"Functional fit" versus "politics of scale" in the governance of floodplain retention capacity.

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Abstract

After major floods occurred in 2003 on the Rhône River (France), the State and local authorities created a new institution at river level, in order to tackle flood issues at a supposedly more functional scale. Called *Plan Rhône*, this new partnership combined several policy sectors and several administrative levels, with the aim of developing the river territory and preserving floodplain retention capacity. The plan included a floodplain restoration project. However, after five years of negotiation, the project was finally abandoned. In this article, we analyze the drivers behind the failure to preserve floodplain retention capacity by focusing on scale issues, using two theoretical frameworks: the concept of "functional fit" between the scale of ecological issues and that of the institutions in charge of those issues, and the concept of "politics of scale" in which scale results from historical processes. We conclude that the scaling of an issue results from history. It legitimates a specific point of view and hampers alternative ways of seeing reality at other scales.

Keywords

Flood; Public Policy; Politics of scale; Functional fit; Floodplain restoration; Rhône; France.

1. Introduction

In many western countries, levees are no longer considered as an appropriate solution to flood management. Past events have shown that failure of these infrastructures cannot be completely avoided. Indeed, in cases of flooding, the presence of levees may serve to exacerbate the problem, causing damage and injury that could have been avoided had they not been in place. The robustness of dykes is questioned in the context of climate change, which may modify the very flood regime they were designed to protect against. The existence of levees fosters land use change, because inhabitants see them as a safety net. The socio-ecological processes leading to the construction of levees have proved to be unsustainable in many places. The multiple factors explaining these dynamics can be summarized as follow. Lowlands liable to flooding are fertile and easily accessible from river or road transport channels, therefore conducive to economic development. However, each flood is a threat to human life, induces business slowdown, and is harmful to perishable goods located at water level. Building levees around lowland will extend the operation period from one overflowing flood to another, and increase lowland profitability by removing water constraints. Despite this, water embankments result in higher flood levels due to narrowed beds and there being less space for the water to occupy, which in turn increases peak flood flows. From an environmental viewpoint, levees will prevent alluviation, groundwater recharge and proper development of a number of lifecycles. Although statistics from past floods help design a levee so that it is quite likely to resist previously known floods, the probability that such floods will occur changes over time. When poorly maintained, levees will fail. In urbanized catchment areas, land sealing and additional levees will ensure quicker water transfer to water courses and higher flood peak (Scarwell and Laganier, 2004). Lastly, climate change may induce more frequent extreme hydrological episodes, with a higher probability that water will flow over existing levees, or even destroy them. So dyke-raising is never enough.

Consensus has grown among water scientists that sustainable flood management requires “making space” for water by increasing retention capacity of floodplains (Maltby, 1991; Moss and Monstadt, 2008; Warner et al., 2013). Retention areas are supposed to strengthen existing systems of flood protection, and thus the security of populations and goods exposed to floods (Montz and Tobin, 2008). Several experts recommend restoring the retention capacity of floodplains, i.e. to remove levees that protect non-urban areas, or to lower their protection potential by creating spillover. This is promoted for two supposed complementary objectives: development of flood retention areas and renaturation of floodplains. For the purpose of this article, we will use the term “floodplain restoration” to grasp this twofold idea. Renaturation is the practice of protecting environmental services found in floodplains, such as aquifer recharge, reduction of flood velocity, and natural habitats (Dufour and Piégay, 2009). However, this scientific consensus has proved to be very difficult to implement in practice. Political scholars explained this gap between theory and practice by institutional and governance related constraints to implementation (Moss, 2004; Tobin, 1995; Warner et al., 2013; Wesselink et al., 2012).

One attempt to adapt institutions and rules in order to foster floodplain restoration occurred in the Rhône valley. However, the new governance did not meet the goal of increasing floodplain retention capacity. It did not succeed in removing or lowering existing levees. Instead the height of other levees was further raised. In this paper, we try to understand why the governance of the Rhône floodplains failed to reach its ecological goals although participants explicitly sought a "functional fit". Our central argument is that the correct scale of governance in this field cannot be defined as a fixed value from the outset. It is rather defined through political processes. This is because there is a multitude of uncertainties and controversies surrounding the scaling of key issues, including a variety of different knowledge claims and interests one can only examines when they operate at work. Some critical geographers characterize such situations as a "politics of scale" (Brenner, 2001; Buizer et al., 2011; Moore, 2008; Swyngedouw, 2004). Their analytical tools help us to understand the lack of legitimacy of rationally designed institutions.

The paper is organized as follows. In Section 2, we present the analytical tools of two theoretical approaches dealing with scale issues for natural resource management: the "functional fit" and the "politics of scale". We then explain the methodology we used to apply them to our case. In Section 3, we present the case of the Rhône floodplains (France) and the objective of *Plan Rhône* as a new institution dealing with flood risk at the level of the river. In Section 4, we analyze the failure of *Plan Rhône* objectives to preserve and increase floodplain retention capacity in two steps: (4.1) the interaction between *Plan Rhône* and "functional fit" issues, and (4.2) *Plan Rhône* as the product of "politics of scale" in which it is inserted. We conclude by discussing the interests of both bodies of literature and proposing improvements regarding flood management and scale issues.

