The contribution of CPR institutions implementing Swiss environmental and nature protection policies

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Switzerland has a long tradition of collective management of natural resources at the local level. Common management of forests, irrigation systems and mountain pastures are now well known since several scholars investigated these historical examples of long-enduring self organized common property regimes in depth during the second part of the 20th century. However, since the second half of 19th century, the Federal State and the cantons (the States) have been playing an increasing role in the field of environmental and nature protection, as well as natural resource management. More precisely, federal and cantonal public policies have been designed for water and forest management, nature and landscape protection, environmental protection (clean air policy, soil protection, etc.), and land use planning. According to the principles of subsidiary and cooperative federalism, the Cantons (together with the communes) are generally responsible for the implementation of these policies which are mainly defined at the federal level.

This paper aims to study how the ancient (or sometimes newly created) self-organized and self-governed CPR institutions are integrated in the definition and implementation of such public policies at the local or regional level. Moreover, comparisons are made between this kind of institution and state actors, especially with regard to their efficiency and efficacy. Finally, their potentialities and limits in the implementation of public policies are outlined. This paper contains four case studies. The first concerns a specific hunting management system in North-Eastern Switzerland, the renting system, in which the State rents surfaces of land to hunting associations that are responsible for the regulation of wildlife within the rented territory. The second concerns flood protection and shows that in some parts of Switzerland the canton and the communes have delegated the implementation of this policy to local self-organized associations. In the canton of Berne, dyke corporations are formed by ground owners of a specific perimeter. Their tasks are to plan, finance and carry out hydraulic engineering works on rivers. The third example deals with collective irrigation systems in the canton of Valais. We show how new common property organisations (irrigation corporations) have been created in order to deal with the new landscape and tourist uses of the historical irrigation channels and with new water needs such as for irrigation of lawns. In the last example, we examine the role of self-organized landscape management structures or organizations in managing the rival uses of the resource landscape. Unconsciously or not, these organizations regulate the access, organise the maintenance, and encourage the respect of good management practices of this resource – which is still rarely perceived as such because of the lack of property rights guarantying a more or less exclusive use of its services.

The comparative analysis leads to several conclusions. Firstly*, contemporary Swiss federal and cantonal environmental policies are – for legal, financial, organisational or traditional reasons – usually implemented by a large spectrum of*

different public, semi-public or private actors, within which self-organized and self-governed CPR institutions often play an important role. Secondly*, comparisons tend to demonstrate that implementation processes incorporating such institutions are at least as efficient and effective – if not more – as the ones containing only state agents (or private agents). There seem to be two important reasons explaining this statement. On the one hand, CPR institutions profit from the deep and fine knowledge their members have of the local resource system. And on the other hand, they are capable of mobilizing local users who are interested in a sustainable use of the resource.* Thirdly*, contrary to the hypothesis of the progressive but unavoidable disappearance of CPR institutions due to the emergence of modern competing state regulations (public policies), adaptation and even renewal may be possible under certain conditions. Moreover, CPR institutions offer opportunities that have not yet been taken into account in the framework of public policy implementation.*

1 Introduction

Despite of the numerous studies analysing CPR institutions and their contribution to a more sustainable management of natural resources (Berkes et al. 1989, Ostrom 1990, Feeny et al. 1990, Stevenson 1991, Schlager and Ostrom 1992), there are only a few examples which were carried out within the context of highly industrialized and post-industrialized countries like Switzerland. It seems as if the authors chose to study CPR institutions in the purest form and under the most unadulterated conditions possible. Their studies often take place in a context where external intervention by both the State and the market is extremely limited. However, these authors risk being biased by a kind of "anti-State" approach. This is problematic for different reasons. Studies on CPR institutions, which neglect the politico-administrative context, will not be able to analyse the structuring role that public policies can play in the regulation of natural resource use in industrialized countries in a realistic manner. The result is regrettable. Neither the frame of the analysis nor the political conclusions, which are drawn (institutional design principles for a sustainable management of natural resources), are designed to carry out studies in a socio-historical context like the one in western political societies.

On the other hand, public policy analysts are often the victims of an opposite bias. Some of the authors of this paper are not immune to this phenomenon (Nahrath 2000a, Reynard 2000). Indeed, there is a tendency to consider CPR institutions as a relict of the past condemned to disappear in the frame of today's politics. This hypothesis is based on findings concerning a loss in functionality of local self-organised institutions. Two main reasons are made responsible for that. First, users are often showing less dependence on the local natural resource – a factor that increases the likelihood of CPR institution existence (Ostrom 2000). And second, since the 1950s, the important development of public policies by the welfare state has caused scale changes at the regulation level of numerous resource systems as well as having had significant impacts on local (private) property

rights. However, being only partly proved by empirical data, the findings on loss in functionality of CPR institutions suffer from a lack of relevance.

Recent empirical observations of regulation processes of several natural resources in Switzerland carried out in a more attentive way lead forward further by breaking the two analytical aporias (Knoepfel et al. 2001, 2003; Gerber 2005; Nahrath 2000a, 2003; Thomi 2005; Varone et al. 2002). Both studies on CPR institutions and on implementing processes of federal policies on environmental issues at the cantonal and the communal level demonstrate that CPR institutions have survived in numerous cases, despite the predictions of their "inevitable" disappearance. There are even some examples of institutions that have been revitalised or newly created. It looks as if some CPR institutions have managed to adapt to the economic, technological, social, political and institutional changes that have affected western societies during the last century. Despite severe transformations, they have survived. Moreover, processes concerning the "reconfiguration of the State" and the transformation of the forms of "*gouvernementalité*" (Foucault 1989; Gordon and Miller 1991) – or the manners of governing – which are represented by the transition from a "government-regime" to a "governance-regime" might be a favourable context for the reinforcement of CPR institutions. Furthermore, it might constitute an opportunity of creating new modern forms of the latter.

Based on the different aspects sketched above, the present paper focuses on the CPR institutions that are engaged in the implementation of public environmental policies in Switzerland. Four questions are of a particular interest:

1. What role are CPR institutions playing in the framework supplied by public environmental policies? How do they participate in the implementation of the latter?
2. What are the conditions of perpetuation of CPR institutions within highly industrialized and post-industrialized countries like Switzerland?
3. Is there a difference in public environmental policy implementation due to the presence or absence of CPR institutions in the politico-administrative configuration, especially with regard to efficiency and efficacy in terms of sustainability?
4. What are the potentialities of political-administrative configurations involving CPR institutions in public policy implementation with regard to the development of sustainable policies?

Four cases are analysed in this paper. The first concerns a specific hunting management system in North-Eastern Switzerland where hunting associations are responsible for the regulation of wild life within a specific territory rented by the State. The second case deals with CPR institutions, which are engaged in flood protection. So-called dyke corporations formed by ground owners of a certain

perimeter carry out hydraulic engineering works on rivers. The third example concerns collective irrigation systems in the canton of Valais. We show how new common property organisations (irrigation corporations) have been created in order to deal with new landscape and tourist functions of the historical irrigation channels, as well as integrated water use at the local level. In the last case, we examine the role of self-organized landscape management structures or organizations in managing the rival uses of the resource landscape.

The paper is divided in three main chapters. The first describes the institutional, jurisdictional and political context of the regulation of common-pool resources in Switzerland in a brief and conceptual manner. The second chapter presents and analyses the four different types of regulations involving CPR institutions (see above). The main emphasis is concentrated on the role played by CPR institutions in the implementation of the corresponding public policy as well as on their impact in terms of efficacy, efficiency and sustainability. Furthermore, conclusions will be drawn by comparing regulations with and without CPR institutions. Finally, the last chapter will compare the four case studies and point out the main findings.

2 The institutional, jurisdictional and political context of the regulation of common pool resources in Switzerland

In Switzerland, like in all the other European countries, the political regulation of common pool resources has been affected by two major changes since the last century: the diffusion of the *modern conception of property rights* and the emergence of a great number of *public policies* since the 1950's (Welfare State).

The French Revolution has thoroughly modified the property rights regime that is the legal definition of property in most of the European countries. It marks the decline of the feudal conception of the simultaneous and common property (*plura dominia*) and the emergence of the modern exclusive and private conception of property (*propriété privative*) (Aubin, Nahrath, Varone 2004). In Switzerland, the introduction of the Federal Civil Code in 1912 established the triumph of the exclusive and private property conception over the feudal one (table 1).

Feudal property regime	**Modern property regime**
Ancient Régime	French Revolution
Plura dominia	**Exclusive property**
Common or collective property	Private or State property
Lord's fiefdom	Enclosures
Saisine: Coexistence of a multiplicity of different use rights conceded by a land Lord on the different goods and resources located within its fiefdom	*Principle of access* : Exclusive ownership on all goods and resources located on a specific property
Property as possession	**Property as belonging**
Focus on the *productivity* of the use rights on a good or a service provided by a resource	Focus on the *materiality* of the formal property rights on a resource

Table 1. Comparison between the feudal and modern property regimes (based on Ost (2003 [1995]: 47–88)).

This change of the property regime had three main consequences:

- The progressive disappearance of the *legal* definition/category of "common" or "collective" property and the "privatization" of the commons. The Swiss federal civil code encompasses only a few examples of "pure" common property or collective property (i.e. one indivisible object with several owners). The main ones are the inheritance (*hoirie*) and the family-run agriculture enterprise[1]. The federal civil code only *mentions* the possible existence of other forms of long enduring CPR institutions (i.e. corporations), but leaves the difficult task of redefining their legal status to the civil code of the cantons. Thus, these corporations are only *tolerated* by the federal civil code as a "relic from the past". Moreover, their legal status in the cantonal law is very loose/unclear and oscillates between public law and private law corporations.

[1] Nowadays, the legal category of the civil code which is probably closer to the *concepts* of "common/collective property" and "CPR institutions" is the legal category of the "associations" (arts. 60 ss CC). However, an "association" can only pursue an "idealistic" goal and not a commercial one.

- The weakening of the long enduring local CPR institutions (i.e. corporations) like for example communal pasture and forest tenures (*Allmende, consortages*), alpine irrigation communities (*bisses*), etc. A lot of these corporations have disappeared during the 20th century. Common land has often been sold to private owners or to the State.
- The collapse of the regional and local – most of the time long enduring and sustainable – resource management regimes through the individualization, atomization and heterogeneization of exclusive property and use rights on specific resource units. This atomization of property rights on a multitude of resource units has as main consequence the great difficulty to (re)create collective property rights at the resource *system* level (e.g. hydrological cycle, air shed, landscape, ecosystem, biodiversity, climate, fauna and flora endangered species, etc.).

