Problems in estimating radionuclide parameters in relation to nuclear waste disposal, long-term environmental change and mire succession

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Background

- Coastal areas of the Baltic Sea have been selected for nuclear waste repository sites in Finland and Sweden
- Safety cases demonstrating the long-term safety of the repositories need to consider the ecosystems in a time frame of at least 10 – 100 thousand years
- In these time frames, the post-glacial crustal uplift (at present 6 – 8 mm/y) change the landscape at the sites into an inland type and also mires will form
- In addition to the formation of the mires, also their further development needs to be considered

Radioecological and radiological assessments

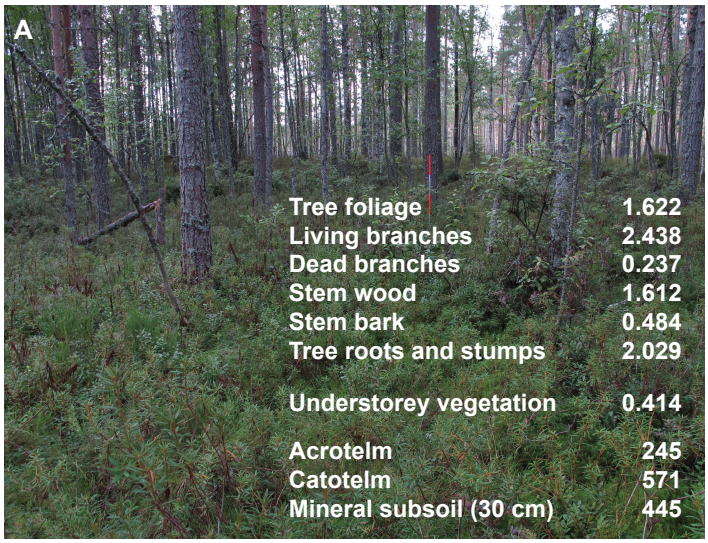
- Radionuclide transport models that are simplified from conceptual and numerical hydrobiogeochemical models are used for the safety cases
- The future ecosystems are projected from the past development in the region
- Due to the long time frames, input data representing a limited set of mire types and characteristics are needed
- For the repositories, radiologically most important radio-nuclides are long-lived but have very low or non-existing concentrations in the present environment – stable isotopes of the same elements are used as [biogeochemical] analogues
- In this presentation the process of the input data derivation is exemplified with stable Ni (for Ni-59) in mires at different stages of development

Results

- No essential differences in Ni storage of vegetation between different mire stages (total Ni pool from A to C 8.8, 6.5 and 5.6 mg m^{-2}, respectively)
- Ni pool in vegetation is small compared to soil
- Properties of the mineral subsoil (top layer 0 – 30 cm) are assumed to be the same

How to combine data to represent one mire biotope in the biosphere assessment?

- Using weighting factors based on aerial distribution of mires in different developmental stages in large mires (e.g. Lastensuo mire in western Finland, 440 ha with a catchment of 11 km^2)
- Using weighting factors based on biomass distribution in the same area?



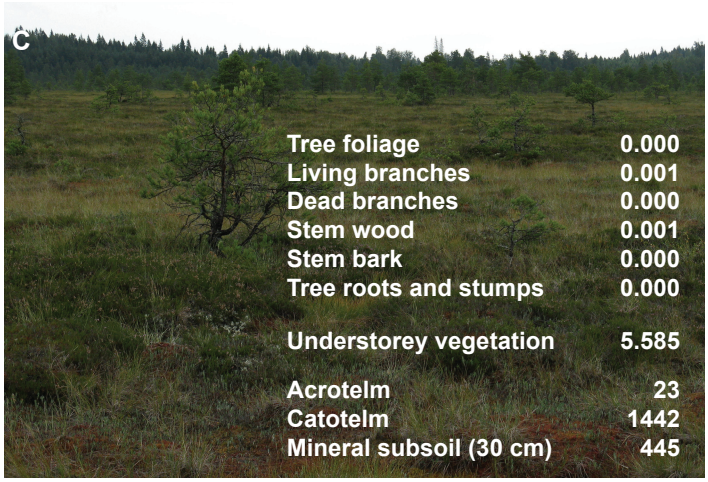


Fig. 1. Distribution of nickel (mg m^{-2}) in forested mires (**A**; Posiva's case), in a shallow peaty hardwood swamp (**B**; dominated by 20-year-old downy birches, peat thickness 0.23 m), and in a treeless bog (**C**; Lastensuo mire, peat thickness 6 m) in western Finland. Photos: Lasse Aro/Luke.

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