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Which factors spur forest owners' collaboration over forest waters?☆

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A B S T R A C T

Collaborative river basin governance has been advocated both by research and legislation, while at the same time certain silvicultural practices are shown to lead to deteriorating water quality. In order for collaboration to be initiated, however, the majority of key stakeholders must be willing to participate. This paper investigates which factors at the local level are crucial for initiating collaboration over forest waters among individual private forest owners. For that purpose, a survey was sent out to all individual forest owners within a catchment area in northern Sweden. The survey was complemented by a qualitative analysis of in-depth interviews. The existence of several key preconditions for the initiation of collaboration was investigated, namely: low belief and cultural heterogeneity, information diffusion, perception of the problem, existing stores of social capital, interdependence, and leadership. The results show that although the context was one of low belief and cultural heterogeneity, individual private forest owners are not interested in collaborating for improved forest water unless they perceive the issue of water quality important enough to invest resources in collaboration. It also became clear that the diffusion of information about the problem is not reaching those stakeholders who are crucial for the commencement of collaboration. Moreover, those stakeholders do not recognise their interdependence on each other for resolving the issue and therefore the need for collaboration. Finally, initiating leadership was also found to be lacking, leading to the conclusion that to successfully implement policies requiring collaborative management of natural resources among highly empowered individual forest owners, those missing factors need to be addressed by the state.

1. Introduction

The current turn towards more collaborative forms of natural resource management has been supported both by research and legislation. Collaborative governance engages public and private stakeholders across levels of government and sectors into a process of policy joint decision-making and management, usually to address “wicked societal problems” and to accomplish aims that could not otherwise be achieved (Emerson et al., 2012). Whether or not collaboration is to form has been shown to depend on the presence of contextual factors (Ansell and Gash, 2008; Sabatier et al., 2005), as well as certain key triggers or ‘drivers’ (Emerson and Nabatchi, 2015). Context includes a myriad of layered and interconnected conditions – environmental, political, institutional, cultural, economic, social (Emerson and Nabatchi, 2015), as well as legal (Amsler, 2016). Among the factors which play an important role in the consolidation and continuation of the collaborative process is trust between stakeholders (Emerson and Nabatchi, 2015, Sabatier, 2005), interdependence of stakeholders on each other for solving the problem at hand (Emerson et al., 2012) and leadership (Emerson et al., 2012; Margerum, 2011). Furthermore, collaborative

governance processes are required on all administrative levels, including local, regional and state (Ansell and Gash, 2008; Brown et al., 2016) in order for the anticipated improvement to be achieved.

While forest policy research on collaborative governance has focused extensively on issues such as certification (Cashore et al., 2004; Johansson, 2013), conflicts (Eckerberg and Sandström, 2013; Yusran et al., 2017), indigenous rights (Widmark and Sandström, 2012), forest protection (Primmer et al., 2014; Widman, 2015), as well as management of public or state-owned forests (Dang et al., 2012; Mohammed et al., 2017; Raitio, 2013), little attention has been given to collaboration over forest water. Likewise, research which examines collaborative management of water (Sabatier et al., 2005; Huitema and Meijerink, 2014; Margerum, 2011) has not examined the specific issues related to the management of forest water even though it requires cross-sectoral collaboration between stakeholders with conflicting interests. Practices which have a positive effect on timber yields have been shown to have a negative impact on forest water (Laudon et al., 2011), while those forestry practices which take into account water quality are usually less beneficial economically (Roberge et al., 2016). Recent research in other contexts shows that the institutionalisation of a cross-

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Table 1
Summary of factors spurring collaboration between forest owners themselves and forest owners and other stakeholders at the local level.

Factors	Operationalisation
Context	
Low belief and cultural heterogeneity	This factor is important for the initiation of collaboration between forest owners themselves. Sharing common interests and values facilitates collaboration for reaching defined goals.
Information diffusion	Knowledge forest owners have acquired of the issue at hand, which could motivate them to collaborate with other forest owners and/or other stakeholders. The information could potentially be diffused from a variety of stakeholders but the state's role is key here if the initiative for collaboration comes from the central level.
Perception of the problem	Recognition by the forest owners of the problem's importance and the urgency of resolving it through collaboration with other forest owners and/or external stakeholders.
Existing stores of social capital	The level of existing trust between forest owners themselves and with external stakeholders, as well as the existence or establishment of networks within the community (bonding), and with external stakeholders (bridging) increases the likelihood of forest owners stepping into collaboration between themselves and with external stakeholders.
Drivers	
Interdependence	Recognition by forest owners of their interdependence on other forest owners and government authorities to resolve a problem and thus the recognition of the need for collaboration.
Leadership	An individual from the local community or external to it, who is willing to take upon the role of leader, could compensate for the absence of other factors in initiating collaboration.

sectoral approach has, however, proved to be a tough nut to crack and requires broad national and international political commitment (Bastos Lima et al., 2017), which makes collaborative governance of forest water a serious challenge for both policy-makers and practitioners.

The relevance of the legislative context has been underscored by many previous studies on collaborative management (Amsler, 2016; Brower, 2016; Mattor and Cheng, 2015). In the case of Sweden, the legislative context includes the European Union Water Framework Directive (EU WFD, 2000/60/EC), which endorses the inclusion of all interested stakeholders in the governance of water resources (Coenen and Bressers, 2012) as opposed to top-down state governance. The directive further stresses the need of achieving 'good status' for all water by applying an all-encompassing approach, based on river basin management (EU WFD, 2000/60/EC). At the same time, researchers have accumulated significant knowledge on the relationship between intensive forestry and forest water quality, and have clearly linked forestry practices to the deterioration of forest water quality (Futter et al., 2016; Laudon et al., 2011). While a legislative framework concerning forestry practices is present in Sweden, most of the prescriptions regarding how forestry should take water quality into account are recommendatory (SFA, 2014b). It is the forestry sector itself which should take into account environmental as well as social forest values whilst exploiting the forest resources – the so called “freedom with responsibility”, with the law only setting the minimum criteria of conduct (Appelstrand, 2007; Bjärstig and Kvastegård, 2016; Löfmarck et al., 2017). Stepping into collaboration is, therefore, an entirely voluntary decision that each individual private forest owner has to make. Additionally, in the legislative context of “freedom with responsibility”, the different forest values and the uncertainty of how to balance them could lead to conflict and uncertainty (Löfmarck et al., 2017).

