



**Natural Water Retention Measures**



Web-based knowledge  
Community of practice  
NWRM practical guide



European Commission



Office International de l'Eau

**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 & WFD/FD – Opportunities for  
the Danube Region to provide  
ecosystem based economic gains**

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Research – Water Economics Unit**

**2nd Danube Regional Workshop  
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ACTeOn

## **Natural Water Retention Measures are for the long term strategy**

**In a world with growing pressures on resources and the environment, \_\_\_\_\_ has no choice but to go for the transition to a resource-efficient and ultimately regenerative circular economy.**

## Natural Water Retention Measures are for the long term strategy

**In a world with growing pressures on resources and the environment, \_\_\_\_\_ has no choice but to go for the transition to a resource-efficient and ultimately regenerative circular economy.**

**\_\_\_\_\_ = the EU**

**Resource Efficient Europe 2020 Manifesto**

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## Global competitiveness

**The EU has few other obvious fields then its environmental resource management where comparative advantages to maintain the present quality of life can exploit.**

- Human costs? – We don't want it to level out.
- Technology? – Levelling out quickly
- Human capital - Levelling out slowly
- Capital? – Already mobile
- Environmental resources?
  - ♦ Legal frame
  - ♦ Growing social consciousness about nature
  - ♦ Perceived risk of climate change
  - ♦ Cost rationalization

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## Where the gains of NWRMs do come from?

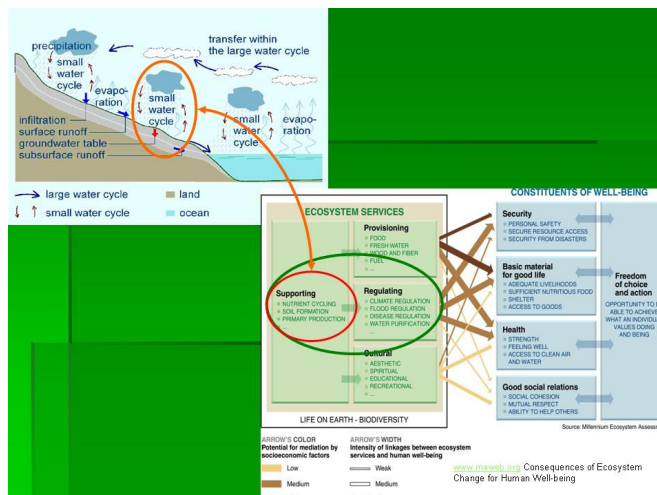
### Water retention plays a key role in creating Supporting Ecosystem Services

Key feature: capacity of the small water cycle in the landscape

It drives:

**Primary production**  
**Nutrien cycling**  
**Soil formation / erosion**

**Water circulation in the  
landscape as**  
**Production input**  
**Transport medium**



## Where the gains come from?

### Ecosystem service provision

- More water for the ecosystem
- Improved Supporting Ecosystem Services higher potential of the whole ecosystem services

### Cost efficiency – the pentathlonist's case

- In need of balanced performance it is better to apply:
- 1 good pentathlonist than
- 1 runner, 1 swimmer, 1 horseman, 1 shooter and 1 fencer
- IF COSTS ARE RELEVANT!

## WFD + FD the legal drivers NWRMs

### The most obvious elements of cost reduction:

- Flood prevention and
- Diffuse nutrient overload reduction
- Prevented future costs have immediate present value in the calculations

### The key issue to achieve complex gains via NWRMs?

#### Land use agreements to tackle

- **Asymmetric cost – benefit distribution**
- **Recently recognized connections between stakeholders without clarified allocation of responsibilities – beyond the parcel effects**

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## The role of EU money – gains from protection

### Improving the ecosystem – improving its services

- Improvement in protected areas,
  - ♦ (Belen Island, Kalimok, BG, Lonsko Polje, HR, Kiskunság, Hortobágy HU)
- Buying out the conflict points
  - ♦ (Dümmer marshes, DE 175ha enhanced the status of 2500ha; Slampe river, LV, Prut-Jilija, RO)
- Integration of AES CAP payments to resolve territories beyond public/protected lands
  - ♦ (Alzette river, LUX; Zuvilnas, Amalvas wetlands, LT)

