# Optimization of Disaster Waste Treatment Process by Utilizing AI and Construction of Support System for Preparation of Treatment Plan/Treatment Execution Plan

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[Abstract]

Key Words: Disaster waste, Treatment plan/Treatment execution plan, Separation, Collection/Transportation/Treatment linkage model, Treatment process, AI, Optimization

This study aims to establish a system to support the formulation of effective disaster waste treatment plans and treatment execution plans, to help improve the rate of formulation of treatment plans and prompt formulation of treatment execution plans at the time of a disaster, and to optimize and accelerate the treatment and effective utilization of disaster waste. Therefore, we analyzed disaster waste treatment plans and treatment execution plans, established templates for these plans, developed an optimization model for the disaster waste treatment process, and improved and expanded the accuracy of the "coefficient of separation," which can predict the quantity and quality of separated products obtained in the treatment process. For the treatment plan, we listed more than 20 items to be added, and clarified the importance of efforts to be made during normal times. In the treatment execution plans, publicly funded dismantling, administrative outsourcing, and financial resources were added. A draft table of contents and a template for these plans were also created. The constructed ontology enabled the developed system to properly detect omissions, duplications, inconsistencies, temporal order, and distortions of terms. Simulations were performed on 21 hypothetical processes to validate the model and to calculate reasonable results for the amount of generation, plan changes, and process increases, as well as to confirm that the computation time is fast. The optimization method using a multi-objective genetic algorithm was developed, and the optimization of a general treatment process was conducted using this method. The optimal number of transport vehicles and processing machines were obtained. When the water content ratio approached the plastic limit of the soil, the mixture became more consolidated and the proportion of residual sediment increased. It is believed that evaluating the plastic limit of sediment in disaster waste will enable early prediction of the amount of modifier to be added, treatment period, treatment cost, and recycling rate. Finally, we summarized the good points of the system, points that need to be improved, and functions that we would like to see added in each of the eight items in the municipal hearing, and proceeded to brush up the system in the areas where it was possible.

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