2. Addressing the governance of floodplain restoration in terms of "functional fit" or "politics of scale"

For the purpose of this paper, we define scale as the spatial scope and the resolution used by any actor to represent a process having spatial dimensions. Individuals choose to address an issue at a specific scale according to their points of view and beliefs. Institutions, such as political mandates, economic sectors and administration levels, are vehicles for spreading specific beliefs on territories, populations and socio-ecological problems at specific scales they claim to be legitimate. Restoration of floodplains involves socio-ecological processes which are differently perceived by decision-makers according to their roles in policy-making or the economy. From their diverse points of view, they apprehend these processes at different scales. The governance of floodplain restoration must encompass multiple scales (Gregory et al., 2011; Molle and Mamanpoush, 2012; Wallis and Ison, 2011). It requires the collaboration of many stakeholders acting at different levels and the adjustment of the rules that were forged for living with levees. Systems whereby towns benefiting from floodplain restoration pay compensation to those losing out are hard to implement (Erdlenbuch et al, 2009). Scale issues can be

critical in respect of the success or failure of floodplain restoration projects. To highlight this challenge we identified two strands of literature that are not water-specific, but seem relevant to address this institutional issue related to flood management: one focuses on the "functional fit", the other on the "politics of scale".

2.1 "Functional fit"

Some scholars have addressed the issue of scale and environmental management as one of a "functional fit" of institutional design (Ekstrom and Young, 2009; Folke et al., 2007; Young, 2002). They argue that restoring ecological functions is a matter of reforming institutions and rules to make them more ecologically functional. They provide a methodology to check whether regulations and stakeholder jurisdictions are consistent with the protection of a natural resource at stake.

This approach is rather normative. It seeks to provide decision-makers with recommendations for sustaining ecological processes. Ekstrom and Young (2009) have aimed to assess how "the nature, functionality, and dynamics of a specific ecosystem" are taken into account by the institutions that influence it. In line with other institutionalist scholars working on environmental issues (Norgaard et al., 2008; Ostrom, 2009), they consider that mismatches between socio-ecological processes occurring at specific scales and institutional settings dealing with other scales may lead to failures to sustain natural resources. They have defined this question as a problem of "functional fit".

From this perspective, institutionalists have noted several criteria for successful natural resource management. They notably advocate:

- Identifying all factors affecting or being affected by the natural resource (Cash et al., 2003); Defining clear boundaries of the ecological system to prevent misfits (Ekstrom and Young, 2009; Ostrom, 1990);
- Establishing a set of regulations with clear-cut and effective compliance mechanisms (Young, 1989).

Applied to the protection or restoration of floodplain retention capacity, this approach consists of listing the factors affecting flood patterns (increased runoff due to more impervious surfaces, higher water levels due to embankments, lower water levels due to retention, more extreme flows due to climate change, and levee failures) and activities threatened by floods. Focusing on the hydrological nature of floods, institutionalists generally recommend addressing the problem at the scale of the watershed. Seeking a "functional fit" calls for the creation of rules that are consistent with the restoration of floodplains. We shall first consider the question of consistency and then address the plurality of factors affecting the system.

In the context of multi-level governance[1] (van Tatenhove and Leroy, 2003), institutionalists no longer recommend designing a unique institution. They postulate that institutions and stakeholders situated at different scales must coordinate their actions and rules to govern ecological systems (Cash et al., 2006). They draw the analyst's attention to the set of binding regulations ruling the issue at stake and recommend checking its consistency. Rules are considered inconsistent when two regulations contradict each other and there is ambiguity regarding which prevails (Cash et al., 2006). Reviewing all rules requires a systematic approach. E. Ostrom dealt with multi-level governance considering that "all rules are nested in another set of rules that define how the first set of rules can be changed (…). Changes in the rules used to order action at one level occur within a currently "fixed" set of rules at a deeper level."(Ostrom, 1990:51). This nested approach assumes that the precedence of some rules over others do not depend on cases. It corresponds to situations where rights are ascertained and the boundaries of the resource well-defined (Sax et al., 2006:310-320). In European countries, where laws are based on codes, those codes are used as a basis for systematic reviews. With this approach, the civil code prevails over regional legislation, which in turn has power over local arrangements. Sustainability requires an adjustment of the rules at all relevant levels, so that existing stakeholders' rights and rivalries do not hamper environmental functionalities (Gerber et al., 2009; Varone et al., 2013)[2].

Ostrom initially considered that defining boundaries and identifying factors affecting the system could be achieved by providing more information about the system (Ostrom, 1990). Her followers have been less optimistic. They have tended to distance themselves from the notion of "functional fit" for dealing with complex environmental issues known as "wicked problems". These problems involve a large diversity of social groups. They have numerous and conflicting definitions, solutions that can create problems for others, and no rules for closing the debate (Lach et al., 2005; Rittel and Webber, 1973). Restoring floodplains is arguably a wicked problem because the development of floodplains is an uneven historical process resulting in much diversity among riparian populations. Removing levees is a solution that creates other problems. In case of controversial assessment of flood behavior, only the occurrence of floods can close the debate, which does not happen on demand. Cash et al. (2006) admit that ignorance and diversity are two cross-scale challenges. The former arises because "ignoring cross-scale dynamics within spatial and temporal dimensions is common". The latter refers to "the incorrect assumption that there is a single, correct, or best characterization of the scale and level challenge that applies to the system as a whole or for all actors". Moving away from the objective of a perfect

[1]Government refers to State-centered public action. Governance means multiple stakeholders participating to the decision process. Institutionalists consider that "one important aspect of governance is the role of "institutions": the formal and informal rules that provide the framework for the behavior of human beings" (Pahl-Wostl, C. et al., 2008. The importance of social learning and culture for sustainable water management. Ecological Economics, 64(3): 484–495.)

