

Owners Escape Unharmed.
Activation of Institutional Rules in Rivalries
between Heterogeneous Water Users

Paper presentation

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Abstract

The provision of different goods and services from the same natural common-pool resource increases scarcity and threatens renewability. The behaviour of resource users is regulated by various institutional rules, mainly property rights and public policies. These rules are activated in order to defend their own use against others. How do heterogeneous water users solve their rivalries? Our theoretical framework suggests that a resolution of rivalries comes out of a process of activation and confrontation of rules between competing users. We postulate that an owner activates property rights and a non-owner public policies that point him out as a final beneficiary. We retain here two ideal-typical user confrontations: property rights against property rights and property rights against public policies. We advocate that success in the resolution of the rivalry is subject to a specific kind of local arrangement in each case. If two owners confront, then the rivalry is solved through a bilateral agreement, and if an owner confronts with a final beneficiary, then the State compensates the owner for his loss. We test these two hypotheses on four empirical cases in Belgium and Switzerland. What emerges from the analysis is that an owner never loses in a resolution of a rivalry, or not much at all.

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Introduction¹

Water scarcity grows with the multiplication of anthropogenic pressure. More and more users are sharing the same resource simultaneously and at the same place. All along a river, or within a watershed, different users compete in order to produce various goods and services, e.g. hydro-power, drinking water production, industrial cooling or bathing. All these heterogeneous uses can be complementary, but they are often competing. When resource scarcity increases, then the distribution of access and use becomes tense and leads to rivalry. A rivalry is a situation in which two users face an incompatibility between their respective uses, when at least one user has not enough resource to satisfy his needs. In such an environment, we observe that users often succeed in solving these rivalries. Our question is, precisely, how do heterogeneous water users solve their rivalries? According to us, the resolution of rivalry comes out of a process of activation and confrontation of rules between competing users. Users activate property rights or public policies that designate them as owners or final beneficiaries of a policy and enter in a confrontation of rules. The resolution of a rivalry is brought about by a local arrangement that appears as the outcome of the confrontation. Precisely, we investigate the link between the forms of the local arrangement with the configuration of activated rules. Our hypotheses state that when two owners confront property rights, the resolution of rivalry results from a bilateral arrangement, but when an owner confronts with the final beneficiary of a public policy, then the resolution necessitates financial intervention from the State that covers the costs of the arrangement. As such, we suggest that an owner never bears the costs of the resolution of rivalry. Starting from the elaboration of a conceptual framework that establishes relationships between the resource, the users, the rules, and the local arrangement, we present the different variables and the process that leads to a local arrangement. We empirically test our hypotheses with four cases of rivalries, identified in two different river basins, the Vesdre in Belgium and the Val de Bagnes in Switzerland. After a description of the different cases, we formally test the hypotheses and discuss the results.

1. Resolutions of Rivalries in Multiple-Use Situations and Complex Regulatory Environments

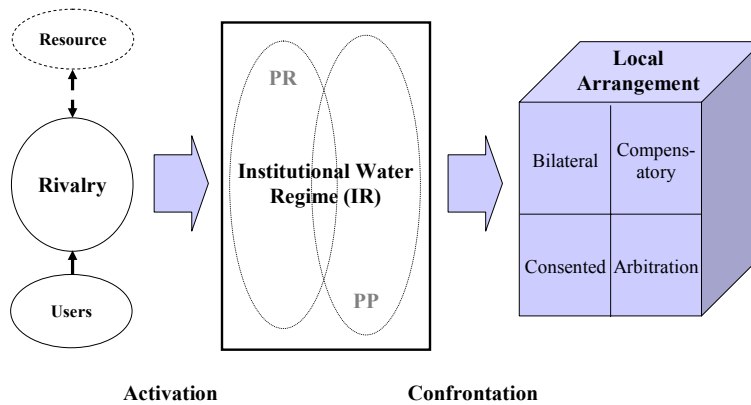
Different means to solve a collective action problem have been identified in economics and political science. Initially, it was believed that institutional change only came from outside (Hardin 1968; Olson [1965] 1978; Demsetz 1967). Contrary to the collective view that individuals are deemed unable to solve collective problems, we state that users are the major actors in processes of the resolution of a rivalry. They devise local arrangements by themselves, backed on the rules they activate. The initial trigger of the resolution process does not come from an external actor, neither the State nor the market. This work echoes what E. Ostrom says about the self-capacity of users to solve collective action problems: "Instead of presuming that the individuals sharing a commons are inevitably caught in a trap from which they cannot escape, I argue that the capacity of individuals to extricate themselves from various types of dilemma situations *varies* from situation to situation"

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(Ostrom 1990: 14). It supposes that resource users reach collective arrangements that overcome their rivalries.

The conceptual framework we develop establishes a link between the rivalry and its resolution (see Figure 1). The initial situation that creates the rivalry is the conjunction of resource scarcity with the presence of competing users. Facing a rivalry, and willing to preserve their consumption in current conditions, the users activate rules that may guarantee the continuity of their use facing a rival user. Situations of rivalry can also appear with the entrance of newcomers that are granted access rights to the resource. We postulate that users activate the rules that best protect their uses. The rules are either property rights or public policies. We identify the bundle of available rules as an institutional resource regime (IR). The IR constitutes the regulatory environment within which users behave. It is composed of the sum of property rights and public policies under application within a given perimeter (e.g. a nation-state, a region, a river basin or a municipality). Users activate these components of the IR and confront these rules in their search for a resolution. The confrontation is not directly a confrontation between rival users, but rather a confrontation between the activated rules. A local arrangement results from this confrontation. A local arrangement is a set of decisions and actions taken in order to solve the rivalry. We categorise local arrangements with two attributes, i.e. the degree of coercion and the distribution of costs, and obtain four different forms of arrangements, viz. bilateral, compensatory, consented and arbitration arrangements. The form of the local arrangement should be influenced by the configuration of the confrontation. In sum, our conceptual framework suggests that users in rivalry activate rules in order to get a resolution.

Figure 1: Conceptual framework of the resolution of rivalries



The model derived from the conceptual framework is based on a number of assumptions. We consider that the resource is scarce and that resource availability does not vary during the resolution process. Resource scarcity and anthropogenic pressure are constant. On the users' side, we only retain situations where two users (or groups of users) compete, and thus neglect situations where several groups of users interact through fluctuating coalitions and arrangements. The confrontation occurs in a one-to-one configuration. In order to proceed to empirical testing, we voluntarily restrict the time- and spatial scales of our case studies. The

cases have occurred within the last 50 years, in contexts of complex institutional water regimes. Concerning the perimeter, cases are selected within tributary river basins. For each case, we only consider a functional perimeter within the tributary basin. Rivalries do not necessarily occur at the same place, but rival users are functionally dependent on the same resource, as is the case when a user located upstream, even kilometres away, disrupts the use of another one located downstream. Before presenting the local arrangement and the related hypotheses, we first describe the different variables of the conceptual framework, i.e. the users, the resource, the rivalry and the institutional resource regime (IR).

1.1. Heterogeneous users in a context of resource scarcity

As most natural resources, water is exploited by heterogeneous users. The resource provides different goods and services. Water is first a living environment for fauna and flora and provides drinking water to humans. It is also essential for production activities (processing, cooling, drainage and irrigation in agriculture), hydro-power and transport. Water purifies our waste (water). We also use water for leisure activities, fishing, swimming, walking along the banks, or relaxing in thermal cures. Last, water provokes floods against which we must protect ourselves. All these goods and services produced from the water resource benefit different users. All along the stream, these users withdraw, retain or discharge water, or use it as a support for leisure or transportation. For instance, one user retains water upstream with a dam in order to produce hydro-electricity, while a second pumps up from the reservoir for drinking water purposes. After the dam, an industry withdraws water from the river for cooling and rejects wastewater from its production process. After that, a leisure centre hires canoes and maintains a bathing area. Fishermen fish all along the banks. All these different uses concentrated along the same river (or river basin) are not necessarily complementary. Uses are in competition, and all of them must be regulated in order to maintain the coexistence. In fact, if the dam manager retains too much water, the industry cannot cool its machinery properly. If this industry discharges too much waste in the river, the leisure centre loses its bathing area because of pollution and the fishermen catch no more fish. Thus, coexistence between heterogeneous users is not to be taken for granted.

In addition to heterogeneous demands, water is a scarce resource, a natural renewable resource. In order to maintain the provision of goods and services, its renewability must be preserved. Renewability is the capacity of a resource to self-regenerate. We distinguish the yield and the stock (Ostrom 1990). Renewability is maintained as long as the stock, i.e. the minimal amount of resource sufficient to the regeneration, is preserved from withdrawals. Only the yield must be harnessed, which limits the quantity of resource available for the production of goods and services. Given the limited regeneration capacity of the resource, scarcity appears when the available yield cannot satisfy all the users. Scarcity is either provoked by a low yield or by the progressive destruction of the stock of resource. Scarcity can be objective, when there is not enough resource for all, or socially constructed, when only some users suffer from shortages. In addition, scarcity is not only a quantity problem, but also occurs when quality decreases. We consider that scarcity increases the difficulty for resource users to co-exist within the same perimeter.

In a context of resource scarcity, the cohabitation between (heterogeneous) resource users can turn into rivalry. A rivalry is a situation of incompatibility between different uses, in a context of limited resource availability. It appears when two users covet goods and services that exploit the same resource. It is, so to speak, a struggle, a confrontation, usually peaceful, for the reallocation of a resource between different users (Sproule-Jones 1982). When unresolved, rivalry can turn into conflict, but not necessarily. Rivalry differs from conflict, as

it does not imply hostility between the parties (Freund 1983: 65). Resource users can find themselves in a situation of rivalry without being hostile towards the other's practices, without wishing the elimination of the other. Conflict only appears when one party considers themselves injured in the distribution of the resource. It is an extreme form of rivalry, competition being the weakest one. Scarcity is a pre-condition to rivalry.

The users bring solutions to the rivalries they endure. They elaborate specific arrangements adapted to the situation. The resolution of rivalry is an attenuation of the antagonisms. It implies change either in the distribution of access to the resource, or in the resource status (e.g. an increase in the availability of the resource due to abundant rainfall). Rivalries are not necessarily suppressed, but are at least regulated, or fixed. The resolution must be seen as a process and an outcome. According to us, a rivalry is considered as resolved in two situations, when the rivalry disappears or is suppressed, or when a local arrangement is adopted. First, a rivalry disappears thanks to an increase in resource availability (e.g. due to a change in climatic conditions or the discovery of new springs), or is suppressed by a technical solution (e.g. construction of a mains for drinking water provision), or the exclusion of one category of users (e.g. the prohibition to bathe in the river due to pollution or the closure of a plant). Second, an arrangement is reached between the users about a (new) division of the resource. The redistribution can be more or less egalitarian or equitable, or negotiated or imposed with constraint. However, the process of resolution of a rivalry can take a long time and sometimes fails. Finally, the resolution of a rivalry is the result of a decision on the division of the resource (access) between the users concerned. Then, the question is to know if the users are able to go beyond their antagonisms to reach a solution to the rivalry themselves, or if only an authority at a higher level can solve the rivalry, at its own initiative and with a coercive decision.

