

# ECO-FRIENDLY RIVERBANKS: A POLICY ASSESSMENT

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## CASE STUDY ON THE PROVINCE OF ZEELAND

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## 1. Introduction

Surface water quality with respect to its ecological status is of great importance for preserving biodiversity. Currently existing policies concerning its improvement often incorporate the measure 'eco-friendly riverbanks', i.e. to make riverbanks more nature-friendly. This holds that a riverbank is constructed in such a way, e.g. with a certain slope, that vegetation development and biodiversity are stimulated. Consequently, due to plant growth the nutrient concentrations, inter alia nitrogen, will reduce and water quality will improve. Besides, eco-friendly riverbanks also touch upon flood risk management and have also a recreational function. Overall, eco-friendly riverbanks can be seen as an infrastructural measure. This points to an effect-based policy rather than a source-based policy.

Currently, eco-friendly riverbanks are still in its implementation phase. Meanwhile, water quality concerning nitrogen in the Netherlands is sub-standard. Besides, there are signs that measures taken against this problem, inter alia eco-friendly riverbanks, are not implemented according to set time schedules. Therefore, this paper aims to give insight in the policy's bottlenecks concerning eco-friendly riverbanks. In order to do so, the policy design will be assessed by using the draft assessment method of Brouwer et al. (2012). The overall aim of this paper is to give, based on the results from the assessment, recommendations for improvements in the policy design.

This paper will sharpen its focus on the province of Zeeland, because there the responsible authorities do not keep pace with their time schedule regarding implementation.<sup>1</sup> In addition, nitrate concentrations in a large part of the surface waters within its territory are found to be sub-standard.<sup>2</sup> Reasonably, it raises the question whether their water management and governance is of sufficient strength, which will be assessed in this paper. Inevitably, these two facts point to the urgent need for an improvement of their policy on eco-friendly riverbanks in order to cope with the excess concentration of nitrogen in their surface waters.

It has to be said that, from a public administration point of view, the situation for the province of Zeeland is somewhat complicated. At the moment of the release of the water board management plans for 2010-2015, the territory of the water board Scheldestromen belonged to the former two water boards Zeeuwse Eilanden and Zeeuws Vlaanderen. Just after the releases of their water management plans, they merged into the current water board Scheldestromen. Both water management plans were adopted within the new water board.

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<sup>1</sup> As stated in the annual report of 2012 from water board Scheldestromen.

<sup>2</sup> See table on p. 73 of the water management plan of water board Zeeuwse Eilanden, date unknown.

The following chapter describes shortly the assessment method and how it was used. In chapter 3 the results from the assessment method will be presented. Chapter 4 contains the discussion, where both the assessment method itself and an interpretation on of the results will be given and uncertainties will be pointed out. The discussion will be followed by the overall conclusion and recommendations for improvements for current policies on eco-friendly riverbanks, where it will be endeavoured to do some recommendations for a wider scope than only the province of Zeeland or the Netherlands.

## 2. Assessment method

As mentioned in the introduction, this paper based its assessment on the draft version of the interdisciplinary Water Management Assessment method created by Brouwer et al. (2012). It is a step-by-step approach in which multiple interlinked “building blocks” as being part of the assessment as a whole will be analysed. In this paper, these blocks form the basis of the policy assessment on eco-friendly riverbanks in the province of Zeeland. Brouwer et al. (2012) visualised their integral and comprehensive approach as can be seen in figure 1.

