European Commission

NWRM

Natural Water Retention Measures

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Service contract n°07.0330/2013/659147/SER/ENV.C1

Case Study

Kylmäojankorpi forested wetland, Vantaa, Finland

Environment

This report was prepared by the NWRM project, led by Office International de l'Eau (OIEau), in consortium with Actéon Environment (France), AMEC Foster Wheeler (United Kingdom), BEF (Baltic States), ENVECO (Sweden), IACO (Cyprus/Greece), IMDEA Water (Spain), REC (Hungary/Central & Eastern Europe), REKK inc. (Hungary), SLU (Sweden) and SRUC (UK) under contract 07.0330/2013/659147/SER/ENV.C1 for the Directorate-General for Environment of the European Commission. The information and views set out in this report represent NWRM project's views on the subject matter and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this report. Neither the Commission nor any person acting on the Commission's behalf may be held Key words: Biophysical impact, runoff, water retention, effectiveness - Please consult the NWRM glossary for more information.

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I. Basic Information

Application ID *(Country_Numeric, e.g.: Greece_01)*	*Finland_01*			
Application Name *(provide a short name)*	*Kylmäojankorpi forested wetland, Vantaa, Finland*			
Application Location	Country: *(select from list in Annex 1)*	*Finland*	Country 2: *In case of transboundary applications*	
	NUTS2 Code *(select from list in Annex 1)*		*FI1B Helsinki-Uusimaa*	
	River Basin District Code *(select from list in Annex 1)*		*FIVHA2 Kymijoki-Gulf of Finland River Basin District*	
	WFD Water Body Code *(select from list in Annex 1)*		FI0109208	
	Description *(free text, short description of the location)*		Kylmäojankorpi. A protected urban forested wetland (11.3 ha), within a 39 ha forest, Vantaa, Finland.	
Application Site Coordinates *(in ETRS89 or WGS84 the coordinate system)*	Latitude: 60°20'20" (6690769) - *ETRS89 or WGS84? Specify:WGS84*		Longitude: 25°02'09" (391576)- *ETRS89 or WGS84? Specify:WGS84*	
Target Sector(s) *Possibility to select more than 1 sectors (primary vs. secondary)*	Primary:	Forest		
	Secondary:	Urban		
Implemented NWRM(s) *Possibility to select more than 1 NWRM. Link to NWRM catalogue and NWRM Factsheets, Select from list in Annex 1.*	Measure #1:	*F 11 Urban forest parks*		
	Measure #2:	*N1 Basins and Ponds*		
	Measure #3:	*N2 Wetland*		
	Measure #4:			
Application short description	The Kylmäojankorpi case study represents research work which aimed to assess if and how existing forested wetland improves and regulates stream water quality and flow.			

II. Policy context and design targets

Brief description of the problem to be tackled	The study monitored a forest wetland, Kylmäojankorpi, in Vantaa city. Because of the large amount of impermeable (urban) land surrounding the wetland, there are potential problems with flashy runoff and water quality.		
What were the primary & secondary targets when designing this application? *Select from the drop-down menu.* *The possibility for more than one target is provided. Additional info can be given in the "remark" field to address e.g. other targets not included in the list, and give some details*	Primary target #1:	Regulation of hydrological cycle and water flow	
	Primary target #2:	Regulation of the chemical status of freshwater	
	Secondary target #1:	Flood control and flood risk mitigation	
	Remarks		
Which specific types of pressures did you aim at mitigating? *Select the relevant Directive (EU, non-EU) from the drop-down menu and type-in the related pressures. Different types of pressures as identified by EU-Directives (WFD, FD, etc.) are listed in the Annex 2*	Pressure #1:	WFD identified pressure	*2.1 Diffuse - Urban runoff*
	Pressure #2:	Floods Directive identified pressure	*Natural Exceedence*
	Remarks		
Which specific types of adverse impacts did you aim at mitigating? *Select the relevant Directive (EU, non-EU) from the drop-down menu and type-in the related impacts. Different types of adverse impacts as identified by EU-Directives (WFD, FD, etc.) are listed in the Annex 2*	Impact #1:	WFD identified impact	*Nutrient pollution*
	Impact #2:	WFD identified impact	*Chemical pollution*
	Impact #3:	WFD identified impact	*Altered habitats due to hydrological changes*
	Impact #4:	Floods Directive identified impact	*Protected areas*
	Remarks		
Which EU requirements and EU Directives were aimed at being addressed? *Select from the drop-down menu the different types of requirements as identified by EU-Directives (WFD, FD, etc.), and provide additional specification.*	Requirement #1:	WFD-achievement of good ecological status	
	Remarks		
Which national and/or regional policy challenges and/or requirements aimed to be addressed?	The study was performed to explore whether wetlands improve and regulate *certain* water quality and stream flow characteristics		

