

Results from stakeholder workshops on governance concepts



SOILS2SEA

Reducing nutrient loadings from agricultural soils to the Baltic Sea via groundwater and streams

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1 Introduction

Nitrogen (N), and phosphorus (P) loads from land and atmosphere to the whole Baltic Sea peaked in the 1980s and have been then decreasing since, mainly due to a significant reduction in coastal point sources (for example by improving sewage treatment) (Gustafsson et al. 2012; Elmgren et al., 2015). The Baltic Sea Action Plan (HELCOM, 2007) however requires substantial further reductions of N and P loads. Achieving additional reductions is not an easy task. In many cases, the 'low hanging fruits' (i.e. the most straight-forward measures) have already been implemented (see Dalgaard et al., 2014). The goal of BONUS SOILS2SEA project is to find new and innovative approaches to further reduce nutrient loads to the Baltic Sea. It is common practice to use nationally applied, one-size-fits-all regulations to manage nutrient loads. However, this uniform approach does not account for the significant spatial variation in the retention (removal by biogeochemical processes or sedimentation) of nutrients in groundwater and surface water systems. By using local data on nutrient transport and retention, **measures can be spatially differentiated** to target 'hotspot' areas where the natural retention is low. The BONUS SOILS2SEA project considers the potential of spatially differentiated approaches for achieving further reductions in nutrient loads to the Baltic in three case study areas: the Norsminde Fjord catchment in Denmark; Tullstorp Brook in Sweden and the Kocinka catchment area in Poland. In previous deliverables (Stelljes et al., 2017; Allbrecht et al. 2017), the BONUS SOILS2SEA team developed and discussed new governance concepts on how to make use of the concept of spatially differentiated regulation. These concepts have been discussed with stakeholders in different workshops at the different case study areas. Here, the co-governance approach was seen as a promising approach by stakeholders to reach reduction targets. The co-governance approach implies "that societal parties join hands with a common purpose in mind, and stake their identities and autonomy to this process" (Kooiman 2008).

One part of the report focuses on the transfer and up-scaling of these workshop-results to areas around the Baltic-Sea that are not part of the BONUS SOILS2SEA case study areas (chapter 4). In three workshops, these approaches were discussed in more detail with every workshop having a specific focus. The first workshop was held in Berlin in May 2017 with a very diverse group of stakeholders. The second workshop was held at the Swedish Agency for Marine and Water Management (SwAM) in Gothenburg in October 2017. The third up-scaling workshop was held on November 15th in Olstyn (Poland) with focus on transboundary aspects of water management. Including project team members, altogether 51 persons participated in the three workshops. Chapter 5 summarizes results from the project related to governance issues and thus spans on the two rounds of case study workshops, results from the ethnographic study and the up-scaling workshops.

2 Methodology

This report on the transfer of new concepts is the result of previous activities discussed in a new context. The activities built on activities described in deliverable 6.2 and 6.3 (see Stelljes et al. 2017; Albrecht et al. 2017). For the transfer of results three workshops in various settings were undertaken. The methodologies of the workshops were based on the previous workshops and the method of the world-café was used for discussing governance aspects. The results of each workshop were structured and summarized by the authors of this study and sent to the participants of each workshop for comments and adjustments. The more detailed summaries of each workshop can be found at the project website (http://soils2sea.eu/meetings_uk/index.html). For the workshops in Berlin and Gothenborg, the discussions focused on a co-governance scenario, developed in deliverable 6.2 (see also next chapter for more details). In particular, the world-café method was used to engage participants in the discussion about variables and design principles for the co-governance approach. For the workshop in Olztyń, the discussion was centred on the theme of transboundary water management with inputs from short statements from participants and two world-café tables.

3 Consolidation of results from D 6.2 and D 6.3

In the deliverable 6.2 new governance concepts were developed and discussed with several stakeholders in the three case study areas. Special emphasis was given to the approach of spatially differentiated regulation. This approach has also been discussed from a legal perspective in deliverable 6.3.

Deliverable 6.2 builds on the results of two rounds of workshops held at three case study areas of the BONUS SOILS2SEA project. Stakeholders invited to the workshops included local farmers, land owners, land managers and their organisations, NGOs, community members and (local) political decision-makers. At the first round of workshops, different policy instruments and options were proposed and discussed, including ones that empower local stakeholders collectively to commit to targets and decide on technical measures for implementation. These workshops provided a first point of exchange between the BONUS SOILS2SEA project and local stakeholders. Measures for improved water quality were discussed differently in each case study region depending on local needs and previous work. In Poland discussions were on a more general level around water quality regulation, Sweden developed water improvement measures in the workshop, while Denmark discussed specific spatially differentiated regulation options. All workshops focused mostly on practical measures (rather than policy instruments which are used for analytical orientation).

In **Sweden**, technical environmental and agricultural measures (e.g. catch crops, wetlands) with which stakeholders had experience were more feasible than complex measures around differentiated regulations where knowledge gaps existed. This inexperience created space for fear around devaluation of land and injustice. In **Denmark** stakeholders found catchment level regulations helpful to achieve larger scale projects with higher impact. However, an additional, independent institution would need to ensure trust and compliance for such community-based governance concepts as farmers cannot regulate each other. In **Poland**, a major concern was other sources of water pollution besides agriculture and a lack of support for farmers.

In all workshops, a general need for **simplicity before bureaucratic complexity** (and economic burdens) was expressed. Stakeholders, especially in Poland, feel already too much of a bureaucratic burden. Hence, concepts should be easy to understand or old concepts should be improved. Financial compensation and education can help acceptance and implementation. This need for simplicity was also experienced implicitly in the discussions in Denmark around (the complex topic of) emission based trading. Also, Swedish stakeholders expressed concerns of too rigid bureaucratic regulations.

Furthermore, stakeholders at the workshops tended to visualise eutrophication at a higher level, and **shift the burden away from an individual scale**. Although research, especially in Poland, needs to be conducted to show evidence of the main sources of eutrophication, it should be made clear that the results will help inform and select the best available options. Exchange on good practices, also outside the farming sector, could be beneficial to show that other sectors are also active and inspire with possibilities. Generally, solution-oriented instead of problem-oriented concepts can benefit constructive communication processes.

Additionally, an ethnographic study was carried out in the three case study areas with special focus on the Polish case study area. The studies – which consisted of interviews and observations - provided insights into the culture of institutional and non-institutional stakeholders in their different societal settings in each of the case study areas. Within the focus of the ethnographic research, culture was applied as an ideational system where culture comprises beliefs and values and is non-material and non-social (see Geertz, 1973; Ross, 2004). Information was mainly collected through desk-research and narrative qualitative interviews with key stakeholders. In general it can be stated that the socio-cultural-political and economic contexts of the people living and working in the three case studies are very different and hence lead to diverse decision making with respect to farming practices, nutrient inputs and outputs, collaboration amongst farmers, monitoring and reactions towards measures, regulations and policy options. It was found that the perceptions, values, beliefs, thoughts about nature, the environment and hence needs, acceptance and uptake of measures and regulations are in many ways opposed, which in turn demands different approaches.

