Modelling of the source term for a predominantly inorganic waste landfill using data obtained from laboratory-scale testing, lysimeter studies and pilot scale monitoring.

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For setting proper limit values on wastes to be landfilled, a better understanding of the processes taking place within the landfill body is needed. Not the individual wastes disposed in a site are of relevance, but rather how the wastes mutually interact leading to concentrations in leachate from an entire cell or landfill site as a function of time. The latter is important from the operator's perspective in relation to the necessary aftercare. The key question being: is leachate treatment required in the long-term? And if yes, what level of leachate treatment would be required or can measures be taken to eliminate the need for leachate treatment after closure?

A proper description of the processes between wastes and within wastes in the landfill body is crucial as it can lead to less severe release than anticipated on basis of evaluating individual waste leaching and can lead to measures to control undesirable inputs into the landfill. The kind of information that is important for any decision is a proper projection of long term behaviour with information on the concentrations to be expected from a given landfill scenario as a function of time. This creates the major challenge to apply modelling and accelerated testing in the laboratory to allow such long term prediction.

In the framework of a Dutch national research project on sustainable landfill, laboratory experiments, lysimeter studies and a 12000 m^3 pilot demonstration project are carried out in conjunction with speciation and release modelling. The waste input to the pilot cell is controlled by more stringent acceptance criteria than currently required by regulation. Samples were taken from all waste streams deposited in the cell for the laboratory testing and for filling three lysimeters with a representative waste mixture.

The studies at field, lysimeter and laboratory scale represent different time scales through the liquid to solid ratio, to which the waste is exposed. By carrying out a pH dependence leaching test on the waste mixture information on chemical speciation can be derived through geochemical modelling. The role of dissolved organic carbon (DOC) on metal mobilisation is addressed by applying the NICA-Donnan model in ECOSAT. The relative importance of reducing conditions versus DOC mobilisation is addressed.

The time-dependent source term for the predominantly inorganic waste landfill is modelled to provide a prediction of long-term leachate quality. This information can be used as input for contaminant transport modelling in the unsaturated and saturated zone to assess local impact, which forms the basis for management decisions on acceptance of waste and treatment of waste prior to disposal.