



## **A review of approaches for communicating uncertainty in radioactive waste disposal programmes**

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The technical safety case for a geological repository is based in part on assessments of long-term future behaviour. Technical specialists are required to provide evidence to the greatest extent possible that the predictions are sufficiently reliable for the purpose of making the safety case. This process involves comparison of modelling results with laboratory and field results and with observations on natural and man-made analogue systems. A collection of arguments and evidence are required to help establish the basis for the safety of the repository, as well as to help reduce uncertainty and develop confidence in the analyses themselves. The safety case prepared for a proposed repository must be understood by regulators responsible for scrutinising and judging its acceptability. For the general public, however, it is difficult to make all of the arguments sufficiently transparent and understandable to ensure they share the same level of confidence as the technical specialists.

A large body of qualified knowledge resides in the worldwide radioactive waste technical community. This knowledge should provide a firm scientific basis on which the long-term performance and safety of a geological repository can be discussed with confidence so informed decisions can be made. Despite this many countries around the world continue to face difficulties with implementing programmes for the deep geological disposal of radioactive waste.

Geology, and effective communication of geological knowledge and uncertainty, are essential parts of the 'tool kit' needed to allow meaningful communication and engagement with the public. These tools can be used to build and maintain public confidence at each step in the process. The search for a geological disposal site is complex, with many stages. At each stage, geological uncertainty will inevitable exist as we will never know everything about the sub-surface unless it is mined out at which point it is of no use as a repository! What level of uncertainty is acceptable? Can these levels be defined for each stage of the process? How can it be communicated? Where in the process is uncertainty acceptable and where is it not?

Geoscientists have vital roles to play in both the technical aspects of the repository siting process, but also in public communication of what they know. They should also address how to deal with uncertainty and how geoscientific knowledge should be integrated with other specialisms, and public and stakeholder engagement. This paper will examine how uncertainty is managed in geological repository siting programmes across the globe. In particular, it will examine how geological uncertainty has been defined, represented and communicated to the public.