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Natural Water Retention Measures

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Barriers and success factors for Natural Water Retention Measures

Environment

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The present synthesis document has been developed in the framework of the DGENV Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures (NWRM) in River basin management. The project aimed at developing a knowledge based platform and a community of practice for implementation of NWRM. The knowledge based platform provides three main types of elements:

- the NWRM framework with access to definition and catalogue of NWRM,
- a set of NWRM implementation examples with access to case studies all over Europe,
- and decision support information for NWRM implementation.

For this last, a set of 12 key questions linked to the implementation of Natural Water Retention Measures (NWRMs) has been identified, and 12 Synthesis Documents (SD) have been developed. The key questions cover three disciplines deemed important for NWRM implementation: biophysical impacts, socio economic aspects and governance, implementation of financing.

They rely on the detailed delineation of what NWRMs cover as described in *SD n°0: Introducing NWRMs. 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.* Evidences included into these synthesis documents come from the case studies collected within this project (see the catalogue of case studies) and from the individual NWRMs factsheets which are available on the page dedicated to each measure (see catalogue of measures). This information has been complemented with a comprehensive literature review.

More information is available on the project website *nwrm.eu*.

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I. Introduction

Following the identification of windows of opportunities for successful Natural Water Retention Measures (NWRM) implementation (synthesis document 8)[1], the questions that remain are:

- what are the barriers that still impede taking advantage of these opportunities (**section II**)?
- and what have been keys for success in the few places where these measures have been successfully implemented (**section III**)?

The synthesis document further seeks to answer the following question: **what are the preconditions to success for an effective implementation of NWRM by river basin managers and practitioners?** To do so, the document will be based on:

- examples from the project's **case studies** of measures that were implemented across Europe;
- conclusions and illustrations based on the experience of participants to the project's regional **workshops**, that were shared during presentations and discussions;
- the project's **measures factsheets**;
- the project's other **synthesis documents**;
- an extensive **literature review** (academic and institutional sources at different levels).

The objective is twofold: a) to see what worked, what didn't and the reasons that may explain such situations, as well as the ways forward in case a project meets difficulties; b) to come up with operational recommendations for river basin managers and practitioners when implementing such measures (please refer to the practical guide developed under this project for further recommendations). Because NWRM are special in the sense that they often step away from traditional water management approaches, the barriers and keys to success rely on these distinctive characteristics. NWRM features will thus be presented (**section I**) in order to identify barriers and levers to implementation.

Figure 1[2] illustrates the key challenges identified, along with their interrelations, which will be developed under the following sections.

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[1] Please check the project website (www.nwrm.eu) for the other synthesis documents, or any NWRM case study mentioned in the following.

[2] Adapted from Pierre Strosser, "Background note to the WG POM: Implementing the NWRM Pilot Project: progress, feedbacks and next steps", 14 March 2014, p. 8.

