Interreg
2 Seas Mers Zeeën
PROWATER
European Regional Development Fund

Restoring fen wetlands & heathlands for climate adaptation

Results of changes implemented to the 'Grobbendonk' site by Pidpa

October 2022

www.pro-water.eu

DISCLAIMER

COLOFON

The PROWATER project has received funding from the Interreg 2 Seas programme 2014-2020 co-funded by the European Regional Development Fund under subsidy contract No 2S04-027. Interreg 2 seas is a European territorial cooperation program for the United Kingdom, France, the Netherlands and Belgium (Flanders).

This report represents Deliverable 6.1.7 of the project PROWATER : 'Synthesis booklet: Report of the assessment results for the cases'.

Citation: Deleye Lien, De Mey Karel, van San Erwin, Vande Velde Katherine (2022). Restoring fen wetlands & heathlands for climate adaptation – Results of changes implemented to the 'Grobbendonk' site by Pidpa. Deliverable 6.1.7 of the PROWATER project, Interreg 2 Seas programme 2014-2020, EFRD No 2S04-027.

AUTHORS

Deleye Lien, De Mey Karel, van San Erwin
Pidpa OV
Desguinlei 246,
2018 Antwerp, Belgium

Vande Velde Katherine (editor)
Departement Omgeving
Afdeling Strategie, Internationaal Beleid en Dierenwelzijn
Koning Albert II-laan 20 / 8
1000 Brussels, Belgium

PROJECT PARTNERS

COLLABORATERS FOR THE DEMONSTRATION SITE

Restoring fen wetlands & heathlands for climate adaptation

In Grobbendonk, the public water company Pidpa developed the Interreg 2 Seas PROWATER site 'Grobbendonk' to demonstrate how the region can adapt to the consequences of climate change through Ecosystem-based Adaptation measures.

Pidpa is a public water company responsible amongst other for the drinking water production and supply in the main part of the province of Antwerp in Belgium. Pidpa invests in Ecosystem-based Adaptation to safeguard and increase the quantity and quality of the groundwater as a major source for drinking water production. Ecosystem-based Adaptation (EbA), a Nature-based approach to climate change adaptation, harnesses ecosystem services to increase resilience and reduce the vulnerability of human communities and natural systems to the effects of climate change. These EbA measures can be integrated into adapted agriculture, forestry and environmental management.

This publication summarises the EbA measures and results of 'Grobbendonk. Pidpa aims to restore historical local water buffering landscape elements. This includes the degraded fen (called "heart fen" due to its historical heart shape) that was already present in 1778 in the Pidpa Forest. Restoring these water buffering elements are aimed at diminishing flooding risks (downstream) in wet periods, increasing water availability (downstream) in dry periods and maximising the time that water can infiltrate to the groundwater bodies. In addition to the fen restoration, Pidpa also converted a part of the currently present pine forest plantation to restore the infiltration capacity of the historically present heathland in the area. This will increase groundwater replenishment.

The results are summarised using various steps (chapter 1 to 4) that represent the process for successful planning and implementation of climate change adaptation measures (see Output 1). Presented insights and lessons learnt can help governments (national, provincial and municipal), knowledge institutions, consultancies, managers of nature areas, drinking water companies and landowners in the design of climate change adaptation projects.

Figure 1 - The dot situates the demonstration site for Ecosystem-based Adaptation in the Interreg 2 Seas region.

1 Understanding the catchment

1.1 Geographical & hydrological context

The demonstration site Grobbendonk is located in the Central Campine region, which is characterised by the presence of sandy soils, naturally allowing easy infiltration of rainwater to groundwater bodies (in areas with healthy and non-compacted soils).

The area containing the two EbA sub-sites in Grobbendonk is mapped as land dunes. Due to the hilly topography caused by the presence of land dunes, the groundwater levels can locally vary significantly. Restoring the water storage and infiltration capacity of the fen sub-site and the water infiltration capacity of the heathland sub-site will increase the amount of water in groundwater bodies.

The groundwater abstraction by Pidpa started in 1942 and could potentially negatively impact (the restoration of) the fen. However the fen has been present since 1771 and has not disappeared since. It seems that the fen is mainly fed with local run-off, as is often the case for fens. This stored water can then slowly infiltrate to groundwater bodies. The plant species *Hypericum elodes* is present in the fen. This species is a pioneer species of fens. Only if the conditions are right, this plant stays present. As seen on site, this species has grown its typical floating mats over the years. This indicates that the abiotic conditions are met for this species, otherwise it would have been overgrown by other species.

