

2. Biogeomorphological interactions within floodplains and their role in sediment transport and ecological transformation processes in the lower Rhine delta

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General introduction

Lowland floodplains (Fig. 2.1) play an important role as sinks of suspended sediments and pollutants, and have a key-role in ecological transformation processes along the river continuum from the upstream basin towards the estuary. Sediment accumulation rates on floodplains are spatially highly variable, associated with differences in flooding frequency, flood pattern and distance to the river channel (Walling and Owens, 2003).



Fig. A-2.1: Field photograph of a floodplain with a side channel.

After deposition, sediment-associated pollutants, such as metals, are incorporated in the ecological food-chain (Torres and Johnson, 2001). Floodplain characteristics and inundation frequency also influence ecological habitat ('ecotope') distributions, which in turn determine the potential biodiversity (De Nooij et al., 2004). Over the past centuries, the natural biogeomorphology of many flood plain has been dramatically affected by humans, which has caused considerable degradation of their ecological status (Tockner and Stanford, 2002). In recent years, therefore, ecological restoration projects have been carried out in many countries (Buijse et al., 2002). At the same time, however, flood protection has remained a primary objective for river management.

The study was part of the LOICZ-project "Biogeomorphological interactions within floodplains and their role in sediment transport and ecological transformation processes in the lower Rhine delta". It consisted of three components. Firstly, a study was performed into the parameterization of floodplain vegetation for hydrodynamic models (Straatsma, 2007). Secondly, influences of multiple stressors on floodplain biota were studied (Schipper, forthcoming). The results of these two projects were integrated into a value-based scenario study of the biogeomorphological interactions under climate change (Straatsma et al., 2009).

2.1 Hydrodynamic roughness of floodplain vegetation: Airborne parameterization and field validation

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i. Problem

Hydrodynamic modeling is a central tool for flood risk management and lies at the base for the determination of deposition of sediment and heavy metals. In recent years, considerable effort has been made on the development of 2D and 3D hydrodynamic models that accurately simulate overbank flow patterns and predict extreme flood water levels in rivers and floodplains (e.g., Baptist et al., (2007) and Stoesser et al. (2003). In addition to surface topography (Marks and Bates, 2000), hydrodynamic roughness of the floodplain surface is the key input parameter of these models. Currently, no accurate, spatially distributed and quantitative method exists to