AN OPERATIONAL METHODOLOGY TO ANALYSE CONFLICTS OVER WATER USE AT THE RIVER BASIN LEVEL

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ABSTRACT

This paper presents a methodological framework to analyse and represents conflicts over water use at the river basin level. The method consist in conducting interviews to collect the view points of stakeholders on existing and latent conflicts. The authors then propose an operational tool box to highlight the interdependency of conflicts, which are frequently connected though parties involved, water resources and/or regional policies. The tool box is implemented in two French river basins where a participatory water planing process is being initiated. The results of the conflict analysis are presented to stakeholders in order to facilitate the emergence of a common understanding of the issue at stake and to facilitate the formulation of the problem to be solved through negotiation.

RESUME

Cet article présente un cadre méthodologique pour analyser et représenter les conflits d'usage de l'eau à l'échelle de bassins versants. La méthode consiste à recueillir par enquête le point de vue des acteurs sur les conflits existants et latents. Les auteurs proposent ensuite des outils permettant de mettre en évidence l'interdépendance des conflits qui sont souvent liés entre eux par les acteurs, la ressource en eau et/ou les politiques régionales. Ces outils sont appliqués dans deux bassins versants français, dans lesquels une dynamique de concertation se met en place. Les résultats de l'analyse des conflits sont restitués aux acteurs en vue de faciliter l'émergence d'une représentation commune des enjeux et contraintes de la gestion de l'eau, facilitant ainsi la formulation du problème devant être résolu par la négociation.

Keywords: water, conflicts, management plans, France, public consultation, European Water Framework Directive

INTRODUCTION

In France, stakeholder participation was first introduced as a water management principle with the promulgation of the 1964 water Law. The 1992 Water Law reinforced this principle by enlarging the role of stakeholders in the design of water policies. Participation is occurring at two different scales of planning process : representative of water users are involved in the preparation of a Water Development and Management Master Plan (WDMMP or SDAGE in French) at the River Basin District scale, which size range between 19,000 and 155,000 km²; and at the local level, stakeholders may define, on a voluntary basis, a Water Management Plan (WMP or SAGE in French) for a specific functional hydrologic unit (aquifer or sub-watershed covering a few hundreds to thousand square kilometres). The main objective of this progressive opening of the decision making process was to promote socially sustainable water management arrangements that would be accepted by all water users including environment protection NGOs. These arrangements are defined separately in each District, through negotiation where the concrete objectives and the

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intervention strategy are defined, under the supervision of Government Agencies which guarantee that the general interest prevails.

At the River Basin District level, stakeholder involvement in the preparation of the six Water Management and Development Master Plans did not create major acceptability problems. The Plans were all agreed and signed not more than four years after the law that set up these SDAGEs, determining the orientation for qualitative and quantitative criteria at nodal points of functional hydrographic units. The picture was quite different with the local water management plans (SAGE). In February 2001, only 3 of the 42 SAGE projects initiated before 1997 had been signed. Three reasons were advocated to justify this poor result: firstly, the procedure was generally very slow, leading to a rapid decrease of motivation of the participants (Richard, 2000); secondly, the public actors in charge of supervising and steering the negotiation systematically tried to avoid addressing conflictual issue, focussing the debates on topics for which most of the stakeholders could reach mutual gains trough a consensual decision (Piegay, Dupont et al. 2002); thirdly, the alternative options to be discussed by stakeholders were identified by technical experts, with little input from stakeholders whose livelihoods are actually affected by the decision (Garin, Rinaudo, Ruhlman, 2002). The French experience somehow points out that stakeholder participation cannot lead to sustainable water management agreements if major conflicts are not addressed and settled during the negotiation process. It also highlights the need to develop methodological resources and practical experience to analyse conflicts and to transfer them to those in charge of conducting the negotiation.

The present paper proposes a simple methodology for conflict analysis and illustrates it through two case studies conducted in South and South-Western France. The next section reviews the recent literature dealing with environmental conflict management and proposes a conceptual framework to analyse these conflicts. The third section then proposes a concrete methodology to implement this conceptual framework, using semi structured interviews. The fourth section presents selected findings from the two case studies. Using evidences from these case studies, the paper concludes with highlighting and analysing the difficulties encountered while trying to conduct conflict analysis in the French context.