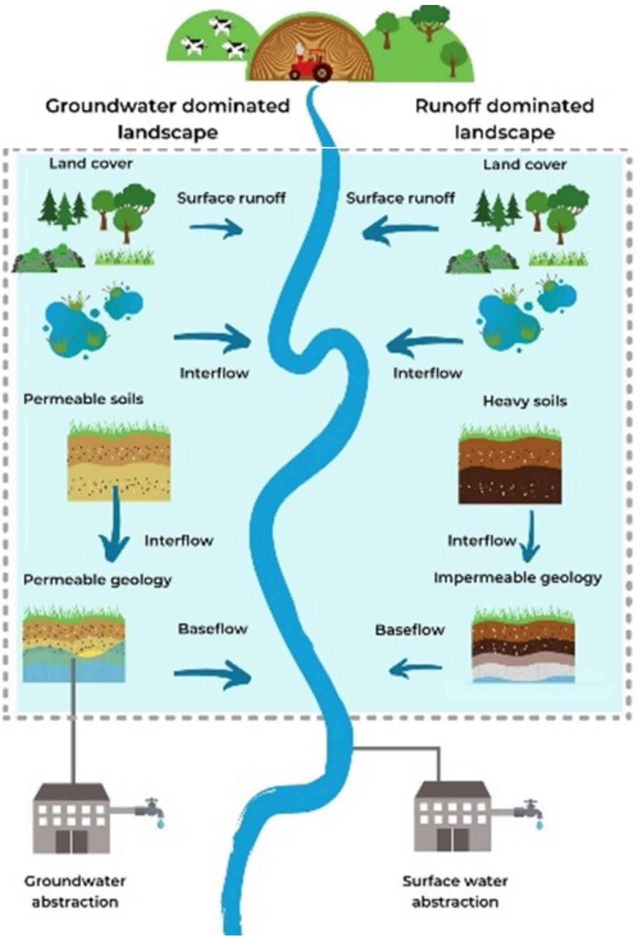


Figure 2 – The site Grobbendonk is located in a groundwater dominated landscape.

In unmodified or sustainably managed groundwater dominated catchments there is little runoff following precipitation as water predominately infiltrates through permeable substrates and moves either laterally or vertically below the surface. However, modification such as surface sealing, soil compaction and land drainage reduce the ability of water to infiltrate and therefore result in greater levels of runoff. Groundwater replenishment depends on the hydrological connectivity to the surface. When connectivity is interrupted by these modifications the resilience of this water supply is reduced.

In unmodified or sustainably managed runoff dominated catchments, water predominantly moves above the surface but interflow and baseflow are still present. As above, when the landscape is modified, surface runoff dramatically increases and interflow and baseflow are further reduced. This leads to an increase in frequency and severity of low river flows during dry periods and an increased risk of flooding following periods of extreme rainfall.

1.2 Human context

The sub-site for fen restoration in Grobbendonk is adjacent to a forest owned by Pidpa. The offices and water treatment facility of Pidpa are located on the other side of the forest. Between the fen and the heathland in Grobbendonk there is also a small settlement of houses. It is located in the protection zone of Pidpa’s groundwater abstraction site for drinking water. In the wider area, land is also used for agriculture and on the other side of the canal an industrial park is located.

Figure 3 - The sub-site where a degraded fen is restored to its 18th century contours, will contribute to the storage of rainwater and its delayed infiltration to groundwater bodies.

Figure 4 - The sub-site where pine tree plantation is restored and maintained to heathland will reduce transpiration and interception losses of rainwater, increasing thereby the replenishment of the groundwater.

The fen is classified as habitat 3130 (oligotrophic and mesotrophic standing waters with vegetation belonging to the *Littorelletalia uniflorae* and/or *Isoëto-Nanojuncetea*). The heathland is also classified as habitat; 2310 (dry sandy heaths with *Calluna* and *Genista*). Pidpa has an approved 'forest management plan' for its forest in Grobbendonk. This is currently being converted to a 'nature management plan' in line with the evolution of the legislations.

The Pidpa forest and its larger area are classified as a protection zone for groundwater abstraction for drinking water production, as they include groundwater abstraction sites for Pidpa. Here, emphasis lies on increasing infiltration by managing the land use and land cover. Vegetations that favour infiltration like heathland are preferred instead of pine trees that retain water in the canopy, have year round transpiration and decrease infiltration. Also important for infiltration is increasing the (temporary) retention of rainwater (e.g. restoring and increasing historical fens). This reduces the amount of water that can leave the infiltration area to quickly (e.g. diminishing the runoff capacity of the ditches), allowing it to slowly infiltrate to groundwater bodies.

1.3 Water Resource risks & challenges

The main sources for drinking water supply in the province of Antwerp are the Albert canal and the groundwater catchments of Pidpa. Albert canal water is transformed into drinking water by another drinking water company (Water-link), but is distributed largely to the city of Antwerp and the port of Antwerp. Drinking water distribution in the larger area around Grobbendonk is obtained from groundwater. Compared to the rest of the Central Campine System, the aquifer layer is relatively thin in the region of Grobbendonk and absent in the southern part of the area. This makes Grobbendonk a critical/strategical point in the drinking water production.