1.2. Multi-level regulatory framework: institutional resource regime

The behaviour of competing resource users is regulated by various institutional rules. A rule is a legal prescription, imposed on actors, whether they accept it or not, and conditioning their behaviour. It is the product of a regulation process and is backed by a coercive apparatus. In order to be effective, individuals who suffer it must recognise and accept it. For that, the rule must be elaborated and implemented by a legitimate authority (Reynaud 1993:31). In the same vein, E. Ostrom defines the rules as "prescriptions that define what actions are required, prohibited, or permitted and the sanctions authorised if the rules are not followed" (Ostrom, Gardner and Walker 1994: 38). In a State-of-Law, the general legal framework has its source in the constitutional, legislative and administrative dispositions. "In other words, the rules-in-form are consistent with the rules-in-use" (Ostrom 1999: 50). Users provide an answer to rivalries in activating rules. Rivalries are considered as periods of tension in resource management, which reveal a need of adjustment inside the IR.

The behaviour of resource users is framed into wide sets of rules of different nature and levels, in Western countries at least. First, national private law defines the property rights on the resource, tells who has access to the resource (e.g. private landowners) and which rights derive from ownership. Public law comes along with public policies and tends not only to limit property rights, but also to grant access to non-owners, to a certain extent. Public law is formulated at different levels of authority. Given the political organisation of the country (i.e. central State versus federalist State), public policies are developed at the national or regional levels. Municipalities also have some competence to adopt local regulations. In parallel, the European Union also develops public policies on water (e.g. quality of the drinking water, standards for waste water treatment, etc.). International law can also exert an influence on the

behaviour of users (e.g. 1971 Ramsar Convention on wetlands), even if its effects are more indirect. This number of levels of authority makes it difficult to find out which rules determine or influence the behaviour of users. The task is complicated by the fact that these rules are developed at the sectoral level (e.g. transportation, public health, environment, etc.) and not necessarily in a resource perspective. The IR is an analytical tool that proves useful in the inventory of the regulatory framework managing the resource.

The Institutional Resource Regime (IR) is the set of rules that influence users' behaviour. It provides a comprehensive framework that allows in-depth analyses of the regulatory environment of resource users. It results from the convergence of two research streams, i.e. economics of natural resources (Bromley 1989; Devlin and Grafton 1998) and environmental public policies (Dente 1995; Grant, Perl and Knoepfel 1999; Howlett 2002), and brings a synthesis of the rules that guide natural resource management (Kissling-Näf and Varone 2000a). It integrates two modes of regulation of the user's behaviour: property rights and public policies. The IR organises access and use of the resource and co-ordinates the relationships between users. It does not exist *per se*, but is simply an analytical framework that is defined as: "an institutional framework which combines the prominent programme elements of a resource-specific protection and/or exploitation policy (=policy design) with a specific arrangement of the formal ownership, disposition and use rights for the goods and services provided by a natural resource (=water rights system)" (Varone *et al.* 2002: 83). Then the IR results from the combination of property rights, declined in formal rights, disposition rights and use rights, with public policies, declined in exploitation policies (e.g. drainage of fields, navigation, mineral water) and protection policies (e.g. waste water treatment, monitoring of aquifers, minimal flows in rivers) (see Table 1). The IR approach considers that these two institutional dimensions are complementary and that they must be treated simultaneously in order to reach a sustainable management of the resource. It adopts a resource perspective, rather than a sectoral perspective. It has temporal and spatial dimensions. The institutional perspective reaches an explanatory potential only because it traces back the historical development of institutions: "Institutions are both the result of past actions and the framework within which their new activities take place. Institutions and, hence, IRs can change over time and become increasingly differentiated" (Kissling-Näf and Varone 2000b: 6). As for the spatial dimension, the IR is attached to a perimeter, either a territory or the natural boundaries of the resource. In general, in the case of water regimes, we tend to consider the river basin (or watershed), while in the particular study of resolutions of rivalries, we will rather define the IR according to the scale of the rivalry.

Table 1: Constitutive elements of an institutional resource regime

Institutional Resource Regime (IR)	
Water rights system (<i>property rights</i>)	Policy design of exploitation and protection of the resource (<i>public policies</i>)
1. Formal property rights 2. Disposition rights (appropriation) 3. Usage rights	1. Political aims 2. Causal and intervention hypothesis (rationale) 3. Target groups 4. Instruments 5. Institutional (implementation) arrangement 6. Final beneficiaries

Source: (Kissling-Näf and Varone 2000b: 7).

The IR has two constitutive elements, i.e. public policies (PP) and property rights (PR). Public policies are the product of State intervention. A public policy is defined as a series of

intentionally coherent decisions or activities taken or carried out by different public – and sometimes – private actors, whose resources, institutional links and interests vary, with a view to resolving in a targeted manner a problem that is politically defined as collective in nature. This group of decisions and activities gives rise to formalised actions of a more or less restrictive nature (outputs) aimed at modifying the behaviour of social groups presumed to be at the root of the collective problem to be resolved (target groups, e.g. polluting industries) in the interest of the social groups or the environment that suffer the negative effects of the problem in question (final beneficiaries, e.g. producers and consumers of drinking water, fish). Thus, the term "public policy" refers to a large number of legislative and administrative activities aimed at the resolution of current problems. A public policy is divided in five constitutive elements: the policy objectives, i.e. the resolution of the public problem identified, the rationale, i.e. the causal model for the intervention on target groups, the target groups whose behaviour must change, the instruments which are the means to modify the behaviour of target groups and the institutional arrangement set up to implement the public policy (Knoepfel, Larrue and Varone 2001). In our analysis, we concentrate on the target groups, the instruments, and the final beneficiaries. In natural resource management, public policies designate particular groups of resource users as *target groups*. In general, the rules enacted are deemed to limit or re-orient their uses, as these uses are considered to be the source of a public problem (e.g. prohibition of manure spreading, as this indirect use of (ground-) water is deemed responsible for excessive concentrations of nitrogen in drinking water). The *instruments* are the means by which public authorities tend to modify the behaviour of target groups. We identify four categories of instruments: prescriptions (e.g. prohibitions, authorisations, permits, or standards), incentives (e.g. taxation and subsidies), information (e.g. information campaigns), and self-regulation (e.g. codes of good conduct or voluntary agreements). A public policy implies a redistribution between actors. The *final beneficiaries* are those who benefit from the public policy. Initially, they are those who suffer from the public problem identified. Following the modification of the target group's behaviour, their situation should actually be improved. It is the public policy that designates target groups and final beneficiaries among the users, while property rights distinguish between owners and non-owners (see Figure 2). Thus, the final beneficiaries have interest in a good implementation of the policy. In fact, once enacted a policy does not immediately produce homogeneous effects on all users effectively recognised as target groups. As such, a final beneficiary could have interest in pointing a competing user as a target group and asking the State to effectively apply the public policy to this particular user. As with property rights, public policies are rules that are activated by resource users in order to solve a rivalry.

Property rights are the second set of IR components. They grant ownership on goods to owners, as well as the legal capacity to benefit from the good owned. In institutional economics, property rights are usually defined as social relations between two or more competing users of the same natural resource. "[Property] relations between two or more individuals (or groups) have been defined by stating that one party has an interest that is protected by a right only when all others have a duty. It is essential to understand that property is not an object such as land, but rather is a right to a benefit stream that is only as secure as the duty of all others to respect the conditions that protect that stream." (Bromley 1991:22). Property rights are usually guaranteed by the State. These rights are secure as long as the duty of all the other (potential) users respects the conditions that protect the benefit stream (Bromley 1992: 2). Accordingly, the first virtue of property rights is to exclude non-owner and rival appropriators from the use of – goods and services derived from – the natural resource.

In IR analysis, we currently distinguish between formal property rights, disposition rights and use rights. Use rights are very specific rights that specifically determine who can or cannot use the resource with the purpose of producing particular goods and services. They constitute a bundle of rights associated with formal ownership or disposition rights. Disposition rights determine under which conditions an owner can appropriate (or not) the resource, or part of the resource, or transfer the resource to another appropriator either by selling it, giving it or putting it under a concession. Formal ownership rights give absolute control over the thing to the formal owner, i.e. the person who owns the formal title of property, including the right to destroy it. It encompasses the disposition and usage rights that are directly exerted on the thing or conceded to other users. Thus, property provides a bundle of rights on the thing owned that is absolute, exclusive and perpetual.

The water rights system determines the access and use of the natural resources. It evolves through time and problems, is modified by public policies, successive amendments and jurisprudence. When considering water, we are confronted with a particular type of property rights, which is land ownership. In Western Europe, water is subject to property, often attached with land. While the flow of water is considered public property and cannot be appropriated, property rights can be set on specific uses of this flow (e.g. the right to build a dam, the right to withdraw or to discharge). Furthermore, water can be privately appropriated in specific conditions (e.g. rainwater, springs, or groundwater in a certain extent). When considering property rights, we will only consider the *de jure* rights (versus *de facto*), i.e. the rights that are backed on a formal ownership title of or a legal recognition of the usage right.

The division between public policies and property rights is an analytical construction, as the border between both is not so obvious (Should we consider a discharge permit a property right or as a prescriptive instrument of public policy?). In any case, the IR allows a combined analysis of resource management, in a resource perspective. The implementation of public policies is actually confronted with (long-standing) property rights. Once distributed, property rights limit past and future public policies. An IR analysis shows the convergences and incoherences that exist between the different public policies and the property rights applied within a same resource perimeter, as well as the extent of the regulation, i.e. the extent to which all users are effectively considered in the regime. All the institutional rules included in the IR, be they property rights or public policies, are guaranteed by the State. All in all, the IR provides a kind of "tool box" available to the users for the resolution of rivalries. The activation process transforms "rules-in-forms" into "rules-in-use".

2. Reaching a Local Arrangement

Once the resource is scarce, competing resource users can fall into a situation of rivalry. In order to find a solution, they activate rules, or components of the IR, and confront them until a local arrangement is settled. The local arrangement is the set of decisions and actions deemed necessary to solve the rivalry. In this study, we consider the behaviour of resource users vis-à-vis other users in order to satisfy their uses and solve the rivalries in which they are embedded. When two users are placed in a situation of rivalry, the permanence of the one party's use of the resource is threatened by the other's.

1.1. Definition of a local arrangement

The local arrangement is a set of decisions and actions taken with the intention to solve the rivalry. It is the result of a process initiated by the users themselves. With the local arrangement, the users consider the rivalry to be solved. This does not mean that the problem,

of resource depletion for instance, is objectively solved. Rather, it means that the users are either satisfied with the new arrangement or complain they have to conform to it. In fact, the local arrangement takes different forms. It is a kind of agreement, more or less consented or agreed on by the users, that implements an adjustment in the distribution of the resource, and consequently announces a change in the users' behaviour with the aim of solving the rivalry. This process of activation of rules mobilises components of the IR. Either one user invokes the application of a rule to a public authority — in this case the decision is taken by the State and imposed to the other user — or the two users decide to negotiate voluntarily. Their bargaining power depends on the legal strength of the rules that they respectively invoke.

