

Uranium Mill Tailings Remediation in Central Asia

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IAEA
International Atomic Energy Agency

IAEA Regional Project RER9086

Safe management of residues from former mining and milling activities in Central Asia

- Members States participating :
Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan
- All interested in managing and/or remediating the legacy of former uranium mining and milling activities to protect their population and environment
- These 4 Member States have some common history and similar problems in the same geographical region under similar climatic conditions
- TC received requests from some of these Member States which were almost identical

Kazakhstan

Uranium mining legacies



Mailuu Suu , Kyrgyzstan - April 2007



Tailings

Landslip

River

Plant

Landslip

Landslip



Tajikistan
Uranium mining
legacies





Uzbekistan
Uranium mining
legacies

Rationale

A regional project offers opportunities for improving cooperation and understanding between the participants; it also offers efficiencies in service delivery for IAEA

A number of TC national projects in Tajikistan and Kyrgyzstan were also initiated and financially supported giving these countries additional help for development of their capacity building (monitoring) and legal framework (management)

Waste Safety Section of NS Department is providing and coordinating Technical Support to TC RER/09/086

Project Objectives – RER9086

- To develop a regulatory framework and decision making process to assess radiological impact of radiological residues at former uranium mining & milling sites
- To evaluate the remediation works already underway
- To ensure international safety standards are being met
- To develop a plan of action to minimize the impact of radioactive residues on the population and assist sustainable development

Main activities

Transfer of experience and knowledge to both regulators & operators - 6 workshops

Improvement of Regulatory Framework & Laboratory Capacities

Improvement of Monitoring Programs

Development of monitoring network (procurement of equipment and training of personnel)

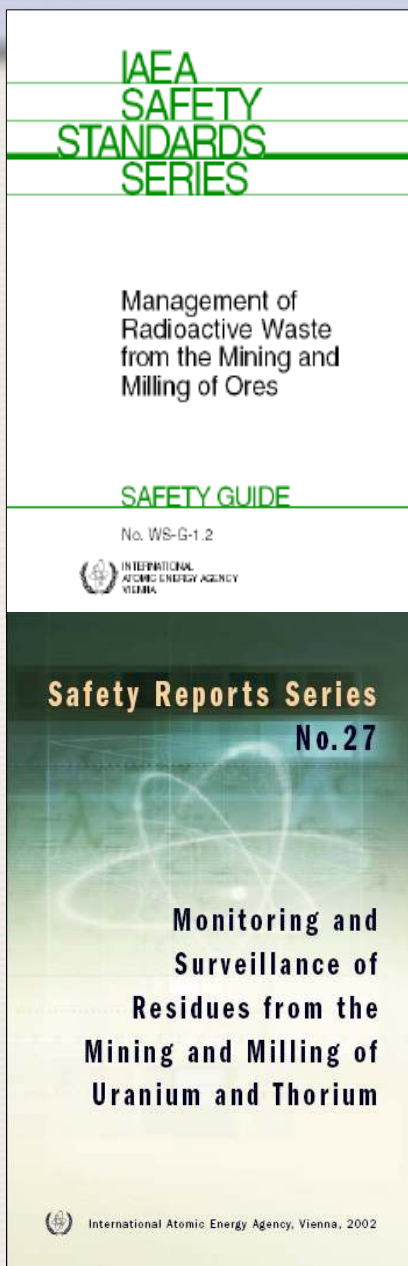
Expert missions and consulting services

Arranging analyses of environmental samples

Environmental and Radiological Assessment

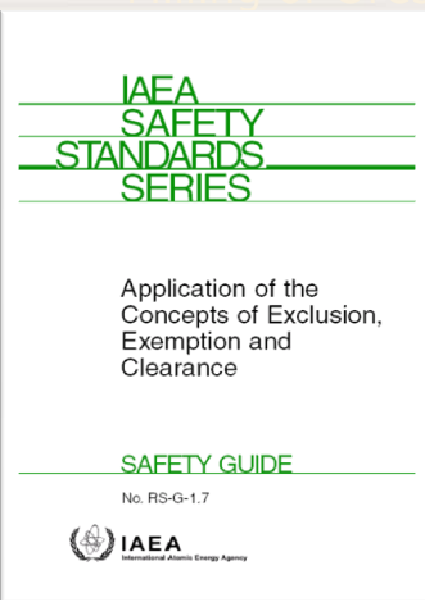
Assistance in Remediation Planning

IAEA Documents relevant to the Project



Safety Standards Series No. WS-G-1.2

Management of Radioactive Waste from the Mining and Milling of Ores Safety Guide



Safety Standards Series No. RS-G-1.7

Application of the Concepts of Exclusion, Exemption and Clearance

Safety Reports Series No. 27

Monitoring and Surveillance of Residues from the Mining and Milling of Uranium and Thorium

