European Commission

NWRM

Natural Water Retention Measures

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Case Study

Vallei van de Grote Nete

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	*Belgium_01*			
Application Name	**Vallei van de Grote Nete**			
Application Location	Country:	Belgium	Country 2:	
	NUTS2 Code		*BE21*	
	River Basin District Code		*BESchelde_VL*	
	WFD Water Body Code		BEVL031	
	Description		*A zone of approximately 30 kilometres along the Grote Nete river.*	
Application Site Coordinates	Latitude: 51.12146		Longitude: 4.87057	
Target Sector(s)	Primary:	Hydromorphology		
	Secondary:	Agriculture		
Implemented NWRM(s)	Measure #1:	*N2*		
	Measure #2:	*N3*		
	Measure #3:	*N8*		
Application short description	The measures are part of the Sigmaplan programme, which is a long-term large-scale programme aiming to improve flood storage of the Scheldt catchment. This particular scheme, on the Grote Nete, reconnects the river to its floodplain, which is currently isolated by dykes along both river banks. In the middle reach of the catchment, 'controlled water storage areas' will be developed, where a connection between the river and floodplain will be introduced but controlled. In the upper and lower catchment, free connection between the river and floodplain will be restored, allowing development of more natural forest, grassland and wetland habitats. The details of the scheme are still being finalised, taking into account the results of studies and modelling, and implementation will be timed in the best interests of the local landowners.			

II. Policy context and design targets

Brief description of the problem to be tackled	The Sigmaplan has been developed to protect the Scheldt catchment from flooding. It originated following extensive tidal flooding in 1976. The original scheme was mainly to control tidal flooding, but in later phases of work reaches further upstream have also been considered for storage of river flooding (such as this project on the Grote Nete). In addition to the flooding, areas beyond the river dykes are suffering from increased dryness, and associated loss of wetland habitats, due to the lack of connectivity to the river. The proposed solutions aim to address both of these problems together.	
What were the primary & secondary targets when designing this application?	Primary target #1:	Flood control and flood risk mitigation
	Secondary target #1:	Biodiversity and gene-pool conservation in riparian areas

	Part of the NWRM consists of development of new wetlands along the shores of the river. The other part consists of development of controlled floodplain storage.		
Which specific types of pressures did you aim at mitigating?	Pressure #1:	WFD identified pressure	2.7 Atmospheric Deposition
	Pressure #2:	Floods Directive identified pressure	Defence Exceedance
	Pressure #3:	Floods Directive identified pressure	*Other pressure contributing to flooding /flood risk (backwater from the Scheldt river)*
	Remarks	The Grote Nete is still slightly influenced by the tidal mechanism coming from the Scheldt river and this problem combines with high river flows coming down the Grote Nete during adverse weather conditions.	
Which specific types of adverse impacts did you aim at mitigating?	Impact #1:	WFD identified impact	*Altered habitats due to hydrological changes*
	Impact #2:	Floods Directive identified impact	*Rural land use*
Which EU requirements and EU Directives were aimed at being addressed?	Requirement #1:	WFD-achievement of good ecological status	*Morphological alterations will be addressed by reconnecting the river to its floodplain. New wetlands will be developed along the river banks.*
	Requirement #2:	Floods Directive-mitigating Flood Risk	*Increased flood storage will be provided, to reduce the risk of flooding downstream*
	Requirement #3:	Other EU-Directive requirements	Habitats Directive-improvements to Natura 2000 area
Which national and/or regional policy challenges and/or requirements aimed to be addressed?	The "Integraal waterbeleid Vlaanderen" is the guidance policy document for integrated water management in Flanders. The project is part of the wider Sigmaplan programme.		