Even if the local arrangement can take tangible forms (e.g. a convention on water releases from a dam, a court decision that condemns one user for failure to respect his discharge permit, a voluntary agreement for the preservation of an aquatic eco-system, the delivery of a discharge permit, the acquisition of a protection perimeter around a water catchment, or the adoption of a navigation regulation), we chose to contain our representation of the local arrangement within two attributes: the degree of coercion of the agreement and the distribution of costs between users. The degree of coercion allows to see if the users succeed in negotiating the arrangement between them, or rather if this arrangement is necessarily imposed from outside, most frequently by the State. The distribution of costs informs about the way users bear the net costs of the arrangement. The arrangement is equal when the costs are equally supported by the users involved in the rivalry or fully externalised, and redistributive when one single user bears the costs. The combination of these attributes leads to four ideal-typical forms of local arrangement: bilateral arrangement, consented arrangement, compensatory arrangement and arbitration arrangement. Before detailing these different forms of local arrangement, we will first specify the meaning of the attributes. It is also important to point out that a local arrangement is a micro-level arrangement, even if it results from activations of rules at multiple levels.

The choice of attributes that characterise the local arrangement is influenced by the idea that actors are moved by both the institutions and their interests (Scharpf 1997). We represent the weight of the institutions by the degree of coercion exerted on the users and the interests of those by the cost that the local arrangement represents. The first attribute of the local arrangement is the degree of coercion of the arrangement. Is the arrangement voluntary or coercive? The degree of coercion corresponds to the obligation to accept the local arrangement². The choice of the attribute of coercion is borrowed from T. Lowi (Lowi 1972). Lowi spread the idea that public policies were not only a consequence of the decision-making process, but also determining in the modalities of the decision-making process ("policy determines politics"). He stated that the form and intensity of coercion exerted on the actors by the public policy determines their mobilisation. "Different ways of coercing provide a set of parameters, a context, within which policies take place" (Lowi 1972: 299). Lowi stressed the importance of the targets of coercion, coercion being either concentrated on one particular group of users, or being more diffuse. Measuring the degree of coercion is thus relevant when considering the influence of institutions.

A coercive arrangement is imposed by the State, and not by any other user, simply by force or persuasion. A typical coercive arrangement is a court decision. We acknowledge that State coercion can take more indirect forms, e.g. the activation of property rights can convince a user to withdraw from the rivalry without the State needing to intervene, but we retain only

² And not necessarily the constraint to respect the terms of the arrangement in the implementation phase.

direct State intervention in coercive arrangements. By contrast, voluntary agreements are related to negotiations and private arrangements. In this case, no user is constrained by a State decision to accept the arrangement. He accepts, even if he is not fully satisfied with the arrangement or acts under pressure or moral constraint. As such, a voluntary agreement is consented by both users; each party takes the decision to accept it. Typical voluntary agreements are conventions (e.g. a convention about minimum flows between a dam manager and a fishing association) or a transfer of titles (e.g. sale of land in order to protect a water catchment or to create a nature reserve). Even if they do not necessitate a State decision, it is important to notice that they always occur in the "Shadow of the State": "[In any] case, state law regulates the institutional settings within which such negotiations take place and assures the binding force of negotiated agreements" (Scharpf 1997: 200). The State guarantees property rights as much as public policies.

The second attribute of the local arrangement is the distribution of costs. We look at how the costs of the local arrangement are distributed between users. By costs, we mean not only the financial cost of the implementation of the arrangement, but also the costs related to the alteration of the use (e.g. costs of conforming to a more restrictive discharge permit, limitation of harnessing, suppression of use, loss in value of the property title, payment of a compensation to continue to exert one's use). Costs represent either a limitation of the 'benefit stream' related to the property title for an owner, or a financial burden for a user that is a non-owner. Only net costs are considered. By net costs we mean the difference, for each user, between the potential costs and benefits of the local arrangement. We balance the net costs of each user in order to determine who wins and who loses in the local arrangement. The use of costs as the second attribute of the local arrangement is derived from J. Wilson (Wilson [1979] 1986). Like T. Lowi, Wilson attempts at explaining the differences in the decision-making processes according to the specificities of the public policies under adoption. To his mind, the determining factor is the distribution of costs and benefits among the actors. "Politics is in large measure a process of raising and settling disputes over who will benefit or pay for a program and who ought to benefit or pay" (Wilson [1979] 1986: 429). As a consequence, he postulates that the decision-making process of policies varies according to the concentration or diffusion of costs and benefits for the actors involved. The importance of costs in the resolution of rivalries is also pointed out by R. Coase: "The problem which we face in dealing with actions which have harmful effects is not simply one of restraining those responsible for them. What has to be decided is whether the gain from preventing the harm is greater than the loss which would be suffered elsewhere as a result of stopping the action which produces the harm" (Coase 1960: 27). This assumption brings us to the idea that the allocation of costs in a local arrangement is a key question in the resolution of the rivalry. Ostrom also sheds light on the calculation that users make in a situation of rivalry about the costs and benefits of a resolution: "To explain institutional change, it is therefore necessary to examine how those participating in the arenas in which rule changes are proposed will view and weight the net return of staying with the status quo rules versus some type of change" (Ostrom 1990: 142). The determination of individual strategies in an institutional arrangement is influenced by the importance of expected costs and benefits. The arrangement must provide gains when change is implemented.

We distinguish in the distribution of costs between an equal and a redistributive arrangement. Equal costs do not imply any form of redistribution between the resource users. They cover two situations. In one case, costs are shared equally between both users (e.g. an environmental association purchases a parcel from a farmer in order to stop drainage and creates a wetland). In the second case, none of the users shares the burden of the local

arrangement. Costs are externalised, either to the community or more strictly to other resource users (e.g. the public financing of an industrial treatment plant, or the transfer of the responsibility of the pollution to a larger group of users than in the initial rivalry). As such, the parties in rivalry either share the costs or externalise these costs. Costs may also be redistributed between both parties of users. This means that a significant share of the total costs of the local arrangement is attributed to one of the two users. A redistributive arrangement clearly designates a winner and a loser. For instance, it happens in a situation where a farmer must stop drainage in compliance to a law on the protection of wetlands and loses one parcel for crop production. This arrangement benefits the environmental association that claimed the respect of this law. In the local arrangement, the farmer loses from the environmental association. Thus, the distribution of net costs is the second attribute of the local arrangement, the first being the degree of coercion. When combining these two attributes, we obtain four categories of local arrangements.

The local arrangement is appreciated by means of two attributes (see Table 2). We distinguish bilateral arrangements from compensatory arrangements, consented arrangements and arbitration arrangements. The first one, i.e. the bilateral arrangement, results from an equality in the distribution of costs between both resource users, settled in a voluntary agreement. Users negotiate and share the costs of the arrangement. With equal costs, we also consider that they can arrange to externalise the burden of the arrangement, for instance by enlarging the perimeter of the rivalry and involving more users. For instance, a bilateral arrangement could consist in a transfer of property titles or a convention. Users have not much difficulty in reaching the agreement as the distribution of costs is considered to be equitable or costs are not borne by them. A bilateral arrangement is a voluntary agreement and does not necessitate the intervention of the State.

Table 2: Ideal-Typical Forms of a Local Arrangement

	<i>Voluntary</i>	<i>Coercive</i>
<i>Equal costs</i>	Bilateral Arrangement	Compensatory Arrangement
<i>Redistribution of costs</i>	Consented Arrangement	Arbitration arrangement

When a voluntary agreement implies a redistribution of costs, we call it a consented arrangement. In this case, one user consents in bearing much of the costs of the arrangement. That is to say, the loser freely accepts being a loser. This kind of outcome is possible when an actor is in such a weak bargaining position that he has no alternative but this agreement³. We suppose that the loser, however, makes a relative gain in regard to the status quo situation of rivalry. For instance, this arrangement occurred between two communities of irrigators along the Matarraña river in Spain, where the one at the tail-head had enough water and controlled the flow, and the other at the tail-end lacked water. The latter asked for the construction of a dam and, eventually, was compelled to accept a smaller dam than initially expected. This

³ In other words, we could say that the user has a weak BATNA (Best Alternative To a Negotiated Agreement) (Holzinger 2001).

minimalist solution did not bring them much benefit, but it was simply better than nothing at all (Subirats, Font and Costejà 2002). As such, we imagine that users in a situation of rivalry can consent to an unfavourable arrangement when they suffer from the status quo and have no better alternative.

When users do not reach an agreement, they turn to the State. A State intervention leads to a coercive decision that settles the litigation. This brings us to two other types of local arrangements that differ in the way costs are distributed between users. When costs are equally distributed between users, the arrangement is compensatory. In this case, costs are externalised to the State. The State (financial) intervention compensates the user that suffers a loss or finances technical measures that overcome the rivalry. For instance, the State builds a new aqueduct to supply irrigators located at the tail-end of a stream or compensates a landowner for the passage of a drinking water mains under his parcel, which supplies a village. The intervention of the State externalises the costs of the local arrangement and as such resolves the rivalry. It finances the resolution.

When a coercive decision of the State is not accompanied by a financial compensation, and consequently redistributes costs between users, we talk about an arbitration arrangement. The State settles the litigation with a decision of authority; it arbitrates between the parties. One loses and the other wins. In condemning the attitude or behaviour of one of the users, the State provokes a redistribution of costs between the parties. For instance, court decision condemns an industrialist for the failure of compliance with his discharge permit, and prohibits any further direct discharge into the river, a decision that benefits a leisure centre located downstream. The activity of the industrialist is deplored and he must finance the conformation measures that will solve the rivalry. Being hit by the coercive decision, one of the users bears the costs of the local arrangement. He is compelled to conform to the decision at his own expenses. The access to and use of the resource are redistributed between users through a decision of authority.

Local arrangements can take different tangible forms, e.g. a court decision, a public investment in infrastructure, a convention between landowners, but we chose to classify them according to two attributes, the degree of coercion and the distribution of costs. In short, either the users reach an agreement, or the State, as the guarantor of the rules, directly intervenes in the rivalry. We consider that the imputation of costs between the users is the cornerstone of a voluntary agreement. No agreement can be reached without prior consent on the distribution of costs. State intervention either takes the form of a financial intervention or a decision of authority. Nevertheless, a local arrangement is only reached once rules have been acted on and confronted by users in rivalry.

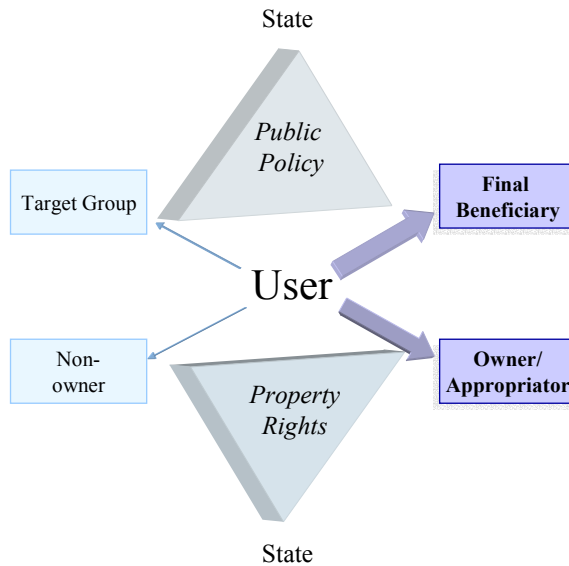
1.2. Confrontation of rules

Resource users in rivalry activate rules, either property rights or public policies, in order to reach a local arrangement. The local arrangement is the outcome of a process of confrontation of rules. More precisely, our theoretical assumptions insist on the process of confrontation of rules once they are activated. We retain two ideal-typical actor confrontations, i.e. a confrontation between two owners and a confrontation between an owner and the final beneficiary of a public policy.