CONCEPTUAL FRAMEWORK FOR CONFLICT ANALYSIS

Water Management Plans are multidimensional projects which may involve changes in water allocation, investment in water infrastructure, implementation of pollution control measures, environmental restoration programmes and/or flood protection measures. Each component of these projects is likely to affect the interests (economic and others) of different categories of water users, different territories and /or different institutional actors. As a result, they may generate (or exacerbate) disagreements, incompatibility, disputes or struggles, etc... For the purpose of the present study, conflicts are defined as *"mutual hostility between or among individuals or groups. Hostility might be expressed in words or in actions"*(Nye, 1973, cited by (Yarn and (eds) 1999). This definition simplifies the distinction between *conflict*, considered as a "state", and its various *symptoms* considered as "process". It is in accordance with stakeholders' way to describe conflicts over water. Conflict that gives rise to a public expression is *manifest*, while conflict that has not given rise to a dispute is *latent*.

Understanding the nature of a conflict implies to investigate four main elements: the people involved, the issues under discussion, the interests at stake, and the dynamics of the conflict (Moore 1986). In this paper, we further argue that, since actors are generally involved in several conflicts, understanding the interdependency of apparently separated conflicts is another crucial peace of knowledge.

Nature of conflicts

The first step of the analysis consists in taking an inventory and characterising all those (individuals or organisations) who feel involve in the conflict. This implies to identify (i) the "opponents" and the "partners", as they are perceived by the protagonists themselves, as well as their power relationships; (ii) the issues of controversy (apportionment of limited water resource; flood management; pollution control; protection of aquatic species, etc.); the interest defended (income, political power, etc.); (iii) the arguments used and the ethical values actors refer to. Interviews and written documents (minutes of meetings, reports of experts, press release, etc.) are different sources of information that can be mobilised to carry out this analysis. A careful analysis of the discourse can be very useful to distinguish among the four following types of conflicts :

- The *cognitive conflicts* (Valchos 1990), also called *informational conflicts* (Priscoli 1994) arise when the stakeholders do not share the same views on the state of the "world", the nature of the fact, their dynamics. For instance, people may disagree on the hydrological, chemical, ecological or economic processes which determine the functioning of the water resource, on its present state or on its dynamics. The issue of controversy can be related to the problem itself (some actors can refute its existence), its expected future evolution (aggravation or improvement), its origin (induced by natural versus human factors) or to the relative efficiency of the different measures that could be implemented to solve it. This sort of conflict is particularly frequent in situations characterised by a lack of reliable technical and scientific data, for instance where water monitoring networks are not sufficiently developed (density of measurement points or frequency of measurements made is inadequate).
- The *consensual* or *interest-based conflicts* (Priscoli 1994), (Moore 1986, quoting Aubert 1963) (Valchos 1990) also called *distributional conflict* in which parties are competing for the same limited resources. They are the most common in water management. They can concern the actual situation, resulting from incompatibilities of different activities developed on the basin (shortage of water in the downstream section of a river basin because of the development of irrigation upstream for instance). But they can also arise during a planning process when the water management measures promoted by each stakeholder are mutually not acceptable for political, social or economic reasons.
- The *dissensual* or *value-based conflicts* (Priscoli 1994), (Moore 1986 citing Aubert 1963) also referred to as *ideological conflict* (Valchos 1990) in which parties are promoting incompatibles norms, values, beliefs, right or principles for application to a situation. Here, the protagonist refer to different models of society or to different visions of what ecosystems should look like which necessarily leads to different visions of what action should be.
- The *power-based conflicts or the relational conflicts (Priscoli 1994).* They result of tensions between the stakeholders, related to the role attributed to each of them in the decision process, role which is determined by the choice of a decision rule, the designation of stakeholders' representatives, the role of the state in the decision, etc. What is at stake here is the potential influence of different stakeholders on the decisions related to current and *future* water management issues, that is the assurance to be sitting in the right position to deal with future and non forecasted problems. Actors compete in different arenas to influence the decision in their favour, putting forward technical and economic arguments and investing in lobbying activities. In such conflicts, the arguments used by the competing stakeholders are mostly related to their social, political and economic legitimacy.