[2] As one reviewer wisely noted, rules have no power by themselves. They are enacted by actors who may wield power by drawing upon rules. The institutionalist approach tends to consider that all rules are enacted.

institutional fit, these authors and others (Biswas, 2004; Folke et al., 2007; Mitchell, 2005; Moss, 2012; Moss et al., 2009; Pahl-Wostl et al., 2008) recommend identifying such challenges and managing them through ad-hoc measures. Somehow they admit that stakeholders involved in wicked problems should have some leeway for adaptation that cannot be grasped through institutional design.

2.2" Politics of scale"

Proponents of the "politics of scale" approach have a more radical view: they consider that institutions, however well-crafted, never fully fit a function or a position on a scale. These critical geographers and political scientists are reluctant to position institutions on a scale because of political implications, which they refer to as the "politics of scale" (Brenner, 2001; Molle, 2007; Rangan and Kull, 2009; Swyngedouw, 1997). They consider that the argument "regional regulation prevails over local arrangements" is a claim for regional hegemony rather than a fact (Jessop et al., 2008) and assumes that the local is subject to the region's power. This should never be taken for granted because it depends on the legitimacy of the regional power on a specific issue. Legitimacy, as everything that deals with social life "is process-based, in a State of perpetual change, transformation and reconfiguration" (Swyngedouw, 2004:26). For the same reason, the spatial scope of institutions is not set once for all. These authors do not consider individuals and collective actors as "stakeholders" because they argue that participants of social movements and members of institutions change their perception of stakes in the process of interacting with others. The term "actors" better grasps the social ability to play with different scales in order to frame the meaning of the issue and the claim for regulation at different levels (Kurtz, 2003). Attention is drawn towards potential ambiguities in the definition of institutional responsibilities, in particular in cases of "trusteeship" defined "as the intent, which is expressed, by one source of agency, to develop the capacities of another" (Li, 2007:5). Critical political ecologists further contend that hierarchy does not exist once and for all in nature either. They consider that positioning actors on the ecological scale is a matter of knowledge claims - only valid within a specific range of assumptions - rather than a fixed law (Buizer et al., 2011; Forsyth, 2003; Rydin, 2007).

For these authors, it is vain to fit institutional scales into ecological ones, because neither category is fixed. More can be learnt from historical accounts of how institutions became legitimate to represent and tackle some socio-ecological problems at specific scales. This can explain which information was produced and which elements were ignored, leading to specific beliefs. In this approach, scale is no longer a category of analysis, but a category of practice (Moore, 2008). It is not something to be rationally crafted, but the result of historical conflicts and cooperation between actors. For these scholars it is not the role of science to design adequate institutions, but rather that of politics. Historical analysis allows for identifying:

- The political reasons why some actors rescaled their perception of a problem;

- How institutions spread beliefs inherited from past policies and power relations, which distort actors' perceptions.

These elements are place-specific. They are crucial to understanding why institutional models that were successful in one place failed when applied in a different place.

Our take on the "functional fit" and the "politics of scale" bodies of literature requires articulating both frameworks. We argue along the "politics of scale" that the discourse of "functional fit" is a political claim. We believe that several functionalist definitions of flood issues compete in the political arena, each of them best fitting one specific scale. Actors engaged in one definition try to rescale the issue to fit their cause. However, we will argue that rescaling strategies are constrained by past policies and longstanding beliefs spread by institutions.

Our case would appear to be an accurate example of this phenomenon. Since major floods occurred in 2002 and 2003 on the Rhône River, State officers dealing with flood management have tried to move from a centralized flood policy to a river-basin level governance of this issue with the aim of preserving the floodplain retention capacity and if possible to enhance it. They set up a strategic and financial contract between all the actors involved in flood issues near the Rhône River, called *Plan Rhône*. They inscribed the floodplain restoration objective of *Plan Rhône* in several legally binding documents[1]. However, at the end of the process some higher dykes were built and no one was removed. The floodplain lost some retention capacity. The decentralized flood governance may have proved effective in some dimensions but it failed to achieve its main target. It must be noted that the effectiveness of governance is multi-dimensional and what may appear as a failure in one dimension may be a success in another (Young, 1994). However, this conclusion is not ours, but that of State officials working in *Plan Rhône*, the institution purposely crafted at river basin level to develop a sustainable floodplain. Our analysis first adopts the point of view of these actors and seeks to identify which institutional factors of success were missing for their goal using the "functional fit" literature (clear-cut boundaries, knowledge of interdependence factors, compliance mechanisms). Second, by elaborating on the "politics of scale", we explain why State actors were not able to see that such factors were missing from the beginning, and why despite their blindness they remain legitimate spokespersons for local actors.

[1] This objective was inscribed in 2005 within a State-Regional Plan Contract (CPER), funded partly through European Funds (European Regional Development Fund). This objective was included in the Water Development and Management Plan defined at the level of the watershed (SDAGE). The SDAGE reinforces the binding character of this objective since local urbanization plans (at the municipal level) must be consistent with SDAGE objectives.

