

The Long-Term Stewardship of Uranium Mine and Milling Remediated Sites in Europe



130/100 ANOS DE ENGENHARIA DE MINAS

Politechnical Academy of Porto (1885/1915)
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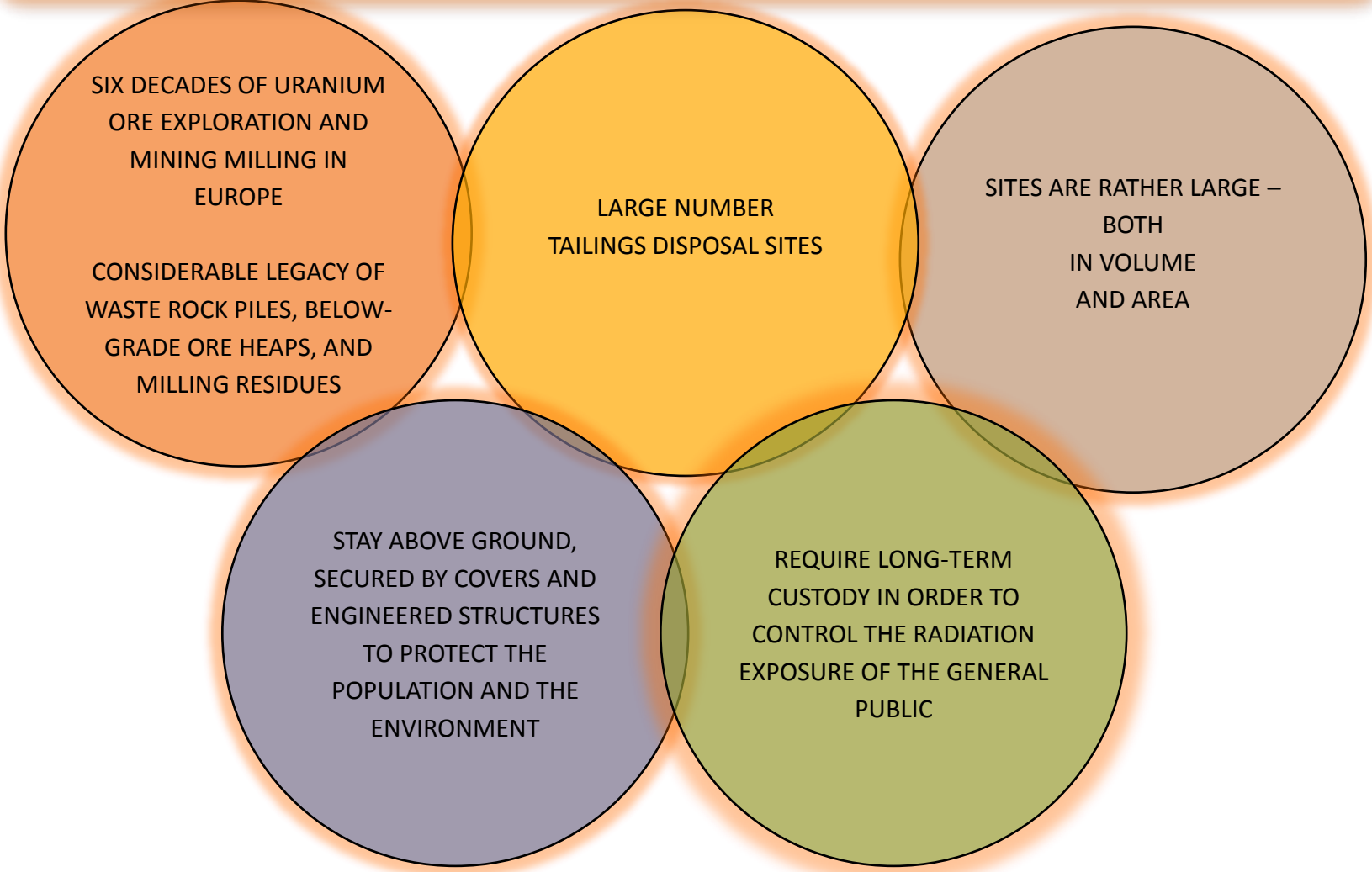
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URANIUM ORE EXPLORATION AND MINING MILLING IN EUROPE



