



Upper Scheldt restoration BE

Restoring water quality and landscapes in the Flemish Ardennes to let them flourish!

Imprint

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1 For the reader

The content of the document was developed as part of the MERLIN project, funded under the H2020 program of the European Commission. Most of the implementation was conducted by the Province Of East-Flanders and specifically by the Department of Integrated Water Management and the Provinciaal Centrum voor Milieuonderzoek in collaboration with the researchers of the Aquatic Ecology Research Unit of Ghent University. This RSP was developed in consultation with various authorities and stakeholders via a workshop such as the representatives from the Institute of Nature and Forest, Flanders Environmental Agency, Province of East-Flanders – Department of Agriculture, Flemish Land Agency, Commune of Oudenaarde, Provinciaal Centrum voor Milieuonderzoek – Erosion Coordinator, Farmers Union and Algemeen Boerensyndicaat, Regionaal Landschap Vlaamse Ardennen, and Province of East- Flanders – Department of environment and nature. This is an interdisciplinary group, consisting of ecologists, environmental scientists, farmers, administrators, on-site implementers, and sector representatives.

Restoring water quality and landscapes in the Flemish Ardennes to let them flourish! This RSP provides steps in enhancing water quality and biodiversity as well as guidelines and proposals to reduce diffuse pollution into the streams within the Flemish Ardennes based on buffer strips with limited impact on crop production as well as remeandering and removal of fish migration barriers to restore habitat.

This RSP is developed for local and regional policymakers and politicians. It can be a guide to different authorities working on water, agriculture and nature development.

2 Focus of the RSP

2.1 Regional characteristics

The region being considered is the Flemish Ardennes, which includes the municipalities of Brakel, Zwalm, Zottegem, Oudenaarde and Maarkedal. The majority of the region is mainly agricultural fields with scattered residences. This region has high potential concerning biodiversity and ecological restoration but has to deal with scattered housing in the rural area with limited access to public sewage/sanitation infrastructure and intensive agriculture and is thus impacted by the discharge of wastewater, the presence of fish migration barriers, problems with erosion and nutrient runoff. Furthermore, climate change has caused more frequent floods and droughts. The region is considered in the River Basin Management Plans, which aims to achieve good ecological status by 2027 depending on its natural restoration capacity and is also considered a focus area. In the area, there are still protected species listed present such as bullhead and brook lamprey. Several projects have been undertaken within the region. Recently the landscape park of the Flemish Ardennes was approved. This will boost the improvement in water quality and natural restoration, but also help to promote the region as a touristic and attractive region with important historical features.

The potential risk the region will face in the NBS context is the limited availability of land, which potentially becomes even more scarce and expensive in the future. This situation may potentially affect the farmer's willingness to give up some of their lands for implementing NBS measures. The availability of funding schemes is also uncertain in the future due to changes in policies and legislation. In addition, some scepticism towards implementing NBS measures or green measures is present certainly given the recent problems on nitrogen and the possible impact on agricultural activities. The general public is also afraid that natural restoration and thus the loss of agricultural fields will lead to less availability of food and thus higher prices.

The focus of the RSP is on the Flemish Ardennes (Figure 1).

