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LIFE River restoration projects in Austria

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ABSTRACT: During the last century nearly all larger rivers in Europe have been regulated, their floodplain areas damned or used for hydropower generation. This has led to considerable ecological and socio-economic problems, from biodiversity loss to increased deterioration of natural flood protection capacities and falling groundwater tables. With support of the European Union's financial instrument LIFE Nature, a reversal in this trend has been initiated by promoting ecological based river restoration projects across Europe. LIFE Nature has taken on a leading role in river restoration and in fulfilling the legal requirements set by the EU Habitats and Birds Directives. The instrument is increasingly supporting the implementation of progressive water policy through the EU Water Framework Directive by establishing examples of "best practice" in river management. Good examples can be found on the rivers Drava, Mura, Danube, Pielach and Lech in Austria, satisfying both the needs of nature conservation and sustainable water management.

KEYWORDS: River restoration, Drava, Mura, Danube, Lech, Pielach, LIFE Nature, Natura 2000, EU Habitats and Birds Directives, EU Water Framework Directive

Introduction

During the 20th century nearly all large river ecosystems in Europe have been altered by human activities – a greater change than at any other time in their history. Natural River stretches have been used for hydropower generation, have been regulated and their floodplain areas damned to a great extent. According to a study conducted by WWF, over 80% of the original floodplain area in the Danube Basin has been lost during the last century [6]. The University of Agriculture in Vienna has investigated 5000 km of the larger rivers in Austria and has shown that 94% are already impacted [3, 4].

These impacts have brought enormous ecological and socio-economic problems. The degradation of rivers and floodplain areas is closely linked to the rapid decline in freshwater biodiversity. Moreover, it is increasingly being recognised as a political issue with socio-economical repercussions. These are mainly caused by deterioration of ecosystem services such as flood protection - the floods 2002 in Central Europe has shown the weakness of technical flood protection - but also as groundwater protection, drinking water supply and water purification. In the last decade, a turn in the management of rivers "from river regulation to river restoration" was more than an act of the moment. Since the beginning of the 1990s, ecological river management has been financially supported by the European Union.

LIFE Nature: A boost in river restoration

In recent years, a series of progressive river restoration projects have been implemented throughout Europe. In particular, the European Union's legal and financial framework

has promoted large-scale river restoration projects for the first time in Europe. Most of them have been financially supported by the LIFE programme of the EU, which has taken over a leading role in promoting river restoration.

LIFE, the financial instrument for the Environment, was introduced in 1992 and is one of the spearheads of the European Union's environmental policy. It co-finances projects in three areas (Life Nature, Life Environment and Life Third Countries) and is open to all EU countries, some accession candidate countries and certain third countries bordering the south of the Mediterranean and the Baltic Sea [1].

LIFE Nature is tailored to contribute to the implementation of EU environmental nature protection legislation, especially the Habitats and Birds Directives, and the establishment of a coherent ecological network called Natura 2000 [1]. Increasingly, LIFE Nature has also been leading the way in the implementation of the progressive EU water policy provided by the Water Framework Directive, the first ecologically-based framework which has adopted ecological principals in water management for future management of river ecosystems, by establishing examples of "best practice".

To date LIFE has been implemented in three phases. Between 1992 and 2004, approximately 1490 Million Euros were allocated through the programme, with the largest amount spent in the LIFE Nature component. Between 1992 and 2002 more than 700 LIFE Nature projects were co-funded [1]. Between 1995 and 2003, Austria has allocated more than 74 Million Euro for 27 LIFE projects, of which 15 were river restoration projects [5]. Between 1998 and 2003, more than 34 Million Euros have been allocated to river restoration under the LIFE program in Austria alone [9].

Today LIFE Nature, as a financial incentive, is one of the key tools for improving the ecological state of important European river ecosystems and a modern way of halting the loss of valuable freshwater biodiversity and solving water management problems such as flood protection, river bed deepening and fall in groundwater tables. It provides examples of "best practice" and guidance for further development of river systems therefore satisfying the needs of both nature conservation and sustainable water management.

Legal framework of the European Union

Natura 2000

Natura 2000 is an instrument of the European Union to establish a Community-wide coherent ecological network of protected areas for the long-term conservation of Europe's most valuable and threatened habitats and species. The legal basis for the Natura 2000 programme is the EU Habitats and Birds Directives. A major objective of these legal standards is the conservation of biodiversity in Europe. For this purpose, both "improvement demands" and "deterioration bans" regarding environmental quality have been provided for [7].

Fauna-Flora-Habitat Directive (92/43/EEC)

The Habitats Directive aims to conserve wild fauna, flora and natural and semi-natural habitats of European Importance, including through the designation of Special Areas for Conservation (SACs) as part of the Natura 2000 network. Measures taken pursuant to this Directive are designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest [7]. River

and floodplain habitats and species including priority habitats such as softwood forests and certain fish species are well presented.

Birds Directive (79/409/EEC)

The Birds Directive aims to conserve populations of wild birds and their habitats through, among other things, the establishment of Special Protection Areas (SPAs) as part of the Natura 2000 network [7].