Documents in Russian

СЕРИЯ
НОРМ
МАГАТЭ ПО
БЕЗОПАСНОСТИ

Обращение с
радиоактивными
отходами,
образующимися при
добыче и переработке
руд

РУКОВОДСТВА

№ WS-G-1.2



СЕРИЯ
НОРМ
МАГАТЭ ПО
БЕЗОПАСНОСТИ

Применение концепций
исключения, изъятия и
освобождения от
контроля

РУКОВОДСТВА

№ RS-G-1.7



<http://www.iaea.org/Publications/index.html>

Case Study areas

Tajikistan

Taboshar (waste rock piles & tailings)

Degmay (tailings), Khujand (seepage & run off)

Chkalovsk (Gafurovo, Cells 1-9; tailings & waste)

Uzbekistan

Yangiabad and Charkesar


Kyrgyzstan

Kadji-Say, Minkush (tailings & waste rock)

Kazakhstan

Koshkar-Ata, Stepnogorsk (waste rock)

Scientific visits and fellowships

Place	Topics	Participation
WISMUT, VISUTEC (Germany)	Remedial strategies, Monitoring programs development, Technol.	KZ, TAD, UZ, KIG
Seibersdorf (IAEA, Vienna)	Analytical procedures and QA,QC	KIG
SPA Doza. Russia Moscow SPA "Radon" (Moscow)	Dosimetry, Alpha-Radiometry UMF-2000, Radonometry	KZ,TAD
Vernadsky Institute of Geochemistry (Moscow)	AAS	KIG
Ukr. Hydrometeorology Inst. Kiev SE"Barrier"Dnieprodzerzhinsk	Radonometry, LSC, GammaSpec Field studies, Data processing	TAD,KIG,UZ
Al-Farabi University (KZ, Almaty)	Basic course in Analytical measurements of Env. samples	KZ, TAD, UZ
Estonia, Sallimayae	Practical implementation of post-remedial monitoring	TAD
Vilnius, Radiation Protection Authority	Radon-monitoring	TAD
 IAEA Field trips & training	Characterization of Tailings dump sites Risk Assessment software (Pecs)	KZ, TAD, UZ, KIG

Improvement of capacity building



Consulting and training



- **Monitoring programs development**
- **Sampling (tailing materials, aerosols, water, soils, plants)**
- **Sample preparation (wet chemistry extractions)**
- **Dose rate measurements**
- **Rn and its progeny measurements**
- **Alpha-radiometry and spectrometry**
- **Gamma spectrometry (NaI(Tl), Semiconductors), operation & calibration**
- **Liquid-scintillation counting**
- **Data processing**
- **Characterization of the Legacy Sites**
- **Basics for Safety Assessment**

Expertise and Assessment

All sites were visited and examined by experts provided by (& sometimes from) IAEA

Germany, Ukraine, Russia, Hungary, Sweden (& IAEA)

Experimental data for the main exposure pathways were collected and analyzed in certified laboratories

“ECOLEGO” risk modeling software was used after training

The results of the radiological assessments were submitted to National Authorities and discussed at Regional Workshops

Prioritization in remediation planning has been proposed for consideration by National Regulatory Authorities

Programs and methods for monitoring were developed and discussed

Summary & Conclusions: Phase 1

The overall project cost was \$1,031,173

Preliminary Assessment has been carried out and was published in the RER-9086 Phase 1 Report (2005-2006) *et seq*

Generally former uranium facilities are not managed in accordance with international standards

Sites require introduction of institutional controls and, eventually, remediation

The lack of monitoring data, experience and national funding for remediation are significant deficiencies

The level of national expertise and analytical capacity in the participating laboratories has improved, but must go further

Summary & Conclusions: Phase 1 [2]

Ongoing and enhanced State support of all these activities is essential to the successful and sustainable implementation of IAEA Technical Assistance

Future activities of IAEA RER and National projects may include comprehensive Safety Assessment of the former uranium facilities

Development of regional linkages and networks should continue and be expanded in a follow-on project

Phase 2 - The continuation

For the 2009-2011 TC Cycle a new expanded project was set up as RER3010:

“Supporting Preparation for Remediation of Uranium Legacy Sites”

The project participant list was expanded by the addition of 5 new partners:

- Romania
- Russian Federation
- Ukraine
- Czech Republic
- Slovenia



RER3010 – Project plan

The project is intended to work at a pilot site in each country to develop a common strategy for site characterization, remediation planning and , eventually, implementation of remediation

The budget is \$1.6 million over 3 years

The new programme comprises 7 thematic work packages

The Work Packages

1. Safety Assessment Methodology
2. Enhancing the Regulatory Framework
3. Establishing Site Specific Monitoring Programmes
4. Implementation of QA/QC procedures
5. Risk Communication for the Public
6. Institutional Controls and Interim Risk Mitigation
7. Development of an information sharing website

Project Activities

- Regional Training Course on Generic Models for Use in Assessing the Impact of Discharges of Radioactive Substances to the Environment Utilizing Ecolego Sweden Feb. 2010
- Regional Training Course on Laboratory Inter-Comparison Proficiency Testing Exercises Almaty, Kaz. 2009