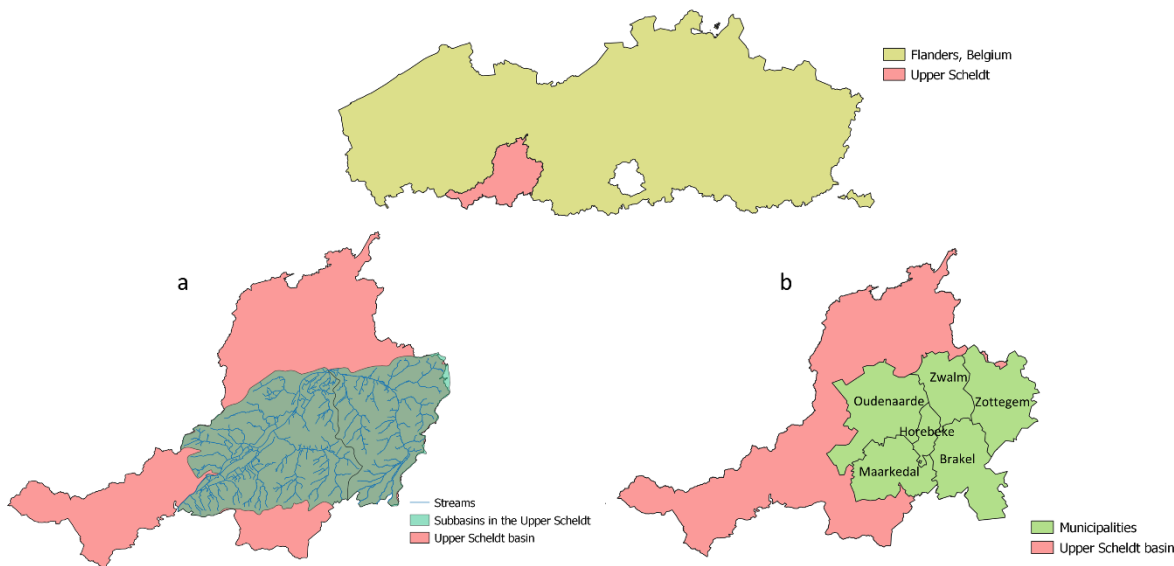


Figure 1. Map of the region where the Regional Scalability Plan is focused on. It covers 2 subbasins in the Upper Scheldt (a) and 6 municipalities within the Flemish Ardennes (b).

2.2 Justification for the region

The region was chosen because it has a high potential for biodiversity and ecological restoration, is considered in the River Basin Management Plan of the Water Framework Directive to reach good ecological status by 2027, has the presence of protected species in Annex II and IV of the Habitat's Directive. In addition, the region has to deal with high erosion problems which causes diffuse pollution. The region has been well studied in previous projects (<https://www.rlva.be/projecten>; Bennetsen et al. (2016), Forio et al. (2020), Boets et al. (2021), Burdon et al. (2020), Dedecker et al. (2002), Dedecker et al. (2005), Forio et al. (2022), Boets et al. (2013), Mouton et al. (2009a), Mouton et al. (2010), Mouton et al. (2009b), Adriaenssens et al. (2002), El Ouazzani Taibi et al. (2011),

Huygens et al. (2000), Goethals and Pauw (2001), Boets et al. (2024), Van Herpe et al. (1998), Witing et al. (2022), https://www.natagriwal.be/wp-content/uploads/2023/06/3_Flanders_LFockaert.pdf) which provides a good basis for future projects.

The boundaries considered are the municipal and river basin boundaries, which makes it convenient in terms of local and province-level governance as well as the involvement of relevant stakeholders governing the region. Furthermore, as mentioned above, the region is being considered in the River Basin Management Plan (<https://sgbp.integraalwaterbeleid.be/beheerplan/nts-engels-rbmp3-web.pdf>).

2.3 Linkages and synergies with other initiatives

The RSP is built upon existing initiatives. Among these initiatives are the (1) "boer aan boord" project, which provides compensation for the construction and management of grass (flower) strips along erosion-sensitive agricultural plots; (2) "water plant project", which re-establishes native macrophytes in streams within the basin and also monitors the establishment of these water plants and its impact on water quality and biodiversity, (3) "establishing spawning beds initiative, which supports in the reproduction of fishes, (4) "removal of fish migration barriers or installation of the fish by-pass initiative" (the region is indicated as a priority for free fish migration), (5) "allocating of areas as buffer basins for flood water initiatives", (6) previous landscape projects also exists which are focused on the areas indicated in the map (see [this link](#)), (7) the Zwalmvallei project which is within the Water-Land-Scape 2.0 program, which tackles drought and flooding. Furthermore, the area was granted a Landscape Park status by the Flemish government. In this respect, the stakeholders are now working on a master plan that will allow agriculture, nature, heritage and tourism to evolve positively towards a new balance for the next 24 years. The RSP of MERLIN can contribute synergistically to the master plan in the region.

3 Stakeholders of the RSP

Table 1 describes the list of stakeholders that can be consulted or involved in the RSP.