III. Site characteristics

Dominant Land Use type(s)	Dominant land use	*231*
	Secondary land use	*241*
	Other important land use	*Type in the relevant Code Level3*
Climate zone	cool temperate moist	
Soil type	*Arenosols*	
Average Slope	nearly level (0-1%)	
Mean Annual Rainfall	600 - 900 mm	
Mean Annual Runoff		
Average Runoff coefficient (or % imperviousness on site)		

	The area is predominantly farmland, with no significant impermeable area. Data available of input to the valley from surface water (upstream water and tributaries), sewer systems and run-off from nearby grounds.
Characterization of water quality status (prior to the implementation of the NWRMs)	The main problem the Grote Nete faces (and surrounding areas) are desiccation and eutrophication, with smaller impacts of heavy metals encountered in its tributary De Grote Laak.
Comment on any specific site characteristic that influences the effectiveness of the applied NWRM(s) in a positive or negative way	The areas to be flooded were previously connected to the river and would previously have been wetland habitats. Therefore they are well suited for restoration to their former state.

IV. Design & implementation parameters

Project scale	Large (e.g. watershed, city, entire water system)	*Catchment-scale project, for a river 44 kilometres length in total.*
Time frame	Date of installation/construction (MM.YYYY)	*Construction not yet commenced. Construction is expected to start in 2015*
	Expected average lifespan (life expectancy) of the application in years	*Permanent when maintained*
Responsible authority and other stakeholders involved	*Name of responsible authority/ stakeholder*	*Role, responsibilities*
	1. Waterwegen en Zeekanaal NV	Overall coordination, water construction works and finance
	2. Agentschap Natuur en Bos	Involved in ecological aspects of projects, ecological construction works and finance
	3. VLM	Involved in agricultural aspects of projects (coordination of the compensation program for professional farmers).
	4. Departement Ruimtelijke Ordening, Woonbeleid en Onroerend Erfgoed (RWO)	Involved in spatial planning issues of the project.
The application was initiated and financed by	Zeekanaal en Waterwegen NV	
What were specific principles that were followed in the design of this application?	The main principles were : - increasing water safety (reducing flood risk) together with an - enhancement of the environmental quality in the area (through provision of wetland habitat with appropriate hydrological regime) - provision of solutions for agricultural landholders who will be affected or displaced by the scheme	

<table>
<tr><td></td><td colspan="3">provision of recreational benefits for wildlife viewing, walking and cycling)</td></tr>
<tr><td rowspan="2">Area (ha)</td><td>Number of hectares treated by the NWRM(s).</td><td colspan="2">ca. 15,000 ha upstream catchment area (river 44 km total length)</td></tr>
<tr><td colspan="3">A total of 850ha of additional wetlands will be created.</td></tr>
<tr><td>Design capacity</td><td colspan="3">The NWRM will increase the storage capacity in the river valley from 6.6 million m^3 to 8.4 million m^3.

The controlled water storage area is designed to be utilised for approximately the 1 in 5 year event (and higher). The wetland areas will be flooded more frequently.</td></tr>
<tr><td rowspan="6">Reference to existing engineering standards, guidelines and manuals that have been used during the design phase</td><td colspan="2">Reference</td><td>URL</td></tr>
<tr><td>1.</td><td colspan="2" rowspan="5">The technical design of the infrastructure has yet to start, but relevant design standards such as Eurocode 7 (geotechnical design) will be used.</td></tr>
<tr><td>2.</td></tr>
<tr><td>3.</td></tr>
<tr><td>4.</td></tr>
<tr><td>5.</td></tr>
<tr><td>Main factors and/or constraints that influenced the selection and design of the NWRM(s) in this application?</td><td colspan="3">Main factors influencing the detailed design, selection and placement of the NWRM were the constraints regarding scepticism from the public towards large infrastructural projects in their area (however the Sigmaplan programme also has the rights to compulsory purchase if necessary).

