Wooden cribwall on Slovenian water courses

SedAlp Pilot Area - Torrent Bistričica

Papež, J.[1], Repnik Mah, P.[2,3] Krivograd Klemenčič, A.[2]

[1]Hidrotehnik, d. d., Slovenčeva ulica 97, 1000 Ljubljana (joze.papez@hidrotehnik.si)
[2]Inštitut za vode Republike Slovenije, Hajdrihova 28 c, 1000 Ljubljana (aleksandra.krivograd@izvrs.si)
[3]Slovenian River Restoration Centre, Hajdrihova 28 c, 1000 Ljubljana (petra.repnik@izvrs.si)

INTRODUCTION - Wooden cribwall through the time

Wooden cribwalls (Kranjska stena in Slovene, Krainerwand in German) are very old technique used mainly for protecting slopes against surface erosion and rivers against river erosion. It is well known that these structures were constructed in Kraina (Slovenia) already back in 1700 (Florineth et al., 2002), from where also the name of technique origin (Schiechtl in Stern, 2002, Urbajs 2010, Rhein-Zeitung 1996). Extensive construction of wooden cribwalls was present till 1970s when concrete constructions for the most part replaced this old technique. Nevertheless construction of wooden cribwalls have never been discontinued in hard accessible parts of watersheds, where constructing with mechanisation is impossible.

Nowadays there is evident increase of wooden cribwalls construction, also due to the fact, that river engineering works has to be harmonised with environmental needs, landscape planning and socio-economical demands. Technique in general stays the same through the time - particular stages of construction are improved or simplified, what represent higher applicability of wooden cribwall on the terrain. There were built numerous wooden cribwalls in Slovenia, especially in the Alpine region, where this technique is recognized as very appropriate for river (torrent) erosion protection.

Wooden cribwall - river engineering good practice

Wooden cribwall is recognized as Slovenian river engineering good practice, due to the fact that is has *good hydro technical characteristics* (resistance to shear stress during flood events, resistance over time, enable percolation, adaptable to terrain characteristics etc.), *high coincidence with landscape* (in mountainous / hilly region), *low negative impact on environment* (in case of vegetated wooden cribwall with autochthon plants, adapted to natural channel characteristics and bank slope, enabling lateral connectivity between channel and riparian zone etc.) and *high socio-economical value* (improving the value of human environment, strengthening of region characteristics by using local materials, compatibility with recreational and tourism activities, representing cultural and technical heritage, acceptable cost of construction and maintenance).

Wood, stone, specially the one obtained from the torrent - beds, and the combination of the two, are preferred materials not only from aesthetical, but also from the functional and rationality point of view. The energy consumption for building with wood and stone is much lower than that with concrete, steel-concrete or similar materials. If we consider that concrete cross-sectional structures last 4 times longer than those made of wood, the energy cost for building wooden structures is still 4,2 times lower (Hitsch in Weinmeister, 1992). It is clear that the aesthetical and functional point of ecologically sound building materials are not in conflict. Wooden cribwall will be promoted as river engineering good practice also within project SedAlp. Within the project wooden cribwall will be built on the Torrent Bistričica.

Wooden cribwall – Intangible Cultural Heritage of Slovenia

Wooden cribwall is symbol of traditional river and torrent engineering in Slovenia and represents technical and cultural heritage. It was and still is strongly connected with people that work and live with rivers. Therefore wooden cribwall was included in Register of Intangible Cultural Heritage in 2013. Wooden cribwall in general represents connection between knowledge and experiences form the past with demands of contemporary society in the future.


Figure 1: Wooden cribwall on the Sava Dolinka River


Figure 2: Wooden cribwall on the Savinja River


Figure 7: Cribwalls on the Torrent Čerinjščica


Figure 3: Wooden cribwall on the Torrent Kolovec


Figure 4: Building of wooden cribwall on the Pšata River


Figure 5: Wooden cribwall on the Sava Bohinjka River

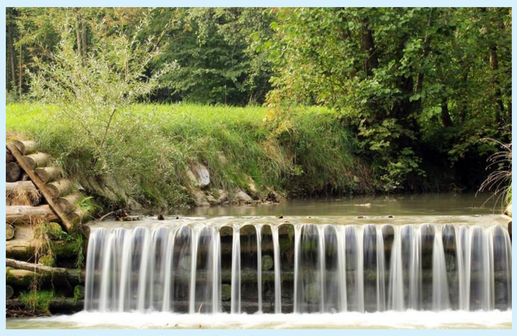


Figure 6: Wooden cribwall on the Pšata River


Figure 8: Natural check-dams - source of idea for the wooden cribwalls?


Figure 9: Building of wooden cribwall on the Pšata River

SedALP PROJECT PILOT AREA - TORRENT BISTRIČICA

Integral and environmental friendly Torrent & Erosion Control in Slovenia

Figure 10: Location of Bistričica

Slovenia faces different forms of erosion, among which water erosion is particularly significant. The most significant are torrent outbursts, extreme sediment transport and debris flow events, landslides, rockfall and avalanches. 44 % of the area is potentially at risk by erosion, one third of the area is considered as unstable or conditionally stable. Almost one quarter of Slovene territory are torrential watersheds, where the erosion phenomenon can obtain larger dimension and cause major damage when precipitations are intensive.