Name of stakeholder	Acronym	Sector	Involvement status	Scale (Level)	Ownership	Web Link
Provinciaal Centrum voor Milieuonderzoek	PCM	Environment	Already involved	Province	Public	https://oost-vlaanderen.be/wonen-en-leven/natuur-en-milieu/provinciaal-centrumvoormilieuonderzoek.html
Province of East-Flanders - Agriculture	PoV - Agric	Agriculture	Already involved	Province	Public	https://oost-vlaanderen.be/
Flanders Environmental Agency	VMM	Environment	Already involved	Region	Public	https://www.vmm.be/
Flanders Land Agency	VLM	Landscape, Agriculture	Already involved	Region	Public	https://www.vlm.be/en/
Agency of Nature and Forest	ANB	Environment	To be involved	Region	Public	https://www.vlaanderen.be/inbo/home/
Agency for Agriculture and Fisheries	ALV	Agriculture	To be involved		Public	https://lv.vlaanderen.be/en/english-version
Regionaal Landschap Vlaamse Ardennen	RLVA	Landscape, Agriculture	Already involved		Volunteer	https://www.rlva.be/
Institute of Nature and Forest	INBO	Nature	Already involved	Region	Public	https://www.vlaanderen.be/inbo/home/
Province of East-Flanders - Environment and Nature	PoV-environment and nature	Environment	Already involved	Province	Public.	https://oost-vlaanderen.be/
Natuurpunt	Natuurpunt	Environment	Already involved	Region	NGO	https://www.natuurpunt.be/
Algemeen Boerensyndicaat	ABS	Agriculture	Already involved	Region	NGO	https://www.absvzw.be/
Boerenbond	Boerenbond	Agriculture	To be involved	Region	NGO	https://www.boerenbond.be/homepagina
Gemeente Brakel	-	Agriculture, Environment, Administration	To be involved	Municipal	Public	https://www.brakel.be/
Gemeente Zottegem	-	Agriculture, Environment, Administration	To be involved	Municipal	Public	https://www.zottegem.be/
Gemeente Zwalm	-	Agriculture, Environment,	To be involved	Municipal	Public	https://www.zwalm.be/

Name of stakeholder	Acronym	Sector	Involvement status	Scale (Level)	Ownership	Web Link
		Administration				
Gemeente Maarkedal	-	Agriculture, Environment, Administration	To be involved	Municipal	Public	https://www.maarkedal.be/
Gemeente Oudenaarde	-	Agriculture, Environment, Administration	Already involved	Municipal	Public	https://www.oudenaarde.be/nl
Aquafin	Aquafin	Water		Region	Private/Public	https://www.aquafin.be/en



Figure 2. A stakeholder workshop on the Regional Scalability Plan held on January 18, 2024 @Marie Anne Eurie Forio

3.1 Further stakeholder opportunities

The target audience is the people involved in policy. For the measures on river restoration, the water managers are the main target whereas, for the implementation of buffer strips, the target is the Flemish Government but also the farmers' associations and even water managers or local policymakers. Specifically, the following stakeholders from the following organisations are important for this RSP: the farmers associations Algemeen Boerensyndicaat, Boerenbond; the research institutes: Instituut voor Landbouw-, Visserij- en Voedingsonderzoek (ILVO), the research institute for agriculture; and Institute for Nature and Forest (INBO); The government regional level agencies: Agency for Nature and Forest (ANB), Vlaamse LandMaatschappij (VLM); the different departments of the Province of East Flanders: Agriculture, Water, Provincial Centre for Environmental Research (PCM); the Regionaal Landschap Vlaamse Ardennen; inter-community project development SOLVA; the municipalities of Zwalm, Zottegem, Brakel, Horebeke, and Maarkedal.

The stakeholders that were consulted are the following: the farmers associations Algemeen Boerensyndicaat and Boerenbond, the different departments of the Province of East Flanders: water, agriculture and environment departments; the regional levels agencies (at the level of Flanders) which are the Flanders Environmental Agency (VMM) and Flemish Land Agency (VLM), the Regional landscape of the Flemish Ardennes, Natuurpunt, and the local level stakeholders which are working at the municipalities of Brakel, Zwalm, Maarkedal, Zottegem and Oudenaarde.

The ministries of the Environment and Agriculture in Flanders will be consulted, and are possibly important stakeholders to be included in the future.

