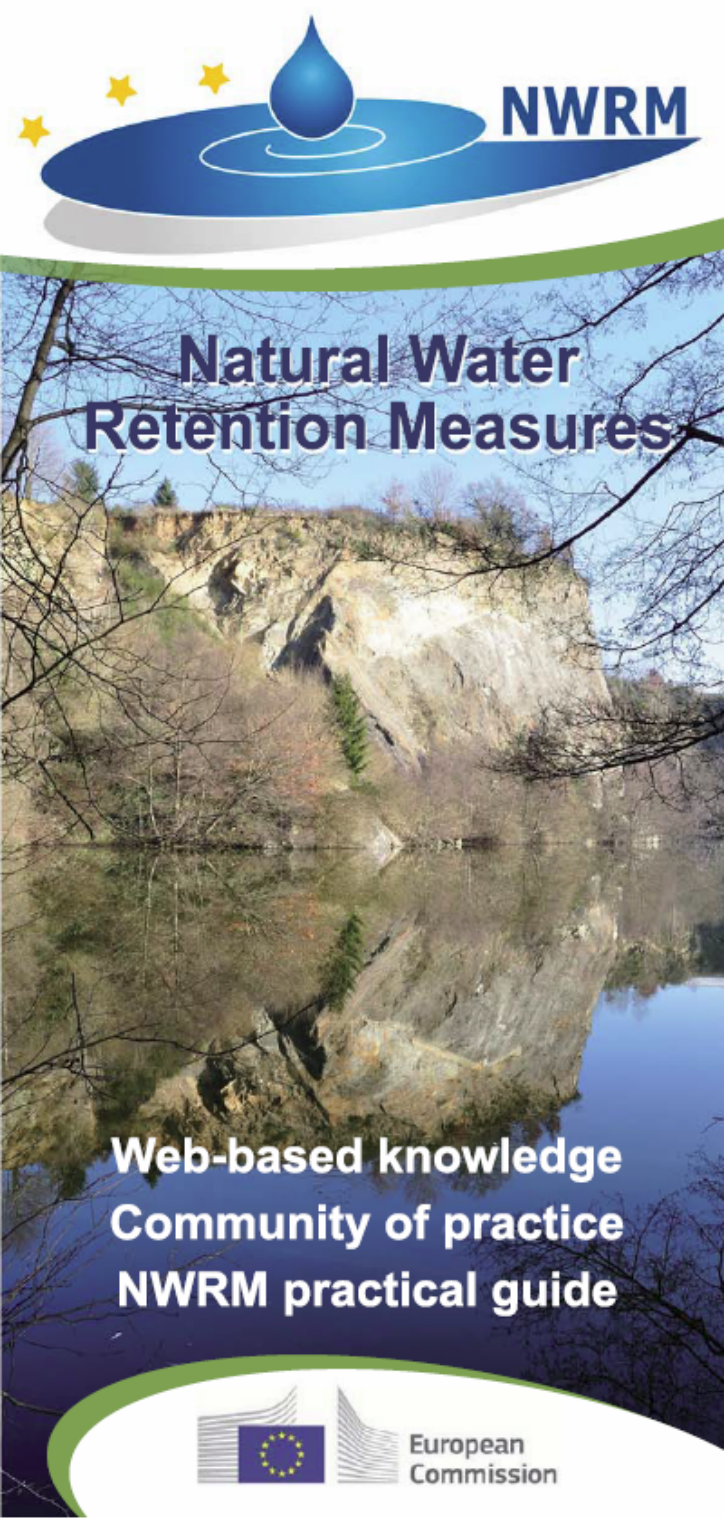


Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures in River basin management

Service contract n°ENV.D.1/SER/2013/0010

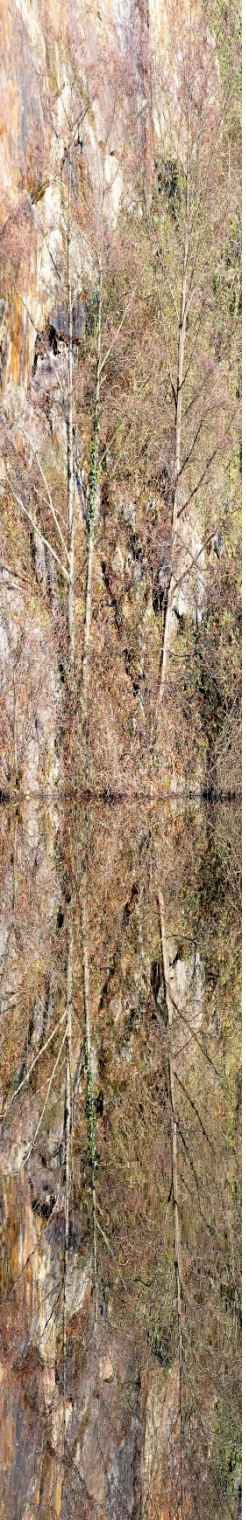
NWRM Tools
The Knowledge Base
The Practical Guide

Maggie Kossida (IACO)
Pierre Strosser (ACTEON)

