Fragmentation and connection of frames in collaborative water governance: a case study of river catchment management in Southern Ecuador

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Abstract
In collaborative water governance, the variety of frames that actors bring to the discussion constitutes an important challenge. In this study, we analyse the fragmentation and connection of frames in collaborative water governance projects in the Paute catchment and its sub-catchment Tabacay in the Southern Andes of Ecuador. We rely on frame analysis of project documents, interviews and meeting recordings to analyse the initial stages of these projects. We discuss (1) the different roles of problem domain framing and issue framing in frame fragmentation; (2) the significance of scale framing to problem domain and issue framing; (3) the challenge of connecting expert frames with frames of other actors; and (4) the importance of face-to-face dialogue for connecting frames.

Points for practitioners
Professionals in public management and administration all over the world are increasingly involved in governance processes where they have to deal with a multitude of actors and perspectives. If their task involves setting up collaborative projects with
other governmental agencies, civil society organizations and/or business actors, there is much to gain by paying close attention to how they themselves and other actors are framing both the problem domain and the issues involved. In processes of collaborative water governance, additional attention is required for how projects are framed with respect to water system scales and administrative scales, and for how technical framing of the issues connects to the frames and experiences of other actors.

**Keywords**
decision-making, multi-level government, networks, partnerships

In this article, we study the process of issue framing in projects of collaborative water governance. We focus on the case of the Paute catchment and its sub-catchment Tabacay in the Southern Andes of Ecuador, where collaborative governance projects, aiming at integrated catchment management, were initiated on different scales. Our aim is to understand the fragmentation and connection of frames, a process that is often mentioned as a key issue for collaborative water governance, but rarely studied in depth. Through analysing, on the basis of project documents, interviews and meeting transcripts, how different actors frame the central issues, we aim to better understand the forms that frame fragmentation and frame connection take in the initial stages of collaborative water governance. Given our focus on water governance, we will pay specific attention to the role of scale framing and the issue of connecting actor and expert frames.

**Theoretical framework**

**Collaborative water governance**

Collaborative governance arrangements have been suggested to deal with complex and interdependent problem domains, in which multiple public and private actors have a stake (Ansell and Gash, 2008; Huxham, 2000; Kickert et al., 1997; Mandell, 2001). These domains are often fragmented and under-organized, in the sense that there are (public and/or private) actors who individually attempt to solve certain problems but fail to do so because of resistance or lack of cooperation from other actors. Collaborative governance arrangements bring a number of these actors together in a process of multi-actor decision-making (Gray, 1989; Huxham and Vangen, 2005). Collaborative governance can be defined as a ‘governing arrangement where one or more public agencies directly engage non-state actors in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets’ (Ansell and Gash, 2008: 545). Several authors have pointed out the importance of different perceptions, understandings or frames in collaborative settings (Agranoff and McGuire, 2001; Ansell and Gash, 2008; Koppenjan and Klijn, 2001).
The process of constructing the meaning of issues that is captured by the concept of framing is relevant for collaborative governance in several respects. Fragmentation of frames can form a barrier for mutual understanding and can evolve into protracted controversies about ‘what the issue is really about’ (Schön and Rein, 1994), delaying or impeding effective decision-making. On the other hand, the connection of different frames into a jointly meaningful story can generate motivation and commitment for collective action. The friction generated by the variety of ideas, worldviews and norms embedded in diverse frames also provides the potential for crafting innovative solutions, granted that the participants are able to deal with this variety.

The call for less technocratic and more integrated approaches in the domain of water governance has turned collaborative approaches into an attractive prospect for water management (Imperial, 2005; Lopez-Gunn, 2003; Pahl-Wostl et al., 2007; Singh et al., 2009). Integrated catchment management, for example, may be implemented in a top-down fashion by a centralized government agency, but can also take the form of a collaborative governance arrangement, when cooperation and negotiation is organized among public authorities, water users and interest groups. Collaborative governance in the water domain implies a number of specific challenges, two of which we want to address here.

First, scaling plays an important role in water management (Benson and Jordan, 2010; Huijma et al., 2009). Defining the scale level is a particularly important step in the case of catchment management – the choice for catchment management in itself involves framing the catchment level on the water system scale as the appropriate one (see Cash et al., 2006, for a discussion of scales and levels). Lower levels (e.g. river branches or segments) or higher levels (e.g. the global water system) could be chosen on the water system scale, or the problem domain could be defined by using local, provincial, national or international levels on the administrative scale. From the perspective of water managers, administrative boundaries are often ill-suited for managing water issues. Even if a choice for the catchment scale has been made, various possibilities remain. Are we talking about the entire river basin – the whole area from which a river drains water to the sea? Or are we talking about a sub-catchment of a tributary river? The variety in river basin size – compare the Amazon river basin with the basin of a small river in a mountainous coastal area – makes defining the scale level for water governance far from straightforward and susceptible to framing processes. For these reasons, we can expect scale frames (Kurtz, 2003) to play a role in the fragmentation and connection of frames in collaborative water governance processes.

Second, water governance is a domain that relies heavily on advanced expert knowledge, including meteorological and hydrological models for predicting water quantity, chemical and biological methods for water quality assessment, and, recently, climate change models for assessing future scenarios. At the same time, water takes the form of a multitude of commonplace but important daily experiences for water users, related to drinking, washing, cultivating, cooking, cleaning, transport, etc. Therefore we can expect considerable diversity between the frames
of water experts and ‘lay’ actors, and an important challenge in connecting them (Craps et al., 2004).