The individual farmers and some residents who will be affected were not actively involved in the making of the RSP. However, a specific workshop or detailed plan can be shown at an information event for local residents.

We do not consider the RSP to be the ownership or responsibility of one organisation. The province of East Flanders and the Regional landscape of the Flemish Ardennes will be the main driving forces of the RSP.

3.2 The responsible stakeholders and their roles

Below we list the main stakeholders that are currently already taking action in the region to obtain a good ecological status.

- 1) All water managers must be involved in order to be able to implement the restoration actions such as free fish migration and remeandering.
 - 1st order rivers (large streams and rivers) --> Flemish Environment Agency
 - 2nd order rivers (small streams) --> Province of East-Flanders
 - 3rd order rivers (very small streams)--> local municipalities
- 2) Aquafin, Farys, municipalities and VMM are responsible for wastewater treatment infrastructure and thus an improvement in surface water quality.
- 3) Flemish Land Agency is involved in combating erosion together with erosion coordinators (province) and the farmers – streamlining with common agricultural policy (CAP)

The proposals in the RSP streamline mainly with the river basin management (RBM) plans that aim to achieve a good ecological status by 2027 or later based on natural rehabilitation. Currently, there is once a year a meeting organised by the “bekkensecretariaat” to assess the progress of the different actions within the RBM plans. However, there is no real “power” of the bekkensecretariaat, they help in promoting these actions, but the major bottleneck is the financial means and the people/administration to get all implemented.

The funding for the actions listed in this RSP comes from different governments (province, municipalities, Flemish government). The main challenge is especially finding a sustainable solution for the buffer strip implementation as this is currently based on subsidies and on the willingness of the farmer to step into the project.

The results of the implementation are now monitored within the project by Ghent University. There is also a long-term monitoring plan set up by the Flemish Environment Agency. However, not all aspects are monitored to be able to assess the effects of the restoration actions. One possible solution is monitoring through citizen science. Another is obtaining funding to fund research on quantitatively assessing the effectiveness of these measures. The best way to have a “living” RSP is to get this really worked out in a practical way and to make the link with the River basin management plans or with the CAP.

4 Green deal goals

4.1 SMART Green Deal goals relevant for the region: primary goals

Below are the goals listed for our RSP. They are subdivided into different domains including biodiversity, climate regulation, inclusivity and zero pollution.

Biodiversity net gain – the main goal is to have free fish migration in all streams, and natural restoration of the small streams with meandering and good status for the hydromorphological, chemical and biological conditions. Furthermore, it is the aim to increase the presence of pollinators and beneficial terrestrial invertebrates. We aim for the presence of a spawning area for rheophilic fish species, with at least one good spawning bed on each river. The ultimate goal is to have (re-)established sustainable populations of bullhead and brook lamprey in the Dorenbosbeek, Roosmeerbeek, Sassegembeek and Verrebeek. Furthermore, it is the goal to establish 12 km (with an average of 6 m width) of grass-flower strips along the watercourse to increase the presence of pollinators, these grass flower strips should be clustered in areas to facilitate management, such that not less than 4 km length (with an average of 6 m width) of grass-flower strips are clustered together.

Climate regulation – it is a goal for lesser emissions of greenhouse gases (GHG) in 50% of the streams in the basins. By reducing the nutrients (particularly the N) coming into the streams, GHG emissions are also reduced. Furthermore, the use of less carbon-based fuel reduces carbon footprint. This can be achieved to a small extent by lesser dredging operations and thus a reduction in the erosion problem. Lesser dredging operations can be attained by reducing erosion coming from agricultural operations and this can be potentially possible by adopting NBS that mitigate erosion.

Inclusivity – it is the aim to involve at least 30 farmers as one of the NBS measures requires the willingness of the farmers to implement the measure.

Zero pollution – it is the aim to reduce nutrient runoff and pollutants coming into the streams and that at least 50% of the streams in the focused basins will be able to reach a good chemical status. Furthermore, it is aimed that all communities are connected to sewer systems or that they have installed a separate treatment system and that the wastewater is treated. In this way, the nutrient inputs to the streams are reduced. Our final aim is to have a reduction in nitrogen by 70% and of phosphorous by 90% by 2033. Currently in the RBM plans there are no reduction targets set for the Zwalm River basin. <https://sgbp.integraalwaterbeleid.be/zonerings-en-uitvoeringsplannen/vr-2022-0107-doc-0739-41bis-stroomgebiedbeheerplannen-bijlage.pdf>.