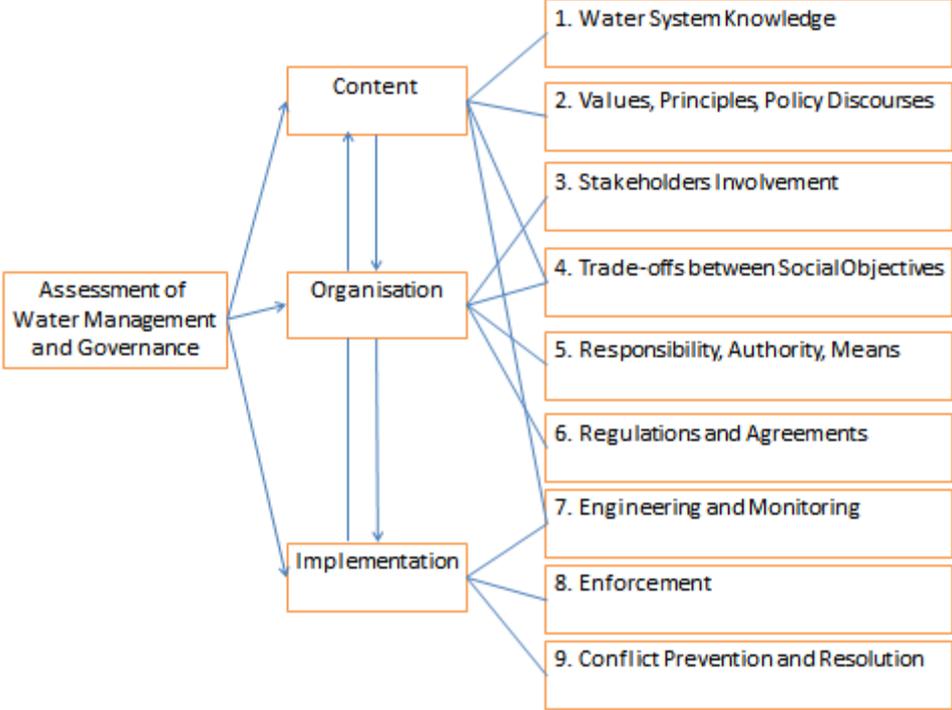


Figure 1: Water Management Assessment Method (Brouwer, et al., 2012)

Every building block is equipped with its own assessment criteria. These were leading in the search for making a judgment on each aspect. As soon as the authors of this paper experienced the need for more detailed questions to judge on a certain building block, there was looked for

additional questions in the article of Brouwer et al. (2012) in order to strive for a well-founded judgment.

### 3. Assessment and results

#### 3.1 Water system knowledge

*“Is there sufficient knowledge on the process, efficiency and effects of eco-friendly riverbanks? Where are still the gaps in the knowledge?” (Brouwer, et al., 2012).*

One of the main functions of eco-friendly riverbanks is improving the water quality by purification of the water by natural processes. Purification of the surface water means that nutrients are permanently or temporarily stored, or permanently disposed. Storage can be in the soil or in the vegetation on the river bank. Disposal occurs through de-nitrification and by location management like mowing and by removing the sediment. The key factors that influence the efficiency and speed of the purification process are (Sollie, Brouwer, & de Kwaadsteniet, 2011):

- Water level (management)
- Speed of the water and residence time
- Vegetation biomass en structure of the vegetation
- Soil type and composition
- Nutrient load
- Maintenance
- Relative riverbank surface

Multiple studies, (Davies & Nelson, 1994) and (Parkyn, Davies-Colley, Halliday, Coslty, & Crocker, 2003), show that the effectiveness of the eco-friendly riverbanks in improving the biodiversity is questionable. These studies show that the buffer zones need a minimum width of >30 meters to have an effect of algal growth and fish biomass. In the Netherlands eco-friendly riverbanks are mostly between 1-10 meters in width. Which would imply that the effectiveness is uncertain and maybe insignificant. The effectiveness of the smaller (1-10 meters) buffer zones must be further researched to get an idea on the effect on the biodiversity.

Another functions of eco-friendly riverbanks is water retention to reduce flood risk. The effectiveness of this function is highly dependent on the design of the river banks. In this part there is still a gap in the knowledge on how efficient a river bank is in storing water. Multiple studies show different results on the function concerning flood management. Sometimes it is

even stated that it will potentially reduce floods downstream, but may result in some local flooding (Parkyn, 2004). On the one hand it is obvious that a river bank with a gentle slope land inwards gives more storage volume than a vertical river bank, on the other hand it is the question how significant this volume increase is.

It becomes clear that there is in fact quite some knowledge available on the factors that influence the efficiency of the function of eco-friendly riverbanks. However the amount to which the factors contribute to the efficiency is still vague. It is hard to connect differences in water quality and ecology with certain measures such as the eco-friendly riverbanks. This is in fact where there are still gaps in the knowledge. Thereby, the question remains whether sufficient knowledge is used by the water board Scheldestromen when implementing eco-friendly riverbanks. This will be dealt with in later parts of this chapter.

### 3.2 Values, principles and policy discourses

*“Is there sufficient knowledge of shared or conflicting values, viewpoints and principles (represented by different policy discourse coalitions) for water issues and their consequences for facing water management issues?”* (Brouwer, et al., 2012)

It is assumed that the values and principles are represented in the goals of different stakeholders on eco-friendly riverbanks. Different layers in governance have different goals and objectives for creating eco-friendly riverbanks. The values become clear when the goals of different governmental layers are assessed. Because the fact that on international level there is no mention of eco-friendly riverbanks, the plans and values are more general on this level of governance, the function of improvement of the water quality is assessed, which is related to the eco-friendly riverbanks.

#### **International**

On the basis of the Water Framework Directive (WFD) environmental quality standards are established at various levels (van Rijswijk & Havekes, European and Dutch Water Law, 2012). The WFD requires the development of river basin management plans. In article 4 of the WFD it is stated that member states must implement the necessary measures to prevent deterioration of the surface water bodies. They must aim at achieving a good ecological potential and good surface water chemical status.