III. Site characteristics

Dominant Land Use type(s) *Select from the drop-down menu with the CORINE LU types and codes. Space of additional comments/remarks is provided*	Dominant land use	*412 Peat bogs*
	Secondary land use	*312 Coniferous forest*
	Other important land use	*Type in the relevant Code Level3*
	Remarks *Site surrounded by discontinuous urban fabric (112) and industrial or commercial units (121); actual site is 100% covered by vegetation (tree canopy and ground vegetation)*	
Climate zone *Select from the drop-down menu*	cool temperate moist	
Soil type *Select from the list with the FAO classes in Annex 3*	Histosols and Gleysols	
Average Slope *Select from the drop-down menu*	nearly level (0-1%)	
Mean Annual Rainfall *Select from the drop-down menu. Values are in mm,*	600 - 900 mm	
Mean Annual Runoff *Select from the drop-down menu. Values are in mm.*	150 - 300 mm	
Average Runoff coefficient (or % imperviousness on site) *Select from the drop-down menu. Space of additional comments/remarks is provided*	0 - 0.2	0 - 10%
	Wetland has NRCS hydrologic group C/D soils	
Characterization of water quality status (prior to the implementation of the NWRMs) *Please link to the WFD water quality parameters (nutrients N,P; organic pollution; chemical pollution, Cu, Zn; saline pollution; TSS; acidification, elevated temperatures; E.coli, Fecal coliforms, etc.)*	*Upstream of the wetland, elevated nutrient, metal, bacteria and sediment concentrations associated were observed. It is believed that the elevated concentrations are due to urban runoff from the industrial areas upstream of the wetland.*	
Comment on any specific site characteristic that influences the effectiveness of the applied NWRM(s) in a positive or negative way	*Positive way:* Forest canopy cover and 100%cover of ground vegetation The fact that the wetland is in a protected area is beneficial as it means the area has been retained in a semi-natural state and has not been subject to urban development. Being downstream of an urban area gives the potential to attenuate pollutants and flood peaks associated with fast runoff from impervious areas.	

	Negative way: Limited size (capacity) of wetland in relation to increasing inputs of storm and urban runoff

IV. Design & implementation parameters

Project scale *Select from the drop-down menu the relevant scale and specify.*	Medium (eg. public park, new development district)	*The urban forested wetland is an existing natural ecosystem in a protected area*
Time frame *NWRM(s) Installation date and lifespan*	Date of installation/construction (MM.YYYY)	*The dates for the study: June – November 2010 but the wetland has always been there, protected since 2000.*
	Expected average lifespan (life expectancy) of the application in years	*Assuming the area remains protected, the wetland should be permanent*
Responsible authority and other stakeholders involved *List of all + Descriptive Text of roles, responsibilities, etc.*	*Name of responsible authority/ stakeholder*	*Role, responsibilities*
	1.Vantaa City	Local authority and land owner, administration and maintenance
	2.Vantaa & Helsinki Parish Church Council	Landowner
	3. **Water Protection Association of the River Vantaa and Helsinki Region**	Monitoring of water quality
	4.Finnish Government, Uusimaa Centre for Economic Development, Transport and the Environment (ELY)	Regulatory framework for wetland protection
	5. University of Helsinki	Conducted the study to assess effectiveness of wetland for NWRM and pollutant attenuation
The application was initiated and financed by	*Site protected in 2000 (given conservation area status).* *The study of the water quality and flow regime was conducted within the MSc programme of the HELSINKI University*	
What were specific principles that were followed in the design of this application? *Examples provided: water-sensitivity, aesthetic benefit, functionality, usability, adaptability, integrative planning, integration of demands, acceptable costs, impact on public perception & acceptability, etc.*	Area protected for conservation purposes. NWRM was a secondary benefit of the project. The main purpose was to retain a semi-natural forest in a rapidly urbanizing suburb of Helsinki.	

