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NUCLEAR & RADIATION SAFETY AGENCY - STATE REGULATORY AUTHORITY



**“INTERNATIONAL SUPPORT  
TO REGULATORY CHALLENGES RELATED  
TO LEGACY SITES IN TAJIKISTAN”**

**Ilkhom Mirsaidov,  
Nuclear and Radiation Safety Agency**

WM2014:Panel: Worldwide Regulatory Challenges of  
Radioactive Legacy Sites – IAEA Working Forum



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Tabriz

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Euphrates

Tigris

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Aqtau

Aral Sea

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## **Infrastructure for Regulatory Control**

**In accordance with Law on Radiation Protection (article 6) - Nuclear and Radiation safety Agency of the Academy of Science of the Republic of Tajikistan, as assigned as authorized executive state regulatory authority for ensuring radiation safety and as a body to implement a unified State policy, co-ordinate the work of other authorized bodies, and:**





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- ✓ **Prescribe the required qualifications for personnel employed at facilities using nuclear energy;**
- ✓ **Determine types of activity with regard to the handling of ionizing radiation sources subject to licensing**
- ✓ **License types of activity involving the use of nuclear energy;**
- ✓ **Establish standards and regulations relating to radiation safety, physical protection, emergency planning,**
- ✓ **Accounting and control of nuclear material and ionizing radiation sources**
- ✓ **Supervise compliance with radiation safety standards and**
- ✓ **Inspections of Licensing conditions;**

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## **Legacy Sites problems and way forward:**

Uranium mining and milling was an intensive industry in most of the Central Asian countries of the former Soviet Union. It has left a legacy of radioactive residues.

Development of most of the uranium deposits in Uzbekistan, Tajikistan, Kyrgyzstan and partially in Kazakhstan was stopped after the collapse of the former Soviet Union. All of these countries found themselves facing the problem of safe management and remediation of many sites affected by the operation of uranium mining and milling facilities. After these countries became independent, the issues of restructuring and decommissioning of the mines and other uranium facilities arose at the same time.



# Industrial pollution and waste hotspots in the Ferghana Valley



### Poorly managed waste sites

- Pesticides and hazardous chemicals
- Mining tailing ponds and piles
- Municipal waste

### Polluting industries

- ★ Metallurgical industry
- ★ Oil and coal production

### Radioactive material processing and storage sites

- ☢ Uranium tailing or radioactive material processing
- ☢ Closed uranium mine

### Pollution pathways

- ⤴ Transboundary and local risk of soil, air and water contamination
- ➡ Spills and reported industrial accidents
- ▨ Areas prone to air pollution (atmospheric inversions)



THE MAP DOES NOT IMPLY THE EXPRESSION OF ANY OPINION ON THE PART OF THE AGENCIES CONCERNING THE LEGAL STATUS OF ANY COUNTRY, TERRITORY, CITY OR AREA OF ITS AUTHORITY, OR DELINEATION OF ITS FRONTIERS AND BOUNDARIES.

MAP BY VIKTORNOVIKOV AND PHILIPPE REKACEWICZ  
UNEP/GRID-ARENDA - APRIL 2005





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**The history of uranium legacy sites in Tajikistan starts from 1944., once the uranium concentrate production was initiated in pilot plant of Gafurov city.**

**6 small plants on uranium oxide production were constructed in the north of the republic in 1945 from which only one big plant operated at the end of 1960th in Chkalovsk city. After reconstruction in 1980th this plant reprocessed up to 1 million tons of ores per year and sulfuric solution containing uranium up to 200 g/l per year. Plant produced approximately 2000 tons of uranium oxide per year.**



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During the second half of XXth century Tajikistan was one of the uranium raw materials suppliers in USSR: more than 20 % of produced uranium in USSR was delivered from Tajikistan.

In USSR, radiation safety requirements were in compliance with Europe and USA standards for 1960–1970th years. Nevertheless, considerable attention was paid to extraction volume increase tasks rather than to environmental protection.