Users activate rules in order to reach an outcome. We do not formulate hypotheses about the process of activation, but only suppose that the holder of a property right will activate this property right and that the final beneficiary of a public policy will activate this policy. In the process of resolution of rivalry the user initially asserts his rights on the resource (use)

towards the other user. To this end, he activates components of the IR that protect his use. When a user intends to defend his position in a rivalry, he has the choice between one or more rules (components of the IR) available. He activates the rules that protect and legitimise the use he makes of the resource. In fact, we consider that he activates rules that recognise his use positively and that respectively stigmatize or condemn the use of the competitor. The activation of rules gives a status to the resource user and legitimises his use.

Figure 2: Effects of the activation of rules on the designation of the user



The user is characterised according to the rules he activates (see Figure 2). He is an owner when he activates a property right (e.g. a farmer activates his property title on his field and accordingly claims the free disposition of this field in order to maintain his current use). Correspondingly, the other user is rejected into the category of the non-owner, which makes him excludable from the resource access. The same goes for public policies. The user activates the public policies that benefit him (e.g. an environmental association claims the prohibition to drain wetlands in protected areas against farmers). Once the public policy activated, the user is recognised positively as a final beneficiary of the policy. As such, he is in a position to claim that the competing user, considered a target group, must change his behaviour in a way that respects the prescriptions of the public policy. We postulate that a user activates property rights when he owns a title on the resource (use), be it a formal property title, a disposition right or a use right. The property right activated recognises his (more or less exclusive) right to use the resource and guarantees the continuity of this use. Respectively, a user activates a public policy when this policy recognises him as a final beneficiary and consecutively entails the competing user (as a target group) to change behaviour to his own advantage. In the activation, the user makes a selection between rules in favour of those property rights that recognise him as an owner (and respectively his competitor as a non-owner, i.e. an excluded third party), or public policies that identify him as a final beneficiary (and respectively his competitor as a target group).

In a rivalry, resource users confront one another with competing rules. The result of this activation leads to different configurations of users' confrontations. As each user activates either a property right or a public policy, this leads to three configurations, i.e. property right against property right, property right against public policy and public policy against public

policy. We will not consider the last configuration, as our focus is clearly on IRs that explicitly consider property rights⁴. In a configuration of property rights against property rights (PR versus PR), two owners are confronted. This confrontation of different property rights (e.g. the appropriator of a water catchment in a dam reservoir opposes the dam owner that releases too much water for hydro-electricity production) is close to the situation of a neighbours' dispute, notably described by Coase (Coase 1960). This configuration also corresponds to situations where an owner is reminded of the obligations related to his property title (e.g. the obligation for a landowner to maintain the flow of a spring when it supplies a village downstream) or where a new entrant wants to purchase the property of an established user in order to change the destination of the property (e.g. an environmental association that purchases a field with the aim of transforming it into a nature reserve). This configuration of property rights against property rights confronts owners or (potential) owners.

The second configuration of confrontation is property right against public policy (PR versus PP). It corresponds to situations where the final beneficiary of a public policy has difficulties in obtaining recognition of his use against a recalcitrant owner (e.g. an ornithological association claims the respect of a law about the preservation of wild birds' habitats towards a landowner who intends to drain a wetland on his field). In this case, dispositions of public law enter into contradiction with dispositions of private law. The effective implementation of the public policy is challenged by the guarantees given to the owner by his property rights.

As such, our conceptual framework proposes to study the influence of such a configuration of confrontation of rules on the outcome of the process of rivalry resolution, i.e. the local arrangement. The local arrangement should differ given the initial configuration of confrontation. In the configuration PR versus PR, users claim property rights that guarantee their uses. Possibly, they can exchange these property rights or decide to share out the use of the resource. We consider that two owners can always find some common ground, given the possibilities that property titles give to externalise costs to third parties. Whatever the situation, we imagine that no owner wants to bear the costs of a resolution to a rivalry alone. Competing owners either share the burden of the local arrangement equally, or get out of these costs. Such considerations bring us to the first hypothesis, which is: *H₁: If two owners confront, then the rivalry is solved through a bilateral agreement.* We consider that two owners resolve their rivalries in reaching agreements on the sharing of the burden of the costs. The arrangement is voluntary and the redistribution of the costs is equal. Between owners, an agreement is thus necessary for the rivalry to be solved.

In the second configuration of confrontation, one user has activated a property right and the other a public policy. An owner defends his rights on the resource with his property titles against another user who claims a usage right on the resource that a public policy endorses for him. The implementation of the public policy questions the validity of the property title, or at least, the extent of the bundle of rights associated with this property title. How could an owner accept the weakening of his property title? We formulate the hypothesis that an owner cannot modify his use of the resource without being compensated for the loss that such a change in behaviour implies. There is no redistribution of costs to the disadvantage of an owner. Given the protection of property at the constitutional level and the strict conditions of expropriation, a financial indemnity from the State to the owner is necessary to effectively

⁴ Furthermore, this PP versus PP configuration of confrontation has already been covered in depth by policy analysis.

apply a competing public policy, and consequently solve the rivalry. The owner has no reason to accept a local arrangement that is detrimental to his use, without being compensated. As such, this configuration of confrontation leads to a resolution of the rivalry only if the owner does not bear the cost of the arrangement. The State is compelled to intervene in order to implement the policy. As no user accepts the cost of the arrangement, certainly not the beneficiary of the public policy, it compensates the owner. This hypothesis is formulated accordingly: *H₂: If an owner confronts with the final beneficiary of a public policy, then the State must provide a financial compensation to the owner for his loss of property.* In this configuration of PR versus PP, a compensation arrangement is necessary to solve the rivalry. Even if the arrangement is considered as coercive, the State intervention is mainly financial and aims at avoiding a redistribution of costs at the detriment of the owner in the resolution process.

Our conceptual framework proposes to explain how (heterogeneous) resource users succeed in solving rivalries within industrial societies characterised by complex institutional resource regimes. The hypotheses are as restrictive as possible. They only consider the first best choice in the activation of the users. It is possible that the users do not activate the more evident rule for strategic reasons. We can imagine, for instance, that an owner rather activates favourable public policies in order to provoke a different legal arrangement. But for the moment, we only attempt at showing the kind of configuration obtained once the users have activated the rules influencing the type of local arrangement reached to solve the rivalry. The related hypotheses are tested with four empirical cases located in Belgium and Switzerland.

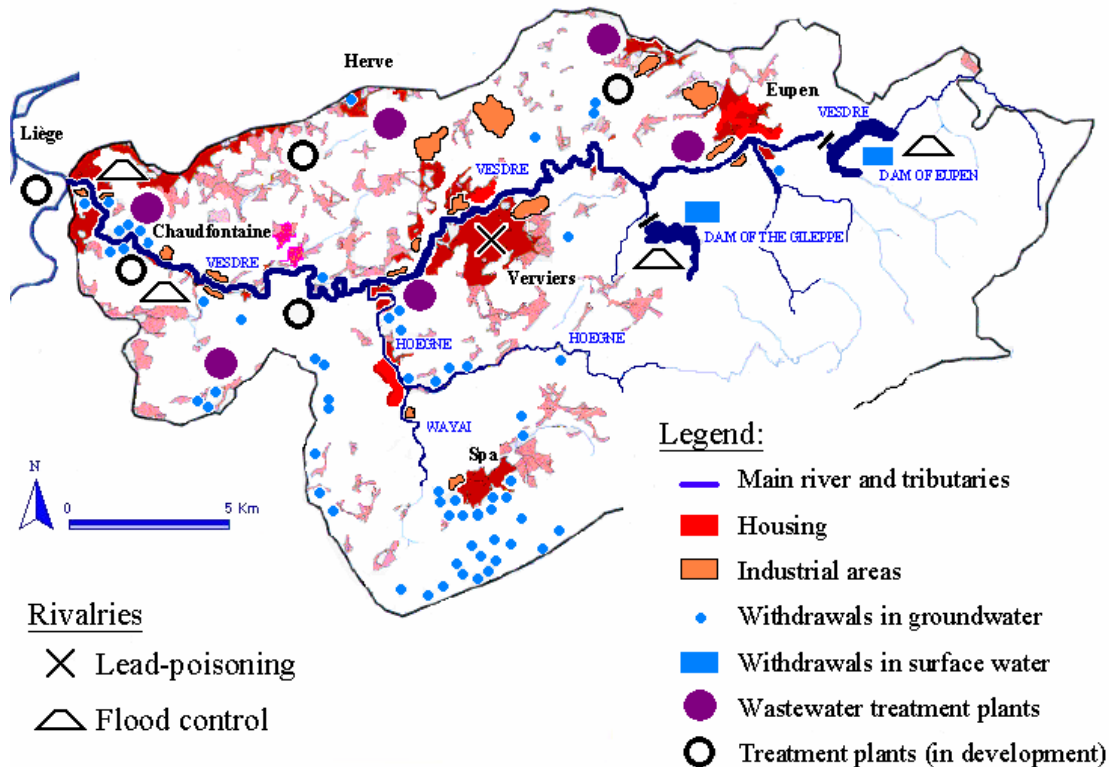
3. Resolutions of rivalries in the Vesdre basin and Val de Bagnes

The case studies below are the result of qualitative research based on primary and secondary documents, completed with semi-structured interviews with the actors. Studies were conducted between 2001 and 2003 in the Vesdre basin in Belgium and the Val de Bagnes in Switzerland.

1.1. Vesdre river basin

The Vesdre river basin is located in the north-eastern part of the Walloon Region in Belgium, at about 100 km from Brussels. It occupies a surface area of 710 km² and has a population of 210,000. The river Vesdre has its source inside the basin and flows into the Meuse. Water is naturally acid at its source. The relief inside the basin is mountainous and landscapes are varied. Rainfall is significant (800-850 mm), particularly in the south-eastern part (1200-1400 mm), and influences the water flow (10.5 m³/s. on average, with peaks at 2 m³/s. and 165 m³/s.). Nearly half the territory is covered by forests. Housing and industry are concentrated along the river Vesdre, particularly between Verviers and Liège. Farming activities, located in the North, are extensive and have a low impact on the water quality. The river Vesdre is particularly polluted, with industrial and domestic discharge being the main pollution sources. Its industrial past caused damage and concentrated the population along a narrow perimeter (see Map 1). Drinking water is mainly produced from surface water within the two dams of the Gileppe and Eupen.

