Analysis of uncertainties in a decision-making process for long-term exposure situations on examples of two Norwegian legacy sites

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DSA

Direktoratet for strålevern og atomsikkerhet

Norwegian Radiation and Nuclear Safety Authority

Overview

→ DSA

→ Objective of the current review

→ TERRITORIES project - context

→ NORM existing exposures in Norway

→ Regulatory decision making – focus on process uncertainties

→ Conclusions

Norwegian Radiation Protection and Nuclear Safety Authority (DSA)

→ National regulatory authority and expert body in matters concerning

- nuclear security
- radiation use and radiation protection
- natural radiation and radioactive contamination in the environment

Analysis of regulatory decision making in NORM cases in Norway

→ Main objective

- Review of uncertainties in long-term radiological exposure situations i.e., NORM legacy sites in Norway, as well as remediation strategies (planned, on-going and conducted) in reducing the consequences to human and wildlife

→ Norwegian experience and lessons learned

TERRITORIES project – context of the current review

→ To Enhance unceRtainties Reduction and stakeholders Involvement TOwards integrated and graded Risk management of humans and wildlife In long-lasting radiological Exposure Situations

→ **TERRITORIES** targets an integrated and graded management of contaminated territories characterized by long-lasting environmental radioactivity

Working Package 3

→ The overall objective of this WP is to **analyze the decision-making processes in long-lasting radiological exposure situations**, taking into account all components of risk assessment, with two key-points: **management of uncertainties and stakeholder engagement**

→ Task 3.1. Uncertainty management in decision-making processes in long-lasting radiological exposure situations

→ Deliverable on Decision processes/pathways (part related to NORM contamination and remediation: focus on uncertainties)

NORM in Norway

→ NORM as existing exposure situations

- areas containing rocks with potential for acid draining, such as **alum shale**
- NORM legacy sites
  - → former mining sites Søve (Nb) and Otterstranda (Mo)
  - → former disposal site of alum shales Taraldrud
- undisturbed areas with naturally high NORM (Kinsarvik, Orrefjell, Fen Complex parts)

→ NORM as planned exposure situations

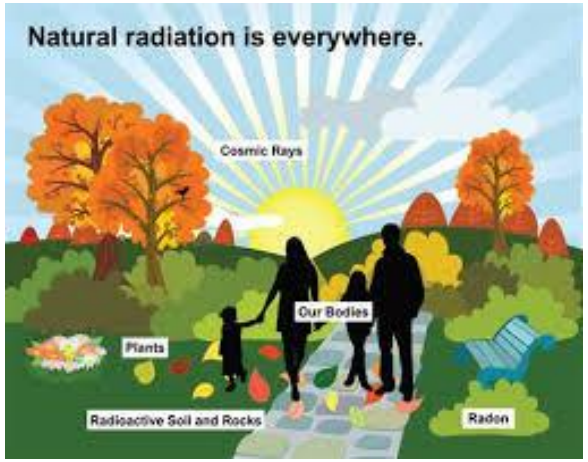
- industries involving NORM containing materials
  - → oil and gas industry
  - → constructions, building industry
  - → other NORM processing industry