**Tailings of former uranium facilities according to data of SE "Vostokredmet"**

Name and Locations of the Uranium ore residue disposal site	Period, when tailings were created	Sanitary protection zone, m and area, ha	Efficient disposal volume, m <sup>3</sup>	Soil cover layer, m	Gamma dose exposure rate at the surface, μR h <sup>-1</sup>	Amount of disposed waste in million of ton/Ci
1. Tailing Degmay, Guisyon 1.5 km	1963	400 90.0	194*10 <sup>5</sup>	No cover	650-2000	20.8 4218
2. Tailing Gafurov, Gafurov,	1945-1950	no 4.0	2.4*10 <sup>5</sup>	2.5	20-60	0.4 159
3. Tailing Cells 1-9. Chkalovsk, 2 km	1949-1967	50.0 18.0	26.0*10 <sup>5</sup>	0.5	20-60	3.03 779
4. Tailing N 1 (I-II). Taboshar, 2 km	1945-1959	50.0 24.7	9.88*10 <sup>5</sup>	0.7-1.0	40-60	1.69 218
5. Tailing N 1 (III ). Taboshar, 0,5 km	1947-1963	50.0 11.1	10.6*10 <sup>5</sup>	0.7-1.0	40-60	1.8 232
6. Tailing N 1 (IV). Taboshar, 1 km	1949-1965	50.0 18.7	24.3*10 <sup>5</sup>	0.7-1.0	40-60	4.13 510
7. Tailing N 3 Taboshar, 3.0 km	1949-1965	50.0 2.86	0.69*10 <sup>5</sup>	0.7-1.0	40-60	1.17 15.2
8. Storage of the factory of "barren ore" (FBO) Taboshar, 4.0 km	1950-1965	no 3.35	11.9*10 <sup>5</sup>	No cover	40-100	2.03 253
Tailing N 2 Adrasman, 1 km	1991	no 2.5	2.4*10 <sup>5</sup>	1.0	50-60	0.4 160
10. Mine-3 (4 units) Khudjand, 2 km	1976-1985	no 5.9	2.7*10 <sup>5</sup>	0.5	60-80	3.5 11.0





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**Productive indicators of extraction, in every possible way, were encouraged by bonus system while achievements in the sphere of ecological protection were not encouraged. There were no requirements to assess the initial condition of environment during establishment of new enterprises for extraction and reprocessing of uranium ores and that's why no data exists allowing to compare the initial and current ecological condition in places where uranium sites were located.**



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**Remediation activities were carried out only in small parts of sites which were located in places which were close to residential areas. Thus, uranium ores reprocessing dumps were covered by solid layer of soil with thickness of 1 m in densely-populated district of Gafurov city which considerably reduced radon exhalation and gamma-emission dose rates on the surface of the dump. Nevertheless, dumps here continuing to remain the risk factor since located only in 50 m distance from neighboring residential houses.**

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**Gafurov tailings site: Note the proximity of dwellings, the cover appears intact with no obvious erosion features**





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**For example, Degmay tailing dump, which is located in 2 km distance from the nearest residential settlement, is not covered at all and there is a free access to public and cattle pasture on the surface of the tailing dump, where vegetation has been grown up.**



**Degmay tailing covered with cracks that intensifies the radon exhalation and increases the risk of erosion of the surface and increases dusting by the wind.**



**The «Yellow hill» a waste rock pile of the factory “barren ore” created during the 1960s is one of the sites where remediation measures are required.**



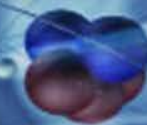


**Drainage water salt deposits (with high contents of uranium in the sodium and sulphates crystals) on the bottom of the creek near the tailing dumps of I-II.**



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**An urgent remedial measure in Taboshar should be the treatment of the overflowing mine water discharging directly into Taboshar.**

**Because of the lack of other water sources the local population uses this water. The analysis of the water samples shows that the water is highly contaminated**



**USE OF NON-ORGANIZED WATER RESOURCES BY LOCAL POPULATION**





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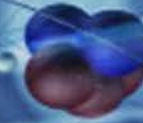
## REGULATORY PROBLEMS:

Legal and regulatory framework of the Republic with regard to the safe management of the former uranium industries is still not well developed and therefore requires improvements and harmonization with international recommendations, in particular with the Basic Safety Standards of the IAEA. The standards and guidelines on how to provide safe management, rehabilitation and in some cases secondary reprocessing of the uranium waste rocks and tailings are either absent or not implemented because of a lack of experience. There is also a lack of adequate mechanisms for putting the already existing laws into operation properly.



