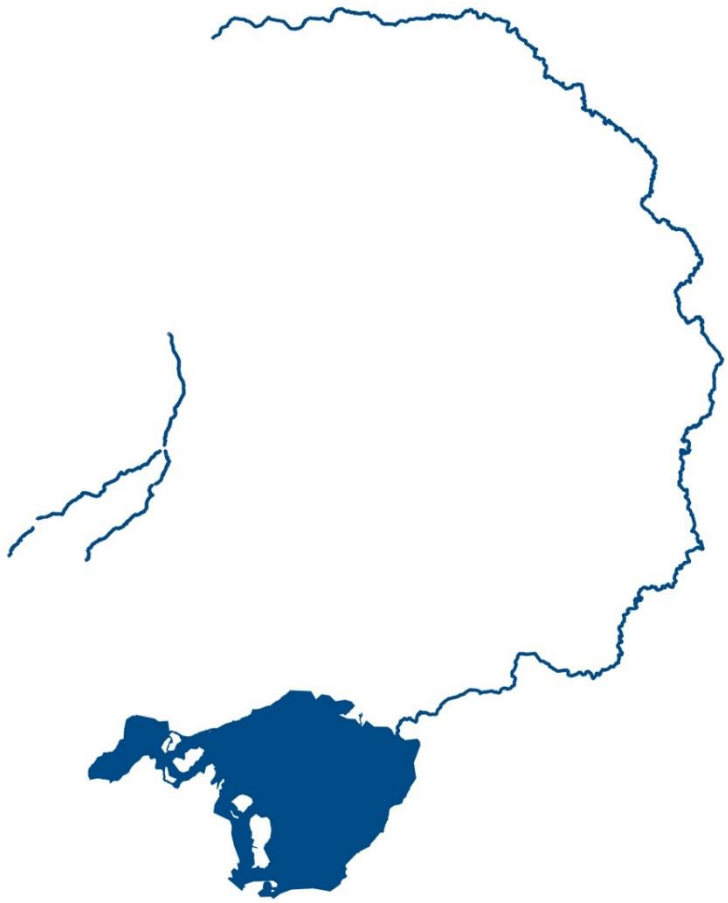
Report sister basin initiative Mpanga - Gete

In context of:
Flagship Climate Project Flemish Brabant - Uganda

Overview situation in Flanders, synthesis situation in Uganda, comparisons and recommendations



VLAAMS-BRABANT

Join For Water

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1. Context

The 'sister basin initiative Mpanga-Gete' stems from the projects Join For Water is developing in Uganda together with local partners. The province of Flemish Brabant supported Join For Water in this before and is now once again supporting projects in Uganda that lead to better access to water, wetland protection or climate-resilient basin conservation and management.

Uganda has good legislation around protecting valuable ecosystems. For example, there is a law that requires a 100-metre buffer zone to be respected around rivers and wetlands, where in principle no (agricultural) activities are allowed. In fact, wetlands are completely off limits. But we see that these zones are often taken anyway and enforcement remains limited.
In the previous 5-year programme, Join For Water and its partners in Uganda have already put a lot of effort into protecting these *no-go* zones. This included reforesting the zones and developing alternative sources of income. But with an eye on more sustainable solutions that also take into account the local context of population pressure, we also want to focus more explicitly on creating win-win situations for people and nature within these zones.

Just as sister links exist between cities, an (informal) 'sister link' has also been established between the Mpanga basin in Uganda and the Getes basin in Flanders. Within this project, the exchange of knowledge and experiences is central. Effects of climate change, such as extreme rainfall resulting in erosion and flooding or, on the contrary, long periods of drought, occur in Uganda but are also familiar to us.
How to deal with challenges that will become increasingly common? What recipes for success exist and which measures are not entirely satisfactory anyway? What legislation can help turn river basins into climate resilient wholes? Questions like these are being explored in Uganda and with us, to look for similarities or differences to learn from each other.

The findings from case studies, research into legislation and scientific knowledge will be displayed on websites of Flemish Brabant and Join For Water and will help form the input for an exchange moment between actors from both Uganda and Flemish Brabant. In this way, we can together strive for integrated management of the Mpanga and Getes rivers.

2. Research frameworks

Within this chapter, a brief explanation is given of the research framework that was prepared for this project based on literature review. This framework forms the basis for studying the cases around the Gete and the Mpanga.

2.1. Integrated shoreline policy

Given the advancing ecological crisis, protection of sensitive ecosystems is essential to continue enjoying linked ecosystem services. riparian zones form the boundary between land and water, and therefore play an important mediating role between the two ecosystems. Due to this position between two extremes, they harbour important biodiversity and provide various services for both the river and humans, ranging from avoiding inwashing of pollutants or sediments from land, limiting flood nuisance to replenishing groundwater and providing access to water for communities.

Protection of riparian zones is therefore essential and can be approached from different angles. To be successful, however, an integrated approach is necessary; challenges for people and nature must be addressed together (González et al., 2017; Singh et al., 2021).

Based on González et al (2017) and Singh, Tiwari and Singh (2021), the framework in Figure 1 can be used - for analysing and building an integrated riparian policy.

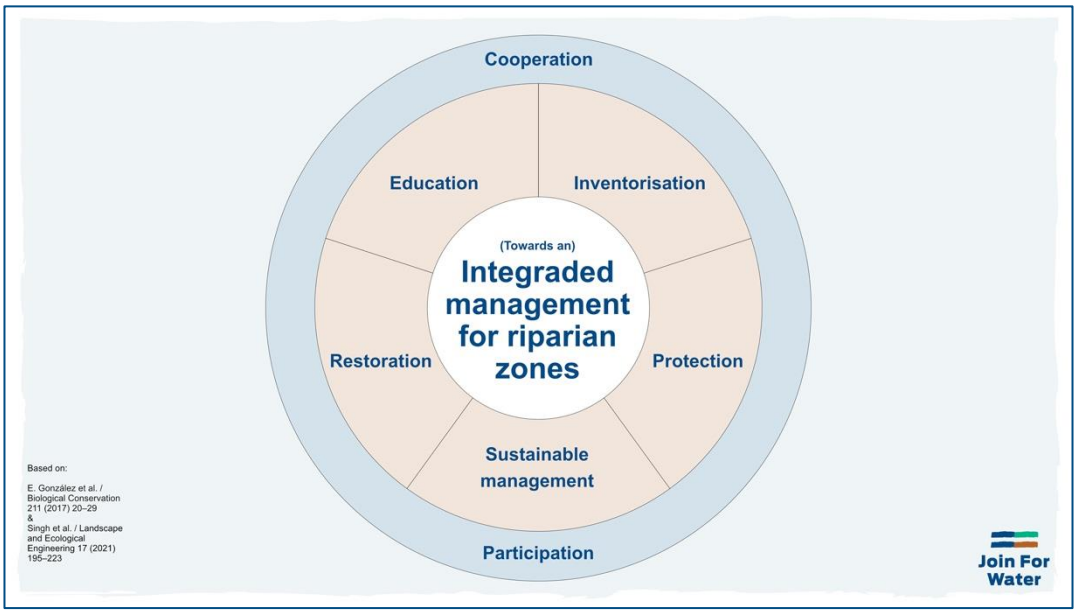


Figure 1 - Framework for an integrated riparian policy. Source: own figure based on González et al (2017) and Singh, Tiwari, and Singh (2021).

The framework for integrated bank management consists of five complementary parts: education, inventory, protection, sustainable management and (structural) restoration. To obtain the best possible result, measures situated in all parts should be applied jointly - or at least equally -. Furthermore, an additional overarching section with 'cooperation' and 'participation' is added, as this is essential to apply to all parts of the framework.

2.1.1. Inventory

Before protective measures can be taken, an inventory of the state of the river basin is important. Based on the exact condition of the basin, tailor-made measures can then be taken.

2.1.2. Protection

Protection (also called conservation or preservation) of intact riparian areas is of great importance, both from an environmental and economic point of view. It is distinct from structural restoration, which concerns degraded systems. Intact riparian areas are valuable reference sites for understanding the objectives and effectiveness of different restoration approaches and other management efforts. In some cases, they are important sources of genetic material for the reintroduction of native species into areas to be restored. For these and other reasons, riparian areas in a nature reserve deserve a high level of protection.

For elaborating protection of riparian zones, a legal framework is an important element. Again, an integrated approach is important to reconcile the various aspects (both natural and human) with which banks interact (Singh et al., 2021, 208).

This helps to avoid the possibility that different individual laws may conflict with each other, as González et al also describe: *"For example, in Europe, young cohorts of poplar and willow trees are frequently removed under the Flood Risk Directive to avoid vegetation encroachment and increase stream conveyance capacity, while these same species are being promoted by the Habitats Directive to preserve alluvial forests and create ecological networks along* river". (González et al., 2017, 23).

2.1.3. Sustainable management

Sustainable management techniques in general

From a legal framework that enables protection, measures can then be taken to achieve actual protection. Because watercourses are part of wider river basins, the management of watercourses - but also their riparian zones - must be considered within this wider area.

It is a holistic approach that addresses multiple sources of pollution within a watershed, such as urban and agricultural pollution runoff, landscape modification, depleted or contaminated groundwater and the introduction of exotic species. It addresses those problems that are not adequately addressed by traditional point source pollution programmes, which have usually failed to protect riparian zones from the cumulative effects of multiple activities or sources of pollution.

While riparian zone management may vary in terms of specific objectives, priorities, elements, timing and resources, integrated management should be based on partnering (already discussed), focus on specific geographical areas and be guided by scientific frameworks.

Differences in management can be seen between a more voluntary or rather restrictive approach to taking action. A restrictive approach, for example, excludes certain areas from any activities. A voluntary approach is the opposite and starts from commitments made by landowners, for example. However, a restrictive approach requires control and a voluntary approach often requires a high level of commitment. A middle way is often found in working with incentives, where users or owners are encouraged to take or follow certain measures.

There are also two forms of management on which measures can be based: *land sparing* and *land sharing*. *Land sparing* aims to safeguard as much land as possible, by linking intensification to safeguarding nature on other plots. The scale on which this is done can vary greatly. On a small scale, for example, by creating small landscape elements or different management of plot edges. These

principles of *land sparing* (can) be worked out in the form of management agreements (*agri-environment schemes*). With the principles of *land sharing*, nature conservation and other functions are then combined together. The principles of agri-environment schemes are used to preserve biodiversity on agricultural plots through more extensive farming. (Honnay & Ceulemans, 2016).

