Development of Decontamination Guidelines for the Management of Contaminated Areas as an Emergency Preparedness

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1. Introduction

In 2011, a nuclear power plant in Fukushima was damaged due to the occurrence of the East Japan Great Earthquake, and a large amount of radioactive material was discharged into the environment. As a result, decontamination works were carried out on large area in Japan.

Lessons learned from the responses to emergencies over the past years were led to similar conclusions. One of the lessons was that impossibility to establish standards consistent with radiological protection principles after an emergency. To reduce radiological and non-radiological (e.g. economic, social, and psychological) risks for emergency situation, it is necessary to pre-establish guidelines for emergency preparedness [1].

Korea government established a risk management standard manual for radiological emergency in 2016. However, there is no specific guideline on decontamination technology. In this study, we developed decontamination guidelines on the management of contaminated areas as a emergency preparedness.

2. Materials and Methods

The guidance for decontamination is a tool to support decision-makers in developing a recovery strategy following a radiological emergency. To facilitate decision-making, it is important to obtain abundant data. We reviewed decontamination methods and techniques in literature, including European Approach to Nuclear and Radiological Emergency Management and Rehabilitation Strategies (EURANOS) project [2], decontamination guidelines [3] used in actual decontamination planning in Japan, and the US Protective Action Guides (PAG) data.

In the EURANOS guidelines, decontamination techniques were proposed by dividing into buildings, roads areas, soils, grass and plants considering the surface. The EURANOS project has created a data sheet for all management measures and made it available for decision making.

Japanese decontamination guidelines reflected the accumulated technology based on the experience of decontamination pilot project. Similar to the EURANOS project, the decontamination technique data were presented as buildings and other structures, roads, soils, and vegetation depending on the surface of the object. In this study, as in the case of Europe and Japan, the subject of decontamination was largely divided into buildings, soil, roads, and vegetation depending on the material of the surface. Additionally, decontamination techniques in the guidelines were summarized.

In PAG, it detailed community support for recovery, public acceptability, and intergenerational equity. Therefore, in this study, decontamination guidelines were developed considering the participation of stakeholders.

3. Results and Discussion

In this study, the decontamination methods were divided into buildings, soils, roads, and vegetation. Each decontamination method was applied with reference to the decontamination technique data sheet.

The common decontamination procedure was presented in the guidelines shown in Fig. 1. The decontamination procedure can be divided into three parts. First, site characterization is performed for the area that is expected to be contaminated based on the monitoring data. Characterization work should be designed to define, in detail, the nature and extent of the contamination and to provide information necessary to develop and evaluate decontamination alternatives.

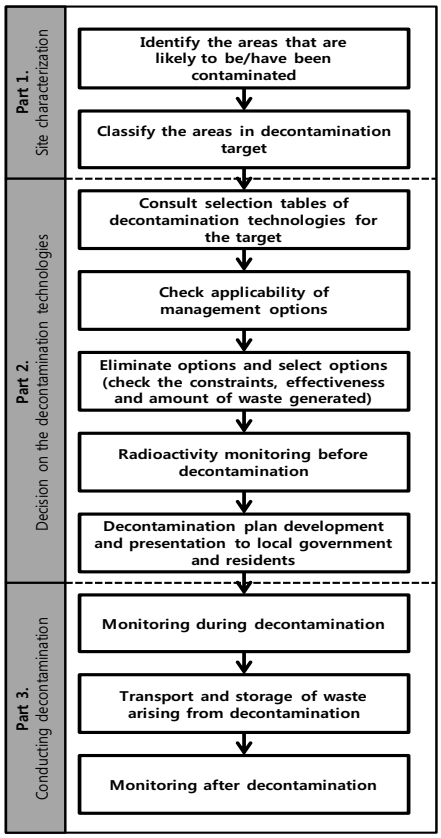

Fig. 1. Overview of the general decontamination planning process.

In the second part, government determines the decontamination technique, check the decontamination data sheet for the decontamination target, and verify the applicability. Afterward, the government establishes a decontamination plan based on the evaluation results (e.g. restrictions, work velocity, volume of wastes) and monitoring results. During the decontamination planning process, a seminar should be held to increase the credibility of the affected citizens in the area.

The third part is to conduct decontamination. To confirm the effectiveness during decontamination, monitoring is conducted before and after the decontamination. Generated wastes during decontamination are transported according to waste management plan.

Table 1 shows the main classification of the decontamination technique data sheet in this study. The decontamination techniques were made into a data sheet so that the decontamination technique can be quickly applied to the decontamination targets. Each decontamination technique was summarized in terms of decontamination procedure, construction speed, waste generation, and cost based on the precedent research.

Table 1. Classification of the Data Sheet

Major category	Contents
Land use type	Buildings, soils, roads, vegetation
Decontamination method	High-pressure washing, thin-layer topsoil stripping, brushing, trimming, mowing, reversal tillage, sand blasting, vacuum removal of debris, etc.
Application and implementation	Application conditions, implementation restrictions
Evaluation	Work velocity, volume of generated wastes, waste type, decontamination factor, gamma dose rate reduction, cost

4. Conclusion

In this study, decontamination guidelines for the management of contaminated areas were developed as an emergency preparedness. The decontamination methods were divided into buildings, soils, roads, and vegetation. Each decontamination method was applied with reference to the decontamination technique data sheet. The results of this study are expected to be used for development of decontamination standards.

ACKNOWLEDGMENTS

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