- Europe - uranium mine started in the 1940's for civil and military applications.
- The great majority of these mines have been shut down and are going through the decommissioning/rehabilitation stages.
- Today, main producers of uranium are located outside the EU - only a few mines are still in operation inside the EU.
- 2006 - Situation of the uranium mines and mill tailings in Europe, identifying the current tailings liabilities, their status, the future plans for these sites and any associated hazards, was reported to the European Commission.
- Residues of these past six decades of mine and mill processing of uranium ore in Europe have resulted in a considerable legacy.
- Although this legacy is much smaller in volume than that resulting from other types of metal or coal mining, the enhanced radioactivity associated with uranium mining requires specific attention.

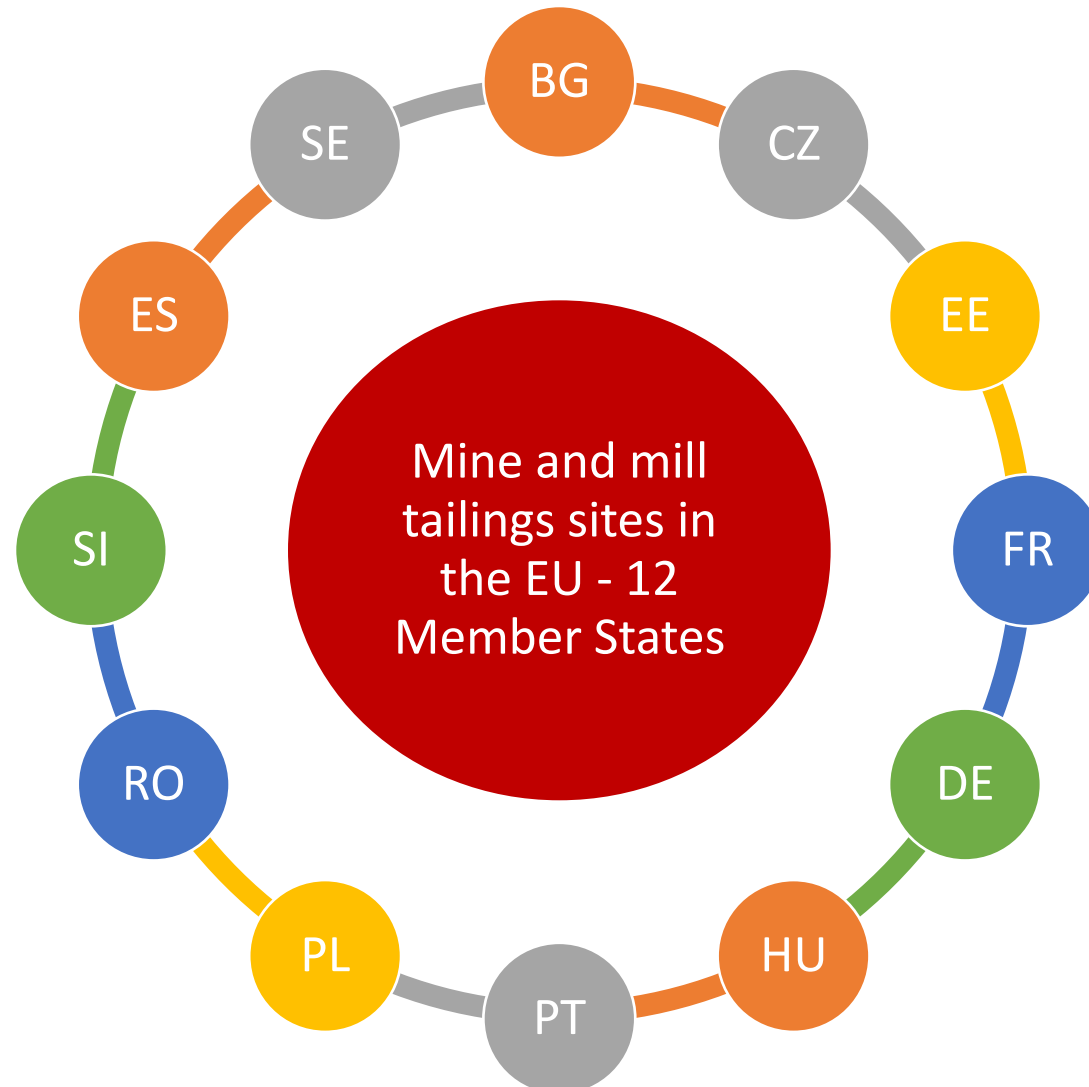
- *TREN/04/NUCL/S07.39881* - study into the situation of uranium mine and mill tailings in the EU (European Commission, 2006), identified the current tailings liabilities in Europe, their status, the future plans for these sites and any associated hazards.
- Follow-up Commission report - '*The Long-Term Safety of Uranium Mine and Mill Tailings in an Enlarged EU*' (JRC, 2008) provided a further analysis and update - extends the scope from merely managing past legacies to preventing the creation of future liabilities.
- Commission report - '*Situation concerning uranium mine and mill tailings in the European Union*' (European commission, 2011) situation overview and legal context (uranium mine and mill tailings) focusing on current issues. Conclusions - need for an effective set of measures for coordinated institutional control of uranium mine and mill tailings, referred to as 'long-term stewardship'.