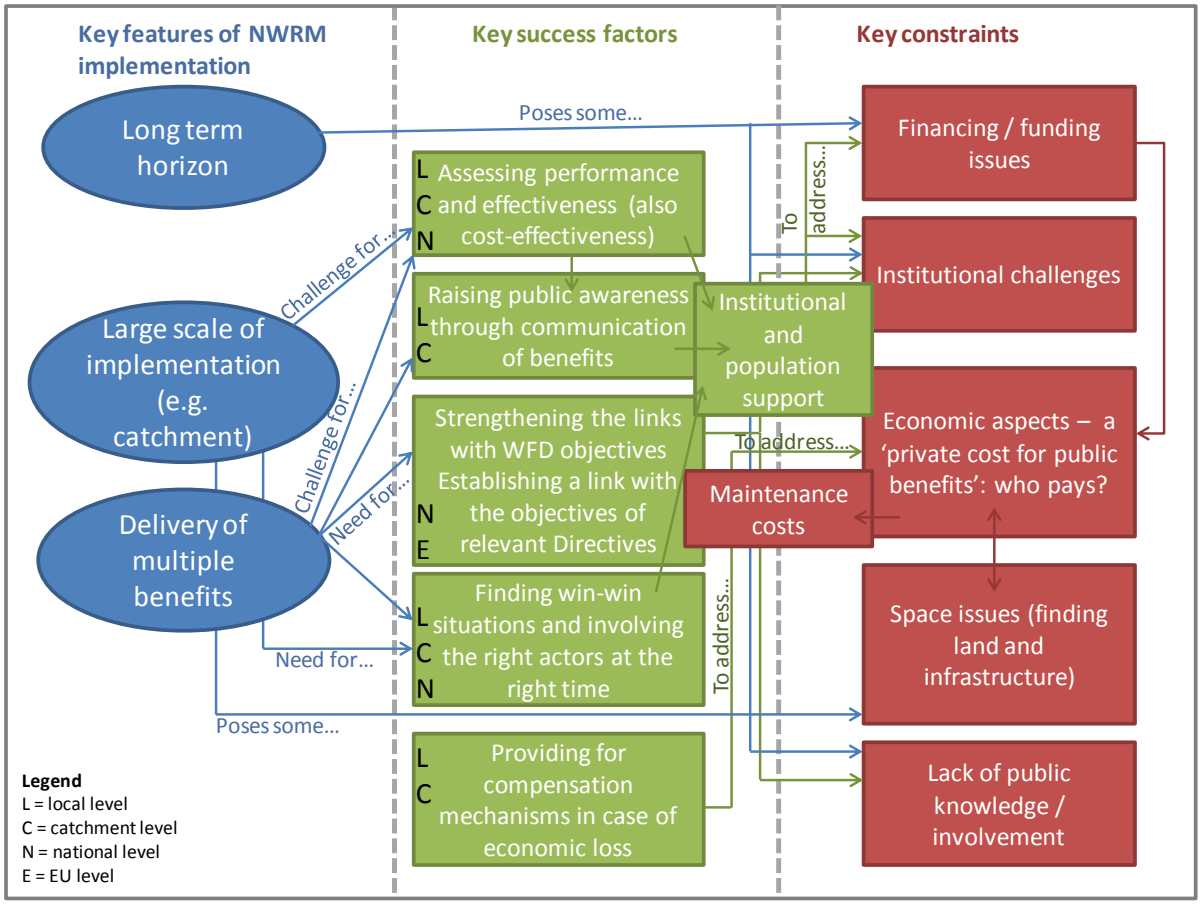

FIGURE 1. INTERRELATIONS BETWEEN KEY FEATURES, SUCCESS FACTORS AND CONSTRAINTS IN NWRM IMPLEMENTATION

Common features of NWRM implementation that were observed across Europe and beyond include:

- a **long term horizon** for the the effectiveness and the benefits of many measures to arise after their implementation; for example, while they require an immediate investment, most of these measures require time to show results (soil conservation practices, river restoration, afforestation, etc.): the soil conservation practices might result in water savings and yield increases after some years, but in the short term they reduce yields, are labour- and care-demanding and might facilitate pest infestations;
- a **large geographical scale of implementation** (such as a catchment level) for the measures to be effective; for example, in the case of urban areas, an isolated measure is mostly ineffective and needs to be combined with others to solve drainage issues, requiring an articulated plan to transform the drainage of the city or the agricultural practices in an entire area;
- and their **delivery of multiple benefits**, which go well beyond water retention itself and include, for example, water quality improvement, biodiversity improvement, enhancement of soil features, better ecosystem adaptation capacity to climate change and so on (IEEP, 2012); indeed, the restoration of riparian areas, wetlands and floodplains may simultaneously help retain water, support biodiversity and soil fertility, and prevent floods and droughts (Blueprint, 2012). This feature is relevant when dealing with barriers as when judged only for their contribution to water management objectives, measures may not appear as attractive as when all benefits are considered.