Value-based conflicts or power-based conflicts are more likely to resist resolution using classical negotiation and mediation techniques than the two first one, because it is impossible then to define common interest or goals. They are classified as *constitutional disputes* (Susskind and Cruikshank 1987) or "*intractable*" conflicts (Burgess and Burgess 1996) or "resistant to resolution " (Campbell 2003). In the water sector, most of the conflicts are a combination of the four types described above.

The typology described above should, therefore, be considered as a framework to describe the different facets of complex conflict rather than a classification tool (Frey 1993).

Conflict intensity and dynamics

Understanding the intensity of a conflict can be assessed through an evaluation of the level of communication and interaction that exists between opposing parties and the level of emotion in their relationships (empathy, goodwill, trust, etc.). When the intensity of a conflict increases, the parties involved become more contentious, the level of communication decreases, the sense of interdependence is reduced and the level of emotion (reflected in the discourse) tends to increase.

Tensions, conflicts and deep-rooted conflicts are gradual hostility along a continuum of intensity (Owen, Howard et al. 2000) . *Tensions* can be defined as disagreements arising over interests and positions, involving low levels of emotion, the persistence of a sense of common interest and the desire to find a solution acceptable by all the parties. *Conflicts* involve higher a level of emotion, less frequent and more contentious social interaction. The different parties adopt more extreme positions (polarisation of the conflict) and engage into lobbying activities to build up coalitions of actors (factionalism). This escalation of the conflict tends to increase the number of disputants and to involve not only the individuals concerned but also the social groups they belong to. In deep *rooted conflicts*, stakeholders are locked in irreconcilable positions, considering that any compromise would run against their basic needs and vital interest. There is no room left for negotiation and problems could have been solved through informal discussion frequently end up in courts. The cost of reconciling the diverging interest rises as the intensity of the conflict increases. Deep rooted conflicts are classified in “intractable” or “resistant to resolution”.

Another interesting feature to be investigated is the origin of the conflict, defined as the factor that has disrupted the social equilibrium established between the parties involved. The conflict can originate from a change in the natural, economic or institutional environment which questions and challenges ancient agreements. In such cases, the society has not (yet) been able to revise and adapt the existing institutions to cope with the external changes. This situation of social scarcity (Ohlsson 2000) can be temporary or last over decades according to the resilience of the institutions, defined as their ability to adapt to external changes. Conflicts may also be provoked by changes that are anticipated by actors.

Interdependancy of conflicts at the watershed level

A specific feature of water conflicts lies in the fact that they are frequently interconnected, forming a network at the watershed level. Any intervention affecting the intensity of a specific conflict is, therefore, likely to have some repercussion on other sources of tension within the watershed. At the watershed level, conflicts should therefore be analysed with major attention given to the three following links relating them:

- the *hydrological link:* conflicts can be made interdependent by the water resource itself. A typical example is that of a watershed where a conflict related to river flow sharing, occurring in the upstream section of the watershed, interacts with a pollution related conflict in the downstream section. In the upstream section, farmers pumping irrigation water in the river enter into conflict with fishing associations, the controversial issue being related to the definition of a minimum in-stream flow to be maintained during the summer months (resource sharing conflict). In the downstream section, tensions occur between environment protection associations and municipalities in charge of waste water treatment plants, the controversy being related river pollution. Since the intensity of the downstream (pollution related) conflict is highly dependent on the discharge released by upstream by farmers, the parties of the downstream conflict may consider themselves as involved in the up-stream conflict). They may, for instance, back up the fishing association in the local political debate, despite not being

directly concerned by the issue at stake. A consequence of this is that the upstream conflict can only be fully understood through a global approach of conflicts at the watershed level.

- the *social link*: conflicts are made interdependent by the actors involved. It is not unusual that one actor be part of several conflict related to different water management issues in the same watershed. In such cases, the positions defended by each actor and the formation of the coalitions can only be understood by looking simultaneously at all the conflicts in which the same actors are involved. To illustrate, let's assume a situation where the interests of actors A and B are opposed to those of actor C in conflict 1 and where the interests of actor A and D are be opposed to actor B in conflict 2 (see figure below). The attitude of actor A towards B (active support, neutrality, hostility) depends the relative importance of the interests at stake in conflict 1 and conflict 2.

