



Origins and causes of river basin sediment degradation and available remediation and mitigation options

Feedback from the Riskbase workshop

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What is RISKBASE?

Review and synthesise the outcomes of project related to integrated risk assessment-based management of the water/soil/sediment system at the river basin scale.

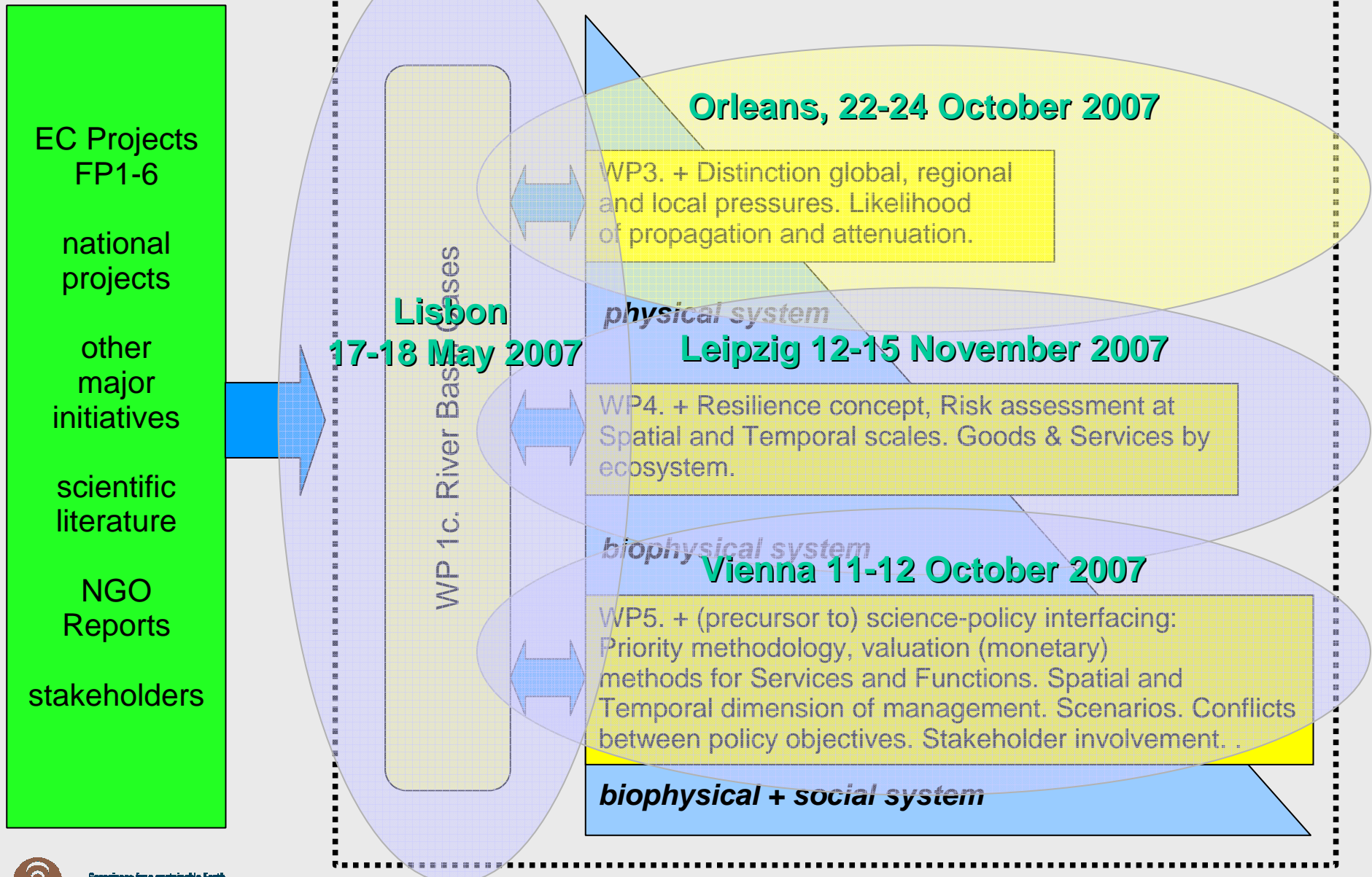
Why?

Development of integrated risk assessment-based management approaches enabling the prevention and/or reduction of the negative impacts caused by human activities on that system.