Approach to regulatory control

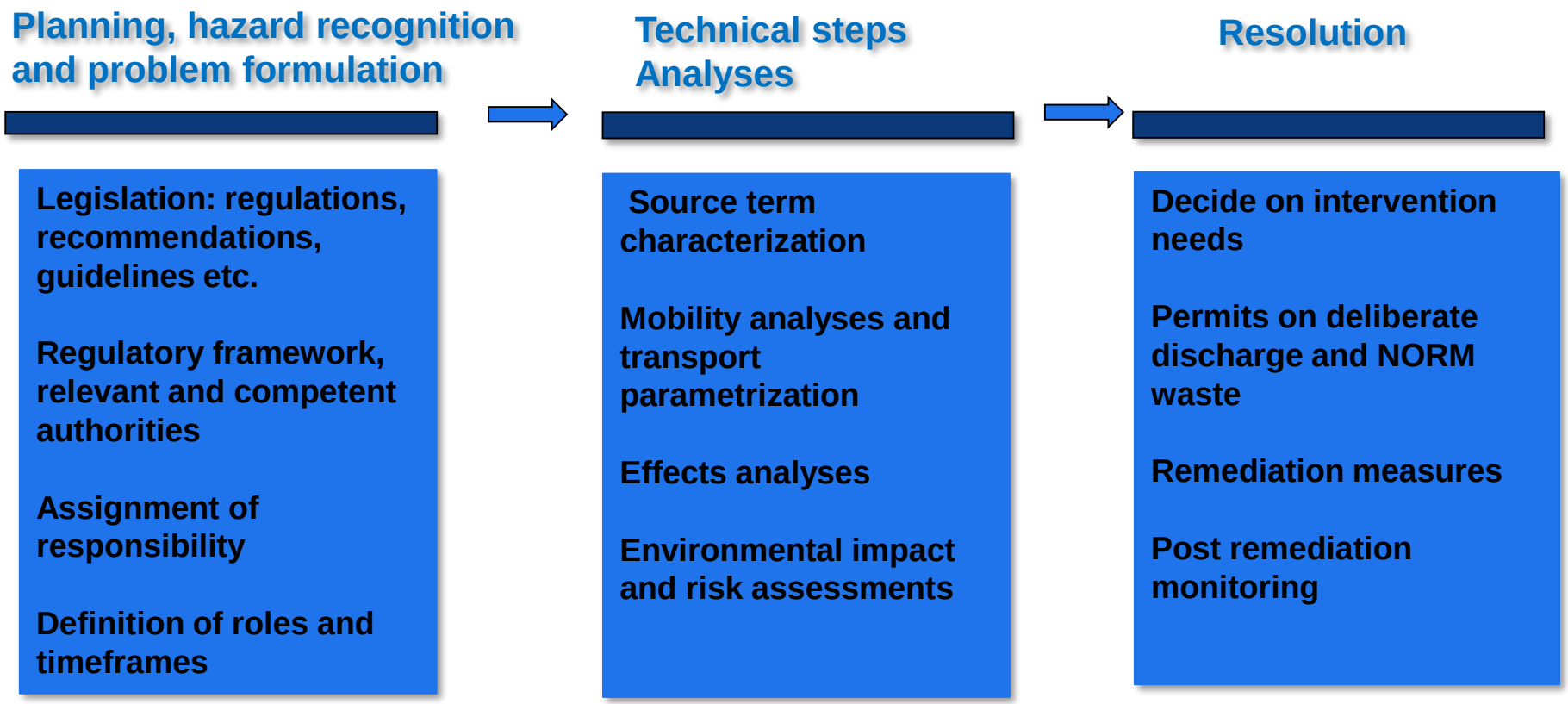
→ Holistic, ecosystem based approach

→ Protection of the human health and environment

→ Collaboration with other relevant national and international regulatory authorities, communication with scientific society, operators and stakeholders



Regulatory decision making: process



- Financial decisions within this horizontal process
- Social aspects and decisions: risk perception and communication
  stakeholders involvement


c)


d)

Legislation and regulatory framework

→ **DSA is the main regulatory body**

→ Regulation of radioactive discharge/pollution and radioactive waste at legacy sites

→ Norwegian legislation for Radiation Protection has been revised and new legislation was put into force on the 1st of January 2011

The Pollution Control Act and proper Regulations

→ Holistic, ecosystem based approach to regulation of waste management and pollution

- radiation and other types hazards
- humans and biota

Legislation and regulatory framework, cont.