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**In particular, there are no clear requirements for environmental monitoring and data reporting, and the assessment and recording of doses to which personnel and the public are exposed at the uranium legacy sites are not well developed.**

**The exemption and clearance safety criteria as well as the exemption and clearance levels which have to be established and which apply everywhere including the former uranium facilities according to the IAEA BSS, have not become an effective tool for radiation protection practice and the safe management of the former facilities in the country.**



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**It is impossible to ensure environmental and public safety and the secondary processing of uranium industry waste without the corresponding legislative and regulatory framework and professional staff.**

**In this regard, the joint project of the Nuclear and Radiation Safety Agency and the Norwegian Radiation Protection Authority was highly important and timely for the Tajikistan Republic, as it provided the development of a normative legal framework for controlling uranium production waste, mining activities, secondary processing and training of professional staff that is a foundation for the implementation of any programs concerning the uranium tailings impoundments in northern Tajikistan.**





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**The Threat Assessment Report carried out under this project demonstrated the following important constraints for the development and implementation of efficient regulatory control:**

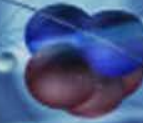
- 1) Inadequate regulatory and legislative framework for the safe management of radioactive waste.**
- 2) Costs of remediation and limited availability of national funding.**
- 3) Regulatory development issues.**
- 4) Inadequate knowledge of the inventory of legacy components and the risks associated with them.**





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- 5) Very varied public and social attitudes toward the legacy sites.**
- 6) Inadequate legislative and regulatory framework for the operation, closure and environmental remediation of mines.**
- 7) Lack of personnel with uranium mining and milling experience or knowledge of remediation activities.**
- 8) Shortage of state-of-the-art equipment and machines.**
- 9) Cross-border regional problems related to the former uranium facilities in Central Asian countries.**



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## WAYS FORWARD:

At present, Tajikistan needs a consistent and reliable assessment of its legacy sites and components, which should include:

- ✓ Characterization of the inventory of both radioactive and non-radioactive contaminants.
- ✓ The effluent and influent streams from the sites and emissions into the air.
- ✓ Information on the geotechnical stability of the sites, erosion, stability of the current containment barriers, if any, and the design details of the containment barriers.
- ✓ A safety assessment and an environmental impact assessment.



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Developing an understanding of a site requires an appropriate monitoring and surveillance plan, including specifications of where to sample, how to sample, and how many samples must be taken, etc. The use of the recently acquired instruments and equipment should be incorporated into these plans.

The decisions regarding in-situ stabilization or relocation of residues such as tailings should be based on the assessment results obtained on the basis of the new data.





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As for filling all of the gaps in the regulatory and legislative framework, the following safety requirements or actions were identified for development and implementation:

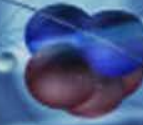
- ✓ Elaborate the draft national policy and strategy for radioactive waste management to be approved and implemented by the government.
- ✓ Review, update and elaborate the necessary legal and regulatory framework for the safe management of existing exposure situations and radioactive waste. This includes the regulatory basis for the licensing of future disposal facilities, including the elaboration of safety assessments, safety cases and environmental impact assessments.
- ✓ Review, update and elaborate the necessary legal and regulatory framework (including authorization, inspection and enforcement) for the safe management of radioactive waste and radioactive waste management facilities, including those linked with the production of NORM waste.





