

Sustainable sediment management for hydropower: Results of the CD-Laboratory “Sediment research and management”

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ABSTRACT: It is predicted that 60% of all new energy investments over the next 20 years will be in renewables. The estimation for new hydropower production is 25% of all new renewables primarily due to potential in China, Africa, Latin America and South-East Asia. Also in Europe, a growth of hydropower production is aimed to achieve emission targets within the European Union by 2050. However, one of the main economic, technical and ecological challenges in future are the deposition, the treatment, and the disturbed dynamics of sediments in river catchments, which reduce the future market potential of hydropower significantly. Due to a lack in awareness of those sedimentological challenges (e.g. lack of process understanding), various huge economical, technical and ecological problems emerge with an increasing relevance for hydropower industry, water management authorities and the society in future.

The CD-Laboratory “Sediment Research and Management” aims to establish and preserve the long-term use of reservoir capacities, and a long technical lifespan of various plant components, such as intake channels, pumps and turbines. Moreover, the preservation of given flood protection (due to reservoirs) like peak flow retention and the important flood storage capacity will be targeted. Module 1 aims to improve the economical, technical and ecological standards for hydropower use. Module 2 focuses on the improvement of the sediment management for industrialised rivers, and Module 3 targets to achieve a long technical life span of various plant components. However, all these issues will be addressed within the framework of the overall aim to minimize the costs in future by improved sediment management in alpine regions and industrialized river catchments. Based on the determination of the state-of-the-art engineering practice, basic research is conducted concerning erosion, transport, sedimentation and remobilization of bedload and suspended load sediments. Here, a combination of both laboratory (e.g. flume experiments, physical models) and field studies (e.g. monitoring of reservoir flushing) on different scales (μm – catchment) enable an improved process understanding. Moreover, based on the development or adaptation of hydrodynamic-numerical models and monitoring techniques (e.g. seismic profiling), advanced tools are provided for the national and international hydropower industry.

The outcomes of this CD-Laboratory provide new standards for technological, ecological and economical optimization of hydropower management and novel aspects for a sustainable sediment management in industrialized rivers based on (i) advanced process understanding, (ii) environmental impact assessments, and (iii) the development of new monitoring / modelling technologies. Further it is targeted the results from the CD-Laboratory “Sediment Research and Management” in strategy plans, guidelines, manuals, natural water safety plan and into laws, and a significant contribution to a consistent Austrian strategy concerning the future sediment management in surface waters, in cooperation with all federal groups working in the field of mountain- and hydraulic engineering.