On the basis of the ethnographic study and the first round of workshops, different policy options emerged. They all provide possibilities to reduce the nitrogen losses to the aquatic environment and can be implemented through different policy instruments. For most of the options, the concept of spatially differentiation (see Box below) can be applied.

Spatially differentiated measures

Spatial targeting of mitigation measures has the potential to produce economic and environmental benefits. Between the root zone of crops and outflow to streams, nitrogen is reduced in the groundwater. This is called groundwater retention. How much reduction occurs in the groundwater varies with factors including soil-type, soil depth, geology, topography and the extent of tile drainage. If the retention is high, lower amounts of N reach the stream. We could therefore exploit this fact by relocating crops and cropping systems with larger nitrogen leaching losses to fields with higher retention.

In the Norsminde and Odense catchment area (BONUS SOILS2SEA Case Study area in Denmark), 10-20% extra nitrate reduction can be obtained in the subsurface through optimal spatial location of crops. Further gains can be made through optimal location of constructed mini-wetlands, but also of in-stream mitigation measures prolonging the transport times, increasing the uptake in vegetated zones or enhancing filtering in streambed sediments. Altogether, there can be substantial economic and environmental gains, because it will be possible to produce the same crop yield with reduced nutrient load or increased crop yield with unchanged nutrient load.

To exploit the full potential of spatially targeted measures, retention maps with a fine spatial resolution (1- 25 ha) are necessary. However, in Denmark for example, the level of uncertainty associated with maps at this resolution is seen to be too high for use in government regulation. For this reason, the Danish government currently uses retention maps at around 1500 km² resolution, while expecting to improve this towards 15 km² resolution in the future. Although 1500 km² resolution maps have a lower level of uncertainty, they also cancel out almost all economic and environmental gains of a spatially differentiated approach.

Basically three different policy options emerged. These approaches included a rather top-down or centralized approach, a market based approach, and a co-governance approach. The features of these approaches are summarized in Table 3-1 and were adjusted for the three case studies.

Table 3-1: Features of the three scenarios discussed at the workshops

Management Scenario	Centralised/ top-down	Market based/ flexible management'	Co-governance
Approach	Clear N-reduction targets uniformly for the whole catchment at farm or field level.	Cap-and-trade system to reach state set nutrient load target.	Co-organisation of farmers to reach state set nutrient load target.
Monitoring	Authorities are responsible for detailed monitoring and requests management plan from farmers.	Authorities only monitor the N load at catchment level and requests management plan from farmers. More detailed monitoring could be arranged by farmers.	Authorities monitor the N load at catchment level. More detailed monitoring could be arranged by farmers.
Retention maps	Only low resolution maps at around 15 km ² are used by government to structure the land use (e.g. catch crops, constructed wetlands).	High resolution maps at 25ha are used by authorities to calculate the exact amount of allowances and their distribution among the catchment.	Could be one tool used by farmers to optimize their fertilizer usage and cropping patterns.
Subsidies	Connected with the requirements set by the authorities.	Connected with the precise usage of allowances.	Only given if the reduction target for the whole catchment is reached.

These three governance approaches were discussed at the second round of workshops in the three case study areas. For the **Danish** case, we found a strong interest in spatial differentiation. Here, stakeholders are highly informed, engaged and motivated to move towards a co-governance approach to the management of nutrient loading. This could be supported by the use of specialised maps to demonstrate differences in nutrient retention in groundwater and surface water systems. Experiences in Denmark have shown that although low resolution maps (15 km² or greater) provide a reliable large scale picture of retention, they are not specific enough to inform top-down regulations to determine measures at farm level or at 1 ha scale.

Sweden already has a long national history of cooperative governance, and top-down systems of governance was not seen as a particularly appropriate way to reduce N loads in Tullstorp by participants of the local case study workshop in Sweden. The Tullstorp Stream Economic Association (TSEA) is an example of a group built up through a bottom-up process and provides a good basis for experimenting with more innovative solutions such as spatial differentiation. Furthermore, the factors leading to the success of this initiative could potentially be used to inform the design of co-governance approaches to implement differentiated regulation in other contexts.

In **Poland**, a differentiated approach could be envisaged, but stakeholders from the Kocinka catchment demonstrated a lack of support for bottom-up processes. The suggestion was rather to work with the existing governance system, favouring a top-down approach with clear and fair regulation. Given the current issues of uncertainty (in highly detailed maps) or usefulness (of low resolution maps), a top-down approach to spatial differentiation is not currently a preferable option for Kocinka. In order to nevertheless reduce N loads in the context of the existing governance system, alternative policy options that involve less of a regime shift could be implemented (e.g. awareness raising, financial support and incentives for environmentally friendly agriculture).

The three case study examples show that a differentiated approach can, in theory, be applied in different governance settings. The most promising application of spatial differentiation, however, is to be expected within a co-governance approach. Here farmers (and other stakeholders) in a defined area (catchment or sub-catchment level) can determine differentiated mitigation measures using local knowledge of the area and using retention maps as supporting (rather than regulatory) tools. In comparison with the traditional top-down approach, the co-governance approach shifts a large amount of responsibility to local farmers or to catchment councils. While the responsibility would not include the definition of the reduction targets, it does include the responsibility for fulfilling the reduction commitments. This includes defining and implementing mitigation measures (placing of wetlands, change of land-use, etc.), collaboration among the farmers within the catchment, as well as the monitoring measures and loadings. Crucial to the success of such collective action is trust, which is highly influenced by a possible repetition of the situation, the reputation of others past actions and a reciprocal linkage structure of the community network.

4 Transferability and up-scaling

4.1 Overview of up-scaling stakeholder workshops

The transfer workshops in this final stage were based on the findings of the work carried out in WP6 thus far and focused on further exploring the potential for further reductions of nitrogen loads through the innovation of co-governance approaches. An initial workshop was held at a European level to discuss the different variables (as per Report 6.3) of co-governance, examining what affects the success or otherwise of such an approach. A second workshop held at a national level in Sweden looked at how such an approach could be transferred in practice to different areas and up-scaled to the national level. The focus in this workshop was the exploration of different scenarios of co-governance as well as whether the design-principles for successful management of common pool resources (as set out in Report 6.3) could be applied in practice to this context. In a third and final workshop, Russian and Polish stakeholders were invited to discuss issues of transboundary water management.

