# The role of international cooperation on estimation the erosion rate and decreasing uncertainties in radioactive waste management safety assessment

Abstract ID : 238

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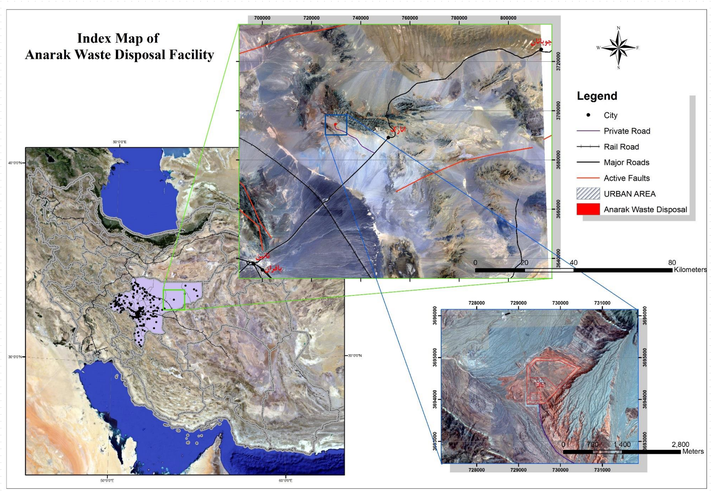
## 1.Introduction

According to IAEA recommendation for Near surface Radioactive Disposal facility, careful consideration should be given to the natural development of the area, including the effects of erosion and climate change. Several factors contribute to the erosion potential of a particular area, including soil properties, topography, climate condition (intensity, frequency, and duration of precipitation) and vegetation.

Water erosion is one of natural processes which exists in Anarak disposal facility, and the effect of erosion on the long-term safety of the Anarak, Iran near surface disposal facility was one of the main issues considered during the safety assessment and design process. According to these reasons the measurement of the erosion rate considered as one of the common projects with IAEA and Hungarian experts who have worked on the issue of erosion before. The various techniques have been studied for estimating erosion rates, and the necessary techniques were chosen in accordance with site conditions. A rainfall simulator that can be used to develop different scenarios was built and has been used in various tests based on different rainfall intensity, slope and soil structures.

## 2. Anarak Waste Disposal Facility

The Anarak site has been selected as disposal facility for LILW in Iran. This site is located in Isfahan province, about 24km west of Anarak city and 90 km northeast of Naein. This site has been located in a syncline structure which consists of clay, marl and sandstone layer that create good condition for controlling of radionuclides migration. These layers are sensitive to water erosion and it should be considered for long term and post closure safety assessment.




