



What are NWRM?

Natural Water Retention Measures (NWRM) are multi-functional measures that aim to protect water resources and address water-related challenges by restoring or maintaining ecosystems as well as natural features and characteristics of water bodies using natural means and processes.

Project aims

- To develop a comprehensive European collaborative knowledge base on NWRM across four sectors.
- Contribute to developing the European NWRM community of practice to support implementation of NWRM to support WFD, Floods Directive, climate change adaptation and sustainable urban plans.

Agriculture



Forest



Urban



Hydro Morphology



53 NWRM organised across 4 sectors, but many applicable across land uses

Why use NWRM?

- Give more space to nature
- Increased resilience
- Deliver multiple benefits
- Achieve multiple policy goals
- Cost-effective solutions
- Multiple financing options

How to implement NWRM

- Identify: objectives, pressures and challenges
- Pre-screen NWRM: relevance to context and expected benefits
- Assess: impacts, effectiveness and compare measures
- Feasibility: technical, financial, governance
- Resources : monitor, interact, adjust and communicate

Ensuring effectiveness

- Ensure knowledge is multidimensional
- Make functioning and scale explicit
- Mobilise stakeholders
- Find the right incentives
- Widen scope of monitoring and evaluation

Assessment covering: design, impacts, ecosystem services, policy goals, cost-effectiveness, finance and governance

'Visit' NWRM in practice

- NWRM have been applied across Europe by water managers, conservation organisations, farmers, urban planners and many others
- Read our in depth and light case studies

A6 - No-till agriculture

Tillage is a mechanical modification of the soil which, if done intensively, can disturb the soil structure, thus increasing erosion, decreasing water retention capacity and reducing soil organic matter. No-till (NT) farming is a way of growing crops or pasture from year to year increasing water infiltration, organic matter retention and cycling of nutrients in the soil. The main benefit of no-till is improvement in soil biological fertility, making soils more resilient and eliminating soil erosion in some areas.

LAND SURFACE RELEVANT FOR APPLICATION

- Artificial surface
- Agriculture land
- Forest and semi-natural areas
- Wetlands

FINANCIAL COSTS (CAPITAL OPERATION & MAINTENANCE)

No-till systems require direct drilling machinery (DD) as an alternative to ploughing. If no-till is used in conjunction with water cover crops, rollers may be necessary prior to drilling of spring crops. Costs remain lower than a ploughing system. Fuel savings range between €10 to €15/ha and reduction in labour costs is around €1/ha. However, additional herbicides and fertiliser costs reach €18 and 16/ha.

SCALE

No-till is applicable at field scale.

DESIGN

No-till can be combined with other agricultural measures such as green cover crops, reduced tillage, controlled traffic farming. The list of those is especially relevant as it can help to avoid problems of soil compaction due to the lack of machinery movements in no-till systems, particularly on wetter soils.

POTENTIAL BIOPHYSICAL EFFECTS

- Rainfall
- Reducing pollution
- Soil conservation
- Habitat
- Climate Change

ECOSYSTEM SERVICES DELIVERED

- Provisioning
- Regulation & maintenance
- Cultural
- Abiotic

CONTRIBUTION TO POLICY OBJECTIVES

- Water Framework Directive
- Floods Directive
- Birds & Habitats Directive
- 2020 Biodiversity Strategy

Studies report that no-till increases soil water retention in the upper soil layer by 4 to 12% compared to ploughing; in some cases runoff has been reduced by 40%. Flood risk reduction has not been quantified, but follows from increased water retention, infiltration and runoff reduction. Catchment level protection of no-till together with other measures that contribute to mitigating flood risk. No-till can reduce P and N loss by 30 to 88% and soil erosion by 89% in hilly areas. This contributes to improving and preserving water status of hydro-morphological quality elements and preventing water status deterioration. No-till increases soil aggregation stability, soil organic carbon (by 30 to 1300g/ha), pore structure, biological activity, infiltration rate, hydraulic conductivity and soil strength, but decreases the amount of wet soil, increases acidity and P accumulation. These changes either result in higher or lower CO₂ emissions (+220 to -57%) but CO₂ emissions from fuel use are lower in no-till systems (30 to 87%). No-till contributes to preserving soil biodiversity by increasing earthworm biomass (200%) and invertebrate population and species, thus supporting wider biodiversity, which helps to address Biodiversity Strategy goals. Combined with other measures, no-till can contribute to sustainable agriculture but its main impacts are linked to soil type and climate. In Europe, yields results may be 5% lower with no-till than with tillage, but they are higher in Southern Europe.