This lack of property rights on the resource systems and the privatization of resource unit consumption are one of the main causes of over-exploitation (Knoepfel, Nahrath 2005). It is precisely this kind of situation that led to the development, notably since the 1970's, of State regulations taking the form of (environmental) public policies.

Thus, for three or four decades, the regulation of each of the various common pool resources is the result of the combination of, on the one hand the accumulation of private and public law defined property rights (regulatory system) and, on the other hand, accumulation of protection and use policies (policy design).

The contribution of these two types of regulation may vary significantly according to the resource and the time period. One can distinguish regimes that are essentially based on the regulatory system ("property rights driven regimes"), and conversely regimes based on the policy design ("policy driven regimes").[2]

Public Policies (policy design)

The policies that constitute an institutional regime contain the substantial and institutional elements relative to the programming and implementation of all of the different use and protection policies affecting the management of a resource. The different constitutive elements of a public policy are the following:[3]

- The *definition of the different collective problem(s) to be resolved* based on the periods being analyzed, and the different objectives sought by the related State intervention. The policy design

[2] Kissling-Näf, Varone (2000).
[3] Knoepfel Larrue, Varone. (2001: 101 ff.).

is often the product of a historical process involving the sometimes uncoordinated accumulation and sedimentation of the successive definitions of the collective problems to be resolved.

- The *causal and intervention hypotheses* forming the causal models, which change as a function of the variations in time and space of the definition of the problems to be addressed. The causal model defines the actors (target group) considered responsible for the existence of the problem and the modes of intervention believed capable of producing the desired changes in the behaviour of the target group(s), thus enabling the resolution or attenuation of the problem and hence an improvement of the situation of those who suffer due to the existence of this problem (i.e. end beneficiaries).
- The *target groups* and the *beneficiaries* of the various public policies constitutive of the policy design that form, together with the *intervening political-administrative actors*, the "basic triangle" of policy actors.
- The *instruments* (regulatory, economic, persuasive, etc.) produced according to the different intervention hypotheses and used in the implementation of the policies in question.
- The *political-administrative arrangements* involved in the implementation of the policies in question. These arrangements generally involve one or more municipal, cantonal and/or federal administrative services with a portfolio of various resources and are more or less coordinated (horizontally or vertically) through administrative procedures.
- The actual *outputs* of public policies take the form of individual and concrete acts of application in the field of political-administrative legislative programmes.

Property rights (regulatory system)

A property regime (or regulatory system) is composed of all of the formal property rights, as well as all of the rights of disposal and use arising from them, that apply to a resource. The content of these disposal and use rights depends on the definition of property used by the society in question (e.g. private, collective/communal) and applicable to this resource. An analysis of the property regime applies just as well to the entire resource system as it does to the individual units used to provide the different goods and services.

Table 2 shows the range of regulations based on property rights (components of the regulatory system) using the example of the resource ground/soil (ground law).

Regulatory System (all property rights)	Examples based on the resource ground/soil[4]
Formal property rights	Land ownership title
Rights of disposal	Right to: sale, gift, rental (leasing), mortgage, inheritance, etc., one's real estate.
Use rights	Right to: construct on, deposit (waste) on, use (agriculture), destroy, protect, etc., one's real estate.

Table 2. *Regulation through rights: the components of the regulatory system*

We propose to call this combination of public policies and property rights an "institutional natural resource regime" (INRR, see table 3) (Kissling-Naef, Varone 2000; Knoepfel, Kissling-Naef, Varone 2001, 2003; Bressers, Kuks 2004; Kissling-Naef, Kuks 2004; Knoepfel, Nahrath 2005; Nahrath 2003).

Institutional Natural Resource Regime	
Relevant public policies (policy design)(accumulation of all use and protection policies)	*Regulatory System (accumulation of all of the property rights concerning the resource and its uses)*
Definition of the social problem and political objectives	Formal property rights
Causality model (causal and intervention hypotheses)	Rights of disposal
Target groups	Rights of use
Instruments	
Political-administrative implementation arrangement	
Outputs	

Table 3. *Summary of the INRR (Knoepfel, Kissling-Naef, Varone (2001: 36); Nahrath (2003: 36)).*

Two fundamental and theoretical incentives can be drawn from the INRR framework:

1. There is a need to put what institutional economics call "property rights" into a concrete form. More precisely, it implies an analysis of the manner/way these "rights" are defined within the

[4] According to Nahrath (2003a).

institutional (constitutional principles, characteristics of the political system) and *legal* (public and private law) frameworks of a specific political regime.

2. A realistic comprehension of (natural) resource management process requires integrating *public policies* within analytical frameworks, theories or models which aim at analyzing and explaining such processes. One of the main reasons is the fact that public policies significantly contribute to the definition – and sometimes to the creation – of (new) use rights or rights of disposal, which are susceptible to play an important role in the resource's regulation process.

Finally, Switzerland is characterized by "cooperative federalism", that is "the completion of federal legislation by the cantons, the implementation of federal programmes by cantonal and local authorities, and extensive finance – and revenue – sharing" (Linder 1994:55). It is interesting to note that, contrary to this decentralization of the policy process, one can observe a centralization of the property rights regime, these rights being defined in the federal civil code (notably the formal property rights and the rights of disposal). However, most of the use rights of the resource owners or resource users are defined (i.e. limited) by means of the articulation between the federal property regime and the cantonal and local implementation process of the federal policy programmes. Thus, cooperative federalism gives significant room for manoeuvre to the cantons and/or the communes with regard to the definition of the political-administrative implementation arrangement, the choice of the instruments, the kind of outputs, or even the interpretation and redefinition of the intervention hypotheses. In this respect, it is interesting to note that cooperative federalism has often constituted institutional conditions favourable to the maintenance/survival and even the revival of CPR institutions, the latter's being not infrequently invested with implementation tasks and incorporated into the cantonal or local political-administrative implementation arrangements.

3 Case studies

3.1 Hunting management System in North-Eastern Switzerland

Since the 15th or 16th century, in Switzerland, wildlife has been a common-pool resource under state-property regime. It constitutes what we can call a *régale d'Etat*[5]. The organization of hunting

[5] The formal (legal) situation concerning property rights is however somewhat more complex. Wildlife and game do not belong to anybody (res nullius), but the state, here the cantons (the states), have a " regalian " right over the resource's

became a legal competence of the cantons which at that time constituted the Swiss Confederation. Throughout this period until the 19th century, the cantons regulated and organized the practice in a very varied and uncoordinated way. During the second part of the 19th century, the dramatic decrease in wildlife population (*definition of the problem*), a direct consequence of this uncoordinated regulation of hunting practices, led to a strong intervention by the new Federal (central) State (Federation).

According to the Federal Constitution of 1874, the Federation is entitled to legislate on the regulation of hunting, on the protection of a number of endangered species, as well as of big game in the alpine regions (*causal hypothesis*). However, the property rights on the game (the hunting *régale*) remain the privilege of the cantons and *not* of the Federation (*regulative system*). This monopoly is due to fiscal reasons[6]. Thus, only the cantons are entitled to receive fees resulting from the sale of hunting rights (Petitpierre-Sauvain 1999; Zimmerli 1951a)[7]. As we can see, unlike a number of other European States such as France, Germany, Austria, Belgium or the Netherlands, in Switzerland, there is *no direct relation between landed property and hunting rights*. Game or wildlife, like in the US (Buck 1998), is *not* the property of the landowner.

In this resource regime, institutionalized through the introduction of the federal law of 1925 – revised in 1986 – (*intervention hypothesis and instruments*), the Federation is responsible for determining *what* can be hunted (definition of the protected species), *when* (definition of the shooting season), *where* (definition of the hunting regions and of the preserve hunting reserves) and *how* (definition of permitted hunting means, types of weapons and munitions). The Federation also fixes the relevant sanctions. The cantons are responsible for defining *who* is entitled to hunt (organisation of the hunting permit exams), *how much* game can be shot (wild life monitoring and elaboration of the (annual) hunting plan) as well as for *choosing the hunting system* (licence, renting or State regulation). The cantons are also free to organize monitoring through game-keepers.

This division of responsibilities (*political-administrative arrangement*) between the cantons and the Federation has led historically to the progressive development of *three* different hunting systems (i.e. *intervention hypothesis*) in the country (figure 1 below):

1. The *State regulation system* (*chasse interdite*) in the canton of Geneva. Since the acceptance of a popular initiative emanating from animal protection organizations in May 1974, hunting is

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appropriation (the hunting régale) and are, consequently, exclusively entitled to receive fees resulting from the exercise of this right. But, once shot/dead, game animals belong to the hunter who killed them.

[6] Most of the hunting administrations are integrated in the states public finance departments.

completely forbidden over the whole canton's territory. The environmental administration of the canton has been entitled with the task of monitoring and regulating wildlife and its vital environment.

2. The *licence-based system* (*chasse à permis*) is present in sixteen cantons of central and western Switzerland. The basic principle of this system consists in the possibility for all the hunters of a canton[8], who have passed an appropriate exam, to hunt a certain quota of game animals fixed by an administrative and political decision on most of the canton's territory, with the exception of the federal hunting reserve (called *districts francs*), during specifically delimited periods of the year. For different reasons (political difficulty to reduce the quotas because of hunters "path dependency", as well as great difficulty to limit the number of hunters), the *licence system has been considered (end of the 19th and first half of the 20th century) as more "game consuming" then the renting one*[9].

3. The *renting-based system* (*Revierjagd, affermages*) is present in nine cantons of the north-eastern part of the country. The renting system is characterized by a significantly different basic principle. This latter consists in the idea that the basic unit of a hunting system is not the individual hunter, but the *local hunting association* (*CPR institution*). The hunting association is accountable to the canton and the commune for the implementation of the hunting and the wild life regulation policy within its rented hunting territory. More particularly, the association is responsible for monitoring the resource (statistics, qualitative state), the (self)monitoring of the hunters (behaviour, weapons, respect of the quotas, distribution and accomplishment of the common tasks) and the territorial protection of wildlife. Enlarged hunting associations (*Hegegemeinschaften*) exist which are responsible for the management and hunting of the most mobile species. Finally, the hunting association has to bear half of the damage costs caused by fauna to agriculture.

The renting contract between the commune and the hunting association lasts between 6 and 8 years. At the end of this period the contracts are reattributed by the commune (sometimes through the system of selling by auction). Admission or exclusion is subject to the approval of all members of

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[7] In 1917, an attempt to institute federal property rights (a federal hunting régale) in order to finance social security encountered massive opposition and was abandoned.