4.2 European workshop

The first up-scaling workshop was held on 17 May 2017 at Ecologic Institute, Berlin. Altogether 26 persons from riparian Baltic Sea countries participated in the workshop. At previous workshops in the case study regions in Sweden and especially in Denmark the co-governance approach was seen as the most promising way to introduce the idea of spatially differentiated regulation (see section 3). The up-scaling workshop was thus used as an opportunity to explore how co-governance could be applied in practice. The workshop had two main interactive sessions that took place in a world-café format.

4.2.1 1st World-café results

In the **first world-café session**, participants discussed the main features of a co-governance scenario which involves a low level of State involvement in the management, monitoring and control of N-loads. Three topics were discussed: (co-)governance, stakeholders, and monitoring. The key points of the topic discussions are summarized below:

1. Overlap

Problems and goals must be **well-defined** beforehand. While reducing N loads to the Baltic Sea is one important goal, there are many other goals which sit in parallel to this. The EU Birds and Habitats Directives, the Water Framework Directive and the Common Agricultural Policy are just some examples where **conflict between goals** could arise as it comes down to the finer details of implementation. On the positive side, there are also **co-benefits** that can arise when taking into account other objectives, e.g. nature protection.

2. Governance structures

Participants did not feel that even ambitious targets required additional governance structures and institutions, but that rather **existing institutions** and structures should be used wherever available in order to reduce transaction costs for farmers to get involved. In some cases, institutions for farmers to participate in co-governance with authorities were said to be lacking for

the national level. It was deemed essential to have a method for coordinating farmers and the subsidies to be disbursed, e.g. through management by catchment officers and/or catchment councils. Participants felt that self-governed **local water councils** were a conceivable solution.

Such a council can be made up in different ways depending on the importance of the topic to the stakeholder, legal obligations and regulations in the catchment. They can operate at catchment or/ and trans-boundary levels. However, it was made clear that **historical and cultural factors** affect the way in which these councils might operate. In Denmark for example, national authorities have in some cases empowered the building of local water councils, which have been well perceived by local stakeholders. While in Russia a top-down approach seems to be a preferred solution, and any self-organized group would most likely look for centralized management from higher levels. In Poland, where farms can be very fragmented (in the south) or rather large (in the north), the practicability of a manageable size of self-organized group would be influenced by scale issues.

3. Framing

The **framing** of the problem and goals were also discussed. When framing the issue of N loads negatively with a narrative of presenting farmers as polluter and responsible for reductions, it can reduce motivation for farmers to act. By framing the issue more positively and by providing training, there may be possibilities for achieving greater buy-in.

4. Participation

It was suggested that not only farmers should be involved in co-governance processes but rather that **everybody** who has a stake and knowledge should be able to participate in a self-organized group. 'Outsiders' with other interests and expertise from different disciplines should also be part of the co-governance regime. If goals (such as clear reduction commitments) are set out clearly from the beginning and issues which are of interest and concern related to the goal are brought to the table, it is rather likely that more, rather than less people will take a stake in the process. Local farmers and landowner organizations should be involved (as they typically hold a lot of valuable knowledge) alongside local water users and NGOs.

5. Process management

Participants were unanimous about the need of a **chairperson/moderator** in any given self-organized group in order to steer communication, build confidence and strive for results. This person should have the trust and **credibility** from farmers, water users, and authorities alike and be able to act as a **bridge builder** between top-down (legal directives) and bottom-up (local) initiatives. It proved to be helpful if the chairperson can act on an employed basis, modest membership fees are demanded and financial means can be made available to support reduction activities (e.g. compensation for land etc.)

6. Target setting

With rather low reduction targets, a complex co-governance regime might not be needed. However, if the targets are more **ambitious**, there is a need for a **greater flexibility** and variety in terms of the management options and governance structures employed. The further-reaching the targets are, the greater the need for co-governance. The targets still have to be set by the authorities. The authorities should clearly explain how the goals are set and must be very transparent in their decision making. The farmers should take part of the decision making to ensure their agreement and understanding of the goals. The discussions also highlighted that clear goal setting is also paramount to clearly defining, **what** and **how** to measure. It should also

be agreed beforehand, who takes **responsibility for failures** - i.e. if measures (like artificial wetlands or two-stage water courses) do not reduce nutrient loads as expected.

7. Monitoring

Under the proposed co-governance scenario authorities would only monitor the N-load at the outlet of the catchment. Any additional monitoring at a sub-catchment level would have to be organized by the farmers in the catchment. Additionally, farmers should also report about measures that they have implemented and the N-input and balance/surplus on field level. It was suggested that farmers hire a **3rd party** to ensure quality of the sampling, reliability of results and therefore ensure the trust in the results. Also new approaches were discussed: with new technologies emerging, **citizen science** can be used for monitoring. New apps can be developed or schools could carry out monitoring approaches on a voluntary basis.

To design monitoring activities, **conceptual models** are needed. They should show sources of water and pollution, including groundwater flowpath and the groundwater/surface water connection. Groundwater in particular is very difficult to monitor, because the groundwater aquifers do not necessarily coincide with the catchment boundaries. Therefore, the difference between the ground- and surface water within a catchment has to be carefully considered and can be a big obstacle to measuring nutrient runoff from the catchment. It has also to be considered, that certain measures have a **time-lag** before measurable results become visible.

4.2.2 2nd World-café results

In the **second world café session**, variables for successful implementation of co-governance were discussed. This list is based on the project deliverable 6.2 'Towards co-governance in monitoring of spatially differentiated regulation for good water quality – Common pool resources and EU law'. It was derived from a literature review (based on: Ostrom 2015, 2005; Poteete et al. 2010) and included seven aggregated variables.

Variables of co-governance

Variable 1: Trust

Workshop participants felt that the establishment of **trust** highly depends on an open and transparent set-up of the self-organized group. Clear goals, roles, responsibility and contact partner were seen as main ingredients. In an echo of the first round of discussions, participants commented in particular on the need for predictability of the conditions of the legislation. Furthermore, some participants remarked on the need to trust the goals themselves (that a problem exists and that it can be solved through these aims). The chairperson of the group should naturally be a good communicator with a strong reputation for solid and transparent work in farming and grounded local knowledge alongside a reputation of integrity. In relation to gaining trust among those parties to the co-governance, different aspects were discussed. One important aspect is **continuity**. There should be an agreement that the participants should stay together during the project phase. Especially a high fluctuation in staff from the authority side can **slow down trust-building**. A second aspect is **transparency**: an open exchange of arguments and information will help in the process. Also, all agreements should be well documented. **Predictability** is another aspect, meaning that consequences of actions should be well predictable. This can imply sanctions but also reward mechanisms must be very predictable. **Reputation** of the other members was also mentioned as aspect that can enhance trust. An **ownership** from all parties of the plans will enhance trust as well.