How?

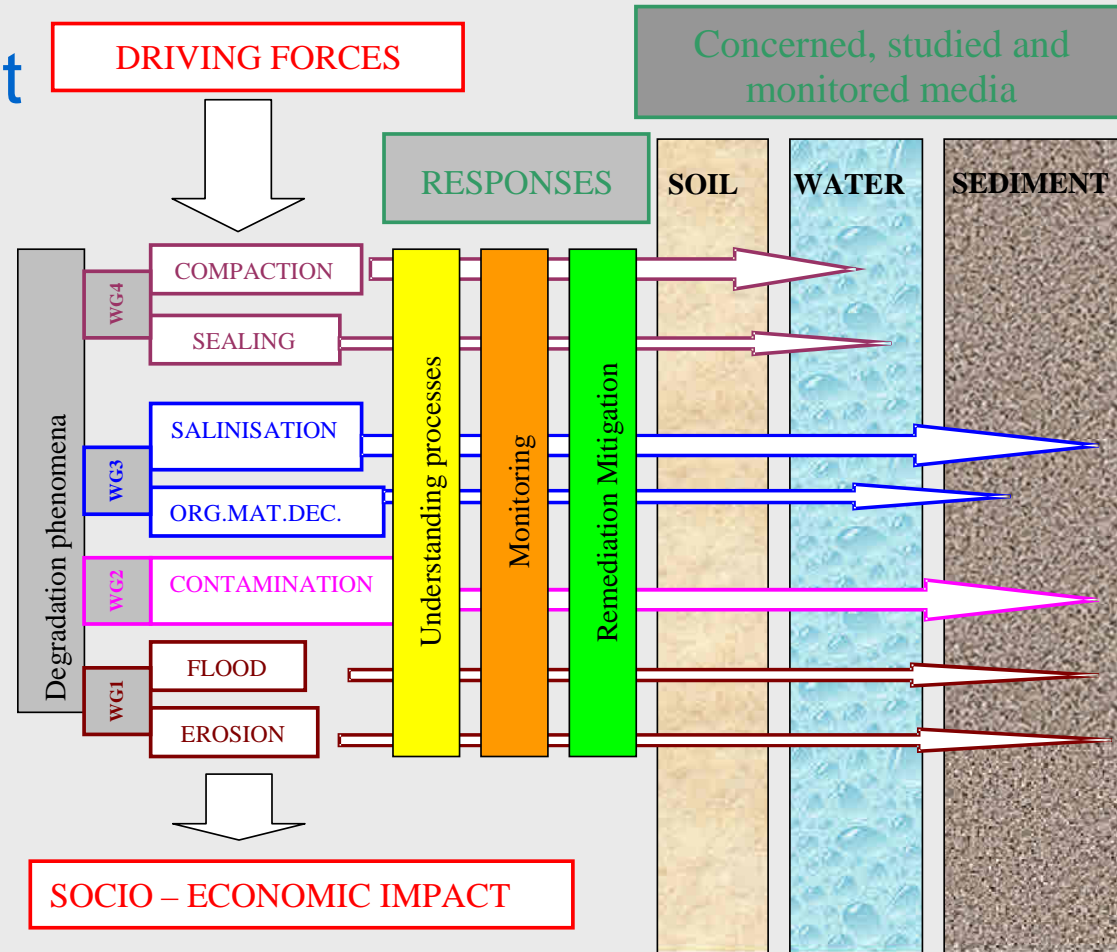
Workshops with experts and stakeholders

RISKBASE Work Packages (WP)