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- ✓ Clearly define how the responsible organizations will realize the national policy for radioactive waste management with use of the available technical measures and financial resources.
- ✓ Define how and when the identified objectives and tasks will be achieved.
- ✓ Define what level of competence is necessary in order to achieve these tasks, and how it will be provided.
- ✓ Develop the management pathways for each type of radioactive waste, through all stages of the RW life cycle (from the moment of generation to disposal), as part of the national strategy for radioactive waste;



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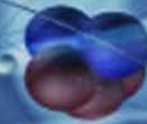
## Strengthen the trust of the public concerning radioactive waste management and remedial action:

- ✓ Establish mechanisms for providing resources and funding for the safe decommissioning, remediation activities and long-term RW management.
- ✓ Guarantee the availability of sufficient and qualified human resources to perform the rehabilitation activities and safe management of radioactive wastes, including resources for training and R&D where needed.
- ✓ Implement the monitoring of radioactive waste storage facilities and disposal sites both during their operation and after their closure (including post-closure institutional control where needed).
- ✓ Perform the safety assessment and radiological impact assessment for the contaminated territories and take the necessary measures to diminish the risks in accordance with the results of this assessment.



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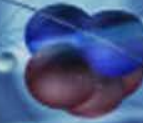
- ✓ Carry out long-term monitoring and control over the abandoned objects of the uranium industry, and take the necessary security measures to prevent unauthorized access to the contaminated sites.
- ✓ Develop safety requirements for the design and implementation of radiation monitoring of the sites contaminated with natural and artificial radionuclides.
- ✓ Develop and implement projects concerning the final disposal or secondary processing of radioactive materials.
- ✓ Develop and implement the necessary projects concerning restoration.
- ✓ Introduce the safety requirements for existing exposure situations including the establishment of the quantitative criteria defining the “reference levels” and consider that the rehabilitation of the sites will be strongly dependent on the established safety criteria (reference levels) and the existing exposure situation.
- ✓ Develop criteria and hygienic specifications for the rehabilitation of sites contaminated by radionuclides.





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**This could provide socially comprehensible guarantees of radiation safety for the population local to the sites of radioactive contamination.**

- ✓ **Develop regulatory documents for maintaining the radiation safety of personnel and the public during the subsequent use of the site, buildings and structures after rehabilitation. Guidance should be developed for the derived levels of residual contamination of the site with radioactive substances for several most probable options for their use after rehabilitation, for example, sites of unlimited use; sites of limited use for industrial purposes with the use of radioactive materials; sites of limited use for industrial purposes without the use of radioactive materials.**





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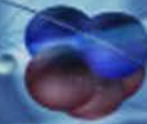


- ✓ **Develop derived reference levels for the radiation parameters that can be directly measured when implementing radiation control.**
- ✓ **Develop a classification scheme for radioactive waste in accordance with the recently approved IAEA international recommendations in this regard.**
- ✓ **Develop and approve safety requirements (regulations) for the design, siting, construction, operation, closure and establishment of institutional control needed for disposal facilities in accordance with the approved national policy and strategy on radioactive waste management.**
- ✓ **Authorize projects concerning the secondary processing of the uranium tailings impoundments with the purpose of extracting uranium.**



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**In the case of secondary processing of the uranium tailings impoundments and extraction of uranium or other minerals from mine waters, it is necessary to implement and enforce an authorization process that will require the potential investors to be responsible for the implementation of the projects concerning restoration at every tailings impoundment involved. This process should include:**

- ✓ Performance of a safety assessment and radiological impact assessment.
- ✓ Rehabilitation and secondary processing of the uranium tailings impoundments.
- ✓ Final disposal and rehabilitation of the off-balance ores and extraction of uranium from mine waters.
- ✓ Final disposal and rehabilitation or dislocation of the secondary processing of the uranium tailings impoundments.
- ✓ Organization and implementation of the requested (when needed) institutional control of existing tailings impoundments.