F3 - Afforestation of reservoir catchments

Afforestation of previously bare or heavily eroded areas in reservoir catchments can control soil erosion, thereby extending the life of the reservoir and improving water quality. Water quality can also be improved if precipitation is able to infiltrate into forest soils before flowing to the reservoir. However, less precipitation may be available for reservoir recharge due to the potentially greater interception and evapotranspiration associated with forests.

LAND SURFACE RELEVANT FOR APPLICATION

- Artificial surface
- Agriculture land
- Forest and semi-natural areas
- Wetlands
- Mitigation of artificial or agricultural surfaces in a form of land use conversion (LUC)

FINANCIAL COSTS (CAPITAL OPERATION & MAINTENANCE)

Typically, the responsible authority owns much of the catchment thus land acquisition costs may be relatively minor. If not, acquisition costs may be considerable and other mechanisms such as easements or landowner agreements should be considered. The capital costs of afforestation can be lower than the cost of other approaches to controlling water quality in drinking water.

SCALE

Reservoirs are typically located in meso-scale catchments so as to have sufficient contributing area for precipitation capture. However, the benefits are largely scale independent.

DESIGN

Generally as much of the reservoir catchment as possible should be afforested such that precipitation can be maximised without undue reduction in reservoir inputs due to higher evapotranspiration from forest cover. The riparian areas should be prioritised. Afforestation of more steeply sloping areas is likely to result in greater benefits related to sediment retention.

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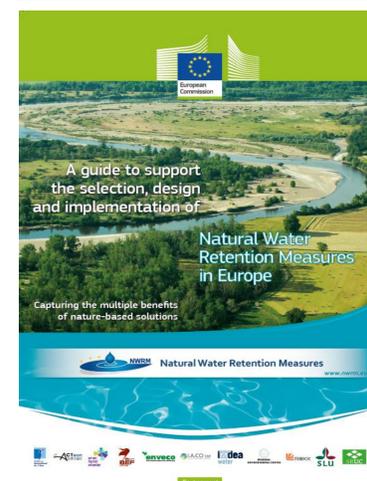
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Afforestation of reservoir catchments can be part of a program to reduce flood risks. Forests are able to return a significant fraction of precipitation to the atmosphere through evapotranspiration and forest soils can slow the transit of water, reducing the height of the flood peak flows (depending on the wetness of the soils and the depth of water in the reservoir). Increased infiltration can contribute to groundwater recharge. Forests can intercept atmospheric pollutants and have the potential to reduce downstream concentrations of heavy metals, nutrients and organic pollutants (forests also enable phytodegradation). This can contribute to improved water quality in the reservoir and indirectly in downstream water bodies. Forests and reservoirs are also efficient at retaining sediment. Increased vegetation growth contributes to carbon sequestration, and reservoirs themselves can provide sedimentation of dissolved organic carbon. The measure can thus contribute to climate change adaptation; however, the standing biomass in reservoir catchment forests should not be harvested by large scale clear cut methods so as to avoid negative impacts on reservoir water quality (See Continuous Cover Forestry measure, F6). Afforestation using endemic or indigenous species will create terrestrial habitats, providing significant contribution to biodiversity preservation and potential for natural biomass production. Forests are also widely prized for their amenity and recreational value.



To find out more visit www.nwrn.eu



Partners



This document is provided in the framework of "ENV.D.I/SER/2013/0010 Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures in River Basin Management" (09/2013-10/2014) with the support of the European Commission. However, it only reflects the views of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.