With a view to protecting biodiversity, Honnay and Ceulemans (2016) initially push large-scale *land sparing forward* for regions with significant biodiversity value and relatively low human impacts. riparian zones can be approached from the same consideration and included as protected zones in larger wholes. In areas where this is not possible other measures such as buffer zones will be needed (González et al., 2017, 25). Agricultural nature management (*land saving* on a small scale) or organic forms of agriculture are ideally situated along the edges of nature areas as a buffer between nature and cultivated landscapes. For improving water quality, source measures are important and efforts should be made to reduce the use of fertiliser and pesticides (Honnay & Ceulemans, 2016, 186-87).

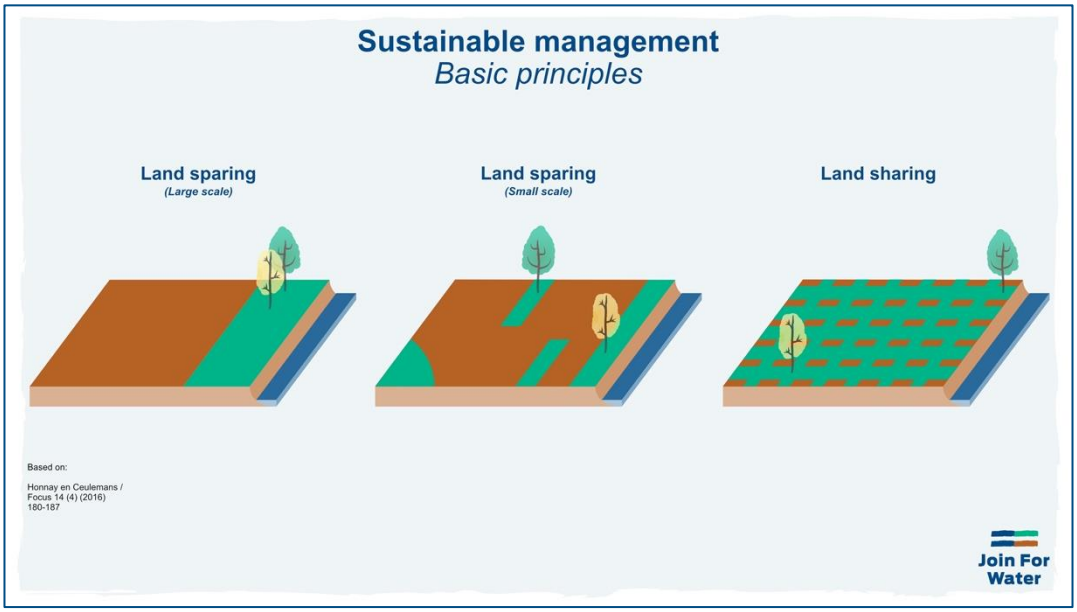


Figure 2 - Overview of basic land management principles. Land sparing on a large or small scale versus land sharing. Source: own adaptation based on Honnay & Ceulemans (2016).

Table 1
General characteristics of the main instruments to promote sustainable land use.

	Lead actors[a]	Targeted unit	Policy mechanism	Enforcement	Potential additionality	Risk of leakage	Scalability
Land use zoning, protected areas	Public	Area	Mandatory restrictions	Surveillance	Very high	Moderate	Moderate
Eco-certification	Environmental NGOs, private sector	Commodity, management area, process	Incentive	Third-party auditing	High	Low	Moderate
Commodity roundtables	*A*, *I*: Corporations; *E*: NGOs	Commodity	Incentive	Third-party auditing	Low	Low	High
Moratoria	*A*, *E*: NGOs; *I*: Corporations	Area and commodity	Market exclusion	Surveillance (by NGO, with government data)	High	High	Low
Geographical indications	*A*, *E*: Private producers, Public; *I*: Private producers	Niche commodity	Incentive	Third-party auditing	Moderate	Absent	Low
Payments for environmental services	*A*, *E*: Public; *I*: private producers and NGOs	Area	Incentive	Second-party auditing	Moderate	Moderate	Moderate

[a] Refers to the actors leading each stage of the regulatory process (*A*: agenda-setting and negotiation, *I*: implementation, *E*: enforcement)

Figure 3 - Overview of possible measures for protecting riparian zones. Source: Rinku Singh, A. K. Tiwari, and G. S. Singh (2021).

Sample measure: agroecological management agreements

Agroecological management agreements involve agreeing with farmers on certain measures that they implement (often for a fee) on their land. The effectiveness of these agreements in maintaining or enhancing biodiversity is often difficult to measure. Previous studies could therefore draw no or limited conclusions that did not improve conditions (Kleijn et al., 2001) or only showed limited increases in species but without clear conclusions (Kleijn & Sutherland, 2003).

However, a recent review study showed that management measures in Europe have had an earlier positive effect. However, an important note is that this has proven to be a very capital-intensive way of management. However, for regions where there is still a high expansion pressure of agricultural land, Batáry et al. do see the potential of agro-ecological management measures to achieve less intensive or destructive agricultural practices (Batáry et al., 2015, 1006-16).

Sample measure: buffer zones

Maintaining buffer zones along watercourses is a common method of protecting the watercourse or riparian zone. This can be organised either in a restrictive manner by delineating certain zones where no activities are allowed to take place, or on an incentive basis that makes the creation and maintenance of buffers consistent with the conclusion of management agreements.

The required buffer width depends on what it is mainly used for. The recommended buffer widths vary and depend on a number of factors. First of all, it is important to determine what purpose the buffer zone should primarily serve. On the other hand, the environment, slope of the riparian zone, vegetation present, land use... are also factors that can co-direct the width of a buffer zone.

In terms of preventing or limiting erosion, the first 10 metres of a buffer strip are especially important to hold back runoff sediments. A possible further width of a buffer is going to contribute additionally to sediment retention to a lesser extent. Other authors refer to buffer widths between 4 m and 8 m as the ideal width to retain sediments or prevent pollutants that bind to sediments from entering the watercourse. For protecting water quality from soluble poluents, widths of 15 m or more

are referred to. Importantly, when buffers are used to avoid inwashing of pollutants, active management of the buffer by e.g. grazing is also often necessary. Buffers do provide protection against pollution of watercourses, but above all, source measures are needed to increase water quality: avoiding the use of pollutants (Cole et al., 2020, 8-9).

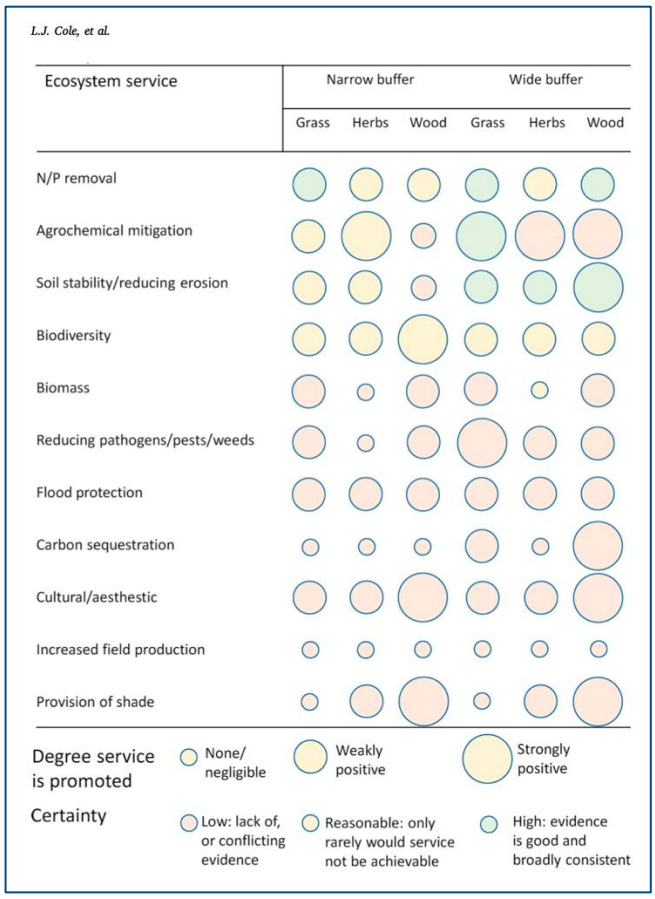


Figure 4 - Overview of the (proven) effect of buffer sizes and their design on various ecosystem services. Source: Lorna J. Cole, Jenni Stockan, and Rachel Helliwel (2020).

Buffers along watercourses can be designed in different ways, each with their strengths and ideally depending on the objectives to be achieved. To achieve the strongest possible result from the buffer strip, we suggest Cole et al. (2020) based on Correll (2005) propose a zoned layout. An initial narrow zone with native trees serves mainly to strengthen the direct bank and can also support water infiltration, among other things.

Next to this zone, a wider zone can be established with native woody crops that can also serve for food production. By working within this zone according to the principles of *agro-forestry*, both the banks can be protected and additional income can partly compensate for the loss of land for the riparian zone.

According to this scheme, the last zone furthest from the watercourse consists of a (again narrower) dense grass strip. This serves mainly to prevent sediment from flowing into the zones closer to the watercourse and also as a buffer for pollutants.

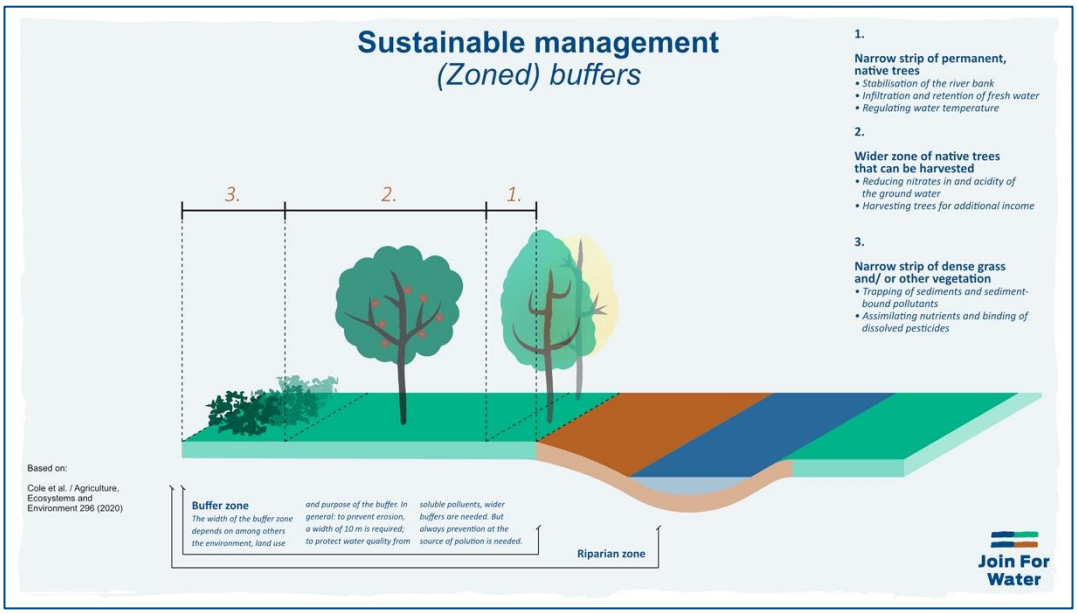


Figure 5 - Diagram of a zoned buffer along a watercourse. Source: own adaptation based on Cole, L. J., Stockan, J., & Helliwell, R. (2020).