These features call for a special attention to inherent constraints when implementing natural water retention measures.

II. What are the main barriers for implementing NWRM?

A first challenge is the **long-term horizon** for effectiveness of measures to show that often results in a lack of institutional and financial support. **Financing issues** arise, in particular, when it comes to the **continuous effort** required to manage a NWRM through time and in many cases without perceiving the benefits (that only arise in the long-term if the measure is effective). Certain measures (i.e. Sustainable urban Drainage Systems, SuDS) require commitment for continuous management and maintenance of public areas which bring additional costs and administrative burden on local management authorities (Northern Ireland Environmental Agency, 2011). Moreover, maintenance can be crucial for other measures' effectiveness, for example if riparian forests are not maintained properly they could have adverse impacts on floods (Stella Consulting, 2012).

Moreover, NWRM have been financed in an *ad hoc* manner, rather than in an **integrated way**. Financing sources have originated from co-financing of EU funds, such as the LIFE Programme (synthesis document 11). Inadequate finance may therefore be seen as a barrier to implementation, as to be effective, NWRM need to be applied simultaneously over large areas and existing financing sources are only available for point interventions. While other EU funds are used for large investments supporting hard-engineering measures such as the construction of dykes (the Structural and Cohesion funds for instance), they have not yet been utilized for supporting the implementation of natural retention water measures investments (European Commission, 2012a). This may be explained by perception-type barriers ("green" versus "grey" measures) and the diminished availability of financial resources (SWD, 2012). Also, the general lack of enough knowledge on the **overall costs of NWRM implementation**, including opportunity costs (yields lost, time and other resources required to maintain the measure, etc.), constitutes a barrier to the determination of financing sources and thus implementation.

The **institutional setups** inside countries may also lack incentives to properly promote NWRM (public participation processes, regulations, political contexts). Coupled with other factors (compartmentalisation into institutional silos, specialized financial incentives, barriers impeding payments for environmental services...), they may only allow for a "weak" implementation of EU Directives. The case study in Box 1 shows that while a coordinated work with private landowners would have allowed for a bigger retention potential, contributing to substantial water quality improvements, the EU funds used to finance the measure had a contrary incentive, even if the measure was still in line with WFD objectives. The funds helped solve technical aspects; however a local coordination of interests, through a multi-party process, would have been necessary.

Box 1. Multi-purpose water management development along the Körös-ér (Hungary)[3]

Source: http://tamop412a.ttk.pte.hu/

The Körös stream catchment lies in a droughts stricken region of Hungary. It is a heavily modified water body, with repeated surface water resource shortages, declining ground and subsurface water levels, nutrient overloads in the stream and ground water from point and diffuse sources that are both agricultural and urban. The water quality problem exacerbates at low flow periods because of effluent discharges. Meanwhile recurring water logging periods cause temporary flood problems for populated and agricultural areas during early spring and in case of torrential rains. In spite of a negative water balance, annual evapotranspiration (500-800 mm) is higher than precipitation (500 mm) and there is run off as well (200 mm).

Public perception of the water problem focuses on the water surplus/flood events, *i.e.* when damages are immediate, concentrated and the parties are well defined. Also the water quality problem of the stream gets more attention because of the apparent sewage effluent and the legal responsibilities that are clear. However the cost and negative consequences of the recent water balance and the opportunity cost of the missing water are not obvious, the effects being scattered and time lagged.

The water directorate, in order to avoid conflicts with local stakeholders both in urban and agricultural territories, applied a twofold approach, which combined water retention in public parts and drainage capacity increases in private parts :

- In the **publicly owned land parts,** it introduced retention measures (detention ponds, locks) in the upper section. The detention pond upstream will serve recreational purposes and run off control, but its main storage purpose is to prevent water quality problems by providing dilution at low flow periods of the treated sewage effluent;
- In the **privately owned land parts** (settlements, agricultural lands), drainage capacities were increased to prevent damage from water logging and torrential rain periods.