2nd Med Regional Workshop, Torino, 11-12.09.2014

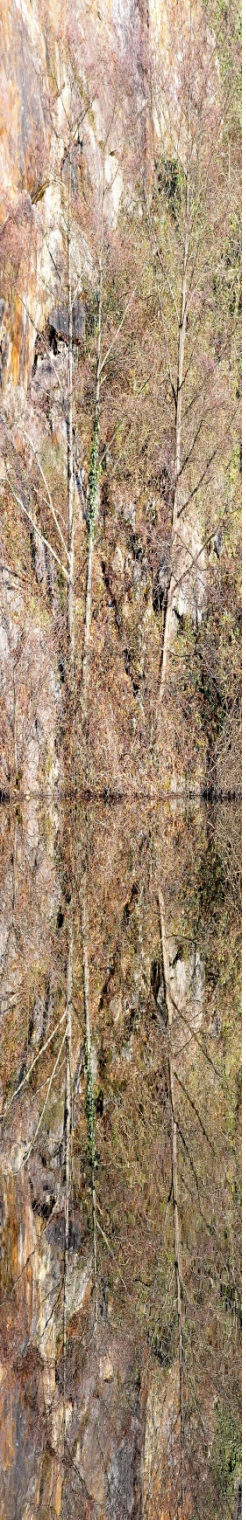
Office International de l'Eau

ACTeon environment



Outline

- **The Knowledge Base**
  - Principles
  - End-user’ perspective
  - Structure
  - Content & Outputs
  - Lesson learned
- **The practical Guide**
  - Objectives
  - Structure & Content



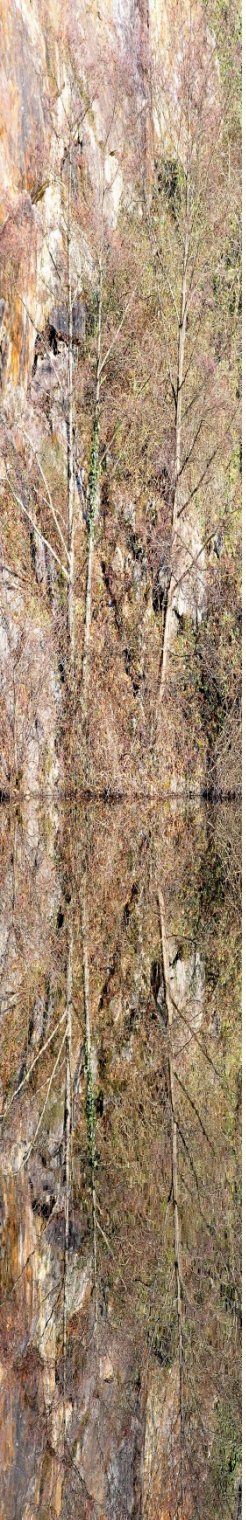
Principles

The challenge…

- NWRM are multi-purpose measures**,** targeting multiple policy objectives
- Wide range of applications, wide range of impacts and benefits, often context specific
- Multiple sources and information flow paths (not harmonised)
- Grouping & "parametrisation" into a DB structure is a major challenge

A knowledge base in this sense is defined as a wider system, **grouping & conveying** information in an organised manner and **targeting multiple end-users'** needs.

Capacity to **access information on different levels** (synthetic, analytical, queries, etc.) is a **seamless and transparent** way.



End-users (1)

- **Design Practitioner (DP)**

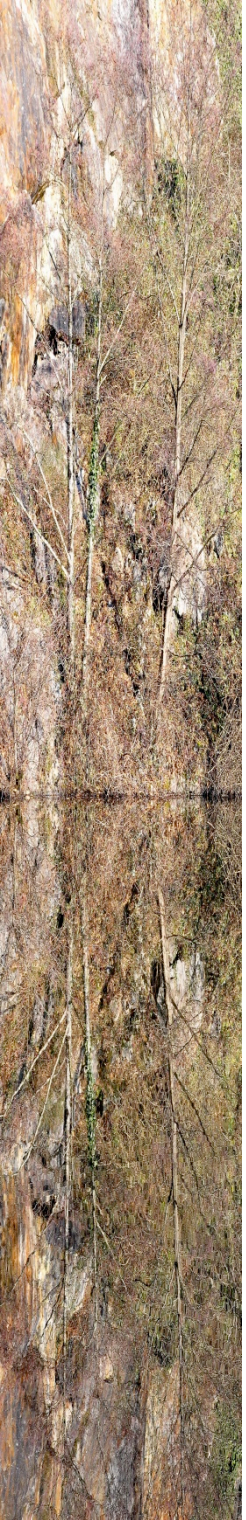
DP need, first of, a **Set of Principles** that will allow them to correctly identify options and design that "qualify" under NWRM

Evidence base of the available options (i.e. detailed for **each measure**). More technical than the ones intended for the policy audience:

- application/function
- intended primary and secondary purposes of each NWRM
- operational risks
- design considerations
- adaptability
- maintenance requirements
- impact to public perception, etc.

Clear references to existing guidelines and engineering standards are also very useful to be included in these Factsheets.

Links to incentives (direct and indirect subsidies) are also very useful to DP



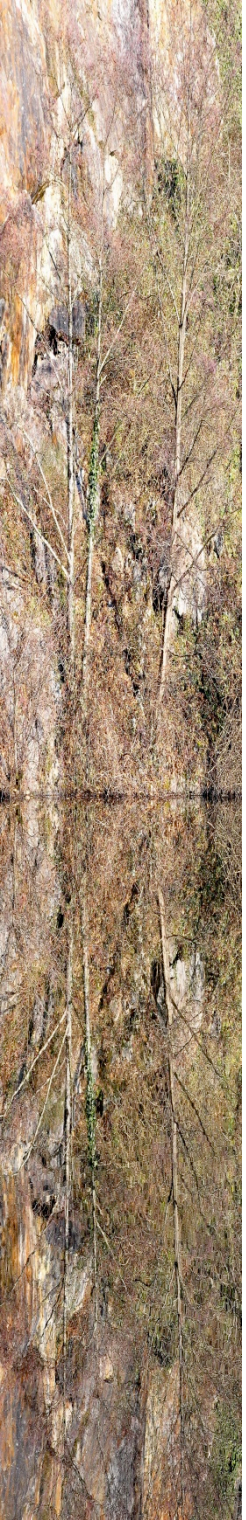
End-users (1)

- **Design Practitioner (DP)**

Yet…. **to guide their selection among the options, the CS** (which give the specificities and feedback of actual applications) **is the real supporting knowledge**.
The CS can provide the practitioners **feedback on** the range of potential impacts (biophysical) across a variety of conditions and under different context, info on the design implications, real costs, social acceptability, enabling factors, constraints and preconditions.