RISKBASE WP3 objectives

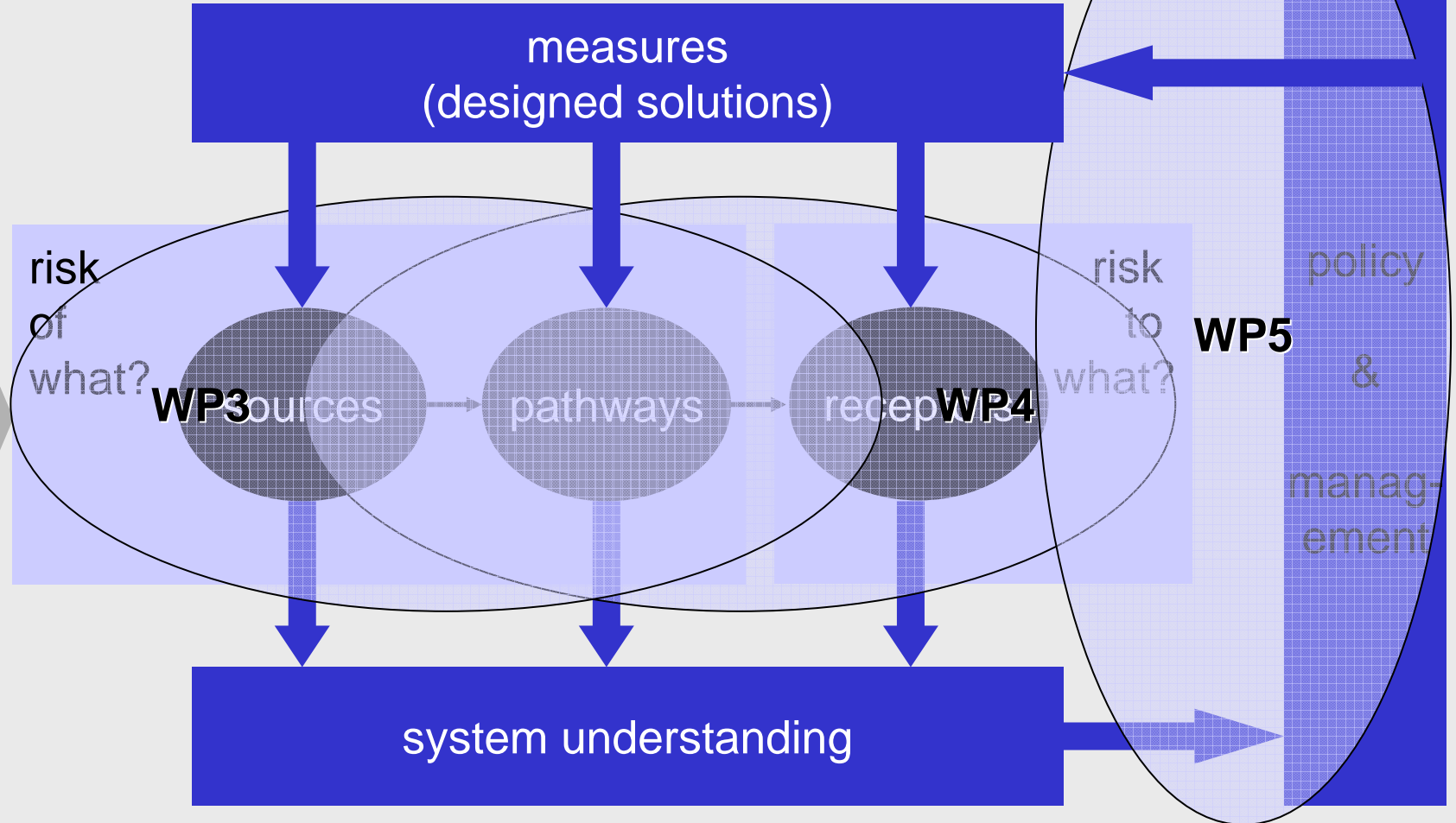
- Compilation and integration of current R&D results on topics related to degradation in river basins: *erosion, contamination, floods, compaction, sealing, organic matter decline and salinisation*



S-P-R approach



socio-economic & global change



biophysical system

societal system



WP3 - 3 phases of work

In the context of “Degradation causes, mitigations and remediation....”

- **PHASE 1:** Identify “State of the Art” Science and data
- **PHASE 2:** Gaps identification and future research needs.
- **PHASE 3:** Compile and integrate existing data