- More than ten years after, apart from a few cases where respective projects have not been concluded yet, the majority of the uranium mines and milling legacies in Europe have been remediated according to acceptable environmental standards.
- Still, Europe is about to face a new challenge from the concluded remediation projects, for which an effective set of measures for coordinated institutional control or long-term stewardship, is needed including, in most cases, continuous and active maintenance.
- The uncertainty of what will happen to these sites if institutional control breaks down at some point in time, is a major concern.

CURRENT SITUATION IN THE EUROPEAN UNION

- Mine and mill tailings sites in the EU - 12 Member States.

1. Bulgaria,
2. Czech Republic,
3. Estonia,
4. France,
5. Germany,
6. Hungary,
7. Poland,
8. Portugal,
9. Romania,
10. Slovenia,
11. Spain and
12. Sweden.



CURRENT SITUATION IN THE EUROPEAN UNION

87 tailings objects at 63 sites.
Most of these sites are no
longer in operation.

314 million m³ of uranium
mine and mill tailings,
2530 ha in total.

Individual volumes vary from a
few thousand to several tens
of million m³ per object.

More than 40 objects have
already been completely
remediated.

Some 20 others are currently being
remediated while for the remaining
objects, remediation has yet to start.

Costs of remediation work are site
specific and can be considerable.

Uranium production ceased - mines and
mills are abandoned - especially where
companies have ceased to operate or even
exist, the responsibility for remediation,
including financing, falls to the STATE.

- Remediation work costs - site specific, can be considerable - most legacy sites, STATE'S responsibility for remediation AND financing.
- Legacy from the extensive uranium mining and milling activities in Central and Eastern European Countries:
 - Faced not only financial difficulties, but also lacked local expertise for remediation.
 - PHARE programme administered by the European Commission has been the main channel for EU financial and technical cooperation.
 - PHARE assistance has been provided to assess the situation, identify remediation priorities and objectives, to actually implement remediation work, stimulate the development of national remediation programmes and support cooperation between countries involved.
- To date, individual MS and EU - dedicated considerable efforts and resources to dealing with the legacies and liabilities from uranium mining and milling activities.

- Situation in each country is different and each site is unique in many aspects.
 - Local climate, geology and topography largely determine the extent of remediation measures needed - identified with close regard to locally available resources, which means each country or each site will use 'best practice', as evidenced in many cases.
- Good examples at national level:
 - Approach taken by Germany to manage legacies of uranium industry developed in the former GDR (WISMUT act).
 - Approach developed by Czech Republic to manage legacies of uranium industry, especially from vast in situ leaching activities.
 - France has developed a holistic approach to tackle its specific issues resulting from its past uranium industry activities.
 - Estonia - recently completed project for remediating the Sillamae site - resolving a relatively small but complicated case with potential cross-border risks and impacts through extensive international cooperation such as with the Nordic countries and the EU.
 - Portugal - prioritize remediation for 62 UMMT sites – March 2018 remediation works: 40 concluded; 6 ongoing; 16 planned to start in 2018.
Empresa de Desenvolvimento Mineiro (EDM) concession: mine and mill ownership, responsibility for institutional control.

