Are the regional water authorities assessments of the impacts of small hydraulic systems on water quality in accordance with the European Water Framework Directive

Universiteit Utrecht

waterschap Hollandse Delta

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Name: Edwin de Jong
Student number: 6566782
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Supervisor: Dr. Carel Dieperink
Second reader: Prof. dr. M.J. Wassen

Foreword

Before the report started I would like to thank a few people. In the first, place I want to thank the regional water authority Hollands Delta in the person of Erik Willemse en Piet Schakel for giving me time and resources for conducting this research. Furthermore a want to thank all the employers of the water authorities that helped me with answering the interview or questioner. Besides that I want to thank the second readers: Guus de Jong, Christa van Oorschot and Lieske de Wit. Last but not least I want to thank Carel Dieperink for his feedback and clarity he brought into this research.

Summaries

English summary
According to the Water Framework Directive (WFD) and the Weser arrest, it isn't allowed to cause any degradation of the water quality. This rule is challenging for regional water authorities and raises the following question:

To what extent does, the practice of assessing and addressing the impacts of small hydraulic structures on the water qualities by the regional water authorities, meet the standards set by EU law?

To answer this question, the following steps are taken. First an framework is created, which is used to analyses the assessment practice of the regional water authority Hollandse Delta (WSHD). In order to find out whether the practice of the WSHD is representative for all regional water authorities the results of the case study are translated into survey statements and questions. Most of the regional water authorities reacted on the survey.

In the analytical framework water quality has been defined. Water quality consist out of two categories: the chemical component and the ecological component. This definition is used by the EU in the WFD. Monitoring water quality is taking place in designated WFD waters that represent a larger water system. How to monitor is described in the WFD documents and is translated by the STOWA in the nine ecological key factors. In a water system several kinds of small hydraulic structures can be created, all of these small hydraulic structures may have negative effects on the water quality.

The case study shows the effect that small hydraulic structures have on water quality but how this can be assessed is barely described in policy documents of WSHD. There is only stated that no significant degradation is allowed. There is a new policy document of the WSHD coming, which states that the water quality may not be reduced. Clear strategy for assessing impacts of small hydraulic structures on the water quality however is missing. This cause some challenges that the WSHD faces like how to act on the contradiction between the current and the new policy documents.

The survey reveals that most regional water authorities struggle with the same question of how to assess the change in water quality caused by the construction of small hydraulic structures.

The conclusion, the assessing and addressing of small hydraulic structures is done to a limited extant and therefor the standards by the EU are met with a limited extant.

Dutch summary
Volgens de Kade richtlijn water (KRW) en het Weser arrest, is het niet toegestaan om de waterkwaliteit te verslechteren. Deze wetgeving is een uitdaging voor waterschappen en roept de volgende vraag op:

In hoeverre worden, de effecten en de invloeden van kleine waterstaatkundige werken op de waterkwaliteit geborgd bij de waterschappen, om aan de standaarden van de EU wetgeving te voldoen?

Om de vraag te beantwoorden, worden de volgende stappen ondernomen. Eerst wordt er een kader gecreëerd, welke wordt gebruikt om de beoordelingen van handelingen van het waterschap Hollandse Delta (WSHD) te analyseren. Om te achterhalen of de handelswijze van de WSHD representatief is voor de andere waterschappen worden de resultaten van deze casus vertaalt in een enquête met daarin stellingen en vragen. De meeste andere waterschappen hebben gereageerd op deze enquête.

In het analytische kader water kwaliteit is gedefinieerd. Waterkwaliteit bestaat uit twee componenten: de chemische component en de ecologische component. Deze definitie wordt gebruikt door de EU in de KRW. Het monitoren van de waterkwaliteit gebeurt in de aangewezen KRW wateren, welke een groter watersysteem representeren. Hoe de monitoring moet plaatsvinden staat beschreven in de KRW documenten en is vertaald door de STOWA in de negen ecologische sleutelfactoren. In het watersysteem kunnen verschillende soorten kleine waterstaatkundige objecten worden gecreëerd, al deze objecten kunnen een negatief effect hebben op de waterkwaliteit.

De casestudie laat zien dat de effecten die kleine waterstaatkundige objecten hebben op de waterkwaliteit nauwelijks is beschreven in het beleid van de WSHD. Er wordt slechts benoemd dat er geen significante achteruitgang mag zijn van de waterkwaliteit. Er komen nieuwe beleidsdocumenten welke stellen dat de waterkwaliteit niet achteruit mag gaan. Een heldere strategie voor het beoordelen van de waterkwaliteit in relatie tot kleine waterstaatkundige objecten ontbreekt. Dit zorgt voor een aantal uitdagingen, zoals de contradictie die gaat ontstaan tussen bestaand beleid en het komende beleid.

De enquête bij de andere waterschapen laat zien dat de meeste andere waterschappen ook worstelen met hoe om te gaan met de beoordeling van kleine waterstaatkundig objecten in relatie tot waterkwaliteit.

Concluderend, de beoordeling van kleine waterstaatkundige objecten wordt slechts beperkt gedaan waardoor er ook maar tot een bepaald niveau aan Europese standaarden wordt voldaan.

Content

1 Introduction

1.1 Water quality goals

Citizens, nature and water using industries all need clean water from rivers, lakes and groundwater to function (European Commission, 2021). Maintaining a good water quality and preserving its ecology and chemistry is therefore important. Good chemical water quality is important to make water suitable for the production of safe drinking water, while a good ecology is important to provide ecosystem services like a good and sustainable fish stock (Schumacher, 2011). Therefore, we must treat water in the best way possible. However, in the past decades water quality has decreased all over the world. These problems were already addressed in the famous book *Silent Spring* by Rachel Carson in the sixties. This book spread awareness about the consequences of bad water quality. Something has to be done to improve water quality chemically and ecologically, to prevent ecological disasters like Berkeley Pit, where contamination from a mine created a toxic lake (Berkeley Pit History, n.d.). The problem with degradation of water quality and ecology is that it is not a suddenly appearing event, but rather a gradual process. As a consequence, the baseline and awareness for a good water quality shifts downwards in a gradual process. This effect is called the *shifting baseline effect*. This resulted in not addressing the problems adequately, enabling it to become a serious and sometimes irreversible problem (Dayton, 1998). This changed in 1986, when a fire in a chemical factory in Switzerland resulted in the leakage of chemicals in the river Rhine. It caused the river to turn red and killed almost all of the fish (Hoogweg, 1987). This was a wake-up call for society to emphasize the importance of water quality and European Directives like the *"Directive for Integrated Pollution and Prevention Control (IPPC)"* (1996) and the "Water Framework Directive" (2000) were developed (European commission, 2019).

1.2 The Water Framework Directive

In the year 2000 the Water framework Directive 2000/60/EC (WFD) was introduced, as a legally binding European water quality legislation. Its purpose is to effectively cope with the increasing internationalization and complexity regarding the water quality management in the European Union (EU). The WFD has profound effects on decision making on water policy in the EU (Kaika, 2003). The aim of the WFD is to create good water quality and ecology in all the waterbodies of the EU member states by 2027. To achieve this deadline, three management cycles were introduced by the EU, as well as a framework for assessing the status of water bodies. In management cycles of six years each, starting at 2009, water quality is evaluated and adjusted by the water authorities and the EU (Gudde, 2018). The assessment framework is split into two parts, a chemical framework and an ecological framework. Each with different parameters that are categorized accordingly. Also a differentiation is made between types of water (rivers, lakes, transition waters and coastal waters), for each type a specific set of parameters is developed. The second management cycle ends this year (2021), but the goals that were set in 2000 are still out of reach despite all efforts (Moss et al, 2020). Every member state of the EU is responsible for implementing the WFD and reaching the targets. In the Netherlands, water management is assigned to specific organizations: the national water authority (Rijkswaterstaat) and 21 regional water authorities (waterschappen). The burden of the WFD is mostly vested by the regional water authorities as they are responsible for clean and sufficient water in the water system with the exception of the big rivers and waters like the Ijsselmeer and the North Sea where the national water authority is responsible (Waterschappen, n.d.). In figure 1 the area of the regional water authorities is shown. In the water system of the regional water authorities small hydraulic structures, like culverts, bank protections or weirs, are placed to facilitate all kind of functions, like managing the water level. These structures influence the water quality in their own way.

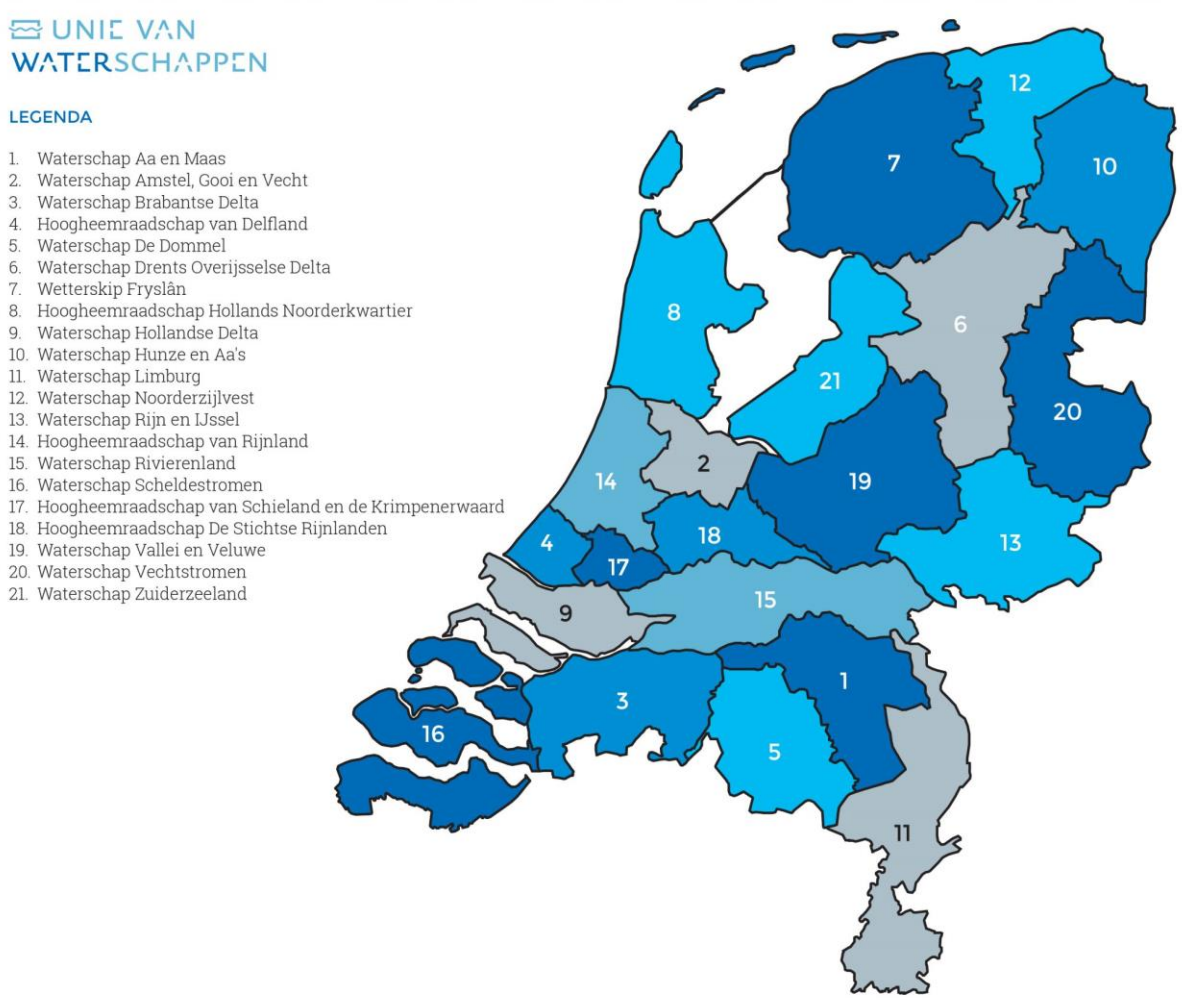

Figure 1 area of the regional water authority (kiesraad, 2021)

1.3 Addressing changes in water quality

Surface water provides all kinds of services, like for example recreation, ecology, irrigation and transport. All these functions have different needs and interact with each other. Interaction between services can create a net positive or a net negative effect on other services. For instance, dredging a waterway to improve transport capacity is beneficial for transport but a disadvantage for the ecology.

The above mentioned problem regarding the trade-off between economic gain and ecological loss is also addressed in the ruling of the Court of Justice of the European Union in case ECLI:EU:C:2015:433, from now on the Weser Arrest. In this case the river Weser was dredged to make the harbor accessible for large container ships. This dredging influenced the ecology in a negative manner. This case was brought to the European court of justice in 2014 by a German nature organization which claimed that this dredging was against the WFD. The court agreed on this. The ruling of the court of justice of the European union was as follows: *"to refuse authorisation for an individual project where it may cause a deterioration of the status of a body of surface water or where it jeopardises the attainment of good surface water status or of good ecological potential and good surface water chemical status by the date laid down by the directive."*. This implies that if a project decreases a parameter in the WFD, it is not allowed. Or as the court of justice of the European union puts it *"The concept of 'deterioration of the status' of a body of surface water in Article 4(1)(a)(i) of Directive 2000/60 must be interpreted as meaning that there is deterioration as soon as the status of at least one of the quality elements, within the meaning of Annex V to the directive, falls by one class, even if that fall does not result in a fall in*

classification of the body of surface water as a whole. However, if the quality element concerned, within the meaning of that annex, is already in the lowest class, any deterioration of that element constitutes a 'deterioration of the status' of a body of surface water, within the meaning of Article 4(1)(a)(i).", which means that, when the water body has the lowest level of water quality possible, according to the WFD no project that lowers the water quality even more is allowed (court of justice of the European union, 2015). This ruling has far reaching consequences, because it is legally binding to the whole of the EU.

1.4 Knowledge gap

There is a lot of research conducted regarding the WFD. In the year 2009 there were already over 1.900 papers about the WFD (Birk et al, 2012) and in 2020 it was over 6.000 (Scopus, 2020). However, if this search term is further finetuned by including "water authorities" or "waterboard" and "Netherlands" only three papers can be found. Of these three only one is published after the Weser arrest. This published paper clarified the strengths and weaknesses of the Dutch approach to the WFD (van Rijswick et al., 2016). It is clearly shown in this paper that there are gaps in the knowledge on how to deal with the WFD. Currently a net-loss approach is followed in the Netherlands where a single project may cause a decline in water quality provided that this will be compensated in a programmatic way. The problem, however, is that a single project according to the Weser arrest is not allowed to cause degradation. How the water authority deals with this is unknown. As well as it is unknow what the consequences of this approach are and how to cope with this threat of not compiling with the Weser arrest and not meeting the goal of the WFD by 2027.

1.5 Research aim and questions

The aim of this research is to reduce the knowledge gap and to make recommendations to improve the approach of water quality. To do this the following main research question will be answered:

To what extent does the practice of assessing and addressing the impacts of small hydraulic structures on the water quality by the regional water authorities meet the standards set by EU law?

The main research question is too broad for one answer. For this reason this main question is divided into seven sub questions. These seven questions are divided into three phases, of which the first phase is to create an analitical framework, the second phase is a case study how the water authority Hollandse Delta is coping with small hydraulic structures and the third phase is a verification how other water authorities in the Netherlands cope with this same problem. This is all visualized in figure 2.

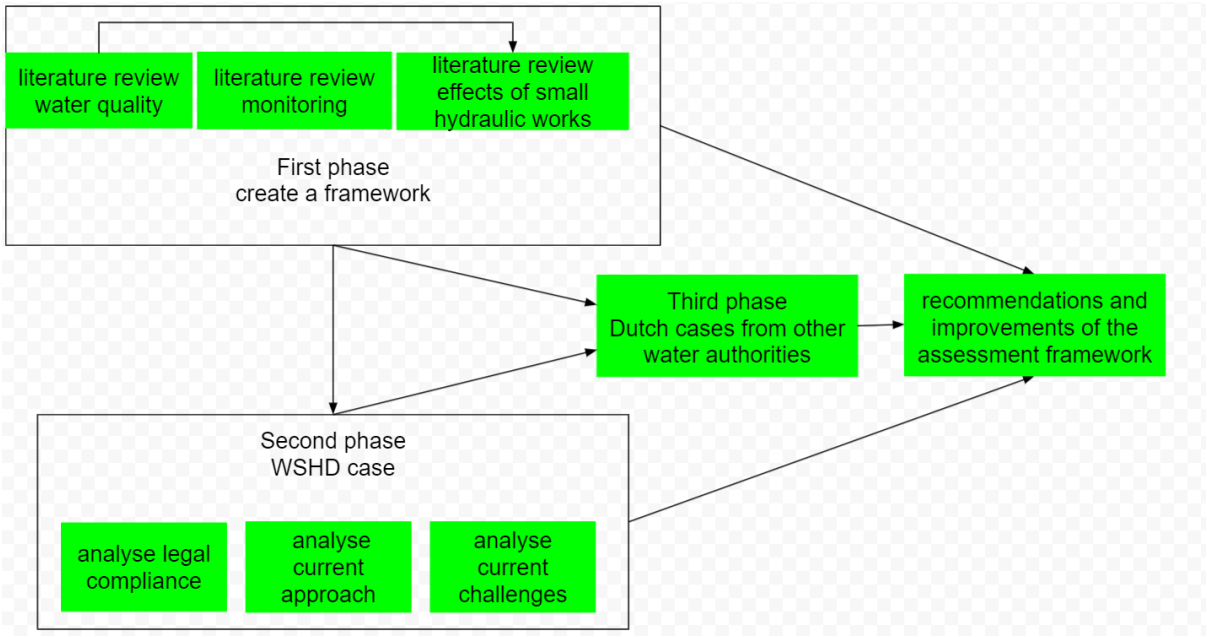

Figure 2 Research framework

Summed up these seven sub questions and phases are:
Phase one, analytical framework

1. How is water quality defined in literature and EU regulation?
2. What monitoring requirements are set in EU regulation?
3. What possible impacts can small hydraulic structures have on water quality?

Phase two, case study

4. In what manner does the WSHD determine effects of small hydraulic structures on the water quality?
5. What challenges does the WSHD face regarding the assessment of small hydraulic structures and water quality?
6. Does the assessment practice of WSHD meet the standards set in EU law?

Phase three, perceptions of other water authorities

7. Are the findings from the case study representative for other RWAs?

1.6 Overview of the report

In chapter 2 the analytical framework is presented consisting out of three parts. The first part is about what is water quality 2.2, the second part is about how this is monitored 2.3 and the third part is about the effects of the creation of small hydraulic structures 2.4. In chapter 3 the method on how the empirical research is conducted is shown. In chapter 4 the case study is presented, this study started with how the WSHD deals with small hydraulic structures 4.2, after this the challenges of the WSHD will be discussed 4.3, last part of the case study is to see if the WSHD comply with EU regulation 4.4. In chapter 5 the results for the other regional water authorities are shown and how they deal with small hydraulic structures. Chapter 6 is the discussion and the conclusion, here the limitations are shown and the answers to the main research question.

2 Analytical framework

2.1 Introduction

In this part three topics will be discussed: what is water quality, how is it monitored and how do the creation of small hydraulic structures effect the water quality. This all to create an analytical framework about this topic, where the rest of the report is founded upon.

2.2 How is water quality defined in literature and EU regulation?

To answer this question, English and Dutch written academic papers, the contents of the WFD and related EU reports as well as documents of the STOWA will be reviewed. The STOWA is a renowned research institute by and for the water authorities of the Netherlands (STOWA, n.d.). Scopus and Google Scholar are used as search engines to find the specific papers. Within these search engines (combinations of) the following search terms are used: "water quality", "assessing" and "surface water" with the Boolean search command AND. After the academic papers the WFD and related reports or documents are reviewed to answer the same sub question. The related reports or documents must be published by the European Union or European Commission or the reports must be commissioned by the European union or European Commission. The used search engines are: https://www.google.nl/, https://europa.eu/ and https://ec.europa.eu/. Here the same search terms are used with the addition of "Water framework Directive". After the WFD documents, documents from STOWA are reviewed. The search engine used here is https://www.stowa.nl, the same search terms are used as in the previous parts. Only here the search terms are in Dutch, as STOWA is a Dutch organization that publishes their documents in Dutch.

The definition of water quality varies per topic, for instance drinking water and surface water have different definitions of water quality. The following definition could fit them both: *"Water quality is a measure of the condition of water relative to the requirements of one or more species and/or to any human need or purpose."* (Johnson et al., 1997, pp. 587). For our purpose three different characteristics will be leading: chemical, physical and biological (Johnson et al., 1997). Because of the different purposes of the water, different standards are created (Daniels et al., 2009). These standards do not only differ for the purpose, but also from the location. The location could be the Netherlands or the United States, or within a country, from marine water to fresh water lakes. In this report the focus is on the water quality of fresh surface water. This is because this is the most common water type within the Netherlands.

To determine the water quality of surface water there are a lot of parameters to pick from, this makes it difficult to determine the water quality (Katyal, 2011). Furthermore, different agencies use different methods of determining the water quality (Katyal, 2011). This complicates the process of determining the definition of water quality.

According to Karr & Dudley (1981), there are four factors contributing to the water quality in the surface water. These factors are:

- energy dynamics, this is the temperature, but also the amount of sunlight on the surface water;
- flow regime;
- habitat structure;
- water quality, the amount of nutrients and sediment.