2.3 Methodology for studying the governance and the scaling of flood issues in the Rhône valley (France)

Our methodology is based on what actors say and write. We analyze their discourses in order to identify how actors understand flood issues in terms of system boundaries, impacting factors and rules. We seek to identify at what scale actors apprehend flood issues in the Rhône valley, at what scale the information they can rely on is represented, and what their beliefs and understanding of flood governance are.

Our empirical data came from interviews with actors engaged in flood governance on the Rhône River during the 2003-2013 years and the literature they produced (expertise, information provided to the general public) on floods in general and on the Rhône River in particular. Between 2009 and 2013, we conducted and transcripted 62 semi-structured interviews with *Plan Rhône* participants, central and local State officials and elected representatives, as well as opponents to the floodplain restoration project (inhabitants, associations, local governments). In order to follow changes in problem definition and issue rescaling, we systematically compared how the proponents defined and mapped the problem of flood at different periods, in interviews and public documents. We related these definitions and scales to what actors believed, what solutions they promoted and the factors of success or failure they identified.

In a second step, we sought in second hand literature the origin of what *Plan Rhône* actors *a posteriori* considered as their own wrong beliefs. We looked for beliefs inherited from past policies and power relations, which influence actors' perceptions. For this purpose, we consulted literature written by historians and geographers on the history of the Rhône and its infrastructure. We also examined how public projects were justified in archives relating to the construction of a dam and dykes located near the floodplain earmarked for restoration.

3. Case Study Presentation

The Rhône is one of the main French rivers, rising in Switzerland and running towards southeastern France, ending in the Mediterranean Sea by the Camargue delta. The river operation and governance changed through history. After the Second World War, the semi-public company CNR (Rhône National Company) was created by French State representatives and was given the concession for managing the Rhône River, with the aim of developing three missions: hydropower production, navigation, and developing irrigation. From 1935 to 1986, CNR built 19 hydropower stations (with dams and dykes) along the river, between the Swiss border and the upstream part of the delta. CNR is responsible for operating and managing the Rhône infrastructures within this territory. The management of infrastructures within the delta is left to local authorities.

Four major floods occurred on the Rhône River in the 1990s and 2000s. Those floods sparked conflict between inhabitants, the State, and the CNR. Inhabitants blamed the CNR works for exacerbating the

impact of floods through dyke and dam construction. They also believed that these developments were indirectly responsible for agricultural dyke failures in the delta. After the floods in the 1990s, the State asked the recently-created river association (Territoire Rhône) to carry out a study on flood risks and propose risk reduction strategies. Results were released just before the 2003 floods. The State was then accused of knowing that dykes were fragile, but not putting in place any kind of flood reduction strategy. In 2003, several actors were entrusted with the problem of floods in the Rhône valley. However, a lack of clear-cut responsibility created political crises.

As an answer to these issues, the State, along with other local representatives, created a governance system (*Plan Rhône*) to manage flood risks and other issues at river level. *Plan Rhône* was initially created to tackle floods, before being extended to cover other issues such as tourism, culture, energy, water quality, and transport. This institution was designed in 2007 as a strategic and financial contract signed between the State, Regional authorities, CNR, and the European Union (ERDF). This provided 175M€, 200 M€, 185M€ and 33 M€ of funding respectively. Beyond these main partners, *Plan Rhône* brought together other actors, by means of a steering committee: Departments,, and main municipal authorities located along the Rhône. Through consultative committees, local inhabitants and associations were also associated. *Plan Rhône* was a financial partnership allowed to grant funds to local governments, project managers or inhabitants wishing to implement projects consistent with *Plan Rhône* strategy. As such, *Plan Rhône* was operating a kind of "trusteeship" (Li, 2007) on local actors. Table 1 summarizes the spatial scope and the responsibilities of actors and institutions in relation to flood management on the Rhône valley.

Table 1: Spatial scope and responsibilities of actors and institutions in relation to flood management in the area covered by the *Plan Rhône*

Nb: All figures have been adjusted to the area covered by the 5 regions involved in *Plan Rhône*.

4. Analysis

4.1 The "functional fit" of *Plan Rhône* according to its leaders

State officials at regional level were responsible for mapping flood risks at river basin level and steering *Plan Rhône* process. They considered that flood was the primary issue to address in the area[1]. The flood section of *Plan Rhône* accounted for half of all funding. The reading of *Plan Rhône* official documents reveals that participants understood the problem of flood in the Rhône valley as a lack of

[1] « the 2003 flood event provoked the creation of Plan Rhône. In 2004, the prime Minister assigned the Rhône 'préfet' (State official) to create a global strategy to prevent floods on the Rhône River » (interview with a State official at River basin level, May 2010) ; « the flood issue was the historical problem, the rallying theme. [Plan Rhône] sought to provide an answer to flood issues. At this period, the unique theme to address was flood. » (interview with a State official at River basin level - October 2012).

flood retention capacity of rural areas. The Plan asserts an overall economic goal: “reducing flood damages”. This was to be achieved by a twofold strategy: (1) raising and strengthening some dykes in urban areas in order to avoid frequent flooding: “reducing flood discharges that are the most damageable to densely populated areas”, (2) lowering dykes in rural areas in order to store water during extreme floods: “enabling the riverbed to accommodate the rise in water levels”, “preserving floodplain retention capacity”, “optimizing the flooding in some plains”.