Previous case studies of collaborative forest governance (Brown, 2002; McDougall et al., 2013) and collaborative water management (Fish et al., 2010; Sabatier et al., 2005; van Buuren et al., 2012; Watson et al., 2009) examine attempts to empower the local community in relation to private corporations and/or government authorities. This study aims at filling a research gap within collaborative governance literature by studying the management of forest water within a context where most of the forest land is privately owned. In Sweden the (common) water runs mainly through privately owned forests. Only 3% of the productive forest land is owned by the state, while > 80% of the forest is privately owned. A whole 50% of Swedish forests are owned by individual private owners (SFA, 2014b), implying that everyday decision-making concerning forest and forest water management largely rests with these individual landowners (Widman, 2015). Their decisions shape the management of the forest water within the larger context of collaborative governance between levels and sectors. In other words, when studying the local level, one examines the collaborative *management* of forest water. This management, however, is just one of the

building blocks of the collaborative *governance* of forest water. It is important to note that the large share of private forests owned by individuals is not unique for Sweden and the findings will have implications outside the studied context. For example, in Finland, 60% of the forest land is owned by individuals (Simila et al., 2014), while in the US 35% of forests are owned by families or individuals (USDA, 2008). This puts the issue of responsibility for common waters to its point.

The aim of this study is to examine how individual forest owners can be willingly included into a collaborative natural resource management process, in order to make joint forest water management possible. To achieve this aim, the main research question posed is: which factors are important in spurring local forest owners' collaboration for improved forest waters? Pinpointing those factors could provide better understanding of the preconditions for collaborative management of forest waters as required by the WFD and fill in a void within both collaborative water governance and forest policy literature.

2. Theoretical departure

The collaborative approach in natural resource governance has been presented in the past few decades as a catch-all phrase and as a potential solution in general (Ansell and Gash, 2008; Emerson et al., 2012; Wondolleck and Yaffee, 2000), as well as to water management (Sabatier et al., 2005). Improved legitimacy, trust-building and efficiency have been stressed as some of the most important virtues (Sabatier et al., 2005; Wondolleck and Yaffee, 2000). Several contextual factors (Emerson et al., 2012; Ostrom, 2009; Sabatier et al., 2005) and drivers (Emerson et al., 2012) have been identified as being of specific importance for the launching of collaborative action, while many of those and several additional factors are significant for its further effective functioning. While legislation is part of the context, previous research has shown that top-down initiated legislation promoting collaborative governance is not sufficient in initiating collaborative processes, but rather must be complemented by other contextual factors, such as existing institutional traditions of cooperation (Benson et al., 2013) and drivers such as leadership (Mattor and Cheng, 2015) and interdependence (Emerson et al., 2012). When focusing specifically on the initiation of collaboration at the local level, several preconditions stand out as of particular relevance (Table 1), as opposed to others, such as political dynamics (Emerson et al., 2012), which are applicable at the regional and national levels of governance.

2.1. Low belief and cultural heterogeneity

The initiation of collaboration has proven to be dependent on the extent to which stakeholders share the same beliefs. The Advocacy Coalition Framework stresses actors' lenience towards stepping into coalitions with other actors with whom they share beliefs (Sabatier and

Jenkins-Smith, 1999). Shared beliefs lead to lower transaction costs of participation for stakeholders (Libecap, 1989) and thus increase the likelihood of an engagement in collaborative processes (Sabatier et al., 2005). Furthermore, recent research has shown that within climate mitigation policy-making, shared policy beliefs play a more important role as a promoter of collaboration than stakeholders' perceived power (Ingold and Fischer, 2014).

Since previous research on individual forest owners' motivations and behaviour shows that personal and family values have a stronger influence on those owners' forestry practices than external incentives such as policies and economic conditions (Côté et al., 2015), it is of particular importance when investigating forest management decisions at the community level to look at the values that the individual forest owners rate highest (Björstig and Kvastegård, 2016; Pöllumäe et al., 2014). When analysed through the lenses of the Advocacy Coalition Framework, a forest owner who rates the forest's economic value high and its environmental value low is potentially less likely to easily step into collaboration with a forest owner who rates the forest's environmental value highest. If forest owners have relatively homogenous views on what the most important values of the forest are, then it would be expected that they would more easily step into collaboration aiming at achieving certain goals. Similarly, forest owners might be expected to trust to a higher degree and be more willing to step into collaboration with government authorities which are responsible for the values they rate highest.

2.2. Information diffusion

When looking first at the knowledge-dimension, in the framework of Sabatier et al. (2005) the accumulation of scientific knowledge on the problem is a factor attributed to the resource (in this case forests and water), while human capital is the factor attributed to the community. However, while focusing on the community level, this study examines the diffusion of knowledge about the issue at hand and its further acquisition by individual stakeholders, specifically forest landowners and professional practitioners who are entrusted with management tasks. Environmental governance relies on stakeholders having knowledge about the environmental systems governed, as well as on how that governance affects the systems and how their actions affect other stakeholders (Ostrom, 2009, 2010). Not having information about the issue and the regulation guidelines (nor understanding it) can lead to unintentional non-compliance of forest owners (Simila et al., 2014). It is a fundamental prerequisite that a stakeholder first is well informed about the problem before other factors start weighing in on the decision whether or not to step into collaboration with other forest owners or government authorities.

