

Research project proposed by: Nicola Surian

Title: Fluvial sediment dynamics in a changing climate and environment

Outline of the project proposal:

Notable variations in sediment regime have taken place in most of Italian rivers over the last few decades, causing widespread channel incision and narrowing (Surian et al., 2009). Even though this alteration of sediment regime has been documented and considered as a key factor of channel adjustments, there is a limited knowledge on the different causes of alteration and on the present and future responses of fluvial systems to this alteration. Only in few cases links between sediment production processes in the catchment and corresponding alluvial channel changes have been studied in some detail (Liébault et al., 2008; Ziliani and Surian, 2012).

Analysis of sediment dynamics, that is of how sediments are transferred from slopes to stream channels and through the fluvial network, and estimate of sediment transport are key issues to understand functioning of fluvial systems. The general objectives of this research proposal are: (i) a better understanding of sediment dynamics at the catchment scale, especially of coarser material; (ii) identification of the most efficient techniques to analyze sediment dynamics; (iii) assessment of evolutionary scenarios of river catchments in relation to sediment dynamics.

The specific objectives include:

1. Identification of sediment sources, quantification of mobilized material, and evaluation of connectivity between such sources and stream channels.
2. Quantification of the metrics that characterize bedload transport (e.g., entrainment conditions, transport rates, travel distances) at the event and the annual time scales.
3. Characterization of the study reaches in terms of sediment budgets and channel evolutionary trends (i.e., aggradation, equilibrium, and incision).
4. Documentation of the overall sediment cascade at catchment scale, through reconstruction of sediment fluxes from upland source areas down to debris flow-dominated channels and fluvial reaches.
5. Development of possible future scenarios. That is, the formulation of qualitative and quantitative predictions of drainage basin response to climate and/or anthropogenic changes of sediment production and/or transport regimes.
6. Appraisal of the most efficient techniques for assessing drainage basin sediment dynamics in relation to the quality of available data, and evaluation of the potentials and limitations associated with the integration of different methodologies.

Collaborations: CNR-IRPI (Padova and Torino); University of Bolzano; IRSTEA (France)

Available funds:

- research contract with CNR-IRPI (2015-2016)
- ex 60% funds