By this strategy along the **middle section** of the stream two types of developments were introduced:

- The flood period drainage capacity of the stream was increased (bottlenecks removed) to cope with the higher runoff from the settlement and fields during flood events.
- Sluices were upgraded along the section at four sites that could retain water in the streambed after the flood wave passes. While the works can induce the inundation (reconnection) of low-lying areas along the stream, it only remained a potentiality because these lands are privately owned and the owners are not interested in converting their crop lands into a more water adaptive land use form. They are thus conditioned by a change in public demand.

EU funds played a crucial but tricky role in this case. While they helped solve technical aspects, they were not a solution to a local coordination of interests. In this case, a coordinated work with private landowners would have allowed for a bigger retention potential and thus contributed to substantial water quality improvements.

As highlighted during the second Western workshop of the present project, **social acceptance** may constitute a further barrier (which may be overcome as exposed in Section III). Indeed, the long term effectiveness of measures may also pose some challenges in terms of **public involvement or interest** from citizens and decision-makers (depending on measures): often, an impending threat or immediate

[3] Author of the NWRM case study: Gábor Ungvári, REKK Water Economics Unit, Budapest.

effects and results from a project are needed to justify taking action. It might be explained by the overall lack of prioritization for nature conservation and long-term water resource protection, constituting a barrier to the implementation of NWRM. Society does feel less concerned by long-term impacts or benefits, "so there is resistance to change practices if the problems are not pressing, or if it is not evident that the solution will have an immediate and effective response" (European Commission, 2012a). Long term benefits are more uncertain than short term costs.

The geographical scale is another crucial aspect of NWRM implementation: as shown, for example, by case studies in the Western and Mediterranean regions,[4] the **catchment scale is key**, as individual measures may have little effect, and it is rather the cumulative effect of measures appropriately placed throughout a catchment that is relevant when considering benefits.

However, such a large application scale poses some difficulties when **assessing the performance and effectiveness of measures**: benefits are often widespread, and interventions in one place may yield benefits elsewhere, i.e. downstream (Stella Consulting, 2012). Therefore, those who receive the benefits are not necessarily the same as those who incur the costs: in many cases, it corresponds to a '**private cost for public benefit**'. The wide spread of benefits might make it challenging to identify and incentivize key parties sitting within a single sector or policy area.

A further challenge when assessing NWRM performance relates to the fact that they provide **multiple benefits**. If some of the benefits are overlooked or unknown, **NWRM might not appear cost-effective**, and thus key stakeholders might not have an incentive to engage in NWRM implementation (synthesis document 6). NWRM could then be seen as a burden rather than an opportunity for those with key roles in implementing them. Measuring those benefits is a challenging task, and in fact most of the discussions during workshops as well as the Stella report highlighted the **need for a better knowledge about multiple benefits** and their values (Stella Consulting, 2012). In particular, "links between geomorphological components, good ecological status and ecosystem functioning, with both preservation and restoration perspectives" need to be further explored in order to evaluate the possible positive and negative effects from the application of NWRM measures. Also, information on the impacts of drivers such as land use change on the capacity of aquatic ecosystems and on the quality and provision of different ecosystem services is often poor or incomplete (CIS-SPI, 2011). Measuring of benefits (synthesis document 4) is thus limited by: a lack of **tools for quantification** of certain benefits (i.e. correlation of measure's impact to specific ESS indicator) – this can be cumbersome for certain ESS i.e. provision of habitat or impact on water quality (IEEP et al. 2012); and a lack of **practical economic valuation tools** and **comprehensive CBA methodologies** especially for valuation of benefits and assessment of trade offs (IEEP et al. 2012; Ecologic Institute and GHK Consulting 2011) that still need development[5].

Finally, the large application scale also leads to difficulties in **finding space** for the implementation of a measure, especially on land that already serves a purpose, in the case of urban and agricultural measures for example. In Box 2, two case studies illustrate conflicts of interests for space that took place between

[4] During the first Western Workshop, the Eddleston Water and Belford catchments were mentioned as examples where measures were not as effective as expected, in terms of interactions with other measures and between rainfall events.