Positive influences are the vast amount of study work preceding the project which led to a development plan, and the benefits of having coordination structures already in place as part of the overarching Sigmaplan. The Sigmaplan carried out a large options identification and appraisal process, that started with 300 potential sites and carried out a cost-benefit assessment to select the final sites, including the Grote Nete. This meant that by the time the Grote Nete was selected, information from hydraulic modelling, agricultural impact assessment etc. had already been taken in to account.</td></tr>
</table>

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	*Increase in storage capacity of the valley*		*+27% increase in flood storage*
Peak flow rate reduction	*Peak flow rate downstream on the Grote Nete and the Scheldt will be reduced as a result of the flood storage*		
Impact on groundwater	*Groundwater levels will be increased in the wetland areas*		
Impact on soil moisture and soil storage capacity	*Soil moisture will be increased in the wetland areas*		
Restoring hydraulic connection	*The connectivity between the river and floodplain will be restored, by removing dykes and creating areas of wetland*		
Water quality Improvements	*Through increased flooding there will be the potential for capture of sediment on the floodplain, reducing sediment transport downstream*		
WFD Ecological Status and objectives	*The river morphology will be restored more closely to its natural state.*		
Reducing flood risks (Floods Directive)	*Peak flow rate downstream on the Grote Nete and the Scheldt will be reduced as a result of the flood storage*		
Mitigation of other biophysical impacts in relation to other EU Directives (e.g. Habitats, UWWT, etc.)	*New areas of wetland will be introduced, which will become part of a wide network across the Scheldt catchment*		
Soil Quality Improvements	*There are likely to be some changes to soil quality due to the changes in land use. The percentage of organic matter will increase over time.*		
Other	*n/a*		

VI. Socio-Economic Information

<table>
<tr><td>What are the benefits and co-benefits of NWRMs in this application?</td><td colspan="3">Following positive outcomes are expected:
- the social benefit of obtaining a self-sustaining estuary of the Scheldt (from the Sigmaplan as a whole, with contributions from the Grote Nete project), as well as local flood risk benefits in the Grote Nete catchment;
- Creation of a natural area of a significant size, including biodiversity and social benefits (recreational value) ;
- indirect positive outcome through creation of recreation-economy</td></tr>
<tr><td rowspan="6">Financial costs</td><td>Total:</td><td>25Million €</td><td>Initial estimate only, based on 2005 prices.</td></tr>
<tr><td>Capital:</td><td></td><td></td></tr>
<tr><td>Land acquisition and value:</td><td></td><td></td></tr>
<tr><td>Operational:</td><td></td><td></td></tr>
<tr><td>Maintenance:</td><td></td><td>Due to the fact that dykes will be removed, infrastructural maintenance costs will be lower than the existing regime. This will be accompanied by a rise in costs concerning nature conservation in the concerned area.</td></tr>
<tr><td>Other:</td><td></td><td></td></tr>
<tr><td rowspan="4">Were financial compensations required? What amount?</td><td colspan="3">Was financial compensation required:</td></tr>
<tr><td colspan="3">Total amount of money paid (in €):</td></tr>
<tr><td colspan="3">Compensation schema:
The accompanying agricultural support measures are set under the framework of the Sigmaplan:
- Support for farmers to identify exchange of land or company relocations
- Extra time to transform the company by phasing the works
- Border corrections to assure the liveability of companies by for example excluding lots with construction
- Appealing retirement scheme
- Financial support for changing land-use from arable to pasture</td></tr>
<tr><td colspan="3">The overall Sigmaplan foresees in a compensation of 2000 euros per ha for land users directly affected by the measures and compensation of 1000 euros per ha for land users not directly affected by the measure but who voluntarily make their lands</td></tr>
</table>

	available within the framework of the NWRM (for example as part of land exchange schemes with directly affected farmers). The land owners will get an allowance of at least 20%. When the land owner and land user are the same, both compensations can be cumulated.
Economic costs	*Actual income loss: In general there should be no income loss, because (besides voluntary agreements), land is acquired generally upon retirement, or upon provision of new land elsewhere.*
	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 ecological status for a sustainable commercial production of shellfish with human health and welfare values.*	Flood security and protection Storm surge protection Amenities such as tourism and recreation

VII. Monitoring & maintenance requirements

Monitoring requirements	Monitoring of river flows in the Grote Nete will be necessary to establish effectiveness. Monitoring is already in place on the river.
Maintenance requirements	Maintenance requirements will be reduced from the existing regime, because the dykes currently require high levels of maintenance. In the areas where wetlands will be created the maintenance costs will be considerably lower, along the other parts of the river (where dykes will remain unchanged), maintenance requirements will be unchanged. Water flow regulation equipment for diversion of water to the controlled water storage areas in the middle catchment will need to be maintained additionally.
What are the administrative costs?	