Sargaonkar & Deshpande (2003) stated that every agency, has developed their own standards for the different water usages. An overarching topic for these standards are the effects on human health, vegetation and the quality of life. The standards also delivers a guide in what substances are allowed in the water. Especially when it is shown that these substances harm the aquatic life. The different agencies also have clear distinctions between them. Some use target values while other agencies use acceptable levels of a given compound. Furthermore, the selection of parameters for measuring the water quality is different for each agency.

Some agencies have simplified the water quality to a single value (Abbasi, 2002). This is the so called Water Quality Index (WQI). It helps to make the assessment of water quality more transparent. The WQI started with ten parameters, and in the mid-twenties it was adapted and expanded over the following years (Horton, 1965). Brown et al. (1970) expanded this list to eleven parameters which were proven important for determining water quality. These parameters are: dissolved oxygen, biochemical oxygen demand, turbidity, total solids, nitrate, phosphate, pH, temperature, fecal coliform, pesticides and toxic elements. For all the different circumstances, agencies and time the WQI had to be made specific for that situation. This has resulted in many parameters that could all be analyzed into a single score (Poonman, 2013).
Due to the large number of parameters that are used, it is difficult to compare different surface waters with one another. Some effort is done to make one standardized WQI for different circumstances (Katyal, 2011). The WQI's are useful to make sense of complex data, however, experts are needed to get a better understanding of these numbers mean (Gitau, 2016). Abbasi & Abbasi (2012) concluded that there are six major benefits of the WQI:

1. Resource allocation, it is easy to determine efficient allocation of funds;
2. Ranking of allocations, is useful to compare water bodies with one another across locations and geographical areas;
3. Enforcement of standards, it gives the enforcer the possibility to see if standards are met and if enforcement is needed;
4. Trend analysis, to see how the water quality is changing over time and where problems are occurring;
5. Public information, the index is easy to understand for the public, so it is clear what the water quality is on a day to day basis;
6. Scientific research, it is useful to determine the effects of particular measures and make the result uniform.

There are a lot of different ecosystems, and every ecosystem has its own specific parameters to determine the water quality. For every small type of ecosystem, a different scheme could be tailored to determine the water quality. It is not possible to create one scheme that fits all. In a very specific situation of a shallow lake 28 variables are needed to reliably determine the water quality (Moss et al., 2003). This shows how much different parameters are available to choose from, for an agency to determine the water quality.

Seasons have a profound influence on the water quality (Ouyang et al., 2006), as are the climate parameters (Prati et al., 1971). This means that the water quality is depending on the season as well as the climate. This has to be addressed when indicators are determined and when monitoring data is compared.

Another important factor that influences the water quality is the surrounding land use. Which means that, for example urban areas or agricultural areas will influence the water quality in a different manner. This is due to the quality of the runoff water that comes from these areas (Boyacioglu, 2006).

The WFD is within the EU the leading legislation regarding water quality. In this legal document water quality is unfortunately not clearly defined. However, in the WFD there is spoken of "a good ecological status and a good chemical status" (European commission, 2019). With these two the water quality is defined. To determine a good ecological status, the WFD distinguishes a few types of so-called ecoregions. For every region the meaning of good water quality is slightly different. These ecoregions are: rivers, lakes, transitional waters, coastal waters and the heavily modified or artificial water bodies. For every ecoregion there is a system A and B with different parameters to determine what kind of system it is. To determine the water quality, the assessment is put in a framework. Within this framework there are four categories: general, biological quality, hydromorphological quality and physical-chemical quality. The assessment criteria for each ecoregion are different, with the exception of the general category, which applies to all ecoregions.

Every assessment criterium is divided into three classes: high, good and moderate status. To elaborate on what these classes mean, the general category that is applied on all ecoregions and is further explained.

- For a high status, there are no or very limited anthropologic changes in the water quality elements for the specific type of ecoregion in comparison to the normal undisturbed state. The biological quality elements for the surface water are undisturbed and there are limited to no signs of disturbance.
- For a good status, the biological quality elements show little disturbance from human activities and only deviate slightly from the normal ecoregion in undisturbed state.
- For a moderate status, the biological quality elements show moderate deviation from what is considered normal for the specific ecoregion. The ecoregion shows moderate human activities in comparison with the good status.

From earlier classification it is clear that the ecoregions are important to determine whether the water quality is good. A total list of the criteria is listed in annex V of the WFD (Europese Gemeenschappen, 2000). The rest of the categories follow a similar pattern.

For defining good chemical status the WFD has a separate classification system, this system applies to all ecoregions. This is determined by five preexisting EU regulations/directives (Europese Gemeenschappen, 2000). These five are:

1. The Mercury Discharges Directive
2. The Cadmium Discharges Directive
3. The Mercury Directive
4. The Hexachlorocyclohexane Discharges Directive
5. The Dangerous Substance Discharges Directive

For all of the above it is a pass or fail principle: if they all pass the water chemistry is good, if one fails the water chemistry is not good. With these two combined the water quality is determined and evaluated.

The STOWA created a tool to assess the water quality. This tool is the ecological key factors (EKF), of which an overview is shown in table 1. In this tool there are nine main criteria for assessing the water quality.

EKF 1	Production of water
EKF 2	Light climate
EKF 3	Productivity of the soil
EKF 4	Habitations suitability
EKF 5	Migration
EKF 6	Removal
EKF 7	Organic loads
EKF 8	Toxicity
EKF 9	Context

Table 1 Ecological key factors (STOWA, n.d.)

The basic inputs for this tool are productivity of the water, light climate and productivity of the soil (STOWA, n.d.). The productivity of water is the amount of phosphor and nitrogen in the water, this can cause algae bloom which has negative effects on the water quality. Productivity of the soil is the amount of phosphor in the soil, too much of this is harmful for aquatic life (Zuidam, 2013). Light climate is the amount of light that reaches the bottom of a water body, which is crucial for plant growth on the bottom of the water (Schep et al., 2015).

Supplemental to the previous factors there is habitations suitability, migration and removal. In the habitations suitability the following parameters are: depth, slope, water level fluctuation, waves and current, substrate density and substrate type are used. These are all important for the settlement of flora and fauna (Cusell & Teurlincx, 2018). The migration involves how well the flora and fauna can travel through the water system (Haterd et al., 2018). Removal is the method of

how and when the water system is maintained and dredged. This has huge influence on the growth and spread of plants and animals (Teurlincx et al., 2018).

Some factors are very specific for the water system and surroundings. These factors are organic loads and toxicity. The organic load is all organic matter that ends up in the water system. This could be for example from sewage water or leaves, and an excess of this could lead to a rapid use of oxygen which will cause oxygen deprivation. Mostly this is only for a short time and local, nevertheless it is very destructive for the ecology (Tanis et al., 2018). Toxicity is according to the STOWA a difficult parameter to determine. This is because, not for all substances it is known how toxic they are and only a limited amount is tested according to the WFD. Therefore, there are two tracks in this factor: the chemical track and the toxicology track. The chemical track looks at what effects a certain element could have, toxicity looks of the combinations of elements and their effects (Posthuma et al., 2016).

The last factor is context. This one is aimed to look for all the other actors and to create co-operative solutions for the earlier mentioned factors to create a win-win situation for all parties (Bodegom et al., 2018).

2.3 What monitoring requirements are set in EU regulation?

The previous paragraph, was about water quality and how it is determined. It is confirmed that the different entities, define water quality in different ways. Without monitoring it is unclear what the water quality is. In this chapter we take a look at how the water quality can be monitored.

To do this the same approach will be used as in the previous question. With some minor adjustments. Here the search terms are different, the following search terms are used: "monitoring", "requirements" and "water framework directive". Here the Boolean search command AND is used. Furthermore, the secondary search terms with the Boolean search commands OR is used. These search terms are extrapolated from annex V of the WFD and are: "biological quality elements", "hydro morphological quality elements" and "physico-chemical quality elements".
Then the WFD and the related documents are studied using the search terms: "monitoring" and "requirements". Here the Boolean search command AND is used. Only the documents as described in the previous question are used, as well as the same search engines.
For the last part of this sub question documents from the STOWA are reviewed. Also, here the same search terms and the Boolean search commands are used.

There are various methods to monitor the water quality, and each has its pros and cons. For example, remote sensing in combination with geographic information systems (GIS) for the monitoring of water quality can be used. This method uses the following parameters: suspended matter, phytoplankton concentrations, turbidity and dissolved organic matter (Usali & Ismail, 2010). In combination with historic data this method can make a good prediction for the hydromorphological quality. This indicator is easy to use (Raven et al., 2002). Unfortunately, not all the water quality parameters can be addressed by this method. Determining the chemical compounds in water is also important, as is pointed out by Brown et al. (1970). To monitor chemical water quality a laboratory analysis must be done to gain insight. The method in the laboratories is mostly standardized, which makes good monitoring and comparison possible (Coquery, 2005). Biological water quality parameters can be found by using a site specific macroinvertebrate fauna to determine the stresses in the environment (Wright et al., 2000). For good monitoring a water quality monitoring plan (WQMP) needs to be made, which consists of eight parts according to Bartram & Balance (1996). These are:

1. what is the objective of the monitoring?
2. determine the sampling sites or network
3. selecting the parameters
4. select monitoring frequents
5. determine resources (human, technical and finance)
6. prepare logistics
7. identify information diffusion
8. assessment if information will be used.

Even with this plan for monitoring the water quality, it is a challenge, as Behmal et al. (2016) point out in their literature review. They researched multiple guidelines, handbooks and papers regarding this subject and found that there are a few key components that aid the water manager. The key message is that there is no one size fits all WQMP but a diverse set of tools that must be used. In this toolbox expert knowledge is required in combination with a decision support system that helps the water manager. This can be a complicated system or just a simple flow diagram that supports decision making.

In article 8 of the WFD it is stated that a monitoring plan needs to be created. This is needed to create a good picture of the water quality. In total there are three types of monitoring determined by the WFD.
Surveillance monitoring, which provides the basic needs for the river basin management plans;
O*perational monitoring*, which looks whether the water is at risk of failing the environmental targets;
Investigative monitoring, which is used for water that does not meet its environmental target for unknown reasons (Kaste et al., 2008).

The European commission made a document on how to monitor in regard to plans. This is done with a guide consisting of 37 documents with a number of technical reports related to those (European Commission, n.d.). The aim of the monitoring guide is to create a pragmatic approach on how to monitor the water quality. Due to the size of the EU and the geographical differences it includes, the guide is flexible to be adjusted for specific circumstances. This guide makes use of the best practices of monitoring that are currently in use (European Commission, 2003).

The EU has set up a screening method for Water data InFormaTion (SWIFT-WFD). The setup of this program has four main points (Allan et al, 2006):

1. Consolidate and identify information to validate existing methods and emerging methods of monitoring;
2. Determine if new monitoring methods can replace the old methods;
3. Creating a network for the purpose of training and advising on monitoring methods and emerging tools;
4. Create a link between water policy and research.

To reduce the amount of monitoring needed by the WFD, waterbodies can be merged with other waterbodies with similar characteristics such as the location of the waterbody and the type of waterbody (Allan et al, 2006). This will reduce the amount of monitoring needed. With all this combined there is a lot of freedom for the individual member states to determine their own monitoring system. However there are some basic information requirements for these appointed waters, these are (Rijksoverheid, n.d.):

- Location of the monitoring;
- The measurements on the monitoring locations, must comply with standardized methods;
- Evaluate results of the measurements to the chemical norms and ecological targets;
- Determine trends within the measurements;
- Determine if there will be compliance to the WFD.

The WFD demands from the member states to create a monitoring plan and STOWA help in the creation of such a plan. Monitoring is important, not only to know the current situation of the water quality but also to find out if degradation takes place. The STOWA assisted in the creation of "Besluit kwaliteit en monitoring water" or Bkmw 2009. The documents that were created consist of three documents, the appendix I and II of the Bkmw 2009 which are focused on water chemistry and a report made for the maximum ecology potential or MEP including the method on how to monitor (Rijkswaterstaat, n.d.)(informatiepunt leefomgeving, n.d.).

For every different type of water stated in the WFD, a different method of monitoring may be necessary. A table is made by the STOWA, this table is a translation of the EKF, in which it is shown how to monitor in the different water types (Evers et al., 2018). Besides how to monitor, it also contains a table for each indicator for each water type mentioned in the annex V of the WFD. The table shows whether the measured value is bad or good and everything in between (Evers et al., 2018). These tables are to comprehensive to include in this report, for the full table the STOWA needs to be contacted.

2.4 What possible impacts can small hydraulic structures have on water quality?

The past two paragraphs were about the definition of water quality and how it is monitored. In this paragraph there will be taken a look on what factors influence water quality in relation to small hydraulic structures. To maintain a water system, small hydraulic structures are needed. These structures varying in form and size. Some like pumping stations and weirs are needed to maintain a certain water level, while bridges and culverts are used to cross the water or let the water through. Some structures are used to improve the living conditions and the surroundings area like bank protection, board walks and floating solar parks. All these small hydraulic structures have their effect on the water system and water quality. In this chapter the effect of the above mentioned small hydraulic structures on the water quality will be assessed.

To do this, academic papers and documents from the STOWA are reviewed. The search engines that are used are the same as in the previous question. However, the search terms are different. For this question the search terms are the same for the academic papers and the STOWA. Here the search terms: "water quality" and "impact assessment" with the Boolean search command AND are used. Beside those search terms a few common small hydraulic structures that are used within the water system are searched with the Boolean search commands OR. These activities and therefore search terms are: "retaining wall", "bridges", "board walk", "culverts", "weirs", "small pumping station" and "floating solar farms". Also synonyms for these terms are used, as some of these structures have multiple names, also the Dutch translation will be used.

Road crossings

To cross a body of water or let water pass through, a bridge or culvert is used. These structures come in all sizes and shapes, and their effect on the water quality differs accordingly. This is not to say that small structures have less impact on the water quality than big structures. The contrary can be true, due to the fact that small structures are not always properly designed. Therefore they sometimes have a greater effect on the water quality than bigger structures which are often designed better with stricter regulations (MacPherson et al., 2012).

Bridges

To know what the effect of bridges is on the water quality, it is good to know what the definition of a bridge is. The distinction between bridges and culverts becomes blurrier for smaller water bodies. The definition of a bridge used in this research is a structure over a body of water with limited to no changes in the profile of the water body it crosses (Baat & Hermus, 2014). An example of such a bridge is shown in figure 3. The effects of bridges on the water quality can be divided into two categories; the use of the bridge by cars and pedestrians etc., and the physical presence of the bridge. The use of the bridge will cause pollution that runs off from the bridge into the water, or it falls directly into the water. This pollution comes from the wear and tear of the bridge itself and the users. The pollution ranges from toxic (heavy) metals and fluids to nutrients from al the users and the wear and tear of the bridge itself. This could lead to eutrophication and an increase in toxicity of the water (Bark & Hedeen, 2020). The bridge itself can also negatively affect the water quality. One reason for this is the leaching of material that the bridge is made from (Whelton et al., 2013). Another way bridges affect the water quality is by changing the profile of the river or stream. This can increase the flow velocity under the bridge, which makes it for some type of fish harder to migrate (MacPherson et al., 2012). Another important effect of a bridge is the amount of sunlight reaching the surface water. This reduces plant growth and also reduces the number of animal crossings (Keep et al., 2020). The amount of sunlight reaching the water is depending on the width and height of the bridge, the less sunlight reaching the water the stronger the effect.

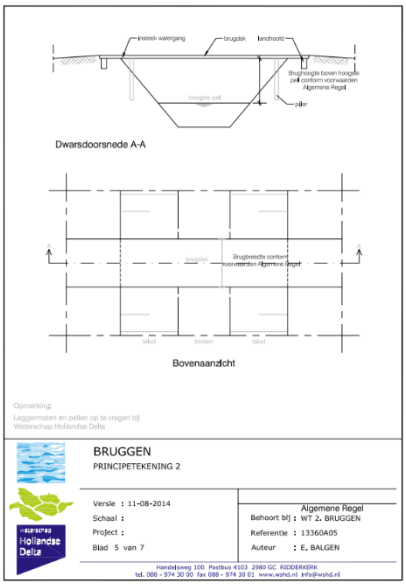

Figure 3 Drawing of a bridge (Baat & Hermus, 2014)

Culverts

Culverts are used to cross bodies of water and to transport surface water. The main difference between a bridge and a culvert is that the culvert is closed on all sides and can only be used to cross small streams. An example of a culvert is shown in figure 4.

The issues of water quality with culverts are similar to that of bridges. However, the severity is different depending on the issue. With a culvert water will runoff into the surface water. Due to the slope between the road and the surface water some pollutants are absorbed. This slope functions as a so called bioretention zone (Davis, 2007). The bioretention zone in a culvert is limited in size, still this zone could take up to 40% of the nitrogen and 30% of the phosphor depending on the width (David et al., 2006).

Due to the prolonged exposure to water, materials could easier leach out of the culvert, which could cause toxic pollution of the water, and decreasing the water quality (Whelton et al., 2013).

Due to the fact that a culvert makes the stream smaller the flow velocity increases. This will hinder the fish migration. This effect is stronger in comparison to the effect of a bridge, due to the fact that a culvert increases the flow velocity more than a bridge (MacPherson et al., 2012). Also the length of a culvert influences the fish migration. It is found that a culvert over 17 meter decreases the fish migration (Briggs & Galarowicz 2013). The amount of sunlight is also important for the limitation of migration. The increasing length, reduction of the diameter and the increasing amount of turns in the culvert decrease the amount of sunlight and therefore the migration (Keep et al., 2020).

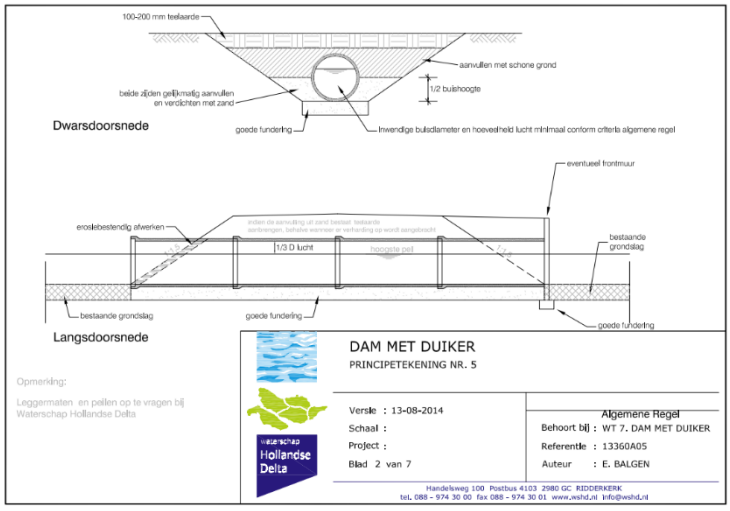

Figure 4 drawing of a culvert (Baat & Hermus, 2014)

Bank protections

Bank protection comes in all kinds of shapes and sizes. These can be categorized in two groups, the green bank protection and grey bank protection (SEPA, 2008). In figure 5 and figure 6 a green and grey bank protection respectively are shown. Where gray protection is a hard construction and green a more natural construction. The overall goal of this protection is to prevent erosion. Green bank protection does this by creating a gentle slope. This has an overall positive effect on the water quality and is often the replacement of a grey bank protection. For this reason green bank protection will not be discussed here into detail. If erosion is often prevented by making a wall in or near the water, than this is called a gray bank protection.

When the land is used for agricultural purposes, placement gray bank protection will decrease the amount of nutrients that runoff into the surface water (Sweeney et al., 2014). When this is meadow this can be up to 90% reduction in nutrients (Sheffield et al., 1997). However, some bank protection tends to leach chemicals into the water reducing the overall water quality (Pouwels et al., 1995). Erosion is a natural process that gray bank protection is preventing, this will cause problems in regard to the ecology. The erosion of a bank could create gentle slope that is ideal for some kinds of animals and plants that thrive in these locations (Rotterdam et al., 2020). Steep slopes or wall bank protection make it difficult or even impossible for some plants to grow or animals to get out of the water (Florsheim et al., 2008).