Area (ha)	Number of hectares treated by the NWRM(s).	*11.3 ha of protected area*
		The "NWRM" wetland is embedded within a 37.3 ha forested area and whole area protected since 2012. Upstream catchment area is 1-2 km^2, in Tuusula city, immediately to the north.
Design capacity *Briefly describe the design capacity(ies) of the implemented NWRM(s), e.g. maximum volume of runoff water that can be retained per time step, maximum pollutant removal capacity in mg/l, etc.*		
Reference to existing engineering standards, guidelines and manuals that have been used during the design phase *References: active links to specific documents or website(s), and if not available online, provided them on the collaborate platform in the library section and URL here*	*Reference*	*URL*
	1.	
	2.	
	3.	
	4.	
	5.	
Main factors and/or constraints that influenced the selection and design of the NWRM(s) in this application? *List and describe specific factors that either guided or constrained the selection and the design (e.g. land use constraints, cooperation issues with land owners, specific legislation, existing funding for specific priorities, private investments, legal obligations - EU requirements, etc.)*	This is a protected area to maintain a semi-natural forest and wetland in an urbanizing landscape. The main factors influencing site selection are thus pre-existing flow paths and historical land use.	

V. Biophysical impacts

Impact category (short name) Select from the **drop-down menu** below:	**Impact description** (Text, approx. 200 words)	**Impact quantification** (specifying units)	
		Parameter value; units	% change in parameter value as

			compared to the state prior to the implementation of the NWRM(s)
Runoff attenuation / control	*Stream discharge (Jun –Aug 2010) decreased, i.e. reduced runoff and risk of flooding downstream, which is housing areas*	*From 3.2 to 2.0 l/s*	38%
Peak flow rate reduction	*Mean peak flows (6 rainfall events, Jul-Aug 2010) reduced*	*From 15 to 7 l/s*	47%
Impact on groundwater	*There were no measured impacts on groundwater.*		
Impact on soil moisture and soil storage capacity	*Reduced runoff and peak flow can be attributed to braiding of stream within the wetland and greater retention of water by the soil, and to increased evapotranspiration by forest and vegetation*		
Restoring hydraulic connection	*This is not relevant as the NWRM is part of a natural hydraulic network.*		
Water quality Improvements	Change between the wetland input and output: • *Dissolved oxygen significantly increase*	*From 2.7 to 7.5 mg/l*	*177%*
	• *Total nitrogen decrease*	*From 2.0 to 1.7 mg/l*	*15%*
	• *Turbidity decrease*	*From 15.6 to 14.4 NTUs*	*8%*
WFD Ecological Status and objectives	*There were no reported effects on WFD Ecological Status and objectives. Nevertheless, overall improvement in water quality and reduction in water temperature.*		
Reducing flood risks (Floods Directive)	*Risk of flooding downstream reduced*		
Mitigation of other biophysical impacts in relation to other EU Directives (e.g. Habitats, UWWT, etc.)	*The protected area and wetland complex will provide more natural habitat and may contribute to meeting Habitats Directive requirements.*		
Soil Quality Improvements	*The NWRM has helped to maintain soil quality. Much of the surrounding area has degraded soil quality due to land sealing.*		
Other	*Please described any other biophysical impacts not captured in the predefined list*		

