

# Research proposal: peat development in deep sand pits

Emiel Brouwer Research Centre B-WARE  
Sarian Kosten Radboud University sarian.kosten@ru.nl

Under the current concentrations of carbon dioxide in the air, the lower parts of the Netherlands will eventually drown due to rising sea levels. Therefore, it is not only crucial to reduce our carbon emissions, but also to find ways to store part of the excess carbon again. One of these ways is the storage in organic matter. The Netherlands has limited possibilities to do so, because there is little room for large forests and peatlands.

A possibility that has thus far not been explored, is the formation of peat in the many hundred deep and large sand pits that haven been dug in the past century. This is largely because some major difficulties must be overcome in the initial peat formation. The sand pits are deep, with steep shores. Also water levels may fluctuate considerably. This means the circumstances are not suited for the classic peat formation on permanently moist soils; peat formation must start in the aquatic phase as floating rafts. In particular in the initial phase, there is little organic matter present and the concentrations of necessary gasses to form natural floating rafts (carbon dioxide, methane) is too low. At least in the initial phase, buoyancy probably has to be supported artificially.

This research proposal aims to create an overview of the amount of carbon storage that can be achieved, the problems that are involved in doing so and the available techniques for this peat formation. More in detail, the following questions are raised:

- What is the amount of carbon that can theoretically be stored in deep sand pits, and how much is that compared to other possible carbon sinks in the Netherlands?
- What is the range in environmental conditions in the sand pits, for example in water quality, size, hydrology, wind speed, land use and recreational use? Which type of sand pit is most suitable for peat-formation?
- Can waterfowl disturb initial peat formation, in particular grazing by geese? What is the best way to prevent this?
- Which plant species are suitable for the various stages of peat formation, and for the various conditions present in sand pits?
- Fertilisation is needed to enable sufficient peat growth in the initial phase. What is the best way to realize this fertilisation without losing much of the nutrients to the relatively nutrient poor water layer?
- What technical or natural means are available to ensure sufficient buoyancy for the floating raft, in the initial phase as well as in later phases of peat formation. Can artificial buoyancy be combined with other functions, such as floating solar panels?
- What is the relation between peat accumulation and the water quality? In particular pH, alkalinity and concentrations of sulphate and nitrate influence decomposition rates.
- What is the rate of methane formation in the sediment of the sand pits and in later stages of the floating rafts? How much can this contribute to the buoyancy of the floating raft? What are the losses to the atmosphere? Can these losses be reduced? For example by a *Sphagnum* cover on the floating raft.

- Does the planting of trees on the shores improve the circumstances for the formation of floating rafts? Possibly by reducing wind speed and by the accumulation of nutrients and organic matter.

It is likely that more questions will arise during this study, an aim is also to make an overview of these questions.