2.3. Perception of the problem

When stakeholders have accumulated the required knowledge about the problem, they also have to perceive it as important and serious enough to act upon. This perception depends on how important the resource is for them. Stakeholders who are economically dependent on the resource or attach high value to it are more likely to self-organise to manage that same resource (Ostrom, 2009). Chhatre and Agrawal (2008) have shown a linkage between two aspects of community dependence on forests: commercial and subsistence and their influence on forest degradation and subsequently regeneration. While both aspects affect forest degradation, a positive association was found between forests' commercial value, the level of local enforcement and forest regeneration (2008: 13,291). Moreover, it is not only the commercial value of a resource that plays a role in how important a problem is perceived by stakeholders. When stakeholders perceive a resource's sustainability as important this could lead to the implementation of more sustainable forestry practices (Pinkerton, 1998). In addition to timber production, forests can be the source of leisure in the form of hunting and fishing (Ezebilu et al., 2012).

Therefore, a forest owner who has an interest in fishing could be expected to be more prone to perceiving water quality within his or her property as an important issue.

One aspect which has been investigated by previous research is the link between forest owners' possession of a management plan and their interest in forest policies and incentive programmes (Huff et al., 2017). A management plan is a way of structuring the management of the property, with included recommendations for specific operations at certain time periods. A forest owner is required to have a forestry plan if s/he is to certify her/his forest (SFA, 2014b), with certification implying that the forest estate is being managed taking environmental aspects into account. Thus, having a management plan could point to a forest owner's perception of the importance of taking environmental aspects into consideration when managing his or her forest.

However, in order for stakeholders to consider collaborating, their perception of the resource's condition should neither be too positive nor too negative. If stakeholders perceive the problems related to the resource as either too big and therefore unsolvable or too small and thus insignificant, they will not have incentive to collaborate (Ostrom, 2009).

2.4. Existing stores of social capital

The importance of social capital and social networks for collective action has been highlighted for decades, especially after Putnam's seminal work (2000). Sabatier et al. (2005) identify social capital as one of the key factors for the formation of collaboration which are attributed to the community. They follow the classical definition (see Putnam, 2000 among others) of social capital, where trust, horizontal networks, and norms of reciprocity lead to collective action (Sabatier et al., 2005). The degree of trust stakeholders have in each other and in government authorities and their representatives is part of the context within which collaborative initiatives are to form (Jin and Shriar, 2013). Collaborative initiatives are more likely to happen in communities with a high level of trust, and likewise, stakeholders are expected to step into collaboration with external stakeholders they trust (Sabatier et al., 2005). Furthermore, whether or not stakeholders will trust the knowledge they are presented with depends, among other things, on the level of trust they have for the authorities presenting it (Focht and Trachtenberg, 2005).

Horizontal networks are important because measuring social capital at a community level has proven to be difficult (Putnam, 2000) and one way around this obstacle is to identify existing networks within the community (Margerum, 2011). Local networks have shown to be of special significance to the introduction of more sustainable methods of forest management (Khanal, 2007). Among other things, networks in cases of low conflict function as fora for disseminating knowledge, persuasion and exchange of ideas (Lauber et al., 2008). Communities with already existing and well-established social networks are more likely to step into collaboration which aims at addressing issues related to natural resource management (Margerum, 2011). Existing social capital at a community level, however, does not necessarily mean that ties with networks which are external to the community are strong. On the contrary, strong bonding within groups without bridging between them could lead to more conflicts arising between those groups (Putnam, 2002). For effective collaborative management of complex social ecological systems which require the inclusion of a wide array of stakeholders, both from within and outside of the community, bonding and bridging of social capital would be expected necessary.

2.5. Interdependence

Interdependence has been proven to be of crucial importance to whether or not stakeholders step into collaboration and how that collaboration develops (Sabatier et al., 2005; Zachrisson and Beland Lindahl, 2013). Interdependence is the realisation by stakeholders that the problem or opportunity at hand cannot be resolved or taken

Table 2

Descriptive statistics of the responses to the survey presenting the proportion of owners, according to interest in collaboration, size of property, presence of forestry plan, and perception of importance of taking water into consideration.

	%
Forest owners who claim interest in collaborating	48
Forest owners with property < 150 ha	76
Forest owners who have a forestry plan	65
Forest owners who claim taking water into consideration is important	59
N = 46	

advantage of without collaborating with others (Gray, 1989). Since forest waters are shared among many forest owners, it is relevant to analyse the extent of perceived interdependence among the forest owners in this respect. Furthermore, depending on the legislative and institutional context, forest owners may be dependent on government authorities for permission to carry out certain practices, or conversely, government authorities might rely on landowners' consent or willingness to adopt and apply certain management practices (Eckerberg, 1987).

2.6. Leadership

Previous research has concluded that policy and administrative guidance do not suffice in stimulating collaborative approaches in management but need to be combined with institutional, community and individual factors, among which leadership is essential (Mattor and Cheng, 2015). Moreover, studies have shown that some of the already presented factors such as high local capacity in the form of knowledge of the issue at hand, interest and social capital lead to strong leadership and participation in decision-making processes in participatory management arrangements (Thaler and Levin-Keitel, 2016). It is often within existing networks that certain individuals stand out as central (Margerum, 2011). Furthermore, research has identified leadership as a central driver for the formation of collaboration (Eckerberg and Dahlgren, 2007; Emerson and Nabatchi, 2015; Ostrom, 2009; Sabatier et al., 2005). Leadership could either come top-down, from authoritative institutions, or it could be a grassroots initiative from the community itself (Margerum, 2011). Leadership can be defined in short as the existence of an 'identified leader who is in a position to initiate and help secure resources for a collaborative arrangement (Emerson et al., 2012). This leader is usually a respected representative of the local community with entrepreneurial skills (Ostrom, 2009) but could also emerge from external organisations or groups such as government authorities or NGOs (Margerum, 2011).

