NATION-WIDE GEOSCIENTIFIC INFORMATION TO IDENTIFY "STABLE" GEOLOGICAL ENVIRONMENTS

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NUMO has assembled the latest geoscientific information nation-wide over the last decade and a half and updated the geoscientific database in which, for example, thermal, hydrological, rock mechanical and hydrogeochemical (THMC) data are stored. Such state-of-the-art geoscientific knowledge is critical both for more precisely specifying geoscientific requirements for selecting potential siting areas, which is now led by the Japanese Government, and also for developing a safety case – the NUMO 2015 Safety Case – to demonstrate the technical feasibility and long-term safety of geological disposal in Japan.

Providing assurance of the long-term stability of the geological environment is a prerequisite for geological disposal and of special concern in Japan. Focus thus concentrates on identifying 'stable' deep geological environments where potentially suitable host rocks should be located. Over a large spatial scale, 'stable' tectonic (or regional geological) settings are in general required and hence areas where natural events/processes have potentially disruptive impacts on geological environments over geological timescales must be excluded. Here igneous activity, occurrence of non-volcanic or deep-seated fluids, fault movement and significant uplift/erosion are commonly perceived as natural disruptive events/processes in Japan. At a site-specific scale, 'stable' host rock environments where the prevalence of favourable THMC conditions must be ensured are essentially required.

On the basis of the latest geoscientific information, basic concepts and criteria for precluding the potentially significant impacts of natural disruptive events/processes on the favourable THMC conditions are defined. With regard to igneous activity, for example, an exclusion area of 15 km radius is drawn around a Quaternary volcanic centre in Japan. One of the key natural system evidence behind this criterion is that low pH (<4.8), high temperature fluids that would potentially perturb the favourable T and C conditions occur generally within a 15 km radius circle around a Quaternary volcano. In addition, the state-of-the-art geoscientific knowledge demonstrates clearly that the favourable THMC conditions most likely prevail in deep geological environments in Japan. A convincing indication for slow groundwater movements, for example, is that deep groundwater having a very long residence time (2 to 10 million years) has been reported in some low permeability sedimentary formations.