Appendix 8. Past and current water management policy in Flanders and the protection status of actual and potential wetlands

The organization of hydrological and water level management in Flanders has always been very complex with many actors on different government and administrative levels and a total lack of overall coordination. In the past the focus of each actor has always been on draining wet soils and evacuation of surplus water to the sea as fast as possible. A large proportion of Flemish rivers and water courses has been widened, straightened and embanked from the 1950s onwards. Powerful pumps were installed to drain wetlands and artificially control water levels. It became custom practice that in the so-called 'water-sick' areas the water levels were kept very low during winter, while in summer irrigation water was supplied to create an optimal water level for agriculture. Farmers of historic wetland areas were (and still are) organized in local water boards (so-called 'polders en wateringen') with a mission to improve agricultural exploitation, financially supported by the government. These local water boards cover 208,000 ha of Flanders. Furthermore, intensification of agriculture and improved drainage was facilitated by large-scale land consolidation programs in 150,000 ha or 12% of Flanders.

Mind setting started to change from 2003 onwards with the approval of the Flemish Decree on integrated water policy, which was initiated by the European Water Framework Directive (2000). Meanwhile the socio-economic problems caused by extreme flood events due to artificially improved drainage, soil sealing and climate change were recognized and more interest for wetland restoration and floodplain functioning was observed in the different governmental layers and media. The once common practice of widening and straightening of rivers, as well as urbanization of irregularly flooded areas has virtually stopped. Still, of the current 68,000 ha of remaining wetland only about 44,000 ha is protected by Flemish or EU regulations (nature zones in spatial planning maps, Birds- or Habitats Directive and Ramsar sites). For the 147,000 ha of potential wetland on top of actual wetland we found that one third of the area or 49,000 ha already has the appropriate spatial planning and protection status to justify wetland restoration (see Table 1).

Table 1. Spatial planning and protection status of actual and two scenarios of potential wetlands in Flanders for several categories of wetlands (in ha). Note that for shallow and deep waters values are identical because no potentials could be calculated.

	Actual wetland		potential wetland (forested landscape scenario)		potential wetland (open landscape scenario)	
	area	protected	area	protected	area	protected
deep water	6.824	2.238	6.823	2.238	6.823	2.238
shallow water oligo-mesotrophic	1.408	1.314	11.266	7.212	11.266	7.212
shallow water eutrophic	9.858	5.898				
temporary wet soil (meso-eutrophic) - open	34.676	21.466	47.687	19.486	109.457	34.534
temporary wet soil (meso-eutrophic) - forested	6.389	5.196	70.997	21.961	9.227	6.913
temporary wet soil (oligotrophic) - open	1.295	1.287	2.622	2.229	21.800	9.069
temporary wet soil (oligotrophic) - forested	597	570	23.858	10.729	4.680	3.890
permanently wet soil (meso-eutrophic) - open	2.576	1.936	11.856	8.027	29.582	13.925
permanently wet soil (meso-eutrophic) - forested	2.802	2.419	24.579	11.435	6.853	5.537
permanently wet soil (oligotrophic) - open	256	254	950	849	3.044	1.775
permanently wet soil (oligotrophic) - forested	539	524	3.687	2.356	1.594	1.430
tidal marsh - open	566	556	3.758	2.682	9.335	5.310
tidal marsh - forested	103	101	6.344	3.183	767	555
TOTAL	67.889	43.759	214.427	92.388	214.427	92.388

Nowadays, some of the most prestigious nature restoration projects in Flanders go hand in hand with flood protection:

- More than 1,800 ha of brackish and fresh water tidal marshes are currently being restored along the river Schelde, simultaneously providing areas for flood control (Beauchard et al. 2011, Jacobs et al. 2009, Temmerman et al. 2013). After the deepening of the river Zeeschelde for better navigation access to the port of Antwerp ecological compensations were imposed on the Flemish government by the European Commission, including nearly 600 ha of polders that will be converted into salt and brackish tidal marsh.
- Along the river Grensmaas more than 400ha of flower-rich floodplain grasslands and natural gravel bed river dynamics were restored on former intensively used agricultural land after removal or lowering of the artificial embankments (Van Looy 2008).
- Along the river IJzer old plans for higher embankments to protect natural floodplain areas from flooding were cancelled at the turn of the century after decades of hard debate and 1000ha of floodplain ecosystems are now being restored to their full ecological potential (e.g. (De Rycke et al. 2004)).