The drinking water production plant of Grobbendonk, which treats the abstracted groundwater from Grobbendonk and Oostmalle, is coupled to the distribution network of Herentals and is mainly distributed to residential and rural areas, with some modest industrial centres. Water production of Grobbendonk on average is around 33.000 to 35.000 m^3/day. A slight increase of drinking water demand is expected over time in the (largely residential and rural) distribution area. However, at the current and projected production rates, there should still be enough water left for the environment after the human demand is met in the catchment area.

In order to adapt to climate change and maintain the existing equilibrium between groundwater extraction and feeding of the aquifer, local infiltration of water must be reinforced. As far as surface water is concerned, the Albert canal depends on the rain river Meuse, meaning long periods of droughts are an increasing point of attention and extraction there is at its maximum level, certainly in dry periods.

2 Identifying and engaging buyers, sellers and brokers

The basic idea behind the PES (Payment for Ecosystem Services) financing model is that investments made by 'buyers' in climate change adaptation measures result in the targeted provision of ecosystem services provided by the 'sellers' (see Output 2).

The site Grobbendonk was financed in the more traditional way, with the help of subsidies, including the European Regional Development Fund (ERDF). Drinking water consumers (through consumption charges) and European citizens (through public funding provided by the Interreg 2 Seas programme) can be perceived as buyers of the ecosystem services in Grobbendonk. The targeted ecosystem services that these buyers receive in return is a more secure water provisioning, increased biodiversity, and more healthy nature in which recreation can take place (cf. § 4). From this perspective, Pidpa (landowner) is acting as seller. The Agency for Nature and Forest (nature management and evaluating environmental permit applications) and the regional landscape organisation "Kleine and Grote Nete" (RLKGN) of the province of Antwerp acted as brokers. RLKGN aims to realise futureproof local projects to increase the beauty, the biodiversity and accessibility of the region.

The restoration works of the fen will be the biggest cost. The cost of the additional archaeological research was not foreseen but significantly raised the necessary budget. For Grobbendonk, currently no budget is foreseen to measure the impact of the EbA measures on water infiltration and retention in the field. Ideally, this will be taken up in future realisations, to further strengthen the (business) case for EbA.

The theoretical application of the PES financing model can help identify opportunities for future financing. This is much needed to achieve a climate resilient catchment. Beyond the PROWATER project, important potential sellers of ecosystem services supporting drinking water production, within this protection zone for groundwater abstraction for drinking water production, include landowners of forests, nature or (extensively managed) grasslands in the area. Agricultural landowners could also partake, assuming special attention is given to water quality of infiltrated water in this protected area for groundwater abstraction sites.

Possible future funding sources for similar EbA measures may be found in water-related project funds, like 'Water-Land-Schap' and 'Blue Deal' in Flanders. Co-funding in the form of input from other engaged organisations of expertise, project coordination and working hours have proven to be useful and successful in our demo-sites of EbA. These collaborations also create a strong network of organisations in support of and with the necessary knowledge for future projects on EbA.

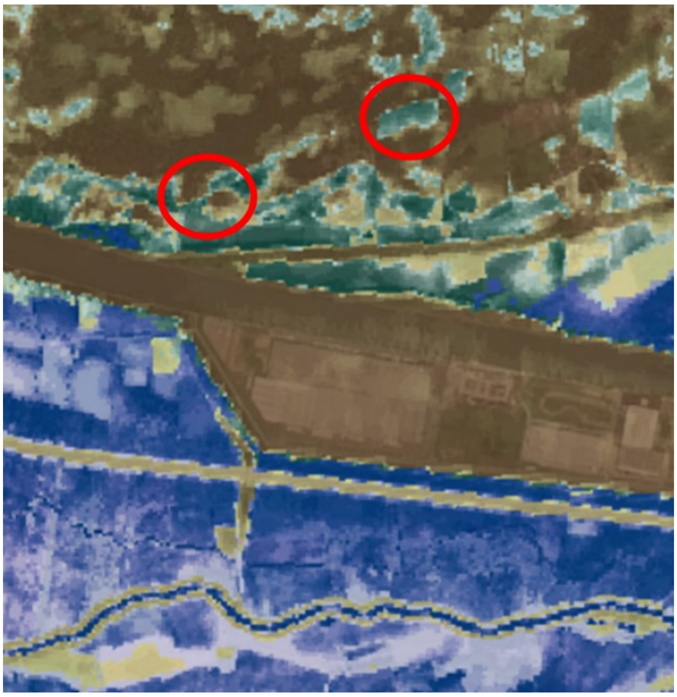
Ideally, the yearly groundwater abstraction taxes should be used in part to fund and realise EbA measures, as demonstrated by PROWATER. This is currently not possible and requires legislation to be adjusted. More available funding for the right EbA measures in the right locations will help maximise the climate change adaptation capacity of our regions.

