Risk management of downward erosion in the coastal area for disposal of radioactive waste

*Ryuta Hataya[1]

1. Central Research Institute of Electric Power Industry

1. Introduction

In the report related to the selection of scientifically preferable areas for geological disposal of HLW in Japan, the coastal area was regarded as a more suitable area. The Research Group on Technical Issues of Geological Disposal at the coastal seafloor said that it was necessary to improve both survey and evaluation methods related to uplift/erosion. Meanwhile, in the deliberation on the regulation of medium-depth disposal, it is discussed that at least 100,000 years avoid the influence of remarkable erosion and securing the depth necessary for isolation even in consideration of erosion effect.

In coastal areas, rivers erode the ground downward. This research discusses the risk management framework of evaluation related to downward erosion in coastal areas, the way of risk-related decision making.

2. Outline of the framework of risk management of downward erosion for geological disposal

(1) Risk management policy

The law of geological disposal in Japan says that the influence of remarkable erosion must be avoided at the site selection. For example, facilities for geological disposal will not be exposed to the ground surface at least 100,000 years.

(2) Risk assessment

Following are conceivable about the amount of downward erosion in the coastal area for future 100,000 years.

[A] The amount of maximum erosion in the future 100,000 years is smaller than the sum of the maximum decrease and uplift of the sea surface for about last 100,000 years.

[B] In Japan, the amount of downward erosion during the glacial / interglacial one cycle is less than that of uplift after late Pleistocene plus 100m (Hataya et al. 2016).

[C] The amount of downward erosion that actually occurred in the past 100,000 years in each area is regarded as the downward erosion in the future 100,000 years.

(3) Risk treatment

In general, risk treatment is classified into four category: avoiding, reducing, sharing, and retaining. For examples, the former three issues are to exclude from the site, deepen the burial depth, select and develop multiple points respectively.

3. Discussion of risk criteria

For smooth decision-making, we often decide on the risk criteria for some risk, and compare it with the results of the survey and evaluation. In the chapter 3, I introduced the idea of risk assessment of three river downwards. From these, we can think about the following three risk criteria for the downward erosion in about 100,000 years in the future.

[A] Less than the sum of the maximum decrease amount and uplift amount of the sea surface for about last 100,000 years

[B] Less than the amount of uplift after late Pleistocene plus 100m

[C] Less than the amount of uplift after late Pleistocene plus depth of bottom of alluvium layer

Criterion-A accepts sea level fluctuation. If the sea level maximum decrease amount is larger than the assumed value in the future, the downward erosion becomes deeper. Furthermore, criterion-B holds the influence of uncertainty related to the depth distribution of the alluvium base. Criterion-C holds not only the sea level fluctuation but also the uncertainty of the topography/geological survey. When future river channels can't be specified, we can select criteria-A and B, but we can't adopt Criterion-C.

4. Conclusion

This presentation doesn't state which of the risk standards is appropriate. I'd like to say the following. Accepting future projections, determining risk response policies, risk criteria, and risk response are to retain the underlying risks. This is commonplace. In the radioactive waste disposal project, which is required to see the long-term future, I believe that the following will provide effective information in decision making: They are to show the framework of risk management, to express concretely the research of risk analysis which is mostly carried out individually in this framework, and to explain the retaining risks.

[Reference] Hataya et al., 2016, Journal of the Japan Society of Engineering Geology, 57, 15-26.

Keywords: geological disposal, coastal area, erosion, risk management

