



## Natural Water Retention Measures

Web-based knowledge  
Community of practice  
NWRM practical guide



# 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)

*2<sup>nd</sup> Med Regional Workshop, Torino, 11-12.09.2014*





# 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.)*

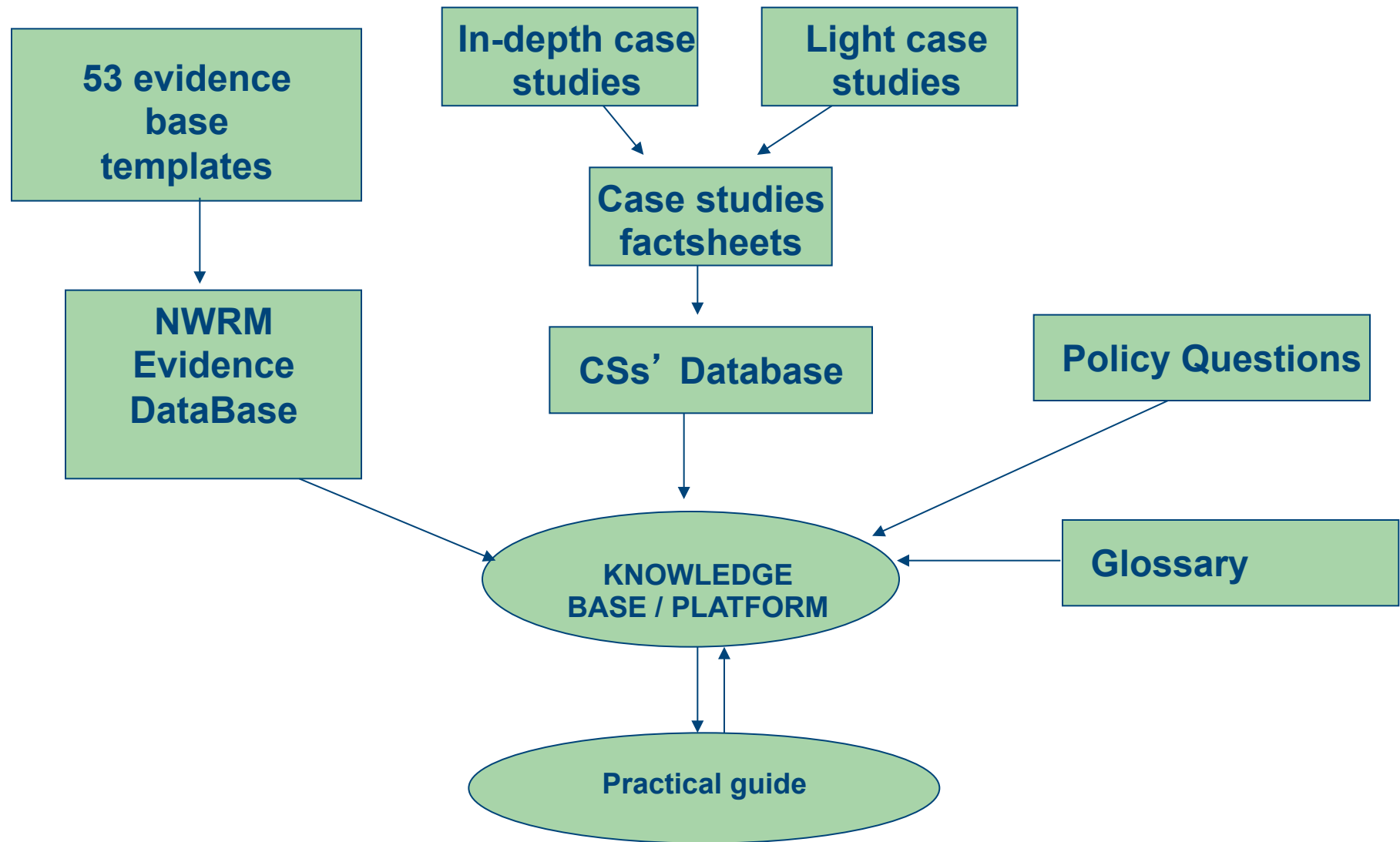
- **Research community**

Input to modelling, simulations, comparative studies

Quantified parameters mainly on biophysical impacts and costs

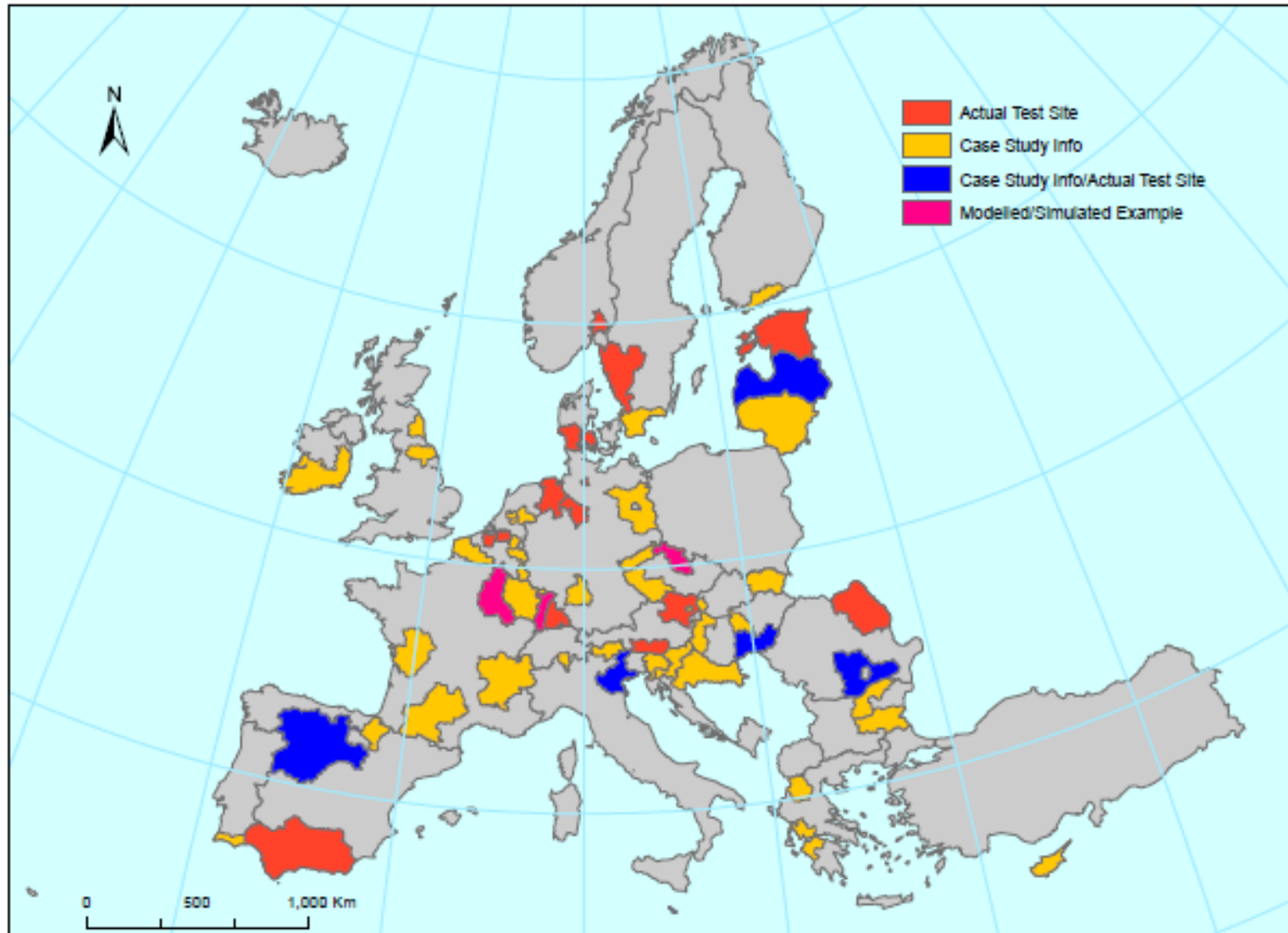