Meeting
1st 2nd



➔ **BOOK CHAPTER**



WP3 – Orléans workshop, October 07



SEDNET Conference, OSLO, 28th of May 2008





WP3 – Orléans workshop, October 07

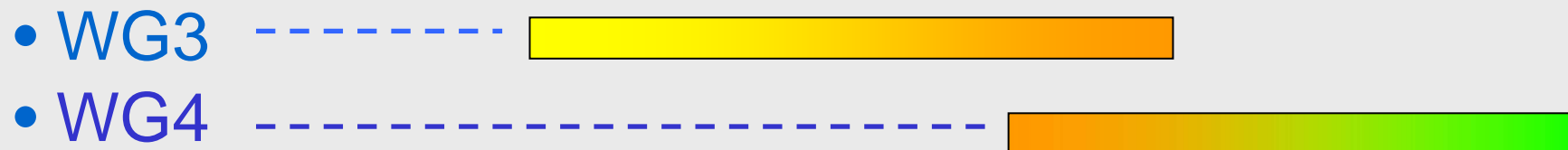
Rational of the Working Groups



Soil / Sediment

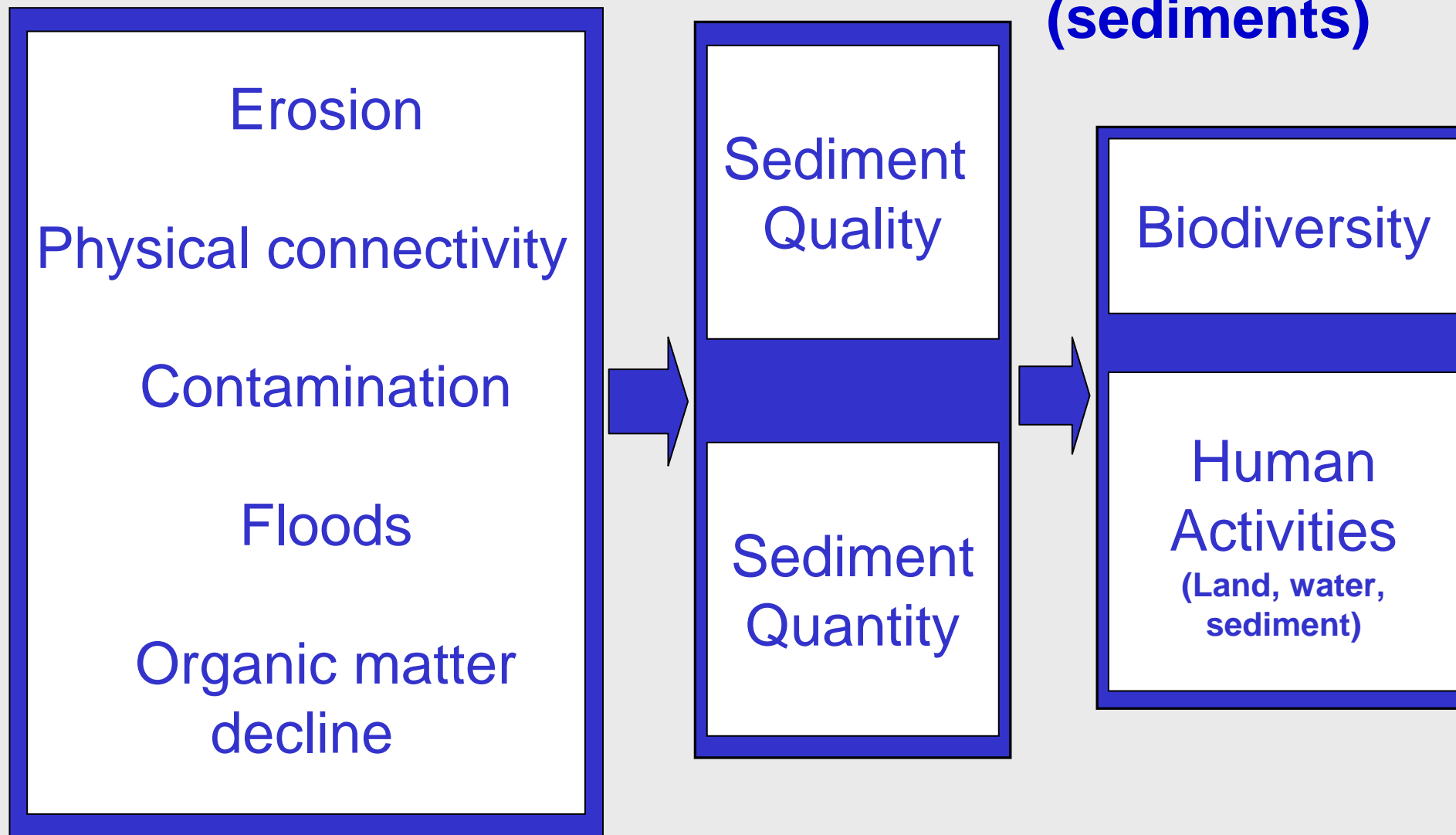


Water





Results of the workshop - Causes of degradation (sediments)





