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Institutional, economic and ecological challenges of nature-based solutions implementation for flood risk management in two Central-European river basins.

Weronika Warachowska¹, Gábor Ungvári², and Andras Kis²

¹Adam Mickiewicz University in Poznan, Institute of Geoecology and Geoinformation, Department of Geoinformation, Poznan, Poland (weronika.marynowska@amu.edu.pl)

²Corvinus University Budapest

The paper aims to investigate the nature of problems related to the implementation of polders as nature based solutions (NBS) for flood risk management in two European river basins – the Tisza and the Warta rivers. The research focuses on economic and institutional challenges related to the implementation of polders and on consequences for existing or potential ecosystems of the polder areas. An important aspect of the research focuses also on investigating the course of social innovations that led to the institutional preconditions needed for enhanced implementation of future investments for multi-purpose NBS for flood risk reduction in river basins located in the Central Europe.

Due to the observed climate change in recent years, in both the Tisza and the Warta river basins, attempts have been made to regulate legal background for water management, in particular for flood risk reduction. As both regions are characterized by an increasing flood risk and significant flood damage related to the former flood events, it is necessary to investigate the possibility of the implementation of effective solutions for flood risk reduction that would be cost effective and at the same time contribute to the preservation of the environment according to the dual expectation of the Flood and Water Framework Directives.

In both regions one of the analyzed and planned for implementation measures were polders that can contribute to significant flood risk reduction in local and regional scale. However, despite significant socio-economical and geographical similarities of both regions, the undertaken actions aimed at implementation of polders brought different (at parts even the opposite) outcomes. While actions undertaken in the Tisza river basin led to establishment of fully operational polders, polders in Poland are still in the plans. However, establishing new infrastructure in Hungary did not solve all problems related to flood risk management.

The following issues related to establishing polders as Nature-Based Solutions will be analyzed:

- (i) Costs of establishing polders;
- (ii) Formal and legal condition;

(iii) The role of interests and social conflicts;

(iv) Environmental impact.

According to the above, despite comprehensive plans prepared on the basis of the EU Water Framework Directive and Floods Directive, the investments in the Tisza and the Warta river basins brought unexpected outcomes (such as social conflicts, ambiguity of formal and legal conditions or negative environmental impact) that affect the effectiveness of NBS.

Identification and description of the obstacles in the decision-making process related to the flood risk mitigation and characterization of ongoing social transformations in the Tisza and the Warta river cases provide insights for future investments in other Central European countries that face similar societal, environmental and economic challenges.