# Structure of an Integrated Knowledge Base



# The Case Studies' Database

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







# CSs DB: Data Model Characteristics

## **Main Entities:**

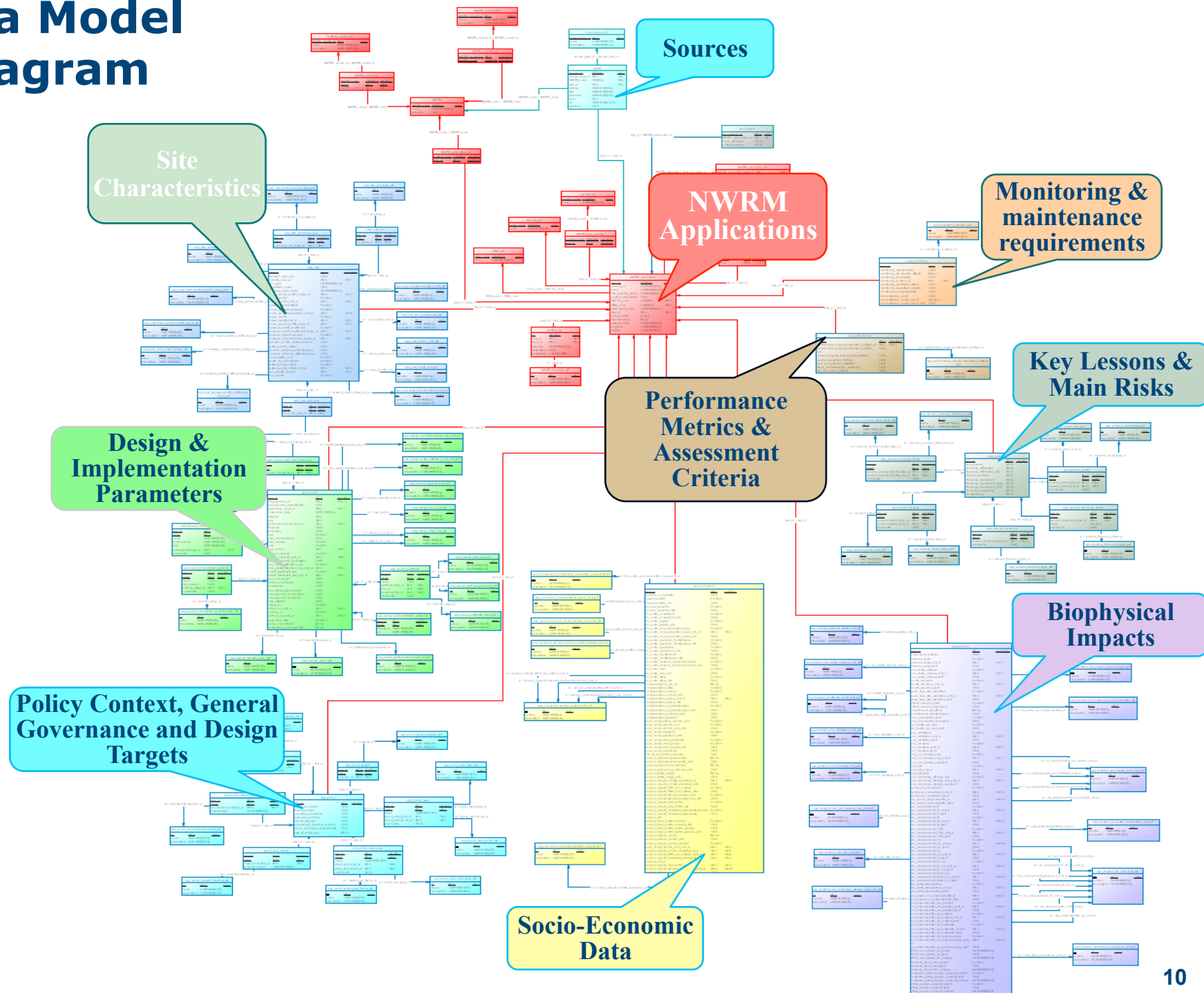
- NWRM applications of any kind e.g. test site, a case study or even modeled results documented in research studies
- NWRM types grouped in more general categories, NWRM sectors, e.g. forest measures, urban measures, agricultural measures
- Sources (references) that have been used to document NWRM applications 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	#
<b>A1</b>	<b>7</b>
A11	1
A12	1
A2	1
A3	1
A6	2
A7	2
A8	3

NWRM	#
<b>F1</b>	<b>8</b>
F2	2
F4	1
F5	1
F9	2
F10	2
F11	2
F13	1

NWRM	#
N1	9
<b>N2</b>	<b>26</b>
<b>N3</b>	<b>20</b>
<b>N4</b>	<b>14</b>
<b>N5</b>	<b>11</b>
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
<b>U11</b>	<b>7</b>
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 Conservation		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 <sub>2</sub>
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 Conservation		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 <sub>2</sub>
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																	