**Framing issues and the problem domain**

Although the literature on collaborative governance emphasizes the importance of framing and its possible outcomes in terms of stagnation or innovation, the question of where and how frames and framing play a role in these processes is rarely addressed. In order to address this question, we draw on framing theory developed in domains like organizational sensemaking (Weick, 1995), conflict management (Lewicki et al., 2003) and multi-actor collaboration (Dewulf et al., 2004; Gray, 1989; Hardy et al., 2005) and network governance (Kickert et al., 1997; Koppenjan and Klijn, 2004). In multi-actor settings, the various actors often voice divergent opinions about what the issue is exactly, or what the whole situation is about (Lewicki et al., 2003). From their different backgrounds they direct attention to different aspects of the situation and tell a different story about what is going on and what should be done. By framing the issue in divergent ways, they create a specific kind of uncertainty about the content of the issues, called ambiguity (Dewulf et al., 2005; Koppenjan and Klijn, 2004). According to Entman (1993: 52), to frame is ‘to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described’. Confusion, misunderstanding, disagreement or even intractable controversy (Scho¨n and Rein, 1994) are likely when participants frame the issues in divergent ways. Often it looks like everybody is talking about the same thing, while they frame that ‘same thing’ in very different ways and thus get stuck in endless discussions.

We understand issue frames primarily as sense-making devices used for interacting and communicating with others (Dewulf et al., 2009; Drake and Donohue, 1996). According to Bruner (1979: 102–103), ‘the process of reaching a decision among those involved is more like a conversation than like a rational calculus. It usually results from a set of speech acts.’ Language plays an important role in framing issues (Alvesson and Kärreman, 2000; Dewulf et al., 2004; Drake and Donohue, 1996). Through the use of certain words and descriptions an issue acquires a specific meaning. Selecting and arranging issue elements into meaningful frames does not happen in an abstract universe but at the level of discourse or language-in-use (Wood and Kroger, 2000), in the way frames are forged out of language and the way issues are linguistically formulated. We think three processes are key to framing: people frame issues by bringing certain aspects of a complex problem into the picture (a process of selection), by putting certain aspects in the foreground and others in the background (a process of focusing), and by using certain aspects as the overarching elements within which the rest fits (a process of embedding).

To grasp the process of framing in collaborative water governance, we propose to make a distinction between framing the *problem domain* and framing the *issues* in
the problem domain. The concept of problem domain (Gray, 1989; Trist, 1983) is used to refer to the complex mess of problems which contain the interdependencies that bind multiple actors together. Delimiting the common problem domain, i.e. which issues are going to be addressed in this collaborative process and which issues not, is a key challenge for multi-actor decision-making. Jointly framing the problem domain to work on is a quest for the common ground needed for collective planning and action (Gray, 1989).

Framing the boundaries of the problem domain is complemented by the process of framing the issues that are part of the problem domain. Two actors may agree that a certain issue (e.g. flooding) should be part of the common problem domain, but still frame that particular issue in a very different way (e.g. as an issue of dike maintenance versus an issue of lacking flood insurance). We expect that framing a problem domain and framing an issue formally work in the same way: through including and excluding certain aspects (the issues and the issue elements, respectively), and arranging those aspects into a meaningful whole (the problem domain or the issue, respectively) by focusing on some aspects in the foreground and relegating others to the background.

The general research question for this study is how to understand the fragmentation and connection of frames in collaborative water governance. On the basis of our theoretical framework, we translate this question into four specific research questions:

1. How can the fragmentation of frames be understood for both problem domain framing and issue framing?
2. What is role of scaling in problem domain and issue framing?
3. What is the role of actor and expert frames in problem domain and issue framing?
4. Which processes are conducive to frame connection?

In the next section we outline the methods of frame analysis that we used to formulate answers to these questions. The results section reports the analysis of three consecutive phases in a collaborative water governance process, and in the discussion section we interpret the results in terms of our research questions. Finally we formulate some overall conclusions.

**Case and method**

This case study (Flyvbjerg, 2006) focuses on collaborative governance of the Paute catchment (Dewulf et al., 2006), extending over several provinces in the Southern Andes of Ecuador and draining to rainforest areas to the east of the Andes (part of the Amazon catchment). Within the Paute catchment two projects were started, both aimed at integrated catchment management: one at the level of the entire Paute catchment and one at the level of the Tabacay sub-catchment.
The study covers the time frame from the formulation of the integrated catchment management project for the Paute catchment (2002) to the establishment of the catchment council for the Tabacay sub-catchment (2004). Three broad phases can be distinguished: (1) formulation of integrated catchment management projects at the Paute and Tabacay level; (2) start of the Tabacay project with an interview round; and (3) initial multi-actor workshops on the Tabacay project (see Table 1).

The activities took the form of action research (Eden and Huxham, 1996; Fals Borda, 1987) carried out in cooperation between the first author, then at University of Leuven (Belgium), and the co-authors, then social scientists at ACORDES at the University of Cuenca (Ecuador). Water experts from the University of Cuenca were involved in the projects which were studied as well. The authors were involved in the formulation of the projects (phase one), carried out the interview round (phase two), and assisted in facilitating the workshops (phase three). Through this involvement, the authors were able to carefully document the ongoing process.

To be able to address the research questions that were formulated, the following data were gathered and problem domain and issue framing were analysed in the different phases. Following the discursive approach to framing we relied upon linguistic formulation to assess framing.

**Phase one**

For both the Paute and the Tabacay projects, participant observation during project formulation gave access to preliminary and final project proposal documents. Using a comparative qualitative research approach, the relevant sections of these documents were analysed. The comparison of both projects, that differ mainly in terms of scale framing, provided an excellent opportunity to assess the role of scale in problem domain and issue framing.

**Phase two**

At the start of the Tabacay project, 18 interviews (five of which were group interviews) were conducted with key actors (see Table 2). The actors were selected on the basis of their relation to water issues in the catchment and interviewed in their native language. Actor selection was done as broadly as possible, aiming at inclusion of all relevant actors. The interviews were literally transcribed and analysed using the software for qualitative data analysis Atlas.ti (www.atlasti.com), enabling coding, commentary and comparing text fragments. For each interview, issues were coded and their framing was analysed comparatively. This resulted in a cross-tabulation of 18 actors by ten issues, where each cell indicates whether a particular actor mentioned a particular issue as part of the problem domain, and, if so, how that issue was formulated or framed (Table 2 presents a part of this cross-tabulation).
Phase three

