

STEEP STREAMS

Solid Transport Evaluation and Efficiency in Prevention: Sustainable Techniques of Rational Engineering and Advanced Methods

The recent increase in intensity and frequency of meteorological and hydrological events in mountainous areas is recognized as one of the effects of climate change. Extreme meteorological events endorse hydrological extreme events in steep channels, like flash floods, intense bed load transport, debris flows, and driftwood. Conventional defence works and their design criteria currently in use are erratic to ensure sufficient protection to human life and urban settlements. For this reason, new approaches need to be studied. The STEEPS STREAMS project aims at researching structural innovative solutions and design criteria reliable to mitigate the impacts of flash floods and debris flows especially in presence of intense woody material transport, typical of mountain catchments. Given the growing increase of the risk conditions and the increase in urbanization of these areas in the European context, a rigorous study approach is needed. The study approach envisaged by this project is the following:

Analysis of the correlation between climate change and the increasing in intensity and frequency of extreme events on the small catchment in mountain areas, by highlighting the consequences for the environment, such as changing soil conditions, vegetation, the effects of frost and thawing, in order to define more certain design conditions as regards the liquid and solid flow and the driftwood.

Development of a mathematical model capable of simulating the transport of liquids and intense solids flows, even in the presence of plant material.

Development of rational criteria of the mitigation remedial and defence techniques for the prevention and risk management related to extreme events in mountains area, like debris flow and intense bed load transport, associated with the driftwood. In particular, the development of innovative rational approaches to the design of the defence structures, but with innovative solutions in order to operate a lamination of the solid material and of the wood material separately.

Assessment of the tools developed with physical model, mathematical model and at real scale. The outcome of the project is the application of innovative rational criteria for the mitigation, prevention and risk reduction against extreme events. Criteria are adapted to the particular conditions of mountain areas and account for the effects of climate change.

The output of STEEP STRREAMS will consist in scientific publications and in a guideline for the prevention, risk management and risk mapping against extreme events of solid transport in steep stream of mountain areas in Europe, developed accounting for the effect of climate change. The project also aims at starting a collaboration between researchers and practitioners also belonging to different disciplines, like meteorology, climatology hydrology, hydraulic engineering forestry engineering, including the research fields of sediment transport and of wooden transport in steep streams.