# The SedAlp Project:
# WP6: INTERACTION WITH STRUCTURES

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www.sedalp.eu

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# SedAlp project (Alpine Space)

- Sediment management in Alpine basins: integrating sediment continuum, risk mitigation and hydropower

- 14 EU project partners
  - 4 from Austria
  - 2 from France
  - 1 from Germany
  - 5 from Italy
  - 2 from Slovenia

- Duration: Sep 2012- Jun 2015
- Total Budget: approx. 2,5 millon €

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# SedAlp project - structure

- 8 Work packages

- WP1 – Project Preparation
- WP2 – Project Management
- WP3 – Information an Publicity
- WP4 – Basin-scale sediment dynamics
- WP5 – Sediment transport monitoring
- WP6 – Interaction with structures
- WP7 – Sediment management
- WP8 – Synthesis and capitalization

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# WP6 Interaction with structures

- Duration from September 2012 to March 2015
- WPL : PP9 UL FGG
- Project partners
  - LP BMLFUW
  - PP1 Province of Bolzano
  - PP2 ARPAV
  - PP3 UNI PD TESAF
  - PP5 Regione Piemonte
  - PP7 IRSTEA Grenoble
  - PP12 IZVRS
  - PP13 AKL (Carinthia)

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# WP6 actions

- **Action 6.1**: Assessment of mutual interactions between control structures, torrential-river sediments and large wood.

- **Action 6.2**: Evaluation of the effects of hydropower dams on sediment continuity for design and planning purposes.

- **Action 6.3**: Evaluation of river hydro-morphological alterations due to longitudinal sediment-continuity disruption and performance analysis of river restoration measures.

- **Action 6.4**: Performance analysis and definition of optimal planning and design of torrent control works to reduce their impact on longitudinal sediment continuity.

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# WP6 outputs (1 Report & 3 Guidelines):

- 6.1: Improved concepts of responses of torrent/river control structures to floods and debris flow impacts (including wood)

- 6.2: Guidelines for planning/designing of efficient torrent control structures with low impact on sediment continuity between upstream torrential headwaters and downstream river reaches

- 6.3: Guidelines for improved planning of hydropower plants aimed to improve the longitudinal sediment continuity between upstream torrential headwaters and downstream river reaches

- 6.4: Guidelines for planning and designing of effective flood protection systems, river training and restoration projects that have lower impact on sediment continuity

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# Improved concepts of responses of torrent/river control structures to floods and debris flow impact (including wood)

- Up to date insight on main driving forces for improving flood control management from EU and Alpine Space context
- Flood control & Sediment management in the context of integral flood risk management – SedAlp recommendation on improved planning approach
- Modern protection concepts with cross-sectional structures in torrent and erosion control in Alpine torrent catchments
- Effectiveness of check dams

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# Improved concepts of responses of torrent/river control structures to floods and debris flow impact (including wood)

- Effectiveness of barriers documented during events in Austria (real case scenario research)
- Check dams influence on sediment transport in steep slope stream (lab experiment)
- Analysis on protection work system on Maira river (case study)
- Concept of torrent control in Bistricica torrent (case study)
- Maintenance of torrent control structures (improved concepts of maintenance practices)

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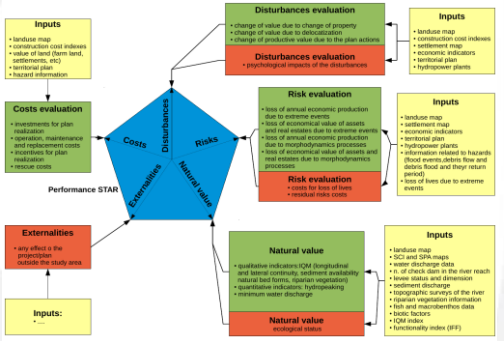
# Efficient torrent control structures with low impact on sediment continuity

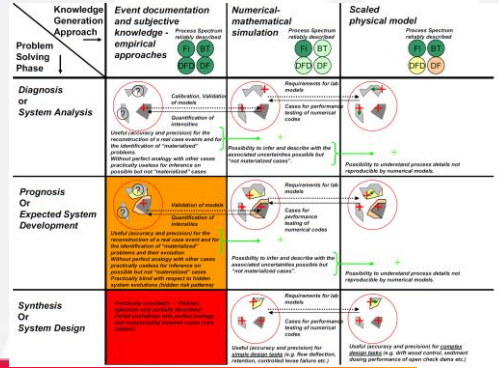
- **Aim → effectively reactivate the hydro-morphological and ecological system dynamics, while keeping risk below acceptable level**