[8] It is also possible to buy a licence and hunt in a state other than the one of domicile.

9 Thus, very early (1876) and in order to prevent an excessive depletion of the resource and to better manage the relation between the stock and the yield of the resource, the Federal government forced the licence's alpine cantons to agree to the creation of protected areas on their territory functioning as game reserves thus providing an absolute protection of the "capital" of the resource (Zimmerli 1951b). The main idea was that, in such a situation, only strong state-controlled intervention would be able to keep under control the depletion process engendered by the impossibility to intervene on the number of hunters. These protected areas still constitute a central masterpiece of the licence system in the absence of which, the system would probably not have been able to survive.

the hunting association. As the number of rental territories is limited, the number of local associations and consequently of hunters is, contrary to the licence system, also *limited*[10].

This delegation of responsibility has some advantages for the members of the association: they have the fundamental right to accept or exclude non-members from access to the resource, the hunting periods are significantly longer than the ones of the licence system, members of the association can (in accordance with club customs) invite friends or acquaintances to hunt in the renting territory, control of the members' behaviour by the canton is more loose, there is considerable freedom to organize hunting activities within the rental territory (for example the possibility of constituting teams or groups, or of defining the way in which the quotas are reallocated). A consequence of these shared responsibilities is that members of such associations have strong incentives to collaborate in the good management of the renting territory, as well as of the resource (wildlife).

However, if the renting system is, as we can see, characterized by a strong component of self-organization and -monitoring, a large part of the resource management is still the prerogative of the canton. In fact, the canton's administration defines the goals of the planning as well as the quotas allocated to the different renting territories through consultation within a hunting commission, composed of representatives of the various actors concerned[11], who together devise a hunting plan. In fact, this *co-managed* system also shares *some* of the characteristics of a *nested enterprise* (Ostrom 1990:90), except the fact that the canton remains the central actor of the governance structure. Appropriation, provision, monitoring, enforcement, conflict resolution and governance activities occur within this system at different levels of organization. Moreover, the local hunting associations are regrouped in a general association organized at the canton's level. It is responsible for the supply of game as well as for hunting statistics. Both sets of data are elaborated by compiling information furnished by the different hunting associations as well as from the official game-keepers (when they exist)[12]. It also defends the interests of the local associations against the authorities of the canton or other interest groups of rival users (agriculturists, tourists, members of nature protection organizations, walkers, riders, etc.).

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[10] The number of members an association accepts depends on the size of the hunting territory.

[11] The commission encompasses representatives of the local hunting associations, forestry groups, agriculture actors, the communes and finally the nature protection associations.

[12] In 1996, the 16 cantons operating a licence system employed together 163 official game-keepers (and 528 auxiliaries) for 19'574 hunters (=1 game-keeper for 120 hunters). At the same time, the 9 cantons operating a renting system employed only 9 official game-keepers (but a large number of auxiliaries) for 11'939 hunters (=1 game-keeper for 1326 hunters). 6 of these 9 cantons do not dispose of any official game-keeper.

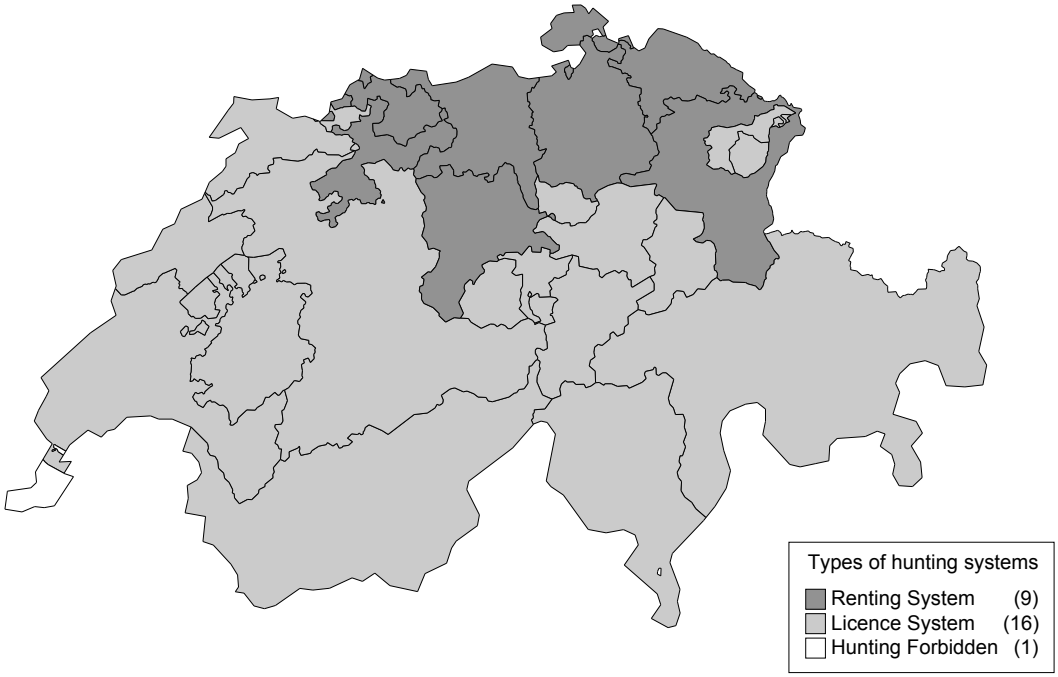


Figure 1. The geographical distribution of the different hunting systems in Switzerland.

During the 1920's and the 1930's, there was a lively debate between the advocates of the two systems. Renting advocates claimed that they encouraged "good" management of the resource, pointing out that the subsequent resource depletion was the direct result of the licence system, while advocates of licensing argued on the democratic right to have free access to the resource and to the practice of hunting, and accused the renting system of being "aristocratic" in this regard[13]. During the first part of the 20th century, *the decision of some cantons to return to the renting system[14] was justified by the objective of limiting overexploitation of the resource, as the renting system is specifically able to limit the number of hunters* (Blanckenhorn 1990).

It is important to note that, during the second part of the 20th century, the central wild life management problem, as well as the hunting policy objectives, tended to reverse: today, in most regions of the country, situations of wild life overpopulation are frequent and causes significant damage to forest and agriculture.

In a former study, Nahrath (2000a, 2000b) produced some evidence suggesting that the renting system has better capacities than the license one to adapt to this reversal of wild life management

13 This philosophical/political opposition was perpetuated in the institutions by the creation of two distinct hunters' federations at the national level.

14 At the end of the 19th century, the renting system had almost disappeared. Its reappearance dates from the beginning of the 20th century.

problems and to reach the (new) objectives of the hunting policy (reduction of situations of superabundance and limitation of damage caused by wild life)

A (very simple) statistical analysis of the available national hunting and wildlife data over a period of 30 years (1968–1998) reveals some interesting tendencies related to hunting management under the different systems, as well as their effects on the fauna.

The most obvious trend is the general increase of the different fauna live-stock during this time period (cf. the right hand column "National Average" of table 4).

Increase of the different live-stock as a % per system	**Renting**	**Licence**	**National Average**
Red-deer	+ 22.9% (837→1'029)	+ 74.4% (11'618→20'264)	+ 71.7% (12'455→21'393)
Roe	- 1% (51'832→51'318)	+ 98.5% (39'910→79'261)	+ 42,3% (91'742→130'579)
Chamois (Only 10% of the chamois are located in the renting system cantons)	+ 70.7% (5'052→8'628)	+ 75.1% (88'380→50'456)	+ 74,7% (55'508→97'008)
Ibex (Only 7% of the ibex are located in the renting system cantons)	+ 489%	+ 222%	+ 232%

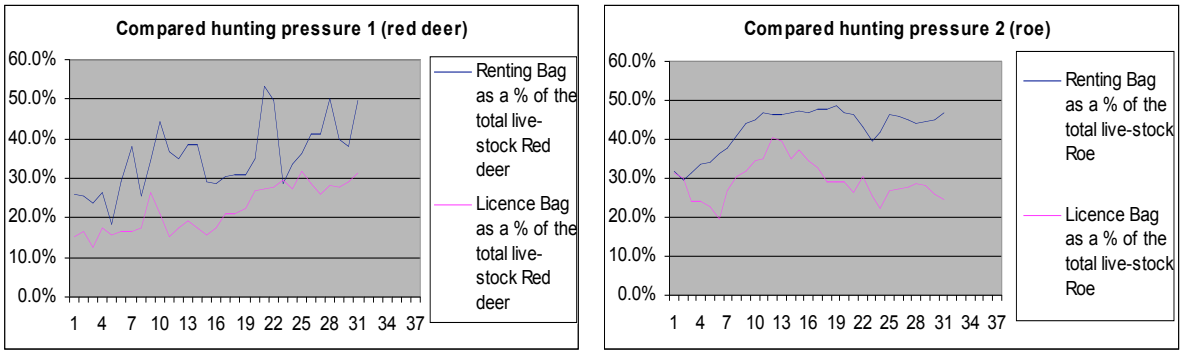
Table 4. Evolution of game live-stock in the renting and licence systems over 30 years (1968–1998)[15], (Ministry of Environment (OFEFP/BUWAL), hunting section; own calculation).

The results of table 4 show something very interesting and, from a historical point of view, to a certain extent *paradoxical*. The increase rate (above all for roe and red-deer live-stock), far from being homogeneous, is in fact much contrasted between the two systems. Thus, contrary to the situation during the first part of the 20th century, the licence system, during the last 30 years, has

[15] This increase goes from 42% for roes to 75% for chamois. The case of the ibex is somewhat peculiar in that it was reintroduced in the protected areas (*districts francs*) of some alpine regions at the beginning of the 20th century, that is, exclusively in licence system states. Its presence in a first renting based canton (St Gall) is rather recent. This explains the astonishing increase rate there of near 500%.

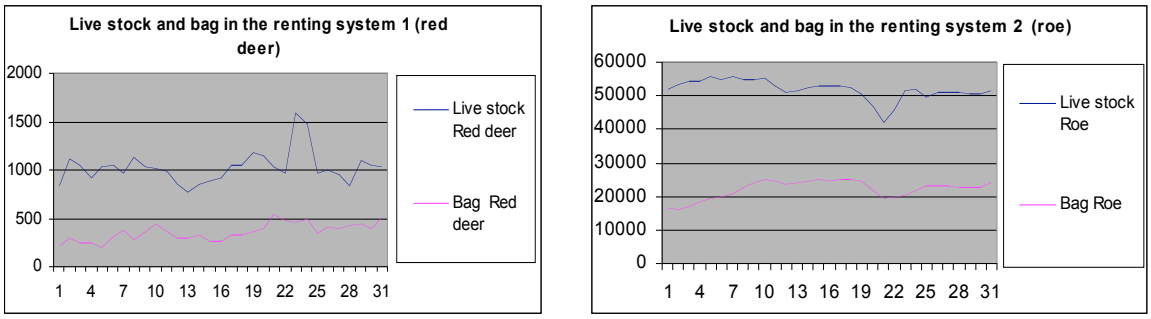
been (much) more favourable to the reproduction and the growth of the resource stock than the renting one.