Variable 2 - Group make-up

Participants felt that everyone with a stake and knowledge in a given catchment should be invited to join the group. As example, in the Tullstorp project in Sweden, 165 potential stakeholders were approached while 75 people joined the group.

Variable 3 - Group membership

The Tullstorp Stream project in Sweden provided a positive example. Here, all farmers have the freedom to enter or exit the group. Participants felt that this should be the normal procedure of any self-organized group.

Variable 4 – Communication

The findings in the literature about communication were clearly mirrored by the discussions, with emphasis placed on reputation, trust, and face-to-face communication. Also, for a positive outcome of such a regime, a sufficient investment of **time** from both sides was indicated. This is important to users to establish trust and also to build up a shared knowledge and understanding of the systems (i.e. environment, industry, society). **Time** emerged as a critical factor for effective communication, i.e. the need for long time frames of engagement to build up trust for open discussion and a shared knowledge of systems (i.e. environment, industry and society). Also, despite the advances of modern communications technology, face-to-face communication was considered indispensable, particularly in the early stages. Participants agreed that in order to get stakeholders to engage, this could be encouraged by an initial meeting with someone whose reputation is known and who is trusted by the farmer. In Sweden, so called 'kitchen table meetings' are an effective way of communicating with farmers – the advisor comes to the farm where they engage in a relaxed one-to-one meeting. Above all, participants noted, the purpose of the co-governance arrangements and meetings must be clear in order to be effective. In terms of information sharing and reporting, it was deemed important to be able to be technical in discussions and to have the relevant information at hand to be able to go into sufficient detail.

Variable 5 - Users' rights

According to the literature on common pool resources, natural resources **users' rights** to organize should not be challenged by external government and those who are affected by operational rules should also be able to modify them. Echoing some of the conversations at the governance table in the first round of discussions, participants raised the question of who are the users that have rights to the resource. In the European context, it is usual that someone owns the land, but not the resources inherent to that land (i.e. soil, water), which are common goods. How is it possible to weight different rights to these common goods against one another, in particular where some of these are supported by a strong lobby group? Furthermore, one participant highlighted the need for people to be compensated for providing public goods, both now and in the future. In some cases, farmers are averse to providing public goods such as areas for nature conservation or recreation as they do not want people walking on their land. One interesting issue raised related to inter-generational equity – how is it possible to take into account the rights of current land users from future generations?

Variable 6 - Sanctioning, monitoring and conflict resolution

Concerning the issues of **sanctions and rewards**, participants felt that sanction mechanisms could only be based on legal agreements. In such a co-governance system, boundaries are needed and sanction mechanism can help to keep the boundaries. However, if the sanctions are too strict, the co-governance system can collapse. The sanction mechanism should be

transparent. It was stated that farmers/participants in the co-governance system should not have the power to sanction other participants. It should rather be an authority that imposes sanctions. It was also suggested rather to focus on rewards instead of sanctions. While the main reason to join such a co-governance approach would be economically driven, other aspects should not be neglected. For example the possibility to improve the environment or to get access to information can be a driving factor. 'Social sanctions & rewards' were also discussed. For example, acknowledgement of 'best farmers' was suggested or peer pressure was identified (for example if most of the farmers join the approach, they can convince other farmers to join as well).

Variable 7 - Long time horizon

The last topic addressed the issue of **time** and how long should a time frame be for a co-governance approach to work. In general the timeframe depends on the overall framework that is driven by the problems and the defined goals. From the problem perspective, the timeframe should be long enough to solve the problem. For the goals, it was suggested to include time steps with definitions when the goals should be reached. The goals should also be linked to actions plans from authorities (like timeframes of the WFD or HELCOM). In theory, such an approach would be a continuous approach without a defined end point, but it was stated that a setting-up of such a co-governance approach should at least be 10 – 25 years.

4.2.3 Summary of European workshop

Until conducting the European workshop, our insights had mostly been derived from three specific case studies in Denmark, Poland and Sweden. Hearing from participants from other Riparian Baltic Sea countries highlighted that accommodating co-governance into national frameworks is not always possible or even desirable under current circumstances. However, participants for the most part, found the approach interesting and innovative and were enthusiastic to hear how it is being applied in the Tullstorp Stream project in Sweden. Discussions on the variables of co-governance regimes largely mirrored the findings of the scientific literature reviewed in Report Deliverable 6.2.

4.3 Swedish workshop

The second workshop was held at the Swedish Agency for Marine and Water Management (SwAM) in Gothenburg on 11 October 2017. Altogether eight persons participated in the workshop. Ann-Karin Thorén from SwAM hosted and introduced the workshop and Anders Wörman (Royal Institute of Technology, Stockholm) and Nico Stelljes (Ecologic Institute) introduced the project. Markus Hoffman and Christer Jansson represented the Federation of Swedish Farmers and Fredrik Fredriksson represented the County Administrative Board of Västra Götaland. A round-table discussion was used to discuss four main aspects of the co-governance scenario: monitoring, role of institutions, design-principles, and up-scaling.

4.3.1 Monitoring

Much of the discussion on monitoring echoed remarks made at the European workshop. While the co-governance scenario implies a monitoring undertaken by authorities only at the outlet of the catchment, it was argued that this single monitoring station might not account for the reduction reached by single farmers. Natural processes (like changing weather conditions or natural leakage) might overshadow the reduction effects of some remediation actions. Therefore

it was suggested to monitor the effects of the measures directly at a farm level¹. In this way the performance of each farmer can be monitored and if the results of each farmer do not result in the foreseen reduction targets, it might be necessary to examine other factors hindering the reduction. Also, measures should only be carried out, where they actually contribute to reducing loads. With precise monitoring activities, the effectiveness of measures like constructed wetlands or buffer zones can be documented and subsidies can be spent more effectively. Additionally the aspect of time-lag comes into play. If certain remediation measures do not show initial success, this might result from time-lags in the soil or in the groundwater system. This is the case if the results of certain measures can only be seen in a certain amount of time (for example in the case study area in Poland, this time-lag can last up several years or decades). This has to be considered, so that a co-governance could only be implemented over a time frame of at least 10 years. For the actual monitoring processes themselves, it was stated that new technologies could be able to improve monitoring techniques. Especially for self-monitoring, new techniques with smart phone apps, simple tool-kits or other technique can simplify the monitoring process and also improve the data basis.