4.2 SMART Green Deal goals relevant for the region: secondary goals

Besides the primary goals, there are some secondary goals that we want to achieve with the RSP, these are listed below.

Flood and drought resilience: It is the goal to be able to hold excessive water during heavy rainfall to reduce flood risks and to have more storage capacity of water to aid drought resilience. Therefore, the installation of buffer basins especially on the Maarkebeek is necessary.

Circular economy: It is the goal to investigate the use all the grass-flower strip cuttings by composting them or using them for biogas production.

Sustainable energy: It is the goal to reduce dredging in streams as a result of reduced erosion, thus saving energy. Furthermore, it is the aim to use the grass-flower strip cuttings for Biogas production to generate energy.

Health and well-being: It is the goal that more people (double than the current numbers) will be hiking and cycling through or along the naturalised sites.

5 From general goals to actions

Below are the actions listed related to the goals

5.1 Climate Goal

Action 1

Get plans executed and seek funding for the restoration of hydromorphology and foresee sufficient buffers to have more resilient rivers against droughts and heavy rain events. This can be done via buffer basins and ecological restoration. The existing funding can come from the call “levend water”, see:

<https://www.vmm.be/water/projecten/levend-water/oproep-levend-water-24>.

Action 2

Execute plans and consult experts in order to have a robust landscape with healthy soil that can act as a sponge and in addition have more buffer strips that protect rivers from nutrient leaching and avoid erosion, thereby reducing greenhouse gas emissions. This can be achieved by for example implementing grass-flower strips. Knowledge gaps exist on where the optimal locations of these grass-flower strips are located. Furthermore, the implementation of these measures will be only realised if farmers agree to implement them or if legislation provides an obligation for implementation. The combination with other measures such as increasing soil biodiversity will be necessary.

Action 3

Convince farmers to implement grass-flower strips by personally talking with them and offering them incentives, i.e. in terms of subsidies. If farmers agree with it, set up a contract and have the contract signed. Preferably long-term solutions are provided to the farmers.

Action 4

Implementation of the RBM plans by naturalization and implementation of grass-flower buffer strips

Action 5

Monitoring the effect of these measures in terms of hydromorphology and towards drought and flooding. Can make use of citizen science for the monitoring of these measures (see FLOW project in Germany).

5.2 Biodiversity Goal

Action 1

Have a brainstorm on restoration actions with key stakeholders and consult affected stakeholders for the restoration of the upstream reaches of the Zwalm River basin and the Upper Scheldt River basin in terms of hydromorphology and free fish migration. Enhancing the diversity of pollinators and beneficial terrestrial invertebrates by diversifying habitats by first investigating optimal measures and consulting experts and ecologists. Improving the habitat condition status in the Habitat’s Directive of the area by first investigating whether re-introduction of water plants will work.

Action 2

Get sustainable populations of bullhead and brook lamprey in the upstream reaches of the Zwalm River basin and the Upper Scheldt River basin by removing fish migration barriers, obtaining good water quality and reducing erosion.

Action 3

Boost the insect diversity by sowing flowering buffer strips and manage them in a sustainable manner

Action 4

Implementation of grass-flower strips at the edge of an agricultural field.

Action 5

Naturalization of the middle sections of streams and rivers within the basin, introducing water plants (to improve the aquatic vegetation after getting insights from the results of an ongoing project related to this).

5.3 Inclusivity goal

Action 1

Include the farmers in the decision-making and present the outcomes of the project in order to increase the support for the measures by inviting them to workshops related to when drafting the management plans.

Action 2

Try to include different water managers within the River basin to have an approach from source to mouth, a real integrated water management

Action 3

Engage all different municipalities to support the ecological restoration of the upper reaches of the Upper Scheldt river basin.

5.4 Other primary/secondary goal

Action 1

Reinforce and keep the existing initiatives such as Landschapspark Vlaamse Ardennen and Water+Land+Schap programme by indicating the importance in terms of reaching the biodiversity and climate targets by 2030.