The future perspectives for a more natural floodplain functioning of the large river valleys in Flanders is generally rather good, but not in all cases there is a large benefit for biodiversity. Floodplain grasslands are often still in intensive agricultural use or low-productive semi-natural grasslands suffer from deposition of eutrophic sediments as is the case along the river Dijle (De Becker & De Bie 2013). The smaller river valleys more upstream are often managed by the provincial authorities and there is

a mixed picture here. On one hand we see continued pressure from agriculture to have the water levels as favorable as possible for agricultural exploitation, resulting in for instance an intensive river and ditch management. On the other hand small scaled flood control areas have been constructed in many places, recognizing the need for stocking excess water during peak discharges. Unfortunately their design is often not very beneficial for biodiversity: they are generally constructed in the lowest places where permanent grassland persisted and many flood control areas function 'off line', meaning they are kept dry as long as possible for agriculture, excluding any possibility for natural riparian dynamics and spontaneous succession. Allowing natural buffer zones along the smaller rivers are still not a wide spread practice in Flanders. According to our calculations the area of valuable floodplain grasslands and forests can be increased with 78,000 ha, with 15,000 ha already protected for nature by spatial planning or Natura 2000 designation.

Restoration projects of nutrient poor wet grasslands and heaths on temporary or permanently wet soils are much rarer and more small scaled. Societal benefits such as flood protection are of no importance here. Hence they are mainly restricted to nature reserves where young forest encroachment is removed, often in combination with removal of the rich top layer of the soil to activate the seed bank. There are also examples of successful restoration starting from former intensively used agricultural grasslands. Fine-tuning of the local hydrological conditions is in all cases crucial. Fen meadows are mainly restored where modern agriculture has left the area. After the traditional mowing practice without fertilization is reinstalled biodiversity values can recover. New reed marshes are mostly found in the margins of newly created water bodies and on artificially raised land with heavy soils and poor drainage. Sedge marshes are most of the times a result of spontaneous succession of abandoned fen meadows. In all cases cessation of management will on the long term lead to a forested version of the habitat. The area suitable for restoration of all these wetland types combined is estimated at 59,000 ha of which 29,000 ha is already protected for nature by spatial planning or Natura 2000 designation. We conclude that for a large proportion of suitable sites for wetland restoration the legal protection status is already in place to get started. In this perspective, the rather low ambition level for expansion of Natura 2000 wetland habitat types and habitats for Natura 2000 wetland species is striking, particularly those of open landscapes.

References

Beauchard, O., S. Jacobs, T.J.S. Cox, T. Maris, D. Vrebos, A. Van Braeckel, and P. Meire. 2011. A new technique for tidal habitat restoration: Evaluation of its hydrological potentials. *Ecological Engineering* 37: 1849-1858. http://dx.doi.org/10.1016/j.ecoleng.2011.06.010.

De Becker, P. and E. De Bie. 2013. *Verzamelen van basiskennis en ontwikkeling van een beoordelings- of afwegingskader voor de ecologische effectanalyse van overstromingen.* Instituut voor Natuur- en Bosonderzoek.
De Rycke, A., K. Devos, M. Sas, and K. Decleer. 2004. A protection strategy for the floodplains of the River "Yzer"(Flanders, Belgium). *Journal of Water and Land Development* 8: 35-48. https://www.infona.pl/resource/bwmeta1.element.baztech-article-BAT9-0021-0004/tab/summary.
Jacobs, S., O. Beauchard, E. Struyf, T. Cox, T. Maris, and P. Meire. 2009. Restoration of tidal freshwater vegetation using controlled reduced tide (CRT) along the Schelde Estuary (Belgium). *Estuar. Coast. Shelf Sci.* 85: 368-376. http://10.1016/j.ecss.2009.09.004.
Temmerman, S., P. Meire, T.J. Bouma, P.M.J. Herman, T. Ysebaert, and H.J. De Vriend. 2013. Ecosystem-based coastal defence in the face of global change. *Nature* 504: 79-83. 10.1038/nature12859.
Van Looy, K. 2008. *36. Vallei van de Grensmaas*. 135-137 135-137. *In* Decleer, K., editors. *Ecological Restoration in Flanders (Belgium)*. Vol. INBO.M.2008.04, Research Institute for Nature and Forest, Brussels.