4.3.2 Role of institutions

One part of the discussion was dedicated to the question of which role the represented institutions at the workshop would have in such a co-governance scenario. Representatives of the Farmers Union saw the Union as an integrating institution. From their perspective, the involvement of farmers in the WFD implementation and monitoring process is **not satisfactory** and they are now considering how to **integrate other actors in a dialogue**. The role of SwAM could be seen as setting the **overall framework** for a co-governance approach with the provision of funding and the definition of rules and regulation. Within different projects, SwAM could already test and try new approaches and therefore expand current boundaries. It could be problematic, if a co-governance approach were connected to a **shift of responsibility** from the national/EU level towards catchment level. Responsibilities that are with the state today are difficult to transfer to regional levels. This would need a **tremendous change in EU and national laws**. On the other hand, a working co-governance approach would need certain legal autonomy, only a symbolic or informal responsibility would not be sufficient.

At the sub-national level, the county administration is an interdisciplinary authority, dealing with topics, like water quality, climate change adaptation and rural development. They are sandwiched between the national and the regional/local level. Based on these circumstances, **the county administration could contribute** to a co-governance approach with a supporting role. They could provide information for single catchments and establish communication channels among different catchmentst and between local, regional and national level.

From all participants, so-called **catchment-officers were seen as an important link** between farmers and authorities. There are already existing examples of these officers in the UK, Ireland, recently also in Denmark, and there are also some examples from Sweden. These officers should work as coordinators and help farmers to apply for subsidies for the implementation for measures. They should also know the catchment very well, meet with the farmers on a regular basis and also should have a close link to regional or even national authorities. Therefore, they

¹ Monitoring on field level however would be a very cost intensive approach and it was not discussed during the workshop if these costs could be covered by a government funded monitoring program. At the European workshop in Berlin a similar approach was discussed and the aspect of citizen science was seen as one way to support a monitoring approach at farm level.

need to have a **wide variety of competences**, ranging from limnology, agro-economy, to socio- and psychology. They should be actively involved in goal setting, carrying out measures and establishing trust among all involved stakeholders.

It was also discussed, where these officers should be located. It was seen as important that they are located in one place, but that could be at the municipality or the county level. **A coordinating unit could be established**, for example at the SwAM. It was mentioned, that in the course of the WFD-process, around 100 water councils have been established which in theory could take the role of the discussed catchment-councils. However, some of these water councils are not as successful as they could be for different reasons. **The role of these councils is not very well defined** and with their legal setting, most of them **cannot apply for funding** and responsibilities are not clarified. So, if a catchment-council is going to be set up, it was suggested to have a close look at the water-councils beforehand and analyze their strength and weaknesses.

4.3.3 Design-principles

A number of design principles for co-governance were outlined in Deliverable Report 6.2. Due to the limited amount of time, a few of the design-principles were selected for focused discussion.

1. Collective choice arrangements

Here, the idea is that those who are affected by operational rules can also modify them. Especially the aspect of collectively finding solutions was discussed. It was stated that **not all farmers in a catchment would need to be involved** in the co-governance approach from a water quality point of view. If the majority of farmers, given that they farm also the majority of the land, support the co-governance, the problem of nutrient leakage could be managed. Also for the implementation of certain remediation measures, **not all farmers need to agree**. Single measures on farms, like small constructed wetlands or buffer zones, should be chosen by the farmer, so **not all measures have collaboration as precondition**.

2. Clearly defined boundaries

Here, the example of Tullstorp Brook and a second example also from Skåne were discussed, where clearly defined boundaries both in terms of area and subject can be examined. In the second example, a small catchment with 900 ha and ca. 30 farmers together with a very active scientist reduced the residues of pesticides in the local stream by 90% only with voluntary measures. This is an example where **not only the area was clearly defined, but also the goals were very clear** from the beginning and results of the measure could be seen almost immediately.

3. Congruence between appropriation and provision rules

The discussion focused on the burden of a co-governance setting being proportional to the benefits. That a co-governance approach would involve a very **intensive collaboration** between the farmers was generally **viewed positively**. Not knowing the possible outcome of such collaboration was seen as exciting. On the other hand, if **no results** can be seen over a longer period of time, participants might lose motivation. This is a **potential risk**, because as mentioned in the above discussion about monitoring, time-lags between the implementation of a measure and the visible results can take some time. From an authority point of view, the intensive collaboration can be problematic so it was suggested to keep meetings to a reasonable number. One way to limit the transaction costs would be to **focus the authority work in areas that are**

not working well and have the co-governance approach in the areas, where it works well. In this way, authorities can work more effectively.

4. Sanctioning and conflict-resolution mechanisms

These mechanisms were only discussed briefly. The SwAM suggested that inspections from authorities should at first be made in a collaborative and advisory atmosphere. It should rather be an informative meeting between authorities and farmers and **only if continuous rule violations** appear should stricter enforcement be applied.

4.3.4 Up-scaling

The last part of the discussion was dedicated to the up-scaling potential of the co-governance approach. It was briefly discussed, if the approach could work for other catchments and if it would be possible to apply this approach for whole regions or even on a national basis. The actual remediation measures have then to be adapted to the local conditions. The Tullstorp Brook example can serve as inspiration for other areas. Especially, the aspect of farmers working together employing a catchment officer and applying successfully for funds, was seen as a positive and easy way to up-scale and is already on the agenda of the Farmers Union. A governance setting that is supportive to co-governance would be required and steered by national authorities. Such a strategic approach with financial certainty would support the roll-out of co-governance. An additional important success factor is the building-up of a trusting environment in the Tullstorp Brook example. The farmers have known each other for a long time and both the driving actors and catchment officer are from or live within the catchment area.

One suggestion from the government perspective was to apply the co-governance approach in areas, where leakage problems are rather low and are therefore not so problematic. In this way, authorities could redirect their limited resources to more problematic areas for greater effectiveness. It was also stated, that there are already a number of individual measures (e.g. at single farm, municipality or small catchment level) being carried out to reach good ecological status (under the Water Framework Directive) from which positive experiences can be examined to see how they could be reproduced for Sweden as a whole.

4.3.5 Summary of Swedish workshop

The previous workshops at the case study level with mostly local farmers and other local stakeholder showed the co-governance approach to be a promising approach - at least for Denmark and partly for Sweden. The aim of this up-scaling workshop was to discuss this view from a regional/national authority viewpoint. While at the local workshop it was mostly the aspect of increased farmer autonomy that was positively stressed, during this regional/national workshop co-governance was positively received because of its communicative and adaptive approach. Communication was seen to be key to co-governance, both between farmers within a single catchment but also between farmers and authorities at different levels. This can lead to a working environment that is characterized by partnership and trust, where authorities are rather seen as a reliable advisor and not as an opponent enforcing overly strict regulations. From an authority viewpoint, this can result in a more effective way of using limited resources. At the same time it requires authorities to be very adaptive and it may result in a differentiated governance approach. In conclusion, as at the European workshop, co-governance was seen as a very interesting approach, but very difficult to implement in practice.

