

# SHORT REPORT ON MANAGEMENT OF HYDROMORPHOLOGICAL PROCESSES AND GOOD PRACTICES IN THE FIELD IN THE ALPINE CONTEXT

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# THE AIM OF THE REPORT

- ▶ **WHAT** - a document addressing the main issues in management of hydromorphological processes and the related good practices
- ▶ **WHY** - in order to highlight the main aspects to be considered, as well to share the experiences and the main results, encouraging the diffusion of the good practices
- ▶ **FOR WHOM (TARGET)** - for policy makers and experts dealing with sediment management and hydro-morphologic processes
- ▶ **HOW** - a short and easy document including real cases and interventions already implemented by Alpine Countries
- ▶ **WHEN** - during the process of implementation and revision of the management plans according to the EU 2000/60 and 2007/60 Directives

# THE STRUCTURE OF THE REPORT

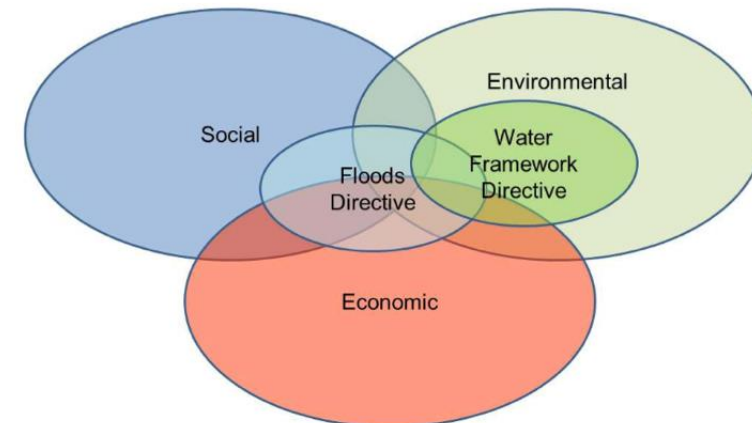
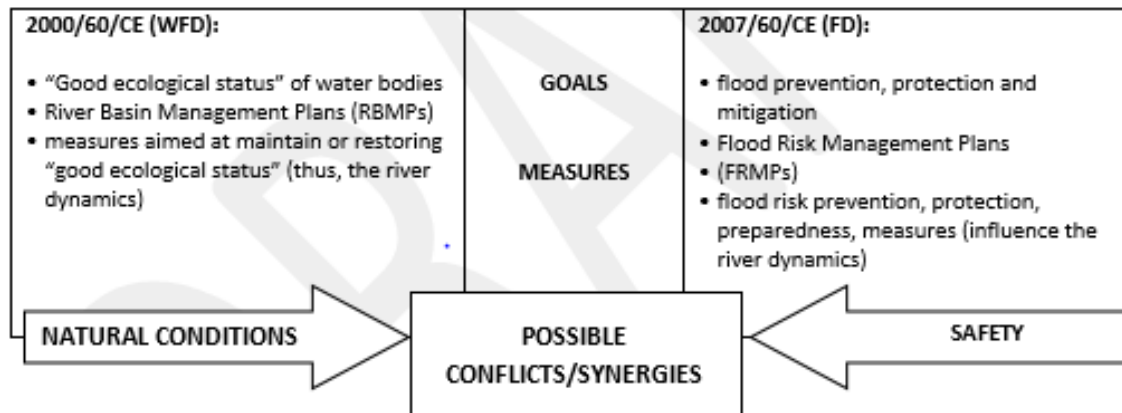
## INTRODUCTION

- 1 THE EU DIRECTIVES 2000/60/EC AND 2007/60/EC COMBINED IMPLEMENTATION
- 2 THE MAIN ASPECTS TO BE ADDRESSED: flow, sediment transport and habitat modelling in a river system
- 3 GOOD PRACTICES FOR SEDIMENT MANAGEMENT
- 4 MAIN ISSUE

