



## 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

## NWRMs - The Concept & Oft-claimed Myths

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# NWRMs: A new concept or and old one with a new suit on?

## NWRMs might still mean different things for different people

*Runoff attenuation features*

*Green Infrastructures*

*Sustainable Drainage Systems*

*Soil and water conservation measures*

*Natural Flood Management ...*

## They might be defined in a restrictive and precise way:

*The implementation of appropriate Natural Water Retention Measures (NWRMs) have as main purpose a reduction in surface runoff following rainfall events in order to reduce flood risk (JRC, 2012: p.11)*

## Or in a broad and generic way:

*Natural Water Retention Measures aim at restoring and maintaining water related ecosystems by natural means. They are Green Infrastructures intended to maintain and restore landscape, soils and aquifers in order to improve their natural properties, the environmental services they provide, and to favour climate change adaptation and reduced vulnerability to floods and droughts (NWRM concept note)*





# What is the distinctive character of NWRMs?

The definition appeals both to a single purpose: (i.e. restoring and maintaining aquatic ecosystems) and to a particular set of means (i.e. by natural means).

1. Not every measure that increases the water stored in water bodies is a NWRM.
2. NWRMs are interventions over water related ecosystems.
3. NWRMs use natural processes (functions usually performed by nature).
4. Natural water retention is not the end but the means that makes NWRMs relevant for water resource efficiency and sustainability.
5. NWRMs are not simply means to restore to its original natural condition the assets modified by human action, which is often not an affordable (if at all possible) task, but to adapt current developments in order to enhance or recover water regulation functions they provide and that were reduced or lost when these developments took place.



# An alternative view...

**NWRMs are measures intended to improve the water storage potential of both natural and modified systems.**

They may consist in creating new green infrastructures or in maximizing the potential of grey infrastructures to contribute to recharge.

**By relying on the functions usually performed by natural ecosystems (infiltration, natural runoff, soil and biomass retention...).**

**In order to increase the ability of these systems to emulate the usual functions of natural systems.**

Ecosystem functions relate to the structural components of an ecosystem (e.g. vegetation, water, soil, atmosphere and biota) and how they interact with each other, within ecosystems and across ecosystems. Sometimes, ecosystem functions are called ecological processes or supporting services.

**So as to improve the ability of those systems to provide the critical environmental services that people and the economy depend on.**

Environmental services are the benefits we receive from ecosystems.



# What are the functions Nature can perform better if its water storage capacity is improved?

- Self regulation of water by filtration / sequestration / storage / accumulation by ecosystems
- Regulation of the chemical condition of freshwaters
- Biodiversity and gene-pool conservation in riparian zones
- Soil formation and maintenance
- Natural assimilation (purification) of effluents by dilution, dispersion and physico-chemical processes
- Mass stabilisation and control of erosion rates
- Buffering and attenuation of mass flows
- Regulation of hydrological cycle and waterflow





# What are the potential benefits of improving natural water storage capacity?

A better provision of the following environmental goods and services:

- ✓ Water provision to deliver water services in the economy for both drinking and non-drinking purposes
- ✓ Water security (reliability of supply and drought resilience)
- ✓ Health security (control of waterborne diseases)
- ✓ Flood security and protection
- ✓ Storm protection
- ✓ Biomass production
- ✓ Amenities associated to habitat protection (fish and plants, tourism, recreation and other activities)
- ✓ Benefits of improved coastal water quality and ecological status for a sustainable commercial production of shellfish with human health and welfare values
- ✓ .....



## Some good news...

### Restoring and protecting natural water storage capacity is the source of many different and simultaneous beneficial effects

- ✓ *Green roofs retain water, reduce flood risk, reduce storm management's costs, capture carbon, control temperature, ....*
- ✓ *Afforestation reduces runoff, improves soil formation, mitigates erosion, improves river flow water quality, serves for carbon fixation,...*
- ✓ *Conservation tillage and other soil conservation crop practices reduce flood risk, improve soil structure, reduce water stress, enhance agricultural productivity, allow for groundwater recharge, reduce erosion, control diffuse pollution,....*

✓ ....

**Rather than one measure to one pressure NWRMs are unique measures to multiple pressures.**

*In addition to their contribution to the purposes of water management NWRMs are associated to significant co-benefits in many relevant policy domains such as: nature conservancy, agriculture, biodiversity, land planning, rural development, ....*

## ... and some not so good news...

**The choice of the adequate means to restore and protect natural water storage capacity requires dealing with important trade offs**