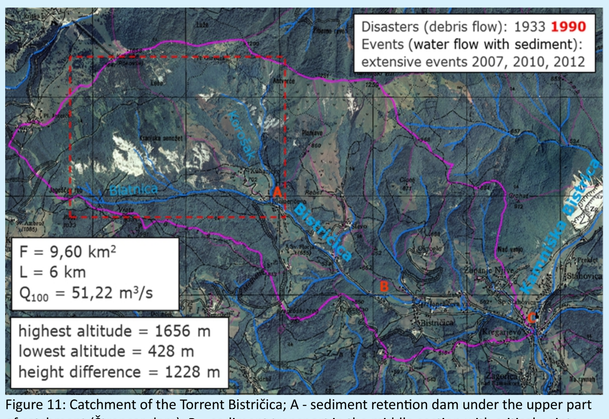


Figure 11: Catchment of the Torrent Bistričica; A - sediment retention dam under the upper part of catchment (Štrancar dam); B – sediment transport in the middle section with critical points; C – inflow in river Kamniška Bistrica

Integrated water management begins in torrent catchments. Bedload transport control is successfully carried out by correctly positioned and designed consolidation and retention structures. These structures are generally integrated in a system and therefore their functions are interactively supplementing. Since the beginning of the organized torrent control in Slovenia in 1884 (1875), quite a lot of work has been done, and safety from erosion and torrents has been substantially improved. The standard of design and execution of construction torrent control works was continuously improved, by means of new knowledge, new materials and new technology of works. The majority of torrent control structures have been actually constructed on proper locations, taking into consideration also the best possible way of their integration in the landscape.

The torrent control management still faces numerous tasks, in spite of the extensive control and management work conducted in the past. In the control and management of torrent and erosion areas we should always be aware that we are managing them in a complex way, taking into account, technical, biotechnical, agro technical and legislative measures. Especially technical antierosion measures are those, that could have negative environmental impacts. We should use them very selectively on the areas, where erosion processes are concentrated or where they are progressively advancing. Environmentally adequate cross-sectional structures consider visual (aesthetical) and functional aspects. The visual aspect is always associated with the functional one and at the same time subordinated to the former. Stone and wood are ecologically sounder materials (e.g. wooden cribwalls). Cross-sectional structures can be specially designed as to stir water flow, provide favorable conditions for water life, allow fish migration, etc. Such considerations however, must not affect the strength and the stability of the construction.

Increased number of weather extremes are causing increasing number, frequency and intensity of natural disasters, and because of the economical development, the consecutive damages are getting proportionally bigger. The significance of maintenance and modernization of the existent torrent control structures is therefore getting larger. Only well maintained torrent control structures and systems can perform the required function.

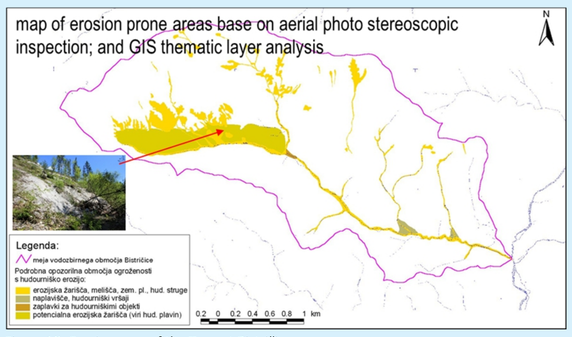


Figure 12: Erosion map of the Torrent Bistričica

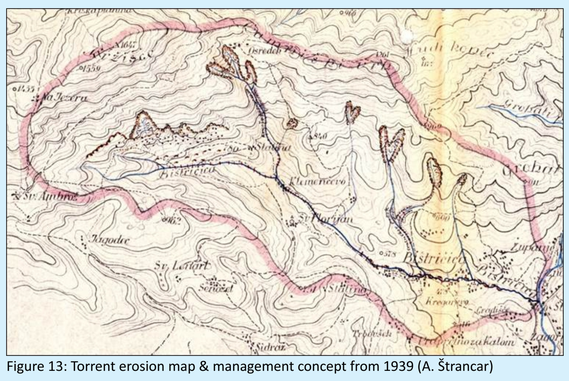
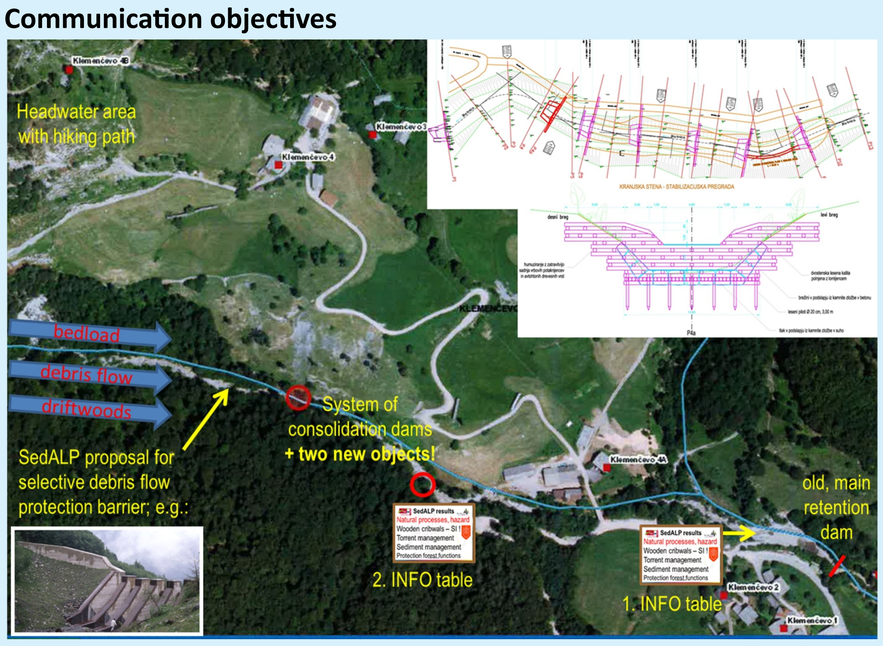


