

Development of Comprehensive Techniques for Coastal Site Characterisation

(2) Integrated palaeohydrogeological approach for development of site evolution models

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Radioactive waste repository designs consist of multiple safety barriers which include the waste form, the canister, the engineered barriers and the geosphere. In many waste programmes, it is considered that the three most important safety features provided by the geosphere are mechanical stability, favourable geochemical conditions and low groundwater flux. To guarantee that a repository site will provide such conditions for timescales of relevance to the safety assessment, any repository site characterisation has to not only define whether these features will function appropriately today, but also to assess if they will remain adequate up to several thousand to hundreds of thousand years into the future, depending on the repository type.

In general, this is done by studying the palaeohydrogeological evolution of a site, defining temporal and spatial changes of various characteristics and processes. These may include hydrogeology, geology, groundwater flow characteristics, groundwater chemistry and site tectonics, including uplift and erosion processes. These key aspects are studied to build up a conceptual model for the overall site evolution over geological time, up to the present and this is used to define the likely future evolution of the site and to assess if the main safety features will continue to function adequately.

The collaborative programme described here is focussed on the palaeohydrogeology of the coastal area around Horonobe in northern Hokkaido, Japan. Data from JAEA's ongoing underground research laboratory project is being synthesised in a Site Descriptive Model (SDM) with new information from the collaborating research institutes to develop a Site Evolution Model (SEM), with the focus very much on changes in the Sea of Japan seaboard over the last few million years. This new conceptual model will then be used to assess the palaeohydrological evolution of other analogous sites on Japan's western seaboard, with the final aim of producing a set of comprehensive techniques to understand the palaeohydrogeological evolution of the deep geosphere of all coastal sites on the Sea of Japan.