Map 1: Localisation of the rivalries in the Vesdre river basin



Water management in the Vesdre basin is mainly organised at the federal and regional levels. Belgium has been a federal state since 1993. The competence in water management is entirely devolved to the Regions, but the property rights are still defined at the federal level, in the Civil Code. The institutional water regime in the Vesdre basin covers all the current water use but the different sectoral rules regulating use are not systematically coordinated. Concerning property rights, surface water is under public domain but parts of it can be privately appropriated (when withdrawn, for instance). Groundwater, springs and rainfall are private water belonging to the landowner. In fact, water ownership is tied to land ownership in most settings. Concerning public policies, many regulations have been adopted concerning surface water quality (e.g. discharge permits and taxes), the protection of aquifers (e.g. withdrawal licenses and protection perimeters) or the practices of recreational activities (e.g. fishing, canoeing or bathing). We observe, however, that there are no well-developed public policies concerning the management of dams and flood control. In the Vesdre basin, we retain two cases of rivalries: lead-poisoning in Verviers and floods in the lower valley.

1.1.1. Lead-poisoning in Verviers

In the town of Verviers, a localised rivalry between the distribution of drinking water and industrial water gave rise to a conflict in the mid-1980s. Citizens of Verviers opposed the municipality (as water supplier), claiming that tap water should conform to European standards. Raw water comes from the dam of the Gileppe and is not treated. Moreover, this water is naturally acid and attacks the lead water pipes. As a consequence, water consumption in Verviers has led to lead-poisoning for more than a century. The same water supplies industry. Industrialists find the acidity of the water beneficial to their processes, due to its cleansing properties, e.g. for washing pipes, wool and paper. They did not want any change to

this specific quality. Thus it was necessary to reconcile drinking water production and industrial supply.

The problem of lead-poisoning appeared in the late 19th century and has been well known since then. Initially, the provision of a booming wool industry was enhanced thanks to the construction of the dam in 1878. The right of withdrawal from the dam reservoir belonged to the commune of Verviers, which distributed water to industry. The population soon demanded a connection of the houses to the raw water mains, which the municipality implemented. Drinking water was not treated. For years the status quo persisted because of diverging interests and a poor knowledge of the nature of the contamination. In the 1970s concrete scientific proof of the contamination was established. The first project for a drinking water treatment plant was planned in 1977 by the national administration, but was postponed several times. The municipality was not able to finance such a plant. Moreover, industrialists were reluctant to a change in the acidity of the water and exerted pressure on the municipal council.

The conflict itself appeared between the municipality and an association of local citizens at the beginning of the 1980s. The citizens were annoyed by the poor quality of the water, not only about the well-known problem of lead-poisoning, but also about the colour and taste of the water. They decided to sue the municipality in 1984, their action being based on the European directive on the quality of drinking water (European Communities 1980). Belgium adopted the directive in 1984, but did so badly: it included a specific exemption on lead concentration for Verviers. The association won the case on appeal in 1987. In parallel, it also referred the matter to the European Commission, a claim that ended up with a condemnation by the EU Court of Justice in 1990 for the failure of Belgium to implement the directive.⁵

The municipality committed itself to introducing modifications. As a result of the case-law, the *Entreprise régionale des Grands Transports d'Eau* (ERPE), as part of the Walloon Region, provided a temporary solution. It modified the source of supply by connecting the drinking water mains to the Eupen dam⁶. At the same time, ERPE was building a drinking water treatment plant, which finally came into operation in 1992. Concerning the complaint of the industrialists, a technical arrangement safeguards their supply of raw (and acid) water.

Ultimately, the public health concern was taken into account without inducing any redistribution to the detriment of industrial uses. The rivalry occurred between two groups of users, the drinking water consumers on the one hand, and the industrials on the other hand. The drinking water consumers activated a public policy that prescribes new drinking water standards. They are the final beneficiaries of the policy, the target groups being the drinking water suppliers who must conform to the standards, whatever the cost. On the other hand, the industrials used to argument of a historical usage right on the water mains given by the municipality of Verviers, which is also the drinking water supplier. They did not accept any change in the quality of (acid) water. The configuration of the confrontation is then property rights against public policy. It led to a compensation arrangement, where the State was not only in charge of the construction of the drinking water treatment plant, but also provided a

⁵ Case law C-42/89 of 5 July 1990.

⁶ However, this arrangement only covered 80% of the population. The situation was left unchanged for 10,000 people in the poorest part of the town, until the necessary drinking water treatment plant should enter into operation.

technical solution that kept the quality of industrial water unchanged. The resolution of the rivalry was possible as soon as this technical solution was found.

1.1.2. Water floods in the lower valley

Water floods in the lower part of the Vesdre created a rivalry between drinking water production and protection against floods. The rivalry was caused by the two dams of Eupen and the Gileppe, which retain water upstream in the basin. The dams were built to satisfy growing needs for industrial and drinking water. In case of major winter rainfall, when the dams are full, the manager of the dams, presently the *Ministère de l'Équipement et des Transports* (MET) (formerly the Ministry of Public Works), commonly proceeds to release for safety reasons.

The MET is confronted with a dilemma in the management of the dams. On the one hand, they have to retain water in order to assure the security of the drinking (and industrial) water supply. On the other hand, they must guarantee the safety of municipalities downstream in case of major rainfall. During periods of heavy rainfall, the dam reservoirs reach their maximum capacity and it becomes dangerous to store more water. In fact, the downstream part of the Vesdre basin is regularly flooded due to water released from the dams of Eupen and the Gileppe. People and communes downstream, notably Chaudfontaine, systematically complain to the MET.

The MET found a technical solution to the problem in 1985. They recalculated the mathematical model that helps to manage the filling of the dam reservoirs. They took all the potential users into account. In order to do so, the MET came to the ERPE and asked if they would be ready to face possible shortages in years of exceptional drought. The ERPE, as the drinking water producer, was the main user of the water. As they were observing a stabilisation in consumption, they consented to the recalculation of the model. As a result, the two actors assumed the risk of water shortages in drought periods, to the advantage of the population downstream who suffered the effects of the regular flooding. The MET reduced the maximum filling level and created a reserve of two million cubic meters in case of major rainfall. The dams no longer threaten the downstream part of the Vesdre. Surprisingly, collaboration resolved the problems in the basin, despite the absence of a regulation of dam management and flood control. The arrangement is supported by the consent of the manager of the dams, who has the full capacity to influence the disposition rights to water stored in the reservoir.

The resolution of the rivalry comes with the redistribution of the water resource between the different uses involved. The main users in the rivalry are the municipality of Chaudfontaine, representing the victims, and the drinking water producer, ERPE. The inhabitants of Chaudfontaine are riparian landowners along the Vesdre and suffer a blow to their property because of the regular flooding. The ERPE benefits from a disposition right on the dam reservoir. It is not directly responsible for the water release, but is primarily interested in the fulfilment of the reservoir. The configuration of confrontation is PR against PR. The solution brought to the rivalry is a bilateral arrangement that is mutually agreed upon between users and that shares the costs (and risks) between users. In this case, the attitude of the MET is determining. They play the role of policy broker between the two (direct and indirect) users involved and proceed to the redistribution of costs between them.

The resolution mechanisms have little in common. In Verviers, the enlargement of the uses of water coming from the dam implied a new infrastructure, but no change in former practice. The conformity of drinking water to the public health standard was achieved without

modifying the previous industrial use. Concerning the floods, the solution was not brought about by recourse to the law, as in the first case. The owner of the dam arbitrated between the different users in the distribution of the uses.

1.2. *Val de Bagnes*⁷

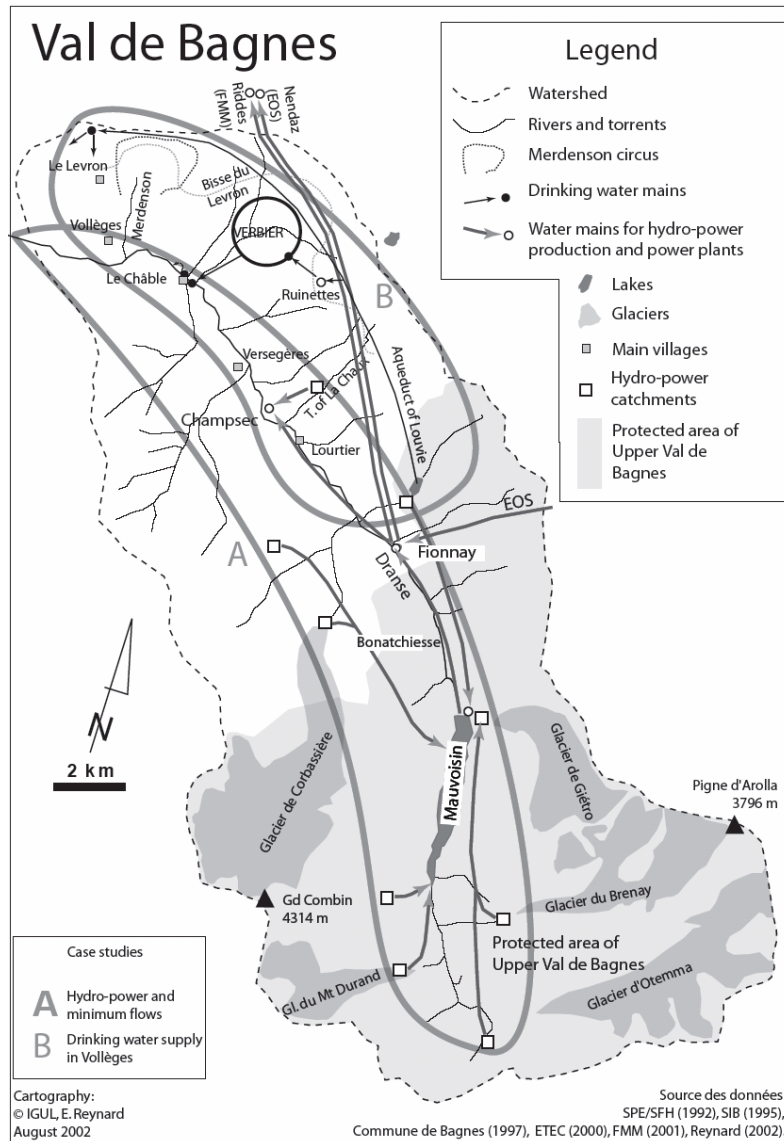
Val de Bagnes is located in the upper Valais canton in Switzerland. The main river of this tributary basin, the Dranse, flows into the Rhône in Martigny. The region is mountainous, surrounded by some of the highest peaks (Grand Combin, alt. 4,314 m, and Pigne d'Arolla, alt. 3,796 m) and larger glaciers of the Alps (Giétro, Corbassière and Otemma). The Dranse is a 30 km long mountainous river that drains a watershed of 300 km² with an average altitude of 2,500 m. It has an average flow of 2.32 m³/s. with a maximum in June (5.23 m³/s.) and a minimum in January (0.69 m³/s.), a flow highly influenced by the dam of Mauvoisin, located in the upper valley, and having been divided by four since its entry into operation (11.4 m³/s. in average before 1956). The hydro-power plant discharges water directly into the Rhône, in the neighbouring valley⁸. The Dranse's current flow is mainly fed by a series of small springs and tributaries. The dam reservoir has a capacity of 210mio m³. Most of the upper valley is permanently under the ice and of course uninhabited. The population is located in the lower valley in the two villages of Bagnes and Vollèges. The permanent population is 7,500 inhabitants, but reaches peaks of up to 30,000 in winter due to tourism in the ski resort of Verbier.