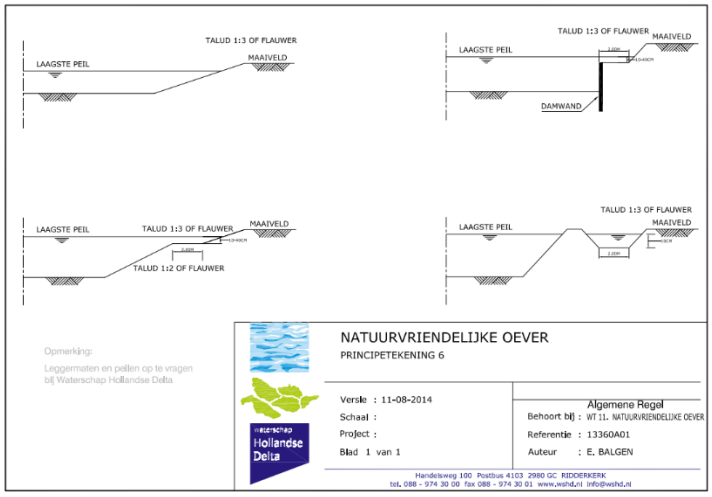

Figure 5 Green bank protection (Baat & Hermus, 2014)

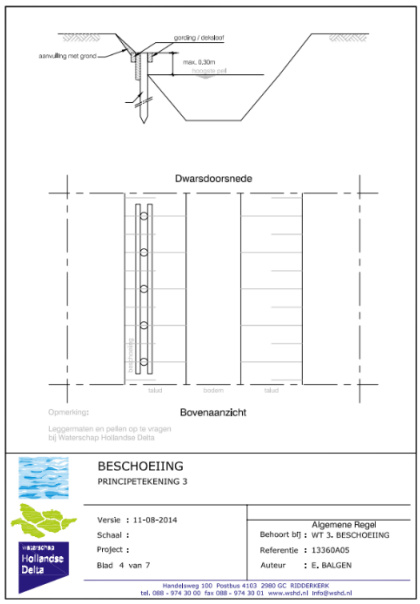

Figure 6 Grey bank protection (Baat & Hermus, 2014)

Board walks

The function of a board walk is to get near the water. These board walks can be created in or near the water. An example of a board walk is shown in figure 7. The board walk is relatively small and have characteristics of a bridge and a bank protection. The effects on the water are to a lesser extend similar to those activities described in these paragraphs (light intrusion and flow velocity). However, there are two noticeable differences in effects on the water system. These are that the board walk does not accommodate vehicles, so less toxic material runs off into the surface water. The use of a board walk accommodates the usage of boats, swimming and all other kinds of water related activities. These activities could negatively impact the aquatic live due to noise and mechanical damage (Lloret et al., 2008).

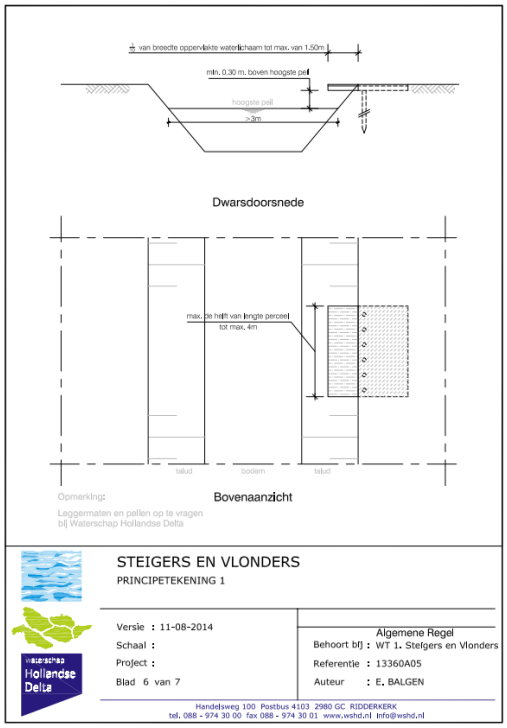

Figure 7 Example board walk (Baat & Hermus, 2014)

Weirs

The function of a weir is to maintain and control the water level. This is done to facilitate a particularly land and water usage. Weirs come in different types. The most common types are a fixed weir and a dynamic weir. An example of a dynamic weir is shown in figure 8. A weir creates a change in water level from one side to the other, this creates a barrier that influences the water quality and ecology. In recent years the use of the weir is increased from only a regulatory purpose to a water storage function. This new function of the weir is not widely used yet but affects the whole water system and not only the direct surroundings of the structure. For this reason, this will not be further discussed in this study because the effect is too big to grasp in this study.

Weirs negatively impact the water quality, which is due to the fact that they reduce the flow in a system. With the reduced flow, pollution will longer maintain in the system and can do more harm in the system (Boariu, et al., 2013). The weir influences the migration of fish throughout the water system, some fish can (depending on the height of the weir) swim upstream to the higher water level. Not all fish are capable of doing that, some only flow down the weirs and get stuck in the lower parts (Mouton et al., 2007). To solve these disadvantages some weirs are installed with fish passages, but the effect of these passages is limited (Cascade, 2013, Mouton et al., 2007). Furthermore, due to the increased flow rate over a weir the sediment transport is disturbed. This leads to erosion on the lower side of the weir and sediment being collected on the other side (Mouton et al., 2007, Quinlan et al., 2015). These effects combined lead to habitat loss (Mouton et al., 2007).

Figure 8 Dynamic weir (department RA, 2019)

Small pumping stations

Pumping stations are used to transport water from low-lying areas to higher areas, or pumping water in if there is a water shortage. These are crucial for a good control of the water system. The pumping stations come in all types from small to large. A small pumping station is shown in figure 9. Pumping stations have a large effect on the water quality and ecology. When pumps are well calibrated and fitted with a trash collector, they can reduce the amount of pollution in the water system. This is done by pulling pollution to the pump where it can be removed (Lukianas et al., 2006). Furthermore, pumping stations disturb the sediment transport, which can lead to erosion and habitat loss (Parks, 1989). But the most important impact pumping station have is on the fish migration. Depending on the type of pump no fish can pass the pump unharmed (STOWA, 2012). Pump trash collectors prevent fish from getting near the pumps (Behrmann-godel et al., 2003). Lastly the pump vibration disturbs the fish even further, causing reduced migration (Bolland et al., 2019).

Figure 9 pumping station (department RA, 2019)

Floating solar parks

A relatively new phenomenon in the water system are, floating solar parks. These parks can cover large areas of surface water, shielding the surface water from incoming sun (Boogaard, 2014). Due to this coverage the effects are similar to that of a board walk, however due to the sheer size of these constructions the effect will be greater. However, thorough research about these structures is missing at this moment.

2.5 Conclusion

In this paragraph the conclusion of the following question ask in the previous paragraphs are drawn, what is water quality, how is water quality monitored and how do the construction small hydraulic structures contribute to the water quality. This conclusion will be further used in the rest of the report.

There are a lot of ways to define water quality, however, the most suitable one for this thesis is the one stated by Johnson et al. (1997) *"Water quality is a measure of the condition of water relative to the requirements of one or more species and/or to any human need or purpose."*. This definition differs from the EU regulation that states that water quality is a component of the ecological and chemical water quality combined. What these components include is described in the WFD. To make a better assessment of the water quality the STOWA put the components of the WFD in nine EKF (Production of water, Light climate, Productivity of the soil, Habitations suitability, Migration, Removal, Organic loads, Toxicity and Context), that can be used by the water authorities to determine the water quality. These nine factors could be seen as different WQI.

There are a lot of methods and indicators that can be monitored in the water system in regard to water quality. The EU has made for this reason a comprehensive monitoring guide that can be used to monitor the water quality. This monitoring is only needed in WFD water, as they represent a larger water system. This guide is modified by the STOWA in a guide to monitor the EKF. This is a practical implementation of the guides made by the EU.

Small hydraulic structures all have effects on water quality and all in a negative manner. The problems that small hydraulic structures cause are mostly: reduced light intrusion, obstruction for migration, change in flow velocity and leaching of chemicals. All those effects are bad for the water chemistry and ecology. The EKF can be a good assessment tool for the impact of small hydraulic structures. In table 2 below the structures are shown and the responding EKF that could be impacted.

	Light climate (EKF 2)	Habitations suitability (EKF 4)	Migration (EKF 5)	Toxicity (EKF 8)	Context (EKF 9)
Bridge	X	X	X	X	X
Culvert	X	X	X	X	X
Bank protection		X	X	X	X
Board walk	X	X	X	X	X
Weir		X	X	X	X
Small pumping station		X	X	X	X
Floating solar park	X	X	X	X	X

Table 2 small hydraulic structures and the ecological key factors (EKF) combined

3 Methods empirical research

3.1 Introduction

In the previous chapter an analytical framework is created, this framework will be used in the empirical part of the research. In this chapter the methods of the empirical research will be shown. This is done for each sub question individually.

3.2 In what manner does the WSHD determine effects of small hydraulic structures on the water quality?

To answer this sub question internal policy documents from the WSHD are collected. The primary search terms used are in these documents are: "water kwaliteit" and "impact assessment". The secondary search terms are: "duiker", "brug", "steiger", "vlonder", "drijfend zonnenpark" and "beschoeiing".

Also in-depth semi-structured interviews with key informants of the WSHD are conducted via MS teams due to Covid-19 restrictions. The respondents are numbered correspondently in the report so it is clear what discipline said what, the respondents are:

- Ecologist (1)
- Policy maker/advisor (2)
- Legal consults (3)
- Systems engineer (4)
- Process engineer (5)
- Controlling agency (6)
- Enforcer (7)

As preparation the interviewees will receive the rough outline of the questions that are asked. In Appendix A, the questions asked are shown in Dutch. These questions are about three subjects: monitoring, assessment and activities. After the interview, notes from the interview have to be sent to the respondent. This so the respondent can place remarks on the notes and to elaborate on the given answers in the interview. The interviews do not have to be conducted one on one. To preserve time interviews could be conducted with two individuals at the same time. No interviews will be conducted with more than two to prevent too much discussion within an interview that will take up a lot of time. After all the interviews are conducted the answers will be summarized to answer this the sub question.
The method used here is a desk research of the policy documents in combination with interviews. These methods are most suited for answering this question. The desk research of documents of the WSHD is needed to know how this problem is addressed by the WSHD. The interviews give insight of how the documents from the WSHD are translated into practice.

3.3 What challenges does the WSHD face regarding the assessment of small hydraulic structures and water quality?

To answer this sub question, it must be clear what challenges the water authorities face. To answer this question in-depth semi-structured interviews are conducted. Those will discuss what challenges there are for the assessment of the water quality. The interviews are conducted with the same people as the previous sub question. To save time all questions are answered in one interview with each interviewee. The questions are included in Appendix A and consist out of what the challenges are in regard to assessment, monitoring and the activities. After the interviews with WHSD personnel two additional interviews are conducted with:

- Management regional water authority;
- Aquatic ecologist.

These additional interviews are used to verify the challenges addressed in the other interviews.

After the interviews are conducted the challenges raised by the interviewees are compacted and clustered into an overview of the challenges that the WSHD faces.

3.4 Does the assessment practice of WSHD meet the standards set in EU law?

To answer this sub question the answers of the previous sub questions will be compared with each other. Besides this, interviews will be conducted with the same people as the previous sub questions. The opinion of the legal consultants of the WSHD will get more weight due to the fact that they are experts in regard to that subject. The interview will be conducted to get a broader view of the topic and to reflect on the preliminary conclusions drawn in the previous questions. The interview will have a semi open structure. The questions will be sent to the interviewee in advance so preparations can be made. The questions asked in this interview are shown in Appendix A.

The method used here is an analysis of the previous sub questions and an interview. The analysis is used to get insight in the performances of the WSHD. The interviews are needed to check and improve the analysis.

3.5 Are the findings from the case study representative for other regional water authorities?

To answer this question, the results of the WSHD interviews and documents are summarized into a digital questionnaire that is distributed among all the other regional water authorities of the Netherlands (20 in total) to verify and to generalize the results of the WSHD. The questionnaire will be of such a length that it can be finished within 10 minutes to get a good response rate. The questionnaire will be sent to the general e-mail address of the specific regional water authority, or, if possible, to persons actively involved in implementing the WFD. After a few weeks a reminder is sent to the water authorities that have not reacted.

The advantage of the questionnaire for this question is that it can be sent to a large population and thus the result will be many opinions, giving a good insight of the opinions of all regional water authorities. A short questionnaire will be used, and can be found in Appendix B. The questions are categorized in the following topics: general information, monitoring, assessment, policy and legal framework and are the result of the case study.

People with the following occupation will take the questionnaire:

- Coordinating policy advisor water quality
- Licensor
- Policy officer aquatic ecology
- Data owner water quality and ecology
- Senior enforcer
- Project leader green-blue services
- Water quality advisor
- Senior Advisor Ecology
- Advisor water quality monitoring
- Policy officer water quality
- Policy advisor water system
- Senior advisor water management (water quality)
- Consultant Water Systems
- Medior specialist planning (ecology specialist)
- Policy advisor Water quality and agricultural emissions
- Specialist Ecology and Water Quality

All of these occupation are water quality related and therefor give a good idea of how that specific regional water authority deals with water quality.

3.6 Conclusion

With this method the rest of the research will be conducted, in the next chapter the case study will be presented and after that the comparison with the other regional water authorities.

4 Case study water authority Hollandse Delta

4.1 Introduction

Where in the previous part the analitical framework was created, in this part there will be taken a look on how one specific regional water authority (the regional water authority Hollandse Delta) deals with water quality in regard to small hydraulic structures. To answer this questions policy documents will be studied and interviews will be conducted with employees of the WSHD. The question answered in this part are:

- In what manner does the WSHD determine effects of small hydraulic structures on the water quality? (4.2)
- What challenges does the WSHD face regarding the assessment of small hydraulic structures and water quality? (4.3)
- Does the assessment practice of WSHD meet the standards set in EU law? (4.4)

4.2 Determine the effects of small hydraulic structures on the water quality

In this chapter there will be looked at how the WSHD deal with water quality issues. This to answer the question: *In what manner does the WSHD determine effects of small hydraulic structures on the water quality?* Sources of information are documents available to the public, internal used WSHD documents and interviews with employees of the WSHD. All of this will give a good insight on how the WSHD deals with the construction of small hydraulic structures and water quality.

Desk research public documents

In this paragraph there will be looked at how the by the Dijkgraaf and Heemraad approved policies deal with the water quality in relation to the construction of small hydraulic structures. In total there are five approved relevant documents found on the site of the WSHD. These documents are:

- The Keur, the Keur is the legal basis of the water authority (WSHD, n.d.)
- Memorandum on assessment frameworks and policy rules for the water system (nota toetsingskaders en beleidsregels voor het watersysteem 2014)
- General rules for the water system and roads (algemene regels voor het watersysteem en de wegen, 2014)
- Water management program 2016-2021 (waterbeheersprogramma 2016-2021)
- Water management report (waterbeheer rapportage)

These documents will be reviewed on three topics: monitoring, analysis and activities, all in regard to the construction of small hydraulic structures and to water quality.

Regulation

The Keur, the memorandum on assessment frameworks and policy rules for the water system and general rules for the water system and roads together, form the basis for the legislation and regulation and are positioned as followed. The Keur specifies everything that is not allowed and for what activities a permit is needed. The memorandum on assessment frameworks and policy rules for the water system gives more clarity about under which conditions certain activities are allowed, for which a permit can be given. The general rules for the water system and roads specify which activities, with a low water management risk, are allowed without permit and only need an approval from the WSHD (WSHD, n.d.).

Keur

The Keur in combination with the *legger* (map) is the legal basis of the regional water authority (WSHD, n.d.). Here the Keur is the written part and the *legger* shows the managed area of the water authority. The Keur has some articles in regard to the water quality, below every relevant article is listed (overheid.nl, 2018).

2.5.1 states that third parties are responsible to remove plants and pollution that harm the function of the water system. This implies that small hydraulic structures that leach into the water system need to be removed.

2.10 owners of weirs must adjust the height of the weirs to a fixed level, which could help with the migration of fish.
2.13 and 3.9 state that some activities are allowed. These activities are clarified into the general rules. This policy document clarifies the Keur.
3.2.1 states that permits are needed to use the water system. In this permit small hydraulic structures are regulated.
3.2.1a stated that it is not allowed without permit to change, replace or remove a small hydraulic structure.
3.2.4 within the permit it is allowed to demand payment or compensation to protect the interests of the water authorities.

Memorandum on assessment frameworks and policy rules for the water system
The note assessment framework is a document that is related to the Keur. Where the Keur says that a permit is needed the note assessment framework specifies under which conditions this is allowed (Haag et al., 2014).
In the note assessment framework one chapter is dedicated to water quality (Haag et al., 2014). This is chapter TK-09 and is only about ecological quality. It states that activities in the water system may not permanently decrease the ecology in a significant manner. This is illustrated by: dead end in the water system, water depth, leaves in the water system by near standing trees and limited light intrusion. It is made clear that it is not a comprehensive list and that there are more factors that influence the ecology. It is said that most of the activities do not affect the ecology significantly. This means that in most cases the activities are allowed without extensive study. There are locations where the ecology is more important that other location, these are: nature areas, swimming areas, waterways and WFD waters. For these locations water quality is of greater importance, but it is not made clear how the water quality should be evaluated at those locations.

For the different, small hydraulic structures there is no further elaboration in regard to effects on the water quality. In this document a reference is made to "Nationaal Bestuursakkoord Water" (national administrative agreement on water). In the National Administrative Agreement on Water it is stated that water quality deterioration may not be passed on to another water system. This implies that the issues need to be resolved within the proximity of where the deterioration is caused. For the chemical circumstances, the assessment framework is referring to other legislation where these issues are tackled like the "Besluit lozen buiten inrichting" (decision to discharge outside the facility) (Rijksoverheid[1], n.d.).

General rules for the water system and roads
Due to the fact that the process of legislation is very time consuming the "algemene regels" or general rules are introduced (Baat & Hermus, 2014). These rules apply for the construction of small hydraulic structures with low hydrological and ecological risks. For these structures the ecological assessment only involves the question whether the small hydraulic structure is located in a water body with a specific nature purpose as defined in the previous paragraph. The activities that are allowed under the general rules are: board walks, bridges, bank protection (high and low) and culverts. All of these small hydraulic structures are allowed, albeit with restrictions. This is to prevent that the structure causes risks to the water system.

Water management program 2016-2021
The "waterbeheerprogramma 2016-2021" or water management program 2016-2021 is the document where the WSHD has written down its program for the following years (WSHD, 2015). This is not a static document but a flexible document with the direction for the following years, not a detailed plan of what must be done. This program consists of four categories: water safety, water availability, water quality and waste water treatment. therefor there will only be looked at the relevant water quality category. In this category a few different topics are discussed, one of these topics is what goal should be achieved. There are two water quality related goals mentioned. These are the goals from the STOWA-klasse III, which is a water quality indicator from the STOWA that is used to determine the water quality of secondary water bodies. The water management

program states that this measurement is going to be abolished in the near future but for the time being it will be used. The goal is to have 60% of the secondary water bodies comply with this method. The other one is the WFD, in 2027 all the water bodies must comply with the WFD, however this is not the case at the moment of writing this program. At this moment none of the waters comply. The goal of this program is to comply with the WFD by 2021.
To measure if the goals from the WFD are met, measurements are taken with a monitoring system. Once a year a report about this are made. Once every two years the water system as a whole will be looked upon so trends can be revealed. This is done in a water maintenance report.

Water maintenance report
The Water maintenance report 2019 is translated into a report called "Waterwerken 2019" and shows the progress (WSHD, n.d.). In this report the STOWA-klasse III is not present and no substitute is shown, in the same report of the previous years 2016, 2017 and 2018 STOWA-klasse III is shown (WSHD[1], n.d.)(WSHD[2], n.d.). From the report of 2019 it is made clear that none of the water bodies comply to the defined goals, according to a methodology developed by the WSHD. This methodology is not based on the principle one out all out but is a combination of the chemical and ecological assessment. From an analysis of the data more than half of the WFD water bodies do not meet the standards. However, not all parameters are measured, and data about the amount of water plants, water animals and fish is from 2017. Biological quality elements are measured every three years, these are: water plants, algae, small water animals and general physical and chemical data. Fish is measured once every seven years. From this data collection the following conclusions are drawn:

- Only one water has good water plants according to the WFD;
- 40% of the water bodies meet the standards for algae from the WFD;
- 30% meet the fish criteria from the WFD;
- 25% meet the criteria set on small water animals from the WFD;
- 24% meet the general physical and chemical elements from the WFD.

For the chemical situation the WSHD looks at priority substances like mercery, cadmium, plant protection products and some PAK's. These substances are monitored every year and 27% of the water bodies do not apply to the standards set in the WFD.

To improve the above mentioned results the plans from the second "Stroomgebiedsbeheerplan 2016-2021" (river management plans 2016-2021) have to be implemented. This plan consists out of 139 smaller plans that consist mostly out of green bank protection.

In 2019 in total 345 measurements points were scattered around the area of the WSHD. In 2020 this was decreased to 270. This monitoring network monitors around 7.200 km of water bodies, this means an average of 20 km for each measurement station.

Documents not yet approved by Dijkgraaf and Heemraad
To make policy applicable it must be approved by Dijkgraaf and Heemraad. The following documents are not yet approved. However, they will be used in the near future or are already in use by the officials from the water authority to make plans for instance.

Waterschapsverordening
This document will be implemented in 2022 as result of the so called "Omgevingswet", this is an extensive new law in the netherlands (WSHD, 2022). The goal of this new law is to improve the cooperation between different branches of government and should make it easier for citizens to do activities where a permit is needed. The "waterschapsverordening" is the replacement of the general rules. The new waterschapsverordening will however be very similar because the transition will be policy neutral as much as possible, to reduce the amount of labor needed. However, some small changes will be implemented to make it easier to use for the legislator. There are no changes proposed in regard to the water quality.

Water management plan (WBP) 2022-2027

The WBP 2022-2027 is the direct successor of the water management plan 2016-2021 (WSHD, 2021). The topics of the WBP2022-2027 are the same as the previous WBP, however the content is differently organized. Water quality and water quantity are now grouped tighter. This is done because they act in the same playing field, the water system. This is because plans made for the water quality affect the water quantity in some cases and vice versa. The long term goals of the WSHD for 2050 is to make a water systems that is climate adaptive and moves with the changes in the surroundings. To do this two main steps are taken to improve the water quality: in all the water bodies no degradation is allowed and fish migration is getting a more prominent role in the ecology assessment

Interviews

The interviews that were conducted consisted out of three parts to answer the main sub question. These parts are monitoring, assessing and activities. In the following part the highlights of the interviews will be shown, the complete summary of every interview is shown in Appendix C.