One of the functions of eco-friendly river banks is the de-nitrification, which is a diffuse pollution coming from agricultural lands. In article 10 of the WFD is the combined approach for diffuse sources laid down. It is stated that for diffuse sources the best available measures must be taken

which are partly set out in Council Directive 91/676/EEC (the Nitrate Directive), concerning the protection of waters against pollution caused by nitrates from agricultural sources.

The focus of the WFD directive is mainly on the improvement of the chemical status of the water bodies. This is one of the goals of eco-friendly riverbanks. However nothing is mentioned on the other goals of the eco-friendly riverbanks itself. In general the aim of the WFD is to come to a good water status with an integrated approach. For surface water, the aim is to reach both a good chemical status and a good ecological status, which indicates what the WFD assigns a good value to the implementation of eco-friendly riverbanks.

### **National**

The overarching national governmental authority is the Department of Waterways and Public Works (DWPW). Also the water basin plans, which is a requirement of the WFD, are on national level. The most relevant national law is the Water Act. The Water Act aims amongst other things, at the protection and improvement of the chemical and ecological quality of water systems (van Rijswick & Havekes, European and Dutch Water Law, 2012). Target values (instead of limit values) are set to the quality standards. The obligation is merely to take account of them when establishing water plans pursuant to the Water Act.

They DWPW makes a division between natural riverbanks and eco-friendly riverbanks. With these eco-friendly riverbanks they want to accomplish cleaner and healthier water, more room for river (decreasing the change for flooding) and a better habitat for animals and plants (Rijkswaterstaat, date unknown). Despite the fact DWPW makes this nice statement on their website, their true discourse lies in their main task: to maintain the water ways and the water defence works. Therefore, creating eco-friendly river banks is mostly only implemented in nature areas, because it is prescribed by EU law to care for nature.

Following the WFD a combined approach of the international Schelde Commission (ISC) resulted in the formation of the paper "Overarching part of the control plan of the international Schelde river basin district (2009)". The emphasis of this paper is on the coordination of the present and future water control between the parties with the focus on sustainable water use (Internationale Scheldec commissie, 2009). The actual eco-friendly riverbanks are only mentioned once in this paper. It is mentioned as one of the measures that must be taken to decrease the effect of hydromorphological changes.

### **Provincial & Water board**

On this governmental level more information and plans are available especially focussing on eco-friendly riverbanks. The value of the province can be found in the document "Wet ecological

connection zones” (Natte ecologische verbindszones). The province sees the eco-friendly riverbanks as an important mean for the ecological connection zones (EHS). It will create extra room for nature, room for water storage, less maintenance to the water courses, a milieu-buffer between agricultural field and watercourse, opportunities for hikers and improvement of the aesthetic quality of the landscape (Nispen & Benschop, 2010).

On the website of the water board Scheldestromen the actual goals and values of the river banks are made clear. The main goal for the water board seems to be giving nature more room because on the part of the transition between land and water the most plants and animals have their habitat. However the second goal for the water board is that the maintenance along the river banks are decreased because less mowing is needed. Also the before mentioned values are mentioned (less pollution from agriculture, decreased flood risk, better ecological state) (Waterschap Scheldestromen, date unknown).

### **Property owners**

The most important property owners concerning eco-friendly riverbanks are the municipalities and the farmers. Not much can be found on the value of eco-friendly riverbanks for municipalities. However, one can think of the added value for recreation and aesthetic. In a brochure which is distributed to the farmers the value of the riverbanks to the farmers is set out (Waterschap Scheldestromen, 2011):

- The river banks ensure that cultivation of the land is possible up till 0.30 meters distance from the water;
- stable banks are safer for farmer with heavy machinery;
- chances of high water decreases because of more water storage
- natural crop protection by the forming of habitat for predator bugs.

However, in an news article other arguments are found: it is stated that farmers are afraid that the water level will rise too high, that the area will attract geese and that the stagnant water will attract potentially harmful insects for their livestock (De Gelderlander, 2013).

### **Other stakeholders**

The shipping sector does not necessarily assign a high value to nature but however prefers eco-friendly riverbanks because problems with natural riverbanks appeared when these banks were not maintained properly. The banks caved in, reducing the depth of the water and reducing the safety of the shipping routes (Koninklijke Schuttevaer, 2012). Eco-friendly riverbanks are more stable banks. Nature organizations see the implementation of eco-friendly riverbanks as a positive development because they adhere to the intrinsic value of nature and biodiversity.

## Conclusion

In table 1 the values of the different actors are summarized. Here it can be seen that, although the values may be different between actors, in most cases they are not conflicting. The big separation can be seen between the dotted line in the table. Above and beneath this sector the main goals are improving the water quality and ecology. The farmers and shipping however do not assign these values to eco-friendly riverbanks because they are more, simply putted, focussed on their own businesses and profits. Therefore, they may not acknowledge the extent and source of the water quality problem. All in all, it can be concluded that there is sufficient knowledge on the different viewpoints, values and principles.