The main economic activities are tourism, farming (stock breeding) and hydro-power production. Hydro-power production is the greatest water consumer, with three-fourths of the natural water input retained and directly discharged outside the valley. The drinking water supply has long been a preoccupation in Vollèges, which lacked a major spring for supply, and later with the tourist development in Verbier. The construction of the aqueduct of Louvie, inaugurated in 1967, solved the problem. The conservation of nature and landscape remains a preoccupation of the locals. The rivalries identified necessarily concentrate around the dam of Mauvoisin. They concern the raising (or heightening) of the dam and drinking water supply in Vollèges. As in the Vesdre basin, the institutional water regime in Val de Bagnes is complex. Switzerland is a federalist State. Competencies in water management are shared between the Confederation and the canton, even if local autonomy remains important. The IR covers most potential water uses. Property rights are quite similar to those in Belgium, with the notable exception that rivers are the properties of the communes. Public policies concerning dam management and ecological protection of rivers are more developed than in the Vesdre region.

⁷ Many thanks to Emmanuel Reynard, who is the author of the initial case studies of the Val de Bagnes. This study was conducted in the framework of the project called Comparative Analysis of the Formation and Outcomes of Resource Regimes in Switzerland (IRM), financed by the Swiss Science Foundation (Reynard 2004; Reynard and Mauch 2003).

⁸ Shrouded water mains get under the hills.

Map 2: Localisation of the rivalries in Val de Bagnes



1.2.1. Heightening of the Mauvoisin dam and the question of minimum flows

A first rivalry occurred about the release of a minimum flow downstream the dam. When the *Forces Motrices de Mauvoisin* (FMM) decided to heighten the dam in 1986, environmentalists opposed the project and claimed the implementation of minimal flows. Environmentalists, mainly the World Wide Fund for Nature (WWF), had long claimed minimal flows in Switzerland⁹. Locally, the case of the Dranse was really striking, because

⁹ E.g. pressure in favour of the adoption of art. 24bis of the constitution of 20 June 1975 (FF 1975 II 97), which introduces the principle of the qualitative and quantitative protection of water, and gives the possibility to the Confederation to adopt dispositions about the maintenance of suitable minimum flows. This commitment is repeated during the elaboration of the Federal Law on Water Protection (LEaux of 24 January 1991), which is a contemporary of our case study. The LEaux, and in particular its art. 80, requires cleansing measures that eventually impose a restitution of minimum flows to the hydro-power installations, without any compensation.

the river does not flow anymore immediately downstream the dam. The flow recovers with the first torrents coming in as tributaries¹⁰. This absence of input from the Dranse has consequences on the eco-systems all along the valley. The river flow has diminished by four (from 10 m³/s. to 2.5 m³/s.) with the construction of the dam. This limits fish life and the development of fauna and flora all along the banks. What also makes the case exemplary is the fact that water turbines discharge the flow outside the basin in the neighbouring valley of Riddes. At last, the motivation of WWF is not only local. The association tries to create a precedent on dam management and minimum flows.

The question of minimum flows was not a topic when the Mauvoisin dam was built. The project of the dam dates back to 1945 and foresaw absolutely no minimum flows. A local engineer, Albert Maret, conceived a first project and obtained a concession from the commune of Bagnes that allowed him to catch the waters for hydro-electricity production. Rivers in Switzerland are the properties of the communes. As such, in order to build the dam, it is necessary to get the concessions from all the communes having a right on the river. The other communes, Vollèges for instance, conceded their disposition rights in 1947. The concessions are given for a length of 80 years. In 1949, Maret transferred his project to FMM, which carried out the work and has managed the dam since its entry into operation in 1957. When FMM decided to heighten the dam by 13.5 m in 1986, they did not need to re-negotiate the concession, as they do not catch more water. The raising of the reservoir's capacity was decided to retain water longer and produce an additional 100mio kWh in peak periods in winter. However, as any construction work, the project of dam heightening was submitted to an impact enquiry on 22 August 1986, with a consultation open to all concerned persons.

During the impact enquiry, WWF manifested their opposition to the project. They argued that, as any new dam construction, this project required a minimum flow of water back to the river, according to the Cantonal Law of 1957 on hydraulic forces. This opposition was based on the activation of the Federal Law of Nature Protection (LPN) of 1966, which grants a legal recourse to environmental associations. All associations and municipalities progressively removed their opposition to the project. Only WWF stood by their position. Bilateral negotiations were set up between WWF and FMM. FMM was put under pressure to consider the position of WWF, as the environmental association lodged recourse to the Federal Court. FMM wanted to go fast and preferred to negotiate rather than lose time and energy in a trial. The negotiations ended with a convention signed on 5 October 1988. FMM agreed to convert a 3 ha plot of land into and hydro-biological site in Bonatchiesse and to leave a minimum flow of 50 l/s downstream the dam of Mauvoisin that would irrigate the site.

The solution was obviously symbolic if compared to the flow of the Dranse at the Châble (2,500 l/s.) or the size of the dam reservoir¹¹! In any case, WWF was satisfied with the agreement. They obtained the precedent they desired, and knew that this convention guarantees that the question of minimum flows will not be evacuated from the upcoming concession renewals. On their part, FMM brought no technical change to the dam, as the minimum flow comes from a diverted torrent and not directly from the reservoir. They quickly started heightening works, in a context of increasing competition on the electricity

¹⁰ The Dranse is reconstituted in Bonatchiesse, i.e. 3 km downstream the dam.

¹¹ On the ecologic side, the results are disappointing. Due to the porous nature of the ground, the minimum flow is entirely absorbed. Furthermore, the hydro-biological site of Bonatchiesse was partially destroyed by a flood in 2000.

market. The resolution of rivalry was a voluntary agreement that does not imply huge costs for FMM¹². Nevertheless, the rivalry was solved at the detriment of FMM, even if the arrangement was voluntary. We can talk of a consented arrangement. The users reached the agreement by activating, on the side of FMM, a disposition right on the resource, through the concessions, and, on the side of WWF, a public policy that grants a right of recourse to environmental associations in case of an impact enquiry. Both parties got satisfaction from the arrangement, at little cost for the owner.

1.2.2. Drinking water supply in Vollèges

Drinking water supply came into rivalry with hydro-power production. In fact, this rivalry occurred at the moment of the construction of the dam of Mauvoisin, but only revealed its importance in the 1960s when drinking water demand increased. The commune of Vollèges started negotiating about the concessions for hydro-power production to obtain a drinking water mains that supplied the commune. As such, they succeeded in solving the long-standing problem of water supply in the commune.

When FMM (or Albert Maret at this time) negotiated the concession contracts with the communes of Val de Bagnes, Vollèges activated its secular and perpetual rights on the torrent of *La Chaux*, granted by Bishop Josse de Silenen in 1492. Water supply in Vollèges has always been a preoccupation. Due to its specific location and poor geological conditions, Vollèges has no water springs, the Dranse flows below the village and has a poor quality in downstream Bagnes villages. As such, the commune has always sought for water resources abroad. Upon obtaining its usage rights on the torrent of *La Chaux*, it constructed a small canal, the *bisse du Levron*, encroached on the hills and conveying water to the upper part of Vollèges. This *bisse* was regularly broken down in its end part because of soil instability (Merdenson circus) and finally abandoned in 1923. The *bisse* was mainly used for irrigation purposes. One must keep in mind that irrigation necessitated a gravitational flow as water pumping (e.g. in the river below) was too costly in the 1950s¹³. In the 1940s, irrigation was the main concern for Vollèges as the boom in domestic water consumption had not occurred yet.

The project of a hydro-power installation raised hopes in Vollèges. The commune sought a connection to the water mains of the hydro-power plant that would supply water to the village. It activated its perpetual rights on the torrent of *La Chaux* and asked for this connection in compensation for the concession of its rights during negotiations with Albert Maret. Maret accepted the demand and the resulting convention foresaw a connection to the mains of Mauvoisin-Riddes at 1,650 m alt., conveying 150 l/s. of irrigation water during 90 days/year for free to Vollèges and 12 l/s. of drinking water all the year. In fact, the issue at stake was not the preservation of the flow in the torrent of *La Chaux* — the dam collection system does not even pump in it — but the consent of Vollèges on their portion of the Dranse.

The connection to Vollèges was not immediately carried out for technical reasons. In fact, when FMM took over Maret's project, they modified the plans in order to improve the capacity of the installation, and made a half-landing with a first set of turbines in Fionnay,

¹² In the context of art. 80 of the Federal Law on the Protection of water (LEaux), FMM told the Valais canton that they would not accept further water releases without compensation (Reynard and Mauch 2003: 235).

¹³ Nowadays, the aqueduct of Louvie is not used anymore for irrigation purposes. Farmers of Vollèges use a sprinkling or drench system that works with water withdrawn from the torrents.

before sending water from Riddes to the second set of turbines. As a consequence, the mains was too low to allow a gravitational flow to Vollèges, as initially expected. An alternative was offered. In fact, the inauguration of the dam in 1957 coincided with a high demographic expansion in the valley, particularly due to tourist development in Verbier, located on the territory of the commune of Bagnes. Bagnes, as well as Vollèges, feared drinking water shortages. The two communes signed a convention in 1960 about the exploitation of the Louvie lake (which was more like a marsh at this time), located just above Fionnay. The project consisted in building a small dam with a reservoir capacity of 370,000 m³ and connecting it to a water mains in direction of Vollèges. Verbier would be connected to the aqueduct. The convention planned a distribution of 540 l/s. to Bagnes and 220 l/s. to Vollèges during low water periods. As such, the project became crucial to Bagnes and was finally implemented, partially at the expense of FMM (for the portion of works involving Vollèges). The construction began in 1964 and the aqueduct of Louvie entered into operation in 1967. As such, above the initial agreement, the rivalry was effectively solved thanks to a change in nature of the problem and an extension of the group of users involved. Afterwards, the use of the aqueduct became permanent and diversified under the impulse of the communes of Bagnes and Vollèges (e.g. Vollèges has exploited a water turbine at the tail-end of the aqueduct since 1977 and Téléverbier started producing artificial snow after a heightening of the dam in 1986). FMM has never been very reactive about the changes in destination of this water.

The initial rivalry led to a significant redistribution of water uses in the *Val de Bagnes*. Initially, Vollèges activated a disposition right on the small torrent of *La Chaux* in order to get compensation for the construction of the Mauvoisin dam. On their side, FMM were not in a strong bargaining position, as they were seeking for an acquisition of the disposition rights on the Dranse to Vollèges. The final local arrangement is a bilateral arrangement. The State did not directly intervene in the rivalry. The arrangement is voluntary. On the cost side, FMM consented to a minor investment in order to obtain the rights to exploit a dam on the Dranse. The arrangement was not costly for them, given the extent of the overall project. The initial agreement was thus easy to settle. However, it is important to notice that afterwards the implementation of the arrangement was not that easy. It involved more actors and needed a broader consensus to be followed up in the end.

