

## More room for water

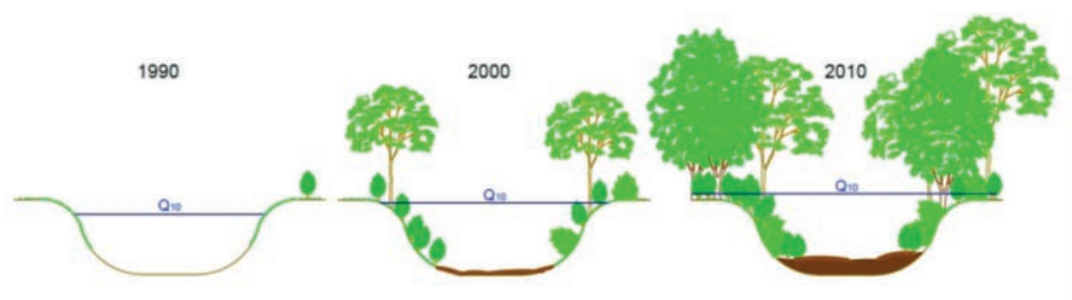
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Watercourses are among the basic natural phenomena that characterize the environment. On the one hand, the water regime limits the anthropogenic use of space; on the other hand, it enriches landscape. The problem of allowing the space that ‘belongs’ to water to be used for intensive anthropogenic uses has been dealt with by the oldest known civilizations. With the growing population, industrialization and urbanization, the inundated areas and wetlands have been consumed and, through river engineering, watercourses have been regulated such that the space belonging to water has been reduced. Since ancient times, and more intensively from the mid-19th century, riverbeds have been shortened and narrowed, and levees have been built for flood protection; this resulted in the serious reduction of flood plains and wetlands. The surfaces ‘taken’ from rivers were intended primarily for agriculture and urban development. The middle of 19th century saw the emergence of such regulation works on the Rhine River, and in the first half of the 20th century, in the United States (de Bruin 2005 and Cassidy 1962). Similar developments occurred worldwide. After World War II, the Netherlands greatly increased its arable land by polder development, land that has been taken from the lakes and rivers (Tol and Langen 2000). A similar situation occurred in Denmark, the United Kingdom, Belgium, Germany and France, where such works were developed from the late 19th century. At the end of the 20th century, many rivers in Europe were in highly confined channels.

The situation was similar in Slovenia. Major projects and developments on the Mura, Drava, Sava and Ljubljana rivers were carried out in the first half of the 20th century. In the second half of the 20th century, we dealt mainly with drainage of agricultural land. A special levy was introduced to compensate for agricultural land in construction. The collected funds were available for agricultural land management and supported the implementation of water management projects, such as the regulation of the Ljubljana Marshes, the Pesnica River and the Vipava River.

Twenty years ago the maintenance of embankments of regulated natural watercourses was brought to a halt, and the new practice was seen as eco-friendly maintenance of watercourses. Many river banks were overgrown with bushes and the space for water was only further reduced. In some places, the vegetation in the narrow channels completely obscured the surface of the water (Fig. 1). The serious damages due to the recent floods and, last but not least, fatalities, are the price that we pay today; examples are the floods of the Gradaščica and Vipava River in 2010. To make matters worse, the pressure on the water land is increasing in urban areas. A particular problem is the culverting of streams for urban purposes. It is ecologically extremely inappropriate; open water disappears from the environment in which it can only be enriched. Channels are diverted and small streams are put in culverts, despite the requirements of the Water Framework Directive. Water land which was often flooded is now occupied by roadways and parking lots.



**Fig. 1** Consequence of overgrowing vegetation.

This situation will be further aggravated by the expected impact of climate change. The study prepared for the Sava River Basin Commission revealed that the 100-year return period discharges will increase to 10-year return period discharges until the end of this century (Brilly *et al.* 2014; Fig. 2).

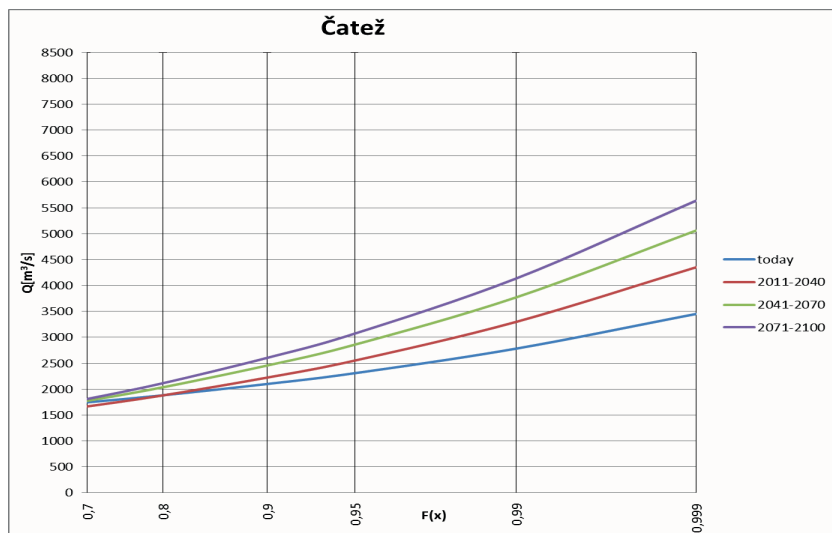


Fig. 2 Climate change impacts on probability curves of Water Station Čatež on the Sava River.

Today, developments in urban water management should allow increase of the room for water and, moreover, give back to the river at least some of the space that it once possessed. An important European project on this topic is underway in the Netherlands entitled 'Room for the River' (Klijna *et al.* 2013). The project, worth several billion Euros, covers 30 locations along the Dutch rivers. Similar activities are being carried out in other European countries, and also in the USA.

A narrowing of the riverbed typically increases sediment transport, while a deepening of the riverbed causes a drop of in-stream water level. Consequently, this causes a drop in groundwater level and a decrease in groundwater storage. Indeed, for some time, the reduction of wetlands and groundwater recharge areas has affected groundwater. These areas and processes need special attention and actions to reclaim the space for water purposes.

In addition, the area next to the stream should be regulated in a people- and environmentally-friendly way. In water management today, problems are actually accumulating, rather than being solved. To address the issues, the Slovenian water associations held the 1st Slovenian Congress on Water and adopted a declaration: [http://ksh.fgg.uni-lj.si/kongresvoda/Deklaracija\\_kongresa.pdf](http://ksh.fgg.uni-lj.si/kongresvoda/Deklaracija_kongresa.pdf). Since 2013, the Slovenian Committee of UNESCO IHP has taken part in the activities focusing on the campaign 'More Room for Water'. The activities of 'More Room for Water' satisfy the requirements of both the EU Flood Directive and the Water Framework Directive.

## REFERENCES

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