Monitoring

The first question was how the effects of small hydraulic structures are measured before, during and after the implementation of the structure. The ecologist knows how small hydraulic structures effect the water quality, but also stated that for small hydraulic structures the effects on the water quality are not monitored (1). This was verified by multiple other interviewees (2, 4, 5, 6 and 7). They mentioned that the reason for this is that the cost of this will be too high and too time intensive (2, 4, 5, 6 and 7). The next question in the interview was about what substances were measured, and the outcome was coherent with the previous question: there are no specific measurements conducted for small hydraulic structures (1, 2, 4, 5, 6 and 7). In the water system there are some measurements stations, these measure all kinds of parameters (pH, temperature, visibility, chemical compounds, fish, conductivity, chlorides and oxygen.) (1), to get a good picture of the water quality in the water system. However this monitoring system is not used or used very limited to determine the effect of small hydraulic structures as multiple interviewees pointed out (2, 4 and 5). In case of an emergency the enforcer told that additional measurements could be taken if there is a reason, however for small hydraulic structures this is not done (7). The next question was about the frequency, location and how there is monitored. The location and the frequency are found on a map but the method is depending on the parameter, as the ecologist pointed out (1). The ecologist explained that the location was the most suitable to get a good image of the water system (1).

Assessment

The answers on this part of the interview are limited, due to the lack of an assessment framework and therefor there were no answers in regard to an assessment framework. It was asked how, what, where, why and by whom assessment of the water quality is done regarding the influence of small hydraulic structures. The answers from the interviewees were unanimous: this is not done. The policy advisor pointed out here that despite that it is not done it should be done before a small hydraulic structure is created (2). Sporadically this is done mostly by WFD waters but this was not consistent (2). The system engineer stated that this is sometimes done by large projects, but not by small projects and only if an effect was predicted (4). A follow-up question was asked, which was about whether the EKF are used for the assessment of the water quality or if it could be used for small hydraulic structures. Here there was a clear division, the ecologist pointed out that the EKF could not be used for the assessment (1). This would be because, this is too detailed and meant for the monitoring. The other interviewees were unfamiliar with the EKF, but after a brief introduction, they saw the possibilities as assessment tool (2, 3, 4, 5, 6 and 7).

Activities

The next question was about how to determine the effects of small hydraulic structures on the water quality. The answers given by the interviewees are similar to an earlier question. The effects of small hydraulic structures are not monitored or assessed and therefore the effects are not determined (2, 4 and 5). Policy advisor mentioned that chemical water quality is well assessed (2). This assessment consists of the determination if only non-leachable materials are used. Another question asked to the interviewees was about who is responsible for the determination of the effects on the water quality. Every interviewee pointed out that this was the responsibility of the WSHD more or less. However, the policy advisor mentioned that there is something called "zorgplicht" (duty of care) in the new "Omgevingswet", and that this "duty of care" become more prominent. This "duty of care" means that the initiator of the projects has the responsibility to maintain the water quality (2). However, it was pointed out that the enforcement of the "duty of care" is very tricky. Because the enforcer does not have a framework to assess if the "duty of care" is done properly (6 and 7).

4.3 What challenges does the WSHD faces

Where in the previous paragraph the manner of determining the effects is shown, here the will be looked at: *What challenges does the WSHD faces regarding the assessment of small hydraulic structures and water quality?* These are found by reviewing the policy documents and asking the interviewees. In total five challenges arose in relations to the construction of small hydraulic structures on the water quality.

Contradiction standing policy and the WBP

One challenge is that there is a contradiction between the standing policy and the new WBP. This contradiction is that the current policy states that the water quality may not be reduced significantly, while the new WBP states that the water quality may not be reduced at all, in all the water bodies. The main differences are that the word "significantly" is being removed in the WBP and that specifically all the water bodies are being addressed. Addressing all the water bodies is not a great issue, this is because of the fact that this is already required under the current policy. The removal of the word "significantly" will create a great challenge. In the interview conducted with the legal specialist it was clearly pointed out that the most concrete or specific policy document should be used (3). In this case it is clear that the WBP is more concrete than the standing policy, and therefore the WBP will be leading. In practice this means that small hydraulic structures can only be made when there is no negative effect on the water quality.

Assessment framework for water quality

The current assessment framework regarding water quality is hardly developed. This makes it impossible to assess whether small hydraulic structures have any negative effects on the water quality. There are, however, some not ideal solutions. One solution is to have every small hydraulic structure assessed by an aquatic ecologist, but this will cause a huge workload for them. Another solution is to use the previously mentioned ESF. The problem with the ESF is that these are not made to assess small hydraulic structures but for the assessment of complete water systems. Therefore the ESF should be modified to be suitable. The use of the ESF as assessment framework for the water quality is possible as has been made clear in one interview (2). Policies or documents from other water authorities can be used (2 and 8). Like the ESF from the STOWA, it is better to have these documents or rules embedded into the policy of the WSHD. This makes it easier to use the policy and makes it more transparent.

Who is going to carry the burden

When it is stated that the water quality is not allowed to be reduced this does not mean that no small hydraulic structures can be created. To cope with the reduction in the water quality compensation measures can be taken. This poses the challenge of who is going to carry this burden (2). There are basically three options, the water authority, the project developer or both of them. All three have their pros and cons, the decision that is made here has impact on how the costs are distributed. Currently the so called cost of the water quality by small hydraulic structures of which the reduction of the water quality is not significant is paid by the WSHD. With the new WBP these costs will go the creator of the small hydraulic structures.

Who is in charge of policy changes

For all that is mentioned above, the line of hierarchy of policy making need to be followed. One interviewee explained it as follows (2 and 8). The department of *policy and plans* makes the WBP, from this WBP a vision is made on how to achieve the goals from this plan. From this vision new policy is made with the department of *Policy and Plans* as leader and the different departments supply the input. This is how it should work in the perfect world. However in reality this is a lot less structured and more fuzzy. In practice it is *policy and plans* who made the WBP, the department of *control and assists* wants a vision on how the goals of the WBP are achieved. After this the department of *policy and plans* create this vision, then for the policy the same process is run through, the difference is that the *department of legislation* is the author of this document. As is made clear here that there are a lot of steps where things could go wrong. The challenge is to get issues found at execution level, to get up to the policy level for a solution.

Stiffness in policy change

Furthermore the WSHD has a "wait and see" attitude in regard to new policies, this is clearly shown in the new "waterschapsverordening" (3 and 6). This new legislation has to be embedded into the new "omgevingswet". WSHD has decided that the current policy is copied to this new policy in a so called "beleidsneutrale overgang" which means no significant changes are implemented. This is in the eyes of multiple interviewees a missed opportunity.

4.4 Does the assessment practice of WSHD meet the standards set in EU law?

The short answer is yes*, however a big asterisk must be placed to this yes according to the people that were interviewed. Citation "Formerly, all small hydraulic structures have to be assessed on the effect that they have on the water quality. This is deemed not practical and feasible, therefore only sometimes the water quality is assessed at designated WFD waters." (2). The philosophy of only assessing WFD waters is that, if the water quality in those waters is good the water quality in the other waters will also be good (2). This approach has put the focus on the WFD waters and neglects the other waters. The standards of the EU are that every water body must have good water quality in 2027, chemically and ecological. The current approach is only partial beneficial to reach this target. It can be stated that it does not comply with the Weser arrest, but this is not completely correct because not all waters are not categorized according to the WFD and therefore the water quality cannot be reduced in their category.

Another approach, is in essence the other way around, that the waters that are not categorized, are at the same level as WFD water nearby. In this case for all the other waterbodies there must be looked at the corresponding WFD category for that region. The first is, at least partially followed by the WSHD and this means that it mostly comply with the Weser arrest. If the last one is followed is does not comply with the Weser arrest. The interview with the legal counsel of the WSHD does not give a conclusive answer on how this should be approached (3). If the last one is the one to follow this problem will be tackled in the new WBP. Because here no degradation is allowed in all the water bodies. This is because the WBP is more concrete than the standing policy and is therefore applied instate of the standing policy (3).

With the new WBP the WSHD will work towards reaching the goals of the EU and therefore meet the standards of the EU. Whether the targets are met in 2027 is unknown but small hydraulic structures will not negatively impact this in the future.

4.5 Conclusion

In this chapter the conclusions will be drawn from the previous paragraphs. The questions asked in those paragraphs were:

- In what manner does the WSHD determine effects of small hydraulic structures on the water quality?
- What challenges does the WSHD face regarding the assessment of small hydraulic structures and water quality?
- Does the assessment practice of WSHD meet the standards set in EU law?

The assessment of the effects of small hydraulic structures is not done very often, and for this reason the effect of these structures are unclear. The assessments that are done only assess if the work that will have a significant effect on the water quality. It is not stated how this assessment should be done so it is done without a framework, but with expert judgment. In the new "waterbeheersprogramma" the term significant will be removed giving more clarity on how to assess the water quality. However, a framework is still missing.

There are five challenges the WSHD faces: contradiction current policy and the new WBP, how to assess the water quality, who is going to carry the burden of the reduction of the water quality, who is in charge of policy changes in regard to water quality and stiffness in policy changes. All of these challenges will become urgent at the first of January 2022, because that the new WBP will become active. The result can be that if nothing changes most construction of small hydraulic structures are no longer allowed to be built due to the decrease in water quality they cause.

The WSHD complies with the EU legislation, however some remarks have to be made on this compliance. Because not all small hydraulic structures are assessed and only if they are situated in a WFD water. Never the less, in the new WBP the WSHD does certainly comply with the EU law due to the stricter definition. This is because no degradation is allowed with makes it certainly applicable with the WFD. It could even be concluded that with this new WBP the WSHD is more strict than the WFD. This is because the Weser arrest do give some room for degradation, where the new WBP completely eliminate this possibility.

5 Approach other water authorities

5.1 Introduction

To compare the WSHD with other water authorities in the Netherlands, a questionnaire is send out to all the other water authorities in the Netherlands. This to answer the following question:
Are the findings from the case study representative for other regional water authorities?
This is to see how other water authorities deal with this issue and what the WSHD can learn from them. The questionnaire consisted of a few statements, open- and multiple choice questions. Every question will be described shortly and it will be stated where the WSHD stands on this according to the previous questions and where the other regional water authorities stand.

5.2 Approach other regional water authorities

To determine whether the given answers are representative, it is important to look at the response rate. In total 16 of the 20 regional water authorities has responded which is a good response. Almost all the respondents that filled in the questionnaire have a water quality related position within the water authorities. This makes the questionnaire a reliable source of information for how other water authorities deal with water quality.

Monitoring water quality

The first statement in the questionnaire was the following: *the monitoring network of the organization is in your opinion sufficient to monitor changes in the water quality*. In the bar diagram in figure 10, 1 is completely disagree and 5 is completely agree (this is similar to the other questions of this questionnaire). The majority do agree with this statement. This in in line with the WSHD as can been seen in the previous chapters.

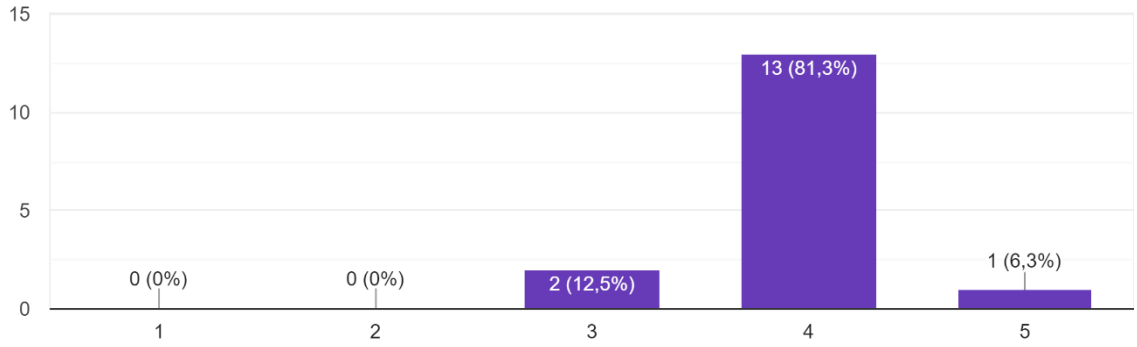

Figure 10 reaction of the statement: the monitoring network of the organization is in your opinion sufficient to monitor changes in the water quality (1 completely disagree 5 completely agree).

The follow-up question is what kind of parameters are monitored to determine the water quality. Overall the following parameters are monitored: pH, temperature, visibility, chemical compounds, fish, conductivity, chlorides and oxygen. These are also the parameters the WSHD monitors for the water quality. Some other water authorities also monitor the following parameters: ecology in the water system, phytoplankton, macrophytes and macro fauna, toxicity and water plants. The WSHD does not monitor these parameters.

The next question is a statement that is stated as followed: *the organization has a good idea of the current water quality*. Where the previous statement question was more related to if the water monitoring itself was sufficient, here is asked if this in combination with the measured parameters is sufficient. For the WSHD this is good, and figure 11 shows that this is also the case for other water authorities.

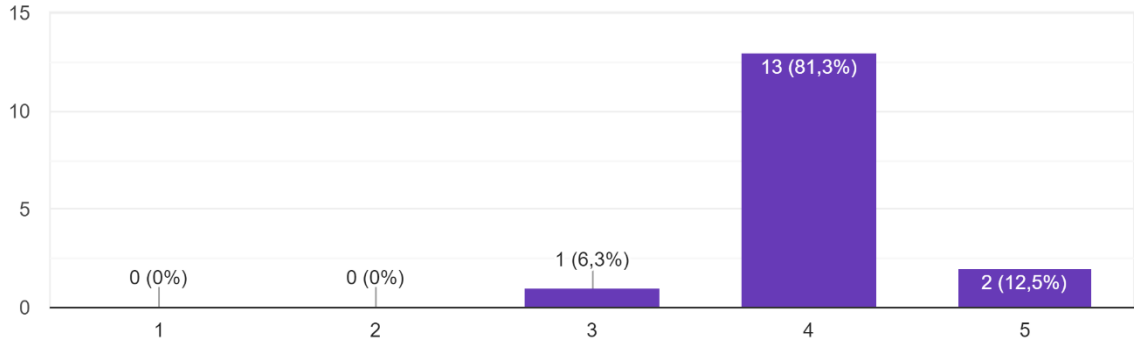

Figure 11 answers of the statement: the organization has a good idea of the current water quality (1 completely disagree 5 completely agree).

The following question is related to when the water quality is monitored. The question has four categories. Small structures like bank protection, medium small projects like culverts, medium large project like pumping stations and large projects like sewage water treatment plants. The WSHD only monitors water quality in the large category or when negative effects are expected. Some other water authorities show a more active monitoring regime, as shown in figure 12. Where most water authorities only monitor the water quality at medium and large projects.

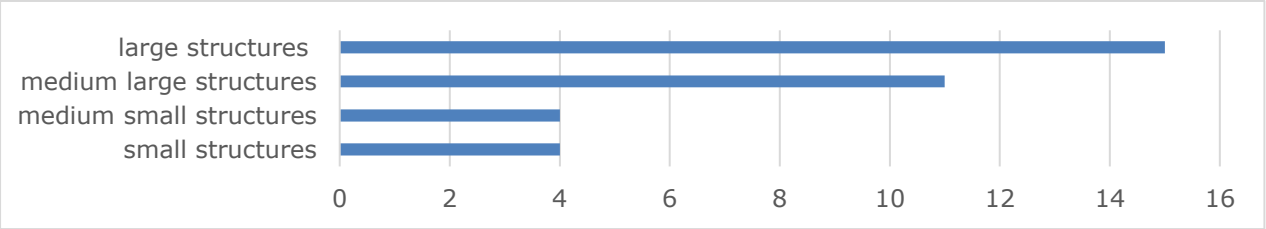

Figure 12 answers of the question: when is the water quality is monitored?

Assessing structures

The next question is a statement that is stated as followed: *the effects of small hydraulic structures on the water quality are clearly depicted*. At the WSHD this is currently completely unclear, and something similar counts for other water authorities as shown in figure 13.

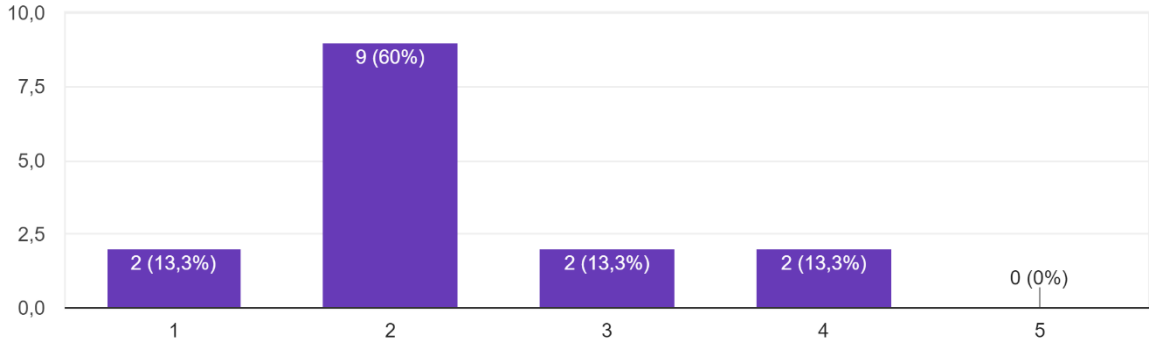

Figure 13 answers of the statement: the effects of small hydraulic structures on the water quality are clearly depicted (1 completely disagree 5 completely agree).

The next question is related to when the water authorities assess the effects on the chemical water quality when, a new small hydraulic structures is created. At the WSHD this is almost always done, but for other water authorities this vary a lot, as is shown in figure 14.

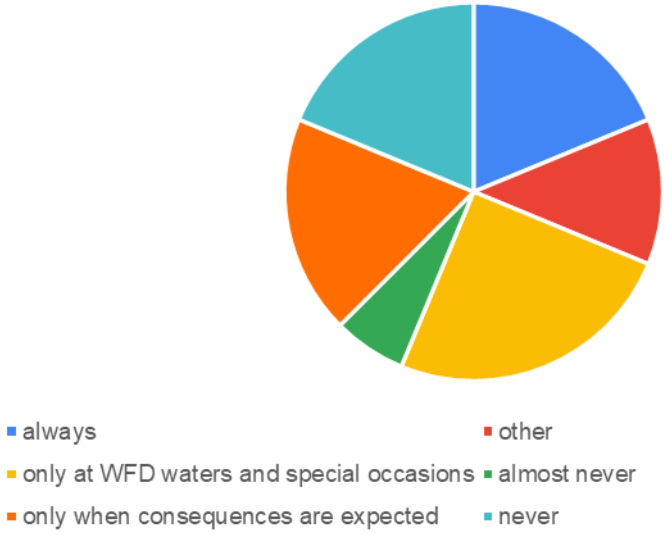

Figure 14 answers of the question: when is the chemical water quality assessed?

The next question is related to when the water authorities assess the effects on the ecological water quality, when a new small hydraulic structures is created. At the WSHD this only happens for WFD waters. For other water authorities this is done more frequently as is shown in figure 15.

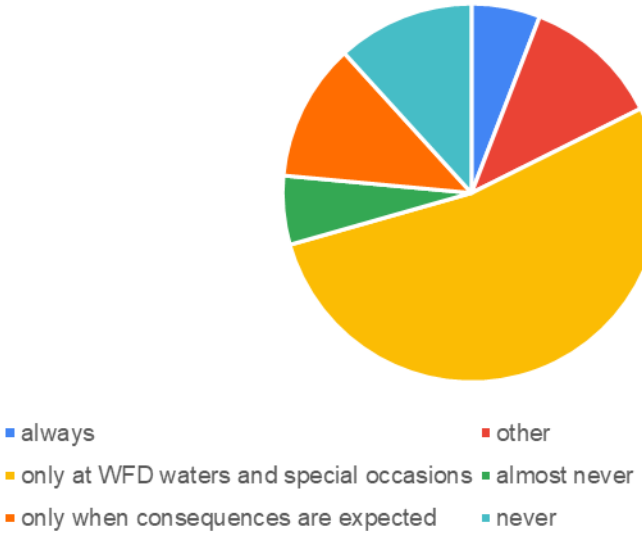

Figure 15 answers of the question: when is the ecological water quality assessed?

The next question is an open question about, how the other water authorities assess the effects of small hydraulic structure. The WSHD does not have such an assessment. Other water authorities all have different methods, these could be grouped into a few categories. The methods used are monitoring, expert opinion or the use of an assessment framework. Some of these methods are also used at the WSHD, mainly the expert opinion.

The next statement: *the existing monitoring is always used to determine the effects of small hydraulic structures on the water quality*. At the WSHD this is not the case, for most some other water authorities this is also not the case. However, the results give a mixed signal, as you can see in figure 16. Some regional water authorities do use the existing monitoring in contradiction of what the WSHD does.

