The morphological destruction and subsequent restoration programmes of large rivers in Europe

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With 7 figures and 3 tables in the text

Abstract: This paper presents a synopsis of the rivers Rhine and Danube in Europe, connected by the Rhine-Main-Danube waterway. Their morphological destruction and subsequent ecological impacts are documented, and the ongoing and future restoration programmes are discussed. While the River Rhine has improved significantly in water quality and still is channelized to a large extent (despite considerable restoration), the River Danube features more near natural stretches and flood plains while still being largely polluted in the middle and lower parts. In both catchments, the goals of research/management are unlimited fish migration (e. g., salmon in the Rhine, and sturgeon in the Danube), some gravel and sediment transport, the conservation/restoration of flood plains as hot spots of biodiversity and flood retention areas, and the sustainable development of the river basin. While the River Rhine authorities (including five countries) are advanced in the political process of river basin management, the River Danube authorities (including 16 countries) still must find a harmonized cooperation.

Introduction

In human history, the large rivers in Europe, such as the Rhine, Rhone, Elbe and Danube, have long been used as nuclei of settlement and veins of transportation. As such, they also attracted trade, crafts, industries and hydropower facilities. Likewise, small to moderate human impacts on fluvial hydrosystems occurred in pre-industrial history. In the 19th century, when the industrial revolution took place, most large rivers were channelized and dammed, mostly for gaining land for development, eliminating diseases such as malaria, flood protection, and shipping

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