Sample measure: PES (payment for environmental services)

A method for protection of watercourses and ecological functions that is often put forward is *payment for environmental services;* the provision of environmental protection measures for a fee. The basic principle is that a 'buyer' of ecosystem services or environmental protection measures pays a provider of these services. In relation to water, for example, this is a user of water downstream who will pay for protection of the watercourse upstream.

Paid ecosystem services assume a voluntary entry into this market-based system. Within this model, both avoidance and incentive actions (avoiding deforestation versus actively planting trees) can be remunerated. Importantly, the service offered should be valued higher than the provision of the service. Otherwise, there will be an imbalance between supply and demand. However, clear agreements on who can function as the 'provider' of the services are important, although this requires strong control. Because of these necessities, a PES model is less obvious, for example, in agricultural frontier areas subject to rapid change but where management is not strong (Lambin et al., 2014, 134-35).

In Kenya, with help from WWF Kenya and others, a PES model was rolled out in the Lake Naivasha basin where very diverse measures were applied simultaneously to comprehensively address water challenges from different perspectives (Chiramba et al., 2011).

A study on the potential for PES systems in Uganda started from five initial criteria: 1) clear ecosystem services; 2) at least one buyer; 3) at least one service that can be 'sold'; 4) at least one provider of the service; 5) conditionality.

A number of important caveats were noted within the study to enable the implementation of PES. The implementation of a PES system can only work ancillary to already having some motivation to or awareness that measures need to be taken to enhance ecosystem services. There must be a good awareness among both downstream users and upstream landowners/providers that they can reinforce each other. If an EAP system is a one-way operation, it will not work.

A certain institutional or community network must also exist to provide implementation and monitoring, among other things. NGOs can work as intermediaries, but knowledge about the

challenges and solutions is needed from all actors, as is their active involvement in the whole process (through representation, participation or a co-productive design of the system).

Finally, funding should depend on the motivation to provide for enhancement of ecosystem services, which is consistent with the awareness and motivation to want to take conservation measures. To work well, the cost paid for providing conservation measures should not exceed the normal cost for a good. Moreover, the benefits of land use change should exceed the cost of taking measures. So setting up an EAP system does require some balancing of interests, advantages and disadvantages (Sengalama & Quillérou, 2016).

2.1.4. Education

Offering knowledge to policymakers, landowners, users and a wider public is essential for the above protection (measures) to be successful in a sustainable way. Offering knowledge can ensure that people's awareness of riparian zones and associated challenges is raised. Thus, the necessary skills and expertise can be developed to address the challenges and attitudes, motivations and commitments can be fostered to take informed decisions and responsible action. In summary, education aimed at protecting riparian zones can focus on:

- Knowledge, awareness and understanding of riparian zones and challenges
- Attitudes of concern for riparian zones and motivation to improve or maintain riparian quality
- Skills to identify and help solve riparian problems
- Participation in activities leading to the resolution of problems in riparian areas

The report Weerbaar Waterland (Declerck et al., 2022) also highlights the importance of knowledge transfer to make everyone aware of the challenges associated with water as a broad topic. The expert report explicitly calls for a cultural shift regarding water: "To encourage behavioural change, the government has the classic tools at its disposal: education and awareness-raising, financial incentives or premiums (the carrot) and regulations (the stick). These are not miracle remedies: behavioural change is a complex and laborious process and cannot be steered simply by policy interventions and government communication. In addition to strengthening education about the water system, the government can therefore engage behavioural scientists to increase citizens' 'flood awareness'." (Declerck et al., 2022, 112).

González et al. (2017) also push forward the involvement of communities within citizen science projects. This strengthens involvement and knowledge within the community around an issue. With regard to gardens in Flanders, the sensitising importance of citizen science is also emphasised in Kiemen voor een Toekomst Tuinenbeleid (Dewaelheyns et al., 2021).

2.1.5. Structural repair

A final element within the framework of integrated riparian management relates to structural restoration of riparian zones. Giving rivers space again by encouraging meandering and softening banks is, among other things, put forward as an important action in a report published after the flooding in Flanders in the summer of 2021. Wherever possible, the authors say, natural solutions to flooding should be resolutely chosen, rather than relying on artificial flood plains or artificial flood control solutions (Declerck et al., 2022). González et al also refer to the same principles, saying rivers should be allowed to regain space (González et al., 2017, 25-26).

Nevertheless, restoring degraded riparian areas is often a scientific and social challenge. There are cases where the natural or pristine condition of a particular riparian area no longer exists. In other cases, multiple causes of degradation may have occurred over long periods of time, so that the cause-effect relationships defining existing conditions are not well known or easily deciphered, both at local and wider landscape scales.

While ecological restoration may be an achievable and desirable goal for some areas, it can no longer be achieved everywhere. For example, permanent or irreversible changes in hydrological disturbance regimes (e.g. dams, cross-basin diversions, irrigation projects, extensive landscape alteration), natural processes (e.g. global climate change, accelerated erosion), channel and floodplain morphology (e.g., channel incision, breakwaters, dykes), and other impacts (e.g., species extinctions, biotic invasions) may make ecological (structural) restoration less desirable or even impossible.

riparian zones adjacent to large rivers may present a greater challenge than those adjacent to smaller streams and rivers because the number of factors influencing the flow regime is greater at this larger scale (Gore and Shields, 1998). Nevertheless, even in such situations, there are often numerous opportunities to achieve significant ecological improvement of riparian zones and at least partially restore many of the functions they used to perform.

2.2. Overarching principle: cooperation for integrated water policy

The integrated approach to successful riparian zone management was explained above. To ensure that this management can be as successful as possible, the entire riparian management process ideally involves as many stakeholders as possible. In this way, key decisions can be supported from broad group, allowing environmental goals to be integrated with economic, social and cultural objectives. By actively bringing actors together, those who depend on natural resources in riparian areas can also obtain information on the planning and implementation of activities.

Arnstein participation ladder

To flesh out the 'cooperation-participation' part of the integrated riverbank management framework, Sherry Arnstein's 'participation ladder' is an older but still valuable starting point. (Arnstein, 1969). In her 1969 article, she describes forms of participation ranging from non-participation (with manipulation or therapy) via growing forms of cooperation to full *citizen power* in which citizens are given ever-increasing control.

Despite the article being written more than 50 years ago, many forms of participation that fall under *citizen power are* still rare. However, the importance of active involvement of all possible actors is essential, even in projects involving bank protection: "*Frequently it was found that many management plans did not achieve their targets due to lack of coordination, collaboration and participation among different stakeholders." (Singh et al., 2021, 204).*

The most important thing to remember from this participation framework is the importance of seeking the strongest possible involvement of local actors and populations in a water policy. If a project is supported by local people, the chances of sustainable conservation are higher.

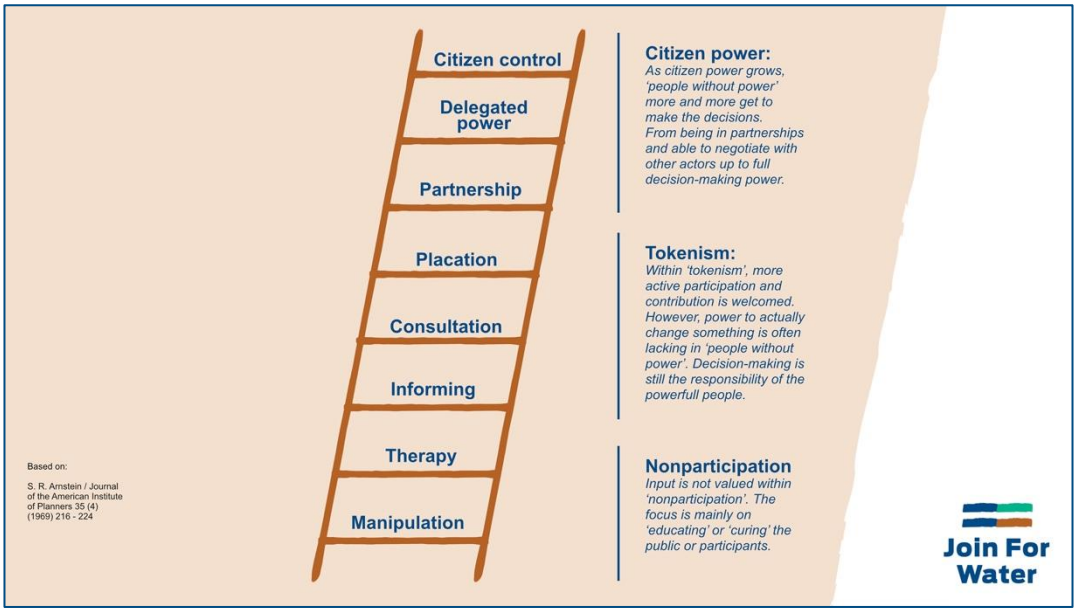


Figure 6 - Arnstein's participation ladder. Source: own adaptation based on S. R. Sherry (1969).

2.3. Case study analysis framework

In order to make comparisons between practices and challenges in Uganda and in Flanders, a number of case studies are discussed. The case studies can each be situated within a particular part of the broader framework for integrated riparian management, but are also prepared according to their own structure.