Erosion

- Erosion: Increase of sediment loads and associated dissolved and suspended matter (soil erosion & run-off, channel bank erosion, sediment dynamics)
- Origins of erosion:
 - Natural: wildfire
 - Anthropogenic: Land-use (crop types / forest), Specific soil management regime, Depopulation of mountain areas
 - Increase of sealing and compaction
 - Decline of OM
- ☞ Shift from natural, geological erosion to anthropogenic, accelerated erosion
- Impacts:
 - Decrease in biodiversity and ecological potential
 - Contamination of sediment
 - Eutrophication





Erosion - Mitigation and remediation

- Good agricultural practices
- Livestock and grazing management
- Forestry and transport and construction planning
- Restoration to combat soil erosion
- Post fire soil conservation and restoration
- Rehabilitation of degraded soils which may involve application of EOM



Erosion - GAPS

- System understanding
 - Relation between erosion – runoff – contaminant redistribution / resedimentation
 - Lack of use of sediment records in sedimentary budget studies
- Monitoring:
 - Morphodynamics (associated with soil erosion and sedimentation), specifically during high- storm flood event
 - Monitoring linking catchment zone and coastal zone
 - Appropriate modelling techniques to study suspended matter, bedload
 - Reconsideration of existing monitoring networks



Contamination

- Contamination: Introduction of hazardous substances into soil-water-sediment system. From soil source & run-off, discharge in river, transfer surface water – sediment, atmospheric deposition.
- Origins of contamination:
 - Point source (Industries, Waste water discharges)
 - Diffuse source (Agriculture (N, P and pesticides))
 - Natural OM mineralisation
 - Acidification
- Impacts:
 - Contaminated sediments (Accumulation, integrated media)
 - Endanger aquatic ecosystems and all receptors associated with aquatic life.
 - Algal growth, organic sediment build up (Nutrients)
 - Water resources



Contamination - GAPS

- System understanding
 - Water column - sediment exchange
 - Bioavailability of toxicants
 - Chemical persistence and metabolites
 - Buffering capacities
 - Long-term aspects (behaviour)
- Mitigations and remediation:
 - Techniques of remediation for emerging compounds
 - Technologies to face issues related to diffuse contamination

Floods

- **Flash floods**

- Small, steep or urban catchments
- Little warning, short duration
 - 1991 Vaison La Romaine
 - Numerous other

- **Plain floods**

- Large rivers
- Slow build-up, long duration
 - 1993+1995, Meuse + Rhine
 - 1997, Oder
 - 2002, Elbe+Danube
 - 2005, Danube
 - 2006, Elbe+Danube

- **Coastal floods**

- Affecting low-lying coastal zones
 - 1953 NL, UK





Floods and extreme events - GAPS

- System understanding
 - Relation between climate change, increasing sealing and increased flood risks has to be better explored
- Monitoring
 - Frequency of monitoring data collection during storm event needs to be increased



Physical connectivity

- Physical connectivity: Horizontal and vertical connectivity (for sediment only horizontal)
- Origins of physical connectivity:
 - Reduced area of riparian wetlands
 - Suppression of hedgerows
 - Drainage and shortcut of riparian zones, ditching
- Impacts:
 - Increase contaminant transfer
 - Reduce landscape-scale buffering capacity
 - Affect flood control structures
 - Accelerate or reduce propagation of perturbations down slope and downstream



Physical connectivity - GAPS

- System understanding
 - Development of knowledge in morphodynamics (associated with soil erosion and sedimentation) especially during high storm event
- Monitoring
 - Development of framework / methods to monitor river course
 - Increase of the use of sediment monitoring tools to improve their economic and technical suitability
- Mitigations
 - Development of remediation and mitigations aiming at minimizing issues associated with morphodynamics



