DIRECTORATE GENERAL
ENVIRONMENT
Directorate C
Unit C1

Service contract n°ENV.D.1/SER/2013/0010

Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures in River basin management

Synthesis of the

Baltic Sea Regional Workshop

Riga, Latvia Jan. 30-31, 2014

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1. The context

a. The NWRM initiative in a nutshell

In the context of the EU Green Infrastructure Policy, there is an increasing policy interest in the so-called Natural Water Retention Measures (NWRM) for improving the water status on hydromorphology and diffuse pollution. NWRMs have been brought to the water policy arena because of their potential contribution for water management[1], among other important contributions to attain environmental policy objectives. More specifically, "among the measures that can greatly contribute to limiting the negative effects of floods and droughts, is green infrastructure, particularly natural water retention measures. These include restoring and maintaining floodplains and wetlands, which can hold water in periods of abundant — or excessive — precipitation for use in periods of scarcity. Green infrastructure can help ensure the provision of ecosystem services in line with the EU Biodiversity Strategy. Reducing soil sealing is another measure that can diminish flood risks. These measures should be included in both RBMPs and [Flood Risk Management Plans] (FRMPs) and, as mentioned, should become a priority for financing under the [Common Agricultural Policy] (CAP), Cohesion and Structural Funds" (COM (2012) 673).

To respond to this interest, DG ENV launched a dedicated study entitled **Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures in River basin management**. This study has a dual aim:

- To develop sound and comprehensive **European (web-based) knowledge on NWRM**. The knowledge base will structure available information on technical, environmental, socio-economic, governance and implementation aspects of NWRM, mobilizing existing practical experiences, studies and stakeholders' knowledge.
- To contribute to the development of an **European NWRM "community of practice"** by bringing together all parties interested in the design and implementation of NWRM the creation of partnerships and information exchange. This is achieved by the development of **four informal regional networks:** the Danube river basin, the Mediterranean sea region, Northern Europe/the Baltic Sea and Western Europe.

In close interaction with NWRM practitioners and experts, the initiative will ultimately produce a **NWRM practical guide** that can **support the design and implementation of NWRM** in Europe.

b. Objectives of the workshop

The Regional Workshops are part of the Regional Processes outlined above. The overall objectives of these workshops are to:

- Update participants on activities within the NWRM initiative;

[1] Other mentions to NWRMs in the Blueprint to Safeguard Europe's Water Resources (COM (2012) 673), its Impact Assessment (SWD (2012) 382) or the Stella Report develop a particular aspect: NWRMs are a type of Green Infrastructure; NWRMs are one amongst other kinds of measures to enhance resource efficiency; etc.

- Consolidate the exchange of experiences and knowledge initiated in the regional networks and web fora, ultimately strengthening the regional networks.

The present workshop is the first to be held in the context of the Baltic Sea Regional Network; a second workshop will be held in June-September 2014. The two rounds of workshops are held in parallel in all four Regional Networks established under the NWRM initiative and have common overall objectives. This first round of workshops, in particular, aims at:

- Introducing NWRM;
- Presenting the NWRM initiative and regional process;
- Sharing views on constraints, difficulties, factors for success that are relevant to the design and implementation of NWRM;
- Collect views on the structure of the knowledge base, and the facilities that are offered to users to extract information;
- Identify expectations vis-à-vis the practical guide to be developed as part of Task 3;
- Agree on follow-up steps for the regional network, while encouraging contribution to the case studies.

The present document provides a synthesis of the main elements and lessons learnt which emerged during the regional workshop on "***Integration of natural water retention measures (NWRM) into river basin management in the Baltic Sea Region***" held in Riga, Latvia on 30-31 January, 2014.

2. NWRM in the States Bordering the Baltic Sea

a. Main features of NWRM implementation in the Region

Several NWRM have been implemented across the Baltic region. Presentations were made about agricultural, wetland and forest-related measures in a number of countries bordering the Baltic Sea.

Malgorzata Przychodzka presented the "Small Water Retention" measures implemented in Poland. In Poland, "soft (or natural) methods" are all measures which do not need technical work, whereas "technical measures" are constructions like ponds, small water reservoirs. The program as currently implemented in Poland is a mix of natural and technical measures.

Several examples of NWRM in Poland were presented. In one agricultural example, a farmer implemented a buffer zone and a pond which enabled runoff to slow down by over 10% over the area. The pond had originally been built for improving water quality and was paid for by the farmer. This example summarized in a nutshell many of the discussions about NWRM at the Baltic workshop. First, water retention is often a secondary or ancillary benefit obtained from implementing another ecosystem service. Second, while NWRM are desirable, someone must pay for their implementation.

Other Polish examples were presented including a case study in the Pisa forest where an NGO decided to improve the water course by building dams on small ditches and recreating wetlands. In Narew valley, a combination of different measure was implemented.

In Germany, a conference was organized to discuss cost-effective measures of wetland restoration. Many wetlands which used to be in agricultural landscape have disappeared in the last 200 years. Germans are starting to restore and rebuild these traditional features of the agricultural landscape. This could be in keeping with the objectives of the Floods Directive, which aims to restore the water holding capacity of the landscape which has been lost due to land conversion and changes in land use.