### A potential cost efficiency aspect:

- the ratio of purchased land to the total size of land freed up for natural water regime

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## Value estimates of Natura2000 sites

### Considered value elements:

- Climate regulation – carbon storage
- Moderation of extreme events
- Water regulation, purification, provision
- Pollination, Agriculture, erosion control and forestry products
- Natural medicines, genetic resources
- Air quality,
- Human health
- Biological controll
- Cultural and Social Services: Tourism, Recreation

**Table 2: Estimated benefits at EU27 based on up-scaling of GDP adjusted site based estimates**

Basis for upscaling	Value per hectare (€)	Value EU27 (€M)
Mean	3,441	313,520
Median	2,447	222,951

- Source: Estimating the Overall Economic Value of the Benefits provided by the Natura 2000 Network IEEP 2011 –
- [http://ec.europa.eu/environment/nature/natura2000/financing/docs/Economic\\_Benefits\\_of\\_Natura\\_2000\\_report.pdf](http://ec.europa.eu/environment/nature/natura2000/financing/docs/Economic_Benefits_of_Natura_2000_report.pdf)

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## Protected area improvements have their limits

**Optimizing for services can be in conflict with naturalness**

**Protected areas are not enough big and their main role is not to mitigate the detrimental effects generated on land elsewhere.**

**Principles of Land Use of non-protected, private land have to be considered as well. – BUT HOW?**

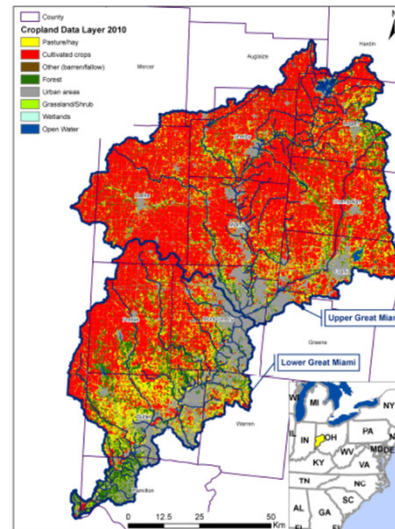
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## Gains from management – single issue

### Great Miami River – Ohio, US

Land Use	Hectares
Urban areas	168,523
Forest	130,453
Grassland/shrub	9,093
Pasture/hay	160,574
Cultivated crops	528,774
Wetlands	791
Other (barren/fallow)	789

Source: USDA, 2010



Map 2.1 – Land use in the Great Miami River Watershed from USDA 2010 Cropland Data Layer

Source: USDA Cropland Data, 2010

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## Gains from management – single issue

### Defining the service – nutrient load reduction – the case of the Great Miami River Ohio, US

- Stricter water quality standards were foreseen
- Legal frame – point sources are liable –
- Treatment plan upgrade (estimated 430 mill USD) vs diffuse source mitigation in the catchment
- Transport processes modelled, nutrient reduction capacities by measures defined for farmers
- Diffuse source - voluntary participation
- Auction for buying nutrient load reduction service from farmers
  - ♦ 10% of the upgrade cost
  - ♦ Nature improvement on the catchment
  - ♦ Community building among urban rural stakeholders

– Source: [www.epi-water.eu](http://www.epi-water.eu) – Kieser, McCarthy, 2011

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## Gains from management complex issues

**Multi-purpose – flood prevention, water quality and environmental quality/morphology also considered**

### Based both on EU money and local sources

- (Ems polder area, DE, Aurino stream, I, Seymaz river, CH, Léze watershed, Fr.)