- **IN MOST CASES** tailings objects in today's EU do not have an intolerable impact on the environment and health (Commission study).
- **BUT** in a number of cases, more work must be done to ensure long-term stability and long-term performance of the sites.
- **STRUCTURED AND CONCEPTUAL** remediation plans that first assess the risk factors concerning a specific object and its location and surroundings. Thereafter risk mitigation is translated into technological remediation steps.
- **COVER SYSTEMS DESIGN** now places much more emphasis on long-term stability and also to long-term performance to prevent future environmental problems through loss of integrity, due to wear or neglect.
- **MAJORITY OF DESIGNS OF ENGINEERING STRUCTURES** assumes periodic maintenance. In any case monitoring is required with inspection periods in the order of (several) years - such designs require institutional control for keep integrity.
- **ONE HIGHLY IMPORTANT ISSUE** remains to be sufficiently addressed in almost all Member States: long-term stewardship of existing legacies to ensure long-term monitoring, surveillance and maintenance.

- Apart from a few cases where the respective projects have not been concluded yet, the majority of the uranium mines and milling legacies in Europe have been remediated according to acceptable environmental standards.
 - A few open cases remains, where the respective projects have not been concluded yet, but are well under way. In some cases, little substantive information on the current state of UMMT facilities and any plans for their closure and remediation are available.
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- Although many remediation projects are technically completed, the long-term future of the sites is unclear. Uncertainty over the long-term effectiveness of remediation solutions means that sites must be monitored, surveyed and maintained.
 - Uncertainty - need for long-term stewardship - institutional solutions for site development over many years: physical state and use.
 - Institutional control must remain in place over the long-term and have a secure financial basis.
 - Monitoring must be adequate and efficient and valid data should be available to the national authorities, the public and the Commission. In some cases, continuous and active maintenance is needed.
 - Records need to be kept 'alive' to provide adequate information when needed.

In remediation decisions:

Important to explicitly consider long-term stewardship issues when examining remediation options and implementation

Strict risk-based approach and prioritization:

Implementation of the remediation measures has not yet started

or

currently available financing for the remediation solutions is so limited that the remediation process is phased over an excessively long period of time.

Several countries are already reconsidering their decision to close uranium mining activities:

If uranium mines are redeveloped, it may become difficult to distinguish between legacy sites and operating facilities.

Regulatory and management approaches for new operations must take into account such situations.

- **Long-term management needs** - Many remediation projects are concluded in a technical sense but Institutional control needs to remain in place and in some cases, continuous and active maintenance. Typically, remediation solutions are designed in a way that leachate and run-off waters have to be collected and treated in a plant in order to meet regulatory discharge limits – these can only be sustained over a time-frame of a few decades at most.
- **Long-term stability of solutions** - UMMT sites are located in high-energy environments, e.g. at slopes or in valleys. It is unclear what will happen, if institutional control breaks down at some point in time - such sites will remain a liability and a system of long-term stewardship has to be put into place. A long-term prognosis and risk rating might be useful as a decision-aiding tool for developing long-term stewardship programmes.
- **Knowledge preservation** - To support stewardship, knowledge-preservation tool resistant to a break-down of the institutional control. Such tool could consist of a database that holds pertinent information on UMMT sites. Several MS have already drawn up databases on a national level.
- **Regulatory needs** - Majority of UMMT legacies with a significant risk potential have already been addressed from an engineering point of view, the expenditure of developing a Directive for these cases does not appear to be justified. It may be however, worthwhile to prevent new legacies being created by developing a legal instrument akin to Directive 2006/21/EC that is applicable to operating UMMT sites.
- **Nuclear renaissance** - 'nuclear renaissance' will shift interest from "just" managing of legacies from past to preventing the creation of future liabilities.