Another German case study of an NWRM designed primarily for water quality improvement was presented. An artificial wetland was constructed to retain nutrients and improve the water quality of Lake Neuklostersee. The artificial wetland was built where there had previously been a natural wetland, thus restoring the natural water holding capacity of the landscape. The benefits have been improvement of water quality and energy cost savings. The wetland construction cost about 500 000€ (construction and monitoring costs). It can be suggested that the wetland has an additional benefit of restoring the natural water retention potential of the landscape.

Other German examples were presented including a peatland restoration program aimed at limiting CO_2 emissions from the peatland. Restoring the natural water retention properties of the landscape has the additional greenhouse gas benefit of retaining carbon. A large scale nature conservation project in Uckermark was also presented.

The German experience showed that wetlands can be cost-efficient NWRM if they are well located in the catchment. They can deliver multiple ecosystem services and restore the natural water retention

capacity of the landscape. However, it was also clear that more institutional support from public policies is needed to increase attention and secure sufficient funding.

Urban case studies were also represented. Gen Mandre from Estonia presented examples of Sustainable Urban Drainage Systems (SUDS). SUDS are "green infrastructure" methods that employ specific types of engineering design techniques to the manner in which a natural ecosystem processes storm water (precipitation) runoff. The goal of the project "(D)rain for Life" is to introduce SUDS in Estonia and Latvia (municipalities and general public) and find solutions to site-connected problems Currently, there are 2 case studies in Estonia and 2 in Latvia. More information can be found - http://drainforlife.eu/index.php/en/

One challenge associated with SUDS in northern cities is the salt which is used for melting and repelling snow in the winter. The (D)rain for Life studies showed that salt has a negative impact on trees, but another study from Finland suggested that salt has no big influence to vegetation.

There are many issues related to NWRM and the urban environment in the states bordering the Baltic. Maintenance is one key challenge. NRWMs are expensive to maintain, and if assessed only in terms of WFD benefits, not cost effective. For city governments to support urban NWRMs, there is a ned to better demonstrate their value for the Floods Directive and other ecosystem services. If local governments do not take them on board, then support from the central government is needed. NWRMs need a lot of space and land prices are one key element in their implementation. It is not always possible to buy land, however, this must be balanced against the multiple benefits NWRM may deliver. SUDS provide multiple benefits and functionality with one measure in one piece of land. However, the more functions an NWRM delivers, the more knowledge is needed and maintenance may be more difficult than with conventional measures. There is a need to better understand what aspects of the environment can and cannot be managed in rural and urban settings. There are many factors in rural landscapes which cannot be controlled (some things can –dykes, ditches), cities can be more easily controlled (i.e. controlling water via sewerage system). In multifunctional areas, maintenance costs will overlap (for example parks have to be anyway maintained). The Floods Directive requires all member states to develop flood risk management plans. One outcome of this is that in Finland from 1st of September, it will be obligatory for every new town plan to incorporate storm water management measures.

The topic of liveable cities was emphasised several times throughout the session. It was pointed out that liveable cities need water. An example from Melbourne, Australia that is one of the most liveable cities in Asia was presented. There they started from the urban design perspective and then brought water in the city (4^{o}C lowering of temperature due to water in the city). However, this issue is very country specific as for example in Estonia and Latvia and many other countries bordering the Baltic, towns do not want water in the town. This also raises the question of mosquitos, snow etc.

Another example was presented from Hamburg, Germany where in new development area HafenCity a planning mistake was made – the area has so little greenery that passive houses have been conquered by spiders (as there are no birds etc.). This example showed the importance of understanding that not only buildings are important, but it is equally important what is between the buildings, that is to say, planning is needed to ensure that urban areas are liveable.

There are many challenges associated with NWRM in cities around the Baltic. Climate is one key factor. Snow and salt influence the design of NWRM and can also affect costs. It was pointed out that in Riga, Latvia most flooding comes from snow not rain- Snow removal is used to reduce flood risk

but the question remains – how should the snow be disposed of, and who will pay for this? Snow is often brought to parks. If NWRMs are placed in these parks, then problems may emerge in spring when melting starts. One solution might be to plan for a greater capacity and better measures for getting melt water off the land. Snow is a very big issue. Earlier, snow was dumped in sea. Now that is illegal. In recent years, there have been huge amounts of snow, even until August. The challenge faced by municipalities is not to retain snow and snowmelt, but to ensure it is moved off the land without contaminating surface or groundwater. One solution to this problem is being tested in Finland where a the first modern, wetland-based snow melting area was developed. The wetland is inside the city and 5 more will be built. In future a lot of small biofiltration areas are planned. These are also good for snow melting/collecting areas. As a result of the discussion to NWRM list a new urban development measure was added - U20 Snow melting area.

There are financial challenges with the implementation of urban NWRM. The Baltic States are not the richest; however there have been studies indicating that the more rich people are, the more selfish they also become. It seems that rich people do not want to invest in common values. Clearly, it is necessary to understanding challenge – what is public space, what is city for? That is not always communicated and has a bit to do also with post-soviet syndrome on how public space was perceived. The main challenge is how to reach politicians with this issue, and if politicians cannot be reached, to make citizens more aware and responsible.