→ No uncertainties related to national policy, legal and regulatory framework (e.g., effective legislation, independent regulatory authorities, existence of proper standards, guidelines)

→ Highlighted collaboration with other relevant authorities

- Intensive collaboration with Environment Agency and County Governors

- Intensive collaboration with relevant Ministries

Assignement of responsibility

Norwegian experiences

- Decision to be made on physical ownership and on financial responsibility, not necessarily the same thing
- Time consuming, often problematic process for legacies
- Commonly several authorities involved and cooperation and cooperation is needed
- Different authorities might have different protection objectives and, thus, different requirements about responsibility

Technical steps and decisions

→ Scientific (radioecology, radiobiology, etc) role is crucial

→ Characterization of process **souce term – transport – uptake – effects**

- Site characterization – right speciation analysis would reduce uncertainties, physico-chemical forms of radionuclides matter
- Mobility and transfer analyses – parametrization of key processes, uncertainties related to nature of parameter, such as for Kd, change over time
- Uptake analyses – TF, BCF – uncertainties related to assumption of equilibrium, uncertainties in existing data basis
- Effect analyses – much is known, but also to be done, e.g., low dose long term radiation effects

Technical steps and decisions

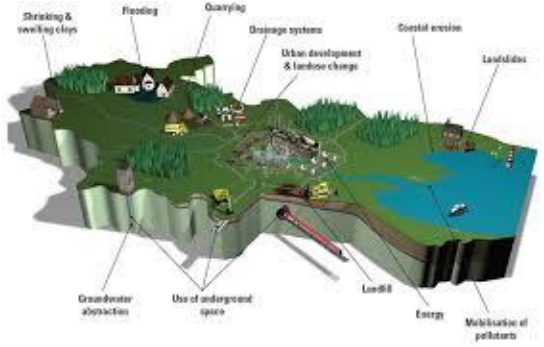
→ Environmental and human impact and risk assessments

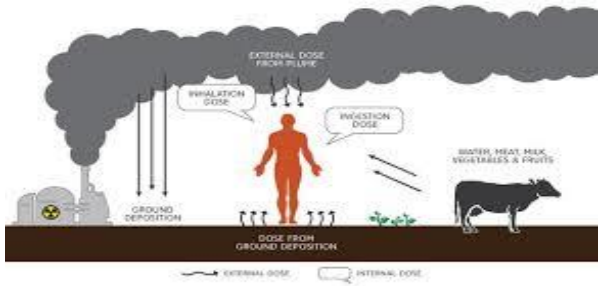
- Valid exposure scenario
- Realistic site characterization, waste and pollution overview
- Modelling – conservative, generic data
  – realistic, site specific data

Justification of using the specific models for assessments

Inteligent models need inteligent use(r) ☺

→ Science should further contribute to decision making processes by reducing the overall uncertainties by developing realistic data basis, better key process parametrization and advanced dynamic models development





ERICA ASSESSMENT TOOL

CROM

Finding solutions

→ Operators confused with dose constraints, reference levels, action levels?

→ How to properly select the clean-up measures

→ Uncertainties related to practical application of

- optimization, justification, dose limitation

Remediation decisions

- What is the right remediation strategy?
- How to define the realistic timeline?
- How to define right end-state?
- What is the best solution for radioactive waste? Local disposal, complete removal?
- What kind of post remediation measures, monitoring….what, how often and for how long?

Financial decisions

→ Funding decisions linked to assignement of responsibility
(availability of fund, problematic ownership)

→ Always part of optimization analyses – radiation risk analysis in line with cost-benefit analysis to make the final decision

Risk communication and stakeholder involvement

→ **Norway has learned lessons, negative and positive**

→ General public perception of radioactive substances being much more hazardous than chemicals

→ Improper risk communication at legacy site Søve

- assignment of responsibility has been unclear for a long time
- information overload, opposite messages about dose magnitude were given to locals from several actors
- how to communicate exposure doses and reference levels when background at undisturbed near area is quite similarly high
- distrust of affected community in local solutions and conservative clean-up criteria
- problems with disposal at repository sites as reflection of bad communication and improper stakeholder involvement

Risk communication and stakeholder involvement

→ Positive experience

- Public meetings and involvement of stakeholders at early stages in regulatory decision making in NORM industry
- Transparency at all stages and improved reliability

Conclusions

→ Identified uncertainties and challenges

- national policy, legal and regulatory framework - no
- **hazard characterization** and problem formulation - potentially
- **radioecological analyses and assessments - yes**
- **decision on clean up actions - yes**
- financial decisions - no
- **risk perception and communication – ?**
- stakeholder involvement - ?

Thank you for your attention

Questions?

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