1.3. Test of the hypotheses and discussion

The conceptual framework developed in this paper suggests that resource users who want to solve a rivalry activate rules and confront them in order to get a local arrangement. We suggest a categorisation of the local arrangement according to two attributes, i.e. the degree of coercion and the distribution of costs. The local arrangements are bilateral, when voluntary and equal in cost distribution, compensatory, when cost equality involves State intervention, consented, when voluntary but with an unequal distribution, and arbitrated, when the State takes a coercive decision implying an unequal distribution of costs. Table 3 provides a synthesis of the resolution process described in the four case studies. It identifies the users, the rules activated as well as the configurations of confrontation obtained, and qualifies the local arrangements according to the two attributes presented above. In case 1, lead-poisoning in Verviers, the group of citizens activated drinking water standards against the commune of Verviers which owned the water supply network and defended the status quo. The confrontation is public policy against property rights. The outcome of the rivalry was a compensatory arrangement. After Court decision, the State intervened and supported the costs devolved to the commune and the industrialists. In case 2, water floods in the lower Vesdre valley, property rights confronted. The commune of Chaudfontaine represented

landowners, who suffered from chronic floods due to water releases from the dam, against the MET, which held the disposition rights on the dam, and managed the dam according to the interests of the ERPE, the drinking water producer. The local arrangement is bilateral. The MET voluntarily agreed to modify the dam management in favour of Chaudfontaine. The ERPE consented to risk shortages in drought periods, but risk was low. In case 3, the heightening of Mauvoisin dam, WWF activated a right of recourse during a procedure of impact inquiry concerning the project of heightening the dam. They required minimum flows, based on serious ecological impact studies, threatening FMM with recourse to the Federal Courts. FMM argued on their side that the terms of the concessions were not modified by the heightening works and that they did not plan minimum flows. The arrangement is consented, as FMM voluntarily accepted to be the loser of the arrangement. In case 4, the drinking water supply in Vollèges, FMM sought appropriation of the Dranse hydraulic force against the commune of Vollèges, which is one of the formal owners of the river. Vollèges demanded a water supply in compensation to the concession and FMM accepted. The arrangement is bilateral, being a voluntary agreement that entails an equal burden of the costs.

As such, the four cases cover the two configurations of confrontation that involve an activation of property rights: PR versus PR and PR versus PP. The outcomes show more difference, as we find three categories of local arrangements. One category is missing, i.e. the arbitration arrangement. The arbitration arrangement is characterised by a coercive decision of the State that arbitrates the rivalry and usually designates a user liable for the prejudice of the other. It tends to impose the costs of the resolution to the liable user, making him the loser of the arrangement. The absence of this form of local arrangement perfectly fits our initial assumption, that an owner never bears the costs of the arrangement. While the owners were condemned in case 1, the State substituted to the liable user and fully financed the resolution. Thus the absence of arbitration arrangements at this stage of our research is not surprising.

The conceptual framework was elaborated with the objective of testing two hypotheses, both articulated around the idea that the configuration of rules activated in a rivalry determines the form of the arrangement necessary to solve the rivalry. The first one (H₁), proposes that *if two owners confront, then they reach a bilateral arrangement*. This hypothesis concerns the fact that a confrontation between two owners does not necessitate direct State intervention in order to reach an outcome. The legal guarantee of the property rights is sufficiently strong to produce effects without the backing of an authority. The two owners tend to negotiate and look for common ground. The agreement organises an exchange of rights and specifies the financial conditions of the exchange. The costs of the arrangement should be equally distributed between the users. The second hypothesis (H₂) claims that *If an owner and a final beneficiary confront, then the arrangement is compensatory*. In this case, we again start from our initial hypothesis, that an owner never bears the costs of the resolution of a rivalry. The final beneficiary can hardly be recognised in his right without a legal statement or other forms of direct State intervention (e.g. formal notice to a landowner). State intervention is necessary because a change of behaviour on the part of the owner, in application of a public policy, requires financial compensation with respect to the constitutional guarantee against any forms of expropriation. Thus, the application of a public policy on behalf of an owner, recognised as a target group, cannot be effective without financial compensation of the State. Without compensation, the chance that the owner modifies his behaviour is small.

Table 3: Synthesis of the rivalries

Case-studies	Users' status	IR components activated	Configuration of confrontation	Nature of the arrangement	Distribution of costs	Local arrangement
<i>Vesdre</i>						
C₁. Lead-poisoning in Verviers	Groupe Action Eau: Final beneficiary of drinking water standards set in the 1980 Directive Commune of Verviers: Operator of the water network Usage right on the Gileppe dam Industrialists: Usage right on water on behalf of the municipality	Groupe Action Eau: Demand the application of the 1980 Directive Commune of Verviers: Inaction Industrialists: require status quo, i.e. the maintaining of natural acidity	PP/ PR	Coercive: Trial opposing the "Groupe Action Eau" to the commune of Verviers Negotiation in order to avoid recourse to the Supreme Court (The Group lacks resources)	Equal: The State finances the conformation as well as the technical solution for the industrials	Compensatory Arrangement
C₂. Water floods in the lower valley	Commune of Chaudfontaine: Representative of landowners Prejudice to riparian properties MET: Owner of the dam and manager ERPE: Usage right on the dam	Commune of Chaudfontaine: No rights on the dam but defending riparian properties MET: Appropriation rights on the dam ERPE: Use rights on the dam	PR/ PR	Voluntary: Trilateral negotiation, technical measure (calculation of the reservoir's fulfilment curve)	Equal: No costs for the actors, except for ERPE, which accepts a risk of water shortages (in a context of decreasing demand)	Bilateral arrangement
<i>Val de Bagnes</i>						
C₃. Heightening of Mauvoisin dam	WWF: Initiator of the resolution Final beneficiary of the Federal Law of 1966 on Nature Protection (LPN) (right of legal recourse) FMM: Disposition rights on the rivers and torrents of the valley through 80-year concessions	WWF: Activates the LPN right of recourse during the impact enquiry Uses this right to negotiate minimum flows FMM: Argues that minimum flows are not stipulated in the initial acts of concession	PP/ PR	Voluntary: Negotiated agreement under the pressure of a recourse to the canton with a threat to refer the matter to the Federal Courts FMM accepts to negotiate on the basis of ecological impact studies	Redistributed: WWF obtains symbolic measures (minimum flows of 50 l/s and hydro-biologic compensations) Minimal cost to FMM as compared with a delay in the construction work	Consented arrangement
C₄. Drinking water supply in Vollèges	FMM: Non-owner, but seeks the acquisition of disposition rights Commune of Vollèges: Owner of the river Dranse and torrent of <i>La Chaux</i>	FMM: Demand a concession on the water flow of the river Dranse Vollèges: Invokes a perpetual right on the torrent of <i>La Chaux</i> to get a water supply	PR/ PR	Voluntary: Vollèges gets a connection to the mains of the hydro-power plant Alternative provided with the construction of the aqueduct of Louvie, involving Bagnes	Equal: FMM respect its commitment to Vollèges, but does not entirely finance the aqueduct of Louvie (Bagnes participates)	Bilateral arrangement

As summarised in Table 4, we apply our two hypotheses to the different cases. As the hypotheses are elaborated according to the configuration of confrontation, and as the case selection is made according to the same criteria, it is not surprising that the hypotheses do not fit all cases. We never meet a confrontation PR/PR, in a situation of compensatory arrangement, or a confrontation PR/PP in a situation of bilateral arrangement. Thus the validity of the hypotheses is not put into doubt by the cases. If we now look in detail at the results of the test, we observe that the hypotheses are met in three situations out of four (C_1 , C_2 and C_4). Concerning C_2 and C_4 , the confrontation PR/PR leads to a bilateral arrangement, as expected in hypothesis H_1 . In the two cases, the users involved activate property rights in order to reconcile their positions. They mutually agree on an arrangement and voluntarily share the burden of the costs. Concerning C_1 , the case fulfils hypothesis H_2 , but C_3 appears as a deviant case. In C_1 , the citizen group succeeded in being recognised by a court decision as the final beneficiary of the policy prescribing drinking water standards. The competing owner, the commune of Verviers was condemned to fulfil the requirements set in public policy. The commune declared itself unable to support the cost of the corrective measures and invoked the State. In the State intervention, it is more surprising to see that the technical adaptation of the mains that allowed a constant acidity of water to the industrialists was also financed of the public budget. In this case, even users holding the de facto usage rights (i.e. the right to receive acid water) did not bear the costs of the arrangement.

Table 4: Test of hypotheses

	Local arrangement	H_1	H_2
C_1	Compensatory arrangement		Yes
C_2	Bilateral arrangement	Yes	
C_3	Consented arrangement		No
C_4	Bilateral arrangement	Yes	

On the contrary, C_3 is deviant. Instead of getting public compensation for the loss of property, we observe that FMM voluntarily conceded a minimum flow without any compensation. The case falls in the category of consented arrangement. This means that one user accepts to lose, FMM in this case. In fact, FMM accepted an unfavourable arrangement instead of enduring an expensive and time-consuming trial. In case of disagreement in the negotiation, WWF had the right to refer to the Federal Court according to the LPN. As such, in its decision, FMM arbitrated between a quick but unfavourable agreement, rather than a slow and unpredictable court decision. We can say that WWF had a strong best-alternative-to-a-negotiated-agreement (BATNA) and FMM a weak one (Fisher, Ury and Patton 1983; Holzinger 2001). The bargaining position of WWF was strong because they knew that they would have good chances to win the trial at a federal court. In contrast, FMM was urged to carry out the heightening work for economic motives and because it was uncertain of the court decision. That explains why FMM accepted such an agreement, without being charged by any legal framework. They concluded on a consented agreement, rather than investing more in trying to reach an (uncertain) compensatory arrangement. Furthermore, the agreement was mainly

symbolic (minimum flows of 50 l/s. downstream the dam) and not expensive to implement. In this case, the owner lost, but little.

The empirical testing of the conceptual framework of resolution of rivalry is quite successful. Both the process and the hypotheses about the expected outcomes are validated as far as the confrontations are concerned where property rights are activated. The development of the process of resolution of rivalry, cut into analytical phases of activation of rules, confrontation, and arrangement, seems plausible. Our four cases gain in clarity when explained according to the conceptual framework. In addition, we demonstrate that the form of the local arrangement needed to resolve a rivalry is determined, or at least highly influenced, by the configuration of the confrontation of the rules activated by the users. We learn that a confrontation between an owner and a final beneficiary of a public policy necessitates the State meeting the costs of the arrangement in order to obtain a resolution of the rivalry. Equally, the resolution of rivalry comes out of the confrontation between two owners when these users reach a voluntary agreement that equally shares the costs of the arrangement. The bargaining is concentrated on the distribution of costs. As such, our findings could contribute to the treatment of rivalries in resource management, suggesting a direction to the conduct of negotiations according to the kind of rules activated by the users involved.

This paper stresses the importance of considering rules as determining institutions in a resolution of rivalry. Certainly, other factors play an important role in this kind of process, such as the other resources mobilised by users (e.g. money, time, political influence, organisational skills, etc.) (Knoepfel, Larrue and Varone 2001); the attitude of particular actors, which acts as a trigger in the resolution (e.g. MET that is a policy broker between ERPE and Chaudfontaine in case 2); or external events (e.g. the minimum flows as a national stake for WWF and the regionalisation process in Belgium in the case of Verviers). A process of resolution of rivalry is not only a matter of activation of rights. Nevertheless, we consider that the bundle of rules available to a user constitutes its core resource. All other resources come in support of this activation process. Of course, this setting is only valid if rules are backed by an effective guarantee of the State. If this is not the case, situations become more violent, opening the way to intimidation or force. Perhaps the existence of guaranteed rules avoids shifts from rivalry to conflict. The possibility to activate rules tends to evacuate hostility from the rivalry (Freund 1983) and safeguards confrontation from violence.

