



# Irrigation canal systems of the Cambodian Mekong delta: Assessing changes in ecosystem services for rural communities after wide-ranging rehabilitation plans.

Christina Anna Orieschnig et al. [▶](#)

Anthropogenically modified hydrological processes shape the Prek agroecosystem in the Cambodian part of the Mekong delta. Preks are trapezoidal channels that were initially constructed during the French protectorate for land raising purposes and extending agriculture in the low-lying Cambodian floodplain, which they connect to the river courses. These channels have become an integral part of the landscape. They are an essential vector for both flooding and drainage, and local communities are deeply organized in relation to these structures. However, with the lack of wide-ranging maintenance work, sedimentation and erosion have modified the functionalities of many of these Preks, *a priori* reducing the environmental amenities provided to the rural communities. In response to this, various development agencies have sought to rehabilitate several of these Preks in recent years, mostly with the objective to further intensify an already intensive agroecosystem.

The purpose of the present study is thus to assess the actual effects of these rehabilitations on ecohydrological services. To this end, a comparison has been carried out of inundation and vegetation patterns, as well as ecosystem services, between areas where Preks have been the subject of rehabilitation projects and areas where they have not. For this purpose, remote sensing analyses, hydrological modelling and sociological methods have been employed. To begin with, an analysis of flood dynamics and vegetation structures in the study area has been carried out in the cloud computing platform Google Earth Engine using Sentinel-1 and 2 data. Furthermore, semi-structured interviews with stakeholders (farmers, village chiefs, staff from sectoral ministries) were conducted in the field to scope ecosystem services and find indicators to integrate these services into a numerical model.

The analysis describes hydrological, ecological and agricultural dynamics that are currently at play in the area, and will further study how Preks rehabilitation could influence these dynamics by comparing areas with and without rehabilitation. Among the processes considered are shifting water availability for irrigation, agricultural intensification, modifications in small-scale habitats, changes in the use of pesticides and herbicides with resulting impacts on soil structure, and alterations in vegetation patterns. Furthermore, several aspects that have caused problems in the rehabilitation process will be considered - such as operational difficulties of sluice gates, bank collapses blocking the water flow in channels, an underestimation of multiple uses of water and a lack of understanding of the complex river flows in the area. The analysis leads to identifying the eco-hydrological processes and indicators to implement in a process-based hydrological model aiming at exploring alternative scenarios of rehabilitation.

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