- **Application (CS) DB** relevant to the DP should contain:

(i)descriptive info
(ii)technical info on the main **design parameters** and **monitoring requirements** (to allow the practitioner identify similarities and/or discrepancies as compared to his candidate site/environment),
(iii)quantifiable **indicators** (especially with regards to **the biophysical impacts** and **economic info**, along with **possible performance metrics**) to help them grasp the range of costs and benefits and the overall performance/effectiveness,
(iv) lessons-learned to highlight the **main risks, implications**, **enabling factors** and **preconditions**.



End-users (2 & 3)

- **Policy community**

Answers to key policy questions

- What are the most effective NWRM's (or combinations of NWRM's) - and for which (biophysical) circumstances? What evidence exists on NWRM effectiveness?

- Which assessment methods and practices are used for NWRM's?

- What is the contribution of NWRMs to reaching EU Directives' objectives?

- What are the benefits and co-benefits of NWRMs?

- "Better" option than the "traditional" measures?

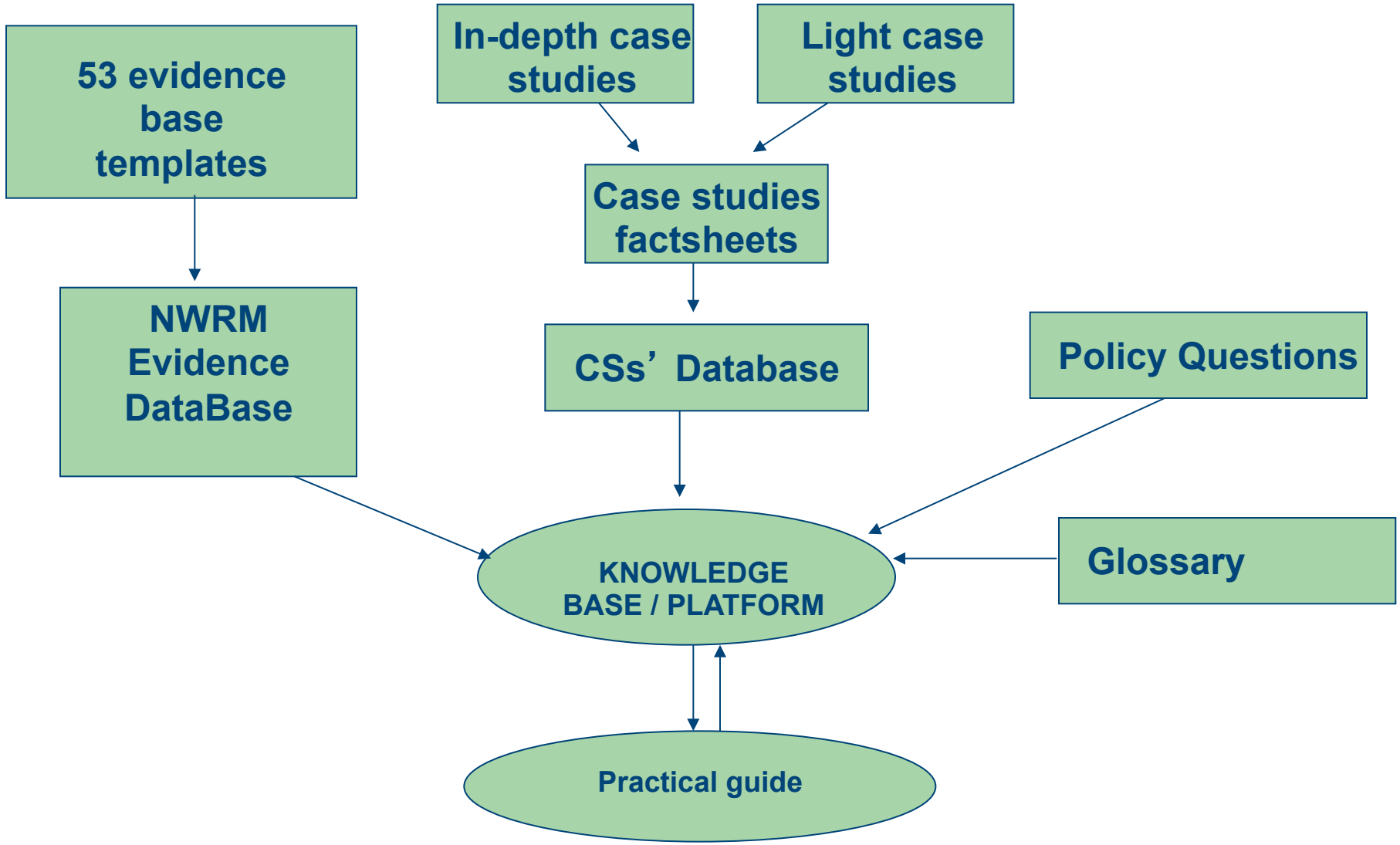
-What are the main barriers and success factors for implementing NWRMs? (public awareness, perception, public investment, etc.)

