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Alpine Rhine: Sustainable flood protection measures between the levees

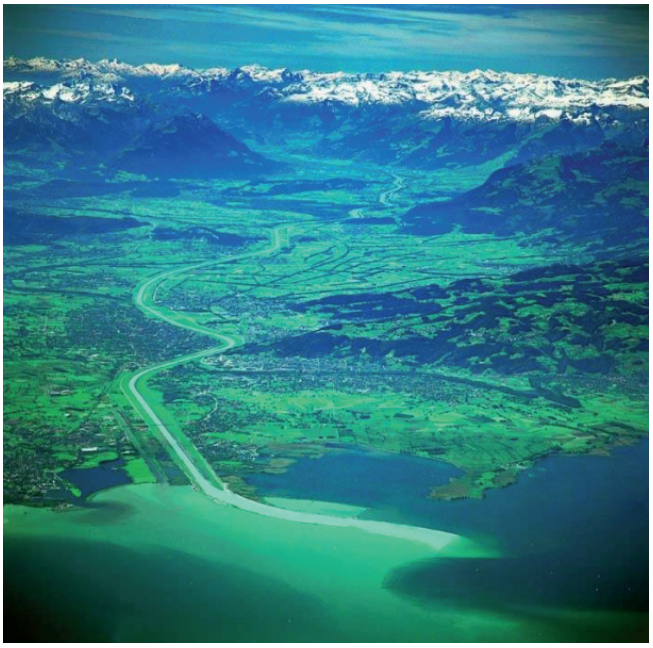

Fig. 1: Lower section of the regulated Alpine Rhine. The settlements extend to the edge of the 19th-century flood protection dams.

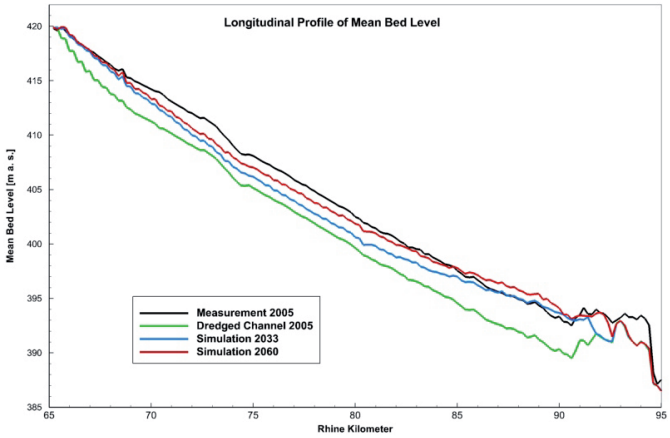

Fig. 2: Longitudinal profile of the development of the mean bed level in the lower stretch of the Alpine Rhine.

The safety against flooding along the lower reach of the Alpine Rhine River should be improved taking into account the concerns of ecology, water supply and recreation. Today, measures to improve the situation can only be realized in between the existing dykes because the settlements extend to the edge of the 19th-century flood protection dams (Fig. 1).

In a feasibility study, various measures were evaluated based on numerical modeling. The main focus of the study was on the sustainability of individual measures, i.e. how they affect the long term development of the bed level of the Rhine River and therefore the flood safety. Due to the actual boundary conditions, the higher protection objective can be achieved only by increasing the dams, by widening the main channel or a combination of these measures.

The numerical simulations which were based on the VAW software BASEMENT show that the bed level of the Rhine River cannot be kept stable without sediment management. With the exception of dyke raisings, all structural changes affect the development of the bed level and therefore also those of the groundwater table.

As an example for the results Fig. 2 shows the predicted development of the mean bed level for one measure variant. In this case the flow capacity of the river was increased by a lowering of the bed level of the main channel. Starting with a bed level which was assumed to be excavated by 3 m compared to the bed level in the year of 2005, the river aggraded continuously over the years to its initial state. Thus, this measure turned out to be not sustainable and therefore would certainly not be realized.

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