system, the creation of a single database on individual dosimetry and environmental monitoring, on the financing of certain areas (e.g. on the development of individual dosimetry, metrological services etc.). • Support of SAEPF from the Government and the Parliament on the implementation of the IAEA national projects in the period 2018-2023. Since 2016, the contribution of SAEPF to the establishment of cooperation with the IAEA has been a constant

		indicator of progress. The expected result of the strengthening of SAEPF by the Government now and in the future is the continuation of successful cooperation with the IAEA. • Development of regulatory documents, their revision, seminars and visits on a regular basis during the cooperation cycle, in accordance with the developed work schedules.
9	Timing	Development of documents, its revision, workshops and visits on a regular basis throughout the cooperation cycle 2020-2025 according to the developed Inception Reports
10	Notes: The IAEA also noted a high interest in solving this problem, as noted in expert reports “IAEA Advisory Mission to Review the National Regulatory Infrastructure for the Control of Radiation Sources in the Republic of Kyrgyzstan. 19-24.08.2013” and “Expert mission to inform the national competent authorities and stakeholders about the creation of a government, legal and regulatory framework for radiation safety. 12-16.11.2018”.	
Transportation of radioactive materials		
Cooperation structure		
1	Identified threats	• Lack of a licensing mechanism for the transport of radioactive materials within the country, • Lack of assessment of the physical safety of radioactive materials during inland transport, • Lack of qualified personnel involved in the processes of regulation, supervision, organization and implementation of the transport of radioactive materials. • There are cases of unauthorized radioactive materials being transported in airplanes, railway and motor vehicles when crossing the state border. *Conclusions made following the results of the remediation in Mailuu-Suu in 2010-2012 and at the Kaji-Sai tailing dump in 2018-2019:* • Transport for radioactive waste does not meet the design and tender conditions. • Insufficient environmental monitoring during the transportation of radioactive waste, audit reports showed the lack of quality control of surface and groundwater in the area of transportation of waste and wastewater generated by washing vehicles. • Inadequate monitoring of transport after the completion of waste transportation. • Inadequate monitoring of drivers working in the transportation of radioactive waste. • Insufficient provison of workers with protective equipment and an adequate medical examination.
2	Priority	High
3	DSA Collaboration Events	• Development of new regulatory documents, revision of existing regulations • DSA comments on documents of the Kyrgyz Republic • Information gathering, discussion and discussions at workshops
4	Stakeholders in the Kyrgyz Republic	*Main* • The Parliament of the Kyrgyz Republic (Jogorku Kenesh) - initiation of laws and legislative acts, discussion, legal processing. • The Government of the Kyrgyz Republic - discussion of the legal acts, legal processing, approval of resolutions and decisions, distribution of functions between state bodies. • SRCEPES SAEPF - radiation safety regulatory authority, the responsible body for cooperation with DSA. *Responsibility in accordance with the functions performed:* • DHPSSES under the Ministry of Health of the Kyrgyz Republic - discussion of new policies, NAPs and development programs, assistance in the field of medical supervision • SIETS - a discussion in the working order of new regulations and programs, assistance in the field of inspection • Ministry of Economic Development of the Kyrgyz Republic - discussion in a working order of new normative legal acts and programs, assistance in the field of export / import of goods and cargo • The Ministry of Foreign Affairs of the Kyrgyz Republic - a discussion in the working order of new regulatory acts and programs, assistance in the field of international cooperation • Ministry of Emergencies - a discussion in the working order of new normative acts and programs, assistance in the field of response in emergency situations • Representatives of other ministries, agencies and committees of the Kyrgyz Republic - discussion in a working order of new NAPs and programs, assistance in the field of interest of each organization

