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A World Apart, But Far From Different - Stream and River Management in the Czech Republic.

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SUMMARY: As in any watershed ecosystem, the wetlands, floodplain forests and meadows act as the stabilizing factors of the hydrology and ecology of a river. During the last millennium, these areas, Czech rivers and streams have been heavily modified by humans. An ambitious state project, titled the "program of revitalisation of the river system" was initiated in 1992. Since then, about 905 000 000 Czech Crowns (approximately $AUS 49 460 000) has been spent. This program is concerned with the restoration of ecological functions in modified watersheds to protect soil, habitats and other natural functions of the river floodplains.

THE MAIN POINTS OF THIS PAPER

- Deterioration of the Central European watersheds is a historical process which has been occuring for more than one thousand years.
- Deterioration of watersheds has brought instability of the large riverine ecosystems.
- Assessment of the river revitalisation projects is a very complicated multicriterial process.
- The real results of the revitalisation projects will only be known after considerable monitoring and time.

1. RIVERS AND PEOPLE - A BRIEF HISTORY

The Central European agriculture civilization started to spread along the rivers. The first Slavic state in the region (Velkomoravska rise) was established in the floodplains of the rivers Morava, Vah, Nitra and northern bank of the middle Danube river (now in the Czech and Slovak territories). The settlements were concentrated around the small hills in the floodplains, surrounded by the rivers. These low-lying points were often flooded in past centuries.

Authors studying the historical hydrological regime and sedimentation declared that the floods in these times weren't as high as contemporary flooding. Better retention of the floodplains, longer river channels, more extensive wetlands and floodplain forest all contributed to minimizing flood peaks. The native models of this situation could be studied in eastern Europe where watersheds still existed with very small human activity. Here, fluctuations in water levels during floods were usually less than a meter. In regulated rivers, with watersheds impacted by human activities such as deforestation and agriculture, water levels could fluctuate several meters.

The impact of people on the landscape of Central Europe started at the beginning of this millennium, when the colonization of the lowlands continued up to the highlands. Deforestation and growth of arable land has brought the water fluctuations, soil erosion in the highlands and deposition of sediments into the floodplains downstream. This increase in sedimentation caused changes to the ecosystems of the floodplains, and was described on the Moravian river by Opravil, 1996. Historical information describing the river management (eg. building of the dams and mills) dates back to the 12th century.

During medieval ages, deforested watersheds caused larger floods and people in the river valleys have started to regulate rivers and build higher dams. These activities have brought about a lower retention capacity of the floodplains and, of course, high velocity water during floods in the valley.

During the last century, and the beginning of this century, the main technical regulations of the Czech rivers were completed (especially in the populated areas). Arable land and settlements were protected from small 20, 50 or 100 year likelihood floods. The technical rate of the flood protection was determined from the main hydrological characteristics, catchment area and rains in the watershed.

Higher floods could cause heavy damages to the arable land, roads, houses and expose people to danger. A big flood on the Morava river in July 1997 killed about 50 people. At the same time in Poland, about 60 people were killed on the Wisla and Odra rivers.

Discussion about the "illness" or "unstable" watersheds began during the last half of this century. Ecologists brought the first knowledge about soil erosion, decrease of the underground water supply, and the decrease of the floodplain and wetlands biodiversity. After the communist revolution, the stress of the landscape

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started to increase through the new industrial technologies imported for farming.

Since May 1992, after years of deterioration of the watersheds and floodplains on almostall of the Czech Republic territory, the new non-Communist government, brought in after the "Velvet revolution in 1989", decided to start the "Program of revitalization of the river system". This project was aimed at the restoration, stabilisation and management of the hydrological regime of the landscape on a wide ecological base.

2. RIVER REVITALISATION

The program of revitalization of the river systems was aimed at all the parts of the streams in the Czech watersheds. There seems to bee complicated to establish general objectives. Follow the general utility of the program were establish 7 basic objectives:

2.1 Basic Objectives

1. To support and enhance the water retention capacity of landscapein a given area.
2. To install a system for improvement of negative impacts of modified drainage and to limit impacts of poorly constructed drainage systems.
3. To restore natural functions of water streams and their beds (including the riverine growths and shelterbelts).
4. To remove poor stream regulations, to strengthen the resistance of riversides and riverbeds by natural means against erosion, and to ensure their stability during floods, through varied bottoms and riversides.
5. To support the self-purifying water capacity.
6. To stabilize the water levels.
7. To provide opportunities for biological revival and certain minimum flows.

2.2 Who and What is Involved?

An advisory committee of the Ministry is responsible for monies of proposed concrete projects. The local community, district authority or local Nature Conservation Authority could ask an Environmental Impact Assessement (fellow Act No. 244/1992) for large projects, or a Biological Assessement (fellow Act No. 114/1992) for smaller projects which could potentially impact upon reserves or localities of endangered species.