[5] Please refer to synthesis document 4 on Benefits of Natural Water Retention Measures for further information quantification and qualification of NWRM benefits.

water managers and authorities; and private and public land owners when implementing hydromorphological NWRM. They are also examples for success factors that led to an effective implementation of measures.

Box 2. The Seymaz renaturation project (Switzerland) and River restoration along the lower Aurino river (Italy): "hydromorphological" measures in action

The *Seymaz renaturation project* (see NWRM case study) consists in several renaturation measures: eliminating concrete casts, softening riverbanks and widening riverbed; a wetland is also re-created (NWRM N5, N9, N2 of the catalogue of measures). While land use constraints have been the initiator factor to the implementation of the measure (because of frequent flooding occurring on farmlands in the Seymaz basin itself), **opposition from private land owners and farmers** concerned by the measures slowed down the implementation process. However, the political context (the Geneva canton is much more in favor of renaturation than other cantons); legislation (two laws on renaturation voted by the Geneva canton) and existing funding sources (a cantonal "renaturation fund" available since 1997) have been main factors for the selection of NWRM, instead of "traditional" works for flood management.[6] Finally, involving farmers in the decision process (for e.g., through the creation of the *Seymaz Charter Group*), and negotiating compensations and decisions such as the non-expropriation of farmers or the "drainage right" were success factors for the measures' implementation. Farmers had the choice between selling their lands in exchange for compensation, or signing a "nature contract" regarding the way to manage the land.

The main objective of the interventions along *the lower Aurino river* (see NWRM case study) is the improvement of riparian natural environments (tackling the near-total disappearance of islands and gravel areas), coupled with protection against floods (due to a dramatic reduction of flooding areas). These correspond to NWRM N8 and N3. Another major objective is to raise the groundwater level, which has significantly reduced over time, causing damage to longitudinal hydraulic works and riparian forests that are now rarely flooded, disturbing ecological dynamics. At the same time, a lower groundwater table allowed the expansion of agricultural areas, and this had to be taken into account when designing and implementing the measures –i.e. bringing back the ground water level back to the original level would not have been a desirable outcome for farmers. As such, the **availability of land** was the main constraining factor: most of the measures were implemented on public land (state or municipal land). Only in the case of Gatzauer/ Gais Lot III measures were implemented mostly on private land, but this required compensation. Finally, informing and involving local communities and key stakeholders was the key to successful implementation (see e.g.; negotiations with farmers). A further success factor was the Autonomous Province of Bozen's almost full autonomy over land and river management, as well as access to funds. Therefore measures were fully implemented by the Province, which has all the necessary equipment, and no external intervention was necessary, allowing for keeping the costs down.

[6] Switzerland, with its 10 000 km of highly modified water courses, has known severe environmental problems. As a consequence, a strong opposition to traditional hard engineering has developed since the 1990's. For further information, please refer to Fournier, Marie and Corinne Larrue, *La renaturation des cours d'eau : modalités de régulation et effets d'une activité nouvelle au sein d'espaces ruraux français, néerlandais et suisses.*

III. What are the main success factors for implementing NWRM?

A key requirement for encouraging implementation, which is also inherent in the purpose of this project, is the need to provide a **strong evidence base** (including evidence of biophysical effectiveness and of the **cost-effectiveness** of measures, synthesis document 6).[7] Clear evidence, both of the effectiveness of the measures and of cost-benefit assessments, in order to justify their implementation may also induce a change in the policy processes and in public awareness. When balanced against the multiple benefits that may be delivered (not only restrained to WFD policy goals), maintenance costs become comparatively lower and measures appear more cost-effective compared to more conventional measures (e.g. hard engineering).[8]

Knowledge on multiple benefits and its effective **communication** will be determinant in gaining **legislative and policy support**, as well as **population support**, crucial success factors for the implementation of measures.[9] Ensuring institutional support may lead to **financial support**, for example through the establishment of appropriate funding mechanisms. Promoting multiple benefits, in particular, is key to ensure such support – provided that such multiple benefits can be demonstrated. Indeed, funding mechanisms may be linked to other non-water retention benefits.