Water Framework Directive (2000/60/EC)

The new EU water law aims to preserve and improve the aquatic environment within the Community and to promote a sustainable use of water on the basis of a long-term protection of existing resources. Correspondingly, the European Union specifies clear environmental objectives for its Member States as well as its accession countries including "no further deterioration" of both surface- and ground waters and the protection and improvement of all waters with the aim of achieving a „good ecological status" by 2015 [7].

Benefits for nature conservation and water management

Today, problems in river ecosystems for both nature conservation and water management have basically the same origin: a high degree of historically based river engineering of natural water courses. The enormous decline of freshwater biodiversity has challenged nature conservationists, whereas the deterioration of natural flood retention capacity, the river bed deepening and the fall of groundwater tables has caused a paradigm shift in the Water Management Authorities. For the sake of both, conservation of valuable habitats and species and sustainable water management, numerous projects were or are already implemented on several rivers in Europe. Good examples with the aim of restoring the natural river dynamic processes can be found on the rivers Drava and Lech in Austria. Further examples encompass the rivers Danube, Mura and Pielach.

Examples of "best practice" in river management

LIFE Project "Upper Drava-river valley" [1, 2]

The upper Drava in Carinthia in Austria is a typical Alpine river which hosts the last remnants of inner alpine floodplain forest associations and endangered species populations such as the Danube Salmon (*Hucho hucho*). The alder-ash floodplain forests are the best preserved and largest ones in the entire Alps. It is one of Austria's largest rivers which have being preserved as a free-flowing river on over 60 km without any dams.

Situation before restoration

The upper Drava in Carinthia, once a highly braided river with many side arms and gravel banks, has met the same fate as so many other Alpine rivers in the 20th century: the river bed was canalized, bends were straightened out and branches cut off from the main stream, dams built and farming in the floodplain area intensified. This has brought an enormous loss and degradation of the natural freshwater habitats including alluvial forests and a decline of species populations including the Danube salmon (*Hucho hucho*) and the crayfish (*Austropotamobius pallipes*). Major problems, including the deterioration of natural flood retention capacity leading to great risk of flooding for the whole area as well as

deepening of the river bed (e.g. deepening of 2 cm per year) which caused a fall in groundwater tables, have forced a fundamental reassessment of Carinthia´s approach to river management. Starting in the early 1990s, the Water Management Authority of Carinthia has started restoring the river to a semi-natural state again. New efforts were made to preserve and improve what was left of the rich natural environment and have to date culminated in one of the largest river restoration projects in Europe.

Photo 1, 2 and 3: Drava River before and after restoration 2003
(Water Management Authority of Carinthia/Tichy)

The LIFE Project

Project period: 1999 – 2003

Beneficiary: Water Management Authority of Carinthia

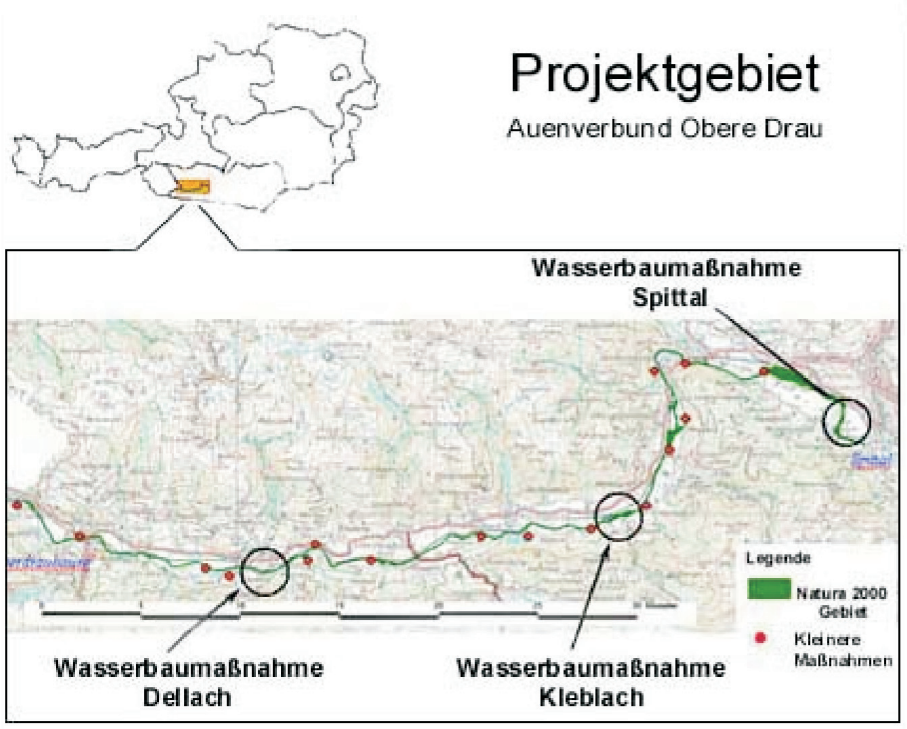
Partners: Federal Ministry of Agriculture, Forestry, Environment and Water Management, Nature Conservation Authority of Carinthia, WWF Austria

Budget: 6, 3 Mio Euro

Life contribution: 26%

Situation after restoration

The main objective of the LIFE project was to maintain and improve natural flood protection and the river dynamic processes and therefore to improve natural habitats and typical species populations. This was achieved through restoring three ecological "core zones" by river bed widening and reconnection of the former side-arm system with the main river of over 7 km of its length. An additional focus lay in the restoration of the natural floodplain forests, the protection of endangered species and the creation of a combined biotope system along the whole river valley.