Workshops Planned for 2010

Title of Event	Host (Country, City)	Date (month, dates)
Regional Training Course on Risk Communication and Public Involvement	KIG, Bishkek	4-8 Oct
Workshop on Legacy Site Characterisation	Pecs Hungary	16-18 August
Workshop on Application of Safety Assessment Methodology in the Decision Making Process for Remediation Planning	UZB, Tashkent (TBC)	24-26 Nov
Workshop on Licensing Process for Remediation of Uranium Production Legacy Sites	UKR, Kiev (IHME)	1-3 Sep
Workshop on Evaluation of the Intercomparison Exercise	AUS, Seibersdorf	4Q, 3 days
Workshop on Institutional Control Mechanisms as Interim Risk Mitigation Measures (WP6)	TAD, Chkalovsk	July, 3-4 days
Project progress/review meeting	AUS, Vienna	4Q, 3-4 days

Central Asian Initiative

- UNDP Regional Conference, Bishkek April 2009
- IAEA International Conference, Astana May 2009 resulting in Framework Document
- UNDP in Geneva: “Uranium Tailings in Central Asia: Local Problems, Regional Consequences, Global Solution”. June 2009
- IAEA General Conference 53 Resolution, Vienna September 2009
- IAEA TM Vienna November 2009
- IAEA Regional Assessment Document March 2010

Conclusions of Assessment Document

1. **Regulatory framework:** develop guidelines/standards for monitoring sites and setup efficient regulatory processes
2. **Training and education:** radiation protection, environmental and long-term monitoring, project management, remediation planning, restoration technologies, experience exchange, risk assessment, operation of scientific equipment
3. **Internet database for information exchange:** monitoring data and regional knowledge exchange and experiences
4. **Establishment of a regional watershed monitoring network**
5. **Analytical Capacity Building:** effective laboratory system for site investigation (soil and ground water samples)
6. **Environmental impact assessments and safety assessments conducted region wide and at priority sites**

International Conference on Remediation of Land Contaminated Radioactive Material Residues Astana, Kazakhstan May 2009

The conference was designed to cover all relevant aspects related to environmental remediation including:

- Regulatory and Safety Regimes,
- Innovative and Mature Technologies,
- Life-Cycle Planning,
- Technical Experience Exchange,
- Stakeholder Issues



International Conference on Remediation of Land Contaminated Radioactive Material Residues Astana, Kazakhstan May 2009

- Hosted jointly with Kazakhstan Atomic Energy Commission
 - 34 countries represented
 - 215 attendees
 - 53 presentations
 - 50 posters (28 presented)



International Conference on Remediation of Land Contaminated Radioactive Material Residues Astana, Kazakhstan May 2009

- **Outcomes of the Conference:**
 - **Need for enhanced regulatory regime and call for establishment of an international regulatory forum**
 - **Strong endorsement of the EnviroNet as a means of information/expertise exchange**
 - **Recognition of the importance of stakeholder involvement**

International Forum on Regulatory Supervision of Legacy Sites (RSLS)

- The IAEA General Conference has adopted a resolution GC(53)/RES/10, 18 September 2009, as follows. The GC:
 - “Encourages relevant Member States to participate in a multilateral initiative to remediate the uranium mining legacy sites in Central Asia, supports the Agency’s involvement in this international initiative as technical coordinator and requests the Secretariat to report on further developments; notes the conclusions of the International Conference on Remediation of Land Contaminated by Radioactive Material Residues in Kazakhstan in May 2009, and supports, as recommended by the conference, the development of an international working forum for the regulatory supervision of legacy sites.”

International Forum on Regulatory Supervision of Legacy Sites (RSLS)

To promote high standards of regulatory supervision for the management of legacy sites, in line with the IAEA Safety Standards and good international practices

To be achieved through:

- collection and collation of information on nuclear legacy sites, the historical experience of legacy supervision;
- exchange of information on nuclear legacy site restoration plans, and the role of regulatory supervision in planning activities;
- the generation of mutual support through presentation and discussion on how regulatory supervision can be made effective and efficient.

International Forum on Regulatory Supervision of Legacy Sites (RSLS)

- Planning Meeting held in Oslo at NRPA offices December 9-10, 2009
- First TM to be held in Vienna 11-15 October 2010 (with a focus on uranium legacy sites)



Upcoming Related Technical Meetings

- TM on Safety Aspects of Uranium Production from Exploration to Remediation Vienna, August 2-4, 2010 (continuation of UMREG)
- TM on International Forum of Regulatory Supervision of Legacy Sites - Vienna, October 11-15, 2010

Summary & Conclusions

- There is a great deal of international interest in the remediation of these uranium legacy sites
- Introduction and application of appropriate international safety standards is seen as an essential element of the process
- Objectives for success have been identified

Summary & Conclusions [2]

- Main objectives:
 - Harmonization of legislation & regulation frameworks
 - Preparation of pre-remediation environmental assessments
 - Develop and use safety assessments for remediation planning
 - Preparation of remediation plans
 - Prepare for Implementation of remediation works
 - Develop and support delivery of public education and information programmes
 - Development & improvement of analytical capabilities

Summary & Conclusions [3]

- A long term programme
- Much has been achieved but there is much more to do
- Some impact due to resurgence of the global uranium industry but this will be accommodated
- The long term prognosis for remediation looks good

Living in the shadow.....