Support may be favoured by **stakeholder involvement** and **public participation** at crucial stages of the measure's design and implementation, as discussed in the second Western workshop. In the case of agricultural NWRM, or measures that are partly implemented on agricultural lands, consensus should be sought with farmers. During the second Western workshop, the importance of involving farmers when selecting and implementing NWRM was stressed. It is believed that their involvement in monitoring activities will favour motivation through the perception of benefits. Moreover, a real bottom-up process whereby farmers are asked "how would you like to implement NWRM?" instead of pointing out the need to do it is considered to be more efficient. In this respect, CAP "greening" could be counter-productive due to its compulsory approach. For example, in Norway, soil erosion maps have been drawn with farmers who could then apply for some measures and get subsidies for it. The need for bottom up knowledge was also apparent from the forestry discussions, where the success of sediment detention ponds and water sensitive driving were both dependent on the skills of the worker.[10] Box 3 shows that a progressive involvement of farmers in the design and implementation of a measure may be a success factor.

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[7] Synthesis of the First Western Workshop, Brussels, 22-23 January 2014.

[8] See Stella Consulting, 2012: "Based on the qualitative information, it is clear that wetlands, agricultural measures and SuDS are the NWRM providing the most benefits and they should be further promoted by the EU policy framework."

[9] Synthesis of the First Western Workshop, Brussels, 22-23 January 2014.

[10] Synthesis of the Baltic Sea Regional Workshop, Riga, Latvia, 30-31 January, 2014.

Box 3. Progressive involvement of farmers in the implementation of NWRM from the agricultural sector : example from the implementation of grassy strips and meadows in the Boiron basin (Switzerland)[11]

From 2005, in response to high levels of herbicides in Boiron's waters, the administration for water protection of the Canton of Vaud started to implement a project "according to article 62a of the Federal Law for water protection". In the framework of this project, farmers can implement several types of measures (substitution or abandon of herbicides, sowing perpendicularly to the slope, grassy strips, meadows, etc.) in exchange of a financial compensation for the loss of revenues induced by the consequent land-use change, as well as implementation costs.

Also, a **progressive rather than early involvement** of farmers was preferred, as it allows farmers to enter the project at their own rhythm.

Choice of measures as well as their implementation were therefore designed in order to promote a progressive involvement of farmers:

- Participation of farmers is not compulsory but voluntary. This allows farmers to start implementing measures when they are ready. Word of mouth with neighbouring farmers can play an important role for helping farmers to start.
- Possibility to choose "light measures" for an easier entrance into a program. Farmers often start with "light measures" (measures which are not very constraining such as the substitution of herbicides). Once they are involved in the project, they often go on with more efficient measures for water retention, such as the water retention measures (grassy strips or meadows).
- Flexibility in order to adapt the implementation to potential problems met by farmers, etc. Farmers have the possibility to start the implementation of a measure, but in some cases, they can abandon it. For example, if they meet problems due to a measure (weeds problem...), they have the possibility to change the agreement with the cantonal administration. This is done in order to encourage farmers implementing a measure.

Win-win situations should be found where the costs and benefits are distributed among a set of stakeholders. Despite the long term effectiveness of NWRM, a **short term implementation** with benefits visible in the first year (especially linked to tourism, outdoor and recreational activities, etc.) may help getting support from decision makers, financers and the population.[12]

Social support and implementation incentives may also be found through **compensation mechanisms** for costs incurred by the implementation, or changes in land use (seen as a financial loss) in some cases, as Box 4 illustrates.