3 Prioritising locations for climate adaptation measures

3.1 Prioritisation by means of the water system map

For the project PROWATER, the University of Antwerp applied the water system map to the Interreg 2 Seas area (including catchments in Flanders, the Netherlands and South England) (Output 3). This map helps prioritise where to best apply EbA measures to infiltrate and retain water, based on hydrological characteristics, soil typology and topographical information. The map identifies 'natural places' in the landscape for seepage (groundwater coming back to the surface) and infiltration.

The map shows that the sub-sites selected in 'Grobbendonk' are suitable for the development of temporary wetlands such as fens that would naturally be present in the area (indicated in green on figure 5) and infiltration zones (indicated in brown on figure 5). Extensive preliminary soil and topography studies confirmed the possibility to enlarge and restore the presently degraded historical fen to its original 18th century contour in the fen restoration sub-site. The sub-site for heathland restoration in an area formerly covered by a pine tree plantation is an evident measure to increase infiltration capacity for drinking water production and restore this historically and ecologically valuable habitat. Pine tree plantations previously served the now shut down mining industry.



Groundwater dominated catchment

Hill top / Plateau – infiltration area, where water can infiltrate to groundwater bodies (indicated in brown)

Valley height – infiltration area, where water can infiltrate to groundwater bodies (indicated in yellow). Water that infiltrates here will have less residence time before it emerges in streams. However, flood attenuation can be achieved by infiltration.

Hill depression / Valley depression – Temporarily wet area, where runoff can be retained and slowly infiltrate. (indicated in green)

Floodplain – Temporarily wet area, where runoff and seepage can be retained and slowly infiltrate. (indicated in blue)

Figure 5 - The red circles indicate the location of the heathland (left) and fen (right) sub-sites on the water system map. The map confirms the suitability to restore the previously degraded fen (with the potential for temporarily wet zones indicated in green) and to restore heathland (with the potential for infiltration zones indicated in brown). The colour categories were interpreted for a groundwater dominated catchment.

3.2 Refining spatial prioritisation & EbA opportunities

Besides the hydrological processes within the catchment, visualised via the interpretation of the water system map alongside topographical and soil data, other factors can further refine the choice to implement a specific EbA measure in a specific location.

The parcel of the fen and part of the adjacent parcels were already owned by Pidpa. Additionally the fen was already present on maps of 1771 which made it clear that the fen had potential to be restored.

As for the demo site for heathland in Grobbendonk, the extensive forest that Pidpa owns in the area has more possibilities for heathland realisation in this conifer tree plantation.

3.4 The expected impact

The targeted ecosystem services resulting from implemented EbA measures in Grobbendonk include increased water infiltration and retention. It is clear that the restoration of the fen and reduction of drainage by ditches in the area will increase the retention and delayed infiltration towards the groundwater. The restoration of heathland, where there was a conifer tree planation, will further increase the infiltration towards the groundwater in the abstraction cone of the drinking water production.

However, resulting ecosystem services from implemented EbA measures are not limited to these services. E.g. the fen restoration and heathland restoration also result in increased recreational value and increased biodiversity of the area.

4 Monitoring and Evaluation

Since Pidpa did not yet own all the parcels necessary to restore the fen at the start of PROWATER project, communication with the previous landowner of those parcels was crucial. After several constructive talks, the landowner was willing to sell the necessary land for climate change adaptation.

Several meetings and gatherings occurred to establish good communication between two independent administrations, i.e. the Agency for Nature and Forest and the Regional Landscape organisation) acting as brokers. It is important for all parties to be accessible and open in their communication at all times otherwise problems or delays will occur.

The presence of a broker can be very beneficial. In this case, the temporary absence of a broker, externally influenced by the COVID-19 crisis in this particular instance, has led to delays. Also due to COVID-19, the administration for this purchase was delayed, hereby delaying the restoration of the fen. Once the purchase was finalised, additional archaeological research had to be performed which led to an additional delay.

With the PROWATER experiences, Pidpa gained more theoretical knowledge and practical knowledge needed to implement EbA measures efficiently into the landscape. This helps to further streamline the engagements of Pidpa in Grobbendonk as well as other areas in the province of Antwerp, resulting also in an increased quantity and quality of the groundwater and a climate proof 'water loving' environment. First examinations have already been done to explore the potential for future realisations of similar EbA measures within the zone of the Grobbendonk groundwater abstraction site.

Using the yearly groundwater abstraction taxes to fund and realise EbA measures, as demonstrated by PROWATER is currently not possible. This requires legislation to be adjusted, to generate more available funding for targeted right EbA measures and help maximise the climate change adaptation capacity of our regions.