This structure is based on the *neighbourhood arrangement* framework developed by Hajer et al (2020). Within this framework, some are considered to systematically visualise a neighbourhood *arrangement*. This framework consists of the elements: actors, resources and legislation. It is complemented by more general elements to synthesise projects such as drivers, challenges, progression and participation within a project.

In function of the cases, a broader structure has been elaborated that captures the elements of the *neighbourhood arrangement*, but also looks at the reasons for the project within the case, the course of the process, the main challenges and the way participation was approached within the case. By analysing cases in both Flanders and the Mpanga basin in this way, it becomes possible to compare challenges or opportunities despite very different contexts in the two regions.

Structure analysis cases

Location	Project area surface	Project start and end date	Actors involved	Focus within the case
Reasons				
Run				
Challenges				
Resources/ tools/ Legislation				
Participation				

Focus within the case:
What was the main focus of the project? What were the main reasons for setting up the project? (Briefly, in a few words; more extensively under 'reasons')

Process:
By whom was the process initiated? How did it proceed?

Challenges:
Throughout the process (before - during - after), what were the main challenges that had to be dealt with? How did this happen?

Resources, instruments and legislation:
What tools were covered throughout the project? Why were these tools chosen? What resources were used for the project? Where did these come from? Are the tools and legislation used sufficient? What could be different or better?

(How) was participation started within the project?

3. Flanders: the Gete region and additional instruments

3.1. Gete region (Flemish Brabant, BE)

Focus: 'Water-Land-Schap' project and related projects

Location	Project area surface	Start and end date	Actors involved	Focus within the case
Valleys of the Getes. In the territory of the municipalities of Hoegaarden, Geetbets, Linter, Landen, Tienen and Zoutleeuw	Getes catchment area. Territory of Getes municipalities with small extension: **+/- 283 km2**	**2017** - 2020 (Gete Region Strategic Project); **2018** - present (Water-Land-Schap)	**Municipalities**; VMM; VLM; Bekken secretariat Demerbekken; waterings; Boerenbond; province of Flemish Brabant ...	Reduce floods and droughts through nature restoration; restore ecological quality
Reasons	A growing awareness that naturalisation is needed to adapt the environment to growing challenges related to water. - Flooding in July 2021 as a very immediate additional incentive.			
Run	Water-Land-Schap is the umbrella project (within the Gete region Strategic Project), within which a multitude of small and large projects are housed.			
Challenges	- Bringing all actors together around one story and trying to eliminate (any) contradictions between many (potential) partners. - Interweave different interests and objectives in a way that is acceptable to all. - Reversing a "history of intervention on water systems" (drainage, encapsulation of watercourses, etc.) towards restorative and more natural management. Obstacles can still be found on the course of the Getes that make interventions upstream (potentially) difficult to become successful.			
Resources/ tools/ Legislation	Various; including from a Strategic Project and Land Development Project			
Participation	Present within various sub-projects. With a focus on strengthening knowledge around water challenges, cooperation with farmers and strengthening the role of citizens in the broad Water-Land-Schap project. In large infrastructure projects, however, participation often still remains stuck in a story of informing or consulting.			

Cooperation for integrated riparian management - actors in the Gete region

Given the importance of participation, it is crucial to identify all actors involved within an existing or to-be-planned project. Due to the legal arrangements (see below) around the management of watercourses in Flanders, common challenges and intensive cooperation between municipalities in the Gete region, there is a long list of actors to be addressed within water challenges.

Through inter-municipal cooperation, Hoegaarden, Geetbets, Linter, Landen, Tienen and Zoutleeuw are working together with the province of Flemish Brabant, Regional Landscape South Hageland,

Natuurpunt, Boerenbond, Hageland+ and the Demerbekken basin secretariat in the OnverGETElijk project.

The Water-Land-Schap project is situated within this wider project and has the VLM as the pulling supra-local partner.

The integral project on the Getes (Total Plan Space for Watercourses) is being led by the basin secretariat of the Demer basin. There is also cooperation with the supra-local partners who are also involved in the above projects, as well as with the water managers (VMM, province of Flemish Brabant, Wateringen 'De Grote Gete', 'De Kleine Gete', 'De Mene', 'De Natte Nest' and Watering of Sint-Truiden). Other Flemish administrations (ANB, Dep. Agriculture and Fisheries, Dep. Environment), sewage operators (Aquafin, Fluvius) and civil society (farmers' union, Natuurpunt) are also partners.

Within Chapter II. Art. 1.2.2 of the Decree on IWRM, the principle of participation is finally mentioned with a view to implementing a policy around IWRM. This states, "pursuant to which citizens shall be granted early, timely and effective participation in the preparation, adoption, implementation, monitoring and evaluation of the integrated water policy." (The Integrated Water Policy Decree of 18 July 2003, coordinated 15 June 2018, 2018). The importance of participation is also discussed within the Decree on IWRM, although in practice this often lingers on forms of consultation or information sessions, so that a very active involvement of citizens is often still to be sought.

Besides various project partners, different actors are also responsible for managing the area. As large parts of the Gete area are still mainly agricultural, farmers are a very important partner to involve within landscape management. There is also a growing presence of Natuurpunt as manager and owner of several nature reserves in the area.

Inventory

3.1.1. Inventory state of Getes and Gete region

The inventory of the qualitative status of the Getes was done within the framework of the Scheldt and Meuse 2022-2027 river basin management plans and specifically within the Demer basin sub-plan (Coordinating Committee on Integrated Water Policy, 2022).

The 'Getes' originate in Wallonia and are the conjoined Grote Gete, Kleine Gete and Gete. The first two rivers and their confluence are located in the Demer basin. This basin is the largest in Flanders and lies partly in the province of Flemish Brabant and mostly in the province of Limburg.

In terms of ecological quality, the Getes do not differ greatly from Flemish (negative-moderate) averages. On some parameters for water and ecological quality, especially the confluence (Gete) scores well. Certainly for the Kleine and Grote Gete, the scores across various parameters are rather insufficient or moderate. Reasons for this include cross-border pollution (from Wallonia) and companies in the Tienen area.

In addition to challenges around the ecological quality of the watercourses, the area around the Getes has also experienced regular flooding and erosion problems in recent years. The wider Demer basin - and hence the Getes - is mainly vulnerable to pluvial flooding caused by excessive rainfall. The junction where the Gete flows into the Demer, among others, is particularly prone to flooding. Due to loamy soils along the Kleine and Grote Gete, this area is prone to erosion.

Some key challenges related to water quality, erosion and flooding issues include strengthening the water treatment infrastructure, disconnecting rainwater from hard surfaces, erosion control through intensified cooperation with farmers and others, providing both natural flooding opportunities and water buffering and reuse in times of drought and, finally, a more general strengthening of the interaction between the valley floors and their watercourses.

3.1.2. Protection

European legislation

Integrated water resources management (IWRM) in Europe is divided according to different geographical levels: river basins, basins and sub-basins. River basins have the largest scale and comprise the entire area in which water is collected that flows to the sea via that basin's supporting river. Each catchment is then divided into basins, areas in which runoff water flows to a single point in a watercourse or canal. These basins are divided into sub-basins based on hydrographic criteria.

With a view to protecting water, the European Water Framework Directive (WFD); Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, 2000) the basis for all legislation within the European Union. Since it came into force (22 December 2000), the directive aims to safeguard Europe's water resources and water quality, minimise impacts from floods or droughts and ensure member states use water in a sustainable way. To achieve this, member states must draw up a management plan for each river basin.

The entire water system (both land surface water, transitional water, coastal and groundwater) is a complex ecosystem that is not confined to national borders. With the EQF, planning was provided for the first time at the level of international river basins and thus transboundary.

The original aim of the EQF was to achieve good water system quality by 2015. The possibility was offered to obtain two six-year postponements, which Flanders requested each time. By 2027 at the latest, Flanders should now meet the quality requirements within the EQF.

Flemish legislation

1) Water legislation

The elaboration of management plans per river basin, as required by the European Water Framework Directive, was done in Flanders in the form of the Decree on Integrated Water Management (DIWB; The Integral Water Policy Decree of 18 July 2003, coordinated 15 June 2018, 2018). This decree defines objectives and principles of integrated water management, provides instruments, classifies water systems geographically and translates this classification into an organisational structure and planning. The Decree Integral Water Management forms the legislative framework in Flanders but a number of implementing decrees have also been published for concrete implementation.

With a view to protecting riparian zones, the tool 'riparian zone' was created in the DIWB. Riparian zones are part of the water system and form the boundary between land and water. They include at least the zone from the bottom of the water body to the upper edge of the 'embankment' of that water body. The riparian zone can also be delineated more widely if this is necessary with a view to nature conservation, flood protection or to prevent erosion or the run-off of substances towards the water body.

Within the riparian zone, practices such as fertilisation or the use of pesticides are prohibited. If the riparian zone includes only the embankment of the water body, certain strips must also be kept free from fertilisation etc. Fertilisation is prohibited in a zone of 5 m (or even 10 m if the riparian zone is located on a sloping plot or in VEN territory) from the upper edge of the embankment. The use of pesticides and tillage are prohibited in a strip of 1 m from the upper edge of the embankment. New structures may not be erected within a strip of 5m from the upper edge of the embankment, although there are exceptions in the context of assigned functions to or management of water bodies. These measures are largely taken in the context of the objectives of the DIWB: to increase water quality in Flanders. The DIWB also provides for an instrument 'delimited riparian zone'. In these demarcated riparian zones, the above use restrictions are extended to a wider riparian zone, which is demarcated on the basis of hydrographic studies. In Flanders, there are currently two delimited riparian zone projects: Oeverzone Dijle (Dijle and Zenne basin) and Oeverzone Molenbeek (Dender basin).

In addition to the objectives of the DIWB, banks are also mentioned within the Nature Decree (Decree on nature conservation and the natural environment, 1997), where they (with the watercourses to which they belong) are defined as 'small landscape elements'. The provisions within the Code of Good Nature Practice - watercourses section therefore relate more to the natural values associated with watercourses. This describes, for example, provisions for mowing or thorough clearing of watercourses. It is also important to note that in VEN (Flemish Ecological Network) areas (and IVON (Integral Vegetation and Support Network)) no changes may be made to vegetation and small landscape elements (e.g. changing the structure of watercourses).