- **Research community**

Input to modelling, simulations, comparative studies

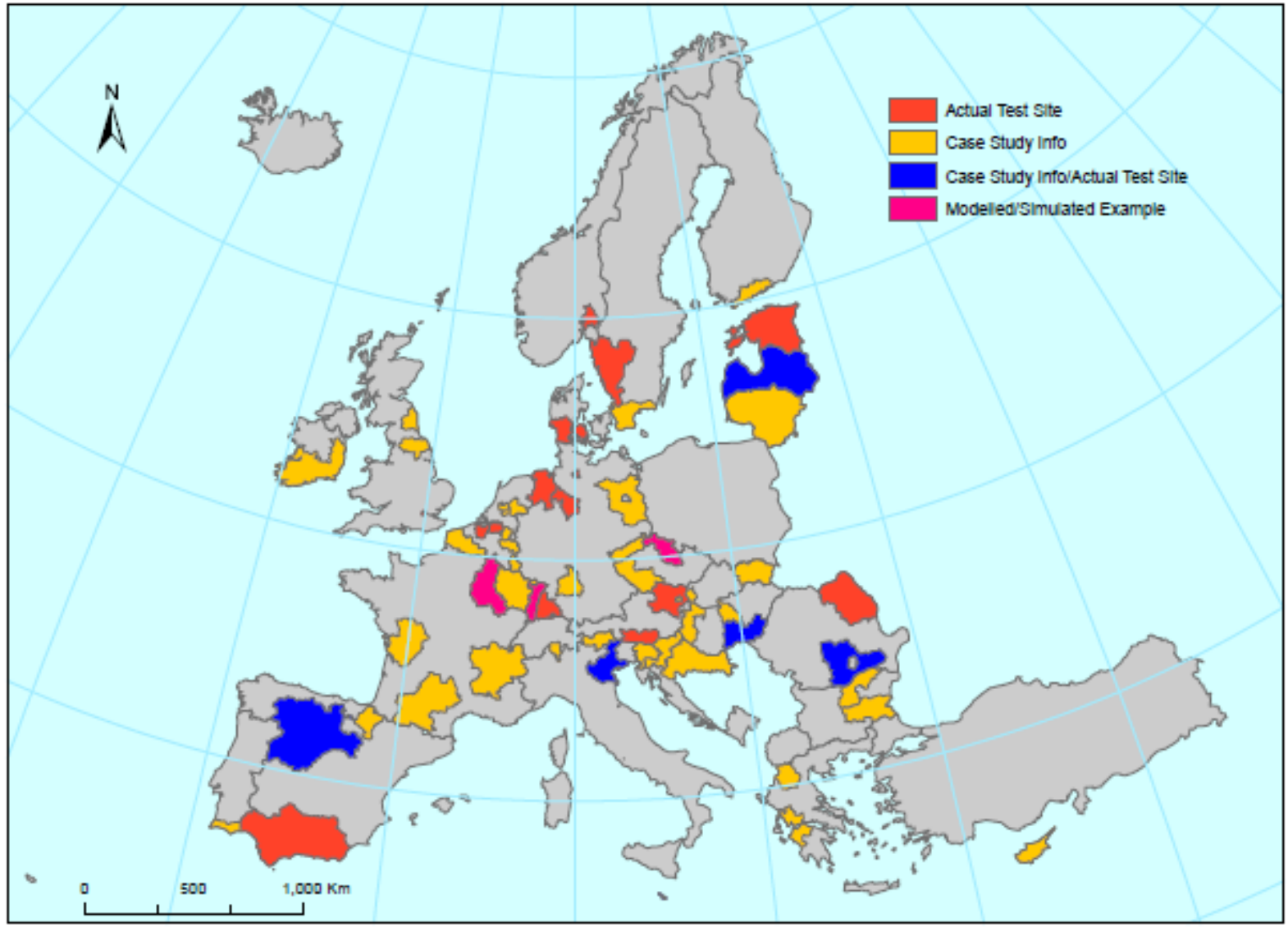
Quantified parameters mainly on biophysical impacts and costs

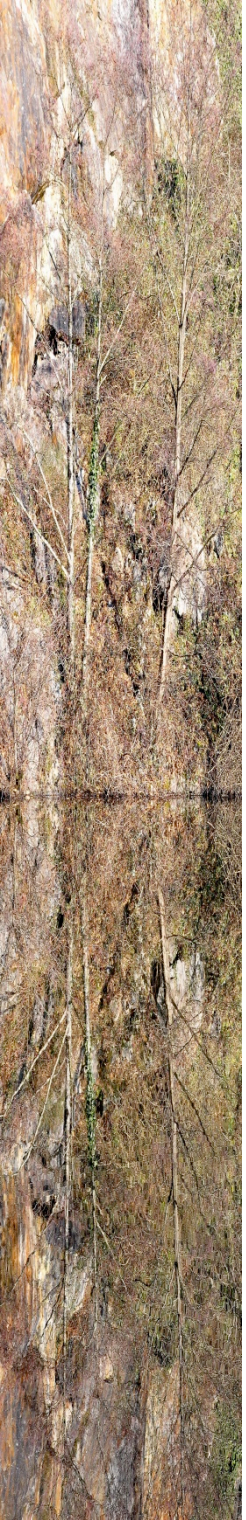
Structure of an Integrated Knowledge Base