3. Method: quantitative and qualitative analyses

Sweden was chosen in this study because of its large territory covered by forests (SFA, 2014a), as well as its innumerable water resources within intensely harvested areas (SFA, 2014b) which together provide a setting where forestry has a big impact on water quality. Furthermore, since half of the Swedish forests are owned by individual private forest owners (SFA, 2014a), this makes it possible to examine the necessary preconditions for individual private stakeholders to step into collaboration for forest water management.

The local setting – the Krycklan catchment in northern Sweden – was selected for several reasons. First, there is considerable research data about the region's forest water status that has been accumulated over the decades, including detailed areal maps of the different properties within the catchment (Laudon et al., 2013), which aided the choice of forest owners for in-depth interviews. Second, Krycklan is part of the Vindel river basin – a historically important location as far as civil engagement in environmental issues in Sweden is concerned. The Vindel River is one of only 3 rivers longer than 150 km in Sweden

which have remained unregulated (WCD Report, 2000) as a consequence of an intense environmental campaign in the early 1960s – one of the first environmental protest movements in Sweden (Vedung, 1978). The majority of forests around the water basin and within the Krycklan catchment, however, are not protected and therefore subject to regular timber exploitation (Laudon et al., 2013), which on its part, has substantial effects on the water quality within the area.

Scientific research has accumulated significant knowledge on the effects forestry has on water quality at the local scale. Common forestry practices such as ditch-clearing, final felling, transportation of timber on wet soils have been proven to effect runoff, nitrogen and phosphorus levels, and dissolved organic carbon (DOC) concentration, among others (Futter et al., 2016). The location of the Krycklan catchment within a river basin with important ecological, social and cultural values, together with the relatively high fragmentation of the land in small-sized adjacent properties (Table 2) and the fact that the majority of land in Krycklan is regularly harvested (Laudon et al. 2013), motivates the choice of this case.

The factors leading to collaboration at the local level were investigated through a survey of the whole population of the Krycklan catchment. It was sent to all 85 individual forest landowners, and had a response rate of 54% (N = 46). The aim with the survey was first to determine whether or not collaboration was ongoing, and then to acquire a deeper understanding of how stakeholders perceive the issue of forestry and water protection, how much information about it they have, as well as whether or not they are interested in collaborating with other stakeholders. Consequently, the results were expected to shed light on which factors were of crucial importance for the initiation of collaboration. The results were analysed through descriptive statistical methods, as well as through looking for association between different variables.

This quantitative analysis was then complemented through qualitative analysis of in-depth, open ended interviews (Bryman, 2008) with a total of eleven key stakeholders, in order to obtain a more varied and detailed picture. The interviewees can be categorised as two types: individual forest landowners and other stakeholders. Three individual forest landowners were selected from the Krycklan area together with forest ecologists who could evaluate the degree to which collaboration would be deemed necessary with neighbouring owners due to the forest water situation on the estate. One other forest owner from the area was also interviewed in connection to his leadership role within the Fishing Management Area (FMA) of Krycklan. FMAs are interest-based member organisations consisting of land, and thus fishing-rights' owners, which are state financed and manage the majority of Sweden's water sources (Olsson and Folke, 2001, p. 89), and successfully so (Lundqvist et al., 2004).

Additional interviewees included the chief responsible officer for forest water at the Swedish Forest Agency, a fishing advisor who chairs the Ume and Vindel River Fishing Advisory Board – one of the most active in the region regarding issues concerning forestry and its impact on forest water. A restoration project leader within the Vindel river and a hydrologist doing research in the Krycklan catchment were interviewed to gather knowledge on the particular ecological issues and forest owner involvement in their solution within the catchment. Two County Administrative Board officers responsible for the then-ongoing information campaign called Healthier Forest Waters and one regional forest inspector of the Forest Owners' Association were interviewed to examine their roles in relation to the local forest owners.

The survey and interviews were further complemented by an analysis of official documentation. This included reports from the Swedish Forest Agency, the County Administrative Board and the Water Authorities (PMP, 2015; SFA, 2014b), as well as official information on various policies and activities by these agencies (CAB website; SFA, 2016) in connection to the issue at hand.

4. Results

The first step of the study was to determine whether or not collaboration was ongoing. Respondents were asked if they were interested in collaborating with other actors and < 48% (Table 2) of them claimed that they were willing to collaborate with other parties. Another point of interest was whether or not respondents had met with anyone to discuss the water within their property. Only 20% of forest owners replied that they had done that. These numbers brought about the follow-up question – why are more than half of the forest owners within the Krycklan catchment not interested in collaborating? The investigation of the factors which contribute to the initiation of collaboration could hold the answer to that question.

4.1. Low belief and cultural heterogeneity

To establish whether or not individual forest owners within the Krycklan catchment share similar beliefs on issues of relevance to forestry and its impact on water quality, the survey included a question where respondents had to grade from 1 to 5 what aspect of their forest was most important for them. The alternatives were economy, conservation, hunting, fishing and outdoor recreation. The results showed a relatively low belief heterogeneity within the catchment. The economic value of the forest was rated either 4 or 5 by 74% of the respondents. This result suggests a relatively high dependence on the economic gains from forestry in this region. Conservation also scored quite high with 59% scoring it either 4 or 5. As many as 58% of those who rated the economic dimension of their forests high, gave the same rating to its conservation value.