Nevertheless, the huge differences between bundles of rules available to the users soften the tempering nature of rule activation. Owners appear in a particularly strong position. By owners, we mean users who own property titles on the resource, either formal property rights, disposition rights or usage rights. On the one hand, owners tend to be less frequently subject to coercive decision. Our findings suggest that property rights do not need to be permanently reaffirmed by the State in order to produce effects. Confrontation involving owners more often leads to negotiated agreement rather than to coercive decisions. As such, a property right brings more autonomy and adaptability to a user. On the other hand, property rights provide strong guarantees to the users on the continuity of their use, particularly in a context of change (even in case of informal/ de facto usage rights, e.g. for industrialists in Verviers). The State has great difficulty in undermining property rights, even in the legitimate conduct of a public policy. Owners always have the capacity of recourse to the Courts to defend their property rights against State interventions. Public authorities must adopt insidious (or indirect) attitudes when they want to alter ownership without compensation (e.g. difficulties in implementing the art. 80 of LEaux in Switzerland). Such a situation obviously weakens the position of users who are non-owners but who are granted access to the resource by a public

policy. Their confrontation with owners is difficult, and would presumably necessitate direct State intervention, possibly involving financial compensations. An owner never loses in a resolution of rivalry, or very little.

If rules are determining, the status of the resource is nonetheless important. The actual availability of the resource is certainly decisive to the intensity of the rivalry and its likely resolution. In the cases under scrutiny, the abundance or scarcity of the resource seems to be a driving force in the resolution. In Val de Bagnes, FMM did not have much difficulty in consenting a water supply to Vollèges and residual flows to WWF as it exploits less water than it owns. Water is abundant in Val de Bagnes, and all the torrents appropriated are not caught by the installation. The partial redistribution of water does not affect the production process. In the case of water floods downstream the Vesdre, when ERPE consented the risk of a water shortage, they took their decision in a context of over-production and decrease of drinking water demand. On the contrary, in the case of the aqueduct of Vollèges, it is an increasing drinking water scarcity in Verbier (Bagnes) that triggered the construction of the aqueduct and transcended the traditional tensions between Bagnes and Vollèges about water supply. As such, the availability of the resource should be reconsidered to be a core variable in the process of resolution of rivalries between users. However, the link between resource and rivalry is not that obvious. A resolution of a rivalry does not necessarily bring more sustainability to the resource uses. A resolution is not necessarily a success. A local arrangement, satisfying both users, can ultimately lead to catastrophe, if the distribution is done at the expense of the resource. In contrast, resolutions of rivalry are prerequisites to sustainability. Sustainability cannot be attained when users cannot share a resource that is too scarce to satisfy both parties, and compete in its exploitation. As such, the sustainability issue must be examined in complement to the process of resolution of a rivalry. Broadening the focus from the initial rivalry to the whole basin where it takes place and considering the interactions with other users should shed more information on the issue. Institutional indicators of sustainability would provide useful tools in such an analysis.

Conclusion

In a context of increasing resource scarcity, rivalries between heterogeneous users of natural resources are common. Far from passively waiting for State intervention, users attempt to solve rivalries by themselves. After an empirical test, our conceptual framework suggests that they do so by activating rules and confronting them with their rival users. The local arrangements in through the process are highly influenced by the configuration of the rules activated. When an owner confronts property rights with another owner, then the resolution comes from a bilateral arrangement, i.e. a voluntary agreement that shares the costs of the arrangement between them. In another situation, when a final beneficiary confronts a policy to the property rights of an owner, then the arrangement tends to be compensatory, implying direct intervention of the State, which finances the arrangement. As such, an owner never really loses in the resolution of a rivalry. These results point to the pre-eminence of property rights on public policies, notably those policies recognising resource access to non-owners. This has implications in terms of (integrated) resource management. On the one hand, the strength of the guarantees of property rights drastically limits the possibilities of State intervention conducting redistributive arrangements in favour of a more sustainable resource management. In cases of unsustainable use backed by property rights, the State must completely compensate each owner if it dispossesses them from their rights to the resource, even if their behaviour is highly detrimental and depletes the resource. For lack of public money, these users are not disturbed in their activities. This point is particularly important to

underline in a period when public authorities encourage the development of new property rights on natural resources (e.g. tradable permits of pollution, patents of the human genome). On the other hand, this confrontation between users shows that public policies are the only one means to grant access to natural resources to excluded third parties. They play an important role in introducing new uses, particularly when these uses are non-commercial activities (e.g. protection of ecosystems, hiking or contemplation of natural sites). As such, policy analysis provides tools to observe how non-owners access and use the resources. Going back to the resolutions of rivalries, we suggest further research about the activation of rules. Why do users rather choose to activate property rights rather than public policies? We could study the bargaining game that users play in a situation of rivalry in more detail, and look at how the social construction of the situation influences the final outcome (Steins and Edwards 1999). As a complement, empirical cases could be broadened in order to assess the robustness of the suggested model of resolution of rivalries. It would be particularly fruitful to look at cases of dam management throughout the world. Dam reservoirs often mix a variety of heterogeneous uses (primarily hydro-power production and irrigation, but also drinking water production, struggle against floods, fishing, navigation, etc.). As such, the study of resolution of rivalries between resource users provides a fertile ground for enhancing knowledge about the effectiveness of rules and developing a more integrated management of natural resources.

References

- BROMLEY, D. W. (1989). *Economic Interests and Institutions. The Conceptual Foundations of Public Policy*. New York/Oxford: Basil Blackwell, 274 pp.
- (1991). *Environment and Economy. Property Rights and Public Policy*. Oxford/Cambridge: Blackwell, 247 pp.
- BROMLEY, D. W. (1992). "The commons, common property, and environmental pollution". *Environmental and Resource Economics* 2: 1-17.
- COASE, R. H. (1960). "The problem of social cost". *Journal of Law & Economics* 3 (1): 1-44.
- DEMSETZ, H. (1967). "Toward a Theory of Property Rights". *American Economic Review* 57: 347-359.
- DENTE, B. (1995). "Introduction: The Globalization of Environmental Policy and the Search for New Instruments". In B. Dente (Ed.), *Environmental Policy in Search of New Instruments*. Dordrecht: Kluwer Academic Publishers, 1-20.
- DEVLIN, R. A., and R. Q. Grafton (1998). *Economic rights and environmental wrongs property rights for the common good*. Cheltenham, UK, Northampton, Mass: Edward Elgar, xii, 189 p.
- European Communities (1980). *Council Directive 80/778/EEC of 15 July 1980 Relating to the Quality of Water Intended for Human Consumption*.
- FISHER, R., W. Ury and B. Patton (1983). *Getting to yes. Negotiating agreement without giving in*. New York: Penguin Books.
- FREUND, J. (1983). *Sociologie du conflit*. Series "La politique éclatée". Paris: PUF, 380 pp.
- GRANT, W., A. Perl and P. Knoepfel (eds) (1999). *The politics of improving urban air quality*. Cheltenham: Edward Elgar.
- HARDIN, G. (1968). "The Tragedy of the Commons". *Science* 162: 1243-1248.
- HOLZINGER, K. (2001). "Negotiations in Public-Policy Making: Exogenous Barriers to Successful Dispute Resolution". *Journal of Public Policy* 21 (1): 71-96.
- HOWLETT, M. (2002). "Policy Instruments and Implementation Styles: The Evolution of Instrument Choice in Canadian Environmental Policy". In D. L. Van Nijnatten and R. Boardman (eds), *Canadian Environmental Policy: Context and Cases*. Don Mills: Oxford University Press, 25-45.
- KISSLING-NÄF, I., and F. Varone (Hrsg.) (2000a). *Institutionen für eine nachhaltige Ressourcennutzung : innovative Steuerungsansätze am Beispiel der Ressourcen Luft und Boden*. Zürich: Rüegger, 252 pp.

- (2000b). "Historical Analysis of Institutional Resource Regimes in Switzerland. A Comparison of the Cases of Forest, Water, Soil, Air and Landscape". Communication in: *8th Biennial Conference of the International Association for the Study of Common Property (IASCP), "Crafting Sustainable Commons in the New Millennium"*. Bloomington, April.
- KNOEPFEL, P., C. Larrue and F. Varone (2001). *Analyse et pilotage des politiques publiques*. Series "Politikanalyse/Analyse des politiques publiques". Genève, Bâle, Munich: Helbing & Lichtenhahn, 397 pp.
- LOWI, T. J. (1972). "Four systems of policy, politics and choice". *Public Administration Review* 32: 298-310.
- OLSON, M. [1965] (1978). *Logique de l'action collective* [Logic of Collective Action]. Paris: PUF.
- OSTROM, E. (1990). *Governing the Commons*. Cambridge: Cambridge University Press, 280 pp.
- (1999). "Institutional Rational Choice. An Assessment of the Institutional Analysis and Development Framework". In P. A. Sabatier (ed), *Theories of the Policy Process*. Boulder/Oxford: Westview Press, 35-71.
- OSTROM, E., R. Gardner and J. A. Walker (1994). *Rules, Games, & Common-Pool Resources*. Ann Arbor: University of Michigan Press, 370 pp.
- REYNARD, E. (2004). *Le régime institutionnel de l'eau dans le Val de Bagnes (Valais) entre 1975 et 2000 (under publication)*. Series "Working paper de l'IDHEAP". Chavannes-près-Renens: IDHEAP, 65 pp.
- REYNARD, E., and C. Mauch (2003). "Les régimes institutionnels de l'eau en Suisse: les cas du Seetal, de la Dranse de Bagnes, de la Maggia et de la Thur". In P. Knoepfel, I. Kissling-Näf and F. Varone (Hrsg.), *Institutionelle Regime natürlicher Ressourcen in Aktion*. Series "Oekologie & Gesellschaft" 19. Genève, Bâle, Munich: Helbing & Lichtenhahn, 205-296.
- REYNAUD, J.-D. (1993). *Les règles du jeu. L'action collective et la régulation sociale*. 2ème ed. Series "U Sociologie". Paris: Armand Colin, 315 pp.
- SCHARPF, F. W. (1997). *Games Real Actors Play: Actor-centered Institutionalism in Policy Research*. Boulder: Westview Press.
- SPROULE-JONES, M. (1982). "Public choice theory and natural resources: Methodological explication and critique". *American Political Science Review* 76: 790-804.
- STEINS, N. A., and V. M. Edwards (1999). "Collective action in common-pool resource management: The contribution of a social constructivist perspective to existing theory". *Society and Natural Resources* 12: 539-557.
- SUBIRATS, J., N. Font and M. Costejà (2002). *Case Study 1: Matarrana River Basin*. EUWARENESS Project (unpublished work).
- VARONE, F., E. Reynard, I. Kissling-Näf and C. Mauch (2002). "Institutional resource regimes: The case of water management in Switzerland". *Integrated Assessment* 3 (1): 78-94.
- WILSON, J. Q. [1979] (1986). *American government: Institutions and policies*. 3rd ed. Lexington: D. C. Heath.