Action 2

Find a sustainable manner to continue the existing project and to upscale it up in order to reach the targets as set by the European Water Framework Directive.

Action 3

Knowledge-building by monitoring and modelling the effects of these measures in terms of erosion, nutrient run-off buffering from grass-flower strips, energy gained from cuttings after biogas production, amount of compost material produced from grass-flower strips cuttings, how beneficial they are quantitatively, determining optimal locations to implement these measures and mapping funding schemes.

5.5 Zero pollution goal

Action 1

Reduction of nutrients and other pollutants such as pesticides (non-point source pollution) into streams by planning and drafting strategies to get the regulations controllable in the field. Challenges of this goal are still the substantial presence of raw wastewater coming into the stream. There is a partial lack of sewer systems in the region.

Action 2

Implementation of grass-flower strips to reduce inputs of non-point source pollution in streams.

Action 3

Knowledge-building of determining how much nutrients from the surface run-off is intercepted by the grass-flower strips through modelling and field monitoring.

Action 4

Optimisation of existing WWTP by decoupling wastewater and rainwater and by optimizing the treatment efficiency for N and P.

6 Proposed Timeline

In the table below, the indicative timeline for the activities of river restoration, i.e., re-meandering, removal of fish migration barrier and naturalisation of streams can be found.

	period (4-year Interval)						
	2025-2028	2029-2032	2033-2036	2037-2040	2041-2044	2045-2048	2049-2052
1. Finding funds for the implementation of measure	x	x					
2. Naturalisation of streams							
2.1 Identifying 2 priority streams to naturalise	x						
2.1. Making a plan to improve naturalisation of streams	x	x	X	x			
2.2. Licensing to do restoration measures	x	x	X	x	x	x	
2.3. Detailing specification			X			x	
2.4. Finding a contractor	x	x	X	x	x	x	
2.5. Restoration works		x	X	x	x	X	
3. Monitoring the implemented measure and its effects on biodiversity							
3.1 Monitoring the (implemented) measure		X	x	X	x	x	x
3.2 Finding funding scheme for the scientific monitoring of the measure in terms of its effect on biodiversity, hydrology, Green Deal goals		X		X		x	
3.3. Scientific monitoring of the measure in terms of its local and basin effect on biodiversity, hydrology, Green Deal goals.			x	X	x	x	x

In the table below, the indicative timeline for the activities of the implementation of grass-flower buffer strips can be found.

	period (2-year Interval)							period (4-year interval)		
	2025-26	27-28	29-30	31-32	33-34	35-36	37-38	39-42	43-46	47-50
1. Finding funding schemes for implementing the measures	x	x			x	x		x		
2. Implementation of buffer strips										
2.1. Identifying priority areas for implementing grass-flower strips	x	x								
2.2. Contacting farmers		x	x		x		x			
2.3. Sowing of buffer strips			x		x		x		x	
2.4. Maintenance of buffer strips		x	x	x	x	x	x	x	x	x
3. Monitoring and knowledge building										
3.1 Finding funding for monitoring and knowledge building		x	x		x	x		x	X	
3.2 Scientific monitoring and evaluating the measure				x		x		x	x	x

	period (2-year Interval)						period (4-year interval)			
	2025-26	27-28	29-30	31-32	33-34	35-36	37-38	39-42	43-46	47-50
through modelling and field validation of the model results										
3.3 Setting up and implementing citizen science for monitoring		x	x	x	x	x	x	x	x	x

7 Opportunities for financial implementation

Currently, given problems due to climate change, several funding opportunities exist such as EU CAP, the Flemish government, EU projects, BlueDeal programme (<https://bluedeal.integraalwaterbeleid.be/>), and to a small extent from NGOs. However, restoration is expensive and these are all funding mechanisms that depend on political decisions. Long-term sustainable funding is crucial to get this ongoing also in the next 2 decades.

8 Uncertainties and assumptions/ boundary conditions

The implementation of the RSP is highly dependent on the decisions made in politics. The policies, regulations and legislation may change over time, and the availability of funds is uncertain. Ideally, these measures are implemented in a long-term vision and are integrated in the CAP. Given the rapid climate change, the effect of the proposed measures might not be sufficient to counteract the negative effects of increased temperature, droughts, and heavy rains.

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