# CHAPTER 1

## THE EU DIRECTIVES 2000/60/EC AND 2007/60/EC COMBINED IMPLEMENTATION

- ▶ The current EU legal framework on water is extensive, flexible and essentially fit to address the challenges faced by the aquatic environment. (EU Water Framework Directive (Directive 2000/60/EC - WFD) and the 2007/60/EC Flood Directive (FD)).
- ▶ There is a need for better implementation and increased integration of water policy objectives into other policy areas, such as the integrated disaster management.
- ▶ A coordinated implementation of the two Directives is required, eliciting a new approach aimed at optimizing the mutual synergies and minimise conflicts between them.



# CHAPTER 1

## THE EU DIRECTIVES 2000/60/EC AND 2007/60/EC COMBINED IMPLEMENTATION

The coordinate application between the two directives has been explicitly stated by FD art 9 that oblige Member States to take appropriate steps “focusing on opportunities for improving efficiency, information exchange and for achieving common synergies and benefits having regard to the environmental objectives laid down in Article 4 of Directive 2000/60/EC”. In particular:

- Flood hazard and risk maps should be developed using WFD River basin management plans (RBMPs) data;
- Flood risk management plans (FRMPs) should be carried out in coordination with and may be integrated into reviews of RBMPs;
- Coordinated stakeholder active involvement;
- Development of win-win measures: the coordination on the development FRMPs and RBMPs measures increases the opportunities for synergies to be recognized, cross referencing of objectives, and to ensure the realization of mutual benefits.

# Possible measures to be implemented: from grey to the green measures

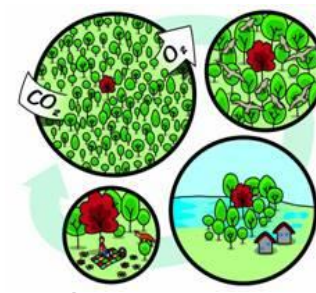
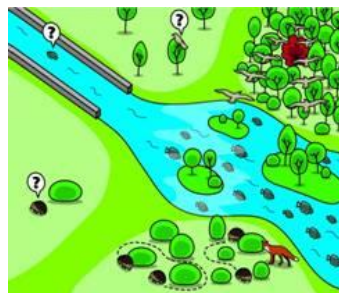
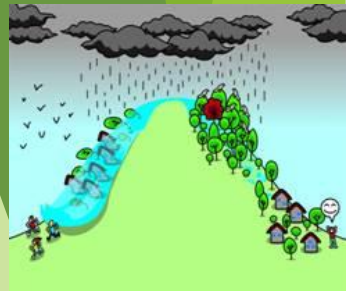
During the last decades, structural measures were extensively used as management options for flood events.

Grey measures may in fact cause unplanned hydrological, morphological and environmental impacts.

Grey measures are being progressively substituted by a new type of environmental friendly, green measures due to their environmental impact that contrasts with the goals of the WFD.

Green measures aim to improve the natural dynamics of the hydrological balance improving water retention, water storage, infiltration during the floods but also increasing the base flow during the dry season.

Nevertheless, there are many cases where we still need grey measures (e.g. flood protection in large cities).





## CHAPTER 2

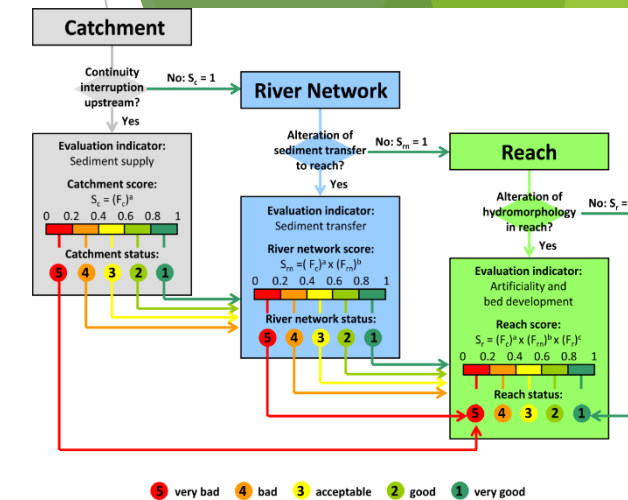
# THE MAIN ASPECTS TO BE ADDRESSED: flow, sediment transport and habitat modelling