- **Historical overview of building permanent structures on Alpine streams since 2nd half of 19th century (from 1970s →filtering check dams)**

- **Effect of protection structures on sediment transport?**

- **New (adapted) design framework proposed**
  - 5 indicators computational architecture
  - Iterative approach
  - Design for problem solving

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# Efficient torrent control structures with low impact on sediment continuity

## Procedures for improved planning

- Design criteria for sediment traps (review and new concepts)
- Construction, functionality and management of the retention basins of torrent control structures
- Torrent check dam failure hazard ranking
- Refining process comprehension and torrent control structure design (physical scale modeling)
- Good practice examples: field assessment of efficiency, failure hazard ranking, physical models

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# Hydropower plants (upstream – downstream continuity)

- Description of negative effects of HPP dams construction
  - Sediment trapping
  - Reduced sediment input in downstream reach
  - River aggradations in upstream reaches, inundation phenomena, rising of flood levels

- Description of negative effects of sedimentation in HPP reservoirs
  - Reduction in live storage capacity of the reservoir
  - Interference with functioning of water intakes
  - Influence of sediment inflow on design of water conductor systems, desilting basins, turbines etc.
  - Sediments (location and quantity) affect the performance of sluicing and flushing measures to restore capacity

- Overview on types of hydropower plants and main operations

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# Hydropower plants (upstream – downstream continuity)

- Measures against reservoir sedimentation
  - Deposition control (erosion control, sediment traps, slope and bank protection etc.)
  - Removal of deposited sediments (hydraulic, mechanical)

- Presentation of actual sediment management project (actual plan)
  - Experience of Veneto region

- Management plan optimization proposal (Multi criteria analysis)

  Energy (production, national energy plans…)

  HP producer economy (financial outcomes, investments ...)

  Economy (downstream measures – sediment input…)

  Environment (ecosystem, morphology…)

  Social uses (tourism, fishing, landscape…)

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# Effective flood protection systems, river training and restoration projects (with low impact on sediments)

- Anthropogenic changes in the environment and river systems

↓

Ecological, economical and technical problems → Interrupted sediment transport

- Comprehensive theoretical background of the problem

- Procedures for improved planning
  - Tools for planning river bed widening
  - Implementation of bed widening
  - Consideration of sediment transport in flood risk management
  - Assessing the morphological spatial demand of rivers
  - Design of step-pool sequences and rapids in mountain streams

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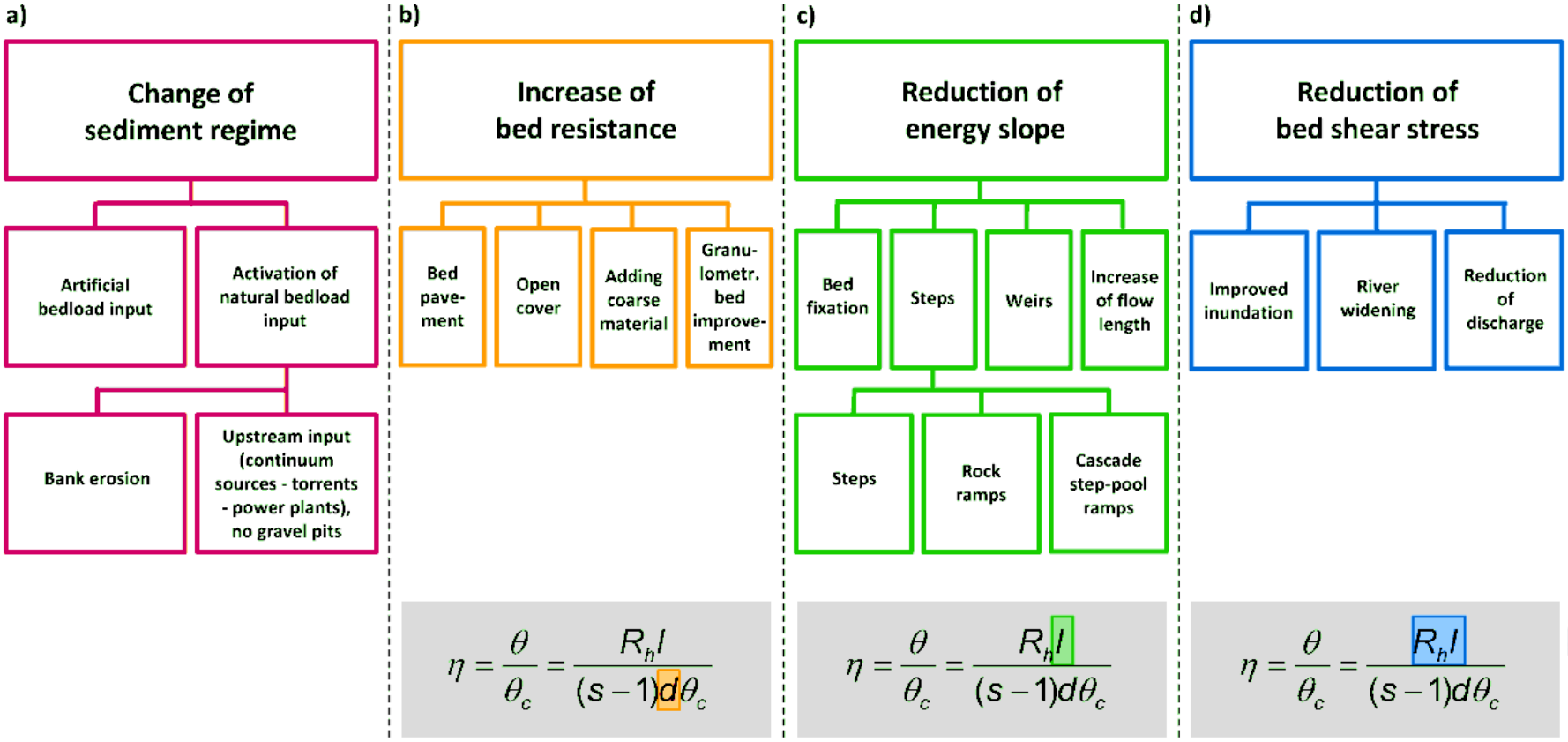
# Effective flood protection systems, river training and restoration projects