One of the main target sites of the flood section was located in the Lower Rhône region, where major floods had occurred. Entitled “Floodplains Optimization Program”, the strategy consisted of modifying the distribution of risk by: i) enhancing the protection of plains experiencing frequent flooding (on average once every ten years) ii) increasing water storage capacity by adding a spillway onto a CNR dyke protecting a rural floodplain against 1000 year return period floods. This latter was entitled “floodplain restoration project”. Besides this Floodplains Optimization Program, *Plan Rhône* was supposed to finance dyke reinforcement around the Rhône delta. Figure 1 represents *Plan Rhône* territory and identifies floodplains concerned by the Floodplains Optimization Program.

Figure 2: Map of *Plan Rhône* territories: the Regions, the sub-basin areas and the floodplain restoration program

As flood experts, *Plan Rhône* leaders understood the issues in hydrological terms. Based on hydrological knowledge, they calculated the dynamic pattern of a 100-year flood taken as a reference of extreme flows. They estimated the amount of water that could safely flow between the consolidated levees and dykes in urban areas. By deduction they determined the retention capacity that was to be found for preventing levee failure. They screened the existing levees that could be lowered in rural areas without threatening buildings and found that one levee owned by CNR for hydropower and navigation purposes would be a good candidate for implementing a spillover. The floodplain to be restored was on the territory of two rural municipalities Piolenc and Mornas. *Plan Rhône* became the arena where actors could meet and cooperate to implement this project.

Plan Rhône leaders paid attention to the dynamic of urbanization. Floodplains earmarked for restoration were ruled by a no-construction provision in a State-approved urban planning document. They also identified that economic considerations would loom large as factors possibly affecting the project. The cost of the spillover was to be covered by financial provisions of the contract. The benefits downstream urban areas would get from the project could cover the farming losses upstream rural areas may suffer, according what *Plan Rhône* leaders called “river-basin solidarity”. The economic loss CNR may experience due to the spillover had to be negotiated within the concession contract between CNR and the State. The overall contract included a clear-cut and deemed effective compliance mechanism: EU funds were subjected to the effective implementation of floodplain restoration project.

As expressed in interviews, State officials steering the *Plan Rhône* considered that this system of governance corresponded to the definition of a "functional fit" for the following reasons:

- Its spatial scope was clearly defined and coincided with that of the flood issues (the watershed level), including the floodplains.

- Actors involved in flood issues were also involved in the governance. State actors responsible for mapping flood risks steered *Plan Rhône* process. Regions were included in *Plan Rhône* as strategic and financial partners. Other floodplain stakeholders such as Departments, municipal authorities and inhabitants participated to steering committees.

- *Plan Rhône* contributed to enhance the knowledge of other factors possibly affecting flood risks by financing:

  - Hydraulic studies in order to understand floodplain and dyke behaviors and the potential hydraulic effects of the modification of the system;
  - Economic studies in order to assess the economic efficiency of the hydraulic-sound strategies;
  - Sociological studies in order to assess the perception of flood risk among riparian inhabitants.

- Some compliance mechanisms preexisted:

  - The planning document defined at river level (SDAGE) imposed to offset the effects of any dyke-raising project with hydraulic compensation (particularly through floodplain restoration);
  - Municipal urban plans designed by municipalities and validated by the State limited construction in floodplains.

- Others compliance mechanisms were settled under the stewardship of *Plan Rhône*:

  - EU funding was granted under the condition of not being used for mere dyke-raising.

Between 2007 and 2012, State officials in charge of coordinating the flood section tried to persuade local governments to take responsibility for the implementation of the Floodplains optimization program through *Plan Rhône* funds. However, the floodplain restoration project proved to be very controversial among Rhône stakeholders, particularly municipalities. It was finally abandoned in 2012, spelling the end of the Floodplains Optimization Program. In the end, the main achievement of *Plan Rhône* (2007-2013) was the enhancement of existing dykes and the construction of new ones, without any real progress in terms of improving floodplain retention capacity. Using "functional fit" arguments, *Plan Rhône* leaders attributed this failure to a number of factors:

- Detailed studies revealed uncertainties and constrains that were not identified when *Plan Rhône* objectives were defined. The planning document *Plan Rhône* leaders relied on, did not mention already built areas. Detailed floodplain topography at higher resolution revealed less retention capacity than expected. Storing flows in the floodplain proved to be a possible threat on the high speed railway infrastructure crossing the area. Such constraints raised the costs associated with *Plan Rhône*.

- Opposition to the project revealed that some stakeholders gained a *de facto* “veto power” that State actors had ignored. The project entailed modifying a dyke owned by the CNR. State actors wrongly believed they had the power to impose the change. CNR’s interests were vested in a concession contract fostering hydropower, transportation and irrigation, not flood management. Beyond economic considerations, CNR did not want to take responsibility in flood management. In addition, State officials, acting as trustees rather than initiators, did not have the power to implement the project themselves. Whereas in theory, local stakeholders had to comply with river-basin regulations, in practice, they gained a "veto power" because they could refuse to initiate projects complying with the aims of *Plan Rhône*. State officials did not manage to convince local stakeholders to take responsibility for the project. The vested interest of local stakeholders (localized flood protection) can explain this refusal.