Factors corroborating and emphasizing this first general observation can be deduced from figure A1 (annex 1) comparing the level of the *hunting pressure* exercised within the two different systems. As one can observe in figures 2a and b, this pressure is on average stronger in the renting system. The proportion of game animals shot is in any cases systematically higher in the renting system than in the licence one. This explains of course the differences observed in the increase of the resource stock.

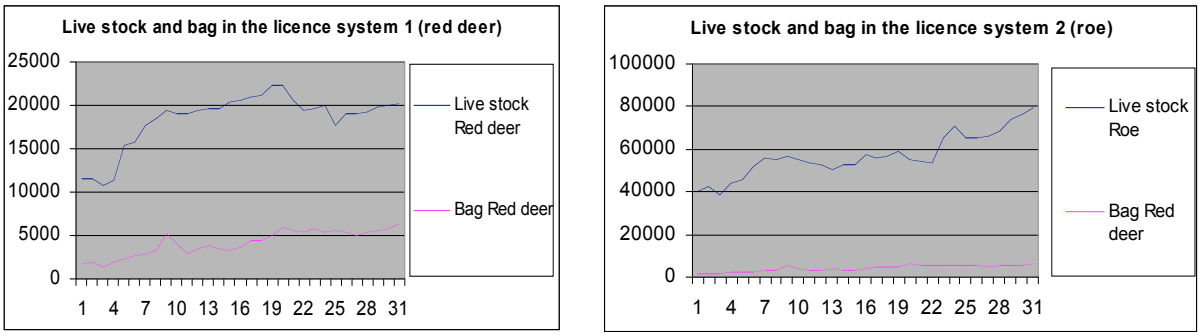


Figures 2a and b. Comparison of hunting pressure between renting and licence systems 1968–1998 (roe and red-deer).

A second interesting observation which can be derived from these statistical data concerns the respective "management philosophies" within the two systems. A comparison (figures 3a and b and 3c and d) of the relation between the curves (expressed in total numbers) of (1) live-stock and (2) game animals shot for different species, tends, in the renting system, to show a *closer relation between variations of the total live-stock and variations of the bag*, than in the licence one.



Figures 3a and b. Relation between total live-stock and the bag in the renting system (red-deer and roe).



Figures 3c and d. Relation between total live-stock and the bag in the licence system (red-deer and roe)

In fact, in the renting system (figures 3a and b), the curve of the bag tends to follow variations in live-stock numbers more directly, whereas in the licence one (figures 3c and d), the number of animals shot tends to be more *stable* and *independent* from the annual variation in live-stock numbers. Such a difference seems to indicate that *management in the renting system is more sensitive to changes occurring on the (micro)local level and tends to adapt to them more accurately and rapidly*. This is still true, even if this adaptation is the result of the sum of different local, independent and loosely coordinated processes. It thus seems that *adaptation processes are easier to implement in a renting system than in a licence one*, probably due to the fact that the decision-making process is more directly linked to the empirical local situation, and is thus easier to understand for the hunters. In fact, while, in the licence system, a modification of the annual hunting plan simultaneously affects all the hunters of a canton in the same way, modifications in the renting one have very segmented, territorially differentiated impacts. Thus, significant modifications are much more easily implemented in the latter system due to the fact that (1) hunters are more familiar with such changes, (2) the changes are not the same for all the appropriators at the same time, and are less susceptible to lead to collective opposition, and (3) as the consequences of the changes for the hunters are more fragmented, and more directly linked to local conditions, they tend to be more easily understood and accepted. Complementary qualitative analysis (interviews, hunting journals analysis, etc.) has confirmed these assertions (Nahrath 2000a, 2000b).

Thus, the case of the Swiss federal hunting policy constitutes a good example of the possible role the self-governed CPR institutions are susceptible of playing in the implementation of contemporary environmental, nature protection or resource management policies. The comparison of some of the outcomes produced by the different hunting systems tends to confirm the high efficiency level of CPR institutions based arrangements. Finally, the adaptability of CPR institutions to major policy change confirms their high potentialities with regard to the implementation of State steered public policies.

3.2 The dyke corporations in the canton of Berne

Dyke corporations are an example of CPR-institutions working in the context of water resource management. While most CPR-institutions manage resources to take opportunities delivered by the resource (see for example the case studies above), the goal of dyke corporations is different. Local non-institutional actors, mainly owners of land and buildings, join together in taking actions against hydrological risks. Thus, the service to the community of this kind of CPR institutions is security from potential future floods.

Nowadays, dyke corporations exist especially in some alpine areas of Switzerland, for example in the cantons of Berne, Obwalden and Glarus. The present case study concentrates on dyke corporations in the canton of Berne. This canton is located in the western central part of Switzerland and stretches from the Jura mountain range in the north to the Alps in the south. Dyke corporations exist in numerous communes in the Bernese Oberland (southern part of the canton) and in the Emmental (eastern part of the canton), but are almost absent in other parts of the canton (see figure 4).

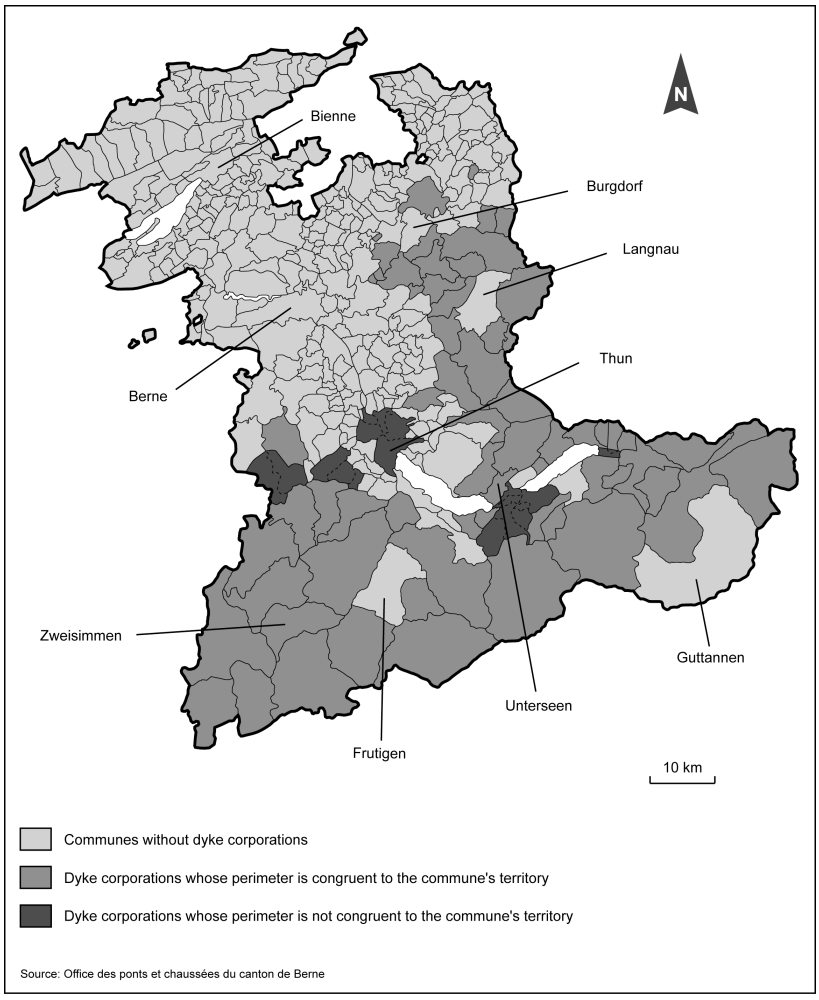


Figure 4. The geographical distribution of the dyke corporations in the canton of Berne.

3.2.1 The Swiss flood protection policy

Flood protection is of great importance in Switzerland. Since 1990, floods have caused damage of more than 4 billion Euros (PLANAT 2004, FOWG 2005). Each year, about 500 million Euros are invested in protection measures (PLANAT 2005). The public policy on flood protection and hydrological risk prevention is mainly designed by the Federal State. Although the Federal Law on Hydraulic Engineering of 1991 attributes the competence of flood protection to the cantons, it is the Federal State which develops concepts, strategies and priority principles of measures to be taken.

The implicit causal hypothesis Swiss flood protection policy is built on concerns natural hazard processes. Under certain conditions, these may cause damage to people and their real value, for example by inundating a zone supporting human activities. Since the hypothesis refrains from attributing responsibility to specific actors for a potentially insufficient security against floods, the policy does not identify a target group in an explicit manner (see below).

Hazardous natural processes being considered as the origin of flood damages (problem definition), the flood protection policy contains two families of measures. The first causal hypothesis assumes that knowledge about river bodies has to be improved in order to be able to protect people and their real values from floods. The second considers constructive works and spatial planning as appropriate measures to reduce flood risk. Whereas the federal flood protection policy assigns the Federal State to collect knowledge about flood risks, the cantons are made responsible for implementing the policy, especially for defining execution modalities of appropriate flood protection measures (intervention hypothesis).

The policy on flood protection concerns several public actors at different levels. The Federal Office for the Environment is responsible for collecting data of national interest (see below) and for supervising the implementation of the federal legislation. The latter is delegated to the cantons which ensure flood protection in their area (see above). In general, there is a cantonal office which is charged with this task. Although the flood protection policy does not define specific target groups *sensu stricto*, these are defined in the cantonal laws on hydraulic engineering. However, the causal hypothesis remains the same. Thus, target groups are committed to coordinating, financing, and carrying out flood protection measures, even though they are not regarded as being responsible for the protection deficit. Since every canton has its own law on hydraulic engineering, there are a lot of public and private actors who may potentially belong to the target group (Thomi 2005, Zaugg et al. 2004). The ones who are mostly concerned are the canton, the communes, concessionaries, hydraulic engineering associations, dyke corporations, and riparian owners (Zaugg et al. 2004). Beneficiary groups are formed by every natural and juristic person who is concerned in a direct or indirect manner by a potential flood.

