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COMMENT

Wetscapes provide the physical basis to sustainable peatland livelihoods

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INTRODUCTION

In our paper (Temmink et al. 2023), we argue that only integrated wetscapes (wet peatland landscapes) allow sustainable and complementary land-use functions. Wetscapes are an inevitable alternative for unsustainable drainage-based peatland use. In their comment, Langston et al. (2023) argue that our design is "desirable" but "overlooks the complex social, cultural and political dynamics of shaping peatlands". We much welcome these comments, which are complementary to the issues we focussed on in our paper.

We all agree that peatland restoration should be "effective, efficient and just". "Effective" primarily refers to the physical basis of peatland management. "Peatland must be wet" is a boundary condition of global and local peatland sustainability, as drainage-based peatland use aggravates its own subsistence base (Joosten et al. 2012). Five percent of all global anthropogenic greenhouse gas emissions currently originate from drained peatlands, which cover merely 0.4% of the land area of our planet (UNEP 2022). These peatland emissions have since 1980 pushed 30 million people out of the "human climate niche" and with unchanged policies, this number will increase to almost 200 million by the end of the century (Lenton et al. 2023).

Indonesia is responsible for a large proportion of these peatland emissions, and will also be one of the major hotspots of livelihood risk under global climate change (Lenton et al. 2023). On the regional scale, fires and haze from drained peatlands cause immense health, economic and transboundary political issues in Southeast Asia. Finally, ongoing subsidence of drained peatlands increasingly leads to saltwater intrusion, uncontrolled flooding, emergence of infertile acid sulphate and (extremely nutrient-poor, sandy) kerangas soils, all leading to the loss of productive land (Joosten et al. 2012). As it is physically impossible to stop the negative impacts of drained peatlands, real sustainability can only be reached with wet peatlands.

PEATLANDS MUST BE WET, BUT HOW?

We certainly recognize the socio-economic complexity of reaching peatland rewetting "on the ground". Our paper, however, focuses on the physical basis, because this aspect of the challenge is apparently not yet self-evident. We highlight this with two examples:

One of the first large restoration projects in the Ex Mega Rice Project area (Indonesia), the Central Kalimantan Peatland Project, explicitly tried to address both the technical/ecological necessities and the social/cultural/political issues. At the end, however, it appeared that one part of the project had been damming up ditches to stop fires, haze and greenhouse gas emissions, while another had been opening them up to improve agricultural production. Both measures sincerely aimed at improving livelihoods, but were inherently conflicting and the project did not succeed to integrate the dual challenge (CKPP Consortium 2008).

Langston et al. (2023) see paludiculture as "generally an undesirable option". However, the physical sustainability demand essentially leaves two options:

1. Either the conservation and restoration of peatlands as "wet nature" (which may with their regulative, cultural and partly provisioning services also support "wet livelihoods"), or
2. The extraction of cultivated biomass (provisioning services, the reason for which peatlands were drained in the first place). If you cultivate biomass on wet peatlands under conditions that the peat body does not degrade, you per definition apply paludiculture. If that does not yet function, research should be conducted and investments made to make it function.

For this reason, we argued in our paper that wetscapes can only be achieved if embedded in large-scale, long-term innovation and transformation strategies. The full responsibility for transitioning into wetscapes does not (only) rest with local communities. Given technical, economic and cultural path dependencies, an active regulatory and entrepreneurial role of the state and the international community is called for, along with compliance and civic responsibility from national and international corporations. Local communities must be involved, and scientists have a role in tracking the impact of peatland (re)conversions on them. Transitioning to more conservation and to paludiculture calls for economic assistance (subsidies, grants, to cover incremental costs), including investing in the domestication of paludiculture crops and the stimulation of market demand so that the difference in income with drainage-based land use is reduced. How to achieve this is different between regions and thus needs to be addressed in a regional context-dependent manner. That, however, goes beyond the realms of our original work.

In case of peatlands, global responsibility and local hydrology prescribe what has to be done physically, whereas local/regional/global socio-economics and traditions determine how that aim could/should be reached socially. The first condition is everywhere the same, while the latter is everywhere different. But they have to be addressed in conjunction. As such, there is no dichotomy between the search for long-term viable living with peatlands, and consideration of stakeholders in the present. Rather, just transitions need both: a sense of direction, and inclusion of those affected, most notably the most vulnerable groups.

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