- Compliance mechanisms were not restrictive enough to oblige stakeholders to implement the project. No whistle-blower voiced the lack of compliance to the SDAGE or the lack of compliance to EU funding rules to national or European courts. Dykes were raised without restoring the floodplain as compensation.

The "functional fit" approach allows us to identify the *a posteriori* weaknesses of *Plan Rhône* implementation, despite the *a priori* consistency of its rules. In the institutional design of *Plan Rhône*, stakeholders considered the issue of consistent rules and financial compliance mechanisms. However, the responsibility to initiate projects (such as constructing a spillover or dismantling a levee) was not given sufficient attention. In this case, the absence of a defined project leader at the design stage of *Plan Rhône* partly explains the project failure. This phenomenon of inconsistency between the objectives of a program and the project leaders for its implementation echoes the lack of « institutional congruence » as defined by Junier *et al.* (2011). State actors who steered the process underestimated uncertainties, vested interests and veto-players in the first place.

Paradoxically State officials remained legitimate spokespersons of *Plan Rhône*. However, municipalities and inhabitants called for a rescaling of the problem at State level. Inhabitants of flood prone areas claimed recognition of their status by the State. They raised the issue in Parliament, but in vain. *Plan Rhône* leaders argued in favor of this legal status for flood prone landowners with no more success. Then, they asked the government to modify a law to be able to initiate the floodplain restoration project in the name of the State. This solution of last resort failed too. This raises the question of State level legitimacy for local actors. The political weight of the State must be analyzed through the use of “politics of scale” literature.

4.2 *Plan Rhône* and the “politics of scale”

Unlike *Plan Rhône* leaders, other actors in *Plan Rhône* did not perceive the flood issues in terms of retention capacity. According to their vested interests and leeway for action they rescaled the issue

during the process. Their definition of the problem drew different system boundaries and another level of legitimate governance, that of the State. The legitimacy of the State results from a long story of State intervention on the Rhône River. Despite their willingness to implement a decentralized governance at river-basin level, State officials are imbued with beliefs inherited from State-level institutions.

4.2.1 Rescaling flood issue at the national scale

In opposition to the strategy built by State officials, other actors defined the problem of floods at another scale, competing with *Plan Rhône* boundaries. Instead, municipalities, CNR and local authorities attempted to define flood issue at the scale of the nation.

Municipalities rescaling of flood issue

For municipalities, the problem of floods should be dealt with at the national scale for two reasons.

First, areas defined as *flood prone* and subjected to construction limitations are negotiated between municipalities and the State. The State allows financial support to municipalities depending on the size of their population. Therefore, municipalities that managed to develop before the implementation of flood prevention plans, and were then allowed to reinforce their dykes, had advantages over others. Municipalities located behind dykes have interest to define the problem at a national scale.

The second reason for this statement is that in France, the authorities are logistically and financially best equipped to deal with flooding at national level. This is based on solidarity: i.e. the whole country should bear the cost of repairing flood damage. A solidarity scheme (called CatNat), financed through taxes on insurance premiums (Barraqué, 2014), is managed at the national level, and covers repair costs in case of 'natural disasters', in order to avoid insurance companies being bankrupted by a sudden influx of high-value claims. The government has the final say on which floods are recognized as 'national disasters', and aims to encourage municipalities to limit their urban development in flood-prone areas. Municipalities therefore argue for a national frame-scale of the problem.

Municipalities did not wish to implement the Floodplains Optimization Program defined by *Plan Rhône* officials, and instead demanded that the national government recognize a legal status for inhabitants living in floodplains[1]. Municipalities found it difficult to identify any positive impacts of the project designed by *Plan Rhône* officials on their inhabitants' welfare. The preexisting CatNat system seemed less uncertain. This echoes the article of Erdlenbruch et al. (2009), which highlights the difficulties in organizing local financial compensation schemes in case of floods because of the high risk of local water management institutions going bankrupt in case of major floods . Instead of

[1] Two Laws were proposed by deputies to the government, in vain (Law proposals were N° 2739 (2005) and Law proposal N° 2596 (2010): "aiming at granting a particular status to municipalities and inhabitants living in floodplains"

modifying the local share of risk, municipalities referred to the national scale in order to demand a public treatment of flood-management strategy by protecting all floodplains.

CNR rescaling of flood issue

The main reason for CNR to define flood issue at the national level was its reluctance to take responsibility for this problem. In particular, they refused to take in charge the implementation of the Floodplains optimization project. CNR was fearing to be held responsible for the damages in case of floods. A legal study realized by State officials revealed the "strong reluctance" of CNR to undertake the works planned by the Floodplains optimization project. Moreover, a letter from CNR legal services addressed to State officials recalls that "the objective of the floodplain restoration project is out of the scope of CNR's responsibilities" and that "there is no mission neither objective within the concession contract giving responsibility to CNR to manage Rhône floods"[1].

CNR claimed that their company was governed by national rules that prevailed over the local issue of flood management. This argument is integral to a "politics of scale". which favors energy production at the expense of flood security, arguing that one is for the benefit of the whole country, whereas the other is deemed more local. CNR began to focus more on what national law defined as its responsibility, i.e. energy, navigation and irrigation. They denied any impact of the company's works on flood patterns. CNR claimed to fulfil its responsibilities with regards to energy and boat traffic at national level. Given the growing level of uncertainty regarding flood damage caused by spillway implementation, the company officials decided that there was no advantage to deal with floods, because of the resulting legal liability and high costs that would be incurred should they be unsuccessful.