Forestry related measures in Latvia and Finland were also presented. Dr. Zane Lībiete-Zālīte from the Latvian Forestry Research Institute presented a study of the effectiveness of mitigation measures related to water quality in forest drainage system renovation. Due to underground water movement and pressure (confined aquifer discharge areas), areas with higher precipitation have less wet forest lands. In Latvia forests are drained to increase their productivity. During last years, the construction of sedimentation ponds as a part of the drainage system has been instituted as one of good practice measure in the forests managed by Latvian State Forests. However, the environmental impacts of the measures must be monitored to justify costs. There is data on phosphorus from these sedimentation ponds, and also in general - about water quality, but no data on water retention. The results indicate differences between monitoring sites set up on mineral or peatland soils as well as between different measured parameters. Additionally, it seems that the effectiveness of the measure depends on the skills and quality of the work carried out by professionals constructing the ponds. The costs for installed sedimentation ponds hasn't been estimated by the research team on environmental impact assessment, but it would be possible to check that with the "Latvian State Forests"

The presentation brought out the issues that are also seen in Sweden and Finland – water needs to be taken off the landscape for trees to grow. The natural water retention capacity of much of the boreal landscape actually hinders tree growth. While sedimentation ponds do slow water down, they provide no benefits for flood protection. Natural features of the landscape can be used to identify areas that may be suitable for the creation of sedimentation ponds.

A question on how to manage beavers which have already destroyed an installed monitoring site at a pond in Latvia was posed by the Latvian expert. Beavers were also raised as an issue in the agricultural discussions. Similar experiences has been also recorded in other countries, however, there seems that no solution has yet been found.

Dr. Mike Starr from the University of Helsinki presented key conceptual principles with regard to forests and their role to provide hydrological and water quality regulating services. Forests do reduce

runoff and slows down flows. But the impact should be understood, especially when having big storms. The situation is that foresters want to get rid of water in commercial forest areas therefore the NWRM might not be very relevant for forests in general, but more for urban forests. He also emphasised that when planning and assessing NWRM both aspects – water quality and quantity – should not be separated, as water quantity has an impact on quality aspects. This suggests a need for integrated planning in which River Basin Management Plans give appropriate consideration to both Water Framework and Floods Directive requirements.

Dr. Starr presented an example of urban forest wetlands in Helsinki and their importance in providing hydrological services. The case study is in Vantaa, near Helsinki airport. The wetland is located in an area surrounded by small industries and the airport. The urbanization near Vantaa has resulted in a significant reduction in the natural water holding capacity of the landscape, primarily through land sealing. Monitoring performed to assess the functions of the wetland confirmed the importance of the wetland not only as nature conservation area but also for improving oxygen concentrations in the water and limiting peak flows. It has been recorded that inflow volume is higher and outflow from the area – lower. Thus, during storms the wetland delays the flows and disperses waters over the area. The Vantaa case study clearly showed that targeted measures to restore the natural water holding capacity of the landscape can have multiple benefits for water quantity, quality and other ecosystem services.

A number of peatland restoration activities have been implemented in Finland. Over the years, many Finnish peatlands were drained for forest production but it was later been recognised that the foreseen productivity has not been achieved in every location, therefore, some areas of peatlands are restored for habitat restoration, not for water regulation. However, peatland restoration should help to return the landscape to its natural water holding capacity.

Dr. Starr emphasised the importance of finding appropriate measures which would address the snow melt management. One third of the precipitation is having runoff in very limited time (3-4 weeks) causing flooding risks that needs rather regulation than retention.

b. Main challenges and issues with respect to NWRM implementation in the Region

One main challenge with NWRM implementation in the Baltic Region is a lack of awareness of the term, and the many possible definitions.

The concept of NRWM is not entirely clear. While it was apparent that (i) NWRM help to achieve natural hydrological cycle by retaining the water quantity in ecosystem and in the same time also to improve water quality by retaining nutrients in the ecosystem; (ii) NWRM improve or at least do not decrease natural ecosystem services and (iii) NWRM are functioning in a natural way using natural processes and in natural media, there were some discussions about the term. For example, it was noted that natural processes (such as infiltration or evaporation) can be achieved by both natural and artificial measures. There was also some discussion as to whether a measure was an NWRM if it resulted in retained water which was then used for human needs for example when stored water is used for agricultural irrigation.

There was some discussion of the demarcation between “natural” and “not natural”. Other classifications may be more appropriate such as: good for the environment *vs.* not good for the

environment and green *vs*. grey measures. Determining naturalness based on the function of the measure, NWRM should have a positive result for the environment. NWRMs may also give better possibilities to identify management alternatives which may return heavily modified water bodies to a more natural status. Natural "green infrastructure" may be able to achieve benefits that cannot be obtained using traditional "grey infrastructure". A question was raised about the dynamic character of retention which is absent in a case of retention without flow.

