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Integrated site descriptive modelling as a coherent means of step-wise enhancement of conceptual model for NORM situations

NORM-involving industrial practices pose multifaceted environmental and radiation safety issues that need to be managed in a cost-effective but reliably safe manner that satisfies both regulatory and public concerns. In addition to the management and possible remediation of a site itself, often there are also aspects of waste and residue management ranging from burial or landfills to (near-surface) geological disposal. Particularly within radioactive waste management programmes, there has been considerable development in site understanding methodologies over the latest decades, as well as growing needs of further collaboration between these developments and those on NORM and legacy issues, recognised also by the IAEA (e.g., in MODARIA II).

For effective, safe and consistent planning and implementation, it is important that the past and present situation as well as relevant future trajectories are formulated into a coherent conceptual model from the beginning, and that this is regularly revisited with further information gained. The conceptual model should holistically encompass the entire system, including the NORM, technical structures, geological, hydrological and ecological settings, and potential exposure groups (including workers and public), as appropriate in the context of the situation (e.g., key characteristics of the situation, regulatory regime, general management plans, implementation stage, etc.). It should be iterated for the validity and development needs not only with the assessment process and results, but also in respect of the other end-users such as (further) site characterisation efforts, engineering, construction and remediation work, environmental management, and regulator and stakeholder dialogue. Indeed, dialogue and gaining trust is a key element that an effective conceptual model and its appropriate quantification through site and system descriptions serve well.

The approach of site descriptive modelling (SDM) to establish and quantify a conceptual system model, originating from the geological disposal programmes in Sweden and Finland and presented in this contribution for application in NORM situations, builds on a common framework and regularly re-evaluated and enhanced integration over scientific and technical disciplines, adjusted fit for the current purpose and needs. Common tools such as utilisation of geographical information systems, interaction matrices, supporting modelling, and identification of most effective points of further improvement will be outlined as well. It is important that the level of effort is proportional to the safety concerns and available resources, though, and the use of a graded approach in the SDM to keep the focus will be particularly addressed in the presentation.

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