		• Large operators: RWDS, Oncology center, «KGRK» OJSC- discussion in a working order of new requirements
5	The list of legal and regulatory documents that will be reviewed or developed in the framework of cooperation with DSA	• Regulations for the Safe Transport of Radioactive Material. To be coherent and consistent with SSR-6 (Rev 1), 2018 Revision and include aspects of radiation safety, physical protection and the environmental safety related issue.
6	Event Costs	Costs associated with: • conducting workshops and collecting information within the country (remuneration of the labor of involved experts). • organization of round tables for the presentation and discussion of new regulatory acts within the country. • translation of documents from English into Russian and vice versa
7	Risk indicators in the absence of activities and the regulatory documents	• The low level of radiation safety during the transport of radioactive materials can lead to risks of environmental pollution and exposure of population and personnel above the established limits. • An increase in the volume of radioactive waste in authorized places and state funding due to the elimination of accidental consequences during the transportation of radioactive materials (in difficult circumstances, prove the carrier's guilt due to the lack of transportation requirements). • The probability of the chaotic occurrence of local radioactive contamination in the country with the risk of late detection. • Threats of sabotage, theft or any other illegal seizure of radioactive materials during transportation. • Irradiation of the population and personnel due to loss, theft and other unauthorized actions with radiation sources. • Lack of information about the real situation in the country about the safety and physical protection of radioactive materials and sources and the lack of preventive measures
8	Expected outcomes and results	• Review of qualification requirements for the transport of radioactive materials established in Decree No. 558 of 08/05/2015. Development and adoption of new regulatory documents in accordance with the requirements of the IAEA SSR-6 and GSR Parts 2, 3 and 7. • Providing regular supervision. • Providing physical protection during transportation.
9	Timing	2020-2021
10	Notes: The country has plans to cooperate with the US Government to strengthen physical protection during transportation of radioactive sources.	
Radioactive waste management and decommissioning		
Cooperation structure		
1	Identified threats	• Weak legal and regulatory framework for the safe management of radioactive waste and decommissioning. • Lack of a licensing mechanism and conditions for decommissioning of uranium-thorium mining complexes and complexes for the processing of radioactive materials. • Lack of qualified personnel involved in the processes of regulation, supervision, organization and management of radioactive waste and obsolete sources. • Limited emergency response capabilities. • Limited ability to detect the consequences of emergency situations that occurred for management of radioactive waste and decommissioning. • Lack of safety assessment of RWDS, uranium plant and tailing dump in the Kara-Balta town and sites where remediation has already been carried out • The difficult situation with the uranium plant in Kara-Balta, which came under the influence of the Moratorium in December 2019 that dictates a complete ban on the extraction and processing of uranium and thorium ore, as well as the import of uranium materials for processing. There are no requirements for the decommissioning of the enterprise and authorities currently have no plans to support the enterprise, which is in an economic crisis due to the loss of raw materials.

2	Priority	High
3	DSA Collaboration Events	• Development of new regulatory documents or review and update the regulatory documents developed some years ago. • DSA comments on documents of the Kyrgyz Republic. • Information gathering, discussion and discussions at workshops.
4	Stakeholders in the Kyrgyz Republic	*Main* • The Parliament of the Kyrgyz Republic (Jogorku Kenesh) - initiation of laws and legislative acts, discussion, legal processing. • The Government of the Kyrgyz Republic - discussion of the legal acts, legal processing, approval of resolutions and decisions, distribution of functions between state bodies. • SRCEPES SAEPF - radiation safety regulatory authority, the responsible body for cooperation with DSA. • SAEPF under Government of the Kyrgyz Republic - discussion in working groups, involvement of specialists and lawyers of the Agency. *Responsibility in accordance with the functions performed:* • DHPSSES under the Ministry of Health of the Kyrgyz Republic - discussion of new policies, NAPs and development programs, assistance in the field of medical supervision. • SIETS - a discussion in the working order of new regulations and programs, assistance in the field of inspection. • Ministry of Economic Development of the Kyrgyz Republic - discussion in a working order of new normative legal acts and programs, assistance in the field of export / import of goods and cargo. • The Ministry of Foreign Affairs of the Kyrgyz Republic - a discussion in the working order of new regulatory acts and programs, assistance in the field of international cooperation. • Ministry of Emergencies - a discussion in the working order of new normative acts and programs, assistance in the field of response in emergency situations. • Representatives of other ministries, agencies and committees of the Kyrgyz Republic - discussion in a working order of new NAPs and programs, assistance in the field of interest of each organization. • Large operators: RWDS, Oncology center, «KGRK» OJSC- discussion in a working order of new requirements.
5	The list of legal and regulatory documents that will be reviewed or developed in the framework of cooperation with DSA	• Regulation on Predisposal Management of Radioactive Waste General (in accordance with IAEA norms and standards, first of all GSR Part 5) • Regulation on decommissioning of facilities (GSR Part 6)
6	Event Costs	Costs associated with: • Conducting workshops and collecting information within the country (remuneration of the labor of involved experts • Organization of round tables for the presentation and discussion of new regulatory acts within the country • Translation of documents from English into Russian and vice versa when processing DSA comments
7	Risk indicators in the absence of activities and the regulatory documents	• Deterioration of the radiation situation in places of temporary storage and “disposal” of radioactive waste. • Damage to the health of personnel involved in the treatment of waste and sources in the processes of decommissioning facilities and remediation of places of storage and disposal of radioactive waste. • Inappropriate use of territories due to lack of narrow requirements and long-term control of lands after the remediation of radioactive waste disposal sites. • Social problems with the population living directly next to areas affected by radioactive waste. • Unauthorized use of radioactive waste, for example, for construction purposes, and the use of other materials (radioactively contaminated coal, ash, scrap metal, etc.). • The risk of accidental pollution of premises and the environment due to the lack of control over sources with expired life or due to untimely decommissioning of radiation sources.