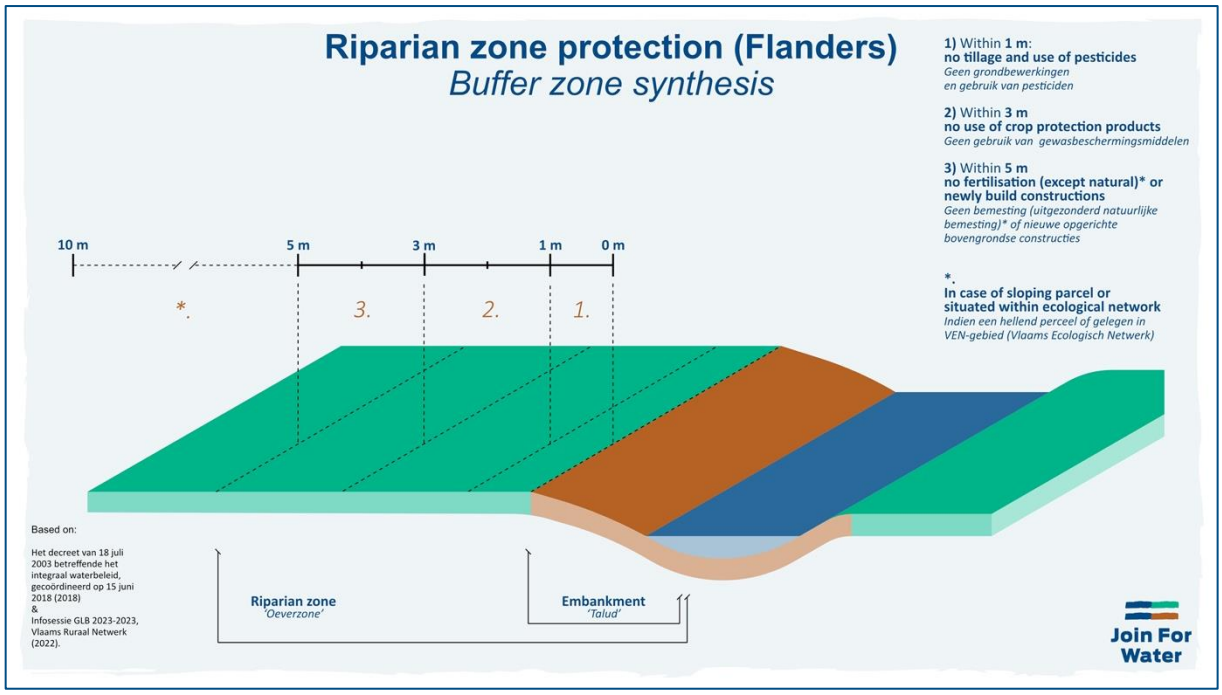


Figure 7 - Overview of the main Flemish legislation related to riparian zone protection.

Source: own adaptation based on The Decree of 18 July 2003 on the integrated water policy (2018) & Flemish Rural Network (2022).

2) Zoning planning in Flanders

Every square metre in Flanders has had a land use designation since the adoption of regional plans in the 1970s and 1980s (Editorial, 2020). The region-wide roll-out of these zoning plans has ensured that the destinations of plots became fixed and difficult to revise. Where - in the context of municipal plans, for example - a revision of the regional plan is nevertheless on the table, protests often arise and/or large sums of money have to be paid by way of compensation for planning damage. Due to these strict provisions of what may happen on which plots, giving space to water and watercourses is often not easy.

Zoning-wise (Regional Plan), the Gete area mainly has a land use as agricultural or scenic valuable agricultural area. This zoning also strongly determines the appearance of the area. The Getes form blue arteries through the area, often surrounded by green areas. The importance of the agricultural area and the potential of the natural and green areas present is also emphasised in various planning and vision documents.

Projects

From various umbrella projects (Gete Region Strategic Project, Water-Land-Schap), a multitude of smaller projects have already been launched or are planned in the Gete region.

The projects are divided here - from the framework used for 'integrated bank management' - into three categories: sustainable management (*management*), education (*education*). And structural *restoration*. Based in part on the feasibility study for the Water-Land-Schap land development project, current, planned and future projects with a clear link to the watercourses and/or banks were listed and placed within the categories.

Most of the projects in the Gete region relate to more sustainable management of watercourses. Many of the projects that intervene in management also seek to take measures aimed at structure restoration. There are also 11 projects that have a link to education, ranging from engaging a wider public in water management and experience to building new knowledge.

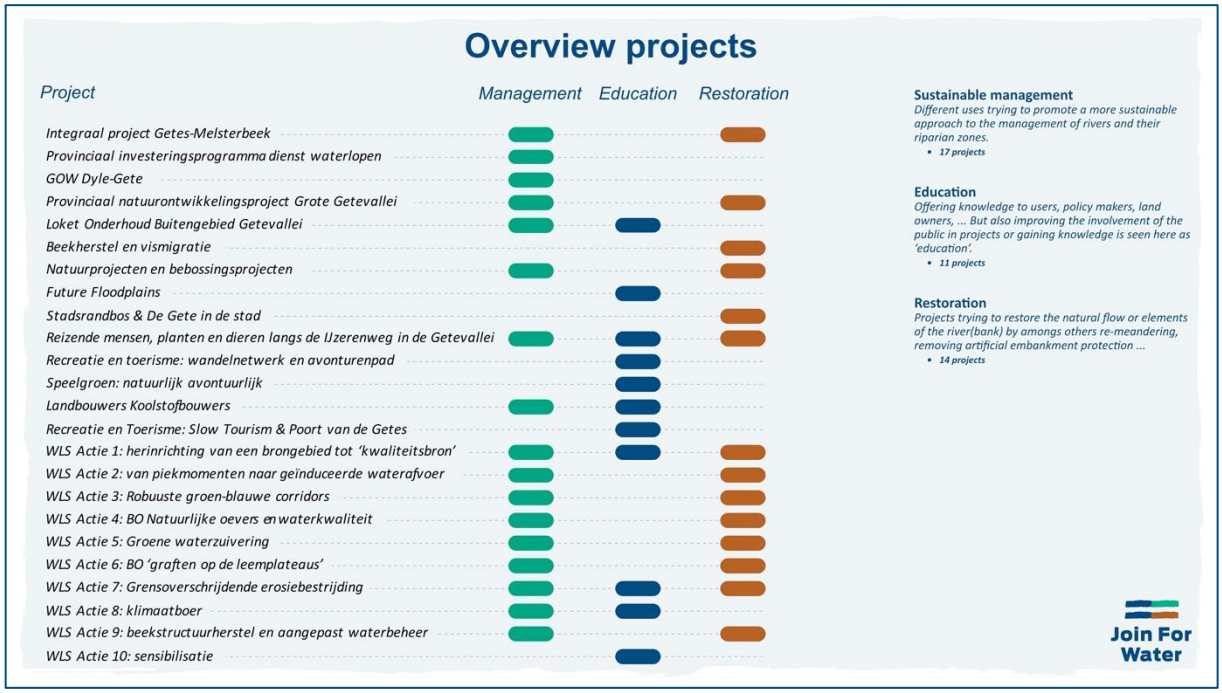


Figure 8 - Overview of ongoing, planned or to-be-planned projects in the Gete region and their classification under the categories 'management', 'education' and 'structural restoration'. Source: own editing based on Flemish Land Agency (2018).

3.1.3. Sustainable management

Of the 24 projects, 17 projects include at least some of the elements within the project that can be classified as sustainable management. These include very diverse projects, ranging from the introduction of small landscape elements to promote water infiltration, for example, to the initiation of two new management agreements specifically aimed at banks, water quality or erosion control. However, with regard to these management agreements that were included as an 'action' in the Water-Land-Schap feasibility study, it should be noted that the 'instrument management agreement' is undergoing a thorough reform, as a result of which the elaboration of these two specific management agreements may no longer be realised.

3.1.4. Education

A major challenge (also linked to participation) within integrated management of banks and watercourses is bringing together often very diverse stakeholders. Several minor or major differences in interests often have to be overcome to achieve a successful project.

Of the projects that fall under the 'education' category, the majority focus on enhancing experiences of the watercourses and valleys in the Gete region. However, there are also a number of projects that explicitly focus on working with farmers to achieve more sustainable management of the region. These could include developing 'carbon plans' for a number of (pilot) farms or introducing new (or complementary) forms of agriculture such as *agroforestry* or the introduction of new crops.

3.1.5. Structural repair

In Flanders, VMM works with the principles of ecological restoration in certain projects (VMM, s.d.). The most important measure for ecological recovery is to allow watercourses to meander in a natural or stimulated way. In Flanders, however, this poses a major challenge as there is great pressure on the available land and many functions have to be reconciled. Gradually, however, awareness is growing that this kind of intervention is needed to tackle the water challenges in the region in a structural way.

Where re-watering is not possible, the VMM tries to design or manage the bank (zones) as naturally as possible within the principles of ecological recovery. This includes the creation of buffer strips along the watercourses (according to the legal requirements of the Decree on IWRM). The principles have already been applied several times to the Zwalm, Barebeek, Grote Nete and Kleine Nete, among others.

Besides management measures, several projects are also under way in the Gete region to restore the course of watercourses to their former course or seek to enhance water storage in the stream by digging new meanders, for example. This kind of project often requires bringing together many involved and diverse actors. Moreover, interests do not always run parallel. However, there are successful projects such as a meander project along the Grote Gete south of Tienen or the example of the (re)meander of the Kleine Gete on the grounds of castle farm Wange.

Among the projects on the list, 14 projects correspond to structural restoration measures. Very different measures can be located within these projects, ranging from removing artificial bank protection to initiating meanders. The structure restoration projects are also viewed from various angles, both with a view to restoring aquatic biodiversity and addressing water management.

Figure 9 - Meander project of the VMM in collaboration with the city of Tienen near the Getestraat. New meanders were dug at the historical meander of the Grote Gete. A new fish ladder was installed on the straightened course of the Grote Gete. Source: photos Join For Water.

