Performance Inspection and Climate Change Adaptation Measures for Final Waste Disposal Sites with Life Prolongation

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[Abstract]

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The recent decrease in landfill waste by promoting the 3Rs (Reduce, Reuse, and Recycle) has increased the life of landfill sites more than the planned period for landfilling. However, as a result, operation and maintenance troubles might occur. The current situation on the troubles should be clarified. Periodic inspection based on laws is not applicable to landfill sites owned by municipalities, and such inspections are done only based on structural regulations, not operation and maintenance. In addition, recent changes in precipitation have increased the risk that leachate generated in unanticipated heavy rain might overflow landfill sites because of the small capacity in storage reservoirs and leachate treatment facilities. Proper leachate management strategies should be developed as climate change adaptation measures while considering future changes in precipitation. The objectives of this study for both landfill sites for municipal solid waste and industrial waste are: 1) To clarify problems caused by life prolongation and recent climate change in the operation and maintenance of landfill sites and the current situation on performance inspection; 2) To make two manuals of performance inspection and climate change adaptation measures based on those results; and particularly 3) To propose renewal strategy and cost reduction in leachate treatment facilities. As a result, 1) a questionnaire survey for landfill sites of municipal solid waste and industrial waste in Japan revealed the actual situation of life prolongation of landfill sites, problems with operating and maintaining landfill structure and leachate operation, and no performance inspection. 2) A performance inspection manual considering life prolongation of landfill sites and a climate change adaptation measure manual (leachate management strategy for adaptation to future change in precipitation) were successfully created. 3) In the climate change adaptation manual, a numerical model to predict leachate generation considering vertical venting pipes was developed. The model was applied to real landfill sites in Japan to confirm its effectiveness. Future leachate generation in each region was predicted using the model and maximum precipitation data by 2100 (data by National Institute for Environmental Studies). A case study of renewing a leachate treatment facility showed that bypass treatment can prevent leachate overflow during heavy rain. Finally, a feasible strategy of performance inspection and renewal of leachate treatment facilities for existing and new landfill sites was proposed.

[References]

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