Instruments used for implementing flood protection policy are generally designed at the federal level. The most important ones are the implementation ordinance of the federal law, recommendation and strategy papers as well as financial incentives. In addition, the Federal State collects hydrological data on some water bodies of national interest and participates in research projects.

3.2.2 The dyke corporations in the implementation of the flood protection policy

A portrait of the Bernese dyke corporations

According to the Bernese Cantonal Law on River Maintenance and Hydraulic Engineering of 1989, hydraulic engineering obligation on rivers is incumbent upon the commune. The duty can be assumed either by the commune itself or be delegated to a Communes-Association (a joining together of several communes or dyke corporations) or a dyke corporation. Being an institution under public law, the dyke corporation's autonomy is ensured by the cantonal legislation. Furthermore, it provides the corporation competences to levy financial contributions (see below). However, hydraulic engineering tasks can only be delegated to a corporation with its agreement. The tasks confided to the latter are defined in a regulation act and may contain planning, execution, and financing of hydraulic engineering projects and of river maintenance measures on some specific or on all rivers within the territory of the commune (Kunz, Walther 1989).

Organization and mode of operation of every dyke corporation is defined in a statute. In order to harmonize structural forms of Bernese dyke corporations, the canton of Berne worked out a model (TBA 2003). Inspired by this model, a lot of statutes of current dyke corporations resemble each other strongly. In most cases, the corporation's perimeter is congruent with the territory of the commune. Every person who owns land or buildings within the borderlines of the perimeter becomes automatically a member of the corporation, regardless of whether his/her permanent residence is in this zone or not. Holders of passing-through-rights (e.g. for wires, pipes, roads, and railway-lines) may also be considered as members. Every member of the dyke corporation has to pay an annual contribution for flood protection measures. The contribution is calculated according to the value of the member's land and buildings.

The supreme organ of a dyke corporation is the member's assembly. Its task is to elect the president, the executive committee and to decide ont hydraulic engineering projects, the budget, and the bill. The executive committee is composed of the president and several members (typically four, six, or eight). In many cases, some of these members are representatives of the commune (TBA 2003, Thomi 2004, 2005).

Dyke corporations are often characterized by the strong willingness and motivation of the president and the other members of the executive committee. Corporations benefit from their profound knowledge of local water bodies and their long-standing experience in river works. However, outside the committee, the majority of the corporation's members often show little interest in participating actively, for example in the assembly (Thomi 2004, 2005).

The role of the dyke corporations in the implementation of the flood protection policy

As dyke corporations are institutions engaged in implementing flood protection policy at the local level, their importance at the federal level is very limited. Nowadays, the spatial distribution is quite heterogeneous in Switzerland. Dyke corporations are mainly concentrated in some alpine cantons like the cantons of Glarus, Obwalden or Berne. Thus, it is not astonishing that dyke corporations play a marginal role in designing federal flood protection policies.

However, their importance may be fundamentally different at the cantonal level. Whereas dyke corporations do not play any role at all in cantons which do not know this kind of institutions, the situation is the contrary in the other ones. In the canton of Berne – which this case study is concentrating on – dyke corporations have existed for many decades or even centuries. However, nowadays they exist only in the rural and mountainous regions of the Bernese Oberland and the Emmental. A lot of the today's corporations probably have their origins in the former cantonal law on hydraulic engineering of 1857. According to this law, hydraulic engineering duty was not incumbent upon the communes, but upon the property which benefited directly or indirectly by protection measures. On public water bodies (the main receiving streams) and on private water bodies put under public supervision (streams known for their inundations and bed load transport), owners of such properties in dyke districts had to organize the coordination of river works. However, some corporations seem to be much older, their origin dating back to the beginning of the 18th century (Thomi 2001). Nowadays, dyke corporations still play an important role in the implementation of flood protection policy in the canton of Berne, especially in the Bernese Oberland and the Emmental. By delegating hydraulic engineering and river maintenance tasks, they become the responsible institution at the local level.

Despite their importance in flood policy implementation, dyke corporations played only a marginal role during the development of the new cantonal law on hydraulic engineering which was introduced in 1989. Indeed, by assigning the obligation to carry out river works to the communes instead of to the landowners, they lost their reason to exist. However, having proved to be an appropriate institution in executing hydraulic engineering obligation, the system of dyke corporations has not been given up and was integrated into the new law. Despite various

modifications at the organizational level (in general, responsibility was extended from one specific river to all streams of the commune), numerous dyke corporations have survived. Reasons for that may differ from one case to another. Some of the general advantages of dyke corporations in comparison with communes are discussed in the next chapter but one.

As the paragraphs above demonstrate, Bernese dyke corporations have been transformed several times. Whereas they initially were self-organized and self-governed CPR institutions *sensu stricto*, they have been gradually instrumentalized by the public flood protection policy. First, in a quite informal way under the cantonal law of 1857 and later more precisely and detailed in the new cantonal law on hydraulic engineering of 1989. However, the basic structures of the dyke corporations as well as their function principles have hardly changed since. Thus, whereas they still strongly resemble the ancient corporations, they have been more and more incorporated in the framework of flood protection policies.

Modalities of regulation without dyke corporations

Since the federal legislation on flood protection contains no specification about institutions at the local level, cantons are free to define implementation regulations. In many cantons the communes are responsible for hydraulic engineering and river maintenance tasks. If the communes do not delegate these tasks to a dyke corporation, they fulfil the obligation themselves. In the canton of Berne, the two systems – implementation at the local level with and without a dyke corporation – coexist. The cantonal administration does not put favour one more than the other.

Comparison of the implementation with and without dyke corporations

The coexistence of two different systems at the local level permits the performance of the involved institutions to be compared. Even though there are significant differences between communes and dyke corporations, neither of them can be considered to be more efficacious and more efficient in implementing flood protection policies. According to the geographical, social, and economic context, efficacy and efficiency of the two institutions may vary. Thus, dyke corporations may be more appropriate than communes in some cases and vice versa.

Advantages of dyke corporations namely concern the area of responsibility, fund raising, and budget allocation. Whereas communes have to deal with a wide range of different tasks, they can concentrate on hydraulic engineering and river maintenance only. All land owners within the corporation's perimeter being members, dyke corporations may integrate their profound knowledge about the local river catchment basins and water bodies. One of the most important advantages of corporations is probably their financial independence. Dyke corporations can levy annual

contributions on landed property, buildings, and through-passage rights, independent of where the owner lives (permanent residency). This may be of particular interest in tourist regions, where there are a lot of second residence buildings. Owners who do not permanently live in the region are nevertheless committed to paying the annual contribution to the dyke corporation. Since financial resources of communes are limited, there is a competition between different potential allocations. Hydraulic engineering and river maintenance projects are one task among many others. Hence, they may be deferred because of lower priority compared to another investment. The budget of a dyke corporation is not only independent from the commune's, but its allocation is strictly limited to river work projects (Thomi 2004).

Dyke corporations also have some disadvantages compared to communes, mainly in administrative topics and in the implementation of modern flood protection policies. Often, exponents of dyke corporations are not familiar with administrative procedures. Since every hydraulic engineering project implies a formal approval proceeding, this may cause problems. In practice, such procedures are led by the cantonal administration, regardless of the type of local level institution (Thomi 2004, 2005). Modern flood protection policy gives priority to spatial planning and river maintenance measures. Structural measures may only be taken if they are not sufficient. Spatial planning being one of the commune's typical competences, the possibilities of dyke corporations are strongly limited. The result is complex: whereas dyke corporations are responsible for hydraulic engineering and river maintenance works, communes have to take spatial planning measures.

Independent to whether a dyke corporation or the commune is implementing flood protection policy at local level, the beneficiary group remains the same. Thus, access to security is open for every natural and juristic person that is concerned by a potential flood.

However, only a part of the beneficiaries has the right and the duty to adhere to the decision and payers group. In the case of a dyke corporation, all land owners within its perimeter have to pay the contribution. Being a member of the corporation, they also have the possibility of deciding upon hydraulic engineering projects and to vote for the executive committee. Although tenants do not have to pay an annual contribution, they participate indirectly by their rent.

The situation is different when the commune is in charge of hydraulic engineering works. In this case, every inhabitant of the commune contributes indirectly by his/her local rates. At the same time, citizens may exert an influence by using their political rights. Land owners with their primary residence outside of the commune benefit from flood protection measures, but do not pay local rates. Of course, they are excluded from political decision rights in the commune, too.

3.2.3 Potentialities of dyke corporations

The case study shows that dyke corporations may be an alternative to communes in flood protection policy implementation at the local level. However, all aspects being compared, neither the commune nor the dyke corporation can be considered as the "ideal" local level institution. Since both have advantages and disadvantages, it is not possible to clearly prefer one of them. Local circumstances as well as the motivation and the commitment of the actors are factors which may be decisive.

Nevertheless, there are some potentialities dyke corporations have not seized yet. The first concerns the perimeter. Whereas communes are strictly limited to their territory, dyke corporations might define it by taking the catchment basins of the rivers they are responsible for as reference. Thus, flood protection would be organized in accordance to the problem to be resolved – which is the control of river runoff in a given catchment basin – and not under the dependence of political and administrative structures. Although there are a few examples of corporations whose perimeter is defined on topographical principles, this is still the exception in the canton of Berne.

Another opportunity of dyke corporations concerns their role in the culture of risk concept which has become the paradigm in public policies dealing with natural hazards in Switzerland for a couple of years. This concept proposes a holistic approach of every actor and the whole society with security aspects (PLANAT 2004, 2005). The dialogue between all actors – public and private – concerned by flood risks is indispensable. Since dyke corporations group private actors and maintain contacts with local and cantonal authorities, they may play an important role in the communication between the different actors. Indeed, dyke corporations may function as a platform which ensures information exchange and serves as a discussion forum. In addition, they may act as mediators between the public authorities and the private actors.

3.3 The collective irrigation systems in the canton of Valais

The Swiss Alps are considered as the water tower of Europe. Irrigation is therefore not necessary for agriculture and livestock production. Nevertheless, because of rain shadow effects, the canton of Valais (Rhone river valley) has developed a complex system of irrigation channels, called *bisses* in the French speaking part of the canton and *Suonen* in the German area (Crook, Jones 1999; Reynard E. 2002) since the Middle Ages. At the end of the 19th century, the irrigation network was about 1400 km long, and more than 600 kilometers of channels are still in use. Local CPR farmer corporations called *consortages* traditionally managed the irrigation systems (see for example Netting 1974). During the 20th century, the system has drastically evolved (Reynard E. 2002). Four main tendencies may be drawn. Firstly, because of a reduction in mountain farming, several

infrastructures have been abandoned and internal structures and rules of remaining corporations have drastically weakened. In several cases water use is now free. Secondly, rivalries with other water uses – especially hydropower and drinking water production – have on the contrary increased. During the last two decades, because of new developments in summer tourism, irrigation channels have more and more been used as hiking paths and most of them are now to be considered as both farming and tourist infrastructures. Finally, important changes concern the management structures: one tendency is the dissolution of the former CPR associations and the management's transfer to local municipalities (Reynard E. 2000, 2002); the other is the creation of new CPR organizations for lawn irrigation or for the new tourist management and promotion. The following case study concerns the area of Savièse and it shows how and why this double tendency can be observed.