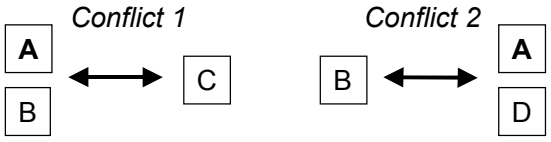

Figure 1 : Interdependency of conflicts through the parties involved

- the *policy link*: water conflicts can also be dependent on conflicts over land use and regional development policies or projects (roads, industrial area or touristic complex, etc) which are not directly related to water management. In such contexts, the conflict is driven by the interests and the actors related to the land planning and regional development issue more than the water management issue. Focussing too narrowly on the water issues itself, the area where the conflict apparently takes place would not enable to capture the real stakes, understand the formation of the coalitions, etc. Illustrations can be found in situations where land use planners and regional policy makers support (through infrastructure development for instance) the residential and/or industrial development of specific areas; these policy choices generate new water demand which can only be satisfied by exploiting water resources located in rural areas; this in turn generates tensions with rural municipalities which tend consider that they "own" the local water resources which they refuse to export towards the city. In fact, the real stakes behind that conflict apparently due to water may be related to the regional development policy itself. What is at stake is investment in infrastructures, economic development, employment and tax income for municipalities.

OPERATIONAL METHODOLOGY

The conceptual framework described above was translated into an operational methodology to analyse conflicts over water use. The method, which mainly relies on interviews, comprises eight major steps (see figure 1). Background information on water resources and uses is first collected and compiled, looking at consultant reports, annual reports published by government agencies and public statistical data (on agriculture, population, water use) (1). Based on that information, a preliminary list of significant water management issues is drafted, the parties concerned listed and the interest at stake are identified (2). A core-list of resource persons to be interviewed is established relying on the advises of local experts (3); this list is continuously revised and enlarged during the interviews. Semi-structured interview guidelines are developed (4) and used to conduct face to face semi-structured interviews (5). Additional telephone interviews, focussing on a category of actors (e.g. farmers, households, etc.) can also be conducted (6). The data collected are interpreted by allotting major importance to discourse analysis (characterisation of the level of emotion involved, argument used, etc.) (7). Finally, a restitution of the results is made to the persons interviewed (groups per type of uses). A final restitution is also organised with all the interviewees to confront the different visions (8).

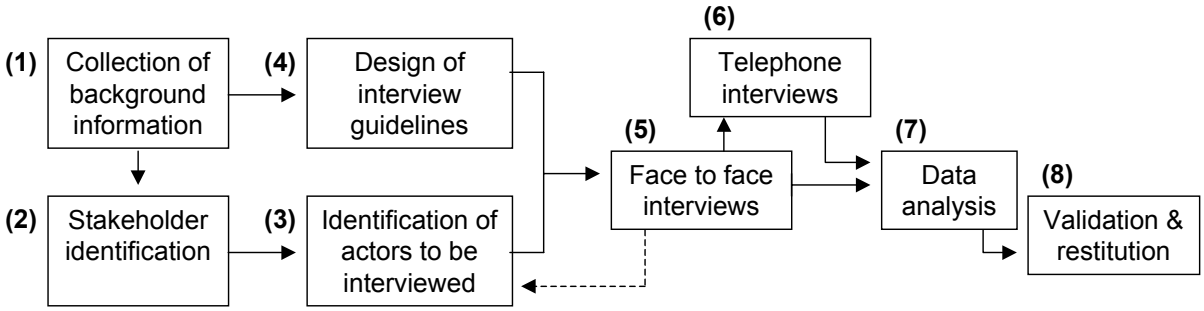

Figure 2 : Major steps of the methodology

Identification of stakeholder

Identifying stakeholders –or concerned parties- in an environmental management problem is clearly a subjective exercise which heavily depends on the experience and the value system of the analyst. As pointed out by Skutsch (2000) in a forestry management context, the result are likely to be very much different if conducted by a government agency (which will tend to ignore informal institutions and illegal resource uses), a locally elected politician, the representative of a specific interest group or an external mediator. There is always a risk that the analyst does consider the interests of actors depending on the water resources of the watershed but located outside the watershed boundaries; or that he does not considers the interests of unorganised groups which are not represented in any local political arena.