4.2. Information diffusion

Scientific knowledge on the effects of forest management practices on forest water quality has already been accumulated in the last few decades (Futter et al., 2016; Laudon et al., 2011). Environmental NGOs (WWF website), state authorities at the national level (SFA website), as well as the state authority at regional level – the County Administrative Board have tried to spread this knowledge to individual forest owners by informing about the importance of taking water into consideration when carrying out different forestry operations such as clearcutting, cleaning and thinning, drainage, logging and building forest roads. This was done, among other things, via an information campaign Healthier Forest Waters (CAB website). Because of this attempt on behalf of the authorities to inform about this issue within the region, it was interesting to explore how informed forest owners considered themselves to be and where that information came from. Within the survey an overwhelming 63% claimed they did not have good knowledge regarding how to take water into consideration when performing forestry operations. Of those who claimed they did have good knowledge, 94% stated that it was important for them to take water into consideration when managing the forest, while the equivalent figure for the whole population is 60%. Only 6% of respondents named the County Administrative Board as their source of information, while 11% mentioned environmental NGOs. Interestingly, 11% of respondents stated that they never received any information on the matter. These numbers point to a low level of knowledge among forest owners about the negative impact that forestry may have on forest water, despite the authorities' attempt to spread that information. This tendency was also confirmed by the in-depth interviews. While the interviewed researchers, public officials, the forest association representative and fishing advisor recognised the negative impacts forestry has had on forest water and the need to act upon that (Interview 1, 2, 4, 5, 9, 10), all of the interviewed forest owners believed that the water within their property was of good status (Interview 6, 7, 8).

4.3. Perception of the problem

When investigating forest owners' perception of the importance of the problems associated with forestry and its impact on forest water, it is worth underscoring that in this case, two resources play a role in determining stakeholders' interest in collaboration. A forest owner may value the forest for its trees but have little or no interest in the water which runs through it, and vice versa. Almost 60% of the forest owners claimed that taking water into consideration when managing their forest was important to them (Table 2). It was therefore interesting to examine how many of those who claimed that taking water into consideration is important were actually interested in collaborating, or in other words perceive that there is a serious enough problem that demands collaboration. Of those who claimed that taking water into consideration when managing their forest was important, only 59% claimed to be interested in collaborating with other actors. The association between their concern for water issues and their will to collaborate was further investigated through a Chi-square test for association. Both the test, and corresponding Phi coefficient showed that there was a positive medium association, between rating of importance of taking water into consideration and willingness to collaborate over water issues (Table 3).

Moreover, a Chi-squared test of association (Table 3) showed that there was a significant positive association between having a forestry plan and a forest owner's willingness to collaborate with other parties. This could be pointing to a connection between an individual forest owner's perception of how important the sustainable management of the forest is and his or her willingness to step into collaborative action to better manage that forest. The dataset did not allow for more complex models of interactions between multiple variables, but bivariate tests of variables which could be expected to be associated with having a forestry plan, such as size of property did not show any significant association to willingness to collaborate (Table 3).

In Sweden, forests are not only the source of revenue in the form of timber harvesting, but also a source of leisure in the form of hunting and fishing, where forest owners also own the sole hunting and fishing rights within their properties (Ezebilo et al., 2012). Anyone who wishes to fish in inland water is required to buy a fishing permit, usually sold by the FMA. In that manner, good water quality within the property could mean increased revenues for the FMA. However, as those revenues are reinvested in the FMA rather than distributed among forest owners, it is more likely that a forest owner will be interested in achieving good water quality within the property only if s/he is interested in fishing.

In the question where respondents had to grade which aspect of their forest was most important, hunting and outdoor recreation were

Table 3

The table presents the frequencies of responses for variables which are of relevance to interest in collaborating.

		Are you interested in collaborating?		
		No/don't know	Yes	Total
<i>How important is water?</i>	1–3 Not important	13	6	19
	4–5 Important	11	16	27
	Total	24	22	46
<i>Pearson Chi-Square value = (4.207); Df = (1); Phi = (0.302), p = (0.064)</i>				
<i>Do you have a forestry plan?</i>	No/don't know	12	4	16
	Yes	12	18	30
	Total	24	22	46
<i>Pearson Chi-Square value = (5.123); Df = (1); Phi = (0.334), p = (0.024)</i>				
<i>Property size</i>	< 150 ha	20	15	35
	> 150 ha	4	7	11
	Total	24	22	46
<i>Pearson Chi-Square value = (1.448); Df = (1); Phi = (0.177); p = (0.229)</i>				

ranked highly only by 33% and 41% respectively. What was surprising is that despite that sport fishing is quite popular in the region, the value most relevant for and dependent on good water quality – fishing – was ranked with 4 – next to highest, by 15% of respondents and with 5 – highest, by only 2%. In concurrence with the survey results, despite the majority of the interviewed forest owners being engaged in sport fishing themselves, none thought that the water within their own property was of high value for sport fishing. Instead they would prefer to buy fishing rights and fish outside of the catchment in “better waters” (Interview 7).

4.4. Existing stores of social capital

The issue of trust in public institutions was touched upon in the survey, while trust in other individual forest owners was referred to within the interviews. However, trust is an elusive concept, and has many dimensions to it, not least the aspect of trust and distrust being two separate constructs instead of two opposites on one continuum (van de Walle and Six, 2014). This makes the investigation of trust a study in its own right. The scope of this paper did not allow for an in-depth analysis of trust in all of its dimensions. With this said, a picture, albeit a coarse one, of individual forest owners' trust in public authorities is presented because of its relevance to forest owners' readiness to accept information and knowledge disseminated by authorities.

In the survey respondents were asked to rank their level of trust on a scale of 1 to 5, with 5 being highest. When ranking their trust in public authorities – the County Administrative Board and Swedish Forest Agency – between 60 and 70% of respondents ranked those institutions with 3 or more (Fig. 1). Even more trust was given to the Forest Owners' Association (FOA). More than 70% ranked their trust in the FOA with 3 or above, with a much higher proportion of respondents ranking the FOA with the two highest options compared to the SFA. Trust in private forestry companies ranked lowest in the survey (Fig. 1). The results indicate that individual forest owners have higher trust in other individual forest owners and their association, as compared to public authorities, and especially compared to private forest companies.

