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Polders as nature-based solution for flood risk management: the case of Poland

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It has been acknowledged that traditional flood protection measures based on grey infrastructure (i.e. dikes, dams, etc.), are not sufficient to cope with highly dynamic flood risk. They should be in conjunction with nature-based solutions (NbS) inspired by, supported by or copied from nature (EC 2015). The idea of nature-based solutions assumes that they need to provide simultaneous benefits for society, the economy and nature (Albert et al. 2017).

Polders are a well known measures in flood risk management, which fulfils several flood protection functions in various land use conditions including intense residential, agricultural and industrial land use. They use existing complex system processes of nature (such as its ability to regulate water ?ows) to safeguard and enhance the water storage potential of landscape, soil and aquifers by restoring and maintaining ecosystems, natural characteristics of water courses and by using natural processes mimicking ecological ones. Natural origin of polders is usually complemented by grey infrastructure what raises flood-protection abilities of this measure. Nevertheless, polders can be considered as the nature-based solutions in flood risk management. Yet they would require supplementing the IUCN definition of NbS (Cohen-Shacham et al. 2016) by geodiversity benefits, which have a significant hydrological, sedimentary and morphological role in inundations of valley bottoms.

Despite their benefits polders face difficulties in their actual establishment and managing as it appears in the Polish case analysed in this paper. As the legal background of establishing and managing polders is ambiguous and the intensive development of the area suitable for polders progresses, understanding the polders implementation gap is of high importance. The research aims to detect and analyze difficulties in polders implementation as a NbS.

According to the data obtained from various available sources (hydrographic maps, existing databases and public administration units archives), there are more than 150 polders in Poland. Polders are rarely used during exceptionally high floods. According to Ł oś (2013) polders in Poland are inundated on average once every 10 years. The data base about the polders comprises: a) functions, b) property rights, c) retention volume, d) area, e) land use and landcover. This data were used as an input to the analysis. The methods combines institutional analysis of the polder status (including legal background), historical development of polders in Poland and spatio-temporal analysis of polders exploitation. Statistical methods of grouping are used to proposes a classification of polders.

Initially, polders had primarily agricultural function, contributing to agricultural production. Currently their function vary, including: flood control, agricultural, industrial, recreational, landscape and geodiversity and biodiversity protection functions. Most of the polders are located on private land, which creates significant management problems during flood water discharges. In addition, many of them are inhabited by family farms, which is another difficulty in their management. Complex legal status in terms of the property rights makes creation of a national polder management plan almost impossible.