



## **Reno river and tributaries monitoring programme to assess soil erosion and surface water status in experimental basins at different scales**

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The main purpose of the Reno monitoring programme is to estimate suspended sediment loads analysing catchment dynamics, assessing the physical/chemical properties of suspended sediments and relating them to the driving hydrological processes and agricultural practices. The programme started thanks to Reno Watershed Authority but year by year many partners have been involved, like ARPA (Regional Agency for Environmental Prevention), CER land reclamation society, local government bodies and Renana Land Reclamation Society.

In the year 1996 a hydrologic, turbidimetric and geochemical monitoring programme was set up concerning the river Reno and some of its main tributaries. The catchment of the river Reno belongs to the Regions of Emilia-Romagna and Tuscany, Italy. The lito-geomorphological arrangement of the Apennines makes these mountains highly exposed to hydrological hazard and, along with the high intensity of precipitations, is responsible of the fast dynamism of this territory. Thus according to the interest in sediment dynamics, gauging stations were built at the mouth of the Reno river (4139 km<sup>2</sup>), at the outlet of the mountain basin of three of its tributaries, the Sillaro (139 Km<sup>2</sup>), the Lavino (83 Km<sup>2</sup>) and the Savena (124 Km<sup>2</sup>), and at the outlet of the minor Gaiana torrent (8.7 km<sup>2</sup>). Each monitoring station is equipped with an ultrasonic flow meter, interfaced to an automatic pumped sampler. The gauging devices measure and store water stage each 30 minutes and compute the water discharge via a rating curve, so that flowed water volume can be computed in real time. A sampling strategy was defined so to instruct the automatic sampler to collect a sample of sediment yield every 50-100,000 m<sup>3</sup> of water crossing the section. The threshold value is set according to

the flow regime occurring during the season. All gauging devices are equipped with a GSM tool allowing for remote querying of the measured data.

Rainfall inputs are estimated for every catchment through the Thiessen polygons method and rainfall data are provided by ARPA. Both rainfall and discharge data are measured and calculated with a half-hourly frequency, and they are then merged into the programme database together with suspended sediment yield data, turbidity data, total nitrogen data and grain size and geochemical information.

The monitoring project can also benefit of other data than those directly produced by the programme itself for all of the monitored sites, namely Digital Elevation Models, land covers information, erosion and geological instability maps, aerial photos and satellite images. Data are currently analysed and processed through GIS tools in order to generate new information.

As the database expands, available data are being used for research purposes, such as verifying the existence of relationships between suspended sediment yield, hydrological parameters and rainfall erosivity indexes, or researching predictive models in the field of soil erosion processes. Along with sediment budgets within a hydrographic catchment, the issue of the high content of nitrogen and phosphorous compounds in rainfalls and river sediments is being investigated. Systematic field data collection and already available data analysis, focusing on chemical and geochemical composition of the solid and liquid fractions of river water samples, allow to estimate the quality of river network in relation to the role of sediment transport, and therefore of soil erosion in agricultural lands, within the nutrients transport.

Collected data are also shared with affiliated Bodies, such as ARPA that uses flow data to perform minimum flow analysis on some of the monitored rivers; this being only an example of how research purposes and practical applications might benefit of the same project.