To reduce this risk, we decided to consider two categories of actors. The first category consists in *representatives ,* i.e. actors who have both a clear interest in the situation and an access to the political decision arena where they can defend the views of the group they are supposed to represent; these are for instance professional organisations, environment protection associations, or elected politicians, all of them being potential candidates to sit in the Water Commission in charge of negotiating the design of Water Management Plan. The second category consists in *grass-root actors* whose interests will directly be affected by the design of the WMP but who have no direct power to influence it. The views of the latter are not necessarily the same as those expressed by their representatives because (i) some stakeholders may not be organised and represented and (ii) the interest and needs within stakeholding groups may not be homogeneous, particularly in large groups (farmers, households).

For these two groups, the major criteria used to select the persons to be interviewed was the possession of relevant information on conflicts over water use and their capacity to propose solutions to these conflicts. Interviewees were also selected according to the interest -economic and other- in the water management issues at stake. All the water uses were covered (farming, drinking water, tourism, fishing activity, environmental protection). The geographic distribution of interests in a watershed was considered as well. It is also important to note that the establishment of the list of persons to be interviewed was an iterative process as each interview shade a new light on a specific conflict, highlighting the existence of stakeholders that were not identified at the beginning.

Interviews of stakeholders

The second step consisted in conducting face to face interviews. Stakeholders were met individually so that each could express his or her views of how the hydrosystem functions, what the water-management constraints and water conflicts are, their origin, and how they are expressed. We preferred this freedom of expression to collective approaches such as focus groups, foresight seminars, consensus conferences, or citizens' juries, most of which are not suited to expressing the

diversity of initial viewpoints when a subject seems to be conflictual (Van Asselt, 2001). Such collective procedures are more appropriate at a later stage, when we seek acceptable solutions to conflicts and wish to stimulate collective learning (Daniels and Walker, 1996). The interviews were guided by a semi-open questionnaire designed to (i) evaluate the respondents' level of knowledge and information concerning the hydrosystem, (ii) identify water-management problems they are concerned about, and (iii) inventory and characterise current or potential water-use conflicts and their areas of influence. A map of the watershed was also offered to the respondents to facilitate the description of conflictual events (location of actors involved, etc.). When the views expressed by representatives (for instance farm unions) on the one hand and grass-root actors (farmers) on the other hand were not coherent, we extended the survey with telephone interviews with grass root actors, in order to compare their viewpoints with those of their spokespersons on several important points that came out during first series of interviews.

Tools to represent water conflicts at the watershed level

The data collected were analysed using simple tools to describe conflicts over water use at the watershed level. Such tools which synthesise the complex information collected through interviews are indeed essential supports for transferring the knowledge acquired by researchers to those in charge of solving the conflicts or even to the actors involved in the conflicts. In the paragraphs that follow, we propose four types of supports that can be used for that purpose.

- The information collected is first used to construct *conflict identity cards*. One card is prepared for each conflict, describing the parties involved (opponents and partners), the nature of the conflict (cognitive, interest based, value based or power based conflict), the arguments of the parties involved, its intensity (tension, conflict, deep rooted conflict), and its dynamics (origin, evolution of the manifestation of the tension).
- *A map of the conflicts* is then prepared. Each conflict is located on the map, using different icons to depict the issue of controversy (point source pollution, in-stream water flow, diffuse pollution, river quality, ecosystem protection, etc). Colours can also be used to depict the intensity of the conflict (from green to red). The zone of influence of the conflict can be represented by a line. And the conflicts which are interdependent can be connected through arrows which can extend, if the case occurs, outside the boundaries of the watershed.
- Starting from the map, the analysis can be complemented by constructing a *conflict matrix* showing the actors in rows and the issues of conflict in column. In the simplest form of then matrix, each cell (i,j) is filled with 1 if the actor i is concerned by the issue of conflict j, 0 otherwise. The cells can also be filled with colours to depict the level of involvement of each actor in the different conflicts. Alternatively, numbers ranging from 1 to 3 for instance, and reflecting the level of involvement in the conflict, can be used to fill each cell. In that case, the sum of the cells in row gives an indication of the overall level of involvement of each actors in the different conflicts whereas the sum in column gives an indication of relative the level of concern of the society for the different conflicts.
- The fourth tool that can be used to synthesise existing conflicts at the watershed level is a *coalition matrix* where stakeholders are listed both vertically and horizontally and the type of relationship established between any two can be signalled in the relevant cell. Here too, different colours can be used to reflect the type of relationship : unconditional support, passive support, passive opposition, active opposition. As explained above, the relationship between two actors may only be understood by taking into account the interdependencies of conflicts.