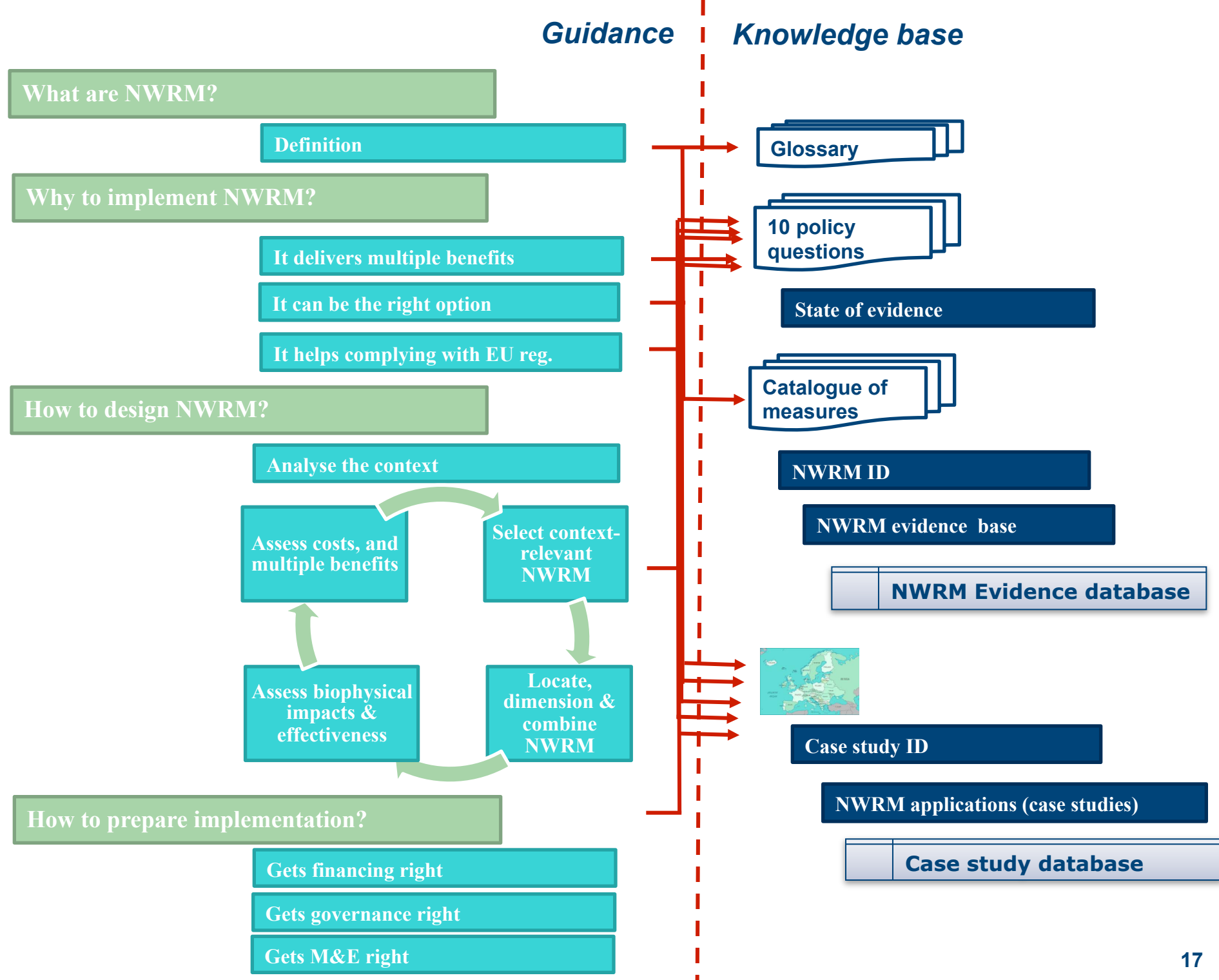
## Lessons learned:

- 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 developed in both paper and web-based format, interacting with the NWRM Knowledge base







# Thank you !

Visit our webpage: [www.nwrm.eu](http://www.nwrm.eu)