To analyse the internal project meetings and multi-actor workshops we relied on observations, notes, recordings and meeting reports. When one of the authors was facilitating, another took the role of observer. Selected parts of the workshop

| Table 1. Chronological overview of events |
|------------------------------------------|
|                                         |
| **Phase one**                            |
| January 2002                             |
| Pre-proposal ‘integrated catchment       |
| management of the Paute’ project         |
| February to June 2002                     |
| –                                        |
| March 2003                               |
| Full proposal ‘integrated catchment      |
| management of the Paute’ project         |
| July 2003                                |
| Start-up of the project at the           |
| University of Cuenca, focused on         |
| Paute-level actors                       |
| October 2003                             |
| Assessment of political trouble at Paute |
| catchment council and refocusing of      |
| the project on Tabacay level as pilot    |
| case                                     |
| **Phase two**                            |
| May 2004                                 |
| –                                        |
| –                                        |
| –                                        |
| May 2004                                 |
| Interview round and actor map            |
| elaborated by ACORDES                    |
| –                                        |
| –                                        |
| –                                        |
| –                                        |
| May 2004                                 |
| Technical study water-related            |
| problems Tabacay by university experts   |
| **Phase three**                          |
| June 2004                                |
| –                                        |
| –                                        |
| –                                        |
| June 2004                                |
| Cross-checking technical and actor       |
| problem list                             |
| July 2004                                |
| –                                        |
| –                                        |
| –                                        |
| July 2004                                |
| First multi-actor workshop including     |
| validation of cross-checked problem list |
| **Further developments**                 |
| August–October 2004                      |
| –                                        |
| –                                        |
| –                                        |
| August–October 2004                      |
| Further multi-actor workshops             |
| including priority ranking and           |
| clustering of problems                    |
| November 2004                            |
| –                                        |
| –                                        |
| –                                        |
| November 2004                            |
| Final multi-actor workshop, including    |
| the formation of the Tabacay             |
| catchment council                        |

**Phase three**

To analyse the internal project meetings and multi-actor workshops we relied on observations, notes, recordings and meeting reports. When one of the authors was facilitating, another took the role of observer. Selected parts of the workshop
recordings were literally transcribed and analysed using interaction and discourse analysis (Wood and Kroger, 2000) to track the framing of issues through the conversations.

Overall this diversified methodological approach provides a broad basis to capture the process of framing in this case. In terms of the framework of Barzelay et al. (2003), our approach of comparing frames between projects, actors and steps in the process aims at limited historical generalizations about frame fragmentation and connection in episodes of collaborative water governance. As a limitation of the methodology, we need to mention that we did not have access to internal or bilateral contacts between the actors.

Results

We will discuss the results of the analyses according to the three phases (see Table 1). We first discuss problem domain framing and issue framing by comparing the project proposals at both the Paute and Tabacay levels. Second, we home in on the Tabacay project by analysing which actors include which issues in the problem domain, and how they frame these issues, on the basis of an interview round. Finally, we home in on how the framing of issues in the Tabacay project evolved over the course of an interactive process. In each of these phases we address, where relevant, the framing of scale and the relation between expert and actor frames.

Phase one: Framing water governance in the Paute and Tabacay project proposals

Framing the problem domain in terms of which issues are part of a common project and which are not, and framing the nature of these issues, begins long before the start of a project and takes concrete form in the project proposal that is submitted for funding. In this case, the process starts with the formulation of a university development cooperation project in which Belgian geographers, engineers and organizational psychologists are involved, together with Ecuadorian engineers and social scientists. The title of the project is ‘Towards integrated catchment management in tropical mountain areas: the problem of sediment management, Paute catchment, Ecuador’. Here are a few quotes from the project proposal, in which the Paute catchment is described in the following way:

The area is facing important land degradation including water erosion (sheet, rill and gully erosion), tillage erosion, mass wasting and fluvial activity.

The sediment produced causes serious problems with respect to water use.

In the long term, the high sediment input into the Amaluza reservoir is a major threat to the country’s energy production as ca. 60% of the electricity of Ecuador is at present produced in the 1200 MW power plant at the Amaluza dam.
Drinking water companies also face problems: the presence of large quantities of sediment increases greatly the cost of drinking water production (extra purification treatment).

The problem domain gets described here in terms of a causal chain, starting with land degradation in the form of soil erosion, which ends up as sediment in the Paute river and produces problems for the water power plant and drinking water extraction downstream. The problem tree in the same project proposal defines the core issue as ‘poor understanding of excessive sediment load in rivers’. Again the focus is on the sediment carried by the river and on better understanding of how this functions. Referring back to the basic processes of framing through selecting, focusing and embedding, the problem domain gets framed here by selecting issues like erosion, sediment and energy production as the relevant ones (selecting), making sediment management the focus of attention (focusing) and embedding all of this in a scientific perspective that defines the situation as a knowledge issue (embedding).

When political trouble at the Paute catchment council impeded carrying out this project as planned, the priority shifted towards the smaller catchment of the Tabacay, which was known to produce considerable amounts of sediment and could serve as a pilot project for the Paute catchment. In the project proposal for the development of a management plan for the Tabacay catchment, a much longer list of problems appears as compared to the Paute proposal. Drinking water provision for the city is mentioned as the first issue, followed by lack of water data, sediment, water pollution, changes in river bed and flow rate, deforestation, forest fires, floods, droughts, conflicts between water users, lack of regulation and control. This framing of the problem domain is different in its broader selection of issues and its focus on the amount of drinking water for the city, embedded in a less scientific and more practical perspective.

Although the project at the smaller scale level (Tabacay) is seen as a pilot experience for the project at the higher scale level (Paute), we can notice important differences. These differences can be better understood by identifying the main actors at both levels. At the Paute catchment level, the water power plant is portrayed as the main actor, given its financial resources, its national importance for power production and its dependence on the Paute river. The water power plant had also been involved in the formulation of the project proposal for the integrated management of the Paute catchment. The proposal mentions that the water power plant is willing to provide extra funding for the project. The focus on sediment can thus be better understood, because this framing highlights crucial issues for the water power plant, like the effect of sediment on the turbines and the long-term problem of sedimentation of the reservoir.