3.3.1 Public policies

Because irrigation is not a wide water use in Switzerland, no specific federal public policy concerns irrigation. Even in the canton of Valais, very few regulations have been developed at the cantonal level and irrigation has always been regulated at the local level, where complex rules have been developed (see Netting 1974, 1981). Because of the current multi-functionality of the irrigation channels and of the changes that concern water management in Switzerland (increasing rivalries between water uses), they are concerned by three main public policies (Reynard E. 2002): the Federal Water Protection Act (1991), the Federal Law on Agriculture (1999), and the Federal Law on the Conservation of Nature and Landscape (1966).

The causal hypothesis of the water law is that because of intensive and multiple pressures on water systems by society, water resources must be protected from overexploitation, both from a qualitative and quantitative point of view. One of the intervention hypotheses considers that overexploitation may be avoided by giving concessions to the various groups of users and by maintaining residual minimal flows in the rivers after each water use. Most of the concessions to irrigation systems were given by the landlords during the Middle Ages, without any time restriction (Reynard E. 2002, 2005); in this sense, irrigation channels are not really concerned by the use restrictions introduced in the law in 1991 and that concern new and renewed concessions. Nevertheless, irrigators are to be considered as one of the target groups of the 1991 water act, as they use high quantities of water. Irrigation is, for example, practiced in urban areas (lawn irrigation), where water is taken directly from the urban water networks and must therefore be coordinated with other water uses.

The legislation on agriculture is based on the hypothesis that agriculture should not only serve for food production, but also provide other services such as the conservation of natural resources, the management of rural landscapes and the decentralized occupation of the territory. In order to

guarantee food production in Switzerland, agriculture is highly subsidized. Since the 1951 Agriculture Law, the federal and the cantonal states subsidize all the technical innovations aiming to improve productivity. Irrigation is one of the technical improvements worthy of being subsidized. Another intervention hypothesis considers that farmers should also receive subsidies in order to finance the (non agricultural) services they propose to society (e.g. landscape management). Subsidies and ecological compensations are therefore available to finance extensive use of farmlands and traditional farming practices that require more time than mechanical agriculture. Traditional irrigation channels may be considered as infrastructures worthy of being subsidized for their historical and ecological importance. The problem is that ecological subsidies are usually calculated on the basis of the surfaces that are farmed with respect of natural processes; because they are linear infrastructures, irrigation channels receive few subsidies.

The main causal hypothesis of the Nature Conservation Act considers that nature is threatened by human activities and therefore, needs protection[16]. Several intervention hypotheses may be drawn; one of them is that the federal state should give financial support to interventions that maintain the natural and rural features of the Swiss landscape. One of the financial programs is the so-called "700th's Fund", a 10 million Swiss francs program aimed at subsidizing works that maintain or renovate the traditional rural characteristics of the landscape. Irrigation channels are one of the infrastructures worthy of being supported.

3.3.2 The irrigation system of Savièse

In this case study, we concentrate on two main aspects of irrigation management in the canton of Valais: the development of irrigation in new urbanized areas and the multiple use of traditional channels both as agricultural and tourist infrastructures. The first one is mainly concerned by the Water Protection Act, whereas the latter is related to both the agricultural and nature and landscape protection policies.

During the three last decades, sub-urbanization has been quite important in the Rhone valley. Most of the new individual houses built during this period are surrounded by individual lawns and because of the dry climatic conditions and high evaporation, water used for irrigating the lawns is now important. In most cases irrigation is practiced by using drinking water, usually provided by municipal services. In several places, drinking water distributed by the public services has to be purified before the distribution. Using it for irrigation is therefore quite a non-sense. Moreover,

[16] In this section we present very briefly some of the characteristics of the nature and landscape protection policy that is presented more in details in the fourth case study.

because of numerous situations of water shortage (Reynard 2000), local municipalities are now trying to avoid misuse of distributed water. One solution is therefore to use water of lower quality – e.g. non-purified water – for some uses, like irrigation.

The second case concerns the new functions of the old irrigation systems. They rely on the current changes in agriculture, and its new ecological and cultural functions. In this context, agricultural infrastructures – like irrigation channels – are now concerned with new actors as the tourist and heritage conservation sectors.

To illustrate the current changes in the management of irrigation channels in Valais we concentrate on the case of Savièse. Until the middle of the 20th century, most of the population was composed of peasants practicing a mixed agriculture (livestock, cereals, vineyards, orchards) and the terrain was irrigated by a complex hydraulic infrastructure. The entire community[17] built the main channel in 1430, and in 1810 the management was translated to a CPR institution[18]: the *Consortage du Torrent Neuf*. In some places, especially in vineyards, irrigation was also managed commonly by small CPR organizations. In 1935, because of high costs of maintenance, an underground gallery, built by the local municipality (public sector) replaced the historic main channel that was partly destroyed to avoid accidents. Water flowing through the municipal gallery continued to feed secondary and tertiary channels that were not replaced by modern pipes, and most of them are still in use now. Since, the local municipality manages the infrastructures, whereas the irrigation of the meadows is still organized by the *consortage* (see Reynard 2005 for the details). In 1974–1975, the municipality created an irrigation system by aspersion for the vineyard area. Several CPR organizations disappeared at that time; others are still in activity. The functioning of both the main *consortage* and the small local irrigation associations is now problematic because of the drastic reduction in the number of farmers. The conclusion should be that these CPR institutions are no longer in balance with the economic conditions (Reynard E. 2000, 2002, 2005).

On the other hand, new CPR organizations are created, with the help of the political authorities. The first case concerns the irrigation of lawns in residential sectors. Because of the vicinity of an employment basin, the population of Savièse has drastically increased during the last decades and most of the new inhabitants have built individual houses with lawns surrounding the historical

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[17] During the 15th century, the channels were built by two types of actors (Reynard D. 2002:77–83): the whole community or a group of farmers called *consortage* (CPR corporation). The reasons explaining the choice between the two systems are not clear; in several cases, the distinction is not clear and the two systems superpose: the whole community is indicated in the statutes, but a small group of land-users is specifically involved in the channel management.

[18] The reasons of the transfer are not clear; actually, the channel was certainly already managed by a small group of users and in 1810 the formal change was done.

villages that make up the commune. Because of farming decrease and physical impacts of urbanization, the former irrigation system is no longer in use near the inhabited areas and most of the former irrigation rights are no longer used – and even known by their owners. Until recently, water used for irrigating lawns and gardens was pumped directly from the drinking water municipal network and a shortage of drinking water was frequent during dry periods in summer. For this reason, the municipality has proposed the creation of new irrigation systems (underground pipes) managed by CPR corporations. Since this, more than ten *consortages* have been created. The municipality furnishes water from the existing irrigation system – still in use for the irrigation of vineyards – and proposes a technical help for the planning phase. The financing of the common infrastructures (pipes, connection to the municipal network) and the management are the responsibility of the corporation members that pay an annual fee and elect their proper CPR committee.

The second case concerns a project of rehabilitation of the former *Torrent Neuf* channel for tourist and cultural reasons. At the end of the 1990s, local individuals suggested to the local municipality to renovate the historical hydraulic vestiges, to build a hiking path along the former channel and to create pedagogic products aimed at diffusing knowledge about the traditional management of water resources for irrigation. The aim of the project is to offer visitors a new tourist attraction in a natural and impressive landscape and to promote the knowledge on the historical heritage of the commune. Subventions were expected to come from the federal and the cantonal authorities with respect to the Nature and Landscape Conservation Act and the Territorial Planning Act, as well as from the private economy. In order to merge private and public financing incomes, the municipality has proposed the creation of an association, which aims to coordinate the project and to carry out its various parts. Currently the CPR association has 120 members, of which there are no professional farmers (irrigators) and some of them are not living in the area. Members are people interested in landscape and heritage conservation.

3.3.3 Potentialities of irrigation corporations

With respect to the other case studies, the local CPR organizations dealing with irrigation and rehabilitation of former irrigation system do not explicitly participate in the implementation of one of the major federal public policies. Nevertheless, even if some traditional CPR institutions seem to be disappearing, the described examples show that common-pool resource management may adapt to more complex current natural resource management. New CPR institutions are therefore created as instruments (and groups of actors) aimed at solving part of a collective problem: the more efficient use of limited water resources in the first case and the conservation and promotion of former hydraulic heritage in the second one.

In both cases, the new tasks – irrigation of lawns and protection and promotion of channel heritage – could be done directly by the local municipality. In the first case, the costs should be then added to the water bill of citizens. The problem would be the difficulty of separating houses with and without lawns, and certainly that the costs would have been divided by the whole population. In this sense, the chosen solution is economically more efficient (consumer-payer principle) and socially more acceptable. It has also another positive effect as it creates social links – based on the common management of a collective problem – in new suburban areas with a population coming from various horizons. In the second case, the main advantage of the CPR association concerns the costs and motivation: all the co-ordination tasks and part of the works (rebuilding of vestiges, construction of the path, etc.) is done directly by the members, who work for free and are very motivated.

The described new CPR corporations are positive, both in the social and economic point of view. On the other way, traditional CPR organizations – in the domain of water management, but also for the management of mountains and forests – are dying because of the drastic reduction of agriculture. Tasks historically assumed by the communities of farmers are abandoned (e.g. forest management, traditional irrigation system maintenance), transferred to the public sector (e.g. maintenance of the rural paths), and even privatized (e.g. alpine buildings transformed in secondary houses).

The positive cases described here could certainly have been experienced in a larger and more complex scale, both in water management and rural landscape management. In both cases, the co-ordination of rival uses in a context of rarity (water shortage, intensive use in inhabited areas *versus* land abandonment in remote parts of the territory) could be solved in cooperative management within new CPR institutions to be created (Reynard 2000).