Assessement of revitalisation projects is concerned with such aspects as biodiversity conservation (including risks assessment and prevention of invasive organisms), landscape restoration, soil erosion and hydrological control in relation to landuse.

The keys for the project’s adoption are given mainly by the studies of the:

- historical development of the sites proposed for the revitalisation;
- actual stability of the ecosystems;
- social relationships; and

ownership’s relations(from „Velvet revolution“ in 1989 haven´t found all the owners of land yet).

2.3 Program Implementation

Implementation of the "program of revitalisation of the river system" consists of the following measures (Kender, 1995):

- restoration of natural river beds or creation of new, close to natural river beds.
- creation of elements enhancing morphological diversity of significantly ameliorated beds (while retaining their function), including the restoration of vegetation elements.
- restoration of hydrological regime of side branches of water courses, restoration of vegetation structure along the side branches of water courses, restoration and creation of new water reservoirs.
- biological, biotechnological and technological measures aiming for preservation of biologically valuable natural tracks of water courses.
- establishment, preparation or reconstruction of areas lacking riverine banks vegetation growths and other vegetation structures in the area.
- establishment and reconstruction of elements that promote ecological stability of the water regime.
- restoration of hydrological and spatial structure of wetland ecosystems (meadows, forests).
- creation and restoration of elements with water retention capacities in the area.
- changes in agricultural lands and forest growths, including erosion control and prevention.
- technological, biotechnological and biological measures aiming at protection and restoration of underground water supplies, including stabilising and protecting of infiltration areas.

2.4 Cooperation

The program is led and coordinated by the Nature Conservation Section of the Czech Ministry of Environment and cooperates with the Czech Ministry of Agriculture (leading other activities in the landscape restoration) and the Czech Ministry of Finance (controlling the economical right and effectivy of the projects). The projects are proposed by landowners, local governments, communities, local Nature Conservation Authority offices, private building firms, research teams (Universities, Academy of Sciences), Environmental NGO´S, fishermen and trappers.

Sometimes the projects are made by groups of people interested to the same aim (stakeholders). In some cases the private consultancy firms help the landowners or community representatives to propose the projects and receive the money.

3. PRACTICES AND RESULTS

Practical outputs of the projects included into the "program of revitalization of the river system" are very different.

One extreme issue is the technical rebuilding of the artificial river channels stabilised by concrete prefabricates along the "soft" channels. Such revitilisation is far from reestablishing the full natural river characteristics.

In other cases covered by this program, wetlands have been restored or established, ponds hundreds of years old have been restored, and old native river channels have been reestablished. It seems the projects advanced by the Nature Conservancy authorities (National Parks, Landscape Protected Reserves) are aimed at biodiversity conservation.. Some of these projects were situated in the Ramsar site wetlands (Tøeboòsko, Litovelské Pomoraví) which helped to conserve the nature and biodiversity of the revitalised wetlands and parts of river ecosystems.

The projects proposed by the river authorities, cities and communities are mostly aimed at flood control and supporting drinking water sources. Since the catastrophic floods in summer 1997, emphasis is given to the combined projects of nature conservation and flood control (Anonymous, 1998). Some projects proposed the multipurpose areas flooded during heavy flood events as the polders decreasing the flood velocity. The areas could be used for an extensive farming and forestry only with priority use as the wildlife refuges. The effects of these projects will be evaluated during the coming years.

4. CONCLUSIONS

It would be too optimistic to say that all the projects hold all of the aspects proposed in the program objectives. Some of those concerning the technical criteria leave out the ecological aspects. The future of revitalisation seems to depend on the objective assessment and good work of the environment mangers in the government as well as on the economical success of Czech Republic.

Any realised revitalization project brings potential goals as well as risks. Real impacts of each revitalization projects to the river and watershed ecosystems stability could be known after the long term research. Objective knowledge would bring the exact monitoring data only.

Since the program was passed by the Ministry of Environment, about 905 millions of Czech Crowns (about $AUD 49 million) has been spent. See table 1 for details on the annual state funding and number of projects supported by the "program of river revitalisation". These costs exclude the contributions to projects from private landowners and communities

Table 1. **Program of the "Revitalisation of the River Systems" overview** (Macháèková 1998, Novotná 1997)

Year	Realized projects	State sponsorship	
		Kè	AUD
1992	24	17 977 000	982 000
1993	88	62 874 000	3 436 000
1994	100	129 900 000	7 098 000
1995	163	213 622 000	11 673 000
1996	216	250 000 000	13 661 000
1997	167	230 755 000	12 610 000

The level of economical support of the revitalisation projects is directly related to the economical situation of the Czech Republic. In the future this is not likely to change, and the future of the "Program of revitalisation of the river stream" will depend on the economical situation of the Czech Republic.

To improve the survival pf the program, hopefully the benefits of these projects can be successfully measured and promoted, and that the interest of the stakeholders will continue.

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