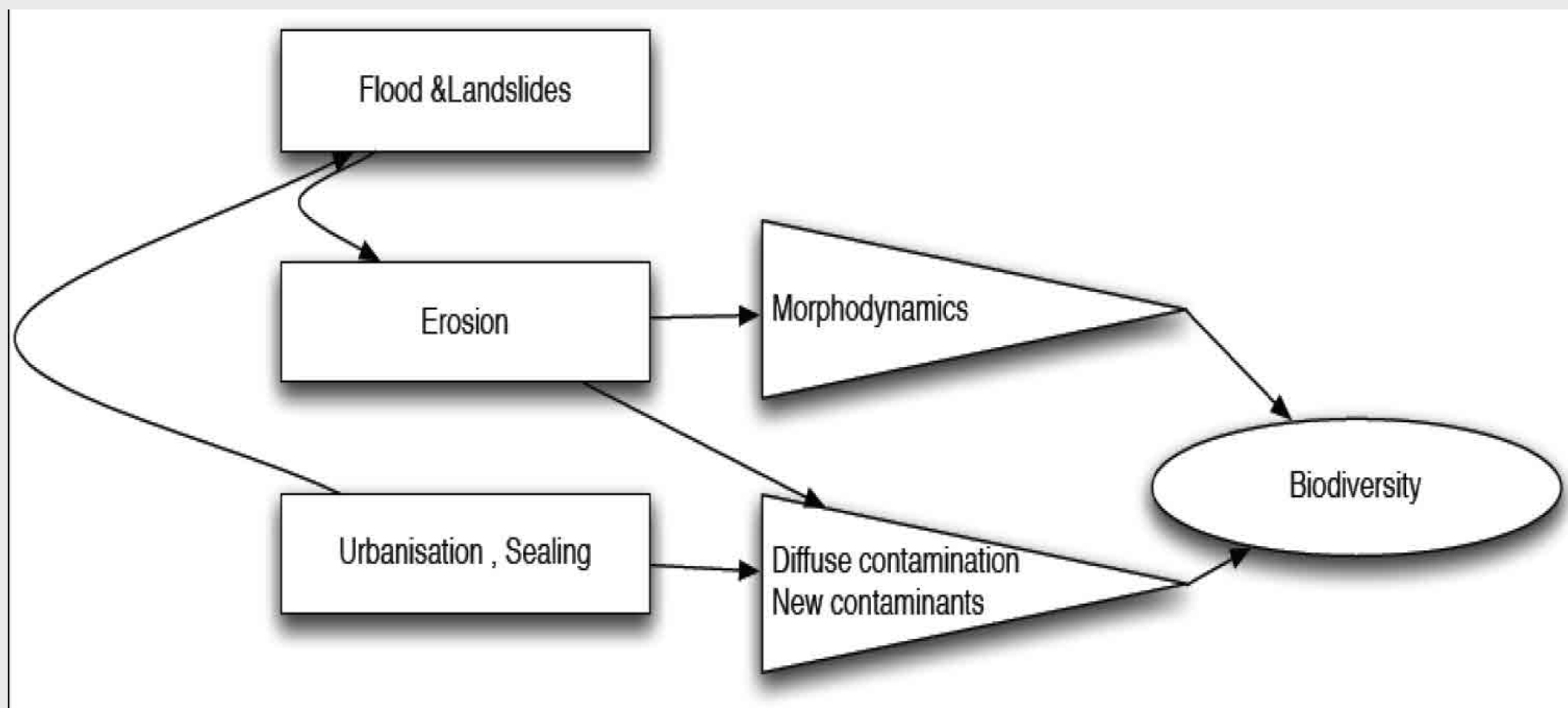
GAPS - Others

- Loss of biodiversity
 - Link between SOM and biodiversity
 - Quantitative assessment of the ecological impacts
 - Development of methods to extrapolate information obtained from the sample to larger scale (field, regional, river basin)
 - Characterisation of biodiversity
- OM decline
 - Link between OM decline and impact on biodiversity
 - Link between OM decrease and water quality
 - Change in mineralization under climate change
 - Affect of SOM on sediments??

Concluding remarks

- Many data on State of the Art and Gaps by degradation types / causes
- The classic way of dealing with Causes of degradation, Monitoring, Management and Mitigation is too simple
 - => Interrelation between threats is lost
- Integrated assessment is needed
 - => Central concept which is currently being developed in RISKBASE

Example of relationship between morphodynamics and other key issues of river basin management





THANK YOU FOR YOUR ATTENTION

For additional information on RISKBASE
www.riskbase.info