Questions remain on all words of the term Natural Water Retention Measures. These were addressed in several ways. Participants made the following observations:

- "I haven't thought about a specific term, which would describe NWRM. It doesn't mean anything, it is just a matter of a name. We already did some of these measures, e.g.:
    - Restoration of rivers, but only to improve hydro morphological- conditions. These improvements are for fish and aquatic species and therefore focus on improving riverbeds – the middle of a river is flowing fast, the sides – slower. We do not work with water loads from the landscape to rivers.
    - A few cases on re-meandering, but all related to agriculture."
- Many participants are working with regulated rivers, infrastructure such as spawning ladders to improve fish habitat and measures such as constructed wetlands, buffer strips; green roofs. However, most participants had never heard of the term "NWRM" before this workshop. It is green or grey infrastructure. In Norway they have a mixture they call "blue-green".
  From the pilot project list of measures – some we do, but not thinking that they are NWRMs. For these kinds of projects our focus is on sediments, erosion reduction."

- The expression NWRM is quite familiar in Finland but only if thinking of flood control – no big projects have been accomplished. In agricultural floodplain areas there is compensation for farmers for the crops that are lost by flooding their fields.
    - Many examples of NWRKM in urban areas: infiltration, etc.
    - In agriculture areas: wetlands, drainage systems We also have artificial lakes to retain water
    - Implementing measures on irrigation, and for fisheries, especially in dry periods."
- "For agriculture the main wish is to get rid of water. There are argi-environmental measures too. A few were tested in Latvia (wetlands). This year there is a plan to establish wetlands on agricultural land. Buffer strips are becoming less popular (because of lack of compensation). The term "natural" in Latvia would be for forests, but not agriculture. This gives more questions than answers."
- "The cities should be excluded, they are not natural. We have to talk about green infrastructure in cities which is driven by 2 main drivers:
    - Heat – climate change impacts
    - Storms – for example, to have small partly paved areas matters.

  Also needed to pay attention if there are too few measures or too many. Moreover, the quantity of measures implemented matters – we couldn't prevent flooding with just a few houses with green roofs, we need thousands to have an effect. So, spatial planning matters when talking about floods.

- The majority of impacts are coming not from urban but from agricultural areas. With cities – it is more about quantity and quality is not on the agenda yet. No contact with

the WFD (in Latvia), but in Denmark there are many interlinks, e.g., some rainwater measures are important also for farming measures.
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The above comments illustrate some of the challenges with NWRM implementation in states bordering the Baltic Sea. People are aware of the existence of measures for restoring the natural water retention capacity of the landscape, and for the use of natural materials to limit flood risk. However, there is some discussion about the benefits of measures – whether for water quality, quantity, biodiversity or other ecosystem services such as erosion control. While the Floods Directive is very clear on flood responsibilities between states, the picture is more complex within individual member states. For example, there seems to be the possibility of conflict between agricultural areas where NWRM may be implemented and the urban areas which stand to benefit from a reduced flood risk. Clearly, issues of responsibility, benefit and compensation need to be better understood and addressed.

While the comments presented above give a sense of participant's thoughts about NWRM, a more structured approach can also be taken. The following is an attempt to deconstruct the term "NWRM":

Natural

The term "natural" can mean either replication or restoration of a natural system, or on the use of natural media or processes for water retention. The first meaning is consistent with the WFD concept of reference conditions. Natural media are consistent with green infrastructure, while it is hard to define an un-natural process.

Water

The stated aim of NWRMs in this project is focused more on water quantity than water quality. They put the hydrology to the front, which is usually considered secondary in water retention measures. However, since there is an interaction between water quantity and water quality, NWRMs must also deal with the benefits for biodiversity, pollution, landscape and cultural heritage. From the perspective of NWRMs they can be seen as indirect benefits from measures to adjust the hydrology. These issues may raise some key challenges for harmonisation of Water Framework and Floods Directive goals in River Basin Management Plans.

How can we incorporate the concept of blue and green water into the definition of NWRMs? Do NWRM's keep more water as Green Water, or to they produce a more even release of Green Water?

Retention

The term retention is not appropriate for beneficial measures of all sectors. Regulation, Rehabilitation, or attenuation would better fit the needs of some areas of work. Water Retention is not an issue in nature conservation of forests, for example.

Measures

Is a list of measures, or working on that list the main output of the project? Participants at the workshop felt that it would be useful to create a catalogue of measures linked to case studies. But using case studies from the past, which had another purpose, without a critically review in regard to directives can be misleading. We need to ask what was their main objective, water quality, hydrology, or both? Was their implementation successful? Should we add cases that were not successful?

2. Why are NWRMs important?

There was little doubt amongst participants as to the importance of the scope and variety of services provided by NWRM. They (i) help improve ecosystem resilience and sustainability, (ii) decrease or mitigate *surface pressures*, for example diffuse pollution from agricultural lands; (iii) increase common benefits, because correctly chosen NWRM may increase multiply benefits – not only improved water quantity and quality but also biodiversity, mosaic landscape, soil features, carbon capture, better ecosystem adaptation capacity to the climate change and even positive impact on human health.