3.2. Additional tools and case studies

3.2.1. Dijle riparian zone project

Location	Project area surface	Start and end date	Actors involved	Focus within the case
Dijle (between Florival and Werchter)	**106.383 ha** Of which: 77.45% is located in nature reserve or nature reserve and 21.81% is agricultural area	**1989** (end of culling and start of 'zero management'); delineation of riparian zone project within basin management plan of the Dijle-Zenne basin 2008-2013	VMM/ ANB, Natuurpunt	Create a riparian zone with **water control** visibility, preserve natural meandering and counteract eutrophication phenomena in summer

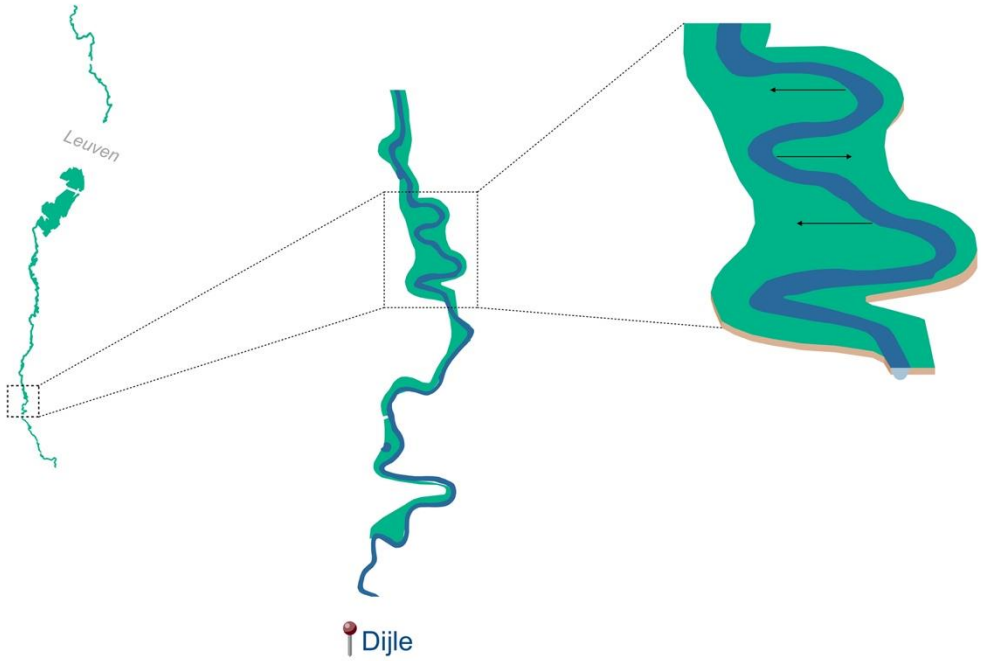
Reasons	/
Run	Cessation of clearing since 1989 with spontaneous nature and meander development, in the context of basin management plans (now river basin management plans) the riparian zone was delineated (after, among other things, carrying out extensive hydrographic studies)
Challenges	Most of the riparian zone around the Dijle River was and is nature reserve, which made it more evident to delimit the riparian zone within this land use. However, the demarcation of a zone that imposes mandatory use restrictions without direct opportunities for compensation* does pose a significant obstacle to the instrument as a whole. After demarcation, enforcement of the riparian zone could potentially be a bottleneck.
Resources/ tools/ Legislation	Instrument riparian zone; Budget €1,025,000 (GDP Dijle-Zenne basin, action no. 207)
Participation	For the creation of the project, the known procedures of consultation were followed. These mainly involve forms of consultation within the official basin consultations and within the basin council. The public enquiry conducted also falls within the known procedures of consultation and participation.

Partly with a view to protecting Leuven from flooding, a riparian zone project around the Dijle has been underway since 1989. With the 2001 nature development plan for the banks of the Dijle as background and from the 2008-2013 basin management plan for the Dijle, a wider riparian zone was delineated. Based on hydromorphological studies of the meandering capacity of the Dijle, a 10-metre-wide riparian zone was thus delineated on both sides of the river. Within this zone, the river is given free space to meander.

Within the riparian zone around the Dyle, mainly open space was included. Zones where the Dyle flows through built-up areas (e.g. Leuven itself) were left out of the delineation. Currently, almost 80% of the riparian zone around the Dyle is located in areas with a nature designation. One fifth of the

zone lies within agricultural areas. The delimitation of the riparian zone extends the legal use restrictions within banks to the entire zone. So in the case of the Dyle, for example, agricultural operations are prohibited within the delimited zone.

Thus, particularly within agricultural areas, the delineation of a riparian zone project ensures that additional restrictions are imposed on plots located along the watercourse. *There are, however, no direct compensations associated with the 'delimited riparian zone' tool, so the implementation of the tool may have far-reaching consequences for farmers with plots located within the riparian zone to be delimited. If a demarcation creates an unsustainable loss for a farmer, the farmer may well sell his plot to the government demarcating the riparian zone. This can be done from the government's obligation to purchase that applies when a riparian zone is demarcated. The delimiting authority also enjoys the right of pre-emption over the plots on which the riparian zone is located, so plots can be acquired even after delimitation.



3.2.2. Management agreements and eco-regulations

Location	Project area surface	Start and end date	Actors involved	Focus within the case
Miscellaneous	Miscellaneous	**2023-2027** (current CAP)	**Farmer**; **VLM**	addressing **agri-environmental-climate challenges**
Reasons	Address agri-environmental challenges; strengthen biodiversity			
Run	With the new CAP 2023-2027, a new cycle of management agreements (MA) and eco-schemes will start. Under these, farmers voluntarily undertake a series of measures that contribute to solutions to agri-environmental challenges and are then compensated for them.			
Challenges	Cann structural measures be taken through one-year eco-regulations or does the annual renewal of the agreement create major barriers?			
Resources/ tools/ Legislation	Management agreement; eco-regulation			
Participation	PAs and eco-schemes are made voluntarily by the farmer. He can contact the VLM's farm planners for advice, but only after having contacted them himself. These types of agreements therefore require a certain level of commitment, although this means that the measures taken have a high degree of 'ownership' for the farmer.			

Despite the introduction of 'riparian zone projects' in the Decree on IWRM, this instrument has so far not proved to be a resounding success. Carette and De Smedt (2013) possibly see a cause of the limited success in "the existence and success of the so-called management packages plot edge management". (Carette & De Smedt, 2013, 586). With more than 3,000 farmers having concluded management agreements in 2018, 13% of Flemish farmers were represented (Flemish Land Agency, 2018).

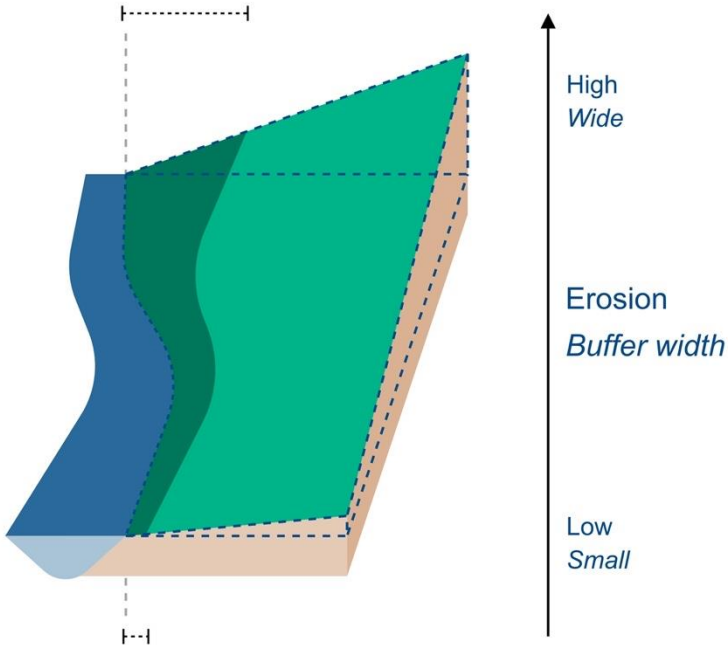
These management agreements (PAs) are an instrument used by the Flemish Land Company (VLM) and financed from the European Common Agricultural Policy (CAP). The PAs are used for, among other things, preserving or strengthening biodiversity in agricultural areas: "Parcel edge management creates a buffer between agricultural land and vulnerable elements that post on it. Vulnerable elements can be forests, for example, or watercourses, wooded banks and road verges. The field edge then forms a protective strip that prevents pesticide drift. Environmental quality in general is also improved because the plot edge has a reducing effect towards runoff of fertilisers and sediment (erosion)." (Flemish Rural Network, s.d.).

However, the renewed CAP for the period 2023-2027 introduces changes compared to previous years and the known content of the PAs. Previously, the PAs were divided into several thematic categories such as field edge management, water quality, erosion control or protection of field and meadow fauna. Within the package of PAs applicable from 2023, the focus is on strengthening biodiversity within agricultural areas. Themes such as water quality or erosion control are no longer included within this package.

However, in order to take steps within these themes, a new type of 'eco-regimes' has been created. The essence of these eco-regimes is similar to the PAs: farmers voluntarily implement measures to support solutions for certain themes. However, the major difference between the PAs and the eco-schemes is the duration, which in the case of the eco-schemes is limited to an annual (renewable) agreement versus a five-year agreement in the case of the PAs. As a result, longer-term, more structural and sustainable commitments are therefore less obvious.

With regard to watercourses, the eco-regulation around buffer strips is particularly relevant. Within this regulation, a distinction is made between buffer strips aimed at erosion control and other buffer strips. Both can be located along watercourses.

A grass strip located along a watercourse should be at least 3 metres wide. If a buffer strip along a watercourse on a non-erosion-sensitive plot is sown with a grass herb or flower mixture, it should be at least 6 metres wide. For buffer strips on erosion-prone plots, the minimum width increases as erosion sensitivity also increases, with a minimum width of 6 metres that can be up to a maximum of 30 metres wide on the most erosion-prone plots.



4. Uganda: basins of the Mpanga and Semuliki rivers

Note: The section below comprises a Dutch translation (and summary) of (parts of) the report on riparian protection in the Mpanga and Semuliki basins in Uganda. The full report is available in English.

4.1. General

Collaboration for integrated riparian management - actors in Uganda

Several of Uganda's legislative frameworks seek greater involvement of all potential actors within environmental policy and specifically the protection of riparian zones. The lead agency for managing water resources (and therefore riparian zones) is the *Directorate of Water Source Management.* A brief selection of other actors includes the *National Environment Management Authority (NEMA); Natioal Forestry Authority (NFA); District environment committees,* various NGOs and various groups (of delegates) representing communities.

Often, however, cooperation is still insufficient, so a lack of participation by local people has led to degradation of riparian zones. Institutional conflicts, rivalries and the lack of effective cooperation and coordination both within and outside the government have led to ineffective implementation of programmes aimed at sustainable resource management, especially in riparian zones, and reversing environmental degradation.