Map 1: Life project area, 60 km river length (Water Management Authority of Carinthia)

The monitoring of the measures has shown positive results. These included:

- Better flood prevention: On 200 hectares natural flood retention capacity improved by 10 million cubic meters!
- Reduced flow velocity: The speed of the flood wave slowed down by more than one hour!
- River bed deepening stopped or even rose.
- More space: 50-70 ha more natural river habitats as river islands, gravel banks, steep banks for engendered species such as Danube Salmon, Common Sandpiper and Kingfisher created.
- Fish population doubled such as the greyling.

The Water Management Authority of Carinthia is currently working on a "follow up" project to restore other parts of the river.

There are three finalised or ongoing large river restoration projects in the Austrian Drava Basin. They aim at restoring the river dynamics by widening of the river bed and reconnection of the former side-arm system. Benefits encompass stopping of river bed deepening and improving natural flood protection and maintaining and restoring characteristic habitats and species populations. More than 12 Million Euros have been allocated incl. the support of the EU funds for work related to river restoration. One project is funded under Interreg IIIa (border Mura between Austria and Slovenia), the other under LIFE Nature (inner Mura in Austria).

LIFE Project „Wild river landscape of the Tyrolean Lech" [1]

The Lech in northern Tyrol is characterised by huge gravel banks and broad areas of lowland riparian forest. It is the last major river in the northern Alps that is in a semi-natural state. For over 60 km, the highly braided river occupies a gravel bed that in parts is up to 100 m wide. The course of the river is constantly changing due to erosion and deposition.

Situation before restoration

In the past, however, flood disaster and increasing pressure from human activities have led to river regulation measures which in certain sections have severely narrowed the riverbed. The construction of debris dams across small tributaries and growing exploitation of gravel from the river bed have also contributed to river bed deepening and the lowering of the groundwater tables. Particular the diminished river dynamics have caused a decline of endangered species characteristic for gravel banks including the German tamarisk (*Myricaria germanica*), the pink-winged grasshopper (*Bryodema tuberculata*) and the little ringed plover (*Charadrius dubius*).

Photo 4: Removal of a debris dam at the Hornbach (WWF A/H. Sonntag 2003)

The LIFE Project

Project period: 2001 – 2006

Beneficiary: Environmental Protection Authority of Tyrol

Partners: Federal Ministry of Agriculture, Forestry, Environment and Water Management, WWF Austria

Budget: 7, 8 Mio Euro

Life contribution: 50%

Situation after restoration

The main objective of the LIFE project is to restore characteristic habitats of the Lech River by widening the riverbed of over 6 km of its length. In the widened sections about 35 ha of new gravel banks are going to be created which increases endangered species populations. At the same time the supply of gravel to the main river channel is being increased by gradually removing the debris dams in the tributaries. This would mean using the ecological approach for stopping further deepening or even raising of the riverbed. The project is being accompanied by species protection as well as visitor management measures.

Photo 5: Ecological improved Lech River (WWF/A. Vorauer 2004)

LIFE Project „River Management of the inner river Mura“ [1]

Project period: 2003 - 2007

Beneficiary: Nature Conservation and Water Management Authorities of Styria

Partners: Federal Ministry of Agriculture, Forestry, Environment and Water Management

Budget: 2, 2 Mio Euro

Life contribution: 50%

LIFE Project "Restoration of the Danube river banks and the alluvial floodplain" [1]

Project period (2 phases): 1998-2003, 2002-2006
Beneficiary: National Park Authority Danube floodplains
Partners: Federal Ministry of Agriculture, Forestry, Environment and Water Management
Budget: 4, 6 Mio Euro
Life contribution: 46%

LIFE Project "Living Space for the Danube Salmon" [1]

Project period: 1999-2003
Beneficiary: Nature Conservation and Water Management Authorities of Lower Austria
Partners: Federal Ministry of Agriculture, Forestry, Environment and Water Management, WWF Austria
Budget: 3, 6 Mio Euro
Life contribution: 50%

Conclusions

Since the beginning of the 1990s, a paradigm shift in the management of several European rivers has taken place, a turn from "river regulation" and new hydropower dams to "river restoration". This has been initiated and promoted by new European legislation and financial incentives which have created a range of good examples of river restoration projects not only in Austria but in other European countries as well. Nevertheless, to fulfil the requirements provided by the progressive EU Water Framework Directive aimed at achieving "good ecological status" of all waters by 2015, more ambitious and large-scale restoration must be developed and implemented across Europe. Therefore, more than 70 Million Euros per year must be allocated for river restoration in Austria alone. Current examples of "best practice" are leading the way in the management of rivers, which accommodates both nature conservation and sustainable water management for the future of Living Rivers in Europe.

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