VI. Socio-Economic Information

What are the benefits and co-benefits of NWRMs in this application?	The economic benefits from maintaining forest wetland in urban areas have not been estimated.		
Financial costs	***Total:***	*Value in €*	*Text / Specify*
	Capital:	*Value in €*	*Text / Specify*
	Land acquisition and value:	*Value in €*	*Text / Specify*
	Operational:	*Value in €*	*Text / Specify*
	Maintenance:	*Value in €*	*Text / Specify*
	Other:	*Value in €*	*Text / Specify*
Were financial compensations required? What amount?	*Was financial compensation required: Yes /No*		
	Total amount of money paid (in €):		
	Compensation schema:		
	Comments / Remarks:		
Economic costs	*Actual income loss:*		
	Additional costs:		
	Other opportunity costs:		
	Comments / Remarks:		
Which link can be made to the ecosystem services approach? *Hint: The actual benefits of improving nature's water storage capacity are essentially linked to an improved provision of some of the following ecosystem goods and services:* - *Freshwater for drinking.* - *Water provision to deliver water services to the economy both for drinking and non-drinking purposes.* - *Water security (reliability of supply and resilience to drought).* - *Health security (control of waterborne diseases).* - *Flood security and protection.* - *Storm surge protection.* - *Biomass production.* - *Amenities (associated to habitat protection): fish and plants, tourism, recreation, and others.* - *Benefits of improved coastal water quality and*	• *Flood security and protection* • *Amenities (associated to habitat protection): fish and plants, tourism, recreation, and others* • *Improved water quality* • *Greater biodiversity*		

ecological status for a sustainable commercial production of shellfish with human health and welfare values.	

VII. Monitoring & maintenance requirements

Monitoring requirements	*The case study represents a research project where water quality (dissolved oxygen, electrical conductivity, turbidity, and temperature) and stream-stage measured continuously. Intermittent water samples for chemical and biochemical analysis were also taken during base flow and rainfall events for more detailed study of wetland impacts on water quality and export loads of solutes.*
Maintenance requirements	Not relevant
What are the administrative costs?	Not relevant

VIII. Performance metrics and assessment criteria

Which assessment methods and practices are used for assessing the biophysical impacts? *Please describe e.g.: comparison to, paired watershed, pre vs. post, etc.*	Biophysical impacts were assessed by comparing flows and water quality upstream and downstream of the wetland.
Which methods are used to assess costs, benefits and cost-effectiveness of measures?	
How cost-effective are NWRM's compared to "traditional / structural" measures?	
How do (if applicable) specific basin characteristics influence the effectiveness of measures?	
What is the standard time delay for measuring the effects of the measures? *NWRM are multi-purpose and multi benefit measures but like other green infrastructures and on the contrary to grey infrastructure, their effects are not always immediately visible and need a certain time lapse to be fully operational and effective (free text allowed to enter the anticipated delay and the effective deviation from this finally found)*	

IX. Main risks, implications, enabling factors and preconditions

What were the main implementation barriers?	*Not relevant*
What were the main enabling and success factors?	*Not relevant*
Financing	*Not relevant*
Flexibility & Adaptability	*Not relevant*
Transferability	*The obtained knowledge can be used to estimate*

	environmental effects from the similar type of forested wetlands in urban areas.

X. Lessons learned

Key lessons	• *Forested wetlands improve and regulate certain water quality and stream flow characteristics* • *Urban wetlands are valuable in sustainable urban planning, but natural wetlands should not be degraded.*

XI. References

Source Type *Select from the drop-down menu*	*Other (specify)* Master's (MSc) thesis		
Source Author(s) *Provide the Name of the author(s)*	*Andrew Taylor*		
Source Title *Provide the Tile of the reference*	*The regulation of stream water quality and flow by a forested wetland, Kylmäojankorpi, Vantaa.*		
Year of publication *Provide the year in the format (YYYY)*	2012		
Editor/Publisher *e.g. Journal/Volume/Issue*	*M.Sc. thesis, University of Helsinki, Dept. of Forest Sciences. pp. 91 + 2 appendicies.*		
Source Weblink *Direct weblink(s) of the reference*	n.a.		
Key People *List names, affiliation and contact details of key people who have communicated important information presented in this factsheet*		*Name / affiliation*	*Contact details*
	1.	*Mike Starr, Helsinki University*	mike.starr@helsinki.fi
	2.		
	3.		
	4.		