3.4 Crop practices					1.2 Afforestation in mountainous areas				
Change in [%] from the baseline 2030 scenario					Change in [%] from the baseline 2030 scenario				
For water stress change in [days per year] from					For water stress change in [days per year] from				
	Fast flow [%]	Evapotrans. [%]	Groundw. recharge [%]	Water stress [d per year]	Region	Fast flow [%]	Evapotrans. [%]	Groundw. recharge [%]	Water stress [d per year]
N. Scandinavia	0.0	0.0	0.0	-0.1	N. Scandinavia	-0.2	0.0	-0.1	1.0
S. Scandinavia	-0.3	0.1	0.0	-0.5	S. Scandinavia	-0.5	0.2	-0.2	0.4
Baltic	-1.1	0.4	-0.8	-1.4	Baltic	-0.5	0.2	-0.6	0.6
Denmark/N.Germany	-2.5	1.0	-1.9	-3.0	Denmark/N.Germany	0.2	0.0	-1.3	0.4
Odra/Vistula	-1.1	0.6	-2.1	-2.0	Odra/Vistula	-0.1	0.1	-0.3	0.6
Elbe to Ems	-1.2	0.7	-1.4	-2.0	Elbe to Ems	-1.1	0.4	-0.9	0.4
Rhein to Schelde	-0.9	0.6	-0.5	-2.0	Rhein to Schelde	0.0	0.0	-0.2	0.6
GB	-0.9	0.5	-0.7	-1.2	GB	0.4	-0.5	0.0	0.6
Ireland/N.Ireland	-0.3	0.2	0.0	-0.9	Ireland/N.Ireland	1.5	-0.8	0.1	0.6
France Atlantic	-2.2	1.0	-1.6	-2.6	France Atlantic	-0.3	0.2	-0.4	0.3
Danube	-1.9	0.8	-2.4	-1.8	Danube	-0.3	0.2	-0.4	1.2
Iberia Atlantic	-1.1	0.7	-1.1	-0.9	Iberia Atlantic	-0.1	0.1	-0.3	0.4
Iberia Mediterranean	-1.4	0.6	-1.7	-0.7	Iberia Mediterranean	-0.4	0.2	-0.3	0.3
France Mediterranean	-0.5	0.3	-0.3	-1.0	France Mediterranean	-1.0	1.3	-0.3	0.5
Po	-1.2	0.7	-0.8	-1.8	Po	0.0	0.1	-0.1	0.7
Corsica	-0.2	0.1	0.0	-0.5	Corsica	0.9	-1.0	-0.1	2.2
Sardinia	-1.5	0.7	-0.6	-1.2	Sardinia	1.2	-0.5	0.1	2.0
Sicily	-3.4	1.3	-2.5	-2.3	Sicily	0.3	-0.1	0.0	0.6
South Italy	-1.7	0.9	-0.7	-1.8	South Italy	-0.2	0.3	-0.3	0.8
Adige/Balkan	-0.5	0.4	-0.1	-1.2	Adige/Balkan	0.0	0.1	0.0	0.3
Greece/Evros	-1.8	0.8	-1.4	-0.9	Greece/Evros	-0.2	0.1	-0.1	0.4

Source. JRC (2012) Evaluation of the effectiveness of Natural Water Retention Measures: Support to the EU Blueprint. to Safeguard Europe's Waters





## ... and some not so good news...

### The choice of the adequate means to restore and protect natural water storage capacity requires dealing with important trade offs

- ✓ Afforestation of mountainous areas is an effective way to reduce peak flows but may increase water stress in the soil and reduce groundwater recharge.
- ✓ Improved crop practices reduce water stress in the soil but increase evapotranspiration and might reduce groundwater recharge.
- ✓ Buffer strips are beneficial for water management but may reduce crop surfaces and yields.
- ✓ Reduced tillage improves soil structure and reduces the exposure of agriculture to flood risk and drought vulnerability but increases pest infestation risks and the use of agrochemicals.
- ✓ .....

*NWRMs are changes towards sustainable land use practices with the trade-offs and opportunity costs thus implied.*



3.4 Crop practices				
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Odra/Vistula	-1.1	0.6	-2.1	-2.0
Elbe to Ems	-1.2	0.7	-1.4	-2.0
Rhein to Schelde	-0.9	0.6	-0.5	-2.0
GB	-0.9	0.5	-0.7	-1.2
Irland/N.Ireland	-0.3	0.2	0.0	-0.9
France Atlantic	-2.2	1.0	-1.6	-2.6
Danube	-1.9	0.8	-2.4	-1.8
Iberia Atlantic	-1.1	0.7	-1.1	-0.9
Iberia Mediterranean	-1.4	0.6	-1.7	-0.7
France Mediterranean	-0.5	0.3	-0.3	-1.0
Po	-1.2	0.7	-0.8	-1.8
Corsica	-0.2	0.1	0.0	-0.5
Sardinia	-1.5	0.7	-0.6	-1.2
Sicily	-3.4	1.3	-2.5	-2.3
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1.2 Afforestation in mountainous areas				
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# Key messages - FAQs on NWRMs

## What are NWRMs?

Restoration actions and changes in land-use practices intended to improve the water storage potential of both natural and modified systems.

## How do NWRMs work?

By relying on the functions usually performed by natural ecosystems (infiltration, natural runoff, soil and biomass retention,...).

## Why should people care about NWRMs?

They improve the ability of those systems to provide the critical environmental services that people and the economy depend on.

## Why do NWRMs represent an opportunity to build better programmes of measures for water management?

Because they are effective means to contribute to many objectives of water management at the same time.

## Why do tradeoffs need to be considered?

A proper assessment of NWRMs requires considering the pros and cons, the additional benefits and the opportunity costs, implied in the land-use changes that characterize any NWRM.



Thank you for attention