In the project proposal for the management of the Tabacay catchment more and other problems received attention. The city and its drinking water company finance the project. The focus is much more on intervention than on research, and drinking water provision figures as a core issue. In effect, all the drinking water for the city
comes from the Tabacay catchment, but the amount of water is insufficient to guarantee a continuous service for the citizens.

In sum, defining either catchment or sub-catchment as the scale level for a project strongly frames the problem domain for the project. Different issues are included and excluded and different actors come into the picture. In the Paute project proposal the perspective of the water power plant is in the foreground, with sediment as the core issue. In the Tabacay project proposal, the problem domain gets framed from the perspective of the municipal drinking water company, with emphasis on the quantity and quality of water for human consumption.

**Phase two: Framing water governance in the Tabacay interview round**

Once the Tabacay project started, two lines of activity developed. The university partner specialized in soil and water management started by collecting data about the current situation in the catchment. The cartographic data were updated and various kinds of measurements were taken. The university partner specialized in organizational support for development projects (ACORDES), to which the authors were associated, started by identifying actors, with the aim of developing an actor map. In a series of interviews, representatives of the actors were asked about their views on the situation of the Tabacay catchment, what the important issues were and what their opinion was about the other actors. The goals of the Tabacay project ultimately consisted of delivering a catchment management plan and the constitution of a catchment management council.

With this interview round a wide range of actors entered into the discussion, and the diversity of issue frames expanded considerably. For each interview we analysed which issues were mentioned and which not (to assess problem domain framing) and how they were linguistically formulated (to assess issue framing). A number of recurrent issues resulted from this analysis (in order of frequency): (1) deforestation, (2) erosion/sediment, (3) water shortage, (4) air pollution, (5) agriculture threatens forests and water sources, (6) wastewater, (7) sand mine exploitation, (8) burning, (9) agrochemicals and (10) exotic species. There was considerable variety in the number of these issues that were mentioned by a particular actor (ranging from one to six out of ten issues), and in the number of actors that mentioned a particular issue (ranging from three to 12 out of 18 actors). This indicates considerable differences in the initial framing of the problem domain by these actors. But there is more variety in framing to be found when comparing how particular issues are framed by different actors.

Below, we take a closer look at the three most frequently mentioned issues (deforestation, erosion/sediment and water shortage), to analyse the differences between the actors in how they formulate these issues (see Table 2, displaying a subset of the whole matrix of actors by issues). This reveals that even when two actors both select the same issue in framing the problem domain, there can still be important differences in how they frame that specific issue through the labels and words they use to formulate it.
### Table 2. Actors and issue framing in the Tabacay project

| Role                                   | Water Shortage                                                                 | Erosion/Sediment                                                                 | Deforestation                                                                 |
|----------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Municipal Drinking Water Company       | ‘the amount of water does not allow for an adequate service to the city’     | ‘the wood cutting and the cultivation of steep slopes provoke erosion’           | ‘one can see the wood cutting’                                                |
| University engineering centre          | ‘they are destroying the water sources’                                      | ‘there is the big problem of sediments, concentrated in a small specific zone of the catchment’ | –                                                                            |
| Cement plant                           | –                                                                            | ‘because this is a region with steep slopes and there is no control on irrigation, you get erosion’ | ‘there has been deforestation over the years’                                 |
| Rural communities                      | ‘the captation of water by the drinking water company, they take all the water’ | –                                                                              | –                                                                            |
| Consortium drinking water associations | ‘lack of water’ ‘our goal is to protect the natural sources so as to never experience lack of water’ | ‘at the moment we cut and the vegetation is removed, there is no more protection and the pollution of the river will start’ ‘the moment one starts to plough the ground erosion exists’ | ‘problem of deforestation’ ‘there is no awareness on the part of the big landowners, we have seen very large forests that are cut’ |
| Sand mining cooperative                | ‘the advantage of water captations is an advantage for the drinking water company, who in turn delivers the water to the whole city’ | ‘[because we exploit it, there is practically no sediment in the river]’         | ‘they have processed the trees, they have cut them and they arrived as construction material’ |
| Urban communities                      | ‘lack of water for human consumption’                                        | –                                                                              | ‘production of charcoal for sale in the city’                                 |
| Land owner                             | ‘I have given them the possibilities so they can do what they want because I see that the city needs water’ | –                                                                              | –                                                                            |

(continued)
| Ministry of Agriculture | Water shortage | Erosion/sediment | Deforestation |
|------------------------|----------------|------------------|---------------|
|                        | ‘there is almost no water left’ | ‘the sedimentation of the river, the river is very dirty and contains a lot of sand’ | ‘the lack of vegetation because everything has been cut’ |
| Local government rural communities | | | |
| Province | | | ‘I have seen that there has been random cutting of wood’ |
| Centre for Economic Reconversion | | | ‘they start cutting the forests and they are not reforesting’ |
| Municipality | | ‘the erosion is in this case apparently concentrated in the Tabacay catchment’ | ‘the deforestation is part of the conflict’ |
| Ministry of Environment | | | ‘large quantities of sediment eventually end up in the Paute reservoir’ |
| Paute Catchment Management Unit | | ‘soil erosion and pollution of the rivers’ | ‘the problem of the deforestation’ |
| Municipal Citizens’ Committee | ‘we are interested in improving the quality and quantity of water for the city’ | | ‘we can also see that there is a lot of deforestation’ |
| Ecology Human Environment Foundation | | ‘the sedimentation of the river, caused by the erosion of the soils’ | ‘one of the worst problems is the problem of deforestation, everything is deforested’ |
| National Council for Water Sources | | ‘just as in the rest of the Paute River, we have a big problem of sedimentation of the rivers’ | |

Note: The rows are in order of how many of the ten issues were mentioned by an actor (ranging from 6 issues for the first actor, to 1 issue for the last actor). The columns are in order of how many of the 18 actors mentioned an issue, showing only the three most frequently mentioned issues: water shortage (9), erosion/sediment (11) and deforestation (12). Empty cells indicate that this actor didn’t mention this issue in the interview.
Water shortage. For this issue, we see the scale level appearing as an important dimension in formulating the meaning of this issue. The Municipal Drinking Water Company and the Municipal Citizens’ Committee talk about water shortage for the city, which surpasses the scale level of the Tabacay catchment. The Consortium of Water Associations, however, speaks about lack of drinking water within the Tabacay catchment. The Rural Communities identify the captation of water for the city by the Municipal Drinking Water Company as the problematic aspect of the issue, and thus frame the issue as one that again surpasses the Tabacay level. These problem formulations have important implications in terms of ‘responsible’ or ‘affected’ actors. In one formulation the Drinking Water Company is affected by water shortage; in another formulation the Drinking Water Company is the actor causing water shortage.

