Development on Intelligent Management System for Nuclear Decommissioning Site Characterization

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Introduction

- **End Point of Nuclear Facilities Decommissioning**
  - To verify regulatory guidance satisfaction
  - To demonstrate safety for the unrestricted or restricted site release

- **MARSSIM**
  - The general procedure of nuclear decommissioning site characterization
  - Consist of the HSA (Historical Site Assessment), scoping survey, characterization survey, remedial action support survey, and FSS (Final Status Survey) called RSSI (Radiation Survey and Site Investigation)

- **Purpose of the Intelligent Management System**
  - To reduce the resources (manpower and time) through AI (Artificial Intelligence) and to support RSSI evaluation
  - To establish the survey plans and to manage the evaluation data

Intelligent Management System for Nuclear Decommissioning Site Characterization

- **Historical Site Assessment Module**
  - The purpose of HSA is to determine whether the facility and surrounding environment are contaminated by reviewing all operation records including events and accident reported from the end of facility construction to the present time.
  - Lots of time and manpower are required to review extensive plant operational data and documents to conduct the HSA.
  - AI model classifies the site through training data shown in Fig.1.

- **RSSI Survey Modules**
  - The area of site is classified by the comparison with the DCGLs.
  - The comparison of survey results is performed by a statistical method, typically one-sample statistical test, or WRS (Wilcoxon Rank Sum) test.
  - RSSI survey modules carry out the statistical test with the use of survey results and give the results of reclassification of site area.

- **DQO Process**
  - A series of planning steps based on the scientific method for establishing the criteria for data quality and developing survey designs.
  - All modules demonstrate a result through user input or program analysis depending on the steps of process.
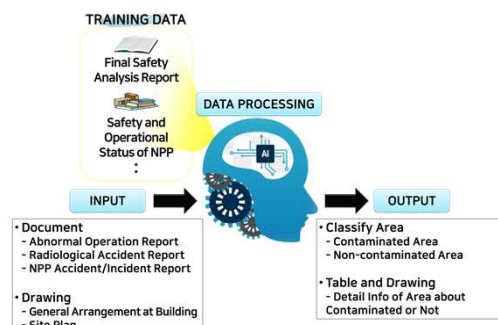

Fig. 1. AI model for HSA

Structure of Intelligent Management System

- User inputs basic information of DQO process and measured value of radioactive nuclides and provides survey documents and drawings into the management system.
- Fig. 2 shows the flow diagram of HSA module, which has the user input, processing and output functions.
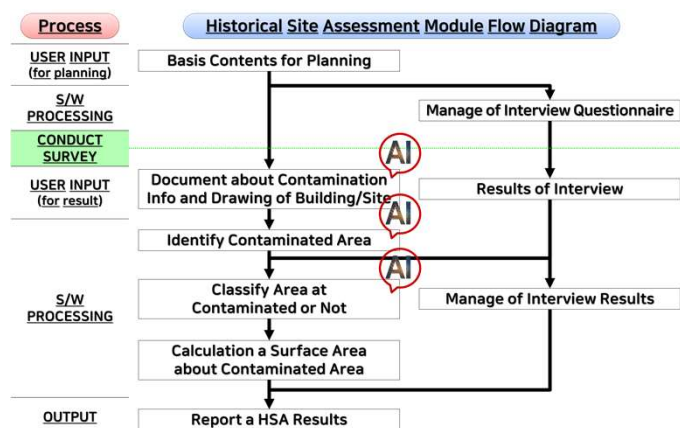
- The input and output of each survey module would be controlled by the data management module during the long-term RSSI shown in Fig. 3.
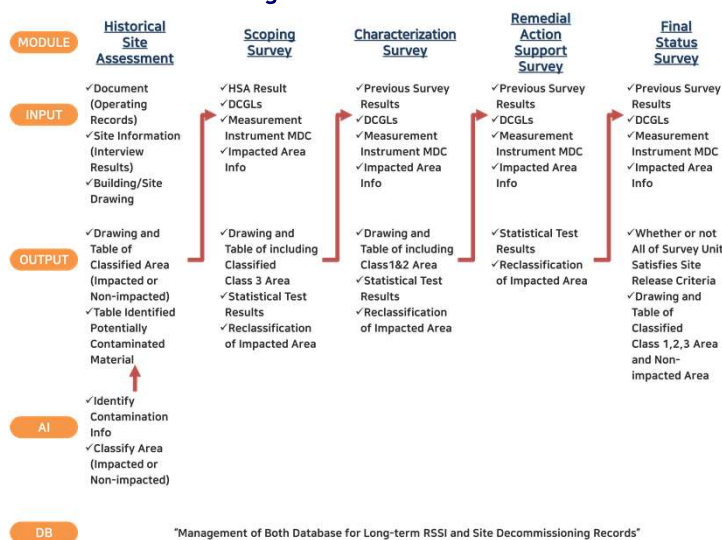

Fig. 2. Flow diagram of HSA module

Fig. 3. Structure of intelligent management system for nuclear decommissioning site characterization

Conclusions

- The system has a structure of user input, data processing and assessment, and reporting, especially the HSA module would be developed with the natural language processing based AI model.

- In addition, the data management module controls the entire process of RSSI evaluation for the long-term evaluation.

- It is expected that the intelligent management system would minimize the engineering cost such as time and manpower, the burden of engineer's judgement as well as the human errors during the site characterization for nuclear decommissioning.

Acknowledgements