Many participants had considerable experience with the Water Framework Directive and saw the value of NWRM to improve water quality. Presentations of case studies from the UK and Finland showed that NWRM could reduce the height of the flood hydrograph, and play a valuable role in slowing down water on the landscape. Opportunities exist to clarify and better demarcate the importance of NWRMs. It is clear that the Floods Directive recognises the importance of restoring the natural water retention capacity of the landscape. NWRMs can be implemented with either a primary or ancillary goal of water retention. When the primary goal is water retention, other benefits may be achieved, such as water quality improvements or greater biodiversity. Similarly, measures with a primary goal of improving water quality or biodiversity may have ancillary benefits related to improved retention of water on the landscape. Because NWRM can have multiple benefits, these should all be taken into account when calculating cost effectiveness. NWRM can benefit multiple sectors and deliver more than one ecosystem service, for example, well-planned wetlands may deliver water retention, water purification and biodiversity improvements. Participants stated repeatedly throughout the workshop that the importance of NWRM must be assessed in a multi-criteria context. Both primary and ancillary benefits must be evaluated, as well as potential costs.

The point was made that NWRMs reduce impacts on receptors, i.e. reduce flooding to towns. We cannot always expect a win-win situation with NWRMs. The reduction in urban flood risk may occur at the cost of damage to agriculture in upstream areas. One clear issue is the need to address how both positive and negative effects can be integrated into the NWRM concept. An important factor for the contribution of NWRMs to ecosystem services is the spatial scale at which the assessment is made. It will also be necessary to define who is the target group for NWRM (farmers, dwellers, urban people). For example, agricultural NWRM may be very important to city dwellers as water holding capacity on agricultural lands may help prevent downstream flooding. However, this may exacerbate conflicts as benefits will be received by some people while costs are incurred by others.

Workshop participants concluded that the following are important:

1. Aims and goals must be specified. It must be clear what a NWRM is meant to achieve. Sufficient effort must be devoted to follow up and ensuring that the measures support achievement of the defined goals

2. NWRMs have multiple benefits compared to traditional measures and these should be emphasized and explained to the public, politicians and other stakeholders so as to raise their awareness and make them believe that the measures work and bring benefits
3. It is important to distinguish between “green“ or “grey“ measures. However, it should be recognised that both can play an important role in retaining water on the landscape and can offer other ancillary benefits.
4. Legislation can be used as a tool to define the line between natural and non-natural water retention measures
5. Size – larger interventions are not natural. However, NWRM may not be able to prevent the largest of floods. Once the water holding capacity of any water retention measure is filed, additional water cannot be retained on the landscape.

3. Feedback on NWRM project tasks

The participants had a number of expectations of the project: (i) To clarify terminology related to NWRM; (ii) To implement NWRM (and to clarify costs); (iii) To raise awareness about benefits of NWRM of different stakeholders (including the general public); (iv) to present more data on implemented case studies in our own countries, there project can support with the catalogue of ideas/case studies/recommendations.

Participants were concerned that people do not yet see the benefit from restoration and renaturalization projects. There is a need for measures/cases on involvement of stakeholders. For example, a case study from Sweden was presented where a Water Board was established for a region (project area) involving different stakeholders and with the aim to gather and disseminate information (i.e. what could be done in the area), the Board has been functioning for more than 15 years and is still operational. We need more of these success stories.

There is also a need for fact sheets on governance and participatory approaches. More work needs to be done to demonstrate and illustrate the multiple benefits that can be realized with NWRM including visible values such as amenities, recreation, or beauty. It is not enough to highlight success stories. Bad examples should be catalogued in order not to make the same mistakes again

a. Task 1: the database and other project tools

There was some concern about the sustainability of the database. A large effort is being devoted to the production and population of the database, but it was not clear to participants how the database would be maintained after the completion of this project.

b. Task 2: the regional fora

Participants seemed generally happy with the regional workshop and may were interested in participating in the regional for a.

c. Task 3: the proposed guidance

It is clear that more needs to be done with the proposed guidance. For example, the relevance or appropriateness of proposed NWRM was not always clear. The following table summarizes the regional feedback about proposed forestry related measures.

Participants feedback on the relevance of forestry-related NWRM in the Baltic Sea region:

Proposed NWRM	***Feedback from the region***
F1 Afforestation of riparian areas	This is a mandatory forestry water protection measure in Sweden. But it is not seen as water quantity regulating measure, maybe slows water down but has relatively small impact. The measure affects water quality, but quantity – very local (maybe more in mountain areas). Lithuanian colleagues have recognised that the type of trees used for afforestation is important, e.g., broad- leaved trees contribute with nutrients more than they absorb. Thus, afforestation of riparian areas will not always lead to benefits.
F2 Afforestation of mountain areas	Not applicable in the region (perhaps, only Norway). Forests do not grow in mountain areas of northern Finland and Sweden.
F3 Afforestation of reservoir catchments	The measure could be relevant in UK. Copenhagen has a reservoir and Tallinn takes drinking water from the lake. But the region mainly obtains drinking water from ground water sources. There have been some studies reporting that coniferous trees take out significant amount of water volumes thus the water availability can drop. So, there are some benefits, but there are also drawbacks to this measure.
F5 Forests as large scale water pumps	Not very relevant for the region as clear cuts are performed in smaller plots thus the processes are balanced. The measure is more relevant for the Amazon and possibly the African rain forest.
F6 Land use conversions for water quality improvements	This is not a water quantity-related measure. In Lithuania the policy is to use agriculture land for production or for maintenance of traditional landscape. Spontaneous afforestation of abandoned agricultural land is discourage as the policy is to stop overgrowing and clear up the abandoned lands, there is an elevated tax for non-managed agricultural land.
F7 Continuous Cover forestry	It seems that there are many definitions for this measure. It is not clear what exactly are benefits to water retention. Maybe this measure is relevant to the Southern part of Europe.
F8 “Water sensitive” driving	The measure can provide benefits to water quality, but result depends on individual operator/driver. In Finland the good practice rule is to avoid harvesting in the wet season.
F9 Maintenance of riparian buffers	The same view as for F1
F10 Appropriate	Appropriate design of roads and stream crossings aims to limit

design of roads and stream crossings	sediment release and to ensure that fish movement is not impaired. As such, these are not really related to water quantity and may be more "grey" than "green" infrastructure solutions.
F11 Sediment capture ponds	Sediment capture ponds are widely used during ditch maintenance. However, the Latvian case discussed earlier showed that they have limited impact on water quantity but may have more impact on quality improvement. Like water sensitive driving, the success of this measure is very dependent on the person doing the job.
F12 Coarse woody debris	It is mainly for habitat restoration, but can have ancillary benefits of slowing down the speed of water flows and potentially keeping water on the landscape for longer.
F13 Re-meandering of forestry affected rivers	While the Floods Directive explicitly recognised the value of "giving rivers more space", re-meandering is performed for nature conservation, not for flood control. The measure could be relevant for small streams/brooks flowing into larger ones. In Lithuania, for example, not so many rivers have ben straightened in forests. Straightening has been performed mainly in agricultural land. If the stream is longer, it is slower.
F14 Urban forests	Urban forests deliver many benefits related to quality of life and recreation, but water quantity is often ancillary. The Finnish example presented earlier (Vantaa) showed how wetlands in urban forests can deliver multiple ecosystem services including flood control and water quality improvement.
F15 Riparian trees in agricultural landscape	This measure can improve aquatic habitat and biodiversity as it shades streams but does not have any impact on quantity or retention.

Nature measures were not discussed widely. Participants noted that some forestry related NWRM currently used in the Baltic Sea region were missing from the list. These included overland flow lands and bog flood control measures. There is literature available about both these measures. They are performed primarily to reduce sediment loads to surface waters but have the ancillary benefit of retaining water on the landscape for longer than would occur without the measure. There are examples of these measures from Latvia and Finland.

As has been noted elsewhere in the document, snow is a key aspect of the hydrological cycle in the region bordering the Baltic Sea. There are significant impacts of forest cover on snow accumulation and melt. In forests, snow melts more slowly, so precipitation is kept longer in the landscape. This effect is dependent on the density of the forest. Forest snow interactions are important as 1/3 of the annual runoff in much of the Baltic Region is from snow melting. Slowing down this water may have significant flood prevention benefits. Participants agreed that while snow retention may not be an NWRM, it is clearly an ecosystem service delivered by forests that helps to restore the natural water retention

capacity of the landscape. Participants also agreed that there are knowledge gaps and lack of measurable results on forest and snow interactions that should be addressed in the future.

Summary:

- Forestry in the largest part of the Baltic Sea region aims to get rid of water to increase productivity. However, the need for retention measures in forestry could be relevant in areas of water shortage.
- Results from monitoring of sediment ponds in Latvia proves that the measure improves water quality with regard to some of elements, it depends on people's knowledge who do that.
- Damage caused by beavers is an issue in certain parts of the region causing a problem for forest productivity as well as water quality. However, it is seen as real although unwanted/unplanned NWRM.
- Water management in forestry is not directly for quantity management, but rather to reduce nutrient pollution load.
- Forestry might help to control minor water floods, not large scale events.
- A knowledge gap exists about interactions between forests and snow.

The guidance arising from this project could help to address a number of questions related to NWRM on agricultural lands in the Baltic Sea region. Relevant NWRM include wetlands, buffer strips, precision farming, "natural" biological measures (beavers), soil structure management and liming, regulated drainage, controlled drainage with an aim of keeping water in the soil, deciding when we open or not the system, when the water should be low or not. Additional measures include reactive ditches and maintenance of existing drainage systems.

Water retention is often an ancillary benefit of agricultural NWRM. In some places water can be retained and used in summer for irrigation. However in other places there is a need to get rid of water. It depends on contexts. The primary goal of agricultural NWRM is to ensure that the right amount of water is available for plant growth at the right time. The benefits for plants include water being made more available, giving plants a better ability to capture nutrients. This can improve farm economy and reduce pollutant loading to surface waters.