Governmental layer	Related paper / stakeholder	Most important value
International	WFD	Improve chemical and ecological water status.
National	Water Act	Protection and improvement of chemical and ecological water systems.
	DWPW	Improve stability of the riverbanks.
	River basin management plan	decrease the effect of hydromorphological changes.
Province & water board	Wet ecological connection zone's	Room for nature & water storage, milieu buffer, improvement of aesthetic quality of the landscape.
	Water board Scheldestromen	Room for nature, decrease in maintenance.
Land owners	Municipalities	Improvement of recreation and aesthetic value.
	Farmers	Stability of riverbank, however farmers see also the potentially negative influences of the riverbanks on their production.
Others	Shipping	Improve stability of riverbanks.
	Nature organizations	Improvement of the biodiversity.

Tabel 1: Values of the stakeholders

## 3.3 Stakeholder involvement

*“Are all relevant stakeholders involved? Are their interests, concerns and values sufficiently balanced considered in the problem analysis, solution search process and decision-making?”*  
(Brouwer, et al., 2012)

In article 14 of the WFD it is stated that member states must encourage the active involvement of all interested parties. This must be done by the publishing and sharing of a timetable and work programme, an interim overview, and draft copies of the river basin management plans. However, the WFD does not give a blueprint for the implementation of public participation. This

is inherent to the nature of framework directives, as it is the responsibility of EU member states to implement them. In the Netherlands a number of official participatory institutions have been created (Behagel & van der Arend, 2013).

A division of three different descriptors can be made to differentiate what was formally called public participation. These are (i) public communication, (ii) public consultation and (iii) public participation (Frewer & Rowe, 2005). The stakeholders that are most involved in the eco-friendly riverbanks are the farmers. The most used form is public communication. The farmers were informed by brochures and were in fact not consulted or asked to participate when the decision was made to implement eco-friendly riverbanks as a mean to improve the water quality. However, some form of public participation can be seen in the water boards because they consist partly of representatives from different stakeholder groups that are elected by the inhabitants of the water board district: the public. However, this is not direct public participation because the farmers in the water boards are not necessarily the land owners of the land where an eco-friendly riverbank is planned to be constructed.

The farmers are partly represented by the partnership LTO (Land- en Tuinbouw Organisatie) Netherlands. On the initiative of the LTO the Delta plan agricultural water management (Deltaplan Agrarisch Waterbeheer) is created. Here is described how the agricultural sector can contribute to resolve water management problems. In this paper the LTO actually encourages the implementation of concrete measures such as eco-friendly riverbanks.

The most relevant stakeholders in the case of eco-friendly river banks are the farmers. They are not directly involved in the decision making process of the implementation of eco-friendly riverbanks. After this decision of implementation by the higher authorities the relevant farmers are informed on the process.

### **3.4 Trade-offs between social objectives: service level agreements**

*“Are agreed service level decisions based on trade-offs of costs, benefits and distributional effects of various alternatives?” (Brouwer, et al., 2012)*

The services of the eco-friendly riverbanks are the good water quality, the increase in flood storage and the improvement of the aesthetic value of the riverbanks. In fact the farmers, municipalities, water boards and DWPW are paying for these services. The land of the farmers and municipalities is used for the riverbanks, and the water boards and DWPW are paying the farmers and municipalities for their land. Indirectly the inhabitants pay for the riverbanks, because the water boards receive 95% of their income by taxes from the residence of their area. The exact distribution of the costs is dependent on the compensation given to these actors. If for

instance the farmers receive a substantial realistic amount for their property the costs of the riverbank is shifted towards the buyers of the land, the water boards and the DWPW.

According to Rudi Geus, project leader landscape manager of Zeeland, land is not always bought but instead, the water board Scheldestromen gives a yearly financial compensation for using a piece of land from the land owner and sometimes also maintenance of the eco-friendly river banks (Landschapsbeheer Nederland, 2007). This is a mechanism for compensation. The realistic price of the compensation is disputable by the fact that the farmers are in fact also the ones who cause the diffuse pollution of the water courses by their fertilizer regime. Therefore it can be stated that it is the duty of the farmers to give or lend their property for the goal of eco-friendly riverbanks.

One of the alternatives of eco-friendly riverbanks could be a drastic change in the management of the fertilizer regime of the farmers. However, this is not seen as an alternative because it is very likely that they are not open to this because this also means a drastic change in crops and profit. It thus can be stated that as far as the available information gives insight in this, agreed service level decisions are based on a trade-offs between social objectives. However, no or not much various alternatives seem to be provided.