The Case Studies' Database

A selection of 80 applications
(actual test sites, case studies, modelled/simulated example





CSs DB: Data Model Characteristics

Main Entities:

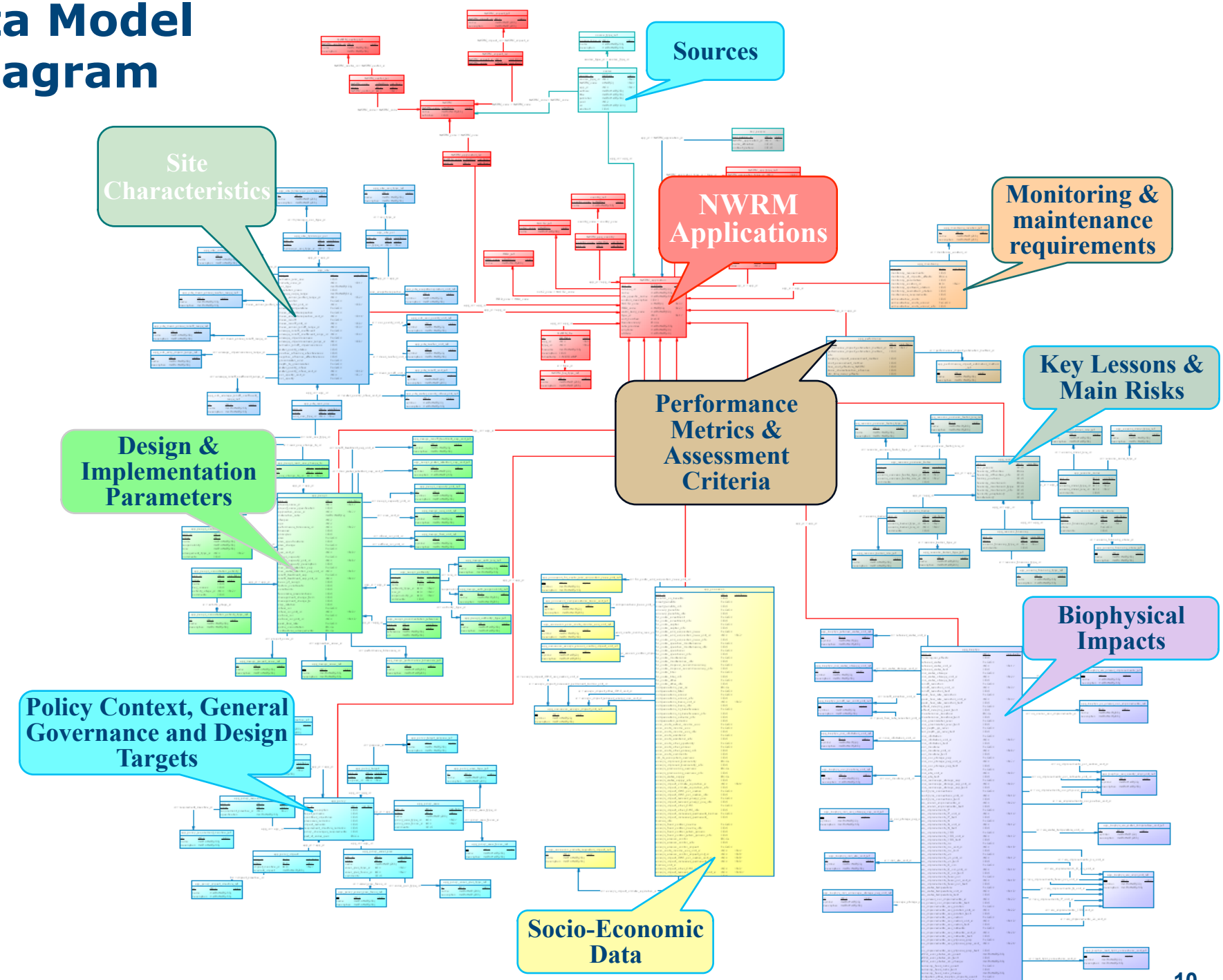
- NWRM applications of any kind e.g. test site, a case study or even modeled results documented in research studies
- NWRM types grouped in more general categories, NWRM sectors, e.g. forest measures, urban measures, agricultural measures
- Sources (references) that have been used to document NWRM applications or NWRM types
- Parameters divided in categories (design, biophysical impacts, socio-economic, governance, policy, etc.)

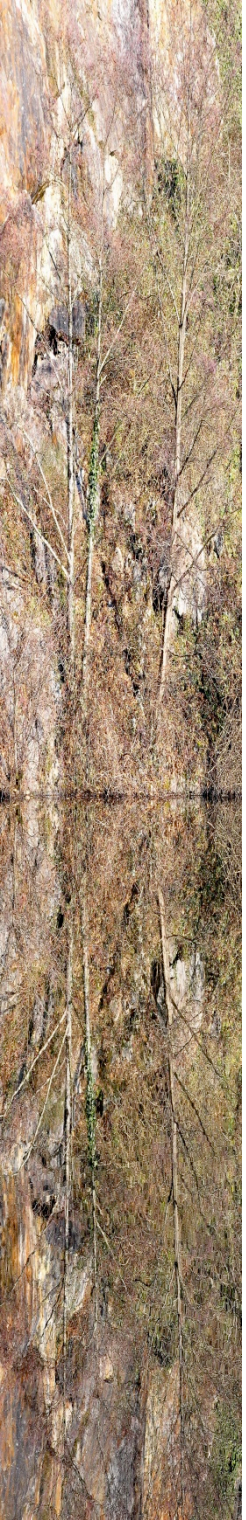
Normalized database design

DB ensures referential integrity

Object-Relational Database Management System (PostgreSQL)

Data Model Diagram





Some statistics….