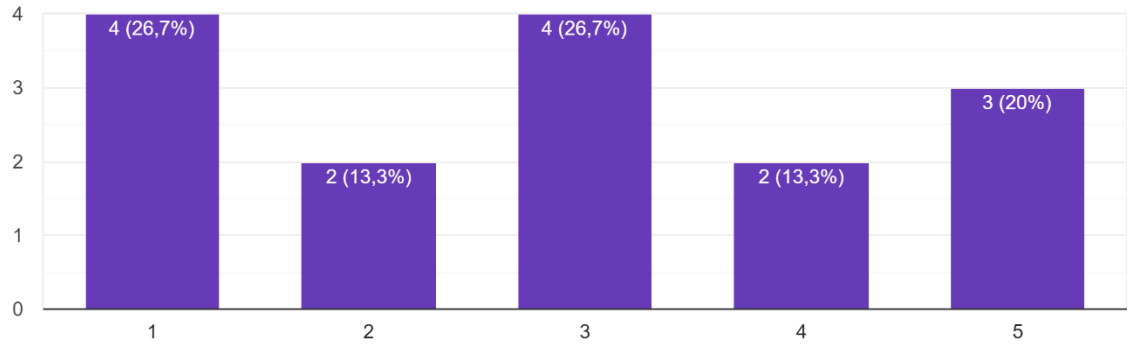

Figure 16 answers of the statement: the existing monitoring is always used to determine the effects of small hydraulic structures on the water quality (1 completely disagree 5 completely agree).

The follow-up question after this is about whether additional monitoring is conducted to determine the effects of small hydraulic structures. At the WSHD this is not done, at other water authorities this is sometimes the case, as is shown in figure 17 but never always.

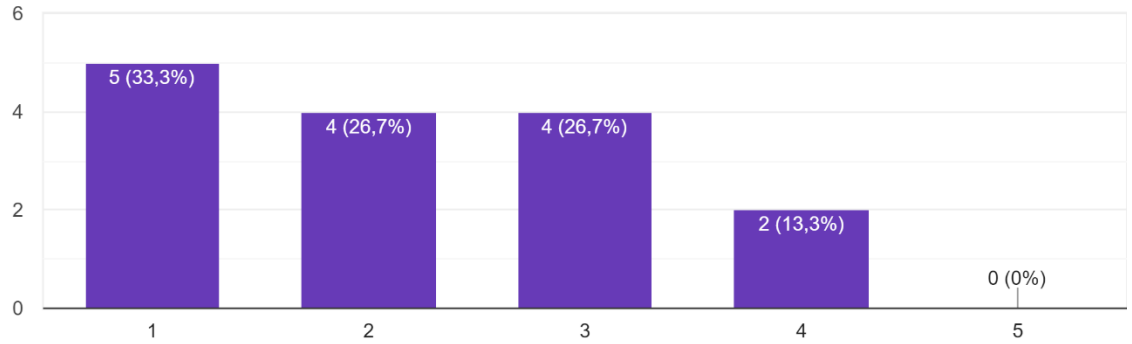

Figure 17 answers of the statement: additional monitoring is conducted to determine the effects of small hydraulic structures (1 completely disagree 5 completely agree).

A follow-up question of the previous question is an open question on what parameter is measured in that case. These parameters are similar to the an earlier question about parameters that are measured (pH, temperature, visibility, chemical compounds, fish, conductivity, chlorides and oxygen), with the exception that some authorities only look at which parameters are needed in their opinion. At the WSHD only the first are looked upon.

Policy

The next statement is: *the current assessment framework is sufficient to determine the effects of small hydraulic structures*. At the WSHD this is not the case, at other water authorities this is regarded more positive and the assessment framework is more sufficient, as can be seen in figure 18.

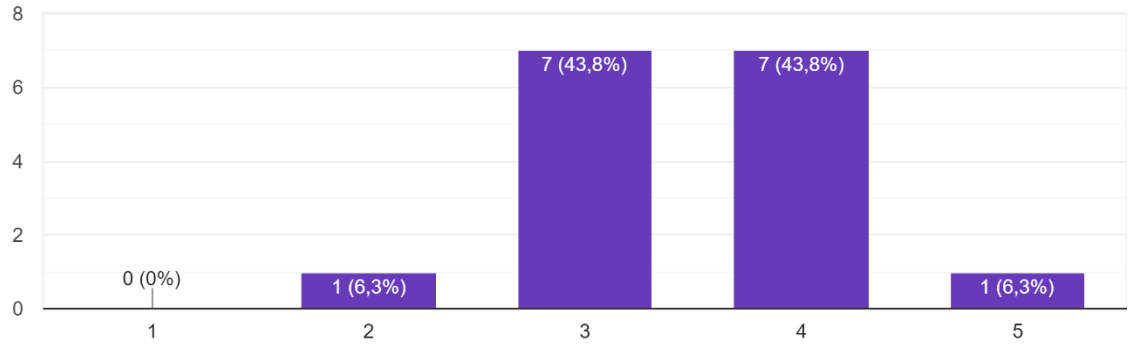

Figure 18 answers of the statement: the current assessment framework is sufficient to determine the effects of small hydraulic structures (1 completely disagree 5 completely agree).

The next statement is: *the regulation of the water authority in regard to water quality is loud and clear for the employers of the water authority*. For the WSHD this is not the case, at other regional water authorities the policy is mostly clear, as shown in figure 19.

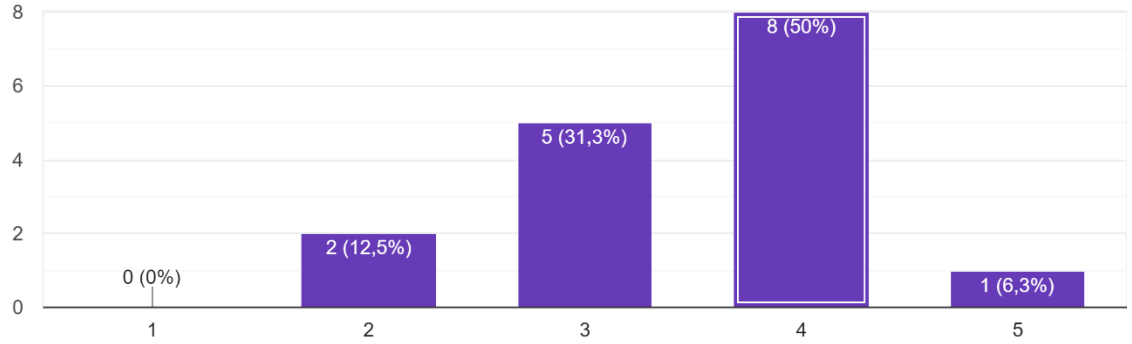

Figure 19 answers of the statement: the regulation of the water authority in regard to water quality is loud and clear for the employers of the water authority (1 completely disagree 5 completely agree).

The next statement: *is the day to day policy compliant with the WBP*. At the WSHD this currently the case however in the near future this is no longer being true. Other water authorities regard themselves consistent with the WBP in day to day policy as seen in figure 20.

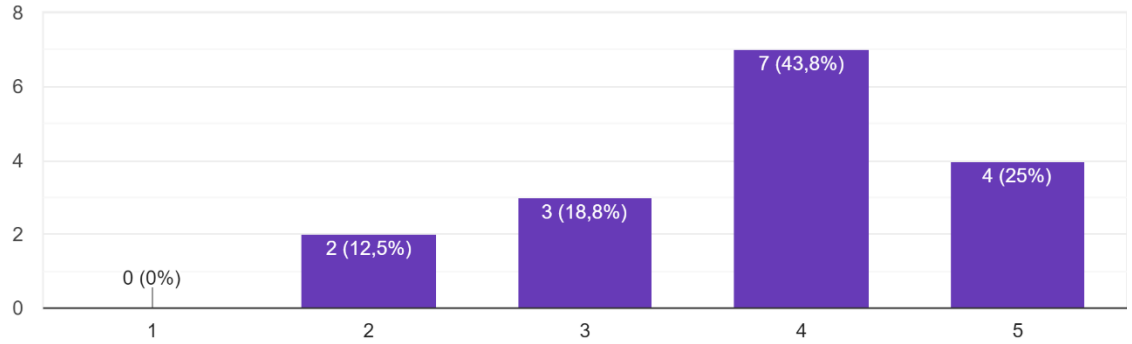

Figure 20 answers of the statement: is the day to day policy compliant with the WBP (1 completely disagree 5 completely agree).

The next question is: *who is carrying the burden for the water quality?* The costs of maintaining the water quality when new small hydraulic structures are constructed must be charged to one of the parties involved, at the WSHD these costs are now taken by the WSHD. At other water authorities these cost are not evenly distributed over the different parties involved as is shown in figure 21. Here 1 is all the cost at the water authority and 5 all the cost at everybody but the water authorities. A mixed image is shown but it trends towards the middle.

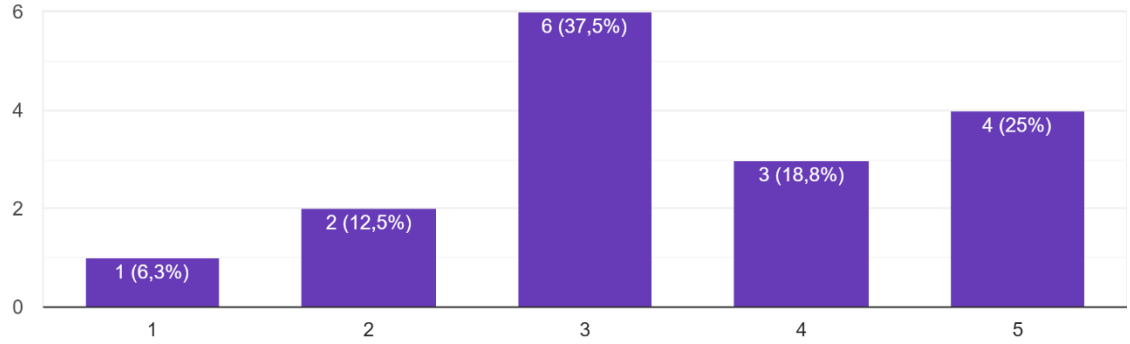

Figure 21 answers of the question: who is carrying the burden for the water quality? (1 all cost for the water authority and 5 all costs for the initiator)

The next question is an open question, this question is: *what challenges the water authority have in the assessment of the water quality?* The challenges of the WSHD are discussed in the previous chapter. The other water authorities do have sometimes similar challenges, but also different challenges arise. The main challenge that the other water authorities face are water quality changes in the long term, which makes it difficult to assess. Also the lack of knowledge and resources (employees) is mentioned.

The follow-up question is: *how can these challenges be elevated*. The most important that the other water authorities point out is to hire people with a specific skill set to look at the problem and develop a clear assessment framework to assess small hydraulic structures.

Water framework directive

The next statement is: *Are the way small hydraulic structures are assessed in line with the WFD and the Weser arrest*. For the WSHD this is a yes with an asterisk, the other water authorities think they are mostly in line with the WFD and Weser arrest as is shown in figure 22.

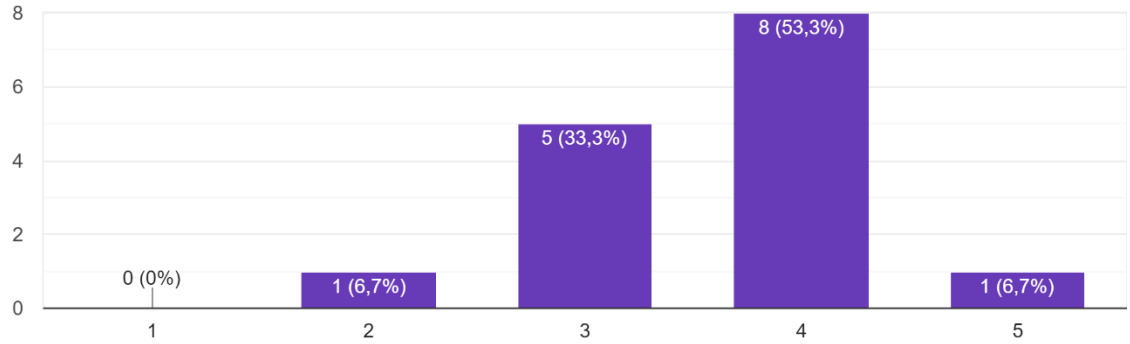

Figure 22 answers of the statement: the way small hydraulic structures are assessed is in line with the WFD and the Weser arrest (1 completely disagree 5 completely agree).

The next statement is about the position of the designated WFD waters: *WFD waters are getting too much attention in comparison to all the other waters.* At the WSHD this is clearly the case, also at other water authorities the same picture is shown in figure 23.

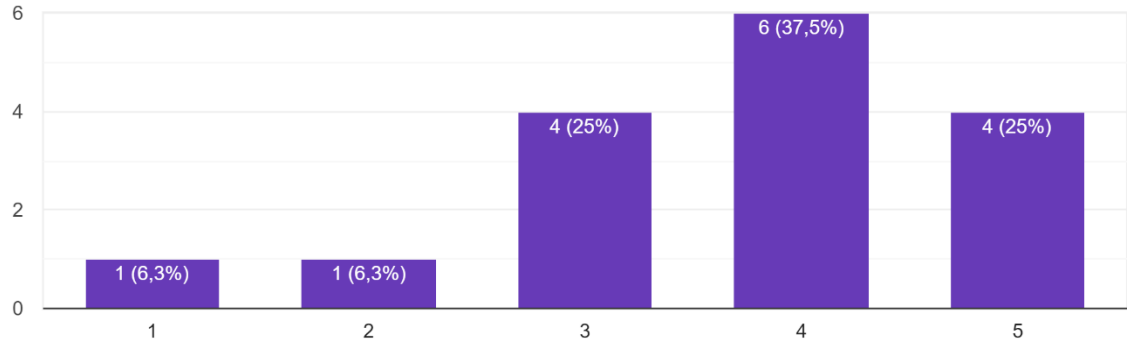

Figure 23 answers of the statement: WFD waters are getting to much attention in comparison to other bodies of water (1 completely disagree 5 completely agree).

The last statement of the questionnaire is: *the current assessment framework for water quality is useful for the assessment of the water quality*. The assessment framework from the WSHD is not useful, at other water authorities this is more often the case, as shown in figure 24.

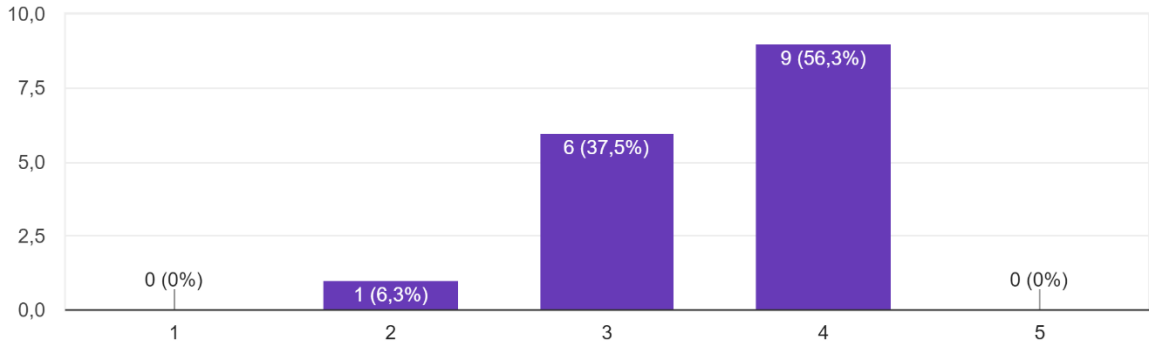

Figure 24 answers of the statement: the current assessment framework for water quality is usable for the assessment of the water quality (1 completely disagree 5 completely agree).

5.3 Conclusion

The other water authorities are mostly in line with the WSHD on how they deal with the construction of small hydraulic structures. There are some examples where they differ. There are also some lessons that can be learned from the other water authorities about how to deal with water quality. The question where there was a clear difference between the other water authorities and the WSHD are shown in figure 16, 18, 19 and 24. The first one in about the using the monitoring system for the assessment of te creation of small hydraulic structures. This is not done at the WSHD at other water authorities this tool is used. The answers at figure 18 and 19 could be grouped together and are both related to an assessment framework. The assessment framework that those water authorities use is suitable for the assessment of small hydraulic structures. At figure 24 it is shown that at the other water authorities have a usable assessment framework at the WSHD this is not present.

6 Discussion and conclusion

In this chapter the short comings of this report will be pointed out and were further research is needed in the discussion part and the main question "*To what extent does the practice of assessing and addressing the impacts of small hydraulic structures on the water quality by the regional water authorities meet the standards set by EU law?*" will be answered in the conclusion part. First the short comings will be discussed and what further research should be conducted, than the conclusions from the three phases will be presented, after that the main question will be answered. At the end the lessons and recommendations from this research will be shown.

6.1 Discussion

Future research

The lessons for the WSHD, may not be directly applicable at all the other water authorities. To see what works best at those water authorities, the research has to be repeated at those water authorities. This additional research is needed to see were the needs are, for these regional water authorities.

The effects that small hydraulic structures have on the water quality are, with the exception of a few cases, not quantified. This means that the effects are studied, but not by how much and when the effects are negligible and what parameter influence this effect the most. Further study of al the small hydraulic structures is needed to quantity these effects on the water quality.

The in this thesis discussed EKF are not directly suitable for the assessment of small hydraulic structures. It has to be researched how these EKF could be made in such a way that it could function as an assessment framework.

Havekes et al. (2021), pointed out in a recently published research, that all the actors should be involved in the improvement of the water quality. In this research only the regional water authorities are questioned. Further research is needed to see how for instance the national water authorities and the municipalities deal with small hydraulic structures. In further research the role of these actors in regard to water quality and small hydraulic structures should be investigated.

Shortcomings

The new policies like the WBP and "waterschapsverordening" are being developed and are not yet finalized. A change of this policy, can alter the conclusion of this research. This means that after the policies are finalized the validity of the research should be re-evaluated. This could result in a different outcome.

The political aspect was briefly described, to get a better grip on the political consequences an additional interview should have been conducted with someone from the "Dijkgraaf en Heemraad". This is not done due to time limitation and accessibility of the "Dijkgraaf en Heemraad".

For the questionnaire only one employee of every water authority answered it. This person could have another view on the topic than other people from the same water authority. If the questionnaire was conducted at multiple people from the same water authority a different result could be shown that was more reliable. Even better is to conduct in depth interviews with key figures of each water authority to get a better general picture of how the water authorities deal with the construction of small hydraulic structures.

6.2 Conclusion phase one analytical framework

In the first phase, the analytical framework was created. The main conclusions that could be drawn are, that water quality definitions are different for the different usages. Therefore is must be clear what the usage is. The same is the case for the method on how monitoring takes place and what parameters are monitored. Depending on the agency the parameters can differ. Within the EU the definition of water quality for surface water is defined in the WFD and is a composed out of the water ecology and the water chemistry, both have to be good to have a good water quality. The WFD does have a guideline on how there should be monitored to get a good result on the status of the water. In the Netherlands this is translated by the STOWA to create the nine ecological key factors (EKF), shown in table 3, with which the water quality could be assessed. Small hydraulic structures do effect the water quality in a negative manner. The effects that these structures have could be linked to the EKF and are shown in table 4.

EKF 1	Production water
EKF 2	Light climate
EKF 3	Production soil
EKF 4	Habitat suitability
EKF 5	Migration
EKF 6	Removal
EKF 7	Organic load
EKF 8	Toxicity
EKF 9	Context

Table 3 ecological key factors (EKF)

	Light climate (EKF 2)	Habitations suitability (EKF 4)	Migration (EKF 5)	Toxicity (EKF 8)	Context (EKF 9)
Bridge	X	X	X	X	X
Culvert	X	X	X	X	X
Bank protection		X	X	X	X
Board walk	X	X	X	X	X
Weir		X	X	X	X
Small pumping station		X	X	X	X
Floating solar park	X	X	X	X	X

Table 4 small hydraulic structures and the ecological key factors (EKF) combined

6.3 Conclusion phase two case study WSHD

For the case study the following conclusions could be extrapolated. The monitoring of the water system is sufficient to have a good image of the water quality, in both ecological and chemical sense. The effects that the creation of small hydraulic structures have on the water quality is only monitored when it is a large project or if negative effects are expected. For this reason the creation of small hydraulic structures are rarely assessed in regard to water quality. With the exception of chemical water quality that is almost always being assessed. This is in conflict with the water authorities own policies, that stated that there must be assessed if the water quality is significantly being reduced. It is unclear, what this significance implies. This makes it difficult to assess the effect on water quality of the construction of small hydraulic structures in general. Furthermore monitoring of the creation of all small hydraulic structures will be very time consuming and expensive, which is another reason why this is often not done.

challenges

In the new WBP 2022-2027, water quality is better secured, there it is stated that water quality cannot be reduced in all water bodies. This poses a contradiction and challenges with standing policies. The most concrete policy has to be followed, which means that in case of the water quality the WBP 2022-2027 has to be followed. This will bring a shift in the proceedings of water quality in the current situation and the situation of 2022. Currently the burden of maintaining the water quality is situated completely at the water authority. With the new WBP it will be the initiator that carries the burden of maintaining the water quality. This is partly addressed in the "omgevingswet" and the "zorgplicht" that stated that the initiator have responsibility to maintain the water quality.

Complying with the WFD

The WSHD complies with the EU legislation, however some remarks have to be made on this compliance. Because not all small hydraulic structures are assessed and only if they are situated in a WFD water. Never the less, in the new WBP the WSHD does certainly comply with the EU law due to the stricter definition. This is because no degradation is allowed with makes it certainly applicable with the WFD. It could even be concluded that with this new WBP, the WSHD is more strict than the WFD. This is because the Weser arrest do give some room for degradation, where the new WBP completely eliminate this possibility.

