Global Peatland Hotspot Atlas:
The State of the World's Peatlands in Maps
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UN environment programme

Flood events, flooding risk, subsidence on peatland

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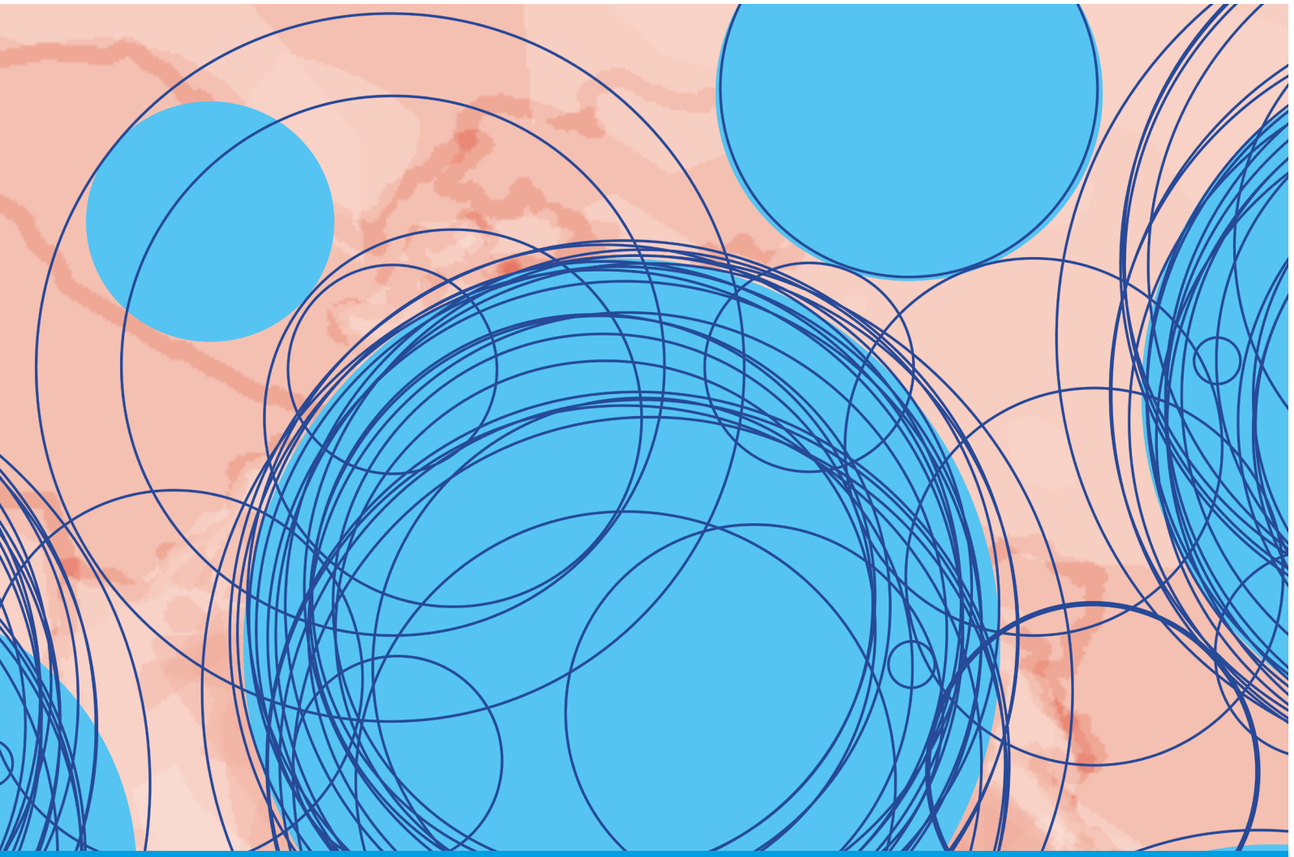

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Flood events, flooding risk, subsidence on peatland

Drainage in peatlands causes the peat to shrink by compaction and oxidation and the peat surface to subside, a process exacerbated by fires that burn away the upper peat layers burn. The irreversible reduction in pore space resulting from oxidation and compaction reduces the peat's capacity to store water and regulate water flow. As the peatland lowers, the risk of flooding increases. **Subsidence continues as long as the peatland remains drained** or all peat has disappeared. By subsidence, drained peatlands loose one (in the temperate zone) up to five meters of height (in the tropics) within a century, leading to severe damage to buildings and infrastructure, the necessity to build dykes and pumps to keep the land dry, and near the sea, to increasing salt water intrusion which threating soil productivity [1, 6].

