

Large wood and sediment retention in the Rienz above the city of Bruneck (South Tyrol)

Sandro Gius, Phd.¹; Martin Moser, Phd.¹; Bruno Mazzorana, Dr.¹; Sabrina Margarete Horak, Phd.¹

INTRODUCTION

Numerous flood events in the past, caused by the river Rienz (catchment area: 640 km²), which determined considerable damages, have been documented in the area of Bruneck South Tyrol, Italy.

In the context of the EU Project „Wood and sediment retention structures upstream of Brunico“, was carried out a research regarding the assessment of potential large wood and sediment and the necessary constructions as protection measures against them.

A hydroelectric reservoir is located in Welsberg 10 km upstream. Due to its low capacity, it's not able to reduce sufficiently the flood peaks of extreme events along the river Rienz. Even an underground bypass solution around the settlement of Bruneck would be extremely expensive.

A specific study (Comiti et al., 2009) put in evidence that for the retention of transported large wood (estimated volume: 7.000 m³) and sediment (approx. 180.000 m³) downstream of the reservoir, a site-specific combination of protection elements would guarantee an optimal risk mitigation performance for a return period of 300 years.



Figure 1. The picture shows from above the large wood retention check dam at Perca just upstream the gorge, with the re-established river continuum, crucial for fish migration.

THE FLOATING LARGE WOODS RETENTION STRUCTURES

A 2 km long incised stream segment of the river Rienz, used mainly as a recreational area, is located directly upstream of Bruneck. Two relevant aspects have to be considered jointly: (I) the need to preserve this area due to its intrinsic public and landscape-aesthetic values, and (II) the peculiar geomorphic characteristics with very low retention propensity with respect to transported wood and sediments. Instead, toward the upstream end of this segment the river plan form (approx 2 km river length) naturally favours deposition of the transported sediments due to relatively low flow velocities.

An open check dam with wood retention function was conveniently built where the river plan form changes from comparably wide to narrow and incised with the objective to meet two fundamental requirements: (I) the spatial separation of sediment and wood in the retention area and (II) a convenient distance from the main settlement areas (i.e. city of Bruneck).

Downstream of the structure the continuity with respect to fish migration was re-established by removing an old check dam (height of 6m) adapting the longitudinal profile accordingly. Whereas the river bed was lowered in the upper part, in the lower part the stream bed was raised by 4 m along a segment of 200 m with respect to the original setting, thereby establishing an average slope of 3,5%. Through an irregular insertion of big cyclopic boulders in the bed river (up to 10 t/ stone) it was possible to provide stream bed stability and morphological variability with irregular forms shaped by stones (up to 1 m).

To check also the large wood (ca. 1800 m³) generated in the whole incised river segment directly upstream of the city, a cable-filter dam (ca. L=50 m, H=7 m) was built.

The decision for this type of structure was made for its good integration into the existing landscape.

After the conclusion of the construction works - apart from riparian stabilization - the cable structure itself is slightly visible.

The two abutments made of concrete, on which the steel cables are fixed, are anchored through 18 anchorages (Ø75 mm) with a length of 21 m in the hillside.

The described structure doesn't interrupt the river continuum. The vegetation and the riparian forest can be left untouched in the future, and therefore regular thinning as flood protection measure might become superfluous.

Both structures and part of the project expenses were financed through the European program for the promotion of the regional development (EFRE 2007-13) with a total budget of € 2.600.000.

For the shaping river morphology, but also for unscheduled geological difficulties during the securing of the construction site, expenditures of further € 450.000 arose.



Figure 2. The picture puts in evidence the great landscape compatibility of the cable-filter dam

KEYWORDS

large wood and sediment retention; Flood control; two-stage structure; debris; cable-filter dam

1 Autonomous Province of Bozen-Bolzano, Bolzano, ITALY, sandro.gius@provinz.bz.it

CONCLUSIONS

With the solution of the issue concerning retention of large wood and sediment it is now feasible to achieve flood protection by a moderate adjustment of the discharge capacity of the river through the city of Bruneck.

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