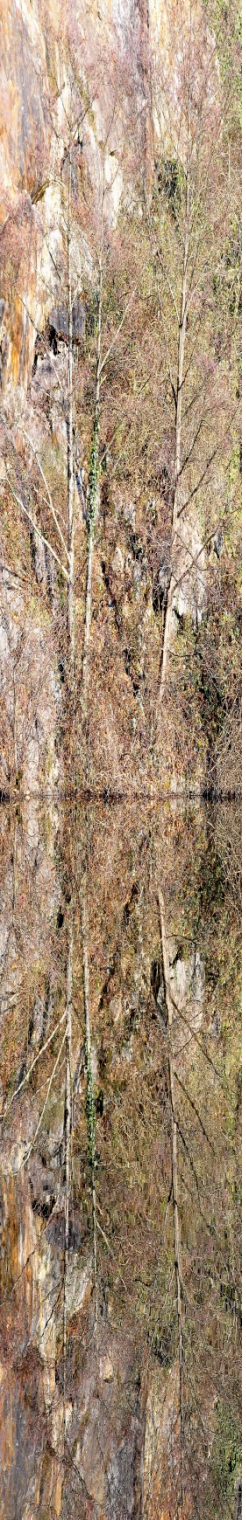
NWRM	#
A1	7
A11	1
A12	1
A2	1
A3	1
A6	2
A7	2
A8	3

NWRM	#
F1	8
F2	2
F4	1
F5	1
F9	2
F10	2
F11	2
F13	1

NWRM	#
N1	9
N2	26
N3	20
N4	14
N5	11
N6	1
N7	4
N8	9
N9	4
N10	8
N11	2
N12	4
N13	4

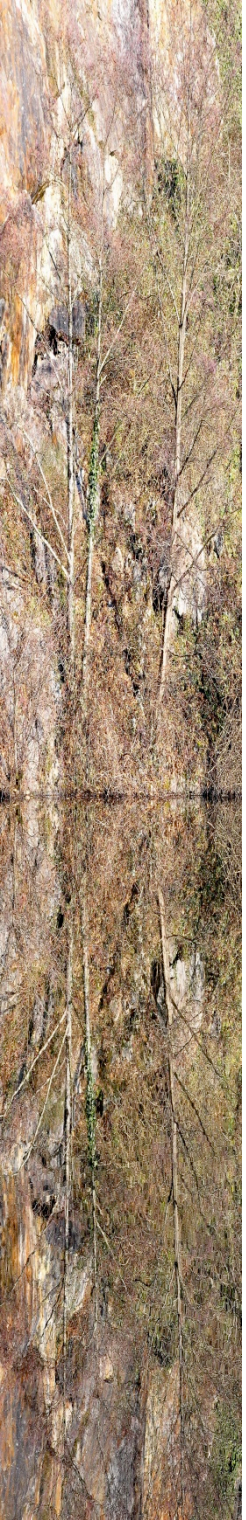
NWRM	#
U1	2
U2	1
U3	2
U4	2
U5	1
U6	3
U7	1
U8	1
U10	2
U11	7
U12	1

A1 = meadows & pastures
F1 = riparian buffers
N1 = basins & ponds
N2 = wetlands
N3 = floodplain
N4 = re-meandering
N5 = Revitalisation of flowing waters
U11 = retention ponds



NWRMs' Evidence Base

- NWRM description
- *Geographic applicability (land use, region)*
- *Scale*
- *Biophysical impacts (slowing & storing runoff, reducing pollution, soil conservation, creating habitat, climate alteration)*
- *Ecosystem Services benefits (provisioning, regulatory & maintenance, cultural, abiotic)*
- *Policy objective (WFD, FD, Habitats, 2020 Biod.Strategy)*
- *Design guidance (parameters)*
- *Costs*
- *Governance & implementation*
- *Incentives*
- *References*

