River and floodplain rehabilitation in Western Europe: opportunities and constraints

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With 8 figures and 4 tables in the text

1. Introduction

The physical landscape has been increasingly influenced by a variety of economic and social changes over a period of more than 6000 years. During this period, human impact on river systems has been substantial and widespread. In Europe, water supply and land drainage schemes were implemented as early as 3200 BC. Embankments were built for flood control and land reclamation, primitive weirs were constructed to regulate river flow for water power, and channelisation was carried out either for the purpose of making rivers navigable or to achieve the engineering objective of flood alleviation or agricultural drainage (Brookes 1988). Although the era of major dam building activity on a world wide basis did not begin until the early 1900's, by 1971 more than 12,000 structures more than 15 m in height had been built, impounding 4000 km³ of water and inundating an area of 800,000 km² (Peets 1984). At present most of the major rivers of the world have been impounded at least to some degree. While populations grow, nations industrialise and global water demand increases, the range of human activities potentially damaging to river systems increases (Table 1) and aquatic ecosystems are being severely altered and even destroyed (Table 2) at a rate far greater than they are being restored (Brookes 1988, Boon 1992, National Research Council et al. 1992). The environmental changes that have stressed flowing water systems have also impaired their value for both human use and environmental functions. Stresses arise from a combination of one or more of the following:

(i) alterations in water quantity or flow
(ii) morphological modifications of the channel and/or floodplain
(iii) excessive erosion and sedimentation
(iv) deterioration of substrate quality
(v) deterioration of water quality
(vi) decline of native species, and
(vii) introduction of alien species.