The rescaling of Rhône flood issues at the national level by municipalities and CNR illustrates their interests to define a problem at a particular scale, but also beliefs inherited from Rhône development history.

4.2.2 Beliefs inherited from State level institutions

State legitimacy for governing flood issues and the Rhône River development has gradually grown in the public mind, given the long history of State intervention in building levees and controlling the river. The strength of this *heritage* is illustrated in the action of State officials. In spite of their attempt to define flood issue at *Plan Rhône* level, they reproduced the national framing.

The Rhône River development, a national history

Until the 19th Century, Rhône River floods were dealt with at community level (Bethemont, 1972; Champion, 2000). Instances of flooding were opportunities for the Imperial government to exercise its

[1] Larrouy-Castera, DREAL Rhône-Alples, 2011, "Mission d'assistance juridique sur les conditions de mise en œuvre du schéma de gestion des inondations du Rhône en aval de Viviers dans le cadre du Plan Rhône".

legitimacy by granting occasional donations or advantages (Favier, 2007). The major flood events in 1840 and 1856 represented "critical junctures" used by the emerging centralized and modern State to legitimate its domination. The "compassionate journey" of Napoleon III along the Rhône after the 1856 event illustrated the attempt by the State to construct its legitimacy following this event (Picon et al., 2006). The Emperor came to see the victims and to observe the damage. Through this visit and State support, the Rhone and its victims gained national interest, and the State, personified by Napoleon, was sending a message of national involvement in recovery from loss. This symbolic journey was the starting point of a flood protection public policy[1], based on dyke construction around cities, drawing on the expertise of State-employed engineers[2] and public financial support. Large-scale flood prevention infrastructure was built between 1860 and 1880. After the works in 1856, 30 000 ha of land were protected from ordinary flood events (Bethemont, 1972, p.136). The risk of flooding became a public issue to be dealt with at a national level. Rescaling the issue at the national level gave legitimacy to the State by providing protection for citizens. The scale (from local to national), the funding (from local to State-financial participation) and the actors[3] involved in flood protection changed. This mindset remained in place until the 1990s. Thanks to a long period without flooding, this governance system remained unchallenged until major floods in the 20th Century.

The Rhône was the theater of a second "critical juncture" in State legitimization in 1945. After the Second World War, the government undertook major modernization works, in particular on the Rhône. The government set up a public company, CNR, with the aim of exploiting hydropower and navigation from upstream of Lyon down to the delta. Large-scale modern dykes replaced or supplemented infrastructures built in the 19th Century, in order to create hydroelectric dams. From the 1980s on, the government allowed another public company (EDF) to install four nuclear power stations along the river, taking advantage of the cooling potential of the Rhone and of the existing dykes. These works reinforced the dominant position of national-level river management (Hecht, 1998; Pritchard, 2004). The initial shareholder composition of CNR testified to the nationalization of the River Rhone: Paris city and its region possessed 25%; the public railway company 25%; the Rhone local governments 25%; and the remaining 25% went to industrial shareholders, including EDF (Giandou, 1999). The State required EDF's and CNR's to avoid modifying Rhône flood regime. However, compliance with this rule was hard to monitor, given the complex relationship between dyke

[1] The "public policy" concept refers to interventions by a public authority benefiting from governmental legitimacy over a particular domain of society or a territory, e.g. a regional public policy for disabled people; a national public policy for housing, etc. (Boussaguet, L., Jacquot, S., Revinet, P. (Eds.), 2006. Dictionnaire des politiques publiques, Paris.)

[2]The "Ponts et Chaussées" public body of engineers was created during the previous century (in 1716) under the Absolutist Monarchy. However, its importance regarding flood prevention on the Rhône increased after the major floods in 1840 and 1856.

[3] In addition to the "Ponts et Chaussées" (Bridges and Roads), after the 1840 floods, a special administrative body was created to deal with Rhone issues: the Rhone Special Service.

raising and land use changes. Hydropower works, through dyke construction, transformed landscapes and floodplains. However, CNR was not entitled to protect citizens from floods.

Between 1950 and 1993, no major floods occurred on the Rhône River. These 40 years of peaceful climate, along with major public works (EDF and CNR) and discourse about security, as well as the belief in technological progress, culminated in the removal of flood risk from the political agenda. No "critical juncture" occurred to change the organization of flood governance on the Rhône, until the 1990s. In the meantime, the Rhone valley had undergone development behind CNR dykes.

The national history of the Rhône favored the scaling of flood issues at the national level. In spite of their attempt to implement a flood management policy at the level of the River through a new institution and a new boundary, State officials have reproduced the conditions favoring the national framing of the issue.

Plan Rhône promoters in between competing scales

State officials operating at the Rhône basin level took charge of developing a flood management strategy at the river level. However, in their attempt of restoring a floodplain, their project suffered from uncertainties that participated to its failure. However, those uncertainties can be seen as *blind spots* created by their framing of the flood issue at the national level.

