Dutch toxic landfill site is now capturing and storing carbon

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Precise carbon measurements indicate that peat is already being formed at the Volgermeerpolder near Amsterdam (NL), a toxic waste landfill site that was capped with foil with an artificial wetland on top. The new peat will offer an extra layer of protection against the poisonous and toxic waste in the future. (Ecological Engineering, 25 May).

Peat contains high levels of carbon which binds pollutants. This prevents toxins from leaking from the highly polluted landfill into the groundwater of the Volgermeer peat polder near Amsterdam. The carbon in the peat acts as a binding agent in a similar way as activated charcoal does for a tourist with stomach problems or a carbon filter in your water bottle. This discovery has eliminated the need to completely dig up the former landfill and made it possible to neatly cap it with foil.

A peat buffer

But at the Volgermeer an additional step was taken: with the peat underneath the landfill forming a buffer to the toxins, the consideration was made that it should be possible to grow peat on top of the landfill in specially constructed ponds. If the foil were to tear in the next hundred years, a natural barrier will then have grown to replace it. This is a great hypothesis, but does it work in practice? Growing peat from scratch has never been attempted before.

The Volgermeerpolder has since become a beautiful wetlands nature

reserve that is used as a recreational area. But six years after its official opening by then crown prince Willem Alexander, ecologists from Radboud University are still conducting research here. Sarah Faye Harpenslager focused on indicating the formation of peat and investigating whether there is a way of stimulating this process. *Ecological Engineering* is publishing the results on 25 May. This study was conducted in collaboration with the University of Amsterdam and Utrecht University with funds provided by Technology Foundation STW (now the NWO Domain Applied and Engineering Sciences, TTW), and the Municipality of Amsterdam.

Peat formation cannot be seen, but it can be measured

Peat grows at a very slow pace of 1 mm per year on average. Harpenslager explains that this is something you can't measure directly. "That one millimetre falls outside of the margin of error. But we can measure whether carbon is being captured and stored by determining the difference in carbon dioxide levels by taking the amount of carbon dioxide that is captured by plants and then subtracting the carbon dioxide that is released when these plants decompose. The less plants decompose, the more peat that is formed. The Volgermeer is indeed capturing and storing carbon, so peat is clearly being formed even though you can"t see it."

Improved formation with organic topsoil

Harpenslager and her colleagues also compared peat formation in ponds with different bottoms: sand, clay, or a layer of organic topsoil. The last has shown to be most fertile. "In ponds with a thin layer of topsoil peat-forming plants grow most prolifically and capture the most carbon. The top soil that was collected in the region also contains seeds of plants that that we need to kick start peat growth."

For peat to form, it is essential that peat-forming plants such as common reed, cattail and water soldiers start to grow here. Harpenslager observed that development progresses slowly on sand bottoms. "This means that it would take too long to form a peat layer in relation to the lifespan of the foil. The protective layer needs to be sufficiently thick to serve as a barrier in the next one hundred years."

According to the researchers the results are not only applicable to cap polluted land, but also for the capturing and storage of greenhouse gases through new peat formation and preventing subsidence which is not only an issue in bog mires in the Netherlands, but also presents a problem in places such as Venice, Florida, and Southeast Asia.

More information: Sarah F. Harpenslager et al. Peat capping: Natural capping of wet landfills by peat formation, *Ecological Engineering* (2017). DOI: 10.1016/j.ecoleng.2017.04.040

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