VIII. Performance metrics and assessment criteria

Which assessment methods and practices are used for assessing the biophysical impacts?	The scheme has not yet been constructed. However the effectiveness is being measured, and used to justify the scheme, on the basis of the design storage volumes, which significantly increase the total flood storage available in the catchment. Modelling and other studies have been carried out to inform the design (some specific to the Grote Nete, and some for Sigmaplan as a whole).
Which methods are used to assess costs, benefits and cost-effectiveness of measures?	A wide-scale modelling programme supported the identification of the flood storage areas that have been selected to be included in Sigmaplan: originally over 300 sites were considered, and all options were assessed to select the best. In most cases, the measures are all controlled flood storage areas, and the Grote Nete differs in having permanent wetlands.
How cost-effective are NWRM's compared to "traditional / structural" measures?	The maintenance costs will be lower than continuing to maintain the dykes, however this has not been quantified in detail.
How do (if applicable) specific basin characteristics influence the effectiveness of measures?	As long as the mechanism and frequency of flooding in the catchment is well understood, flood storage areas such as these can be widely applicable, with no specific basin characteristics.

What is the standard time delay for measuring the effects of the measures?	The effectiveness in terms of flood protection will be immediate once construction has been completed. However the biodiversity benefits will take longer while the wetland habitats become established.

IX. Main risks, implications, enabling factors and preconditions

What were the main implementation barriers?	*As this project is part of the Sigmaplan, overarching consulting pre-existed prior to the project within the sectoral consultation bodies (agriculture, nature, government,…). This enabled to get all local stakeholders involved as well in an early phase to successfully coordinate any issues during the design phase.* *The Sigmanplan programme also has the rights to compulsory purchase land if necessary. This means that ultimately there are no land-ownership barriers to implementation, although voluntary agreements are always sought and consultation carried out on an individual basis.*
What were the main enabling and success factors?	Although time consuming, the preceding study work (reports regarding effects on agriculture and nature development, modulations of ground- and surface waters, …) led to a complete development plan which enhanced coordination and integration greatly. As part of the Sigmaplan programme, the project has flexibility in the timing of implementation, which is central to achieving success with less impact on landowners. The timescales are treated flexibly to wait, for example, until a farmer retires or other land is found for relocation, rather than setting a fixed date.
Financing?	*The project will be funded by the Flemish government, who have allowed for 25 million euros based on 2005 calculations.*
Flexibility & Adaptability	*In its current set-up the NWRM does not have flexibility above its design capacity. If baseline conditions would change, additional projects will have to be considered. The Sigmaplan programme as a whole allows the flexibility for this to be achieved.*
Transferability	*Similar application is possible in areas where the river has not been given enough room due to old water retention measures such as dikes.*

X. Lessons learned

Key lessons	*Integration of the project under the larger Sigmaplan enabled the project communication to go smoother and inter-agency communication was already established through the overarching plan.* *Allowing long timescales is important and allows for the optimal outcome to be achieved, by allowing landowners greater flexibility.*

XI. References

Source Type	*Interview/information gathering through Mr. Maarten Jans, project lead Waterwegen en Zeekanaal.*
Source Author(s)	
Source Title	Welkom bij het Sigmaproject Vallei van de Grote Nete
Source Weblink	http://www.sigmaplan.be/nl/projectgebieden/vallei-van-de-grote-nete
Source Type	
Source Title	Flankerend landbouwbeleid: Begeleiding van actieve landbouwers in Sigmagebieden.
Source Weblink	http://www.sigmaplan.be/nl/projectgebieden/vallei-van-de-grote-nete

XII. Photos Gallery

Overview picture of the project area (source: www.sigmaplan.be), showing areas intended for wetland (green) and controlled flood storage areas (blue)