

Title: Characterization of fractured rock and flow modelling to determine the natural geological barrier for new landfill sites.

Our society is generating excess earth-materials and waste at an ever-increasing rate exceeding the rate of economic growth. Currently most societies do not have sustainable ways of handling excess earth materials and wastes, and we are running out of well-suited localities (space/volume) for their storage. In Norway, despite regulations to stimulate re-use and prevent landfilling of municipal waste, the volume that goes to landfills is again increasing.

Landfill sites provides an efficient solution to end-of life handling of solid waste, but a complete characterization of the potential landfill site is needed to avoid any adverse effect on the environment. Therefore, landfills should be built on the most suitable sites to maximize the long-term protection of the environment and ease of operations. However, current practices for establishing new landfills in Norway are highly variable, hence there is a need to establish national criteria and regulations.

The research of Bilal Tariq's PhD project aims at the development of workflow that how to generate integrated multi-disciplinary 3D digital twin model of the sites selected for landfill development. This model will provide a set of criteria which would assist decision making process and safety plans regarding new landfill sites. The research objectives of Bilal Tariq's PhD project are:

- Which methods are most appropriate to quantify hydrogeological properties of a natural geological barrier?
- Analyse flow and transport conditions in a natural geological barrier, with emphasis on flow in fractured rock.
- Assess interaction between natural geological barrier and the internal waste construction under variable boundary conditions (including climate change)