Forest owners' trust in authorities was also covered in the in-depth interviews. Two of the forest owners told of specific instances when the Swedish Forest Agency had given them recommendations that they felt were wrong and unsustainable from their perspective. As one forest owner put it: “First they tell you to clear-cut all the way to the stream banks, 10 years later it turns out it was wrong and you have to leave a wide buffer!” (Interview 7) This points to forest owners' direct questioning of the knowledge they receive on behalf of the CAB and other authorities regarding sustainable management regarding forest water and forestry.

Apart from looking into trust, attention was focused mainly on the other dimension of social capital which has relevance to the local level – the existence of social networks both within the community

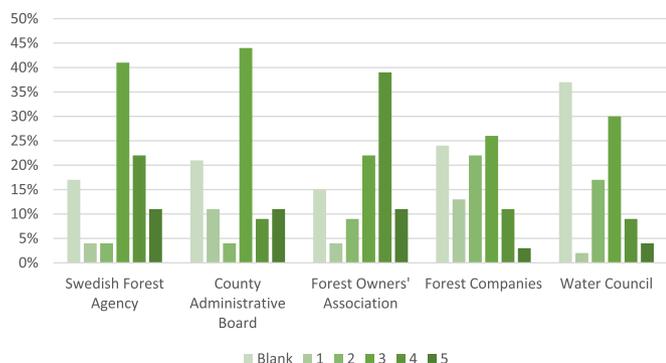


Fig. 1. What level of trust do you have in the following stakeholders (on a scale of 1–5, 5 being the highest level).

(bonding), as well as with external stakeholders (bridging). Individual private forest owners were first asked in the survey whether or not they knew of someone working locally or regionally with trying to mitigate the negative effects of forestry on water and only 24% claimed to know of such actors. As mentioned, collaboration between forest owners was present in connection to the construction of roads and wells. Regarding the management of forest waters, however, it soon became clear that there is no organised collaboration within the Krycklan catchment other than the FMA. The FMA in the Krycklan catchment, although part of the Ume and Vindel River Fishing Advisory Board, does not by itself focus on any concrete collaborative strategies in connection to forestry and its impact on water within the area but instead on fish management (Interview 3). As far as networks including government authorities' representatives are concerned, the Krycklan catchment is within the scope of the Ume and Vindel River Water Council. It is top-down instigated and includes a wide array of public and private stakeholders. Despite its aim to promote local participation and feed-in local knowledge in water governance (The Water Authorities Website) and thus create networks which bridge between the local community and other stakeholders, 37% of the survey respondents when ranking their trust in the council left this question blank (Fig. 1) and several even wrote – “what is the Water Council?” The interviewed forest owners had from little to no knowledge of the Water Council and its work (Interviews 6, 7, 8), which pointed to a lack of interrelation between the local community and the institution aiming at bridging it with other levels and stakeholders. In other words, networks *within* the community were present in the area and stakeholders claimed that collaboration in the networks worked well for the most. However, this collaboration neither included issues which concern forestry or forest waters specifically, nor did it exceed community boundaries.

4.5. Interdependence

It is here, after the knowledge has been obtained and the problem is perceived as important, that stakeholders realise that the solution of the problem requires collaboration with other parties. To investigate individual forest owners' degree of interdependence regarding other forest owners, in the surveys, respondents were asked to fill in whether they owned the property themselves and who was mainly responsible for the decision-making (Figs. 2 and 3).

The majority were sole owners, while close behind followed those who owned together with their partners. Furthermore, a staggering 76% claimed that they are the main decision-maker within the management of their forest land. These statistics point to a lack of perceived need for collaboration at the property level. Any need or interest for collaboration would have to come between forest owners of different properties and as a recognition of the need to solve a pressing problem and a realisation of interdependence. In order to further investigate the existence of this driver of collaboration within the catchment, the surveys included a question: “What do you perceive affects the water in your property negatively?” Other forest owners' activities were considered to be the main source of impact on forest waters by 20% of

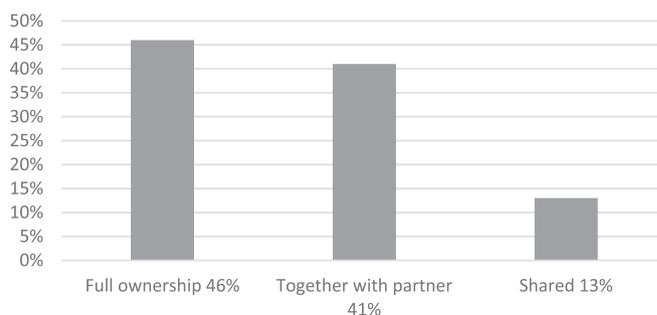


Fig. 2. Are you the sole owner of the property or are there several owners?

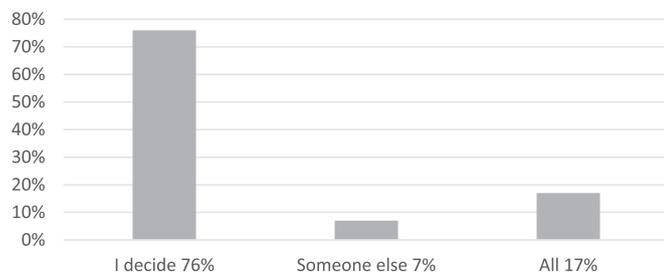


Fig. 3. How are decisions made about forestry practices regarding your property?

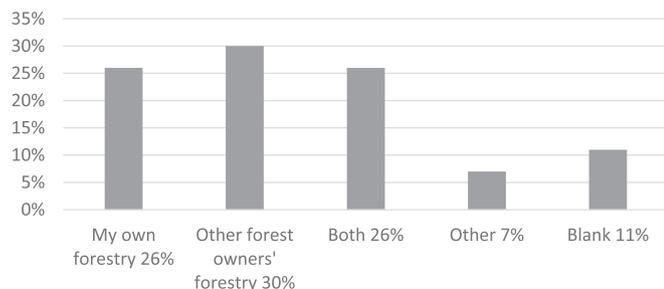


Fig. 4. Distribution of responses to the question 'What do you consider as affecting the water within your property negatively?', where all responses that included 'My own forestry' were fused into one value; all responses that included 'Other forest owners' forestry' in a second value; and in a third value all responses that included both. The 'Other' value was included for all those who chose other options and 'Blank' was set for all respondents who did not fill in that question.

respondents. More interestingly, 82% of the respondents claimed that they perceive their water being affected either by their own, their neighbour's or the forestry activities of both, among other factors (Fig. 4). This points to some knowledge of forestry and its impact on water within the forest and recognition of the interdependence between properties and thus between stakeholders.