4.4 Polish/ Russian workshop

The third up-scaling workshop was held on November 15th in Olstyn, Poland. Out of the four case study areas in the project, the Pregolya river catchment is the only transboundary catchment. Olstyn lies at the Lyna-River (which is named Lawa-River at the Russian side, therefore it is called Lyna/Lawa-River in this document) within the transboundary catchment, and participants from the catchment area in Poland and Russia joined the workshop. This transboundary characteristic was the main focus of workshop. All together, 17 persons participated in the workshop. Apart from the project team members, nine stakeholders joined from the Russian side and three Polish participants completed the workshop. The aim of this workshop was mainly an attempt to discuss and exchange problems and viewpoints of stakeholders from a transboundary catchment area. Therefore, the aspect of co-governance was not the primary focus.

The workshop started with introductory presentations of the project. Przemyslaw Wachniew (AGH Krakow) introduced the project and presented results from the Kocinka case study. Boris Chubarenko (Atlantic Branch of P.P.Shirshov Institute of Oceanology of Russian Academy of Sciences, Kaliningrad) presented project results from the Pregolya catchment. After five short inputs from the participants (see chapter 4.4.1), Grit Martinez and Nico Stelljes (Ecologic Institute, Berlin) presented results from the ethnographic study and governance aspects of the projects and introduced questions for the working groups (see chapter 4.4.2). The workshop ended with the screening of the BONUS SOILS2SEA film.

4.4.1 Reports from the participants

At the second part of the workshop, participants of workshops provided short statements. **Vladimir Bakalin** (*Head of the Council of Pravdinsk Municipality*) reported from the economic and agricultural development in the Pravdinsk Municipality. In recent years, several accomplishments, like new sewage treatment facilities, or reconstruction of a hydroelectric power station, have been installed. Also, the agricultural output has been increased and large pig-breeding complexes have been established. From the ecological perspective, the lack of sufficient water treatment facilities and growing aquatic vegetation in the Lyna/Lawa-River can be stated as problematic. **Vladimir Minasyan** (*First Deputy Head of Administration of Pravdinsk Municipality*) added to the previous speaker that ecological problems arise due to the lack of the connection of households to water treatment facilities in many settlements in the catchment. He reported also about a terminated Russian-Polish cross-border co-operation program, where environmental issues were also addressed. **Bogdan Meina** (*Director of the Department of Environmental Protection, Warmian-Masurian Marshal's Office*) reported from the Polish side of the catchment and stated that there are water treatment facilities in every settlement, but with varying degrees of efficiency. With the financial support of the European Union, aged water treatment facilities are being renewed. Also on the Polish side large pig breeding complexes have been installed with the problem of manure handling during the winter month, where its application on the fields is prohibited. Some experiences with Biogas were made in recent years, to make use of manure and maize, but the activity is declining due to decreasing of governmental subsidies and falling prices for electricity. Also, some experiences were made with the financial support of farmers to construct local water treatment facilities. **Viktor Sergeev** (*Rector of Kaliningrad Institute of Personnel Retraining in Agribusiness*) picked up on the issue of manure. In general, he stated, a ratio of one hectare of arable to one nominal head of cattle is considered as a good ratio. The problem, even if this ratio is reached, is the local concentration of livestock

and the unprofitability to transport manure. Therefore, a surplus of manure can be seen in some areas and the production of biogas can be one solution to cope with this problem. He also stated, that changes in the composition of pollutants can be observed. Increasing amount of detergents, pesticides, fertilizers and plastics require new solutions in recycling and processing such wastes. **Dina Pocelueva** (*Deputy Head of Kaliningrad Center for Hydrometeorology and Environmental Monitoring*) presented results from the State Hydro-chemical Monitoring in the Kaliningrad Oblast. In the transboundary rivers (Lawa, Mamonovka, Angrapa), a gradual increase of nitrate and phosphate over the recent years is visible. However, other water quality indicators for the Lawa River have improved in recent years due to a decrease in the concentration of iron, sulphates and chlorides in water.

4.4.2 Working groups

During the third part of the workshop, two working groups were formed to discuss two main issues at a round-table discussion. The first issue addressed the topics monitoring & governance and the second topic addressed problem identification & solutions in a transboundary catchment. The directions of both discussions were similar with focus on several key elements.

Firstly, similarities and difference in the water management were discussed. In general, in both sides of the catchment, the management of surface water is quite similar. Authorities are responsible for controlling the quality and the polluter of water has to usually ensure the monitoring. Differences however can be seen by the accessibility of water related data. Where in Poland, most of the data concerning the water quality is published in a yearly report and updates are accessible online every three month, for Russia the data are not openly accessible and only available on request. For the management of the Lyna/Lawa-River, participants stated typical upstream-downstream issues. The water quality of the Russian part of the river is directly linked to activities on the Polish side. On the other hand, the water level of the Polish side depends on the operation of a hydropower dam on the Russian side.

A second topic that was discussed at both tables was the issue of monitoring the water quality. In the early 2000s, a transboundary monitoring schemes was installed, but nowadays it is not undertaken anymore. It was suggested to update the monitoring schemes by optimizing the location of monitoring points and increase the sampling frequency and to evaluate the archived data. The monitoring could be made more efficient by applying on-line sensors (e.g. for warning on pollution incidents) or by improving the quality assurance and control mechanisms.

A third topic addressed environmental aspects of the Lyna/Lawa-River. Foam on the stream, a growing beaver population, and an increase in rooted vegetation in the river were seen as environmental problems on both sides. Positively, recent years have shown some improvements of water quality indicators, like dissolved iron or sulphates. On the other hand, there is an increasing trend of nitrate concentrations. One reason could be that the overall denitrification potential of the catchment decreases, but more monitoring is needed to gain more insights for this trend. The participants shared the view, that in general environmental protection is not seen as the most important problem both by individuals and decision makers in the region. Individual well-being and economic aspects are of more importance; however, local residents react to visible signs of water quality deterioration in local streams. Also, the river offers the opportunity as a touristic destination, especially for water sports, like kayaking. The touristic potential could be improved by installing additional check-points for passports.

One of the major transboundary problems was seen in the lack of cooperation between Polish and Russian authorities at regional level (Oblast – Voivadship). It was stated that especially the departments for environmental protection have organizational obstacles for working together. There is a need to extend the relations between the environmental organizations. As good example, the Russian-Lithuanian cooperation was stated and it was suggested to improve the cross-border cooperation. However, at the local level, the cooperation was seen as rather positive. Due to personal contacts, short ways of (informal) communication help to solve problems faster.

4.4.3 Summary of Polish/Russian workshop

At a very productive workshop, several issues of the transboundary Lyna/Lawa-River were discussed openly by the Polish and Russian participants. Similar problems, like sea-grass vegetation, beaver population, or nutrients enrichment occur in both countries. Monitoring is important to control the status of the river; however, a transboundary monitoring scheme was terminated and it was suggested to at least harmonize the monitoring techniques for both countries so the monitoring results are easily comparable.