Participants had a number of questions about agricultural NWRM. Two examples follow:

- ⇨ Q: are the farmers responsible for the drainage regulation? They can be but it depends if they have other purposes and other stakeholders are involved.
- ⇨ Q: Isn't it also about denitrification? Regulated drainage is indeed another way to reduce nitrogen runoff (beside catch crops).

In Finland regulations exist to restore wetlands on agricultural areas. There is a support for farmers (subsidies) willing to implement those measures. Wetland creation on agricultural areas has also been tried in Sweden, but with limited success. The proposed guidance could highlight the successes of the Finnish approach and the challenges encountered in Sweden, this could help to address the following question:

- ⇨ Q: what is the purpose of restoring wetlands? In many of the cases discussed by participants, it is denitrification, since agriculture provides more pollutants than forest.

Agricultural NWRM are not always on the political agenda. The proposed guidance could help to address this issue. In Latvia there is more runoff from forest area than from agriculture areas. The government said there was no problem of runoff. Thus in Latvia NWRM have not been on the agenda until now but measures exist, like green cover in winter, buffer strips, maintenance of pastures. However, lots of pastures have been ploughed just to get subsidies. In Estonia, the same measures are used: buffer strips, wetlands, etc. However, a few measures have yet been established and the government is not yet providing funding. If the guidance can reach the appropriate authorities, there should be a greater possibility for funding of agricultural NWRM as part of the River Basin Management Planning process for the Floods Directive.

Similar challenges exist in Denmark. Growing cereals winter crops (green cover) is profitable for farmers. It is a win-win measure for the farmer and the environment. It is also true with cultivated grassland. However, in Denmark, green cover means catch crops and not cereals. Danish farmers have to grow some amount of catch crops (it is a regulation, without subsidies) and therefore cannot plant as much winter cereal; so they actually lose money. Hopefully the guidance document arising from this project could highlight and solve the following question:

- ⇨ Q: what are the benefits of winter cover for the environment? Benefits are less erosion. However, grass prevents much more runoff than cereals for instance. It has to be taken into account.

As has been noted earlier, flooding is much more considered in urban areas; sometimes rural areas are “sacrificed” to protect urban areas from flooding by flood plains. Flooding can damage farmlands, which are more or less valuable for farming. It is important to make sure that some areas (the valuable ones) escape flooding. Management planning is important, as is a recognition that benefits and costs are not shared equally between rural and urban areas.

In the Baltic Sea region, it is very important to recognize the difference between winter and summer flooding. If we speak of winter flooding, the retention measures can’t be used because the soil is already full with water. Whereas in the case of summer flooding the soil is dry and can absorb water. Thus, the proposed guidance must recognize when NWRM may have an effect and potentially focus more on measures to slow down the rate of snowmelt, or to keep the water in snow on the landscape for longer.

Finally, we shouldn’t underestimate climate change adaptation. An examination of the evolution of the Water Framework Directive shows that climate change was not considered in the original document, but is now a key focus of river basin management planning. Linking climate mitigation and water retention may achieve synergies. For example, peatlands used to be wet, they have been drained and should be wet again. That re-wetting will have positive effects on carbon emissions and sequestration.

NWRM can be effective for policy objectives, but both the policy objective must be clearly specified. It is important to link the measure to the pressure. It is more effective to finance wetlands where you really have a pressure. Results on the effectiveness of different agricultural sector NWRM exist; there is a direct link with the objectives of the directives. Wetlands are very effective tools for nutrient retention. However, some attendees haven’t been convinced that the measures can help for flood directive objectives. People above all talked about water quality. It is also a question of scale. Talking about the Floods Directive and Water Framework directive imply a different return period. There is a gap, it doesn’t seem to match so far. Hopefully this project can contribute to closing that gap and

showing how River Basin management planning can incorporate NWRM for both flood and water quality benefits.

The agriculture group noted a series of institutional challenges to successful NWRM implementation. Many of these were related to the huge differences between the Eastern and Western coast of the Baltic Sea. There should be a combined approach, which might require a more "top-down" approach. It is important to have strategy goals for the agricultural policy. There should be adapted methods constructed in the field with the stakeholders. A real bottom-up process asking the farmers "how would you like to implement NWRM?" instead of pointing out the need to do it would be more efficient. 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.

Incentives/taxes

Financial instruments are needed for successful implementation of NWRM. 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 which kept 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 construction of NWRM.

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 farm measures are usually at a plot scale. (iv) It is great to start talking about quantity and not only about quality.

Institutional set up

Changes are needed to the institutional setup. One example was presented from the UK where new regulation gives more responsibility to water companies on water drainage (via water bills goes back to public). 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. For example, in Finland the responsibility used to be on water companies but now it is on municipalities. There are problems with lack of clarity as to who is responsible for what. For example, in Latvia, the open drainage system is responsibility of one authority. The drainage system based on pipes is the responsibility of another agency. That raises the question - who pays for what? It is important that responsibility is clearly given to somebody but it is equally important that no single group or sector is unfairly penalised.