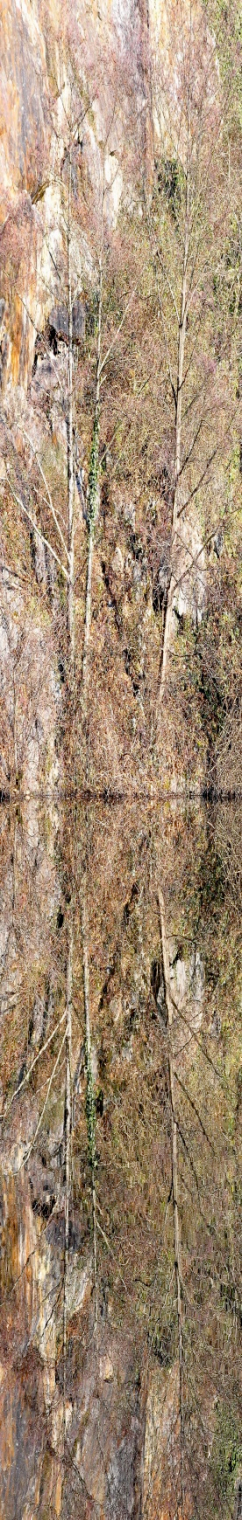


		Mechanisms of Water Retention							*Biophysical Impacts Resulting from Water Retention*									
		Slowing and Storing Runoff				Reducing Runoff			Reducing Pollution		Soil Conservatio		Creating Habitat			Climate Alteration		
		BP1	BP2	BP3	BP4	BP5	BP6	BP7	BP8	BP9	BP10	BP11	BP12	BP13	BP14	BP15	BP16	BP17
		Store runoff	Slow runoff	Store river water	Slow river water	Increase evapotranspiration	Increase infiltration and/or recharge	Increase soil water retention	Reduce Pollutant Sources	Intercept Pollution Pathways	Reduce Erosion and/or Sediment Delivery	Improve Soils	Create Aquatic Habitat	Create Riparian Habitat	Create Terrestrial Habitat	Enhance Precipitation	Reduce Peak Temperature	Absorb and/or Retain CO_2
A1	Meadows and Pastures		■			■	■	■			■	■						■
A2	Buffer Strips and Shelter Belts		■			■	■	■		■	■	■			■			■
A3	Crop Rotation		■									■						
A4	Strip Cropping		■					■			■	■						
A5	Intercropping		■					■			■	■						
A6	No Tillage							■			■	■						
A7	Reduced or Conservation Tillage							■			■	■						
A8	Green Cover		■			■	■	■	■	■	■	■			■			■
A9	Early Sowing		■			■	■	■			■	■						■
A10	Traditional Terracing		■								■							
A11	Controlled Traffic Farming		■					■			■							
A12	Reduced Stocking Density		■								■	■						
A13	Mulching						■	■										
N1	Basins and Ponds	■					■	■					■					
N2	Wetlands	■		■			■	■		■			■		■			
N3	Floodplain Reconnection	■		■	■		■	■		■				■	■			■
N4	Re-Meandering			■	■		■	■		■			■	■	■	■		■
N5	Revitalisation of Flowing Waters			■	■		■			■			■	■	■			■
N6	Temporary Tributaries	■		■	■								■					
N7	Hydraulic Annexes	■		■	■								■					
N8	Riverbed - Alluvial Mattress			■	■					■	■		■	■				
N9	Levelling of Dams and Longitudinal Barriers			■						■			■	■				
N10	Natural Bank Stabilisation			■	■					■	■		■	■	■			
N11	Elimination of Riverbank Protection			■	■					■			■	■	■			
N12	Lake Restoration	■		■									■		■	■		
N13	Aquifer Restoration	■		■			■	■		■		■						
N14	Floodplain Restoration	■		■			■	■		■				■	■			