### **3.5 Responsibility, authority and means**

*“Are authorities, responsibilities and means well-organized to deal with water issues at the appropriate administrative scale(s) in a participative and integrative way?” (Brouwer, et al., 2012)*

At first property rights have to be determined to clarify the responsibility of certain measures such as construction and maintenance. A river bank is often at the edge of a private property; a piece land owned privately by e.g. a farmer and less often at the edge of a common property; e.g. an NGO or a municipality or state property, e.g. from the Dutch Forestry Commission. The river water is a state property, either from DWPW or from the water boards depending on if the water way is owned by DWPW or not.

Authorities are needed to restrict the property rights. Sometimes authorities have to give permits to construct eco-friendly riverbanks. Authorities involved in eco-friendly riverbanks are, from decentral to central, the water board (Scheldestromen), the province (Zeeland), DWPW (national) and more from a distance: the EU.

The *water manager* has the responsibility for the implementation of eco-friendly river banks as is imposed by the WFD. Regarding the improvement of water quality and among others the

implementations of eco-friendly riverbanks, the water board Scheldestromen is the water manager, as is imposed by the Water Act. Sometimes the task of water manager is a shared task with the province of Zeeland when the eco-friendly river bank also functions as a riparian corridor (ecologische verbindingszone, EVZ). Besides, taking care of the bigger water ways are the responsibility of DWPW, and the responsibility overlaps actually with the responsibility of the water boards on the banks. It is not clear if this 'conflict' on responsibility and interests occurs in Zeeland and to what extent.

Because softer river banks, especially in meandering rivers, cave in while hard banks do not, the water boards and DWPW are expected to have a shared responsibility here. However, this is not the case. This forms a bottleneck in the process: who is responsible? The question is also if this hampers implementation in the province of Zeeland. No examples have been found yet, but, however, might arise in the future.

The role that is left for private actors is that land owners have the responsibility to manage their fertilizer regime in such a way that it complies with the law, resulting from the Nitrate Directive. It is also possible that the private actor has the responsibility in maintaining the riverbank., e.g. by mowing.

Financial means are regulated through partly a solidarity principle and partly a polluter pays principle. The solidarity principle arises from the fact that 95% of the income from the water boards is coming from the taxes that are paid by every inhabitant of the water board. The polluter pays principle arises from the fact that the farmers "pay" for their pollution by giving, selling or lending their property for the use of eco-friendly riverbanks and by paying a higher tax to the water boards. Finance is regulated per water board. None of the actors has a direct influence on how the financial means are spent.

For the participative capacity as a mean to manage water, decentralized governments are preferable because it can facilitate local participation more easily. Implementation of eco-friendly river banks touches mainly upon the interests of the agricultural sector on the local/regional scale and on those of nature organisations. The water board of Scheldestromen fits this local-regional scale and seems to be ideal for participative capacity. The authorities and means are well organised to deal with the water issues at the appropriate administrative scales in a participative and integrative way. However, responsibilities are not well-organized since these might overlap in some cases, from which a conflict may arise if no agreement on shared responsibilities is set up.

### 3.6 Regulations and agreements

*“Are regulations and agreements legitimate and adaptive, and if not, what are the main problems with regard to the above mentioned legitimacy aspects?” (Brouwer, et al., 2012)*

To determine the legitimacy of the regulations and agreements, according to Brouwer et al. (2012) it is important that (1) it is “based on shared or agreed values and principles” (chapter 3.2), it has to be (2) “in conformity with the rule of law”, in this case the WFD. In addition, it has to (3) offer a “(legal) certainty with regard to rights, duties and accountabilities”, (chapter 3.5). Another point is that it has to be (4) “formulated in a way that they are enforceable and effective”, (chapter 3.8) and (5) “decision making based at the most appropriate level”, (chapter 3.3). To conclude, it should (6) offer “the right mix of public and private instruments for the objective at stake” (chapter 3.5) and (7) “taking distributional effects into account to avoid damage to the water system, other interests and policy fields and in this way avoid conflicts” (chapter 3.9). If the conclusions on the previous criteria were already promising, it should ideally lead to a good implementation which are assessed with the last three blocks (Brouwer, et al., 2012). Some of the abovementioned criteria are already assessed. The assessment of other aspects can be found in the following sections.

Eco-friendly riverbanks are (1) not completely based on only the shared values and principles (see section 3.1). For the second point it can be stated that (2) eco-friendly riverbanks are in conformity with rule of law in a sense that eco-friendly riverbanks are the means to an end (the improvement of water quality) which is prescribed by law (WFD). Besides, it fits within the river basin approach of the Scheldt (Internationale Scheldecommissie, 2009), which is obliged by the WFD as well. Within this research there were no aspects discovered on which this statement can be contradicted. However, (3) certainty is not guaranteed since responsibilities are sometimes overlapping and therefore duties and accountabilities are not always clear. As will be discussed in section 3.8, (4) enforceability is rather weak. (5) Decision making is likely to be based at the most appropriate level as was discussed in section 3.5. (6) From this study it does not appear convincing that a right mix of public and private instruments is available to reach the objective, since something in the process hampers the implementation. (7) Mainly opposing interests might result in conflict situations, as discussed in section 3.9. Overall, (the implementation of) eco-friendly riverbanks is not optimally legitimate and in need for improvements in order to smoothen implementation of this water quality measure.