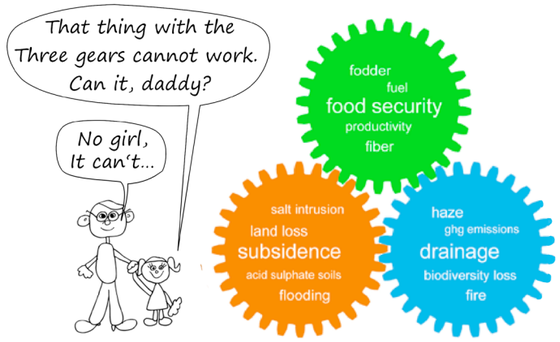
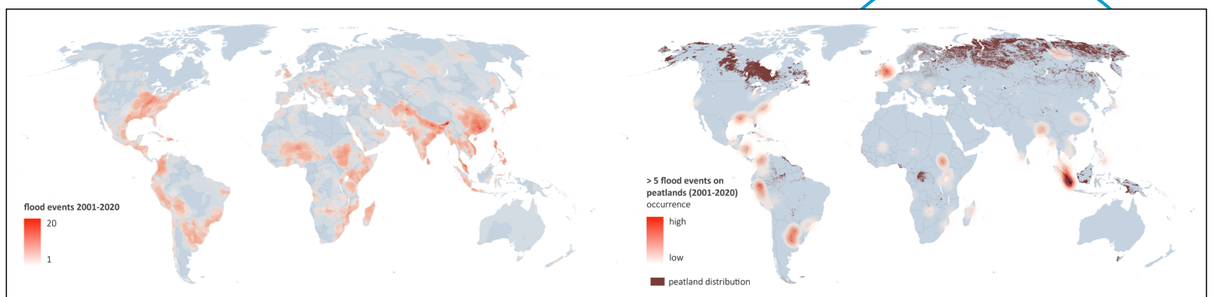


Figure 2 Drained peatland use destroys its own subsistence base

Peatland drainage leads to peat subsidence and increases flood risk, particularly in regions where peatlands are already vulnerable to floods, along major rivers, coastlines, and at the bases of mountains.

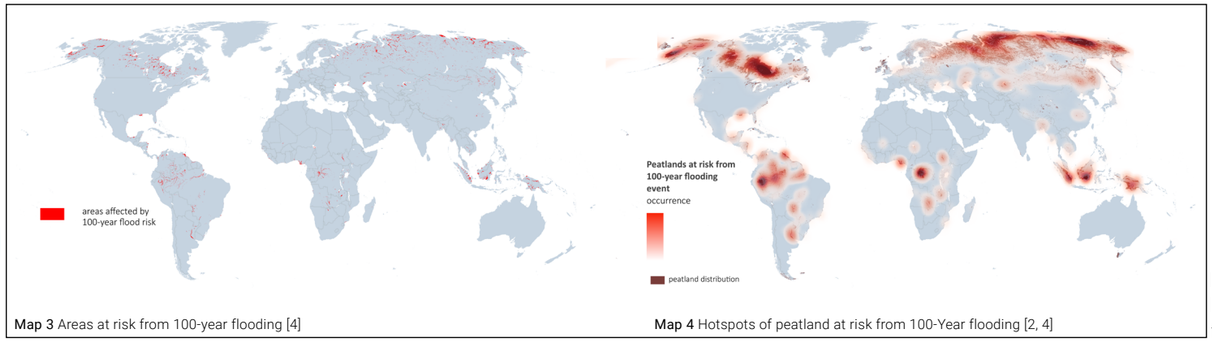
Large, past flood events on peatland



Map 1 Large flood events (2001–2020 [3])

Map 2 Hotspots of large flood events on peatland (2001–2020 [2, 3])

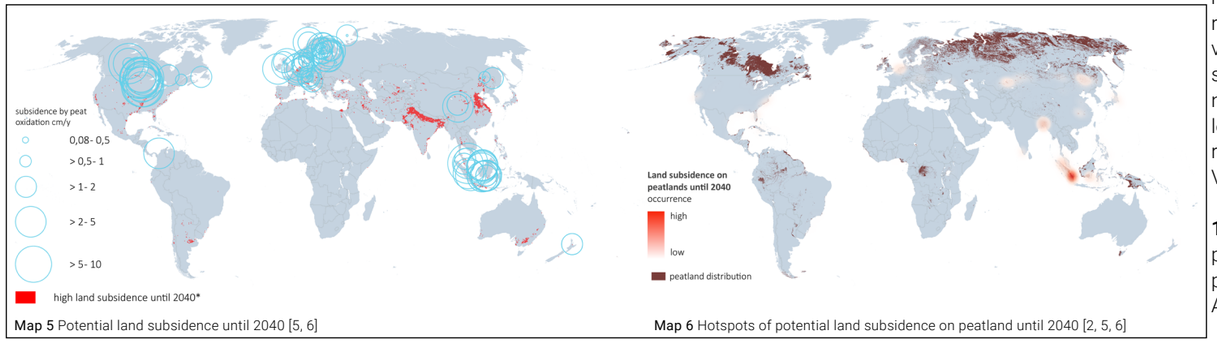
100-year flooding risk on peatland



Map 3 Areas at risk from 100-year flooding [4]