Furthermore, when scrutinising forest management by individual private forest owners at the local level, the issue of interdependence has one more dimension. Individual private forest owners are not only interdependent on their neighbours' management decisions but also often, within their own property, have to resort to the services of other actors, such as forest entrepreneurs. Despite this, the legal responsibility for practices carried within the property rests with the owners, making them dependent on other actors' perception of good forestry practices (Löfmarck et al., 2017). While the majority of survey respondents stated that they do their own planning and thinning within the property, only 22% indicated that they carry out both the clear-cutting and timber logging, and only 17% claimed that they themselves execute the soil preparation before replanting. All the three latter practices can have a significant impact on the water within the property (SFA, 2016).

In the in-depth interviews the forest owners were asked whether the collaboration with other forest owners, when such was necessary, worked well. All but one replied that it worked well when required. However, none of them connected the need of collaboration to the forestry's impact on water or the management of surface water in general, but rather to the construction of roads and transportation of timber, or to drinking water infrastructure. This collaboration focused on the aspect that the infrastructure would have to be built on or affect several properties, but not that it should be constructed in a manner that takes impact on water quality into consideration. These results suggest that forest owners collaborate with other stakeholders over the issues they consider as important or problematic, such as forest road construction but not over issues of secondary importance, such as water quality.

4.6. Leadership

When forest owners themselves have not realised that there is a problem which requires collaboration and there is no top-down implemented regulation demanding it, then a leader could be the driver which could trigger collaboration between stakeholders (cf. Emerson and Nabatchi, 2015). To determine whether this potential driver is present, in addition to the question: Have you heard of local/regional organisations, groups or individuals who work for minimising the negative effect forestry has on forest water?, forest owners were asked to specify whom they had heard of. The majority pointed out the Swedish University of Agricultural Sciences (SLU) as the actor they knew of. This is not surprising given SLU's extensive ecological research within the catchment. However, the fact that only one respondent pointed out forest owners as actors working for minimising the negative effect forestry has on water, one pointed out the Swedish Society for Nature Conservation, and no one indicated a specific person who is active in the issue, shows in itself that there is not much collaborative activity going on in the catchment and that no one has taken on an initiating leadership role so far.

5. Discussion

Despite the accumulation of a significant body of scientific knowledge on issues concerning the collaborative management of a natural resource, key stakeholders could still be unwilling to collaborate in order to solve them if certain factors are missing. In a context of dominating private land ownership where individual forest owners have relatively high power in decision-making concerning the management of their own land, and in the absence of external pressure such as binding national regulation which previous research has proven to be of vital importance for successful collaborative environmental governance (Brower, 2016; Widman, 2016), the presence of other factors becomes ever more crucial if collaboration at a local level is to be initiated.

The results suggest that regardless of top-down initiated efforts to reduce the negative effects of forestry on water through information and appeals for collaborative management, when certain factors are missing, stakeholders at the local level are unwilling to step into collaborative initiatives. The economic value of the forest was rated highly by the majority of respondents within the catchment, along with conservation. What is more interesting is that more than half of the respondents rated both values highly, suggesting that they believe that they can quite neatly be combined. Despite this relatively high belief homogeneity which would have been expected to ease the formation of collaboration between stakeholders as they have relatively overlapping interests and values and can thus cooperate and build trust more easily if collaboration is comprehended as necessary (Ingold, 2014; Sabatier et al., 2005), collaboration between forest owners on forest water was not present. This could be due to the overwhelmingly low appreciation of the forest's value for fishing together with the overall low knowledge of the issue. Both point to little incentive among forest owners within the catchment to step into collaborative arrangements which address water issues. This connects back to perception of the problem. Forest owners may have given up on trying to collaborate for improved water within their estate because they think that its condition in relation to fishing is so poor that it is not worth the effort. Furthermore, they have easy access to resources with better quality which fulfil their needs at a low cost. In that sense, their transaction costs for participating in collaboration cannot be justified. The economic and conservation values, which the majority of forest owners share, are not necessarily directly threatened by uncoordinated management of the forests within the catchment. There are thus no shared perceptions of problems that need to be addressed by such collaboration. However, it is important to point out that the results of this study cannot contribute to the understanding of low belief and cultural heterogeneity's importance as a factor

spurring collaboration. This is due to the factor's presence within a case study where collaboration is not present. In other words, conclusions cannot be drawn on whether collaboration can exist without low belief and cultural heterogeneity but it can be said that its presence does not guarantee collaboration.

Another obvious result is that individual forest owners in this case lack information on the issue and thus the basic requirement to be able to recognise the problem or crisis, which is subsequently expected to trigger a desire to address it. Although the presence or absence of knowledge is a factor attributed to the community, the dissemination of that same knowledge does not happen within the community but rather is dependent on institutions. What information and knowledge is spread is decided by public authorities (Galaz, 2006). However, what knowledge is accepted as legitimate and thus worthy of being followed is decided by individual forest owners themselves. If forest owners do not trust authorities to the same degree as they trust other forest owners, then they may be less trusting and thus less open to the information and knowledge which comes from those authorities. Keeping in mind forest owners' previous experiences of authorities' changing and inconsistent recommendations, it is not surprising that their new recommendations concerning forest water resources are met with scepticism. Information not reaching forest owners and the lack of awareness that water issues actually require collective action could explain their lack of interest in collaborating and unwillingness to accept its urgency. Either way, the efforts of authorities to inform forest owners of scientific research about the problems connected to forestry and its impact on water have not led to the anticipated results.