Concerning the adaptability of the policy of eco-friendly riverbanks, it can be stated that it is very adaptable in a sense that it is neither legally fixed where and when exactly the whole infrastructure of eco-friendly riverbanks will be constructed, nor a “regret-measure”, which

means it has not far reaching consequences and it can be reversed. The goals set are only for a short period. If legal certainty and adaptability are compared and so to say be put on a balance, adaptability would outweigh legal certainty.

### 3.7 Engineering and monitoring

*“Are SLAs sufficient available (implicit or explicit) in order to redesign the existing infrastructure? Are design and consequences of different alternatives sufficient available? Is there sufficient monitoring of the system and are the data analysed?”* (Brouwer, et al., 2012)

The Service Level Agreements concerning this case can be seen as the agreements, after preceding consultation, between the water board and other authorities and stakeholders on the actual implementation of the eco-friendly riverbanks, and the accompanying rules and agreements about land ownership, responsibilities, monitoring and maintenance.

The construction of eco-friendly riverbanks is rather a simple concept from the engineering perspective. How to redesign the existing infrastructure becomes (implicitly) clear from e.g. a brochure provided by the water board Scheldestromen for the farmers (Waterschap Scheldestromen, 2011) and from Annex 6 from the water management plan of former water board Zeeuws Vlaanderen (Waterschap Zeeuws Vlaanderen, date unknown). In some cases agreements on engineering (construction and maintenance, e.g. mowing regime) are made between the water board, sometimes accompanied by the Province or DWPW in case of overlapping responsibility, and the landowner. However, an agreement on the required width and length of an eco-friendly riverbank is not mentioned clearly, while this is of great importance for its success since the size determines its effectiveness (see also 3.1). Besides, compared to a ‘cultural’ riverbank, eco-friendly riverbanks are softer and, as a consequence, more vulnerable to erosion. This important engineering aspect is not dealt with in agreements, but might become of concern after construction.

Design and consequences of different alternatives within the range of different types of eco-friendly riverbanks are to be found, for example in Annex 6 of the water management plan from former water board Zeeuws Vlaanderen. The differences in design and consequences (translated in their goal) are explained. Other alternatives to deal with the excess amounts of nitrogen are however not available. An eco-friendly riverbank is the only measure mentioned for nutrient reduction and water quality improvement by water the water board. For water boards this is the only way within their field of responsibility to deal with water quality with respect to nutrients.

Article 8 of the WFD requires the establishment of a monitoring programme on the water status. Relevant for water quality with respect to nutrients and surface water quality is the second

point for surface waters which requires a programme that covers the monitoring of ecological and chemical status and ecological potential. At the national level monitoring programmes are based on the *Besluit kwaliteitseisen en monitoring water 2009* (decree on quality requirements and monitoring of water) (van Rijswick & Havekes, European and Dutch Water Law, 2012). Monitoring is the responsibility of the water board Scheldestromen. However, monitoring eco-friendly riverbanks, the measure itself, is not straight-forward at all; the linkage between (changes in) water quality and (the implementation of) eco-friendly riverbanks (i.e. the measure-effect relation) is hard to make. This is also acknowledged from a broader scope in an article of Dieperink et al. (2012). The only aspect that can be monitored is the water quality on the nutrients itself. This might declare why nothing can be found on how eco-friendly riverbanks contribute to an improvement on the ecological and chemical status and the ecological potential until now, although not many are constructed (properly) yet, as will be dealt with in section 3.8.

To refer back to the assessment question: The question about SLAs being sufficiently available to redesign the existing infrastructure can be answered by stating that there are some SLAs are supposed to be missing, e.g. on maintenance concerning the potentially caving in of an eco-friendly riverbank and on the required length and width. Alternatives in design and its consequences are sufficiently addressed in the water management plan of Zeeuws Vlaanderen. It is rather impossible to monitor the (direct or indirect) effectiveness of eco-friendly riverbanks. It would therefore be unfair to state that monitoring is insufficient because of this, because it is mainly caused by a lack of knowledge on the measure-effect relation.

### **3.8 Enforcement**

*“Are regulations and agreements enforceable by public and/or private parties, and are there appropriate remedies available?”* (Brouwer, et al., 2012)

If from monitoring can be deducted that there is insufficient execution of tasks or goal achievement, intervention by means of enforcement is desirable. But is this also possible? As a first step to see if enforceability is an urgent need, a closer look will be taken on the implementation of eco-friendly riverbanks by water board Scheldestromen. Its annual reports give insight in what has been realized and what is yet to be done. In 2011 6 km of eco-friendly river bank was constructed in the province of Zeeland. In 2012 another 4 km was added. As is stated in these reports, this is much less than planned. The total of over 100 km is far from reached, while the due date is 2015. The supervising authority, the province of Zeeland, might face a lack of enforceability and/or a lack of remedies.