3.4 Landscape management

Landscape is a sensitive, symbolic and phenomenal *relationship* of a group of spectators with space and nature (Berque 1990). According to their common expectations, resulting from the current fasion, the interests of the era, and their cultural background, the spectators select particular elements of the environment that appeal to them and to which they give a special meaning. This cultural definition of landscape draws a clear distinction between the landscape and its material basis which is composed of a spatial combination of elements of the environment (such as natural elements, buildings, etc.) (Gerber & Knoepfel 2006). Contrary to the other resources that have been exposed above, as a cultural and immaterial resource, the landscape is not regulated by formal property rights. However, like any other resources, *appropriation strategies* can be recognized that

constitute a basis for use rights. The appropriation of landscape takes place indirectly either through property rights on other resources (in particular the soil), through intellectual property which allows (the representation of) a particular landscape to be associated with a specific commercial product, or through public policies which create use rights (in particular access rights).

3.4.1 The Swiss landscape conservation policy

The protection of landscape is provided for by the Federal Law on the Conservation of Nature and Landscapes of 1966 which makes the Federal State responsible for the conservation of the characteristics of traditional landscapes. The law relies on two main causal hypotheses: The Federal State threatens landscapes in the accomplishment of its tasks (in particular through building and modifying constructions, granting of concessions and allocating subsidies). Thus it must better take into account the landscape dimension while accomplishing its tasks. Strictly spoken, the federal law does not force the cantons to look after landscapes while doing their duties. Without specifying it more precisely, the federal Law also mentions that human activities in general threaten the quality of landscapes. This paves the way for financial compensation to those actors who act in favor of landscape protection.

Building on the causal hypotheses, the intervention hypotheses rely, on the one hand, on the introduction of federal inventories, which define objects of national importance (which must be made concrete through a modification of cantonal master plans and preserved as long as no other interest of greater importance opposes to them), and, on the other hand, on the support of the Federal State in terms of financial subsidies for landscape conservation and of a better representation of landscape interests through the creation of ad hoc commissions.

The implicit target group defined by the law is imprecise as human activity in general is made responsible for the loss of landscape quality. The law mainly concentrates on the role played by the Federal State itself. The beneficiary groups are the population in general and, in particular, landscape protection organizations.

Although the Federal Law remains evasive on mechanisms to protect landscapes outside from inventoried sites, as well as on the reason why human activity is harmful to landscapes, it has brought about eight implementation ordinances and two orders, not mentioning cantonal legislation. Within the Federal Office for the Environment which implements environmental policies at the national level, the Federal Commission on the Conservation of Nature and Landscapes is responsible for advising the Swiss federal council, as well as all state agencies, on landscape conservation and inventories.

3.4.2 Landscape CPR institutions

In the 1990s, we observe a transitory phase in landscape protection policies. While existing instruments such as inventories proved to be insufficient to curb the degradation of landscapes (OPCA 2005), the notion of sustainable use of the whole national territory (including inhabited areas) gained wider acceptance. In this context, a new instrument was introduced to the Swiss legislation in December 2005 – nature parks – which binds together local communities which are willing to coordinate their actions in terms of landscape/environmental conservation and economic promotion (tourism). Before this turning point in Swiss landscape conservation policy, there were no legal instruments to manage landscapes in inhabited territories.

However, several initiatives comparable to regional nature parks had already started locally without a unifying legislation at the federal level. These initiatives correspond to the implementation of landscape management structures on a given territory which ceases to be merely a perimeter and becomes an institutional territory enjoying specific responsibilities at an intermediary level between communal authorities and cantons. It is an objective of this case study to show that such organizations share many similarities with CPR institutions dedicated to the management of the landscape resource.

In this paper, we concentrate on two particular examples – the Commission of the Baltschieder valley and the Jungfrau–Aletsch–Bietschhorn World Heritage Site Society (WHS-Society) – which can be considered as precursors of regional nature parks. The Baltschieder-Commission unifies the mayors of the four local administrative communities together with representatives of nature protection organization and the canton. The area managed by the commission since 1986 covers 42.7 km^2. Since 2001, the Baltschieder valley is also part of the larger Jungfrau–Aletsch–Bietschhorn WHS which covers 539 km^2 (an extension up to 824 km^2 is planned). The WHS straddles the border of the two Swiss cantons of Berne and Valais and includes parts of the territories of 15 communal authorities (26 after the extension), which have representatives in the organs of the WHS-Society (assembly of delegates and managing-committee) together with representatives of the tourism industry, agricultural sector, cable car operators and nature protection organizations. The WHS-Society has shown the willingness to encourage the participation of the local population through the organization of discussion forums in order to define the priorities to be followed in the future (Wiesmann et al. 2005). The question remains open as to whether such forums will be perpetuated now that the management plan has been delivered.

Contrary to future regional nature parks, the landscape managed by the Baltschieder-Commission and the WHS-Society is not permanently inhabited. It is constituted mainly by unproductive alpine land (glacier and rocks, unproductive vegetation and alpine forests, some mountain pastures); however it faces considerable pressure resulting from visitor flows.

In the sense that the Baltschieder-Commission and the WHS-Society bring (local) administrative authorities together (and not individual users), they do not match perfectly the definition of a CPR. However, there are many parallels. They bring together representatives of the users of the landscape resource (tourism, nature conservation…) who decide to improve its management in order to promote its image toward external users (tourism), but also to ensure its conservation. CPR institutions are responsible on their own for their specific organization, as well as for the tasks to be carried out. In peripheral regions, tourism is very often the main source of incomes and landscape represents a nature capital to be preserved. In that sense, the preservation of the resource is of vital importance for the participants.

CPR institutions play a central role in the management of landscapes inasmuch as public policies do not provide for instruments allowing it in the context of inhabited territories. Thus these institutions fill the gap in state landscape conservation. The modification of the Federal Law on the Conservation of Nature and Habitats in 2005 has integrated experiences gained in the different local landscape management structures which have played a pioneering role and inspired the legal amendment (the example of neighboring countries, such as France, which have introduced regional nature parks in their legislation a long time ago must not be overseen either).

In the absence of CPR institutions, the regime of the resource is characterized by its lack of coherence. Nature conservation opposes the promotion of tourism and vice versa; different legal actors are responsible for these domains (e.g. private nature conservation organization versus tourist offices which are supported by local authorities), which results in contradictory measures. Advertising attracts flows of visitors which are difficult to manage at the scale of local authorities. In short, a balance between economical and conservation interests is particularly difficult to achieve.

CPR institutions do not solve these difficulties all at once. But because they bring local authorities together with users of the resource, they can play the role of a discussion platform where these incoherencies can be addressed. This is the goal pursued by the Baltschieder-Commission which faces the disappearance of mountain agriculture, the potentially anarchic renovation of former farm buildings, the management of an extended network of paths, the challenge of preserving traditional irrigation channels, etc. The WHS-Society faces similar problems but in an environment which is characterized by highly developed tourist infrastructure reaching sometimes the very limits of the WHS. Because of its economic importance for the region, the expectations of local communities and concerned actors are much higher.

Landscape is a resource which is particularly difficult to manage because all human activities which have an impact on space also affect landscapes. This must be taken into account when assessing the performance of the Baltschieder-Commission and the WHS-Society. Their mere existence and the

fact that they demonstrate that they have reached some legitimacy, which only arises because they bring an answer to a demand for coordination, finding development strategies, bringing together actors in opposition. (Otherwise, they would quickly disappear as no legal constraints would keep them artificially alive.) By so doing, they allow landscape issues to be integrated in new projects, which is a condition for its better management.

3.4.3 Potentialities of landscape CPR institutions

The two case studies show also the difficulties that such organizations are facing. Solving these problems would improve their performance in managing the landscape resource. Firstly, they put together actors which do not have the same monetary resources. The CPR institution can only avoid the mistake of recreating on a smaller scale the same arrangement of the forces in presence if all participating actors are moved by the conviction that they share a common objective (CPR institutions must be able to build trust between participants through better mutual knowing) and through procedural rules which guarantee that all participants have their say. Otherwise, CPR institutions become structures of economical or political promotion. Secondly, CPR institutions must include nature conservation organizations, because they are the representative of the interest of non-local inhabitants who are also users of landscape. Non-local firms of the tourism sector should also be included, because they "sell" the landscape resources (generating flows of visitors) without participating to its maintenance.

4 Conclusions

Contemporary Swiss federal and cantonal environmental policies are – for legal, financial, organisational or traditional reasons – usually implemented by a large spectrum of different public, semi-public or private actors, within which self-organized and self-governed CPR institutions often play an important role. This conclusion has been confirmed and illustrated by the four case studies. Being rooted in the local society and the political-administrative system, the discussed CPR institutions assume specific tasks related to problems defined by a public policy. Even though some of them have a long history and tradition (i.e. the hunting associations and the dyke corporations), they are not simply relicts of the past. The recent creation of new corporations working in the fields of landscape management and lawn irrigation in residential zones point out that CPR institutions may represent an appropriate alternative to state actors.

Some of the studied CPR institutions take a central position in the implementation of public policies, at least at the local and regional level. Usually, their involvement in the public policy is

very similar from case to case. Since causal hypotheses of public policies are hardly targeted on corporations, they mainly act at the intervention hypothesis level. In other words, while CPR institutions are mostly not made responsible for a politically defined problem (the collective problem of a public policy), they are rather seen as an actor that takes actions to remedy to it. Being incorporated into the actors' triangle, they become a part of public policies (i.e. see the flood protection policy and its implementation acts at the cantonal level). Hence, CPR institutions have found there a (permanent) place among other public and private actors. However, despite their commitment to the implementation of contemporary Swiss federal and cantonal environmental policies, their role played during the design phase is very limited. In general, CPR institution do not participate at all in this phase, especially when it concerns federal policies. This observation may be related to the fact, that today's Swiss CPR institutions act mainly in a very precise area at the local level. Corporations covering a larger surface are rather rare. Among the four examples represented in the previous chapter, hunting associations as well as dyke and irrigation corporations correspond to this case. As landscape organisations may work at a regional level (i.e. the WHS-Society), they are the only example covering a larger area. Furthermore, as CPR institutions are committed in the execution of public policies, they mostly care about the concrete actions to be taken. They rarely worry about general strategies and resource management principles at a higher level.