First, State officials have long ignored the detailed topography of the floodplain supposed to be restored. Mayors of this area demanded a detailed survey of the potential impact of flooding their territory, This study[1] revealed that houses and firms (i.e 900 inhabitants) would be impacted adversely by floods. Moreover, it revealed that the topography of the plain was less prone to store water than planned. Second, State officials ignored that the high-speed railway, installed in the floodplain, would hamper the development of the project. A study[2] realized by State officials revealed that its structure would not support the strength of the water stored in the floodplain in case of floods. Last, State officials overestimated their capacity to influence the State at central level to enable the project implementation. The creation of a new law was needed to allow them to implement the project by themselves, or to oblige CNR to implement it. However, the central government did not follow onto this legal pathway. This belief came from their position as public actors, supposedly enabled to negotiate local stakes at the national level. However, they overestimated their power to act on national-level decision making.

[1] BLR Ingénierie, 2008, « Etude approfondie des conditions d'inondation de la plaine Mornas-Piolenc-Orange et notamment des conditions de remise en eau de cette plaine par le Rhône. Phase 1 et 2 : Approche hydrologique et analyse des enjeux »,

[2] DREAL Rhône-Alpes, 2011, « Compléments techniques à l'étude de faisabilité de remise en eau de la plaine de Piolenc-Mornas-Orange. Problématique liée à la présence de la ligne LGV », étude réalisée par ISL Ingénierie, Décembre 2011.

Consistent with ideas put forward in functionalist literature, uncertainties regarding the floodplain restoration project negatively impacted its implementation. But such uncertainties were only revealed afterwards. Similarly the veto power of municipalities did not appear at first to the actors of *Plan Rhône*, but happened *a posteriori* in implementation. Finally, compliance mechanisms, which first appeared as strict constraints, were circumvented more easily than anticipated. This analysis helps understanding the weaknesses of a governance system but it does so *a posteriori*. This analysis only provides us with limited advice since information about scientific uncertainties and compliance mechanism failure was not accessible before implementation and was instead a product of the implementation process.

What we characterized as *uncertainties* in the "functional fit" framework appears as *blind spots* through a "politics of scale" analysis. Indeed, those uncertainties were created by the focus of State officials on higher scales than the local one. Referring to the national scale created their ignorance of the stakes located on the floodplain, and their overestimation of their influence on public (State level) infrastructure and legislative production. This framing, through the production of *blind spots*, created the conditions for the failure of the project.

The analysis of *Plan Rhône*'s failure through "politics of scale" revealed other implementation constraints, linked to competing definition of the problem. In the implementation process, actors revised their understanding of the problem through their interests and their beliefs. Theirs were the product of the river development history, built at a national level. These beliefs, shared by State officials, were the cause of "blind-spots" that caused major uncertainties and misunderstandings of the local situation, provoking the project failure.

5. Conclusion

Floods are typical physical issues that go beyond existing administrative frontiers. Experts advocate managing floods at the river basin scale through the creation of dedicated institutions in order to fit the governance system with the ecological system. Such an institution was created on the Rhone to tackle flood issues. *Plan Rhône* stakeholders launched a new strategy of flood management that consisted of restoring one rural floodplain. However, this floodplain restoration strategy failed. Some reasons for this failure can be highlighted thanks to "functional fit" literature. However, these reasons do not exhaust the case study analysis. In contrast, analysis through "politics of scale" literature revealed other reasons for failure, linked to competing scales over flood management.

This analysis reveals that scales are historical products built through "critical junctures" and attempts by institutions to build their legitimacy. It explains why actors do not naturally collaborate, even when associated within a "fitting" institution. Actors and institutions can have conflicting views depending on how they frame their respective interests, and the way in which they see problems. Conflicting interests and representations can be highlighted through historical analysis focused on scale issues.

549 Confronting two different bodies of literature over a single case study draws us to several statements
550 and recommendations:

551 - The idea of fitting an institution to a particular problem implies that the representation of a problem
552 is uniformly perceived among actors. Scientific uncertainty around flood issues increases the
553 conflicting representations relating to the phenomenon, and therefore generates conflicting views as to
554 how it should be managed.

555 - The functionalist approach of fit and misfit involves in itself a particular representation of the
556 problem and of the institution legitimate to take it in charge. However, the definition of the scale of a
557 problem, and the institution legitimate to take it in charge, are submitted to conflicting representations,
558 that can hamper development of particular problem-solving strategies.

559 - The legitimization of a particular scale depends on history, interests, and representations. Scales are
560 historical products, and as such can hardly be modified by the willingness of some project holders.

561 -. Scales are political constructs rather than physical realities. Processes to change the level of an issue
562 require the support of the actors concerned, but can simultaneously trigger conflicting claims.
563 Defining the appropriate level to tackle an issue is the product of negotiations between political
564 interests, but once a level is institutionalized, it constrains the actors to manage the risk at this
565 particular level (Lebel, 2005).

566 - Addressing socio-ecological phenomena through institutional creation or modification should
567 overcome the functionalist definition of a scale. Long-term and political analysis can contribute to
568 increased knowledge about conflicting representations and interests over scales. So-called “wicked
569 issues” may be better addressed when actors and institutions are aware of the diversity of
570 representations regarding scales. Presenting a scale as ecologically sound is not sufficient to resolve
571 “wicked issues”. Rather, social and political drivers should be given more attention before considering
572 solving a problem at a particular scale.

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