Anarak Waste Disposal Facility

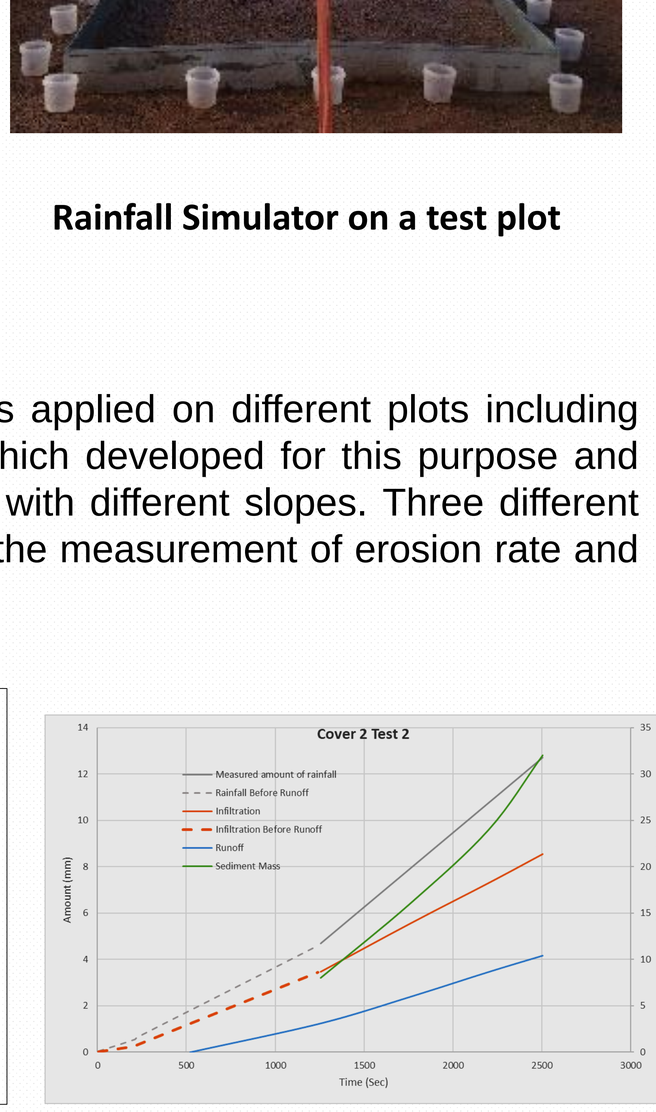
## 3.Material and Methods

### 3.1 Rainfall Simulator

The rain simulator is a notable research tool that allows us to measure the erosion rate of any site in the field with acceptable accuracy and efficiency. In waste disposal sites erosion values of soil and materials to be used as ground cover can also be accurately measured. Thus, rainfall simulators can provide us with important data needed for erosion analysis and modeling to help us design the best possible cover system for disposal trenches and also for long-term erosion stability of disposal site. The primary goal of the rainfall simulator is to create an artificial precipitation with precise specifications for the duration and intensity, as well as the size distribution of the droplets and the kinetic energy.

### 3.2 Establishment of the Device

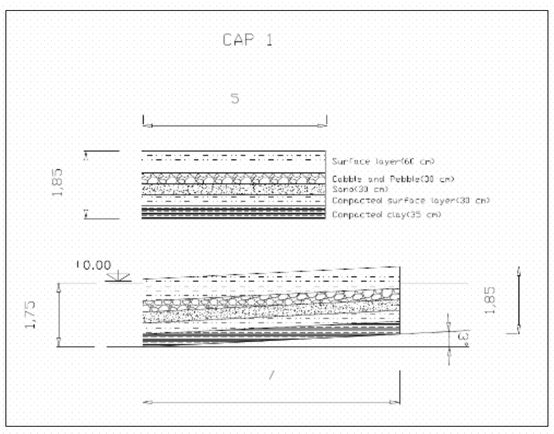
This device's establishment and tests have greatly aided in evaluation the rates of erosion and penetration for safety assessment and designing proposed covers for trench. International cooperation in this area helped us to decrease uncertainty in erosion rate and an improvement in the accuracy of the data used in the safety assessment. IAEA experts and ELTE University of Hungary in common TC project have a great assistance for developing the rainfall simulator. Also they have training courses to work and measure the erosion rate by this device.



Rainfall Simulator on a test plot

### 3.3 Tests

The precipitation simulation is applied on different plots including some different pilot covers which developed for this purpose and on bare land of disposal site with different slopes. Three different type of covers developed for the measurement of erosion rate and infiltration measurements.




Layout of one of pilot test cover




Result of a simulation on a test plot

### 4. Results and Conclusion

Simulations performed on different conditions and different scenarios according to previous environmental condition and designed plans for disposal trenches and their covers. Measuring the sediment loss, infiltration depth and other information used to measure erosion rate in different condition for safety assessments.

This international cooperation helped us to gain more confidence regarding the design and long-term safety of waste disposal trench covers, which is a sign of the impact of international cooperation on sustainable development in the long-term management of radioactive waste

International Conference on the Safety of Radioactive Waste Management, Decommissioning, Environmental Protection and Remediation: Ensuring Safety and Enabling Sustainability, CN-318
Vienna, Austria; 6-10 November 2023