LONG-TERM STEWARDSHIP CHALLENGES

BE ADAPTATIVE

(changing perceptions and improved scientific and technical capabilities)

REALISTIC TIME FRAMES

(stewardship plans have to be adapted to the development of a site - its physical state and use. Periodic revision of stewardship plans)

STAKEHOLDERS ENGAGEMENT

(stewardship and steward's responsibilities, must be defined at practical level of implementation - from the bottom upwards)

ECONOMIC CHANGES

(there won't be a 'permanent' solution for the economic issues, in particular the funds. Finding a new, revenue generating site use - help support the maintenance programme)

ENGINEERING WITH NATURE

(engineering for long term stability poses a variety of challenges and has to cope with many uncertainties – with not against nature and)

KEEPING RECORDS ALIVE

(preservation of the physical integrity of records, readability and comprehensibility - most efficient solution to convey their message to future generations. The same applies to knowledge)

MONITORING PROVIDES FEED-BACK

(Uncertainty over the long term effectiveness of a remediation solution requires provisions for monitoring, periodic performance assessment and possibly maintenance - This uncertainty leads to long term stewardship)

- EU legislation – a distinction must be made between rulemaking under Treaty on the Functioning of the EU and the Euratom Treaty.
 - Treaty on Functioning of the EU, excludes aspects that are specific to radioactivity BUT includes all other environmental and public aspects.
 - Reference document on best available techniques, approved and published, but it does not cover uranium mining and milling waste.
- Chapter III of the Euratom Treaty and secondary legislation – covers radiological aspects of the management of waste from extractive industries, including current and past uranium mining and milling activities.
 - Four articles in Chapter III (Articles 35-38) directly refer to levels of radioactivity in the air, water and soil and are important regarding surveillance and the radiological impact of current and past uranium mining and milling activities.
 - Set obligations for continuous environmental monitoring and reporting of the level of radioactivity in the air, water and soil and empower the Commission to verify the operation and efficiency of monitoring facilities.
 - Furthermore, Commission issues opinions on plans to release radioactive effluents, including those from uranium mining and milling operations.

LEGAL SITUATION AND EU LEGAL INSTRUMENTS

- Basic Safety Standards (BSS) - exploitation and closure of uranium mines subject to prior authorization by MS, which must ensure justification, optimization and dose limitation principles are respected.
 - Authorization is also required for disposal, recycling and reuse of residues, such as from uranium mining, unless they comply with clearance levels established by national competent authorities on the basis of basic criteria laid down in the BSS and technical guidance published by the Commission.
 - For existing uranium mine and mill tailings disposal sites in Europe, BSS also lay down specific rules on intervention in case of lasting exposure resulting from past practice, including, if necessary, demarcating concerned area, monitoring arrangements and restricting access or use of land or buildings situated in demarcated area. Additional Commission recommendations cover protection of the population against the dangers arising from radon in dwellings and in drinking water.
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- EU legislation seems to cover all aspects of the management of waste from extractive industries which may be radioactive and falls within the scope of Directive 2006/21/EC. It also sufficiently covers the issues at stake regarding uranium mine and milling, both for past and future activities.
 - However, the reference document for best available techniques needs to be supplemented and issue of integrated long-term stewardship for both radioactivity and other aspects merits a more thorough analysis.

- UMMT management presents today a twin challenge: to manage existing legacies of uranium mine and mill tailings by establishing effective long-term stewardship and to avoid such legacies in the future.
- Need for stewardship is broadly recognized by experts as a part of responsible management of uranium mining and processing projects, which must include waste management and disposal, site decommissioning, remediation and closure.
- Consequently, establishing long-term stewardship programmes at national level appears as a useful solution to ensure a more effective implementation of the Community framework for managing uranium mining and milling residues.
- Stewardship programmes should integrate all the measures under existing Community and national legislation and take on board all closely interrelated managerial, societal, economic and technical aspects during the decision- making process.
- Effective stewardship should also take into account continuing changes to social, technical and economical conditions and processes, such as changing stakeholders, perceptions of risk, science and technology, societal structures, governmental systems, economic situations and priorities.
- A successful stewardship programme will have the inherent capability to adapt and respond to these changes.

Thank You!



감사해요

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