Erosion/sediment. A first difference is evident in the name of this issue: is the problem erosion (the loss of soil from the hillside) or sediment (the soil that ends up in the river)? Although these are two sides of the same physical process, actors frame differently what is problematic about it. The Municipal Drinking Water Company visualizes a chain of activities: ‘deforestation – cultivating steep slopes – erosion’. The Ecology Human Environment Foundation highlights the part ‘soil erosion – sediment in the river’. The Ministry of Environment brings the last part of the chain into the foreground: ‘sediment in the river – sedimentation of the reservoir’. In this way actors mark a specific part of a complex physical process as problematic and as such put certain actors into the picture. A problem formulation in terms of erosion points towards actors who suffer from the loss of soil (e.g. farmers), while sediment points towards actors who suffer from the soil that is carried by the river (e.g. the water power plant).

An even more striking contrast can be noticed with the way the Sand Mining Cooperative formulates this issue: ‘because we exploit it, there is practically no sediment in the river’. Here sediment is a non-issue. Instead, for them, sediment in the river is a source of income.

When comparing these formulations we can also see the earlier mentioned scale level being used in the framing of this issue. The National Council for Water Sources formulates the erosion/sediment issue clearly at the level of the Paute catchment, as does the Ministry of Environment. The Cement Plant and the Municipal Drinking Water Company formulate the problem at the Tabacay level. In fact, one could argue that using the label ‘sediment’ or ‘sedimentation’ scales the issue up from the Tabacay to the Paute level, in contrast to the label ‘erosion’, which implies an issue that can be analysed and dealt with at the local sub-catchment level.

Deforestation. If we compare the formulations of the deforestation issue, we note differences in how strongly the issue is formulated. Some actors frame the ‘deforestation problem’ in a fairly neutral way (e.g. Paute Catchment Management Unit), while others use stronger language (e.g. Ecology Human Environment Foundation).
Here, important differences can be observed as to how the issue is projected on the time scale. For example, the cement plant representative speaks of deforestation ‘over the years’; the Centre for Economic Reconversion states, ‘they start cutting the forests’; and the Ecology Man Environment Foundation claims, ‘everything is deforested’. These different formulations carry implications for the seriousness of the issue and its expected future development.

**Phase three: Framing water governance in interaction**

In this section we analyse the multi-actor process that was set up in the Tabacay project with the aim of collaboratively developing a catchment management plan and to install a multi-actor catchment council. This process was convened by the Municipal Drinking Water Company, who financed the preparatory technical studies that were executed by University Engineering Centre. The process was facilitated by ACORDES (social scientists from the same university), who had also conducted the earlier mentioned interview round that had resulted in an actor map.

We highlight a number of significant moments in terms of issue framing. A first interesting moment is when the list of issues derived from the interviews with actors is compared with the list of issues resulting from the technical studies. Both were going to be used as input for the multi-actor process, so the social and technical scientists acting as researchers and consultants in the Tabacay project had to somehow deal with these differences in framing. We then follow up on a crucial framing difference by analysing how one of the issues was framed and reframed during the first multi-actor workshop. Finally we briefly discuss the establishment of the catchment council.

**Connecting issue frames from the actor map and the technical studies.** At the start of the Tabacay project ACORDES (acting as social scientific consultants) had made an actor map while the University Engineering Centre (acting as technical consultants) made a technical diagnosis of the area. The development of a catchment management plan by a yet-to-be-created catchment council required more than just diagnoses. A series of multi-actor workshops was planned, with the validation of the results from the diagnosis phase as the first step.

When preparing the first workshop, the problem emerged that the list of issues identified on the basis of the actor map and the list of issues identified on the basis of the technical studies was significantly different. Not all problems appeared in both lists, and if they did, they appeared in different formulations. This exposed fragmentation in terms of problem domain and issue framing between the technical experts and the other actors.

Most of the issues that were identified by the actors, but did not appear in the technical list, could be classified under one of the existing technical problem categories. Other problems were added as new technical problem categories: ‘drinking water shortage’, ‘careless management of the protected forest’ and ‘lack of technical exploitation of sediments’. The problem of ‘air pollution by the cement plant’
did not enter the final technical list of problems, because the University Engineering Centre did not consider it to be a water issue.

On the other hand, the technical problem list mentioned a few problems not mentioned by any of the actors: ‘loss of water regulation capacity on higher ground’, ‘irrigation without planning’ and ‘overgrazing’. That the first of these three problems was not mentioned by the actors was especially remarkable, because the engineers had put it on top of their priority list. After discussion between the engineers and the social scientists, they decided to reformulate this problem. On the list of problems to be validated in the first workshop, it remains first on the list, but with this wording: ‘agriculture in the higher areas: the soils of the higher areas regulate the water and this function gets strongly disturbed when these soils are cultivated’. The original formulation of the problem did not mention a problem owner – it’s as if the soils themselves have a problem. By this technical formulation, the link with human activities or concerns remains obscure. In the reformulation a human activity is mentioned as a cause: agriculture. In this way an important translation takes place, from technical language to a language that is closer to that of the other actors. In the next section we further analyse what happens to this particular issue.

Validation of issue frames in the first multi-actor workshop. With the first multi-actor event in the Tabacay project a process of interaction and negotiation was set in motion. The first workshop consisted primarily of validating the list of problems resulting from the above-mentioned integration of technical and actor problem frames. Through this workshop the process of connecting technical and actor frames was continued but this time in face-to-face interaction.