- ▶ The continuous interactions among water, sediments and vegetation within a river system are fundamental to create and maintain habitats and so to sustain communities and healthy ecological processes.
- ▶ Adequate assessment of stream hydromorphology requires the consideration of many aspects such as the flow regime and its modifications, the sediment transport, the river morphology, the lateral channel mobility, and the river continuity (WFD).
- ▶ Therefore, an understanding of hydromorphological alteration in river ecosystems is central to planning effective ways to protect and restore river systems.
- ▶ Alterations on morphological processes and loss of biotopes have been recognized among the major pressures affecting water bodies located in Alpine areas (AWC, 2011).

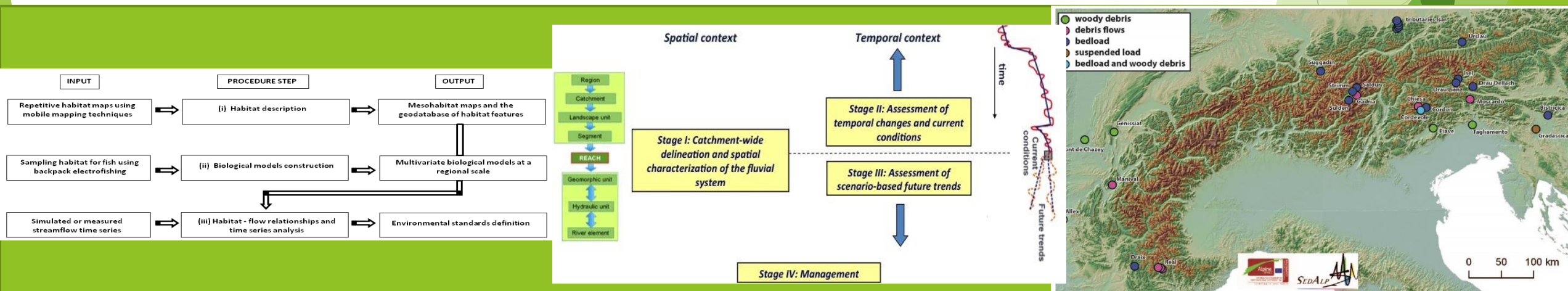
# CHAPTER 2

# Review on eco-hydromorphological evaluation methods

- 2.1.1 The EU FP7 **REFORM** project
- 2.1.2 Classification of the hydro-morphologic status of rivers: the **IDRAIM** methodology
- 2.1.3 The Hydromorphological Evaluation Tool (**HYMET**)
- 2.1.4 The **MESOHABSIM** methodology for habitat evaluation and modelling



REFORM





# CHAPTER 3

## GOOD PRACTICES FOR SEDIMENT MANAGEMENT

Sediment transport is a relevant issue for water protection, water use and flood protection.

Sediment transport is an emerging issue on the national and international level, but is not explicitly addressed in EU water legislation what results in a lack of attention and funding.

In the Alpine context siltation of reservoirs and rivers is a serious and increasing problem, which was underestimated in the past.

Climate change will affect sediment transport but there is no clear evidence with respect to the effects, since possible increased mobilisation in higher altitudes might be altered by flow regimes.

Tackling these challenges there is a broad range of measures in place, but there is no “one-size-fits-all” approach.

# 3.1 Sediment management in reservoirs

Reservoirs interfere with sediment transport continuity causing important impacts in river ecosystem upstream and downstream.