[11] Author of the case study: Guillaume Michel, ACTeon, based on interviews of M. Vallier, Water Protection Directorate, Canton de Vaud; and M. Mastrullo, PromeTerre.

[12] Synthesis of the second Western Regional Workshop, Strasbourg, 01-02 July 2014.

Box 4. Implementation of grassy strips along field margins in Heilbronn (Germany)[13]


Source : www.ackerrandstreifen-heilbronn.de

Heilbronn is a town in Baden-Wurttemberg (South-Western Germany) of nearly 120 000 inhabitants and 100 km². In this region, agriculture is quite intensive and consists mainly of cereals, oil producing plants and open-air vegetables and fruits. At the beginning of the 1990s, as a consequence of the rise of environmental concerns, the municipal council of Heilbronn started an environmental program on agricultural lands: the Field margin program (Ackerrandstreifenprogramm). It consists of the implementation of grassy strips (eventually with fruit trees) along field margins. Farmers receive a **financial compensation** for the loss of revenues induced by the consequent land-use change, as well as in exchange for the implementation costs of this measure. Moreover, seeds are provided free of charge to the farmers. This program aims mainly at creating a habitat network for the wildlife as well as protecting infrastructures from soil erosion. The field margin program is coordinated by the administration for green areas (Grünflächenamt) of Heilbronn. Today, fast 100 farmers are involved in the program, representing about 70 ha or 200 km of grassy strips.

At the end of the 1980s, before the Field margin program was first implemented, conflicts arose between farmers and inhabitants concerning the use of rural roads. On the one hand, farmers were cultivating their fields up to their limit with roads. There were neither shoulders nor ditches between the fields and rural roads. Roads were therefore used as a headland for operating agricultural machineries, which caused some damage to the roads. On the other hand, inhabitants wanted to use rural areas for leisure (outdoor and recreational activities, jogging, etc.). They did not want dirty roads or to have to step in the fields when they were crossing a tractor.

Since the implementation of grassy strips along fields, there are much fewer conflicts between inhabitants and farmers. While this was not an objective of the Field margin program when it was designed, it is now the first motivation of farmers for implementing grassy strips. The program also benefits of a strong support from inhabitants.

If some measures can be **self-effective** (i.e. not requiring continuous intervention to maintain them), in many cases maintenance is needed over a long time lapse: if this is the case, there is a need for long-term agreements and/or specific funding mechanisms.[14] For example, while crop practices are expensive, ranging to €8,320 million per year (€17 per person), if the 100 year flood period was reduced by 30%, it would result in a benefit of €11,040 million, which would make the scenario cost-effective (Stella Consulting, 2012). In particular, concerning measures on agricultural land, farmers may need the reassurance of long-term funding for maintenance, before being prepared to participate.[15] Ideas for **financial and institutional setups**, securing medium and/or long-term financing options, are presented in Box 5 (Danube workshop).

[13] Author of the case study: Guillaume Michel, ACTeon, based on interviews of M. Hetzler, Administration for green areas – Grünlandamt; MM. Schwarting, Mockler, and Schnepf, farmers' union of Heilbronn.

[14] Please refer to synthesis document 6 on financing for further information on funding mechanisms.

[15] Synthesis of the First NWRM Western Workshop, Brussels, 22-23 January 2014.

Box 5. Financial and institutional setups to promote NWRM

Financial instruments are needed for successful implementation of NWRM, helped by a particular institutional setup:

- One possibility currently being evaluated is a **rainwater tax** that is paid for running rainwater into the storm water drain system in one small town in Estonia (Paide). If this concept could be implemented in other towns, it would encourage SUDS, keeping water in the landscape and out of the storm water drainage system.
- In Finland there is new legislation to ensure that storm water is separated from sewerage water. The **storm water payment tax** from residents provides money can be used in the future by the municipality for implementing NWRM.