We will focus on the reformulated ‘problem of agriculture in the higher areas’. As part of the presentation by the coordinator of the University Engineering Centre, this problem was introduced as follows:

A first detected problem is the problem of agriculture in the higher areas. It has already been mentioned that the higher part of the catchment has Andean soils, and these Andean soils are one of the most important natural elements in the regulation of the water. We talk about regulation of the water, not so much about production, because it is the regulation that converts variable rainfall in a normal and stable flow rate. Those soils of the higher area are extremely important for this regulation because they have a high buffering capacity and then start releasing water slowly and that is the flow that gives the river a relatively constant flow rate, despite the great variability in rainfall. The big threat for the functioning of this process is in the first instance agriculture, in particular mechanized agriculture, because when ploughing these soils this mechanism is ruptured, while it is among the most important ones in regulating the water. This problem happens to be a problem that was identified as a priority by the technicians and was not mentioned by the actors in the catchment.
This intervention starts again from the technical part of the problem (water regulation in the soil) and also agriculture is mentioned again as cause of the phenomenon. The coordinator does add a consequence: disturbing the regulation process that results in a constant flow rate for the river. Although formulated in very technical terms, the link with ‘flow rate’ provides a possible connection with the frames of other actors. In this way the technical problem becomes more embedded in a relevant social context. This reformulation also affects the scale level aspect of the problem: rather than a just a ‘higher area’ problem, it now becomes a problem for activities in the entire catchment that depend on the flow rate of the river.

After the presentation of the list of problems, the participants were given the opportunity to react. A representative of a rural community in the area mentioned the problem of fraudulent colonization of the higher community grounds by people who burn the vegetation and start cultivating. After a question from the technical coordinator about the link of that problem with water, the community representative indicated that they were working there ‘on a thin layer of soil’. In this way a social problem frame, put forward by one of the present actors, is connected to one of the crucial technical problem frames.

Later in the workshop the facilitator went through the list of issues one by one in order to let the actors validate them.

In this first, which we called ‘agriculture in the higher areas’, the technical research team has detected it and they have put it on top of the list. They [i.e. the problems] are not really in order of priority, but still for them [i.e. the technical research team], if they do not contradict me, this was identified as the problem of the catchment, as one of the most important water problems of the catchment. To validate this, to see if there are no arguments against this, shall we leave this here as a relevant problem or how do you see this, as a problem that has impact on the water?

Here, the facilitator takes up a mediating role between the technical problem framing and the actors by posing an open question. A first reaction came from an environmental NGO (not involved in the first interview round), who called the problem a ‘priority’.

I would leave this theme as a priority, because really it is precisely changing the land use that provokes the reduction of the flow rate. Recently an analysis has been conducted with students of the school for hydrology and environment about the soils and water retention, in which there were a few results that the natural cover of vegetation has a capacity for water retention of 80% and that in the planted pine trees it was about 35%, and in the affected soils already less than 30% capacity for water retention. The hydrological behavior of the soil has been analysed frequently, and it has been said that the soil in the higher areas is very fragile soil. When it loses the capacity for water retention, it is very difficult to recover and conserve it, so we should find
a way to maintain the original vegetation, if that is possible, because it will allow us to store an amount of water, which in the end is our main goal, isn’t it?

The representative of this NGO reformulated the issue here as ‘reduction of the flow rate’, and gave concrete figures about water retention in soils with natural vegetation versus pine plantations.

The representative of the Municipal Drinking Water Company and coordinator of the project reacted enthusiastically and welcomed this information.

I’m picking something up from what this engineer just said. He just spoke of two important parameters, right, he says 80% compared to another kind of land use 35%. I think, one way or the other, this is what we need to orient ourselves. We don’t all have the same professional background, I know nothing about soils for example, but if you talk of an indicator that says, for example, 80% compared to 30%, then you show me clearly the importance of the problem to take into account. Because at that moment, if I don’t know the subject, I could say ‘well if the expert says it is a problem, then it probably is, I can’t discuss that’. But I think we lack a bit of information to orient us towards the seriousness of the problem. I think we should do that. Good, it is not necessarily part of the commitment for the study by the technical team, but there are other actors that could help us, right? From the different specializations – I don’t know – with a few indicators that orient us to focus effectively and not to overlook problems that could be very relevant and important.

With this intervention he made an argument for concretization (‘parameters’, ‘indicator’); he welcomed differences and not knowing (‘we don’t all have the same professions background, I know nothing about soils for example’); and he acknowledged the contribution of the previous actor and invited more such contributions.

This was followed by a positive reaction from the Ministry of Environment representative, who supported the point of the technical coordinator and provided further arguments.

Indeed: the natural forests, the native vegetation is the best to capture water and also to regulate it. Because of the fact that plantations have been used, and there will be much more if it’s used for agriculture, it seems to me that things will be very very variable. Agriculture in particular also provokes erosion, so these are very negative things for the water issue.

The technical coordinator of the University Engineering Centre reacted to what he called the ‘suggestion’ of the representative of the Municipal Water Company to ‘quantify this problem’.

I think we accept the suggestion to quantify this problem, don’t we? It is not so easy, but I think we can try to quantify this and hopefully reach more concrete things, more
understandable things, like ‘the minimum flow rate of the river in this area could drop by this much’. It is rather difficult, somewhat risky, but I think we commit ourselves to give it a try.

In this way he expressed a commitment to studying this aspect, with a view to more ‘concrete’ and ‘understandable’ conclusions. His example, ‘drop of the flow rate in the river’, built on the intervention of the ecological NGO who talked about a ‘reduction of the flow rate’, but made it more precise.

The Ministry of Environment introduced a concrete example as well, regarding the comparison of water retention in natural grassland versus pine plantations.

There has been a small test: in the same area there was natural grassland and next to it pine plantations. We did an excavation of about 1.50 in both spots and you could see that retention in the grassland was much higher, the humidity was more profound that in the forest plantation.

This provoked a reaction by the coordinator of the technical research team. He clarified the difference between water retention in the soil and the flow rate of the river.

Often this subject is reduced to the humidity on the spot itself, which is important, but from there to the flow rate of the river is still another step, and it interests us very much to know more about that. The humidity on the spot itself as well, of course, but the most difficult and the scientific part that we miss the most, is from there to the flow rate of the river.