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**The NRPA project will give priority to these regulatory documents, which should be developed to eliminate existing gaps in the regulatory basis, based on an assessment of what possible future influence the absence of these documents might have on the public. It is also clear that in order to remove the threats associated with the presence of radioactive wastes - both those which have already accumulated as a result of previous activity and those which are currently being generated in significant amounts and which could be produced in the future - it is necessary to develop at least the following documents:**

- ✓ **A national policy and strategy for radioactive waste management.**
- ✓ **A new classification scheme for radioactive waste, including identification of the corresponding categories.**
- ✓ **Safety requirements for the design, siting, construction, operation, closure and establishment of institutional control needed for disposal facilities in accordance with the approved national policy and strategy on radioactive waste management.**
- ✓ **Safety requirements for the management of radioactive waste.**
- ✓ **Safety requirements for existing exposure situations as well as a clearance policy and clearance levels to be applied.**





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**It is also clear that in order to remove the threats associated with the presence of extensive sites contaminated by radionuclides, their rehabilitation is required and, accordingly, it is necessary to develop a legal and regulatory framework defining:**

- 1) Responsibilities of the government, the licensees (operators) and other interested parties in existing exposure situations.**
- 2) Justification and optimization of protective actions in existing exposure situations, including safety-related criteria such as “reference levels” and derived quantities to be directly measured.**
- 3) Institutions or organizations to be responsible for the remedial actions and the implementation of institutional control in areas with residual radioactive materials.**
- 4) Criteria and hygienic specifications on the rehabilitation of sites contaminated with radioactive materials.**
- 5) Regulatory framework preventing the occurrence of similar situations in the future.**





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**Threat assessment process revealed that in first stage it is necessary to develop the following legal documents of high priority with regard to radioactive waste regulation:**

- 1) Law on radioactive waste (some provisions in this law include policy and strategy statements).**
- 2) Rules of radioactive waste management (PORO).**
- 3) Routine of state accountancy and control of radioactive material and radioactive waste.**
- 4) Procedure for issuing a license on activity dealing with the exploitation, mining and production of uranium, as well as with the secondary processing of waste from the uranium industry.**
- 5) Regulation on ensuring radiation safety for the stock-piling and disposal of radioactive scrap metal.**
- 6) Regulation on the treatment of mineral raw material and material with a high content of natural radionuclides.**
- 7) Regulations regarding the expert examination of documents substantiating the guaranteed nuclear and radiation safety of nuclear installations, radiation sources and quality of declared activity.**
- 8) Rules of radiation safety in the transportation of radioactive material and radioactive waste.**
- 9) Safety requirements for: a) existing exposure situations; b) shutdown and decommissioning; c) remedial actions; d) monitoring.**



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## **INTERNATIONAL SUPPORT TO REGULATORY CHALLENGES:**

### **1) Main outcomes from bilateral Project with NRPA, Norway:**

**Threat assessment report, which revealed a weakness in the regulatory management of legacy sites in the country. Law on Radioactive Waste Management (which included some provisions on RWM policy and strategy – a separate document is in the process of elaboration). The current law was approved after four years of its discussion in different ministries and authorities of Tajikistan in 22 July 2013.**



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- ✓ **Rules of radioactive waste management (in full compliance with IAEA standards but based on the Russian version. Inconsistencies with IAEA standards were excluded. The document has been elaborated and approved by the director of the NRSA.**
- ✓ **“Requirements for carrying out monitoring of sites (radiation control)”. This document was developed in accordance with the IAEA Safety Standards. The document has been elaborated and approved by the director of the NRSA.**





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## **2) Project with EU:**

The regional project **REG 4.01/10 (Financing agreement No.NSI/2011/22-653 was signed last year in December 2011)** "Establishment of a legislative and regulatory framework for the remediation of uranium mining legacy sites in Central Asia, establishment of a regional watershed monitoring system and capacity building in analytical techniques, training and education and information exchange" has an overall budget of 2.5 mill Euro.

The project foresees "Establishing recommendations for a legislative and regulatory framework". This sub-component takes into account the ongoing Norwegian regional project focusing on national policy and strategy for radioactive waste management.