Map 4 Hotspots of peatland at risk from 100-Year flooding [2, 4]

Potential land subsidence on peatland



Map 5 Potential land subsidence until 2040 [5, 6]

Map 6 Hotspots of potential land subsidence on peatland until 2040 [2, 5, 6]

* Subsidence probability high or very high (after Herrera-García et al. 2022)

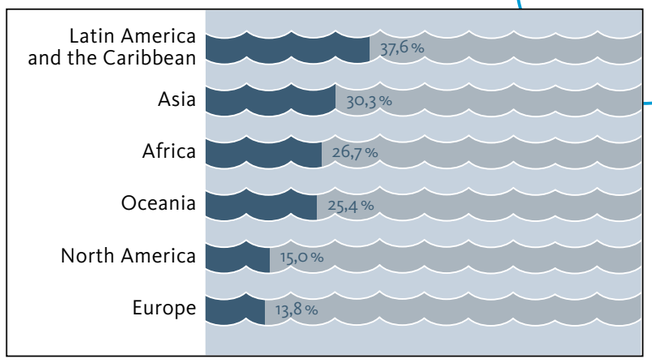


Figure 1 Cumulative past flood events (Maps 1 and 2), 100-year flooding risk (Maps 3 and 4), and potential land subsidence (Maps 5 and 6), as % of total peatland area.

Peat subsidence in the Netherlands © A. Jansen

Large flood events [3] in peatlands frequently coincide with floodplains and deltas of major rivers, where peatlands are commonly found (1=Ganges+Brahmaputra, 2=Yangtze, 3=several rivers on Sumatra, 4=Nile, 5=several rivers in the UK, 6=Mississippi, 7=Rio Parana). Additionally, floods occur in peatlands located at the base of mountain ranges (8= Andes, 9=African Rift Valley) (Map 2 [2]).

100-year flood risk data [4] predicts that the vast northern peatlands of Siberia and North America, as well as the large tropical peatlands in Peru, the Congo Basin and Indonesia, could be severely affected by floods in the next 100 years (Map 4). This is because peatlands are often located in extensive and shallow depressions connected to large rivers, where devastating 100-year flood waters can accumulate. Smaller hotspots are again related to peatlands occurring in floodplains and deltas of major rivers is triggered by natural (e.g., tectonics) or anthropogenic factors, including peatland drainage and degradation. Subsidence [5, 6] permanently reduces the water storage capacity of the peat of the groundwater system, creates sinkholes, damages buildings and infrastructure, and increases vulnerability to flooding. Blue circles indicate global regions where drainage has led to peatland surface lowering of up to 10 cm per year. These areas correspond with hotspots of peatland conversion for agriculture in Europe, Southeast Asia, and North America (Map 5 and 6).

Sources: 1. UNEP (2022) Global Peatlands Assessment – The State of the World's Peatlands: Evidence for action toward the conservation, restoration, and sustainable management of peatlands. Main Report. Global Peatlands Initiative. United Nations Environment Programme, Nairobi. 2. Greifswald Mire Centre (2022) Global Peatland Map 2.0. Underlying dataset of the UNEP Global Peatland Assessment. 3. Brakenridge, G.R. Global Active Archive of Large Flood Events. Dartmouth Flood Observatory, University of Colorado, USA. (Accessed 1 October 2016. http://floodobservatory.colorado.edu/Archives/. 4. Dottori, F., Alfieri, L., Salamon, P., Bianchi, A., Feyen, L., Hirpa, F. (2016) Flood hazard map of the World - 100-year return period. European Commission, Joint Research Centre (JRC) [Dataset] PID: http://data.europa.eu/89h/jrc-floods-floodmapgl_rp100y-tif. 5. Herrera-García, G., Ezquerro, P., Tomás, R., Béjar-Pizarro, M., López-Vinielles, J., et al. (2021) Mapping the global threat of land subsidence. Nineteen percent of the global population may face a high probability of subsidence. Science. 371, Issue 6524, pp. 34-36. DOI: 10.1126/science.abb8549. 6. Ma, L., Zhu, G., Chen, B., Zhang, K. et al. (2022) A globally robust relationship between water table decline, subsidence rate and carbon release from peatlands. Commun. Earth Environ. 3, 254.