The results which showed that individual forest owners have higher trust in other forest owners and their association as opposed to public authorities and private companies concur to a certain degree with those of Löfmarck et al. (2017, p. 40). In their study they observed frustration among individual private forest owners over the fact that environmental regulation and authority discretion to enforce responsibility through sanctions minimised their freedom while at the same time large forest companies and other forest owners got away with mismanagement unscathed.

These results also partially feed in to the issue of interdependence. In the Swedish context where the prescriptions on how water quality should be considered when managing forests are recommendatory (SFA, 2014b), it is the authorities which are to a higher extent reliant on forest owners' willingness to comply to the proposed practices of forest management and not the other way around. As far as the realisation of interdependence between forest owners is concerned, they perceive themselves as being interdependent in relation to issues which concern the construction of infrastructure which enables them to perform certain forestry operations. They do not, however, see themselves as interdependent in relation to the impact those operations can have on the water in the forest.

As factors such as knowledge of the issue at hand and social capital have been shown to result in strong leadership (Thaler and Levin-Keitel, 2016), an area with low existing stores of social capital both within the community as well as with external stakeholders could explain the lack of leadership. The absence of existing functional horizontal networks means that additional resources have to be invested by stakeholders in order to form collaborative arrangements.

Furthermore, the non-existence of horizontal networks points not only to the absence of existing leadership but is also an obstacle for new leadership to take advantage of collaborative opportunities (Mattor and Cheng, 2015). In a context where stakeholders have not identified the need for collaboration, a leader could recognise the presence of certain factors for collaboration and take action to develop them, thus spurring collaboration herself (Emerson and Nabatchi, 2015). The absence of this factor among others creates a setting which does not favour the initiation of collaboration. In concordance with previous research (Widman, 2016), this study points to the need for the state to step in more actively at the local level where collaboration is deemed

necessary but does not exist.

6. Conclusion

Previous studies on forest policy and collaborative governance – albeit with examples examining the local level of implementation, have focused on common property-induced collaboration and have disregarded the issue of forest water and the challenges of its cross-sectoral nature. At the same time, collaborative water management literature has all too often studied collaborative efforts at the regional level where many of the new institutions for collaboration are present, leaving the local level and individual private actors understudied and under-theorised. However, if local stakeholders with decision-making power over their own land are not willing to collaborate, little can be done to actually implement a collaborative approach.

This article has investigated the factors which are expected to spur collaboration between stakeholders at a local level. The results show that individual private forest landowners within the Krycklan catchment are not interested in engaging in collaboration with the aim of achieving improved forest water quality. This comes as a consequence of the absence of several key factors.

To begin with, despite low belief and cultural heterogeneity, if individual forest landowners do not have adequate and relevant information on the issue and do not perceive it as a problem which requires action and, moreover, in the absence of legislation which could force this collaboration externally, there is little which could motivate them into investing the required time and resources in engaging in collaborative efforts. Despite government investment in information campaigns, this information may still not reach individual forest owners who have decision-making power. More importantly, only those forest owners who believe that collaboration is required in order to achieve improved water quality and have specific interests in good water quality are likely to devote themselves to collaboration for the sake of water quality alone. This makes the diffusion of information on the issue and its perception as a problem which requires action a necessary condition. It is only then – when the problem and the need for action are recognised, that individual actors can realise their interdependence on other stakeholders and thus attempt to engage in collaboration. More importantly, the results suggest that the authorities' attempt to bridge social capital through the institution of a Water Council with the aim of functioning as a forum and network for local participation in the governance of the river basin, has obviously not succeeded in engaging individual forest owners within the collaborative process. This study could not pinpoint leadership in itself as crucial for the commencement of collaboration. However, leadership could spur collaboration through compensating for the absence of other factors. A leader could diffuse information, try to influence stakeholders' perception of the problem, bridge social capital and emphasise interdependence. In the absence of a local leader, this role should be in some way assumed by the state.

To sum up, the findings of this study point to the necessity of addressing certain key factors at the local level in order to instigate active collaborative governance of forest water and to achieve a collaborative water governance approach. Firstly, low belief and cultural heterogeneity does not suffice on its own in instigating collaboration between individual forest owners. The diffusion of information about the problem and the existence of stores of social capital in the form of networks and trust proved to be of importance if stakeholders are to want to collaborate. The most crucial factors for spurring collaboration, however, proved to be the perception of the problem as important and the realisation that stakeholders are interdependent on each other for reaching their goal, and thus must collaborate. If all previous factors are missing, then leadership also becomes crucial, as it could compensate for their absence by investing in spreading information and bridging social capital. If government authorities want collaboration to be initiated, then the responsibility of securing and diffusing scientific knowledge about the issue at hand, about its severity and the need to

collaborate for its resolution, as well as the responsibility for bridging social capital would be expected to be theirs.

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Interviews

- Interview 1 – Public official within the Swedish Forestry Agency (SFA), 20.04.2015.
- Interview 2 – Municipality fishing advisor within the Vindel River area, 05.11.2014.
- Interview 3 – Chairman of the Krycklan Fishing Management Area (FMA), 11.11.2014.
- Interview 4 – Hydrologist working within the Vindel River basin, 10.11.2014.
- Interview 5 – Leader of Restoration Project within the Vindel River basin, 13.05.2016.
- Interview 6 – Forest Owner 1, 18.04.2016.
- Interview 7 – Forest Owner 2, 26.04.2016.
- Interview 8 – Forest Owner 3, 21.04.2016.
- Interview 9 – Two CAB officials, one of them project coordinator within Healthier Forest Water, 26.11.2014.
- Interview 10 – Regional Forest Inspector, FOA–Norra Skogsägarna, 05.11.2014.