The regional project REG4.01/10 also foresees the establishment of national laboratory capacity (centralized laboratory and on-site laboratories) that is needed to create the watershed monitoring system.





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## 2) Project with EU:

### Comprehensive Environmental Impact Assessment (EIA) and Feasibility Studies (FS) for Degmay and Taboshar.

These studies are the starting point and they will give information and the basis for choosing the most appropriate final remediation works option for Degmay and Taboshar.

### Taboshar water treatment facility MC4.02/13 (A)

The overall indicative amount is 2.5 MEUR.

Project objectives:

- ✓ The design and engineering of a water treatment facility needed for the cleaning of the contaminated waters from the Taboshar legacy site;
- ✓ The supply and installation of the water treatment facility at Taboshar



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### **3) Project with EURASEC:**

The Council on cooperation of the peaceful use of atomic energy under the Integrated Committee of Eurasian Economic Community (EurAsEC:) considered and approved the project of the Inter-state targeted program “Recultivation of EurAsEC member-states territories subjected to impact of uranium mining and milling industries”.

Sites in Min-Kush and Kaji-Say villages in Kyrgyzstan and in Istiklol (formerly Taboshar) in Tajikistan were selected as priority sites. The total cost for Program is 40 million US\$. The program has been divided into two stages :

Stage I (2013-2016)

Stage II (2017-2018)



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## NATIONAL CONTRIBUTION

The Government of Tajikistan is currently funding a project, carried out by “Vostokredmet” to develop criteria to determine the environmental hazards of contaminated sites, the relative ranking of the extent the hazards of these sites and remediation programs required to remove their environmental impact:

### ANNUAL BUDGET FOR REMEDIATION OF URANIUM TAILINGS

Year	Somoni	US\$ (approx.)
2009	200,000	47,500
2010	164,000	45,700
2011	250,000	56,800
2012	400,000	85,100



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## ACTIVE AND COMPLETED IAEA PROJECTS

### IAEA National Projects:

- TAD/7/002** “Supporting Radon Monitoring of Uranium Tailings”
- TAD/9/002** “Application of International Safety Standards on the Management of Uranium Milling Residues”
- TAD/9/003** “Establishing a Radiation Monitoring System at Uranium Tailings Sites in Northern Tajikistan”





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## ACTIVE AND COMPLETED IAEA PROJECTS

### IAEA INTERNATIONAL AND REGIONAL PROJECTS

- INT/9/175** “Promoting safe and efficient clean-up of radioactively contaminated facilities and sites”
- RER/0/033** “Supporting Quality Assurance for the Measurement and Monitoring of Radioactivity in the Environment”
- RER/3/010** “Supporting Preparation for Remediation of Uranium Production Legacy Sites”.
- RER/9/086** “Safe Management of Residues from Former Mining and Milling Activities in Central Asia”.
- RER/9/121** “Supporting Environmental Remediation Programmes”.
- RER/9/122** “Supporting Safe Management of Uranium Production Legacy Sites”.
- RER/9/127** “Establishing Enhanced Approaches to the Control of Public Exposure to Radon”.



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## CONCLUSION:

Priority sites for remediation should be Degmay (with the purpose of dusting prevention and radon exhalation from its surface) and former uranium industry sites in Istiklol (water purification and determination of controlling zones). In accordance with preliminary calculation of SE “Vostokredmet” specialists the reference costs for remediation of these sites including pre-design, exploratory and design and of course physical works is around 200 million US dollars. Currently economics of Tajikistan doesn't possess such means and here international organizations and funds are necessary.

In conclusion it is necessary to mention that implementation of international projects with IAEA active participation facilitated to expanding cooperation and mutual understanding among Central Asian countries in issues of environmental protection. Re-establishment of radiation control system on former sites of uranium industry of the Republic of Tajikistan is the first step to their full remediation.



**THANK YOU FOR YOUR ATTENTION**

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**QUESTIONS???**

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