Linking E-Flows to Sediment Dynamics: REFORM Stakeholder Workshop in Rome, September 2015

River infrastructure that changes the flow regime can have severe effects on hydromorphology and ecosystems. Specifying environmental flows (e-flows) to address these impacts is a key strategy for maintaining functional river processes and ecosystems and to reach the environmental objectives of the European Water Framework Directive 2000/60/EC (WFD).

The Common Implementation Strategy (CIS) guidance on ecological flows identifies a series of overall key indications to tackle some critical aspects linked to the management and restoration of water bodies affected by hydrological pressures. Among these, the guidance suggests to **consider sediment dynamics and river morphology together with hydrology and hydraulics in order to determine e-flows**.

The links of sediment dynamics to e-flows were discussed by a panel of international experts from relevant agencies and academia during the REFORM workshop organized by ISPRA (the Italian Institute for Environmental Protection and Research) in Rome on 9-10 September 2015. The aim of the workshop was to agree on a common approach to specify efficient e-flow based measures that consider river sediment dynamics and morphological evolution, in order to supplement the CIS guidance on e-flows. The discussion could draw on the newly developed REFORM multi-scalar and process-oriented framework since it is ideally suited for tackling hydrology-sediment relationships.

Workshop structure and content

During the first day the invited speakers gave an overview of the relevant EU activities (REFORM, WFD CIS working group on e-flows) and highlighted the critical aspects related to e-flow specification (role of sediment dynamics, biological response to hydrological and morphological pressures). The latest results from scientific activities and from experimental implementations of e-flows were also presented. In particular, Dr. Nikolai Friberg (NIVA, NO) illustrated the variable and weak response of metrics on biological quality elements to flow alteration, and the possible alternative indicators and methods. Prof. Gordon Grant (Oregon State University, US) evidenced how water flows and sediment flows are interdependent, and how actions on one aspect will inevitably affect the other. Moreover, Prof. Grant underlined how a multiscale process based approach, like the framework developed in REFORM, is needed to understand river processes.

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Figure 1: REFORM Stakeholder Workshop on Linking E-flows to Sediment Dynamics, Rome (photo: Attilio Castellucci, ISPRA).

The case of the Mediterranean context was presented by Prof. Diego García de Jalón (UPM, ES), given that in the Mediterranean context the combination of pressures and water availability issues makes vegetation play a critical role, with permanent encroachment affecting channel morphology and dynamics.

Innovative approaches to e-flow modeling at the mesohabitat scale, consistent with geomorphic taxonomy as developed in REFORM, were presented by Dr. Paolo Vezza (Politecnico di Torino, IT), and an overview of implementation of e-flows in Spain was given by Dr. Fernando Magdaleno Mas (CEDEX, ES).

During the afternoon, the discussion was guided by a series of questions related to the necessities of knowledge, tools and instruments in the field of ecological and geomorphological assessment in order to support the evaluation and implementation of e-flows. The outcomes of the discussion were finalized in the successive morning session and they will be the topics of an ad-hoc comprehensive policy discussion paper, which is currently under preparation.

Some main points can be summarized as follows:

- Water and sediment flows sustain aquatic life and ecosystem services. They are intrinsically interconnected and have to be considered and managed together in order to set and maintain/achieve effective environmental objectives. Together with water, **sediments have to be considered into the analytical and decision-making framework when specifying e-flows**.
- In absence of quantitative evidence on the linkages between ecology and hydrology and also given the shortness of time series of ecological data, rehabilitation of hydromorphological processes cannot but be beneficial for ecology, assumed that no alteration of biotic

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interactions has irreversibly taken place. Therefore, one approach to estimating e-flows is to **identify those flows required to maintain certain geomorphic processes and forms that directly contribute to aquatic habitat and ecosystem functioning**.

- The choice of the best option to be considered in combination with changes in the hydrologic regime (i.e., sediment transport vs. morphological reconstruction) depends on the specific context, for example the reach sensitivity and morphological potential. Therefore, **selecting the appropriate measures requires setting the river reach within a wider spatial-temporal framework**, such as that developed in REFORM.
- Hydromorphological alteration is directly detected by process-based hydromorphological methods. The limitations of the sensitivity of current biological methods to hydromorphological alteration can be overcome by integrating them with hydromorphological assessment.
- Besides the current biological methods, supplementary and more sensitive alternative biological methods/indicators are required, among which are: biological traits (habitat template theory), ecosystem functioning (as secondary production), stressor-specific deviation, riparian organism, riparian zones, and alternative sampling strategies.

Italian stakeholder workshop to present key REFORM findings

A national stakeholder workshop followed the thematic workshop on sediment dynamics and e-flows in the afternoon of 10 September to disseminate the main outcomes of REFORM. The national workshop was oriented to discuss and clarify the aspects related to the sensitivity of current metrics to hydromorphological pressures, how REFORM can help overcome the current shortcomings of current biological methods and which is the way forward. Presentations were given by Dr. Tom Buijse (REFORM project leader, DELTARES, NL), Prof. Massimo Rinaldi (REFORM, University of Florence, IT), Dr. Nikolai Friberg (REFORM, NIVA, NO) and Martina Bussettini, (REFORM, ISPRA, IT) and a public discussion followed.

Many Italian public and private stakeholders, including river basin water managers, attended the workshop (also via web) and gave their positive feedback.

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Figure 2: Italian stakeholder workshop to present REFORM findings, Rome (photo: Attilio Castellucci, ISPRA).

References

Keynotes of the convenors of the E-flows and Sediments Workshop can be found in this link.
Keynotes of the convenors of the Italian Stakeholder Workshop can be found in this link.

Further links

http://www.isprambiente.gov.it/en/events/4th-reform-national-stakeholder-workshop?set_language=en

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