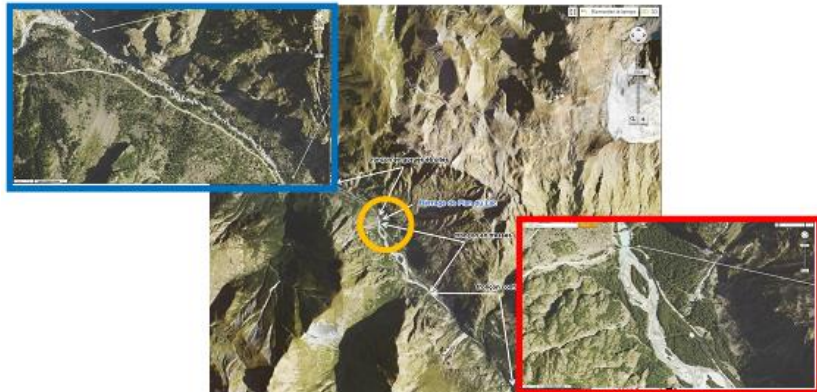
The progressive siltation of reservoirs reduces their storage volume affecting both their usable life and their capacity to reduce flow peak during floods (In Europe, nearly 1% of the storage volume is silted every year).

In recent years the problem has been growing more evident as the need for water storage seems to increase, and climate change effects are likely to intensify the situation in the coming decades.

Approaches for solution are already in place, both for existing or new reservoirs, but require case specific approaches tailored to the situation and innovative approaches in particular for new dams.

There is not really a standardized state of the art and a need to close the knowledge gap about the ecological impacts (critical concentrations downstream), the mid- to long-term consequences and the sustainability of remediation.

- 3.1.1 Sedimentary state diagnosis downstream of dams administratively classified as «list 2»
- 3.1.2 Sediment management during dam removal



## GUIDELINE PROCEDURES

1. Understand project objectives & sediment concerns
2. Gather reservoir and river data
3. Determine relative reservoir sediment volume
4. Estimate risk of sediment consequences
5. Select dam removal and sediment management alternative
6. Conduct sediment analysis
7. Assess uncertainty
8. Determine if impacts are tolerable and, if needed, reevaluate steps 2 to 7
9. Develop monitoring and adaptive management plan for implementation

## Apply Guidelines as an Iterative Process

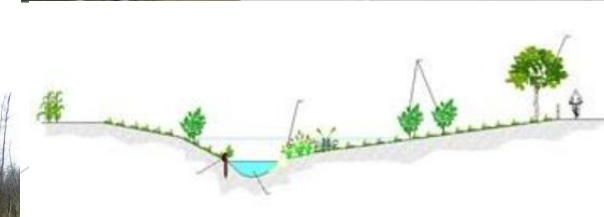
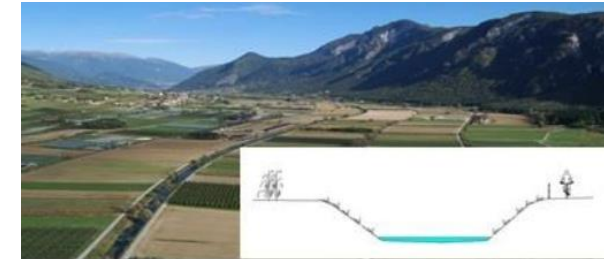
- Planning Level
  - Start as a table-top exercise with readily available data or estimates
  - Assume full and instantaneous dam removal
  - Identify potential consequences
- Analysis Level
  - Field data collection and analysis
- Implementation Level
  - Tolerable sediment impacts