In sum we can observe that this facilitated discussion developed in a constructive way, whereby various participants provided concrete contributions to the discussion, which could be questioned by others, and whereby the issue was explored through formulating and reformulating it. The exchange has important relational aspects as well: the conversation about this specific problem was expanded through the involvement of more actors, the various contributions were valued and commitments were expressed.

Although this discussion still takes place largely among professionals, it provides a number of important steps forward in connecting technical and actor frames. A problem that was initially only identified by the technical research team, and which was reformulated before the workshop, now generates enough connection with various actors to become the topic of a constructive conversation. The connection between multiple knowledge frames that takes place here in direct interaction is not only a content connection but also and perhaps mainly a relational connection between the actors using these knowledge frames.

In this way most of the problems of the presented list were discussed and qualified in this workshop. A number of new problems were added to the list as well. Noteworthy is the issue of air pollution by the cement plant. This problem was not
included in the final list because it was deemed not to be water related. In the workshop the issue turned out to be of great concern for a lot of actors and one of them also succeeded in making a connection with water: because the air pollution affects mainly the lower area of the catchment, people move towards the higher areas, with all the negative consequences for water regulation.

Further developments: Catchment council and management plan. This first workshop was a good starting point for the rest of the process, which we will only briefly outline here. The involved actors got to know each other better and became acquainted with the approach of integrated catchment management and collaboration. The modified and validated list of problems was the starting point for a priority ranking in the following workshops, and an important input for the formulation of the problem tree and the elements of the catchment management plan. A limitation here is that in the project proposal a number of technical designs had already been promised, such that for these issues the results of the collaborative problem definition could not be taken into account.

The group of actors involved in this series of workshops also formed the basis for the creation of a new catchment council. The interaction process, in which the actors were involved with the topic in usually constructive discussions, generated enough energy for the creation of this council. The thorough exploration of the problem domain from different perspectives and the connection of frames in the process made it easier to outline the membership for the catchment council and its sub-commissions.

Discussion

In this section, we discuss the results of the frame analysis of this collaborative water governance case, in the light of the four research questions we set out to answer.

Fragmentation through problem domain framing and issue framing

Collaborative water governance is a complex endeavour that can be framed in different ways. For the water power plant that provides electricity to a large part of the country, integrated catchment management means reducing the sediment in the river, provoked by soil erosion, and resulting in rapid sedimentation of the reservoir. For the sand miners in the sub-catchment of the Tabacay river, however, sediment is not a problem but their source of income, and for the drinking water company of the nearby city, catchment management means in the first place providing sufficient drinking water. As we have shown, the different actors thus frame the problem domain and the issues in diverging ways, resulting in a frame fragmentation.

We analysed this frame fragmentation on two levels. First, at the level of problem domain framing, different actors include and exclude different issues
(selecting, e.g. the empty cells in Table 2), put forward different issues as central issues (focusing, e.g. on sedimentation versus drinking water), and characterize the nature of the whole problem domain (embedding, e.g. as a scientific versus a practical problem). Framing a problem domain can be understood as carving out of a complex mess of interrelated problems a coherent set of issues that actors can agree to work on. Each actor’s problem domain frame is partial (see Table 2), but so is each commonly defined problem domain because it is only one of the possible options (e.g. compare the problem domains as framed in Paute versus Tabacay project formulations).

Second, at the level of issue framing, different actors include and exclude different issue elements (selecting, e.g. whether or not downstream sediment is part of the issue), put certain issue elements at the centre of attention (focusing, e.g. emphasizing field erosion, sediment in the river or sedimentation of the reservoir), and characterize the nature of the whole issue (embedding, e.g. by using the label ‘erosion’ or ‘sedimentation’). In doing so, actors tend to highlight varying parts of the same chain of interlinked physical processes, to frame differently what is problematic about it, sometimes just by using one label rather than another.

Problem domain framing and issue framing are interlinked processes. Problem domain framing sets the stage for the framing of individual issues, but not in a deterministic way. The framing of an issue can also be moulded so as to better fit an already established problem domain framing, as was the case with the air pollution issue that was initially dismissed as not being a water issue and was later reframed into a water management issue.

**Using scales to frame water governance**

Throughout our analysis of three phases of this collaborative water governance process, scale turns out to be a significant parameter in how problem domain and issues get framed. With the aim of setting up a pilot project in integrated catchment management at a lower level of the water system scale, the main difference between the Tabacay and the Paute projects is the framing of their scale level. This change, however, brings about a number of other changes (e.g. focus on different relevant actors, focus on a different subset of physical processes, etc.) with considerable consequences for how problem domain and issues get framed.

When comparing how actors frame issues in the interviews, the scale at which issues get framed produced significant variety as well. Issues were framed at different levels of the water system scale (erosion/sedimentation and water shortage) and at different levels of the time scale (deforestation). Finally, in the interactive discussion in the first multi-actor workshop, scaling up a key issue from a local issue situated in a particular zone of the catchment to an issue of water flow in the entire catchment was important in connecting this issue with others.

Using the concept of scale framing to analyse the Tabacay project also reveals a mismatch between the problem domain framed in terms of ‘integrated management of the Tabacay catchment’ (invoking the sub-catchment level at the water system
scale) and the key issue of water shortage, framed by the project coordinator as ‘shortage of drinking water for the city’ (invoking the broader municipal level at the administrative scale). The very divergent framing of this key issue as water shortage in the catchment, because of the water captations for the city, testifies to this tension.

The scale framing issue has important implications for the integration–fragmentation discussion (Edelenbos and Teisman, this issue). Water governance is mostly fragmented across different scales and levels, and integration assumes a critical choice of the scale level at which to integrate. From the water management domain, the water system scale, particularly the entire river basin level, seems to be the preferred scale frame, rather than administrative levels and boundaries, which were not primarily defined for water management reasons. Integration at catchment scale in the form of a catchment council turned out to be feasible in the smaller sub-catchment we discussed here, but integration at the larger catchment scale was still lacking, and is especially demanding in the case of transnational river basins. Furthermore, integration at the catchment scale by itself creates fragmentation within the broader governance structures, because administrative entities like countries, states, provinces and municipalities do not cease to exist and have water-related responsibilities as well.