In first place it is important to mention that water quality standards and the effort to comply with the standards are enforceable, while eco-friendly riverbanks as a measure are not. Secondly, it is important to mention that construction, maintenance and corresponding responsibilities could be made more enforceable on a basis of agreements. After all, it is a prerequisite for a rule being enforceable is that it is known which parties have which responsibilities and if those parties are accountable for what they do (not) with respect to eco-friendly riverbanks. As concluded in section 3.5, responsibilities concerning eco-friendly riverbanks are not always clear. The origin may lie both in regulations and (a lack of) agreements and it hampers the enforceability of regulations. Remedies are, as a consequence, also not sufficiently available. However, the water board has the power to charge a policy of tolerance for constructing an eco-friendly riverbank on a private property in case a land owner objects to sell his land. This process is time consuming and thus delaying implementation. All in all, enforceability of regulations and agreements on eco-friendly riverbanks as a measure seems rather weak.

### **3.9 Conflict prevention and resolution**

*“Are there sufficient conflict prevention and resolution mechanisms in place?”* (Brouwer, et al., 2012)

A conflict can arise where responsibilities are not clear, especially where the border between property rights (and authorities) are vague. Currently agreements between water boards and DWPW do not yet exist in case of overlapping responsibilities (see also section 3.5). A good example is of an eco-friendly riverbank which was constructed by the water board and resulted in a damaged dike, which is maintained by DWPW. In this case it is still not clear who will have to pay for the repair costs of the dike (W. van Doorn-Hoekveld, personal communication, June 2013).

As concluded in section 3.2 there are divergent values assigned to the importance of water quality between the water board (reflected by their responsibilities and tasks concerning water quality) and the farmers. These different values are a breeding ground for conflicts on land use for eco-friendly riverbanks. The question is whether there are sufficient mechanisms available for conflict prevention and/or resolution.

In general the impression is that concerning the implementation of eco-friendly riverbanks in the province of Zeeland there is an effort made in preventing conflicts because of the attempt to inform stakeholders (see section 3.3), to be transparent, responsive and following the rule of

law. Also, agreements on construction and maintenance (e.g. by providing financial means to farmers for mowing) help in conflict prevention.

When an agreement between the water manager and the land owner cannot be accomplished, article 5.24 in the Water Act provides that it is possible to charge a policy of tolerance for the construction of an eco-friendly riverbank at the private property. A prerequisite is that the water manager has made an effort of achieving an agreement with the land owner (Rijkswaterstaat, 2011). This is made possible because the eco-friendly riverbank as a measure implicitly includes the goal to improve the ecological state of a surface water body. After the policy of tolerance is announced by the water manager, there is a period of six weeks in which the land owner of concern can write a letter of objection to the water board. If this is denied, the land owner can go to the court. In this situation, judgment in the conflict situation might be effectuated. Besides this one, there is no alternative dispute resolution mechanism found.

In contrast, effectuation of judgment is not easy in case of unclear responsibilities. This is not to be solved by alternative conflict resolution methods afterwards but should be prevented. From this last point it becomes clear that conflict prevention is not sufficient in the field of eco-friendly riverbanks and that improvements should be made on clearness on (shared) responsibilities amongst the different involved parties.

## **4. Conclusion and discussion**

### **4.1 Conclusion**

The main question of this paper was whether the water management and governance concerning eco-friendly riverbanks in the province of Zeeland is of sufficient strength. The 9 building blocks from the assessment method from Brouwer et al. (2012) were used to give an elaborated inside on the policy of the eco-friendly riverbanks. These building blocks cover three main dimensions of the policy assessment: content, organization and implementation.

The dimension of content covers the *water system knowledge*, *values principles and policy discourses*, *trade-offs between social objectives* and *engineering and monitoring*. There is elaborated knowledge available on the efficiency of eco-friendly riverbanks. However is not clear if this knowledge is used by the water boards in the implementation of the riverbanks in Zeeland. Thereby, it seems impossible to measure and monitor the effectiveness of eco-friendly riverbanks. The main value that is given to the riverbanks are the improvement of the water quality. In some cases there are some value differences (particularly with respect to water quality) present, but these do not always conflict with each other. However, in the case of

farmers that are focussed on profit, the values may be conflicting. Because of the lack of realistic alternatives no good trade-offs can be made. There are not always sufficient agreements on the engineering and monitoring of the eco-friendly riverbank. This is still a shortcoming in the content part of the policy design of eco-friendly riverbanks.