# GOOD PRACTICES FOR SEDIMENT MANAGEMENT

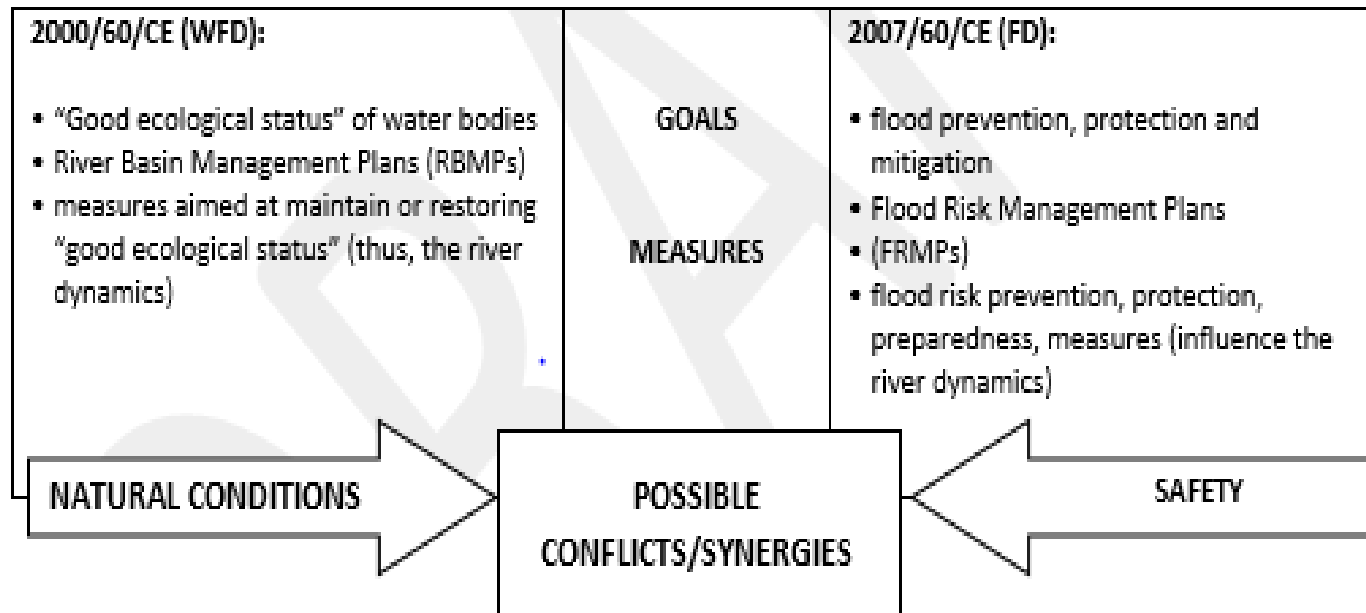
- 3.3.1 A flood event starts a river restoration project: **Lindenbach, Germany**
- 3.3.2 Planning restoration by ensuring also river security: the case of River **Brenta** in Trentino, Italy
- 3.3.3 Undertaking ecological restoration and flood protection on a very dynamic river: the **Giffre**, France
- 3.3.4 Providing the degraded Austrian **Mur River** with sediment via restoration actions



# CHAPTER 4

## MAIN ISSUE

- ▶ Human activities affect hydromorphological processes and sediments management is often a necessary practice. Any project related to flood protection or anyway impacting hydromorphological processes should have the goal of being beneficial to both FD and WFD objectives.
- ▶ The combined implementation of the WFD with the FD should be the praxis for any intervention in order to implement win-win measures beneficial to both directives



# CHAPTER 4

## MAIN ISSUE

- ▶ In order to do so, the hydromorphological impacts related to any given project scenarios should be evaluated. A sound knowledge of river hydromorphological processes at the different scales (hydrological regime, sediment dynamics, sediment connectivity, sediment budget, evolutionary trajectory, etc.), supported by a consistent monitoring activity, and a conceptual framework to contextualise the specific observation are therefore needed.
- ▶ Experience has shown that a very important part of the management process is the consultation phases to discuss and promote such projects. People are often scared by sediment management projects in alpine rivers while in fact, the socio-economic benefits of such projects are often greater than the “do-nothing” or “carry on as usual practices”, both in terms of flood management and achieving WFD goals.

# THANK YOU FOR YOUR ATTENTION

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