On the local level are existing structures that allow informal and swiftly cooperation between authorities. With a more formal cooperation at regional level, transboundary problems could be addressed more effectively. This workshop was a good attempt to strengthen the exchange and cooperation across borders.

4.5 Comparisons of the up-scaling workshops

Stakeholders in the Swedish workshop saw important potential in a co-governance approach, as did certain participants at the European workshop. However, when talking among representatives from different riparian Baltic Sea countries it becomes clear that existing governance arrangements have a strong influence on what is politically possible. In Sweden, there are challenges to a roll-out of a co-governance approach, but these seem surmountable.

The Tullstorp Brook project in Sweden found great resonance at both the Swedish and the European workshops, in particular the creation of a dedicated body to carry out the administrative and financial aspects of the work for the catchment. The points raised in relation to the design of co-governance approaches largely mirrored the findings in the literature, with trust, communication, clear goal-setting, and transparency featuring as key points. With regards to the monitoring process, there appear to be some differences in terms of what is needed for the co-governance process to work effectively, and what is scientifically possible. The role of institutions and stakeholders is something that varies from country to country and needs to be adapted to each individual case.

The Poland/Russia workshop did not address the co-governance issue directly. More important was an exchange between stakeholders in this transboundary catchment. The only topic directly related to co-governance was a joint monitoring program, which ended in the early 2000s. More formal cooperation between the regional and local authorities would be a first step to reduce environmental problems in the catchment. In this way, the case study area of the Pregolya River is not comparable with the other local case studies in Denmark, Sweden and Poland.

5 Conclusions

This chapter concludes the governance related research that was conducted during the BONUS SOILS2SEA project. It is based on results from a total of nine governance workshops, desktop research, and an ethnographic study, which included several interviews, observations, and case study visits in Poland, Sweden and Denmark. It covers four main aspects: co-governance as a promising style of governance, conclusions from the ethnographic study, linking of spatially differentiated measures and co-governance, and general conclusions.

5.1 Co-governance as a promising style of governance

The recognition that a co-governance approach could be a promising way to reach reduction targets crystallised in the second round of the local case study workshops. At the up-scaling workshops in Berlin and Gothenburg aspects of the co-governance approach were discussed in more detail. In general, these results from our findings match with experiences and reports from other European research projects. Generally, the co-governance aspect has emerged as a novel approach. Additionally, research in other European countries showed that there is rather limited experience in cooperation on environmental issues in agriculture. Smith et al. (2017), reporting on the UK, found that farmers generally do not have experience collaborating with one another. This might also be true for other European countries, and can potentially be explained by the Common Agricultural Policy (CAP) and agri-environmental schemes (AES), which have traditionally been delivered at the scale of the individual farmer (Prager 2014). However, Prager (ibid.: 62) also highlights the positive aspects of collaborative efforts: “Collaborative management can be more cost-effective because costs are shared and minimised, (...) aid the harmonisation of multiple objectives, and facilitate the sharing and mobilising of resources.” These positive effects were also mentioned in the project workshops, where it was highlighted that collaboration efforts can enhance trust among the participants.

The co-governance approach is characterised by “inviting social actors to participate in the core activities of the state” (Ackermann 2003). This process was discussed intensively at the workshop at Gothenburg, where it was stated that a co-governance approach would shift roles and responsibilities, which would require adaptive authorities. This would mean a change for the traditional hierarchical governance approach and was discussed as one major barrier for the implementation of a co-governance approach. Gravesgaard et al. (2017: 19), however, emphasise that a mix of “fixed institutional framework around public participation” can lead to cost-effective governance results. With the respect of barriers to implement mitigation measures, Lesch and Wachenheim (2014: 20) focused on buffer strips and identified barriers, like “lack of information about site specific costs and benefits and about conservation alternatives, and that the information that is presented is often too technical”. With a co-governance approach, some of these barriers can be overcome by using a participatory approach. As case study reviews (Newig and Fritsch, 2009; Reed 2008) demonstrate, participatory case studies might not always be successful in reaching environmental goals, but it seems that in general participatory approaches lead to collective learning which can lead to new and creative solutions.

5.2 Up-scaling of results from ethnographic studies

In general it can be stated that - in the same way as the geo-morphological soil conditions differ across the four case study areas - the socio-cultural- economic characteristics of the people living and working on the different soils are very different. This in turn leads to diverse decisions with respect to farming practices, nutrient inputs and outputs, collaboration amongst farmers, monitoring, and reactions towards measures and regulations.

Researchers, for example Friedmann (2005), argue that despite the unifying power of European policies, **differing cultural settings** affect reactions to European challenges such as the implementation of the European Nitrate Directive or the Water Framework Directive. In the BONUS SOILS2SEA case study areas in Denmark, Sweden and Poland it was found that the perceptions, values, beliefs, and thoughts about nature and the environment differ and hence needs, acceptance and uptake of measures and regulations are in many ways opposed. As a consequence, this cultural diversity leads to solutions suitable in one location being unsuitable in others. The awareness of cultural aspects and its importance for policy planning and implementation has been reflected in global governance processes e.g. through the UN Universal Declaration on Cultural Diversity.

Nevertheless, patterns can be found amongst cultural approaches to solve environmental and other issues. Commonly, European cultures are attributed to geographical regions such as Northern/ Northwestern Europe, Eastern and Southern Europe. For instance, cultures and practices in Northern/ Northwestern Europe are often associated with an issue- and result-oriented culture of decision making (Fischer 2009). Cultures in Eastern Europe need to be understood in the context of post-socialist transitions and interrelations between ideologies and practices, issues of trust amongst different stakeholder groups, and coupled with shortage of environmental information and access to information in general (Stataniunas 2009), while cultures in Southern Europe tend to be oriented alongside the traditions and principles of 'patronage' and 'familism' (Vettoretto 2009).

In the light of the existence of such cultural groups, BONUS SOILS2SEA considered this issue when discussing a co-governance approach. Therefore, the co-governance approach cannot be applied uniformly at different countries in the EU, but has to acknowledge the different cultural groups within Europe.

