

## Development of risk assessment tool, GERAS CO2-GS

TANAKA, Atsuko<sup>1</sup>, Yasuhide Sakamoto<sup>1</sup>, KOMAI, Takeshi<sup>1\*</sup>

<sup>1</sup>National Institute of Industrial Science and Technology (AIST)

We introduce our risk assessment tool named 'GERAS-CO2GS' (Geo-environmental Risk Assessment System, CO2 Geological Storage Risk Assessment System) for 'Carbon Dioxide Geological Storage (Geological CCS)'. GERAS-CO2GS aims to assist understanding of size of impact of risks related with upper migration of injected CO2, and assist safety and risk management around Geological CCS. For gaining public recognition about feasibility of Geological CCS in adjacent area of injection planned site, it is important to quantitatively estimate risks and know the level of the risk to be negligible. Generally, as a matter of course of risk assessment procedure, potential hazards could be identified within Geological CCS's various facilities such as: reservoir, cap, rock upper layers, CO2 injection well, CO2 injection plant and CO2 transport facilities. Among them, hazard of leakage of injected CO2 is crucial, because the rate of CO2 retention presents the effect of geological CCS against reduction of CO2 emission, and it is clue to understand risks around a specific injection plan. Our risk assessment tool named GERAS-CO2GS evaluates volume and rate of retention and leakage of injected CO2 in relation with fractures and/or faults, then it estimates impact of seepages on the surface of the earth. At this moment, GERAS-CO2GS is consisted from four major processing segments: (a) calculation of CO2 retention and leakage volume and rate, (b) data processing of CO2 dispersion on the surface and ambient air, (c) risk data definition and (d) evaluation of risk. As regard with injection site, we defined a model, which is consisted from an injection well, and a geological strata model with a reservoir, a cap rock, an upper layer, faults, seabed, sea, the surface of the earth and the surface of the sea. As regard with retention rate of each element of CO2 injection site model, we use results of our experimental and numerical studies on CO2 migration within reservoirs and faults. Being given CO2 injection rate, lithologic conditions and atmospheric conditions, GERAS-CO2GS evaluates volumes and rate of CO2 retention and leakage of each segment of strata model including injection well, reservoir, fault, upper layer, seabed, and atmosphere. It also evaluates dispersion of CO2 on the surface of the earth and ambient air, and displays evaluated risk level on Goole earth contour of risk levels with color classification. At this moment, the development of GERAS-CO2GS is in prototype stage. We are going to extend GERAS-CO2GS functions and evaluate risks of further risk scenarios. Concerning to the route of seabed to sea and the surface of the sea, we are going to implement outer research findings into our logics. In the course of further research, we are going to develop GERAS-CO2GS will be able to estimate broader risks, and expecting to support the efforts for legislations and standards of CO2 Geological storage.

Keywords: CO2 geological storage, risk assessment, CO2 migration, the surface of the earth, impact analysis