Sometimes, in order to balance the share of costs and responsibilities, changes in institutional setup are needed. However, clarity as to *who is responsible for what* must accompany these changes:

- One example comes from the UK where new regulation gives more responsibility to water companies with regards to water drainage (and the public via water bills). Municipalities are responsible for delivering SUDS and water companies are responsible for maintaining SUDS. Such a **shared approach to costs, risks and benefits** could be applied elsewhere in Europe;
- In Finland, the responsibility was transferred from water companies to municipalities;
- In Latvia, the open drainage system is responsibility of one authority. The drainage system based on pipes is the responsibility of another agency.

The group discussing **agricultural NWRM** arrived at the following conclusions: (i) the tax system should be adapted to better support farmer implementation of NWRM. (ii) The problem should be moved to the Pillar 1 of CAP because that is where the money is. It is actually beginning to take place with the green requirements in Pillar 1. (iii) The biggest challenge is the difference of scale: a large number of measures are needed to prevent flooding whereas agricultural measures are usually at a plot scale. (iv) Discussions should give equal importance to quantity and quality.[16]

Understanding the multiple benefits of NWRM would also help in strengthening the links with all relevant EU Directives. Indeed, as measures include both interventions on rivers but also on floodplains and riparian areas throughout a catchment, they are multidimensional and concerned by various Directives. At present, **NWRM are directly linked to the implementation of the Floods Directive**,[17] and in a very few cases the Water Framework Directive was the main driver for implementation. This Directive, in fact, does not give much attention to riparian issues, but rather focuses on the water body as a central concept, and this might be hindering a good approach to NWRM.[18] The link between forestry measures and the WFD, for example, needs to be clarified. As highlighted in the first Western workshop, as the majority of forestry measures are implemented in headwaters, they are not always in parts of catchments that have WFD designated water bodies within them. Furthermore, measures often do not directly interact with the river. Although what happens in these headwater catchments will contribute to downstream impacts, it means there is less of a direct connection between forestry measures and WFD, so practitioners may be less aware of it.

16 Synthesis of the Danube Regional Workshop, Szentendre, Hungary, 28-29 January 2014.

17 The Floods Directive addresses explicitly the importance of natural water retention and the pressures from which areas for natural water retention are suffering. However, it lacks incentives to move the thinking away from hard flood defence measures to "soft" measures; the role of wetlands in flood mitigation, for example, is not highlighted (although it is mentioned that maintenance and/or restoration of floodplains give more space to rivers).

18 Also, the most relevant measures for the promotion of NWRM are considered additional (Part B of Annex VI).

Overall, **an explicit link with the WFD needs to be made**. The multi-dimensional character of NWRM calls for a **full integration** not only of FD and WFD, but also of the **Bird and the Habitat Directives and other relevant Directives**, and this suggests that a more complex approach would be needed. An integration of all relevant EU Directives could help **addressing current institutional challenges** (Stella Consulting, 2012)[19]. In doing so, the reaching of simultaneous objectives (linked with the different Directives) through the implementation of measures could be favoured. It may also allow the access to a broader selection of funds and/or financing options.

Careful coordination of planning and implementation between **water and land planners** was also considered as crucial for promoting a good approach to NWRM, linked to the multidimensional nature of NWRM.

IV. Conclusions

So far, an ineffective catchment management has been observed in most member states, whereby managers' catchment vision is often broken down into different functions. In many cases the focus lies on specific objectives (individual Directives); with a risk of getting drawn into water body-scale management. It impacts an effective and adequate implementation of NWRM, as they are multidimensional (concerning various Directives, different expertise fields, water and land planning…) and deliver different benefits. The implementation of NWRM call for a catchment scale planning and requires careful coordination between stakeholders in their implementation, as well as a specific institutional and financial setups. One of the project's aims is to provide a strong evidence base on NWRM benefits and functions (ecosystem services provided), allowing for a clear vision of the stakeholders that could be involved at different geographical and time scales, as well as ways to overcome financial, institutional and social challenges.

[19] See also the synthesis document on policy coordination linked to NWRM.

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