5.3 Spatially differentiated measures in the context of co-governance

Reduction of nitrates in groundwater and surface water systems shows large local spatial variation due to geological heterogeneities. Managers could benefit from this heterogeneity if, for example, mitigation measures are placed on fields with lower N-reductions. However, with traditional uniform regulation these heterogeneities in the natural environment cannot be fully exploited. Results from the project show that significant gains can be obtained by relocating existing agricultural practices without decreasing fertilisation inputs (see Hansen et al., 2017). A key tool in this approach is the production and usage of N-reduction maps showing how much N is removed by natural reduction processes, i.e. the ratio between the N-load out of the catchment and the N-leaching from the root zone for each spatial unit within the catchment (Refsgaard et al., 2017). The finer the resolution of the maps (e.g. 1ha or below), the more accurate mitigation

measures can be placed. Maps with coarse resolution (e.g. 15 km²) cancel out potential gains of the differentiated approach. Fine resolution N-reduction maps are, however, associated with considerable uncertainty (Hansen et al., 2014). Thorsøe et al. (2017: 209) delved in the idea of implementing a spatially differentiated approach and “explored how the legitimacy of regulation is challenged when the regulatory regime changed from general to differentiated regulation”

At the workshops in Denmark, Sweden and Germany, the differentiated approach was discussed in more detail. Results showed that the level of uncertainty that is connected with the fine resolution maps seems to be one of the biggest challenges for the implementation of the differentiated approach. Firstly, more scientific evidence is needed in order to reduce the uncertainty and also to gain the trust of local stakeholders. It became clear that, without trust in these maps, a spatially differentiated approach cannot be carried out.² Another critical aspect that was discussed at the Gothenburg workshop was the question of who bears the risk if these retention maps lead to undesired outcomes. In particular, it was mentioned that there might be a risk, that certain mitigation measures, for example constructed wetlands, are not as efficient as expected. This becomes a problem if mitigation measures are undertaken but reduction targets are not reached.

A co-governance approach can be a supporting element for the implementation of spatially differentiated measures. In a co-governance setting, the local stakeholders have a certain freedom of action, in which they self-determine the implementation reduction targets. The workshops and interviews indicated that the differentiated approach, if used on a voluntary basis and not enforced in top-down way, would be much more widely accepted. In this case, the uncertainty related to the retention maps is not of such importance, because these maps would only act as a supporting element and not as a regulatory element. However, this rather voluntary approach would also mean that there is no guarantee that the full potential of the differentiated approaches would be exploited. Having said this, applying the differentiated approach in a co-governance approach seems promising, at least from the point of view of local stakeholders.

5.4 Monitoring in a co-governance approach

The discussions from the workshops showed that **monitoring** is a very important element in the co-governance approach. How the monitoring is carried out has to be clearly defined from the very beginning. As described in table 3.1, we proposed a scheme with a central monitoring approach and a more detailed monitoring approach. While the central monitoring is undertaken by authorities to monitor the loads at catchment level, the more detailed approach can be arranged by the farmers.

This approach was discussed at the workshops and both the local workshops and the up-scaling workshops reached a similar result. The central monitoring option, which is the basis for evaluating success is therefore the basis for sanctions and subsidies mechanisms, must be clearly defined before the governance approach is implemented and should be conducted by third-parties or authorities. One of the main reasons is credibility and trust in the results of the monitoring.

² This was especially apparent in interviews conducted with farmers in the Danish case study area, who showed distrust in the use of retention maps by the Danish government (see Stelljes et al., 2017).

A more detailed monitoring from sub-catchment level up to farm level is necessary to monitor the success of single mitigation measures, like created wetlands, buffer strips, or other measures. Especially when applying differentiated measures, monitoring is crucial to document the efficiency of the approach. In the co-governance approach it was suggested that these kinds of monitoring are organised by the farmers themselves and not by the authorities. Some participants of the local workshops, particular in Sweden and Poland, suggested that also the detailed monitoring at farm level should be carried out by authorities and were reluctant to undertake the monitoring themselves. One reason was that they feared that this would increase their workload without remuneration. However, this would be a very expensive solution and participants at the up-scaling workshops stated that it would hardly be covered by the budget of the authorities.

A solution to this problem was suggested in the workshops in Denmark and Germany. Here, participants discussed the possibilities of citizen science to support the monitoring process. Citizen science can be understood as “the engagement of non-professionals in scientific investigations – asking questions, collecting data, or interpreting results” (Miller-Rushing, 2012). In this case, it would be farmers who would be involved in the monitoring activities, not only for scientific investigations, but foremost for the evaluation of certain mitigation measures. At the second workshop in Denmark, a new technology was presented to the farmers by the Danish Knowledge Centre for Agriculture (SEGES), which was received with great interest. This interest, together with emerging and easier to use technologies (for example apps or other programs on smart phones), demonstrate that citizen science can be a useful monitoring strategy. One question that was asked at one workshop was whether citizen science monitoring results are reliable. Steinke et al (2017: 9) show in their study, that “relatively low reliability of individual results does not undermine the accuracy of the findings when a sufficiently large group of farmers participates.” Additional positive aspects of participatory monitoring schemes are mentioned in studies by Mills et al. (2012) and Hammer et al. (2011). These studies show that the monitoring schemes can be made more cost-effective if undertaken in a participatory way and that this can also lead to social learning activities by the different farmers.

5.5 Additional possibilities and limitations of up-scaling the co-governance approach

The workshops at local level with farmers and local stakeholders showed that the co-governance approach was seen as a promising approach, at least in Denmark and Sweden. The up-scaling workshops with focus on co-governance in Berlin and Gothenburg on the other hand highlighted some key implementation challenges perceived by national authorities. The co-governance approach was generally regarded as an inspiring concept, but the feasibility for larger regions or even nations was still up for discussion. When examining the design principles and variables of co-governance, it became obvious that certain variables and principles may work well at larger levels, while others may be difficult to implement.

It was positively acknowledged that such an approach **empowers local stakeholders** and enables **local knowledge** to be used. The example from Tullstorp Brook showed that local actions can bring positive results and reductions in nutrient inputs can be achieved. It was also seen very positive that with the help of external funding a project manager could be hired. However, this positive example was driven by very involved key-persons and therefore the example is very context specific. At the workshops it was discussed how this key success factor can be institutionalised. So-called catchment officers, being responsible for the administrative

burden of the co-governance approach, were considered as one way to institutionalise the process. But to be effective, these catchment officers need a wide variety of competencies, to be equipped with certain decision-making power, and have some budget available.

Aspects of **time** were discussed at different levels. It needs to be recognised that some remediation actions take time to be effective. These time-lags can be up to several years, depending on the natural condition of the area. Apart from considering the natural conditions, establishing a co-governance system needs a certain amount of time. Building up trust, sharing information and knowledge, and having open discussions with stakeholders are time consuming for the involved parties. This can be especially problematic for authorities if several co-governance approaches in different regions have to be supported.

Co-governance requires a certain degree of flexibility from all involved participants. An up-scaling of the co-governance approach will only be successful if it also succeeds in creating a degree of flexibility in dealing with the approach at the administrative level. To allow adaptive governance that acknowledges regional differences seems to be a major obstacle that has to be overcome before a co-governance approach can be successfully implemented.

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