6.4 Phase three approach other water authorities

The other water authorities are mostly in line with the WSHD on how they deal with the construction of small hydraulic structures. There are some examples where they differ. There are also some lessons that can be learned from the other water authorities about how to deal with water quality. The question where there was a clear difference between the other water authorities and the WSHD are:

- Some other water authorities use the existing monitoring to determine the effects of small hydraulic structures on the water quality;
- Some other regional water authorities have an assessment framework that is sufficient to determine the effects of small hydraulic structures;
- This makes the regulation of the water authority in regard to water quality, loud and clear for the employers;
- And makes the current assessment framework for water quality, usable for the assessment of the water quality.

6.5 Main question

To conclude this thesis the main research question is answered, derived from the answered sub questions.

To what extent does the practice of assessing and addressing the impacts of small hydraulic structures on the water quality by the regional water authorities meet the standards set by EU law?

The EU law does not define a standard in regard to the effect that small hydraulic structures have on the water quality. EU law stated that the water quality in all the water bodies must be good by 2027, the manner in which this is achieved is not defined. The construction of small hydraulic structures effect the water quality in a negative way. For this reason it can be concluded that small hydraulic structures are, according to the law, not allowed in the water system. This because it could be a violation of the Weser arrest and jeopardizes the goals of the WFD. Most regional water authorities do not always assess the construction of small hydraulic structures, this is only done in some specific circumstances. Therefore the problems these small hydraulic structures cause are not adactyly talked. This means that some the regional water authorities to not meet the standards set by the EU law, because they are not actively working towards the goals of the WFD.

6.6 Lessons and recommendations

All small hydraulic structures cause some kind of impact on the water quality, as is shown in the sub question *What possible impacts could small hydraulic structures have on water quality?*. To assess the effects of these structures better a framework must be created, as multiple interviewees pointed out. Inspiration for a framework can be obtained from the ecological key factors (EKF) from the STOWA (n.d.). The EKF cannot be used without alterations as was pointed out in the interview with the ecologists. The current EKF is too detailed and intended for detailed monitoring and complete system analysis instate of a single small hydraulic structures. The EKF must be changed to make it easy to use for a wider audience.

To better assess of the effects of small hydraulic structures and their effects on the water quality, the system as a whole should be assessed. This instead of only the section where the small hydraulic structures are created. This complete water system approach makes it possible to see if new small hydraulic structures are possible or not.

Making a better translation of what is happening in the environment and the effect on the water quality, it may be needed to hire a field ecologist. This specialist can translate the effect of the construction of small hydraulic structures and the water quality. This is not only useful for small hydraulic structures, but also larger projects could benefit from this, as was pointed out in the questionnaire.

Good indicators for water quality are vegetation area, light incidence, possibility to enter or exit the water and fish to pass a water level regulation structure in both directions. All of these indicators are relatively easy to assess, which makes it fast and cheap to assess. Time and costs, are the main reason the assessments are currently not done more frequently. These indicators make it easily accessible. The same as with the EKF is that these indicators need to be calibrated, as stated by the ecologist.

Not all waters are equal, some waters have outstanding water quality while others are in a deplorable state (bad). Also, the location is very important, in an urban area the desired water quality and water status is different than at a rural area. This makes it possible, to make for all the different location a different desired state of how the water has to be. Small hydraulic structures can be adjusted accordingly. This is an idea that is a descended from the "water beeldboek" from the water authority Vallei en Veluwe. This approach was pointed out by multiple interviewees.

The manner in which water quality problems are resolved, is in the end a political choice. The requestor of small hydraulic structures can be made responsible for the water quality conservation or the water authority can take this burden instead and obtain the money for this via taxes. Also a middle ground can be chosen, where for small changes the water authority takes care of it and for big structures the initiator. The party who has to pay for it is a political choice in the end, as the policy advisor pointed out. But a choice that have to be made.

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Appendix A

vragen

1) *Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald?*

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.
- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Met welke frequentie wordt er gemeten
- Waar wordt er gemeten
- Hoe wordt er gemeten
- Wie is verantwoordelijk voor deze meting
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek

analyse

- Hoe worden de resultaten van de monteringen geanalyseerd
- Wat wordt er gedaan met de conclusie van de analyse
- Waar worden deze analyses uiteindelijk gebruikt
- Waarom wordt de analyse uitgevoerd
- Wie bepaald wat er wordt geanalyseerd
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten
- Wie is er verantwoordelijk voor deze meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit

2) *Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit?*

Monitoring

- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.

Analyse

- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.

Activiteit

- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- Waarom zijn dit de uitdagingen
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Waar komen de meeste uitdagingen voor
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor
- Welke oplossingen worden er gezien om problemen hier op te lossen

3) *Voldoet het beoordeling van kleine waterstaatkundige objecten van de WSHD aan de standaarden van de KRW wetgeving?*

Monitoring

- Wat zijn de verschillen tussen de monitoring van de KRW en hoe dit wordt gedaan door WSHD?
- Waarom zijn deze verschillen er?
- Hoe moet de monitoring worden aangepast om hieraan te voldoen?
- Waar moeten deze aanpassingen worden gedaan?

Analyse

- Wat zijn de verschillen tussen de analyse van de KRW en hoe dit wordt gedaan door WSHD?
- Waarom zijn deze verschillen er?
- Hoe moet dit worden aangepast om hieraan te voldoen?
- Waar moeten deze aanpassingen worden gedaan?

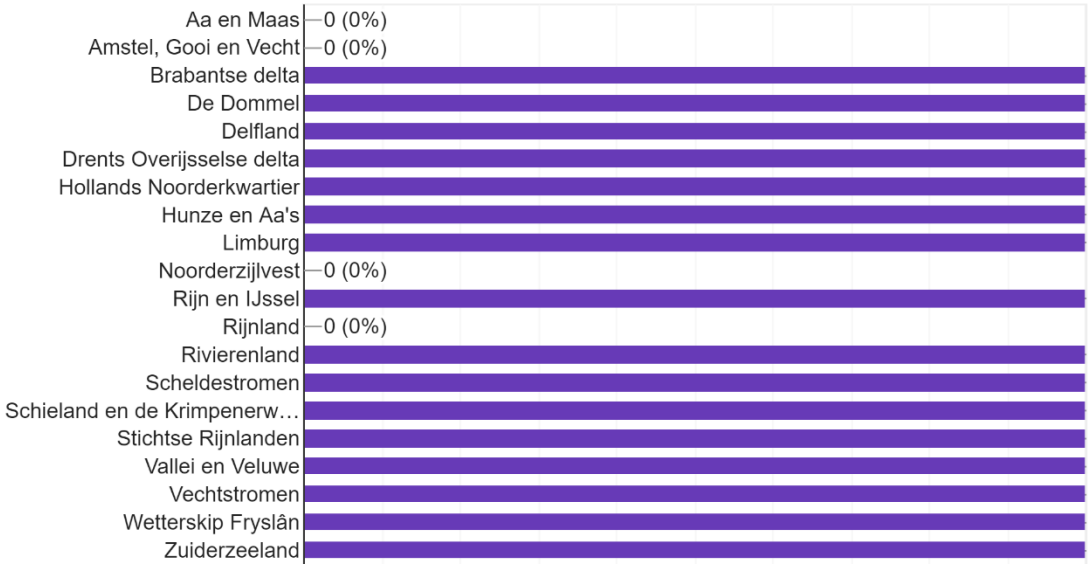
Activiteiten

- Hoe moeten activiteiten worden beoordeeld conform de KRW en hoe wordt dit gedaan bij de WSHD?
- Waarom zijn deze verschillen er?
- Hoe moet dit worden aangepast om hieraan te voldoen?
- Waar moeten deze aanpassingen worden gedaan?

Appendix B

Bij welke organisatie bent u werkzaam?

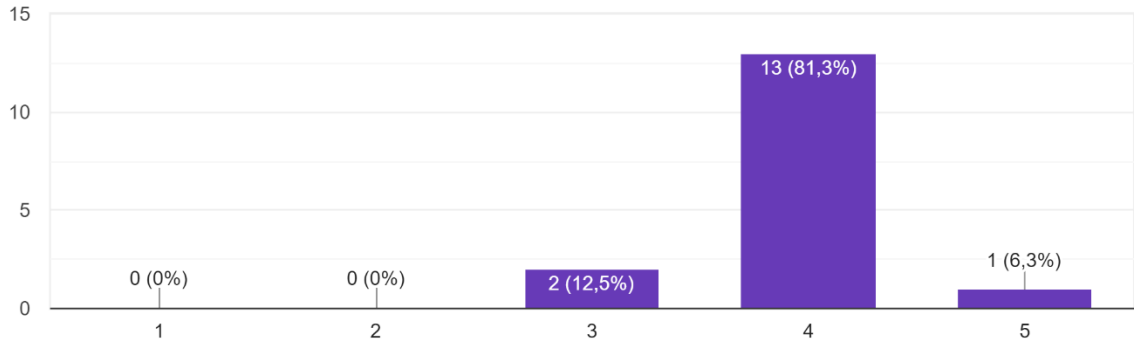
16 antwoorden



Welke functie heeft u?

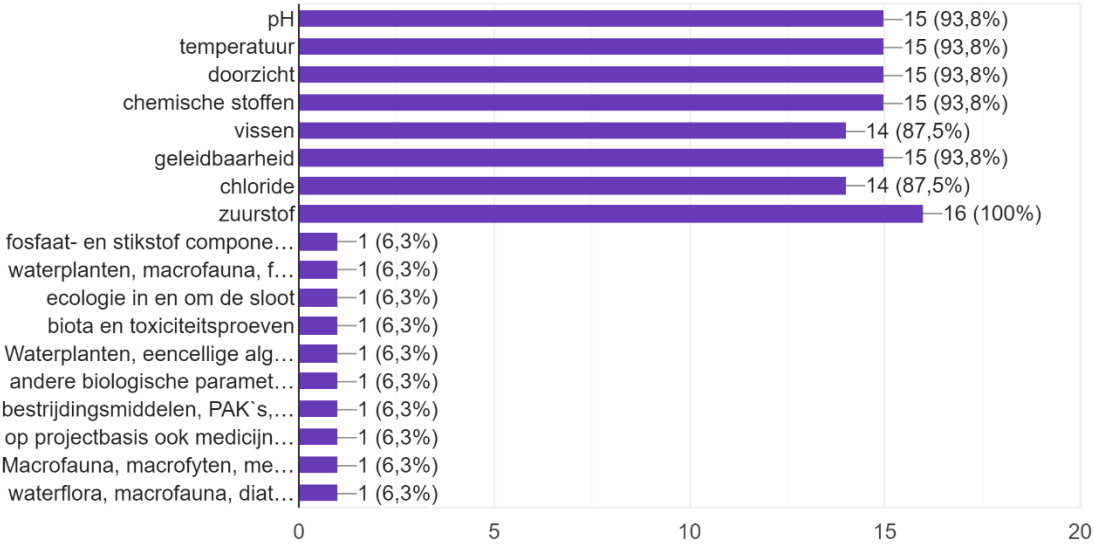
Stelling: Het monitoringsnetwerk voor de waterkwaliteit van de organisatie waar u werkzaam ben is mijns inziens afdoende om veranderingen in de waterkwaliteit te kunnen bepalen.

16 antwoorden



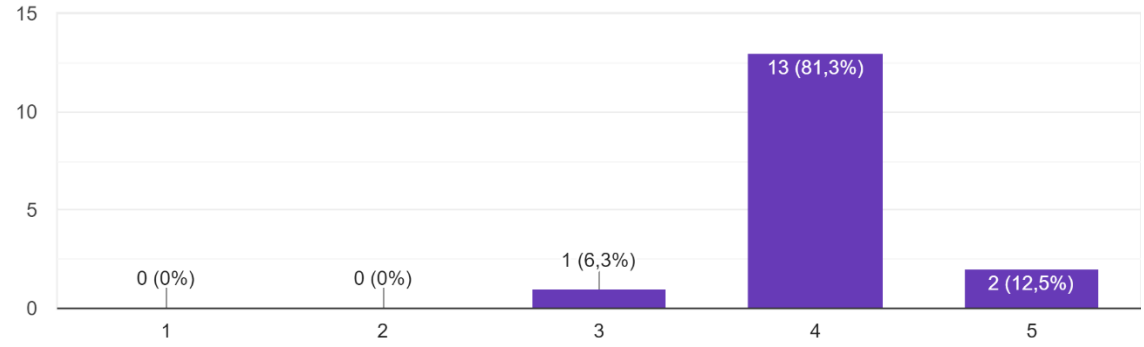
Bij mijn instantie wordt de waterkwaliteit gemeten op de volgende aspecten: (meerdere antwoorden mogelijk)

16 antwoorden



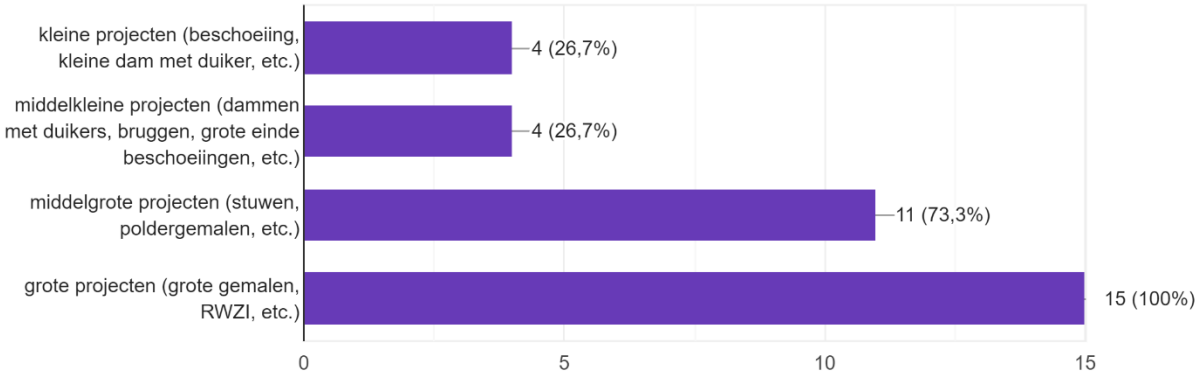
Stelling: De organisatie waar u werkzaam ben heeft een goed beeld van de huidige waterkwaliteit.

16 antwoorden



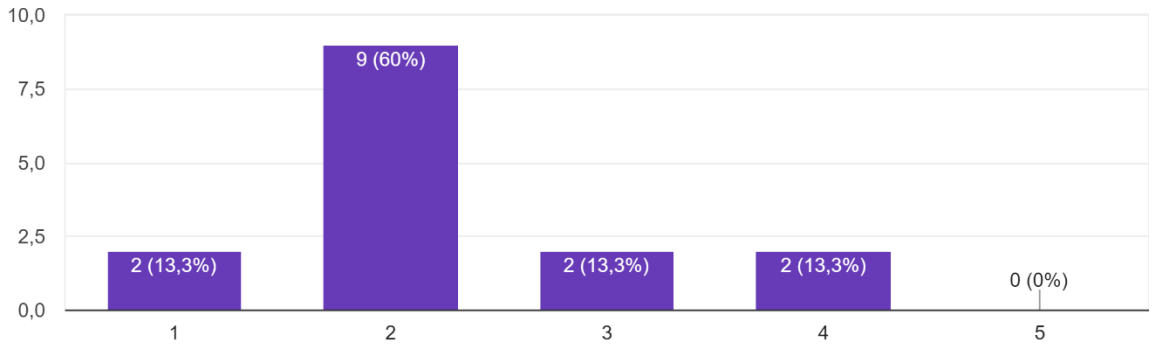
Bij welke projecten worden binnen uw organisatie de effecten op de waterkwaliteit gemonitord? (meerdere antwoorden mogelijk)

15 antwoorden



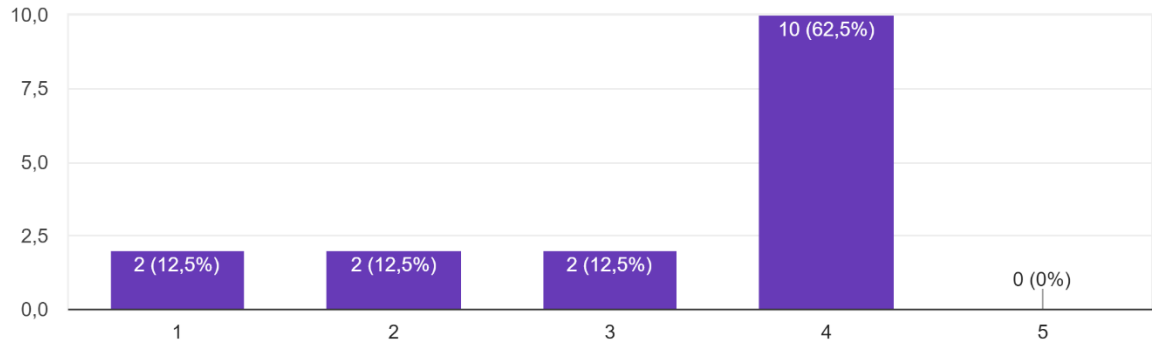
Stelling: De effecten van kleine waterstaatkundige objecten op de waterkwaliteit worden door uw organisatie goed in beeld gebracht.

15 antwoorden



Stelling: Bij projecten in het watersysteem wordt er binnen uw organisatie integraal gekeken naar water -kwaliteit en -kwantiteit.

16 antwoorden



De beoordeling van de chemische waterkwaliteit als gevolg van de realisatie van kleine waterstaatkundige objecten gebeurt binnen uw organisatie:

16 antwoorden

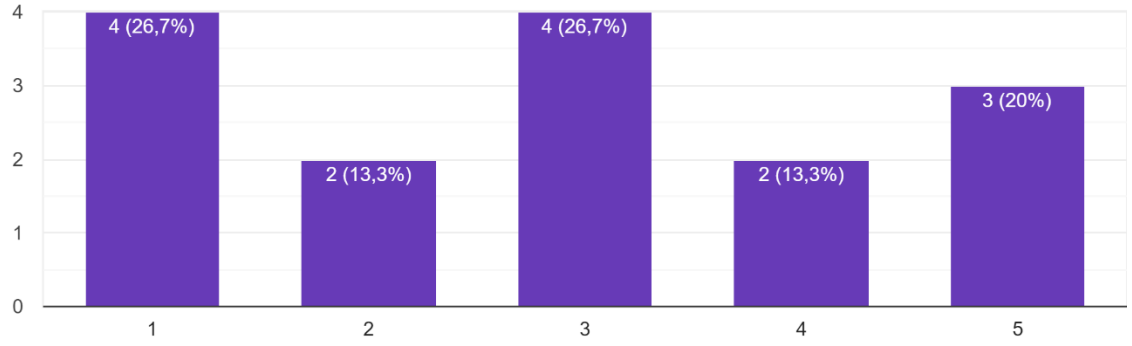
De beoordeling van de ecologische waterkwaliteit als gevolg van de realisatie van kleine waterstaatkundige objecten gebeurt binnen uw organisatie:

16 antwoorden

Hoe worden de effecten van kleine waterstaatkundig project op de waterkwaliteit binnen de organisatie getoetst?

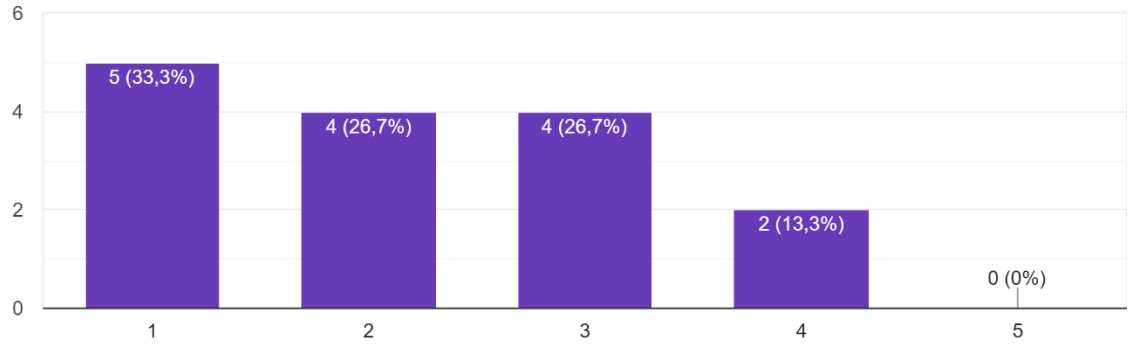
Stelling: Er wordt altijd gebruik gemaakt van het bestaande meetnet voor de beoordeling van de waterkwaliteit effecten van kleine waterstaatkundige objecten binnen uw organisatie.