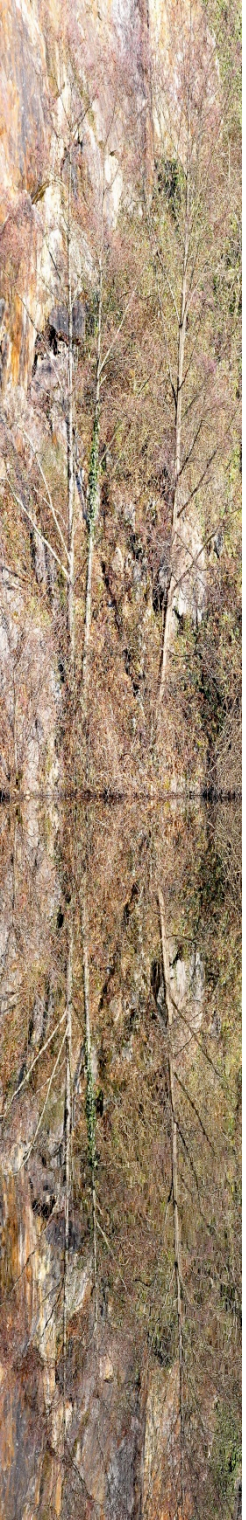
NWRM to Biophysical Impacts

… to Benefits

… to Policy Objectives

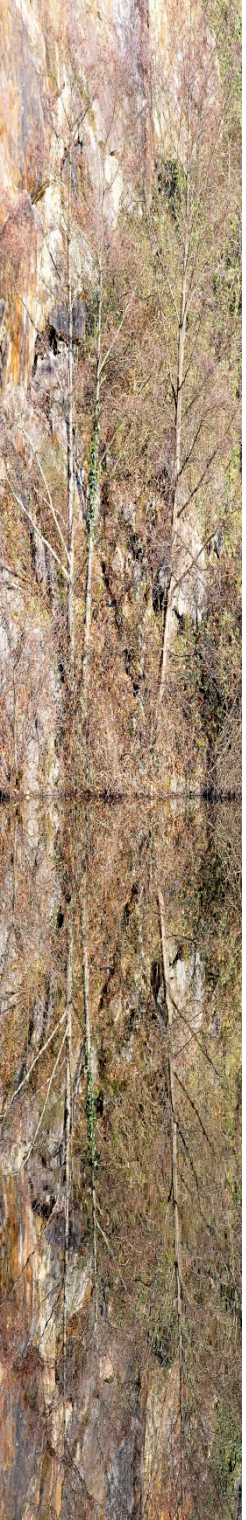


		Mechanisms of Water Retention							*Biophysical Impacts Resulting from Water Retention*									
		Slowing and Storing Runoff				**Reducing Runoff**			**Reducing Pollution**		**Soil Conservatio**		**Creating Habitat**			**Climate Alteration**		
		BP1	BP2	BP3	BP4	BP5	BP6	BP7	BP8	BP9	BP10	BP11	BP12	BP13	BP14	BP15	BP16	BP17
		Store runoff	Slow runoff	Store river water	Slow river water	Increase evapotranspiration	Increase infiltration and/or recharge	Increase soil water retention	Reduce Pollutant Sources	Intercept Pollution Pathways	Reduce Erosion and/or Sediment Delivery	Improve Soils	Create Aquatic Habitat	Create Riparian Habitat	Create Terrestrial Habitat	Enhance Precipitation	Reduce Peak Temperature	Absorb and/or Retain CO_2
U1	Green Roofs																	
U2	Rainwater Harvesting																	
U3	Permeable Paving and other permeable surfaces																	
U4	Swales																	
U5	Channels and Rills																	
U6	Filter Strips																	
U7	Soakaways																	
U8	Infiltration Trenches																	
U9	Rain Gardens																	
U10	Detention Basins																	
U11	Retention Ponds																	
U12	Infiltration Basins																	
U13	Managed Aquifer Recharge																	
F1	Riparian Buffers																	
F2	Headwater Areas																	
F3	Reservoir Catchments																	
F4	Targeted Planting for Catching Precipitation																	
F5	Land Use Conversion																	
F6	Continuous Cover Forestry																	
F7	Water Sensitive Driving																	
F8	Appropriate Design of Roads and Stream Crossings																	
F9	Sediment Capture Ponds																	
F10	Coarse Woody Debris																	
F11	Urban Forest Parks																	
F12	Trees in Urban Areas																	
F13	Overland Flow Areas																	
F14	Peak Flow Control Structures																	



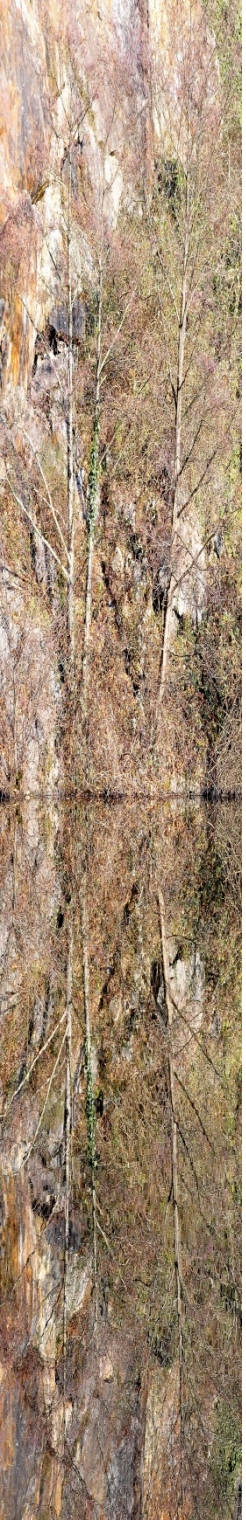
Lessons learned:

- Very diverse cases/applications, often using a bundle of NWRM: thus, 1-1 allocation of impacts & benefits is not always feasible
- EU-level info on NWRM CSs is piecemeal, often lacking quantified data. There is more focus on some NWRM applications than others
- Harmonisation of info is difficult (different objectives, context,..). Not all parameters are applicable for all NWRMs.
- DB not for the purpose of just having a collection of info, but from a users' perspective
- Evidence is important !
- Mix of "DB products" and tailored outputs (pre-formated) to accommodate needs and facilitate access to info.
- Expandable and adoptable to new knowledge and evidence



A Practical Guidance: what for?

- To support the design and the implementation of NWRM at the catchment scale in Europe and contribute to the achievement of EU (water) policy objectives
- A guidance targeting partitionners, water managers, (urban/land/sector planners)
- A guidance developped in both paper and web-based format, interacting with the NWRM Knowledge base



Guidance

What are NWRM?

- Definition

Why to implement NWRM?

- It delivers multiple benefits
- It can be the right option
- It helps complying with EU reg.

How to design NWRM?

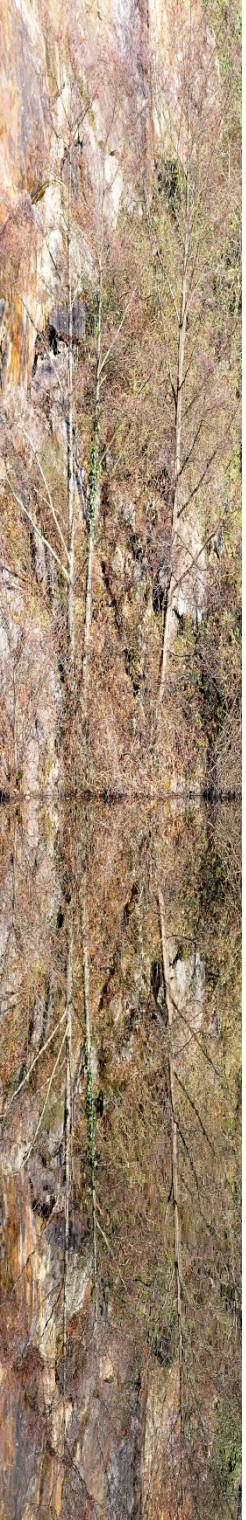
- Analyse the context
- Select context-relevant NWRM
- Locate, dimension & combine NWRM
- Assess biophysical impacts & effectiveness
- Assess costs, and multiple benefits

How to prepare implementation?

- Gets financing right
- Gets governance right
- Gets M&E right

Knowledge base

- Glossary
- 10 policy questions
- State of evidence
- Catalogue of measures
- NWRM ID
- NWRM evidence base
- NWRM Evidence database
- 
- Case study ID
- NWRM applications (case studies)
- Case study database



Thank you !

Visit our webpage: www.nwrm.eu