Benefits visibility

Storm water benefits are visible only for short time (when it is raining), after implementing flooding measures – there are no floods so measure is not visible to public and if people do not see benefits

then they do not want to pay – measures with multiple benefits (like NWRM) can be seen day by day. This project has a role in promoting the multiple benefits of NWRM, both to the public and to other stakeholders. However, NWRMs can also make problems visible again. A case study was presented of the Don River (Sheffield, UK) where water quality problems became visible after NWRM were implemented. Workshop participants agreed that raising public awareness is a challenge – this should be done already on a grassroots level, then there is a chance that things start to change.

4. Key messages and lessons learnt for advancing with the NWRM project

The links between the Floods Directive, Water Framework Directive and River Basin Management Plans could have been more thoroughly explored during the Baltic workshop. As well as contributing to the river basin planning process, NWRM have an important role in urban design. These links should be further explored throughout the project.

The participants were generally enthusiastic about the project, but some people were still confused by NWRM at the end of the workshop. An ongoing dialog is needed.

It was clear that a database of NWRM and best implemented examples including calculations of the costs and benefits would be useful to practitioners and stakeholders. If it were possible to link measures with decreased or mitigated pressures, the database and case studies would become even more relevant. Project results are expected to give useful input for coming 2nd round of river management plans development and results are expected as soon as possible. Unfortunately, this project is probably too late to have much influence on the current round.

Annex I - Workshop Agenda

http://www.nwrm.eu

Regional workshop

Integration of natural water retention measures (NWRM) into river basin management in the Baltic Sea Region

Monika Centrum Hotels, Elizabetes iela 21, Riga

30 -31 January, 2014

Agenda

30 January, Thursday

13:30 - 14:00	***Registration and light lunch***
14:00 - 14:15	**Opening**: introduction to the objectives of the workshop and agenda *by Heidrun Fammler, Baltic Environmental Forum* **Introduction of the participants**
14:15 - 14:30	**Introduction to the DG ENV project on NWRM** *by Natacha Amorsi, OIEAU, project lead*
14:30 - 15:00	**Keynote speeches:** • What characterizes NWRMs and how do these relate to the core of River Basin Management Plans (RBMPs)? *by Dennis Collentine, The Swedish University of Agriculture Sciences (SLU)*
15:00 - 15:30	• What benefits are associated with NWRMs for the purposes of water management? *by Mats Ivarsson, ENVECO, Sweden*
15:30 – 16:00	**Coffee/Tea break**
16:00-16:30	• **The integrated web-based tool** *by Natacha Amorsi, OIEAU, project lead* • **Guidance document on NWRM in river basin management** *by Pierre Strosser, ACTeon, France*
16:30-17:15	**Work group session: how to implement NWR M in programme of measures of RBMP?**
17:15-17:45	Report from work group sessions
17:45-18:00	Synthesis plenary discussion and wrap-up *By Martyn Futter, The Swedish University of Agriculture Sciences (SLU)*
18:00	**Closing of the day**
19:00	**Joint dinner at the restaurant "Burkāns"** *(11. novembra krastmala 9, Riga)*

31 January, Friday

<table>
<tr><td>09:00 – 09:10</td><td colspan="3">Introduction to the day
by Heidrun Fammler, Baltic Environmental Forum</td></tr>
<tr><td>09:10 – 09:30</td><td colspan="3">NWRM in other European regions: experience from United Kingdom
by Nick Jarritt, AMEC Environment & Infrastructure UK Limited</td></tr>
<tr><td rowspan="3">09:30 – 10:45</td><td colspan="3">Thematic work group session:
• Presentation of one or two practical cases from the region</td></tr>
<tr><td>forestry</td><td>agriculture</td><td>urban environment</td></tr>
<tr><td>Z. Lībiete-Zālīte, Latvia

M. Starr, Finland</td><td>M. Przychodzka, Poland
T. Schäfer, Germany</td><td>G. Mandre, Estonia</td></tr>
<tr><td colspan="3">Discussion around issues: what are the main constraints encountered, what needs to be in the database, what are the main issues for the practical guide

Moderators: M. Futter (forestry); D. Collentine (agriculture); P. Strosser (urban environment)</td></tr>
<tr><td>10:45 -11:15</td><td colspan="3">Coffee break</td></tr>
<tr><td>11:15 – 11:45</td><td colspan="3">Continuation of the thematic work groups</td></tr>
<tr><td>11:45 – 12:30</td><td colspan="3">Plenary session: – Building common understanding
• Reporting from the thematic work sessions
• Discussion on what are the main challenges faced in the region, suggestions for adaptation in the knowledge platform and networking on NWRM</td></tr>
<tr><td>12:30 – 12:45</td><td colspan="3">Synthesis of the discussions
by Martyn Futter, The Swedish University of Agriculture Sciences (SLU)</td></tr>
<tr><td>12:45 – 13:00</td><td colspan="3">Next steps & Closing of the workshop
by Heidrun Fammler, Baltic Environmental Forum</td></tr>
<tr><td>13:00</td><td colspan="3">Lunch</td></tr>
<tr><td>14:00</td><td colspan="3">Departure</td></tr>
</table>

EC Disclaimer : This event takes place in the framework of ''ENV.D.l/SER/2013/0010 "Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures in River Basin Management" with the support of the European Commission, however

it reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Annex 2 – List of participants

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