15 antwoorden



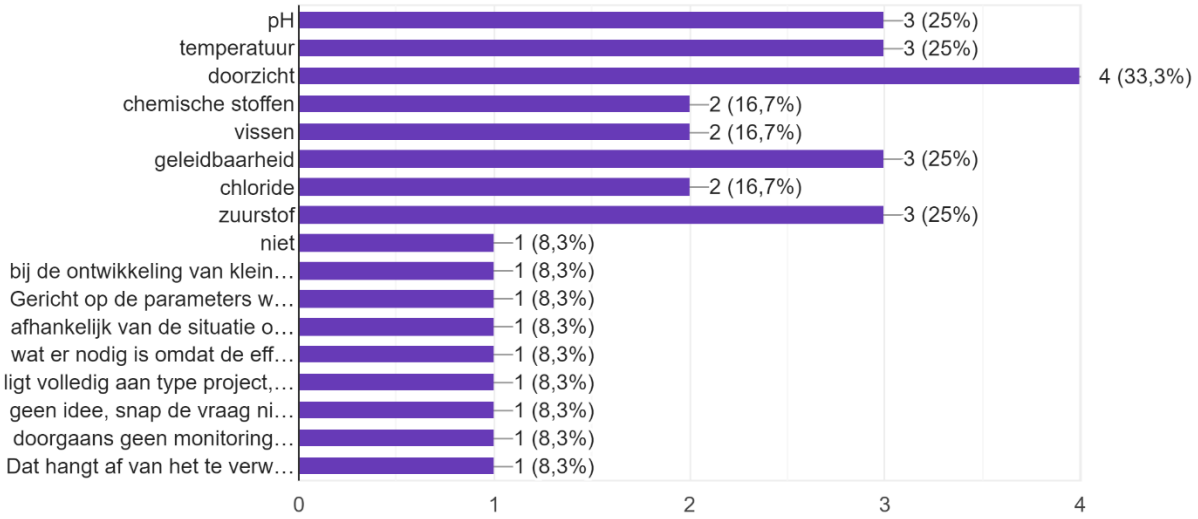
Stelling: Er worden altijd extra metingen gedaan voor de beoordeling van de waterkwaliteit effecten van kleine waterstaatkundige objecten binnen uw organisatie.

15 antwoorden



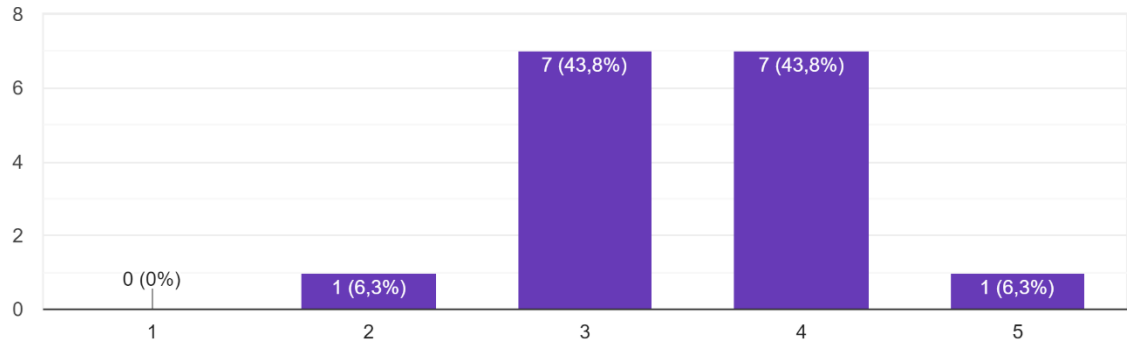
Bij deze extra meting wordt er gemeten op:

12 antwoorden



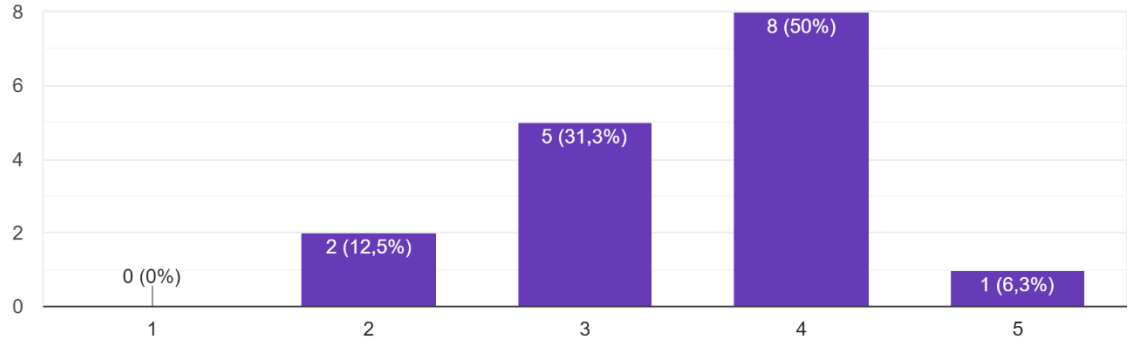
Stelling: Het toetsingskader dat u binnen uw organisatie hanteren is afdoende om de effecten van projecten op de waterkwaliteit goed in beeld te kunnen brengen.

16 antwoorden



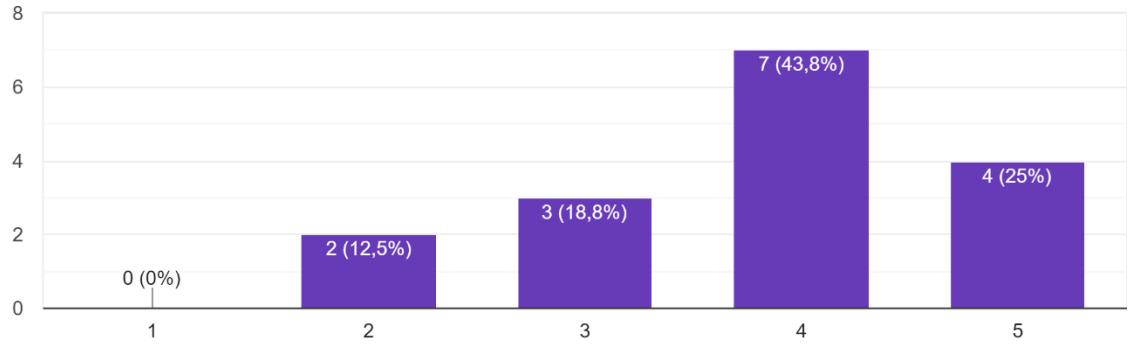
Stelling: Beleid en regelgeving vanuit de waterbeheerder omtrent waterkwaliteit is duidelijk en concreet voor de medewerkers.

16 antwoorden



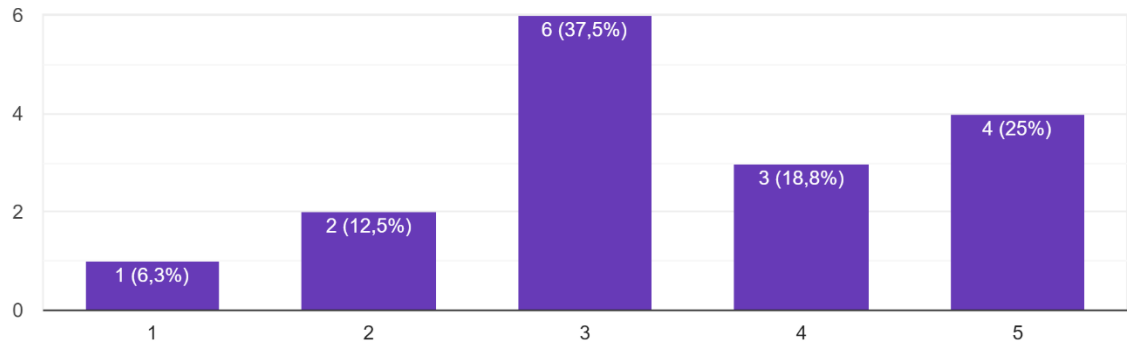
Stelling: De dagelijks geldende beleidspraktijk is consistent met het waterbeheersprogramma van uw organisatie.

16 antwoorden



Stelling: De extra lasten die voortvloeien uit het op peil houden van de waterkwaliteit bij het doorvoeren van kleine waterstaatkundige objecten worden door uw organisatie gedragen.

16 antwoorden

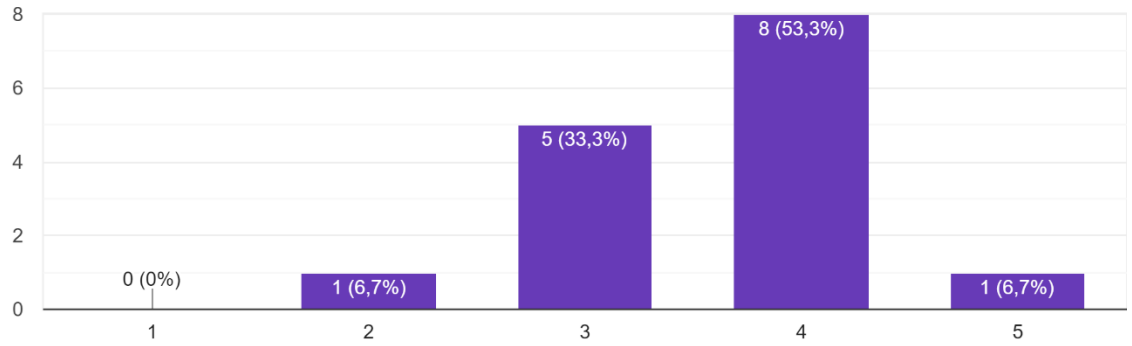


Het beoordelen van veranderingen in de ecologische waterkwaliteit bij het aanleggen van kleine waterstaatkundig objecten is niet makkelijk. Kunt u aangeven welke uitdagingen zich hierbij voordoen?

Welke suggesties heeft u om deze uitdagingen te kunnen verhelpen?

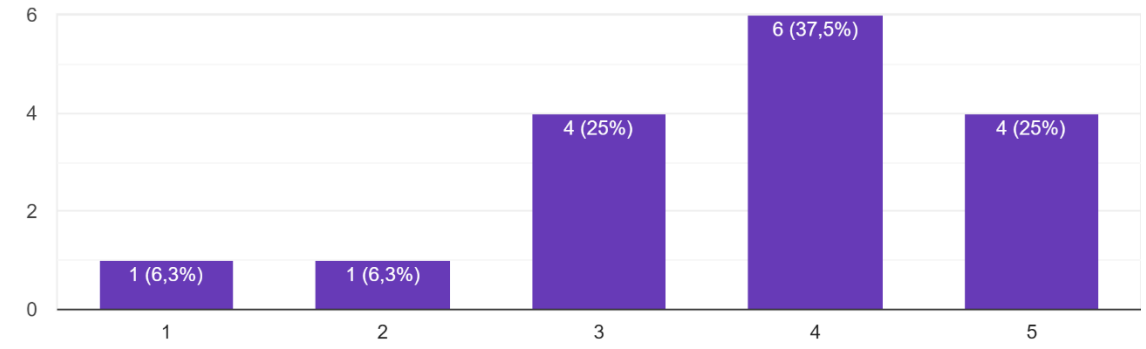
Stelling: De wijze waarop uw organisatie de effecten van kleine waterstaatkundige objecten op de waterkwaliteit beoordeelt, is mijns inziens in lijn met de KRW en het Wezer arrest.

15 antwoorden



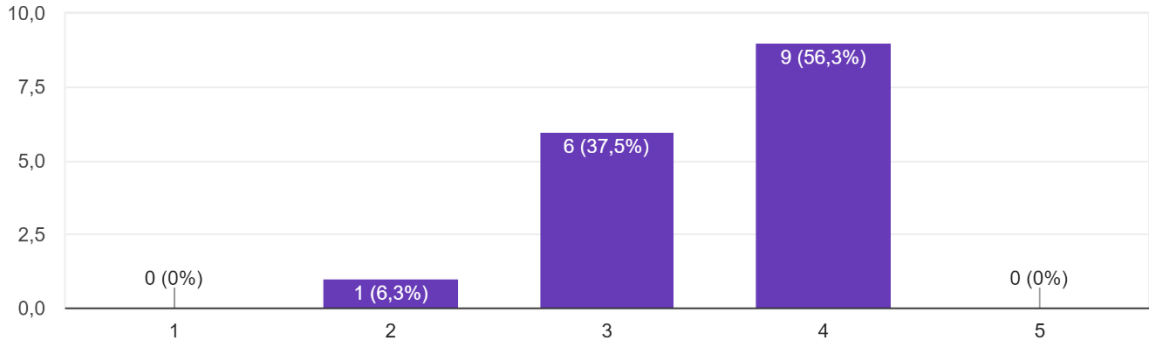
Stelling: Binnen uw organisatie is er focus op de KRW wateren. Hierdoor zijn niet aangewezen KRW wateren minder goed beschermd.

16 antwoorden



Stelling: Het toetsingskader waarmee de ecologische waterkwaliteit wordt beoordeeld is werkbaar.

16 antwoorden



Appendix C

Interview (aquatische ecologen)

4) *Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald*

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.
- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Met welke frequentie wordt er gemeten
- Er zijn door het gebied 2000 metingen gedaan per maand en deze metingen
- Waar wordt er gemeten
- Deze metingen vinden plaats door het hele gebied
- Hoe wordt er gemeten
- Dit zijn zowel geautomatiseerde en niet geautomatiseerd
- Wie is verantwoordelijk voor deze meting
- De afdeling AAAD
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek
- Dit zijn belangrijke wateren zoals KRW waterteren.

analyse

- Hoe worden de resultaten van de monteringen geanalyseerd
- De resultaten worden in het WACO geplaatst waar deze beschikbaar zijn voor de gebruikers. Het is de planning om deze voor het gehele waterschap beschikbaar te maken en ook externe kunnen er mogelijk in de toekomst bij.
- Wat wordt er gedaan met de conclusie van de analyse
- Er wordt aan de hand van de data bepaald waar de problemen zitten en waar de waterkwaliteit slecht is en waar mogelijke maatregelen moeten worden genomen.
- Waar worden deze analyses uiteindelijk gebruikt
- Deze resultaten worden gebruikt om te beoordelen of de waterkwaliteit goed is voor de KRW of als zwemwater.
- Waarom wordt de analyse uitgevoerd
- Om te voldoen aan de monitoringsplicht
- Wie bepaald wat er wordt geanalyseerd
- Dit wordt bepaald door de ecologen (AAAD)
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.
- Deze wordt gebruikt om te bepalen of een waterlichaam voldoet aan de gestelde eisen en wat de trends zijn in het watersysteem

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten
- Wie is er verantwoordelijk voor deze meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit

5) *Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit.*

Monitoring

- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost
- Er wordt momenteel op punten gemeten maar het beeld van het gehele watersysteem ontbreekt.
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.

Analyse

- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.

Activiteit

- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- De effecten van deze objecten op het watersysteem is onbekend maar het valt te beargumenteren dat deze een slecht effect hebben op de waterkwaliteit. Voor het beoordelen is een systeem analyse nodig en de effecten die de werkzaamheden zullen hebben.
- Waarom zijn dit de uitdagingen
- Het is een uitdaging omdat er momenteel geen systeem benadering van toepassing is op het uitvoeren van werkzaamheden en er alleen per project wordt gekeken.
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Er is een verantwoordelijkheid van meerder kanten om een goed beeld te krijgen van het systeem is het de verantwoordelijkheid van AAAD, het beleid is de verantwoordelijkheid van de beleidsmakers.
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Door het ontbreken van een systeem benadering is het niet mogelijk om de effecten van de werkzaamheden te kunnen beoordelen. Ook is het nu niet mogelijk om te kunnen beoordelen of het erg is dat er activiteiten gebeuren in het watersysteem wanneer de waterkwaliteit al slecht is dan maakt wat aanpassingen geen verschil maar wanneer deze goed is maakt dit wel uit.
- Waar komen de meeste uitdagingen voor
- De meeste uitdagingen komen voor in kleine wateren omdat deze niet goed gereguleerd zijn zoals bij KRW wateren
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor
-

Interview (beleidsmedewerker)

1) Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald?

Het beoordelen van de effecten die kleine waterstaatkundige werken hebben op de waterkwaliteit is lastig te meten en het is ook de vraag of dit wenselijk is. Dit aangezien dit een aantal problemen met zich mee brengt over de effectiviteit. Over het algemeen is het uitlogen of lozen goed geregeld echt blijft het een constant veranderen veld door de toevoeging van nieuwe stoffen. Deze nieuwe stoffen zijn niet altijd goed geborgd. Er zal daardoor steeds meer beroep worden gedaan op de zorgplicht van de derde partijen, het is daarbij wel van belang dat er wel een goed toetsingskader is. Het zou hier het beste zijn als deze van het waterschap is echter kan indien nodig een toetsingskader van andere waterschapen of onderzoeksinstanties worden gebruikt. Voorbeelden hiervan zijn documenten van de STOWA. Om de waterkwaliteit te beoordelen kan er bijvoorbeeld gebruik worden gemaakt van de ecologische sleutelfactoren (ESF). Echter blijft het huidige beleid achter op de ontwikkelingen en mogelijkheden dit kan er voor zorgen dat er in de toekomst problemen ontstaand

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.
- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Met welke frequentie wordt er gemeten
- Waar wordt er gemeten
- Hoe wordt er gemeten
- Wie is verantwoordelijk voor deze meting
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek analyse
- Hoe worden de resultaten van de monteringen geanalyseerd
- Wat wordt er gedaan met de conclusie van de analyse
- Waar worden deze analyses uiteindelijk gebruikt
- Waarom wordt de analyse uitgevoerd
- Wie bepaald wat er wordt geanalyseerd
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten
- Wie is er verantwoordelijk voor deze meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit

2) Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit?

Er zijn een aantal uitdagingen die er bij de waterkwaliteit komen kijken deze zijn als volgt. Voor een goed gevormd beleid zal er periodiek een probleem analyse moeten worden gedaan deze wordt nu beperkt gedaan door VTH echter is dit niet de juiste locatie waar dit moet gebeuren waardoor de slager zijn eigen vlees gaat keuren. Het moet eigenlijk van bovenaf komen en dan doorsijpelen naar de rest van de organisatie. Er moet meer ruimte komen op zaken verder uit te werken en te onderzoeken op zo de problemen goed in beeld te krijgen en een beleid daarop af te

stemmen. Echter pak momenteel niemand deze handschoen op. Ook is het beleidsneutraal overgaan naar de omgevingswet een gemiste kans om het beleid op de schop te nemen. Wel komt er in de nieuwe omgevingswet meer ruimte voor de zorgplicht wat ruimte geeft echter kan dit ook een zwaar anker worden voor het waterschap omdat er dan wel adequaat moet worden getoetst waarvoor momenteel de mankracht en kennis voor ontbreekt. Daarnaast moet de kwaliteit beter worden gewaarborgd door het uitvoeren van audits bij andere waterschap en zij bij ons.

Monitoring

- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.

Analyse

- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.

Activiteit

- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- Waarom zijn dit de uitdagingen
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Waar komen de meeste uitdagingen voor
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor
- Welke oplossingen worden er gezien om problemen hier op te lossen

Vragen (proces engeneer)

1) Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald?

Er wordt onderscheid gemaakt in twee soorten projecten de gene die de water kwaliteit verbeteren en de gene die de kwantiteit verbeteren. Er wordt bij de kwantiteit projecten steeds meer gekeken of daar ook de kwaliteit aspecten kunnen worden meegenomen. In zulke gevallen wordt dan ook bepaald wat de effecten zijn op de waterkwaliteit. Er zijn in het verleden wel proeven gedaan waar de effecten werden bepaald voor en na het project echter is dit zeer prijzig en de resultaten zijn twijfelachtig gezien de dynamiek die heerst in het watersysteem. Het is daarom lastig om te bepalen wat de effecten van bepaalde maatregelen zullen zijn of zijn geweest er kan echter wel worden bepaald door de situatie te bespreken met de experts (aquatische ecologen) of de waterkwaliteit zal verbeteren door het nemen van deze maatregelen en hoe groot dit effect ongeveer zal zijn. Daarnaast is het belangrijk om op te merken dat de definitie van een goede waterkwaliteit niet altijd even correct is. Er is in een watersysteem een palet aan verschillende waterlichamen nodig waarbij ook dode watergangen met op het oog slechte waterkwaliteit een rol spelen in het gehele systeem. Het is echter wel noodzaak dat deze watergangen niet de overhand krijgen aangezien ze dan wel een probleem kunnen vormen. Ook wordt er voor de beoordeling nu te veel gekeken naar punt lozingen. Zoals bij een RWZI waar maar weinig vervuiling uit mag komen, echter komt het voor dat door een diffuse lozing over een groot gebied er in totaal meer vervuiling komt op het water.

Voor de beoordeling van de waterkwaliteit kan er worden gekeken naar de ESF momenteel worden deze gebruikt voor het beoordelen van KRW wateren. Deze kunnen worden omgevormd naar meet methodes voor het bepalen van effecten voor andere werkzaamheden. Echter moeten deze dan pragmatische worden gebruikt voor de toetsingscriteria en niet als exact meet instrumentarium.