		• Preventive measures are not taken due to the lack of information on the situation at the sites of storage and disposal of radioactive waste and sources.
8	Expected outcomes and results	• Review of qualification requirements for operators and regulation for the management of radioactive waste established in Decree No. 558 of 08/05/2015. Development and adoption of new regulatory documents which should cover the specific issues in accordance with the requirements of the IAEA GSR Parts 2, 3, 5, 6 and 7. • Providing regular supervision
9	Timing	2020-2025
Radiation safety		
Cooperation structure		
1	Identified threats	• Lack of a licensing mechanism and conditions for any process of handling radioactive materials and sources of ionizing radiation. • Lack of qualified personnel involved in the processes of regulation, review and assessment, authorization, inspection, organization and implementation when dealing with ionizing radiation. • Limited number of programs to protect personnel and the public from radiation risks. • Lack of safety and security assessment in organizations where there is either a large number of SIR or hazardous SIR: OJSC “KGRK”, a source warehouse in the Kara-Balta town, Oncology Center, Radioactive Waste Disposal Site in Bishkek city. • Lack of quality programs in X-ray rooms and CT units. • Lack of a monitoring program for individual internal exposure in the country (by any methods).
2	Priority	High
3	DSA Collaboration Events	• Development of new regulatory documents or review and update the developed regulatory documents some years ago • DSA comments on documents of the Kyrgyz Republic • Information gathering, discussion and discussions at workshops
4	Stakeholders in the Kyrgyz Republic	*Main:* • The Parliament of the Kyrgyz Republic (Jogorku Kenesh) - initiation of laws and legislative acts, discussion, legal processing • The Government of the Kyrgyz Republic - discussion of the legal acts, legal processing, approval of resolutions and decisions, distribution of functions between state bodies • SRCEPES SAEPF - radiation safety regulatory authority Responsibility in accordance with the functions performed: • DHPSSES under the Ministry of Health - discussion of new policies, NAPs and development programs, assistance in the field of medical supervision • SIETS - a discussion in the working order of new regulations and programs, assistance in the field of inspection • Ministry of Economic Development - discussion in a working order of new normative legal acts and programs, assistance in the field of export / import of goods and cargo • The Ministry of Foreign Affairs - a discussion in the working order of new regulatory acts and programs, assistance in the field of international cooperation • Ministry of Emergencies - a discussion in the working order of new normative acts and programs, assistance in the field of response in emergency situations • Representatives of other ministries, agencies and committees - discussion in a working order of new NAPs and programs, assistance in the field of interest of each organization • Large operators: RWDS, Oncology center • KGRK OJSC- discussion in a working order of new requirements
5	The list of legal and regulatory documents that will be reviewed or developed in the framework of cooperation with DSA	• Regulation on Radiation Protection and Safety of Radiation Sources. Coherent with the International Basic Safety Standards GSR Part 3. • Regulation on Radiation protection in medicine. Coherent with the International Basic Safety Standards GSR Part 3.

6	Event Costs	Costs associated with: • Conducting workshops and collecting information within the country (remuneration of the labor of involved experts) • Organization of round tables for the presentation and discussion of new regulatory acts within the country • Translation of documents from English into Russian and vice versa when processing DSA comments
7	Risk indicators in the absence of activities and the regulatory documents	• Deterioration of public health due to environmental pollution, due to exceeding the limits for the content of radon-222 and radionuclides of radium-226, potassium-40 and thorium-232 in residential premises. • Unjustified exposure of the population in medical organizations due to the lack of quality control of X-ray rooms, tomography centers and other medical radiation sources. • Due to the increased radiation doses due to the absence of certain requirements for licensees and employers and the lack of personnel protection programs, there is a risk of damage to the health of personnel of medical organizations, industrial organizations and government organizations working in any way with radiation sources. • Preventive measures are not taken due to the lack of awareness of dose loads for the population and personnel in the country due to limited technical, financial and regulatory requirements for accounting for internal and external doses of human exposure. • The risk of criminal use of radioactive materials for the intentional harm to human health due to easy access to radiation sources and the lack of necessary control and accounting of radioactive materials in the country. • The risk of untimely detection of radiation pollution in populated areas and in working rooms due to an incomplete monitoring system, both departmental and state. • The unsatisfactory pace of development of laboratory services is due to the lack of consumers of such services, which happens due to the insufficient regulatory pressure on organizations operating ionizing radiation. • Lack of training centers, repair, calibration and other metrological services in the country and, accordingly, due to the increased financial costs for providing laboratories with services outside the country. • Lack of a quality algorithm for the provision of medical and preventive care in case of burns from over-exposure and as a result of relapse.
8	Expected outcomes and results	• Review of qualification requirements for operators established in Decree No. 558 of 08/05/2015. Development and adoption of new regulatory documents in the country which should cover the specific issues in accordance with the requirements of the IAEA GSR Parts 2, 3 and 7, Code of Conduct with Sources. • Providing regular supervision. • Development of strategic protection programs (for example, personnel, the public from radon). • Improving arrangements at the Oncology Center of the country
9	Timing	2021-2025

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