- Procedures for improved planning (counter measures for bed degradation)

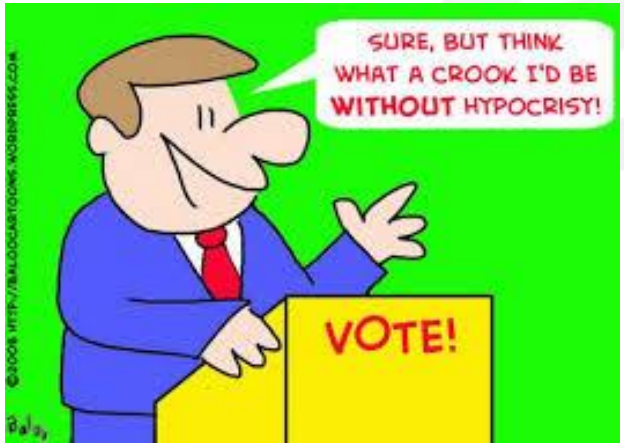


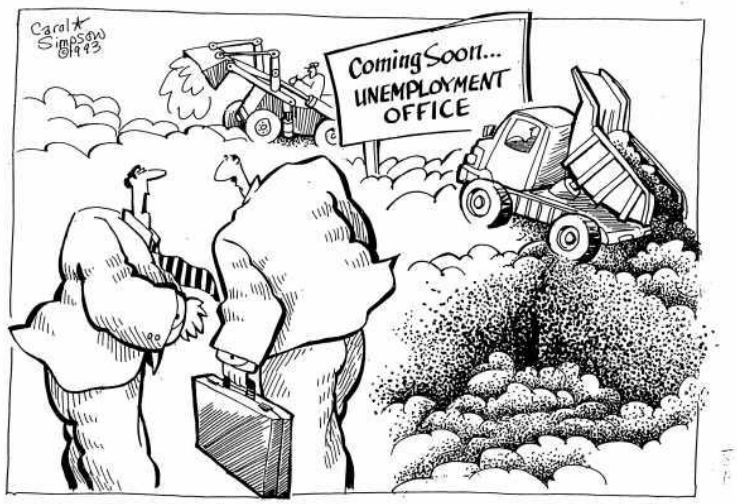

- 2 good practice examples (Drau River, Mur River)

# Recommendations

- Separate recommendations for each field of work
- Over 50 recommendations
- Recommendations for

**Policy makers** **Practitioners** **Researchers**




*"Another sign of a surging economy—new construction."*

# Conclusions: Final results of SedAlp WP6

- All expected outputs ( 1 Report and 3 Guidelines) - available online

***www.sedalp.eu***

+ dissemination

  - 9 Conference papers
  - 7 Journal papers
  - 2 Oral presentations

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**Thank You for your attention…**

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