4.1.1. Inventory

riparian zones in Uganda are mapped for the purpose of preparing management plans for the watercourses and surrounding forested, dry or cultivated land. A riparian classification system is used by competent authorities to map ecosystems in a uniform manner.

Increasing numbers of migratory birds but also fish and other endangered species need a lot of space to find quality habitat. However, due to constant changes and the qualitative degradation of many habitats, aquatic species are especially vulnerable. Up-to-date map information on the status of these two rivers, combined with other habitat data and landscape features in digital form, can provide resource managers and decision-makers with more powerful tools to assess the tools and measures needed.

However, for much of Uganda's rivers, catchments, wetlands and lake shores, digital information on riparian zones is not readily available. Historical maps of riparian zones, once converted to a digital format, are of greater use in answering resource management questions. However, a digital inventory is becoming increasingly comprehensive and thus can also increasingly be a resource for various conservation programmes.

However, the condition of many riparian zones including those of the Mpanga and Semuliki rivers is deteriorating. Despite various legislative initiatives (see below), a lack of space for urbanisation and industrialisation or strong population growth due to migration, among other things, are putting great pressure on the riparian zones. This is due to an imbalance between conservation and development needs in the two river basins. In addition, corruption among environmental policy implementers or enforcers also cause developers to use riparian zones without fully complying with environmental policies. This has already led to loss of fragile ecosystems, siltation of river banks, low water levels, floods and droughts that mainly affect those living around riparian zones.

4.1.2. Protection

In Uganda, the protection of watercourses and other ecosystems is embedded in a broad set of policy and legislative documents. Protection of areas that are relatively unaffected by human intervention should be a high priority. The Ugandan Constitution, *Uganda Vision 2040, National Environment Act (2019)* or various acts focusing on water, wildlife and various ecosystems, among others, have provisions to this effect.

Within the constitution, sustainable use of ecosystems and natural resources is mainly the focus, although this is often complicated by challenges such as urbanisation or population growth.

From both national and local levels, the *National Environment Act* seeks to protect wetlands and riparian zones from negative impacts of human activities. However, a major challenge is often a highly modified condition of watercourses due to dams or reinforced banks and embankments, among other things. Removing these types of structures can sometimes restore a more natural condition, but often the condition is modified to such an extent that active conversion of riparian areas, modification of river hydrology and environmental flows, planting of trees, grazing control or cessation of agricultural production is necessary.

With the *National Environment Management Policy* (2017), riparian zones were (also) designated as sensitive and critical ecosystems. To better protect them, several principles and strategies for delineating buffer zones were put forward (including a general buffer zone around watercourses of 100 m wide). These buffer zones should protect the watercourse and surrounding land from erosion and water pollution, among other things.

4.1.3. Sustainable management

Despite various legislative frameworks and policy initiatives, little priority has long been given to the management of riparian zones. Consequently, there are many degraded riparian zones where strict protection is no longer sufficient. For maintaining a current (fragmented but natural) condition or working towards a restoration of watercourses and riparian zones, various regulations and measures are put forward.

Important here is an integral approach to the watercourse or area for which management measures are being developed. Since riparian zones are only a part of larger river basins, measures should - ideally - therefore be embedded in a broader management plan covering the entire river basin. In Uganda, the *Environmental Protection Agency*, among others, is actively developing management plans bringing together private and public parties to address challenges that cannot be solved by previous management or protection programmes due to the size or nature of the challenge.

Throughout different management programmes, three essential elements keep recurring. Collaboration (1) is essential to properly design and implement complex programmes. This allows the development of a supported plan through which different goals (economic, social, cultural...) can be strengthened in an integrated way. Management measures and plans should also always relate to a specific geographical context (2). As each river basin has different challenges and characteristics, applied management is necessary. To determine the specific measures, scientific justification (3) is especially necessary.

4.1.4. Education

A key element for both protection and management measures to be successful is communicating the actions to the wider population and all stakeholders. By being familiar with the challenges facing riparian zones, individual or collective action can be smoother and solutions can be worked together.

For engaging the broad population, the *National Environment Act* of 2019 is an important legislative initiative. This *National Environment Act includes public* participation in the preparation of visions, plans or management programmes. Awareness of riparian management challenges and issues facing watercourses and river basins is essential to then help promote environmentally conscious behaviour.

4.1.5. Structural repair

If previous human activities caused strong alteration of river structures where it is not desired, the last step within integrated riparian management is to restore the natural riparian structures. In Uganda, the *National Environment Act* (2019) specifically requires degraded riparian zones to be restored to their original state.

However, structural restoration often poses major challenges, both scientifically and socially. In some cases, the natural or pristine condition of a particular riparian area no longer exists, is not known with certainty or multiple causes over a long period of time caused a deterioration in quality with complex or unknowable cause-effect relationships at both local and landscape scales.

While ecological restoration may be an achievable and desirable goal for some areas, it obviously cannot be achieved everywhere. For example, permanent or irreversible changes in hydrological disturbance regimes (e.g. due to dams, cross-basin diversions, irrigation projects, extensive landscape alteration), natural processes (e.g. global climate change, accelerated erosion), channel and floodplain morphology (e.g. channel incision, breakwaters, dykes), and other impacts (e.g. species extinctions, biotic invasions) may interfere with our ability to precisely or fully restore past composition, structure and functions.

riparian zones adjacent to large rivers may present a greater challenge than those adjacent to smaller streams and rivers because the number of factors affecting flow is greater at this larger scale (Gore and Shields, 1998). Nevertheless, even in such situations, there are often numerous opportunities to achieve significant ecological improvement of riparian zones and at least partially restore many of the functions they used to perform.

4.2. Mpanga & Semuliki

Location	Project area surface	Start and end date	Actors involved	Focus within the case
Southwest Uganda	**Mpanga** catchment: **4670 km²** ; **Semuliki** catchment area: **830 km²**	/	NEMA; NFA; NGOs or community organisations such as Join For Water, JESE, HEWASA, Water For People, NRDI; management groups linked to the individual river basins	**Counter erosion** and **degradation** of the watercourse; reduce anthropogenic pressure (deforestation, agriculture, etc.)

Reasons	/
Run	Project-based
Challenges	Anthropogenic pressures from reclamation activities, agriculture and deforestation or urbanisation. Problematic consequences of this include erosion and silting.
Resources/ tools/ Legislation	Various legislative and policy initiatives including demarcating buffer zones and trying to maintain them by planting trees, among others.
Participation	Participation is being pushed forward from various legislative initiatives (e.g. the *National Environment Act* (2019) as an important step to make various projects succeed. There is also a strong focus on sensitisation of the population to ensure measures achieve their maximum impact.

Collaboration for integrated riparian management - actors in the Mpanga and Semuliki basins

An important step in cooperation around integrated water and riparian management was the formation of conservation groups with representatives from the communities both upstream and downstream. In addition, local authorities are also important to monitor protection measures and sanction violations when necessary. Finally, several NGOs are also active in the basins, working on education around water and land use or trying to organise access to water in a sustainable way.

Inventory

4.2.1. Inventory condition of Mpanga and Semuliki

The Mpanga is located in western Uganda. It flows through Kabarole, Kyenjojo, Kamwenge, Ibanda and Kiruhura districts. The catchment is about 4670 km^2 and lies within the *Albertine Rift Montane* Eco-region of the African Rift Lakes within the *Albert Water Management Zone*. It comprises a network of unprotected and protected areas, including the world-famous Kibale National Park, the Queen Elizabeth National Park, the Rwenzori Mountains National Park and the Lake George RAMSAR area. The basin is of great economic and biodiversity value to Uganda and the whole world (MCMP, 2015).

The Semuliki flows between the southern shore of Lake Albert and Lake Edward. Both lakes lie partly in the Democratic Republic of Congo and Uganda. Part of the border between the two countries is formed by the Semuliki.

The Mpanga is currently under severe anthropogenic pressure due to deforestation on the slopes of the Rwenzori Mountains from which it (like the Semuliki) draws its water. Deforestation has led to soil erosion, landslides and siltation of the river. Human activities such as mining of sand, gravel and stones, while important for livelihood and survival, have led to riverbank destabilisation, climate change and thus negative impacts on the river.

Laundries, slaughterhouses and commercial enterprises in Fort-Portal contribute to waste that threatens the river's flora and fauna. Anthropogenic activities in particular threaten the rare cycads, reducing their numbers. Declining water levels in the river and in Lake George, into which the river flows, reduce breeding and rearing grounds for some fish species and may affect the productivity of the lake (Water Resource Assessment for river Mpanga, 2009).

The Semuliki experiences largely similar challenges. In particular, overgrazing and catchment changes have led to erosion and degradation of the river banks, in addition to frequent changes in the course of the river's meandering lower reaches and the formation of *'ox-bow'* lakes in some places. It is estimated that about 10 metres of land on the Uganda riverbank is lost per year due to erosion, and silt from the river slowly fills the southern side of Lake Albert.

In terms of land-use activities, different agricultural practices in particular put pressure on the riparian zones of the Mpanga and Semuliki rivers. Among other things, the use of pesticides causes a decline in water quality. Grazing, in turn, causes the stability of some banks to decrease (although grazing in riparian areas does appear to be an important (economic) activity during the dry season. Illegal fishing or hunting also causes significant pressure on the fauna present in river basins.

Besides activities linked to food supply, other economic activities also put pressure on riparian areas. These include sand or stone quarrying and brick making, hydropower generation or charcoal production.

4.2.2. Protection

An important conservation measure is the demarcation of a buffer zone along watercourses and wetlands in Uganda of 100 metres wide. In the Mpanga and Semuliki basins, various civil society organisations such as Join for Water, JESE or Water for People are working with the *Albert Water Management Zone* (Ministry of Water and Environment) to demarcate the buffer zone and protect it from encroachment and activities that could harm these rivers.

To strengthen the river banks and ensure the buffer zone, the city of Fort Portal, Kabarole district and Join for water and other non-governmental organisations, among others, are working together to plant trees along the banks. For this purpose, mainly indigenous tree species such as acacia, engoti and umbrella tree will be planted.

In addition, efforts are made to prevent trespassing on the banks through sensitisation. Nevertheless, this often proves insufficient and activities or users have to be expelled. Restoration orders to restore the original state of the river are also issued.