### Aurino stream, Italy – Alpine terrain

- narrow valley, shortage of land, degraded stream morphology, decreased groundwater level
- complex action to create more space (not only NWRMs)
- mostly on public land
- crucial was the agreement with farmers on the new groundwater level, not to re-increase too much – the agency obliged to control it

### Seymaz river, CH – wetland creation for flood control

- Purchase with bonus, securing the future drainage rights, non expropriation clause for the negotiations

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## Léze watershed experience, floodbreak hedges

**Size: 35.000 ha, location South-France**

### Problem:

- elimination of 300 km hedges between 1980-2008 from critical slopes - flood risk and erosion increase, driven by efficiency of scale of agriculture practices

**Open question: Allocation of rights to impose cost on others by changing marginal practices on own land?**

**Public funds for replanting cross gradient hedges at 300-500 meter distance, part of „PAPI” (local flood protection action program)**

### Offer: purchase, rent, compensation

- but no purchase was required

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## Belford Burn village – Northumberland

### By UK law public funds is allowed to invest in flood schemes with positive net present value

- costs can not exceed the gains in risk reduction.
- Incentive for cost efficient solutions
- Third parties can undertake commitments (for example NGO payments to farmers for extra maintenance elements). It modifies the calculus

### Belford Burn cost-benefit calculus showed:

- The conventional structural flood protection measure is non recoverable.
- Detention ponds on agricultural land, hedges, woody debris in channels.
- Without purchase or easement

### Aims: flood prevention, pollution reduction, amenity

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## Are NWRMs feasible without EU money?

### Lenzen, Elbe floodplain reconstruction

- CBA Scenarios, 90 year, Net Present Value, 3%, million €

	Investment cost	Avoided damage	Nutrient retention	Value of floodplain ecosystem
Dyke relocation	-407	177	488	926
Dry polder	-42	415	0	0
Wet polder	-124	427	54	202

Source: Grossmann, M., Hartje, V., Meyerhoff, J. (2010) Ökonomische Bewertung naturverträglicher Hochwasservorsorge an der Elbe. Naturschutz und Biologische Vielfalt 89, Bundesamt für Naturschutz: Bonn, Picture: <http://www.erlebnisgruenesband.de/typo3temp/pics/64a4e0b130.jpg>

Wet polder – annual inundation with some dyke relocation



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## Economic discussion on NWRM implementation

### Own interpretation of partial results of CBA elements

	Cost + Flood results	Cost + Flood + Nutrient	Cost + Flood+ Nutrient+ Ecosystem
Dyke relocation	-230	258	1184
Dry polder	373	373	373
Wet polder	303	357	559

#### Value of nutrient reduction

- by treatment plan substitution
- Consider the Great Miami river CS

#### Ecosystem value

- by willingness to pay survey
- consider the UK way of third parties

#### EU funds

- facilitated the development
- But NWRM is still positive without it



Source: Grossmann, M., Hartje, V., Meyerhoff, J. (2010) Ökonomische Bewertung naturverträglicher Hochwasservorsorge an der Elbe. Naturschutz und Biologische Vielfalt 89, Bundesamt für Naturschutz: Bonn

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## Conclusions, points for later discussion

**The knowledge barriers are not technical and biophysical but organisational and institutional**

**EU funds important role is to kick start projects in the region – but it is only a temporary solution**

#### Economic gains comes from

- „No regret solutions“ in rehabilitation projects
- Multi-purpose application, but considerable gains will require land use agreements with private owners as well

**Rethink the responsibilities of „Beyond the parcel“ effect of water management practices to harmonise WFD-FD principles can provide economic basis for NWRM implementation**

- Polluter/user pays (diffuse nutrient, erosion cases)
- Prohibition of exporting flood risk downstream

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## Innovation and care

### Körös valley forests - floodplain reconnection



Small scale reconstruction works of the old terrain with special attention to the safety of the trees.  
Source: Puskás 2010, A Fekete-Körös erdeinek vízpótlása és 15 éves ökológiai eredményei, Figure 3, 7

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Thank you for attention

[www.nwrm.eu](http://www.nwrm.eu)

[www.aqua.rekk.eu](http://www.aqua.rekk.eu)