A lot of the Swiss CPR institutions have a long history and tradition and they were established several decades or even centuries ago. However, public policies are not stable over time. Whereas some of them are modified, others appear and disappear. Thus, the incorporation of a CPR institution in the framework of a public policy may change. Contrary to the hypothesis of the progressive but unavoidable death of CPR institutions due to their incapacity to adapt to the competing state regulations (public policies), the examples described in this paper suggest another explanation. Indeed, in some cases, adaptation and even renewal of CPR institutions is possible within the frame of the environmental and nature protection policies implemented by the Federal State and the cantons. But, what are the conditions of perpetuation of such institutions? In the following paragraphs we will point out several aspects, which have to be taken into account to answer to this question. Some of them refer to the "attributes of the appropriators" proposed by Elinor Ostrom (Ostrom 2000). In her paper entitled "Reformulating the Commons" she listed several conditions which increase the likelihood that self-governing associations will form and perpetuate.

The survival of CPR institutions in modern environmental policies is dependent both on the CPR institution itself and on the State, more precisely on the manner the State designs public policies. To ensure long endurance or new creations of corporations, the latter must find a collective problem

defined as such by a public policy, which they can take care of. The common understanding of the problem to solve by the members of a CPR institution is indispensable (Attribute A2, Ostrom 2000). Moreover, the collective problem has to concern the members in the sense that it corresponds to a particular interest of them. However, in Switzerland, most of the members of today's CPR institutions are no longer "dependant on the resource system for a major portion of their livelihood" (Attribute A1, Ostrom 2000:34). Yet, the resource and its management can still be in the members' particular interest. Even if it is not their livelihood that is depending on the resource, organizing in a CPR institution may offer opportunities at the economic, social or ecological level. In several cases, there is a tendency for the interests of members to be transformed from material to immaterial or symbolic values. This change may be well illustrated by the hunting associations in North-eastern Switzerland. Even if the members are no longer vitally dependant on the hunting grounds, they continue managing the latter. Reasons for this are probably of symbolic, social and ecological purposes (the hunting as a social and cultural event, as well as a sport activity, management of the fauna, etc.). Despite the transformation from material to immaterial values, some CPR institutions still offer important economic opportunities. They may tap alternative sources of income than other actors (see the case of the dyke corporations) or function as a recipient of public subsidies, which the members would not get as individuals (see the case of irrigation corporations).

Public policies are designed and implemented by the State. CPR institutions can only play a role in this framework when they have the capacity of finding their place. The principal condition enhancing their chances of success is met when CPR institutions are complementary to the existing actors and do not enter into competition with existing state or private actors. Two possibilities exist. First, a CPR institution looks for a niche, which is not yet occupied by another actor. And second, it proposes itself as an alternative by offering new opportunities, for example at the financial, social or ecological level. Except for today's dyke corporations, the first solution matches the examples described in the previous chapters well. Indeed, they are not in concurrence with other (public) actors in the respective regions. The situation is different in the case of the Bernese dyke corporations. Since the communes are formally responsible for hydraulic engineering tasks, they are not the only actor at the local level. Among other things, their reason to exist may be explained by the advantages they have compared to the communes (second possibility). Although place finding in a public policy is an important factor enhancing the probability of CPR institution existence, it is not the only one. Consequent incorporation in the implementation of a public policy is certainly a condition of perpetuation. Nevertheless, the structures must not be too rigid. CPR institutions need a certain leeway allowing them to operate autonomously and to develop successfully (Attribute A5, Ostrom 2000). Moreover, to be able to act in the framework of a public policy, they have to be

acknowledged by the public authorities, as well as having their property rights clearly defined and recognized by the latter. Thus, in modern society, they are obliged to organise in accordance to the legal framework of the different administrative levels. In general, today's Swiss CPR institutions refer either to the private law (i.e. the Civil Code) or are embedded in the public law (i.e. the law on the communes).

Comparisons of the different case studies (see previous chapter) tend to demonstrate that implementation processes incorporating CPR institutions are at least as efficient and effective as the ones incorporating only state or private agents. Some possible explanations will be discussed in the following paragraphs.

A first explanation seems to be the deep and fine knowledge of the local resource system. Indeed, members of a CPR institution often precisely know their environment and especially the aspects concerning function and characteristics of the resource. Even if this knowledge does generally not have a technical or scientific character, it may be very important in the solution finding process related to a collective public policy problem. Certainly, state actors do also have profound knowledge, but being more technocratic, it is not of the same quality. Public policies that do not integrate CPR institutions risk therefore of having no access to the local knowledge. Thus, a combination of the latter and the "state actors' knowledge" may be of great interest.

The second advantage of CPR institutions in the implementation of public policies is related to the first. Being founded on the individual resource users, corporations are characterized by a bottom-up structure. This means that locally interested users, which are personally concerned by the resource, organize in a CPR institution to manage the resource or a part of it. Their motivation and commitment with regard to the corporations' tasks is a typical feature of this kind of institution. By contrast, in being characterized more by a top-down structure, public policies profit considerably less from the resource users' involvement. Moreover, CPR institutions group people which are directly concerned by the resource, but do not integrate others. The situation is in accordance with the so-called causation principle: tasks and financial contributions are assumed by actors that are personally concerned by the collective problem to solve. A system without CPR institutions may have more difficulties to apply this principle. It often involves all actors located in a specific area independently whether they are in touch with the problem or not.

Finally, CPR institutions show a great flexibility in implementing public policies at different levels. The irrigation corporations in Valais show that they are capable of reorienting their objectives according to new collective problems. Whereas agriculture is becoming less important, the use of irrigation channels for tourist purposes as well as for lawn watering in residential zones is increasing in demand. Furthermore, CPR institutions being less dependent upon administrative

territories, one of their opportunities is that they are able to organize according to functional criteria related to the collective problem. However, state actors like the communes and the cantons are less flexible, being generally strongly tied to their territories. The Baltschieder-Commission and the WHS-Society illustrate this conclusion. Both of them define their perimeter according to the resource limits without taking into account the boundaries of the territory of local authorities. CPR institutions are not only more flexible with regard to the objectives and the perimeter, they may also respond to several public policies at the same time. This multifunctionality is expressed well by the irrigation corporations in Valais. Indeed, they act simultaneously in the field of at least three public policies concerning agricultural, environmental and landscape issues. Since a specific resource use is often in contact with more than one public policy, CPR institutions may function as coordinators integrating all relevant political aspects regarding to the specific use.

However, CPR institutions do not only have advantages in comparison with state actors. The following paragraphs concentrate on some of the difficulties and limits which result both from inherent aspects to CPR institutions and external factors. In a general manner, CPR institutions may have severe problems when perpetuation conditions are not satisfied. As they have been discussed above, we will not elaborate on them any further here.

Whereas the bottom-up structure of CPR institutions may be an advantage in the implementation of public policies, it may also represent a difficulty. Every corporation does not necessarily have the strong motivation and commitment of its members. If CPR institutions suffer from a lack of involvement of their members, they may have severe difficulties in fulfilling the entrusted tasks. Thus, one of the difficulties they are facing with is related to their inherent structures. Ideally, the strong dependence upon their own members is an advantage, but it may also be one of the most important weaknesses.

Despite the fine local and practical knowledge which CPR institutions often have, they may nevertheless be confronted with a lack of knowledge. Indeed, since they are mainly based upon lay people, they may miss profound administrative, scientific and technical knowledge. The increasing sophistication of environmental legislation may accentuate the problem. By contrast, state actors – for example the communes or cantonal offices – can choose people with specific skills and knowledge when they are selecting the team. In practice, CPR institutions that do not integrate all the knowledge they need will face problems in fulfilling their tasks. Moreover, they risk becoming dependent on state actors and external experts, which can complete the lack of knowledge.

To be able to play a role in the implementation of public policies, CPR institutions have to find their place and a collective problem to whose solution they can contribute (see above). However, they can only assume their responsibility and accomplish the tasks when they have the necessary

competences. These have to be provided by the State via the public policy or the private or public law. The Bernese dyke corporations are facing this kind of problem. Whereas they have the competence of taking constructive measures on river bodies, their possibilities concerning spatial planning measures are very limited. These competences belonging to the commune, they cannot make use of it. Since the new developments of flood protection policy also contain spatial planning measures (Thomi 2004), dyke corporations are committed to collaborating with the commune.

As it has been mentioned above, instrumentalisation of CPR institutions by the State for public policy implementation purposes causes important transformations of the first. However, despite the profound modifications, CPR institutions are not destroyed by the State. The four case studies as well as the conclusions above demonstrate that CPR institutions may be an appropriate alternative to state actors in implementing public policies. Although such institutions also face limits and difficulties, it seems that their potentialities have not yet been exhausted.

Public policies being mainly designed at the federal level in Switzerland, in general, they do not contain details about implementation modalities at the local level. This specification is normally made by the cantons. It seems that capacity and opportunities of actors who belong neither to the public authorities nor to the private sector are underestimated in the public policy design. CPR institutions are generally considered as a relict of the past, but not as an appropriate alternative in modern society. Thus, it can be supposed, that they are more tolerated than actively supported by state actors. One of the reasons why CPR institution are not implementing public policies more frequently may be related to their different structure compared to public policies and public administration. Whereas these two are characterized by a top-down structure, the CPR institutions' one is bottom-up (see above). The top-down principle being inherent in public policies and thinking principles of state actors, this may cause problems of compatibility with institutions that are depending on other structures.

In practice, CPR institutions seem to be neither less efficient nor less effective than state actors and in some cases it is even the contrary that is true. From the State point of view, they could represent an opportunity of delegating some specific tasks to the resource users. By their commitment and their voluntary work, they participate in managing the resource without causing supplementary costs to the State. Ideally, these are even less important than a state solution. Moreover, local users may have more precise knowledge of the resource than public actors. Hence, the State should have a particular interest in taking into account the CPR institutions when designing public policies. However, whether the incorporation of such an institution is recommendable or not, will be different from one case to another, being especially dependent on the local context.

Once a CPR institution has found its place in the framework of a public policy, there is an interdependence, which may ideally be installed between the corporation and the State. On the one hand, the CPR institution and its members have an interest in managing "their" resource themselves without the intervention of a state actor. On the other hand, the State benefits from the different advantages of such institutions (see above). This interdependence could probably replace the users' attribute A1 ("Appropriators are dependant on the resource system for a major portion of their livelihood") proposed by Elinor Ostrom (2000:34) by constituting a new criterion.

Taking into account all advantages and difficulties related to CPR institutions in the framework of the implementation of public policies, which have been discussed in this paper, three main conclusions can be drawn. Firstly, public policies and state actors are not necessary the death of CPR institutions. Although they may cause fundamental changes, the latter keep playing an important role in many regions of Switzerland. Secondly, although some of the CPR institutions already participate in implementing public policies, all the potentialities have not been used up to now. And finally, a revitalisation of CPR institutions by the State and a more consequent integration in the implementation of public policies could result in a win-win situation for both, corporation (and their members) and the State.

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