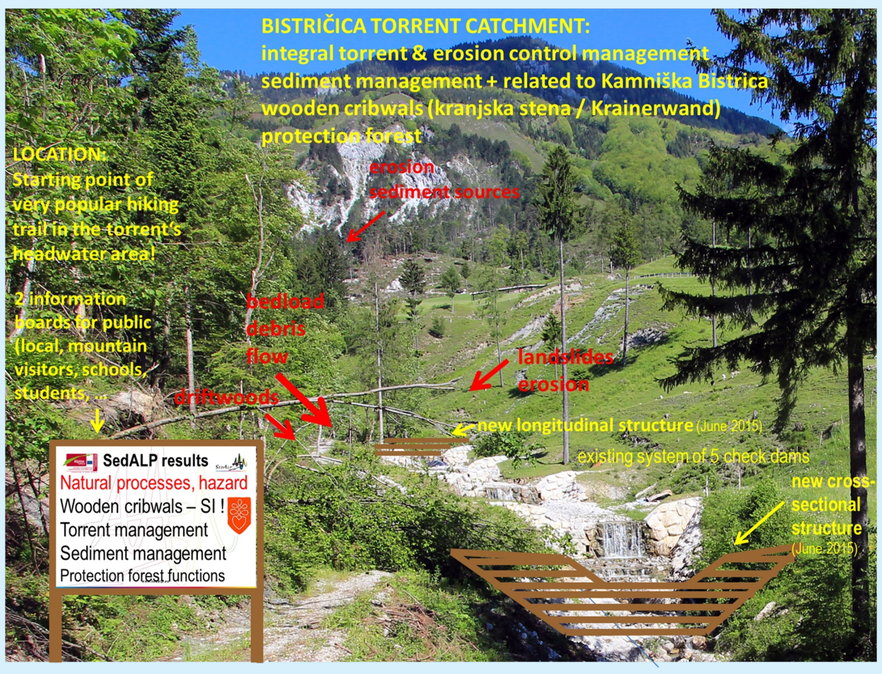
Figure 13: Torrent erosion map & management concept from 1939 (A. Štrancar)

We have to pay more attention to systematic measuring and analyzing of magnitude and frequency of sediment transporting events in Slovene torrents. Because of the obvious non-maintenance of the larger number of torrent structures, Slovenia will have to assign a larger share of funds to their maintenance and increase the share of funds for prevention measures afterwards, to preserve the balance conditions in torrential catchments. Weather extremes could become even more frequent, and the time for catching up the earlier lack of maintenance measures is running out.

WATER MANAGEMENT PREVENTIVE MEASURES & DISSEMINATING of SedALP results: „Wooden Cribwall on SedALP test bed Bistričica torrent“ - finalisation till the end of the June 2015

Communication objectives





- Environmental-sound structural protection measures for benefits of local inhabitants and visitors (protection of local infrastructure)
- Raising awareness of general public & local/regional stakeholders for the importance of integral torrent / sediment management
- Informing about the added-value of transnational cooperation in the field of water, sediment & natural hazard risk management (results of SedALP partnership)
- Informing about the proceedings, outputs & results (e.g. data, methods, experiences in pilots)
- Informing other projects & interested Association, Initiative on the SedAlp activities & supporting exchange of information & usage of synergies
- Informing and training of esp. young water/torrent experts
- Target groups: local, regional, national stakeholders (e.g. politicians), ministries, government, general public, experts, NGOs, media (print, radio, tv), authorities, administration, other projects and programmes & the EU, schools, university etc.

Project: Implementation of two wooden-cribwalls & SedALP info tables:
Initiative of the project: SI SedALP partner PP12:
Institute for Water of the Republic of Slovenia (IzVRS) & HIDROTEHNIK
Operative financing: **Kamnik community** & **„Si.voda“ Fund** (donation)
Designe financing: **Ministry & Slovenian Environment Agency** (ARSO)
Expert support (info tables): SedALP PP12 **IzVRS & HIDROTEHNIK**