The dimension of organization covers the building blocks of *stakeholder involvement, trade-offs between social objectives, responsibility authority and means* and *regulation and agreements*. The most relevant stakeholders, the farmers, are informed in the process but not consulted or asked to participate. There is no clear regulation on responsibilities of maintenance and damage repair, which can create conflict situations. The financial means are regulated through a solidarity principle and a polluter pays principle. Overall, (the implementation of) eco-friendly riverbanks are not highly legitimate and in need for improvements in order to smoothen implementation of this water quality measure. All together it seems that the organization in the policy design of eco-friendly riverbank still have some shortcomings and could use improvement.

The implementation dimension covers the *engineering and monitoring, the enforcement and conflict prevention and resolution*. The engineering requirements are quite just like the possible alternatives designs. Water quality on itself is enforceable. However, the eco-friendly riverbanks are seen as a means to a goal and are not enforceable by itself. As a consequence of the lack of agreements and rules, there is also a lack of remedies. Because of overlapping and unclear responsibilities by multiple actors, there is a risk of development of conflicts. On this moment there are no clear conflict resolution mechanisms.

It becomes clear that there are still multiple shortcomings in the policy design of eco-friendly riverbanks in the province of Zeeland, but probably also in the Netherlands in general. The most striking bottlenecks or signs are that implementation is behind time schedule since too less eco-friendly river banks and sometimes too narrow/short eco-friendly riverbanks are constructed. This undermines the effectiveness of the measure and it is very likely that the needed improvement of the water quality will not be reached by 2015. Besides, there is insufficient monitoring and know-how of measure-effect relations and a breeding ground for conflicts is that there is not always clear allocation of responsibilities. Room for improvement is possible in all the three dimensions, the content, the organization and implementation as will be given in the following section. It can be concluded that the water management and governance concerning eco-friendly riverbanks in Zeeland and probably also in the remaining part of the Netherlands is not of a sufficient strength.

## 4.2 Discussion

### The assessment method

The assessment method was developed for the assessment of the (1) main gaps in the knowledge base, (2) weaknesses in the organisation process, and (3) problems that may arise when implementing the agreed service level. The nine building blocks that cover these three main dimensions are sometimes overlapping and impossible to be followed in chronological order. For example, building block 5 requires to assess legitimacy, while some legitimacy aspects have to be assessed still on that moment, such as the fourth criterion on enforceability and effectiveness. Judgment on legitimacy might be best at the end of the assessment. Besides, the assessment method is not very straight-forward in a sense that criteria are susceptible to misinterpretation. However, careful study can diminish this. Despite a few imperfections it appears to be a suitable method for the assessment of the policy of eco-friendly riverbanks which can help revealing many strengths and weaknesses. The nine building blocks help to get grip on the complexity of law, policy and governance in water management, while covering a very broad range of aspects; it is experienced as a very comprehensive assessment method.

For the assessment made for eco-friendly riverbanks very specific information was used. For instance, on stakeholder involvement, only one brochure was found as an evidence. Due to time and resource restrictions the necessity to make an assumption arose, namely that this was the one and only way stakeholders were informed. Such an assumption increase the uncertainty of this analysis on this aspect.

Although the mentioned bottlenecks such as responsibilities in construction and maintenance which are not always clear, another point of discussion is that it might be the lack of political willingness to improve the water quality as was observed from a broader scope by Dieperink et al. (2012). This is something that does not arise from using the assessment method, while it might be a plausible reason in the case of eco-friendly riverbanks as well.

### Suggestions for improvement of the policy design

There is a need for clearness about the allocation of (shared) responsibility. This could help to prevent conflicts that delay the process of implementation. Therefore, it is recommended to make clear Service Level Agreements on who can be held responsible for construction and maintenance of eco-friendly riverbanks. Besides, it might also help to improve the "Waterregeling" as part of the national Water Act, since this includes the legal responsibilities and

property rights of authorities. Both options result in more accountability on construction and maintenance, so that eco-friendly riverbanks are more likely to be implemented sufficiently.

Besides, because the process of implementation is still too often hampered by a lack of willingness of land owners to sell or 'loan' the riverbank of their land, further increase in cooperation with these land owners, often farmers, is needed. Water managers and land owners are inevitably interdependent on each other. A mediating party, a diplomat-like person or organisation, could help creating a constructive relation between water manager and land owner.

The eco-friendly riverbank approach is more an end-of pipe solution instead of tackling a problem at the source. Since both the effect and the adequate implementation of eco-friendly riverbanks are doubtful, exploration of possibilities for precautionary and prevention approaches is recommendable. Thus, a (partly) shift from end-of-pipe solution towards source solution is recommended. An amendment of the Nitrates Directive, a legal instrument, by for example intensification of maximum allowed values and/or improved efficiency in manure application could provide a way out.

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