Expert and actor frames

Although making a distinction between experts and other actors is far from straightforward, because each person is a special kind of expert (Mitroff, 1983), we do think it is useful to focus on the frames of actors who are involved precisely because of their technical expertise in water management and not because of their stake in the issues at hand – in this case we primarily refer to the university engineering centre. What we observe over the course of the studied phases is a gradual increase in inclusiveness, first with respect to actor frames and later with respect to actors. The initial Paute proposal is very much framed by academic experts, with some influence on the part of the water power plant. The municipal drinking water company has a key role in framing the Tabacay proposal, although the formulation of the proposal is done by the same experts. Still, considering the much broader range of issues included in the Tabacay proposal, we observe more inclusiveness in terms of issue frames of other actors – that the Tabacay project has a much more local character than the Paute project may have influenced this. Through the interview round in the second phase, the inclusion of actor frames increases considerably, although still mediated by the interviewers/analysts. In the third phase, there is a confrontation between expert and actor frames when the resulting list of issues turns out to be significantly different. This led to attempts at connecting these frames, first through an integration exercise among experts, and then through direct discussion in the multi-actor workshops, as we will discuss in the next section.

The boundaries of the problem domain for the Tabacay project, in terms of e.g. the scale level, the overall emphasis on water issues and the focus on drinking
water, are pretty much established in the project proposals. The problem domain framing is thus mainly done by experts, in formulating a project eligible for funding. By the time the majority of actors in the Tabacay project get to meet each other (phase three), they mainly discuss the framing of individual issues and how these connect to each other, with occasional discussion about the inclusion or exclusion of a particular issue in the problem domain.

A remarkable characteristic of some of the expert frames in this case, and one that required substantial connection efforts, was the minimal reference to human actors or activities, e.g. in the ‘loss of water regulation capacity on higher ground’ issue. Expert issue framings that do not specify agency (e.g. by not mentioning actors, human activities or using the agentless passive tense) turn out to be hard to connect to the day-to-day experiences and concerns of interested actors. The challenge appears to be to frame technical issues with a meaningful connection to how human actors contribute to the issue and how human activities are affected by it, an issue also addressed in science communication (Nisbet and Mooney, 2007), but without prematurely assigning blame or responsibility, for this could easily provoke resistance or conflict among implicated actors. As we saw in the analysis of issue frames in the interviews, there is considerable variety in which actors are implicated as responsible for or affected by the issue.

**Connecting frames in collaborative water governance**

Although they had to connect across the disciplinary boundaries between engineering and social sciences, connecting frames wasn’t too big a challenge for the experts formulating the water governance project proposals – after all, the numbers were small and they had worked together previously. When the variety increases, in this case through including a range of different frames and actors, connecting fragmented frames in collaborative water governance becomes a substantial challenge. Confronting the problem list distilled from the actor interviews with the list of technical problems was a first attempt to connect this variety in framing the issues. For one of the crucial problems the formulation in terms of technical parameters obscured the link with human activities or concerns and its relevance for the entire catchment. In a reformulation, the ‘water regulation in the higher soils’ issue was connected to illegal agriculture and to the water flow in the river that affects the entire catchment, through a translation of technical language to language that is closer to the language other actors use, and a language in which issues are connected to actors.

In the first multi-actor workshop the whole list of issues was presented and discussed with the whole group of actors, allowing for further connection between issues at the catchment scale. This connection was not only a connection on the content level of issue framing but also a relational connection between the actors using these issue frames. In these facilitated workshops a constructive discussion was initiated in which the problem domain could be explored. The modified and validated list of problems was the starting point for a priority ranking in the
following workshops, and an important input for the formulation of the problem tree and the elements of the catchment management plan. The thorough exploration of the problem domain from different perspectives and the connection of frames in the process made it easier to outline the membership for the catchment council and its sub-commissions as well.

Although the reliance on a single case limits our conclusions, the detailed analysis of the first workshop reveals a number of process characteristics that are likely to have contributed to the connection of frames, namely the constructive mode of discussion, whereby various participants provided concrete contributions, which could be questioned by others, and through which the issue gets explored by formulating and reformulating it (cf. mode 2 learning; Argyris, 1999). The direct involvement of experts, and the back-and-forth argumentation process and questioning between experts and other actors in a series of formulations and reformulations of the issue contributed to this often laborious but necessary connection of frames as well (see also Bentrup, 2001). The exchange has important relational aspects as well: the conversation about this specific problem was expanded through the involvement of more actors, the various contributions are valued and commitments are expressed.

Conclusion

Although framing is only one of the processes relevant to collaborative water governance, we are convinced that it deserves more attention in theory and in practice. In this study, we have tried to contribute to its conceptualization and to the understanding of its empirical manifestations of frame fragmentation and frame connection. The conceptual distinction between problem domain and issue framing turned out to be useful for empirical analysis of frame fragmentation in collaborative water governance and may be relevant as well for other settings where multiple actors try to define a common project. Judging from this case analysis, problem domain framing tends to be established earlier in the process than issue framing. Scale turned out to be a key dimension of problem domain framing and, in a less pronounced way, of issue framing in the projects that were analysed. Framing the scale of a problem domain is a powerful way of defining the inclusion and exclusion of problems and relevant actors. The challenge of connecting expert frames with the frames of other actors was, at least for one key issue in the case studied, addressed through a serious of formulations and reformulations between technical experts, facilitators and actors. Facilitated face-to-face interaction between experts and other actors appears to have contributed significantly to this connection.

The results and conclusions of this study are of potentially broad relevance for collaborative governance processes in general, and for collaborative water governance in particular. Although the possibilities for generalization are limited, the results suggest that paying attention to exploring and connecting different ways of framing the issues and the problem domain, to scale framing and to connecting
expert and actor frames, is well advised in cases where a jointly validated project definition is crucial. This common ground, although not sufficient, can provide a necessary ingredient for collaborative governance and collective action.

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