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.
- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Met welke frequentie wordt er gemeten
- Waar wordt er gemeten
- Hoe wordt er gemeten
- Wie is verantwoordelijk voor deze meting
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek analyse
- Hoe worden de resultaten van de monteringen geanalyseerd
- Wat wordt er gedaan met de conclusie van de analyse
- Waar worden deze analyses uiteindelijk gebruikt
- Waarom wordt de analyse uitgevoerd
- Wie bepaald wat er wordt geanalyseerd
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten
- Wie is er verantwoordelijk voor deze meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit

2) Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit?
Momenteel wordt er niet afdoende gekeken naar wat de effecten zijn op het gehele watersysteem maar wordt er te veel gefocust op één bepaalde watergang of mogelijk een klein gebied. Dit moet worden verbreed naar een watersysteem benadering aangezien tot daar de effecten grenzen. Ook moet er een bepaalde afruil plaats vinden waarbij aan bijvoorbeeld een zijde van de watergang een natuurvriendelijk oever wordt geplaatst en aan de andere zijde kunnen dan beschoeiingen worden geplaatst. Ook is het niet in elke watergang bezwaarlijk om activiteiten uit te voeren, in sommige watergangen is de waterkwaliteit dusdanig slecht dat er niet veel mis kan gaan, in andere watergang is juist het tegenovergestelde het geval. Er moet een duidelijk lijst komen met waar iets wel kan en waar iets niet kan. Dit maakt het ook beter verdedigbaar naar derde toe waarom iets op locatie a wel kan en op b niet. Ook is het een oplossing om te kijken wat wij als waterschap willen in bepaalde watergangen hoe wij een beschoeiing willen zien en wat de beste ecologische oplossing is voor zulke alternatieven. Dit kan worden bewerkstelligen door het maken van een soort beeldbank met daarin voorbeelden hoe wij werken het liefste uitgevoerd zien. Echter moet om dit te kunnen aanpassen er beleid wijzigen, er is een mogelijkheid om dit te doen met de nieuwe omgevingswet. Deze bevoegdheid komt ook meer onze kan op waardoor we er ook meer verantwoordelijk voor worden en ook meer mandaat hebben om er wat aan te doen. Er is alleen bepaald dat er beleidsneutraal wordt overgegaan naar de nieuwe omgevingswet. Hierdoor ontnemen wij onszelf de mogelijkheid om nu al de nodige wijzigingen door te voeren.
Monitoring
- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.

Analyse
- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.

Activiteit
- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- Waarom zijn dit de uitdagingen
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Waar komen de meeste uitdagingen voor
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor
- Welke oplossingen worden er gezien om problemen hier op te lossen

Vragen (jurist)

1) Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald?

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.
- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Met welke frequentie wordt er gemeten
- Waar wordt er gemeten
- Hoe wordt er gemeten
- Wie is verantwoordelijk voor deze meting
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek analyse
- Hoe worden de resultaten van de monteringen geanalyseerd
- Wat wordt er gedaan met de conclusie van de analyse
- Waar worden deze analyses uiteindelijk gebruikt
- Waarom wordt de analyse uitgevoerd
- Wie bepaald wat er wordt geanalyseerd
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten
- Wie is er verantwoordelijk voor deze meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit

2) Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit?

Monitoring

- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.

Analyse

- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.

Activiteit

- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- Waarom zijn dit de uitdagingen
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Waar komen de meeste uitdagingen voor
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor

- Welke oplossingen worden er gezien om problemen hier op te lossen

3) Voldoet het beoordeling van kleine waterstaatkundige objecten van de WSHD aan de standaarden van de KRW wetgeving?
De beoordeling van de waterkwaliteit zoals deze nu wordt gedaan is acceptabel op dit moment. Dat het huidige beleid niet voldoet aan de KRW is geen problematisch issue aangezien er door een recht zal worden geoordeeld aan de hand van de huidige stukken en niet de KRW. Echter is waterkwaliteit een belangrijk aspect waarop getoetst moet worden het ontbreken van z'n toets kan leiden tot een gegrond bezwaar zoals is voorgekomen bij RIF 010.
Echter wanneer het nieuwe WBP 2022-2027 van kracht wordt dan zit hier een probleem. Het WBP is gemaakt met de in acht neming van de eisen die worden gesteld in de KRW. Er ontstaat door het nieuwe WBP een discrepantie tussen de huidige beleidsregels en dit nieuwe WBP. Wanneer dit het geval is moet er worden uitgegaan van een meest concrete stuk, in dit geval zal dit betekenen dat het WBP leidend zou worden. Dit vanwege dat dit WBP zegt dat er geen verslechtering mag plaats vinden waar de huidige beleidsregels zeggen geen significante verslechtering. Hierin is het WBP duidelijker dan de beleidsnota. Dit betekent dat het tactische WBP moet worden vertaald in operationeel beleid. Ook zal er een toetsingskader moeten worden gecreëerd om de effecten op de waterkwaliteit te kunnen beoordelen, dit zou bijvoorbeeld de ESF van de STOWA kunnen zijn zij het pragmatischer gemaakt. Echter ontbreekt hier de link/ inzicht in de noodzaak.
Er zal echter iets moeten gebeuren en wel een van de volgende zaken, met de kanttekening dat er nog grijzen gebieden zijn om deze oplossingen
- Huidige beleid houden en het waterschap regelt de compensatie voor waterkwaliteit verlies.
- Individuen moeten zelf de compensatie voor de regelen voor de waterkwaliteit verlies.
- Niks mag meer wat mogelijk de waterkwaliteit verslechterd.

Monitoring
- Wat zijn de verschillen tussen de monitoring van de KRW en hoe dit wordt gedaan door WSHD?
- Waarom zijn deze verschillen er?
- Hoe moet de monitoring worden aangepast om hieraan te voldoen?
- Waar moeten deze aanpassingen worden gedaan?

Analyse
- Wat zijn de verschillen tussen de analyse van de KRW en hoe dit wordt gedaan door WSHD?
- Waarom zijn deze verschillen er?
- Hoe moet dit worden aangepast om hieraan te voldoen?
- Waar moeten deze aanpassingen worden gedaan?

Activiteiten
- Hoe moeten activiteiten worden beoordeeld conform de KRW en hoe wordt dit gedaan bij de WSHD?
- Waarom zijn deze verschillen er?
- Hoe moet dit worden aangepast om hieraan te voldoen?
- Waar moeten deze aanpassingen worden gedaan?

Vragen (project manager)

1) Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald?

Er worden momenteel niet standaard gemonitord voor, tijdens of na het uitvoeren van de werkzaamheden. Dit wordt alleen gedaan wanneer er problemen met de ecologische aspecten te verwachten zijn. De rede hiervoor is dat de kosten voor het monitoren erg hoog zijn. Het meetnet wat is opgesteld bied geen oplossing hierin in de meeste gevallen. Dit meetnet is met namen gefocust op de KRW wateren en minder op de overige watergangen waardoor dit geen beeld geeft van de effecten. Momenteel wordt het meetnet onder de loep genomen om een beter beeld te krijgen van hoe de waterkwaliteit is in het systeem i.p.v. alleen de KRW wateren.
Het is mogelijk om ESF te gebruiken om de effecten die bepaalde activiteiten hebben in de waterkwaliteit de bepalen. Deze factoren kunnen als tool worden gebruikt om te bepalen wat de effecten zijn van bepaalde activiteiten. Er zal dan niet een echte meting worden gebruikt maar alleen worden gekeken of de activiteiten de factoren negatief of positief beïnvloeden.
De meeste effecten zijn te zien bij hoge beschoeiing, daar kunnen dieren minder goed de kant op komen en kunnen planten zich minder goed vestigen. Lage beschoeiing van pak en beet 10cm hebben dit probleem een stuk minder tot niet. Echter zal ten alle tijden moeten voorkomen dat er een beschoeiing wordt geplaatst alleen wanneer de stroomsnelheden te groot zijn of als de kanten afkalven is een beschoeiing een valide optie in alle andere gevallen is een NVO een meer wenselijkere optie.

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.
- Dit wordt niet gedaan tenzij er problemen te verwachten zijn
- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Met welke frequentie wordt er gemeten
- Waar wordt er gemeten
- Hoe wordt er gemeten
- Wie is verantwoordelijk voor deze meting
- De ecologen zijn verantwoordelijk voor het uitvoeren van de metingen
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek
- Er wordt met namen gemeten in KRW wateren en op een aantal andere locatie, deze locaties zijn gekozen omdat deze belangrijk zijn voor het behalen van de doelen van het waterschap.

analyse

- Hoe worden de resultaten van de monteringen geanalyseerd
- Wat wordt er gedaan met de conclusie van de analyse
- Waar worden deze analyses uiteindelijk gebruikt
- Waarom wordt de analyse uitgevoerd
- Wie bepaald wat er wordt geanalyseerd
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.
- Momenteel wordt voor de beoordeling de ESF niet gebruikt echter zal dit wel een tool kunnen zijn om een inschatting te kunnen maken wat de effect van bepaalde activiteiten op de ecologie hebben. Dit zal dan geen exact getal geven maar wel een indicatie of de waterkwaliteit vooruit of achteruit gaat door de activiteiten.

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten

- De metingen worden met namen gedaan in KRW wateren maar zijn niet dekkend voor het volledige watersysteem. Momenteel wordt het meetnet onder de loep genomen om een meet systeem gerichte meting te kunnen doen.
- Wie is er verantwoordelijk voor deze meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit
- Met namen door van die hoge beschoeiing kunnen dieren niet meer op de kant komen en is het voor waterplanten lastiger om zich te vestigen. Een enkele hoge beschoeiing is niet bezwaarlijk maar wanneer er een hele watergang vol mee wordt gebouwd is dit wel een probleem.

2) Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit?
Er zijn veel activiteiten die plaatsvinden in het watersysteem deze hebben allemaal effect op de waterkwaliteit de ene meer dan de andere. Het is echter duidelijk dat er bepaalde activiteiten meer problemen veroorzaken dan anderen. Hoge beschoeiingen zijn een probleem omdat deze voorkomen dat dieren het land op kunnen komen en maakt het voor waterplanten lastiger om zich te vestigen. Om dit probleem op te lossen moet er bij het plaatsen van beschoeiingen meer gekeken worden naar het watersysteem in plaats van alleen naar de locatie. Er zal moeten worden gelet op zijn er meer hoge beschoeiingen in de buurt, omdat één beschoeiing niet echt voor problemen zorgt. Daarnaast moet er worden gekeken of het problematisch is in die watergang of dat watersysteem. Mogelijk kan er in die bepaalde watergang niks of kan er juist van alles. Er kan worden gewerkt met bepaalde water wens beelden hoe willen wij dat een bepaalde watergang er uit moet zien. Ook zal er kritisch moeten worden gekeken naar de nut en noodzaak voor deze activiteiten aangezien deze vaak worden gebruikt om extra land te creëren en niet voor bijvoorbeeld afkalvende oevers of voor bij grote stroomsnelheden in de watergang waarbij een beschoeiing te rechtvaardige is. Om dit aan te kunnen pakken zijn er een aantal zaken nodig er moet een beleidswijziging komen omdat deze activiteiten nu zijn toegestaan en deze activiteiten moet niet meer worden toegestaan onder de algemene regels. Ook moeten er duidelijk beoordelingen criteria komen voor het toestaan van deze activiteiten, onder welke criteria kunnen we het toestaan en zal en geen verslechtering van de ecologie op treden om uiteindelijk door te gaan naar een situatie waar de waterkwaliteit bij alle activiteiten gelijk blijft of iets toe neemt waardoor je over de loop van de tijd een betere waterkwaliteit accumuleert.
Monitoring
- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost
- Het meetnet is te beperkt om een goed beeld te kunnen geven van alle watergangen maar geeft met namen een beeld van de KRW wateren en niet van de andere watergangen in het systeem.
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- Heel veel meetpunten maar dit is niet realistische om te bereiken aangezien de kosten hier zeer hoog voor zullen zijn.
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.
- Er wordt een nieuw monitoringsplan gemaakt waarin i.p.v. een watergang benadering (gefocust op KRW wateren) een systeembenadering opgezet dit zal een beter beeld geven wat de waterkwaliteit is.
Analyse
- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.
Activiteit
- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- De uitdaging is dat het niet bekent is wat de effecten van bepaalde werkzaamheden en dat een enkele hoge beschoeiing niet bezwaarlijk is maar een hele watergang vol met zulke

beschoeiingen wel. Daarnaast is er geen duidelijke beleid of richtlijn die kan worden gevolgd en is het niet werkbaar om voor alle activiteiten een ecoloog in te schakelen.

- Waarom zijn dit de uitdagingen
- Zie bovenstaande
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Waar komen de meeste uitdagingen voor
- Het meest uitdagend is hoe om te gaan met beschoeiingen deze worden veelvuldig toegepast en hebben een niet gering effect op de waterkwaliteit zeker wanneer deze veelvoudig worden toegepast
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor
- Zie bovenstaande
- Welke oplossingen worden er gezien om problemen hier op te lossen
- Er zijn een aantal oplossingen om dit probleem mogelijk te verminderen deze zijn bijvoorbeeld een kaart maken met wensbeelden van hoe een watergang er in verschillende situatie uit moet komen te zien. Denk hierbij aan wat verwacht je van een watergang in een stedelijk gebeid en wat van een watergang in een landelijk gebied. Dit zou in een kaart kunnen worden samengebracht waar in het in de ene watergang geen probleem is om iets te doen en waar bij een andere watergang er zeer strenge restricties gelden. Ook kan de mogelijkheid worden onderzocht of er niet net als bij toenamen aan verharding een soort compensatie nodig is maar dan in de vorm van natuur. Uiteindelijk is de beste oplossing geen beschoeiing boven een bepaalde hoogte meer toe te staan en alleen wanner er echt geen andere mogelijkheid meer is. Momenteel is het dweilen met de kraan open het waterschap maakt een mooie NVO en inwoners kanaliseren verderop een watergang.

Interview (toezichthouder)

1) Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.

Wordt momenteel niet gemeten voorafgaande, tijdens en na het werk wordt er alleen gemeten wanneer er echt een probleem zichtbaar is. Dit kan zijn geen doorzicht veel alge of blauwe alge.

- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Eerst wordt de peilbeheerder ingeschakeld en wanneer het nodig is wordt er door handhaving een meting uitgevoerd
- Met welke frequentie wordt er gemeten
- Dit is op incidenten basis en geen structurele meting
- Waar wordt er gemeten
- Waar het probleem zich voordoet
- Hoe wordt er gemeten
- Afhankelijk van het probleem
- Wie is verantwoordelijk voor deze meting
- de afdeling handhaving
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek
- Omdat er op die specifieke locatie een probleem zich voordoet

analyse

- Hoe worden de resultaten van de monteringen geanalyseerd
- Wat wordt er gedaan met de conclusie van de analyse
- Waar worden deze analyses uiteindelijk gebruikt
- Waarom wordt de analyse uitgevoerd
- Wie bepaald wat er wordt geanalyseerd
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Deze beoordeling wordt niet gemaakt door toezicht
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Deze beoordeling wordt niet gemaakt door toezicht
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten
- Er wordt door de toezichthouder voor de waterkwaliteit naar het watersysteem gekeken en niet een specifieke activiteit
- Wie is er verantwoordelijk voor deze meting
- Uiteindelijk is handhaving verantwoordelijk voor de uitvoering van de meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- handhaving
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit
- Geen zichtbaar effect

2) Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit.

Monitoring

- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost

- Voor sommige objecten wordt de breedte en diepte van de watergang niet meegenomen in de beoordeling. Dit kan grote effecten hebben op de waterkwaliteit maar wordt niet meegenomen momenteel.
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- N.v.t.
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- N.v.t.
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.
- N.v.t.

Analyse
- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.

Activiteit
- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- De waterbreedte en diepte wordt nu niet meegenomen en de beoordeling van de activiteiten maar is wel noodzakelijk om een goed beeld te krijgen van de effect van de werken. Hoe kleiner en ondieper hoe problematischer de waterkwaliteit is. Ook moet het beheer en onderhoud van de watergang worden meegenomen in het aanleggen van bijvoorbeeld nvo dit kan voor problemen zorgen op de lange termijn omdat de wateren niet meer te onderhouden zijn. Dit kan op worden gelost door het beheer op te splitsen in doorstroomprofiel en oever. Daarnaast is een goed/beter contact nodig met de gebiedsbeheerder om te zien waar de problemen zijn.
- Waarom zijn dit de uitdagingen
- Doordat het beheer en onderhoud van de watergang moeilijk tot onmogelijk wordt, daarnaast nemen de kosten voor het beheer en onderhoud toe welke op lasten van het waterschap vallen.
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Deze ligt bij de beleidsmakers voor het aanpassen van het beleid en de vergunningverleners voor het benaderen van de gebiedsbeheerders
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Dat er momenteel geen goede beoordeling is van de effecten op de waterkwaliteit door werken en dat om het werkbaar te houden er een aantal zaken moeten worden aangepast. Zo is het mogelijk om de eerder genoemde breedte en diepte van de watergang op te nemen en om fauna uittreed plekken verplicht te stellen bij bepaalde werken. Ook wordt er voor de beschoeiing gebruik gemaakt van doek als grondkering dit is niet duurzaam en is gevoelig voor scheuren door het uitvoeren van beheer en onderhoud dit zorgt weer voor plastic in het water met alle negatieve gevolgen van dien.
- Waar komen de meeste uitdagingen voor
- niet echt een ranking aan gegeven maar beschoeiingen en nvo met betrekking tot onderhoud zorgen voor veel problemen
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor
- Zie vorige antwoord

Vragen (beleidsadviseur)

1) Hoe worden de effecten van kleine waterstaatkundige objecten op de water kwaliteit bepaald?

De effecten van werkzaamheden in het watersysteem op de waterkwaliteit worden nagenoeg niet meegenomen zowel bij KRW wateren als bij alle andere watersystemen. Dit zou in basis wel moeten alleen maar wordt niet gedaan omdat dit als niet relevant wordt beschouwd. Dit is ook niet adequaat beschreven hoe dit moet worden beschouwd in het beleid van het waterschap. Momenteel is het daarom toegestaan om activiteiten te doen in waterlichamen die een geringe verslechtering van de waterkwaliteit veroorzaken.

Monitoring

- Hoe wordt de ecologische water kwaliteit gemeten voor tijdens en na het plaatsen van een klein waterstaatkundig object.
- Wat wordt er gemeten op de verschillende momenten voor, tijdens en na het plaatsen van het object.
- Met welke frequentie wordt er gemeten
- Waar wordt er gemeten
- Hoe wordt er gemeten
- Wie is verantwoordelijk voor deze meting
- Waarom wordt er op deze specifieke plaats gemeten en waarom op die specifieke plek analyse
- Hoe worden de resultaten van de monteringen geanalyseerd
- Wat wordt er gedaan met de conclusie van de analyse
- Waar worden deze analyses uiteindelijk gebruikt
- Waarom wordt de analyse uitgevoerd
- Wie bepaald wat er wordt geanalyseerd
- Worden de ecologische sleutel factoren (ESF) gebruikt voor het beoordelen van de water kwaliteit zo niet waarom niet.

activiteiten

- Hoe worden de effecten van bepaald die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit.
- Wanneer worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit bepaald
- Waar worden de effecten die kleine waterstaatkundige objecten hebben op de ecologische waterkwaliteit gemeten
- Wie is er verantwoordelijk voor deze meting
- Wie is er verantwoordelijk voor het beoordelen van de effecten
- Wat zijn in jou ervaring de effecten van kleine waterstaatkundige objecten op de water kwaliteit

2) Welke uitdagingen komt het waterschap tegen bij het beoordelen van de kleine waterstaatkundig objecten in relatie tot de ecologische waterkwaliteit?

Er zijn een aantal uitdagingen bij het maken van een beoordeling van deze werkzaamheden in relatie met de ecologie. Met het nieuwe WBP is er een inconsistentie ontstaan met het huidige beleid. Dit zorgt voor problemen. Hoe het oplossen van dit probleem zou moeten lopen is via strategie en beleid (SB) die het plan opstelt naar regie en asset (RA) om te evalueren wat de effecten zijn van dit beleid en dan moet het beleid weer terug naar SB om daar strategische doelen aan vast te zetten waaronder het wijzigen van beleid. Het vaststellen van deze doelen is echter een complex verhaal omdat alles met elkaar samenhangt. Voorbeelden hiervan zijn dat er bij het toestaan van NVO moet worden gekeken of het onderhoud nog kan worden uitgevoerd. Ook zullen er hogere kosten komen wanneer we het meer natuurlijk willen inrichten deze kosten zullen uiteindelijk terugvloeien naar de inwoners. Daar wordt het weer een bestuurlijke keuze of wij deze kosten willen neerleggen bij de inwoners. Daarnaast is deze verantwoordelijkheid belegd bij SB maar deze wordt niet adequaat opgepakt waardoor er een leemte ontstaat.

Ook is het bepleidbaar dat de inwoners al reeds belasting betalen en in ruil daarvoor verslechteringen kunnen aanbrengen en dat het waterschap deze dan compenseert. Er kan ook worden gedacht aan een compensatie regeling waardoor grote projectontwikkelaars dit niet kunnen uitbuiten.
Aan het eind van het verhaal is de verantwoordelijkheid van SB om strategische doelen goed te borgen binnen het waterschap.
Monitoring

- Waar zitten de tekortkomingen in de monitoring en hoe kunnen deze worden opgelost
- Hoeveel monitoring is nodig om een goed beeld te krijgen van de water kwaliteit
- Wat is er voor nodig om een betere beoordeling van de water kwaliteit te maken
- Waar is de monitoring nodig om een betere beoordeling te maken van de water kwaliteit.

Analyse

- Wat moet er worden geanalyseerd om beter de effecten van kleine waterstaatkundige objecten te kunnen beoordelen
- Waar moet de beoordeling worden verbeterd om een beter beeld te krijgen van de effecten van kleine waterstaatkundig objecten.

Activiteit

- Wat zijn de uitdagingen in het beoordelen van de kleine waterstaatkundige objecten
- Waarom zijn dit de uitdagingen
- Wie is er verantwoordelijk voor het oplossen van deze uitdagingen
- Wat zijn de effecten van deze uitdagingen op het beoordelen van de kleine waterstaatkundige objecten
- Waar komen de meeste uitdagingen voor
- Bij welke waterstaatkundige objecten komen deze uitdagingen het meeste voor
- Welke oplossingen worden er gezien om problemen hier op te lossen