Projects

4.2.3. Sustainable management

Sustainable management activities were implemented upstream and downstream of the Mpanga. For example, bee keeping, tree planting and improved farming practices such as terracing and agro-forestry. Although sustainable management activities were implemented, the area was prone to landslides and floods, especially during heavy rains.

The water turned brown due to siltation upstream in hilly Karangura (the river's source) where quarrying and sand mining take place. People upstream and downstream of the river had no drinking water and people upstream could not cross the river during heavy rains. However, various stakeholders, including the various WASH civil society organisations, sensitised residents to adopt better conservation practices to mitigate the disaster in the area.

4.2.4. Education

Environmental education in the area is an integral part where residents are sensitised about the importance of conserving natural resources. Upstream groups were formed to work for natural resource conservation and sensitise people in the area.

Both upstream and downstream, the enforcement of environmental laws and policies was emphasised. In the upstream part of the Mpanga, NGOs such as *Joint Save the Environment* and *Natural Resource Defence Initiative* are especially important in raising awareness about managing fragile resources in the area.

Despite the integration of education on the management of the Mpanga River, environmentally damaging activities such as sand mining upstream and the construction of culverts downstream remain in place, causing the river to silt up and pollute the water.

4.2.5. Structural repair

Restoration works were carried out in the upstream and downstream parts of the basin. Activities such as sand mining and deforestation were banned by the government and NGOs operating in the area.

Downstream activities also included the creation of nursery beds (for plants) and culverts following an environmental impact assessment. In the downstream, the people who laid culverts explained that they have established a management plan for the Mpanga and that Fort Portal City staff conduct quarterly monitoring. They disclosed that Fort Portal City has drawn up a checklist that people working in the downstream must adhere to, and that in case of non-compliance, they can be chased out.

While ecological restoration may be an achievable and desirable goal for some areas, it obviously cannot be achieved everywhere. Thus, permanent or irreversible changes in hydrological disturbance regimes were observed.

4.3. Strengthen integrated water management in the Mpanga and Semuliki basins

4.3.1. Challenges

Despite various measures and frameworks to protect watercourses and riparian zones, the actual condition of the Mpanga and Semuliki is not positive everywhere. Among other things, an ever-persistent use of the riparian zones for various activities due to a lack of proper alternative causes a violation of the buffer zones. Illegal fishing or hunting activities, population growth and lack of awareness - in spite of everything - are also threats to improving the condition of the rivers under study.

However, there are also more systemic and structural challenges associated with (not) enforcing existing measures. A brief selection is given below. The more comprehensive description can be found in the English-language sister report.

- The violation of conservation areas by local governments themselves, with the very motivation of using these areas to provide growth opportunities for local communities.
- Political influence can ensure that legislative frameworks are not implemented or protection measures are not enforced. *Top-down* imposition of measures often has no effect due to lack of capacity for enforcement or failure of the courts to follow up.
- A lack of resources makes enforcement of measures difficult. Due to lack of resources, setting up monitoring is also a major challenge, so defining targets is also often difficult.

4.3.2. Opportunities

Gradually, however, more and more initiatives are emerging that should promote strengthening riparian zones and ecosystems - despite the challenges. Existing policies can be counted among these, subject to sufficient enforcement. In addition, projects are also being set up from the *Ministry of Water and Environment* that follow the principles of *ecosystem-based adaptation*, in which ecosystems are used to cope with the consequences of climate change, among other things. In particular, the commitment to 'ownership' of various projects by local communities is an important aspect.

More and more, there is also growing interest in implementing environmental protection much more broadly. Both within different communities and from different levels, including through the *Parish Development Model* through which the central government wants to encourage *bottom-up* development. An important opportunity is also the interest of various companies that are extracting energy from hydropower. Maintaining the quality of the rivers is important to them in order to continue to exploit the continued potential of hydropower as an energy source.

4.3.3. Recommendations

The government of Uganda should assist local governments in drafting regulations on the management of fragile ecosystems, including riparian zones. It is absurd for local governments to manage their riparian ecosystems without any ordinance. The introduction of ordinances is very important for the management of such important ecosystems. An ordinance can be drafted through *bottom-up* planning meetings with all stakeholders at village, parish, *sub-county* and eventually district level.

The local government should continue with mass awareness and community education on the importance of sustainable management of riparian zones. The community should be educated on the management of riparian zones for both the present and future generation. This should be done by all stakeholders, including technical and political leaders.

The local government should continue to monitor and assess critical riparian zones and prepare reports on their condition. Most riparian zones are affected because technical people and political leaders do not monitor them. I hope management of riparian zones can be achieved if technical people and politicians work together.

The local government, especially the natural resources department, must implement existing laws and policies within their jurisdiction. It is absurd that there are laws and policies that mandate the natural resources officer and environmental officer to regulate activities that harm the environment, but nothing is done to manage riparian zones.

The local government should collaborate with existing non-governmental and community-based organisations to set up alternative projects such as planting indigenous trees, keeping beehives and nursing beds as a means of sustainable utilisation of riparian zones. The local government should

integrate environmental planning into all development sectors to ensure full participation and management of the fragile ecosystems by all stakeholders in the district.

The government of Uganda should ensure adequate funding for the Department of Natural Resources. Environmental issues, especially riparian zones, should be given top priority in planning and budgeting.

(By Tumuhairwe Samuel Franklin)

5. Similarities and differences between the Mpanga and the Gete

The ultimate goal of the sister basin project Gete-Mpanga is to exchange information and experiences around the protection of riparian zones in both basins. Through the establishment of a research framework (chapter 2), the study of the Gete valleys and some additional cases in Flanders (chapter 3) and the summarised research around the Mpanga and Semuliki (chapter 4), an extensive amount of information was gathered.

The table below of this short, concluding chapter started from the inputs provided to identify similarities and differences between the Mpanga and the Gete. As in the earlier chapters, the structure of the framework for integrated riparian management is again followed.

Due to scale and context, among other factors, differences between the Mpanga and Gete basins can often be identified in particular. A difference in available data, for example, creates different starting points when preparing management plans. The focus within management plans or land use and conflicting interests (from practical situations or an intended use) also show differences.

Nevertheless, similarities can also be noted between the basins or how water and riparian management are addressed. The main challenges are the same in the Mpanga and Gete basins: stopping erosion, improving water quality and an overall reduction of anthropogenic pressure on watercourses. It is also notable that both regions/countries have extensive legislation. However, one of the main similarities is in the chances and opportunities that can be created if cooperation between different stakeholders can be strengthened. This is therefore a key area of focus.

Inventory	
Data availability	
Differences	A lot of detailed data is available in Flanders. In Uganda, this represents a working point. Growing inventory of watercourses and basins in Uganda is strongly linked to ecosystem, resource and resource management.
Additional notes	A good inventory can be used as a starting point for drawing up management plans.
Scale	
Differences	Very large scale differences between the Mpanga and Gete basins.
Condition	
Differences	In Flanders, there are no longer any completely free-flowing watercourses. A limited exception is the Dijle, for example, where part of the river is still (more or less) free-flowing. The Mpanga has several smaller dams, but is otherwise a free-flowing river with free meandering and little to no straightened bed or banks.
Protection	
Challenges	
Similarities	The main challenges in both Uganda and Flanders are essentially similar: countering erosion, improving water quality and generally reducing anthropogenic pressure on watercourses.

Differences	The specifics of local problem areas are obviously different and highly dependent on scale and local context.
Legislation and policy around water	
Similarities	Both in Europe/Flanders and Uganda, there are many legislative initiatives that protect watercourses and ecosystems associated with water. Effective monitoring and enforceability of legislative initiatives on the ground is the main challenge in both Flanders and Uganda.
Differences	Within Europe and Flanders, there is a strong emphasis on improving the quality of watercourses. In addition (and partly fragmented), various other legislation exists. In Uganda, there is a very strong emphasis on protecting wider ecosystems. Policy or regulation around watercourse quality is included in separate sections of legislation or other applied legislation.
Land use	
Differences	Conflicting interests in Flanders stem largely from zoning planning, which laid down permitted land uses for the entire territory. Changing zonings is often very difficult. In Uganda, the main land use conflicts stem from practical use of land and (possibly) less from defined land use.
Additional notes	Within riparian zones in Uganda, conflicting interests are mainly manifested in the violation of legally (and physically or otherwise) delineated buffer zones around watercourses, lakes and wetlands.
Delimited nature	
Differences	There are especially important differences in terms of the scale of nature reserves in the two regions. The quality of nature in Flanders is often inadequate, partly due to high pressure from parallel activities in directive areas or along nature reserves. In Uganda, it is 'easier' to expand nature parks, although questions can be raised about the impacts (social, for people and communities, farmers) that an expansion may or may not bring about.
Management	
Management and measures	
Similarities	In both Uganda and Flanders, effective control of buffer zones is often difficult. One cause of this is, for example, an unclear set of measures (e.g. the different buffer widths for land use/fertilisation/ pesticides), which does not facilitate control and enforceability.
Differences	In Flanders, there are successful but volunteer-based agro-management measures. However, these cost a lot of money, are often not structural (1-5 years according to the new structure) and mapping the (positive) effects linked to a plot (and thus to the management of an individual user) is difficult. In Uganda, there is no or only poor management of riparian zones. Many partners want to help protect the zones, but there is a use of overarching strategy or distribution of priorities and roles to make management efficient.
Education and cooperation	

Collaboration	
Similarities	The awareness that cooperation, participation and/or co-creation are necessary to achieve supported (water) policies is present among policymakers in Flanders and Uganda and is translated into important legislation or policy documents. In both Uganda and Flanders, it is precisely in this cooperation that important opportunities lie to achieve strong results as smoothly as possible.
Differences	Participation and cooperation in Flanders is often very much organised from different administrative procedures, which does not always yield the smoothest or most qualitative or supported result (e.g. informing versus co-creation via *citizen control*). In Uganda, the main challenge is to coordinate a management plan, divide responsibilities and take them up. Priorities are set, for example, but no one takes responsibility for working them out.
Structural repair	
Condition	
Differences	Flanders is already the most paved region in Europe. Many watercourses have been straightened or have many infrastructural interventions that make natural recovery of the watercourse difficult. Moreover, due to conflicting interests (from designated land use), there is often little room to pursue structural restoration (e.g. allowing watercourses to meander naturally). Uganda has far fewer straightened watercourses and present infrastructure. The still free-flowing nature of many watercourses actually provides an important opportunity to allow water to flow freely and ensure the necessary space for ecosystems.

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