Restitution and validation

The results of the analysis were validated following a three step process:

- The minutes of the interviews were first returned individually to the interviewees to make sure that there is no misunderstanding on the description of conflicts. However, to avoid that clear-cut positions and statements are not removed or reformulated, it is essential to assure the confidentiality of the document, when sending the minutes in a written form to interviewees. In the two case studies where the methodology was implemented, the first level of validation did not provoke a lot of reaction. Less than 10% of the interviewees send comments (by phone or on a written form) and the suggested changes were generally minor.
- A working cession was then organised, bringing together actors belonging to the same group of users (agricultural water users, actors from the drinking water sector, etc). Preliminary results of the analysis are presented and discussed in an arena where knowledge, values and interests are expected to be homogeneous. The expected outcome of the debate is the emergence of a limited number of clear-cut representations of the conflicts.
- A final meeting was organised to confront view points of all the stakeholders. All the parties involved in the major conflicts (existing and latent) are invited to participate. An overview of the different conflicts, their interdependencies, the coalition formed, etc. are presented to the stakeholders in view of validating the representation of the conflicts made by external observers but also to help stakeholders to better understand each other claims needs and constraints.

WATER CONFLICTS IN THE HÉRAULT AND THE LÈRE WATERSHED, FRANCE

The methodological framework described above was implemented in two river basins located in Southern and South-western France, namely the Hérault river basin and the Lère river catchment. In these two case studies, water management is undergoing significant reforms, which have been initiated by public authorities on the basis of technical and economic assessments conducted by consultants (see CG34 and CG30 2000 for the Hérault and Aqualis, Artline et al. 1998 for the Lère). Following a brief presentation of the field sites, this section presents selected results of the conflict analysis.

Presentation of the case studies

The Lère river is a tributary of the Aveyron river, which flows from the karstic plateau in Central France towards the Garonne river and the Atlantic ocean (Figure 3). The Lère catchment covers an area of 790 square kilometres of rural areas, with a population of 96,000 inhabitants. During the last two decades, the farming sector, which mostly comprises small landholding (30 hectares on average) has experienced tremendous changes with the development of irrigated crops, and in particular of high added value crops such has orchards, production of vegetable seeds and maize. As pointed out in the consultants' reports, this evolution has led to the emergence of new concerns about (i) the availability of water in summer and sharing of the resource between the farming sector, production of drinking water and minimum in-stream flow needed for sanitation; (ii) the quality of water and the control of diffuse (agricultural) and point source (municipal) pollution; and (iii) the restoration of the landscape and the river related ecosystems, considered as a common heritage and an economic asset in this area popular with tourists.

In response to these concerns, a River Management Committee was created to define collectively a "river contract" which aims at defining a programme of actions over a five years period (investments, information and awareness campaigns) to improve the quality of the water resources and related ecosystems in the basin. This committee is chaired by an elected politician and it is composed of elected politicians, officials from government agencies and representatives of economic sectors concerned with water (agriculture, tourism, environment, drinking water sector). Although some experts from Government agencies insisted that the Committee should address the three issues mentioned above (apportionment of water in summer, management of diffuse pollution

and restoration of the landscape and river banks), the Committee rapidly focussed only on the third issue where a consensus could easily be reached on the actions to be implemented. The two other issues were not debated within the Committee despite being potential sources of conflicts in a very near future.

The second field site where the method was implemented and tested is the Hérault River basin, which covers an aera of 2500 km and stretches from the Cévennes mountains to the Mediterranean sea (160 km long). In this basin, there is an increasing pressure on water resources due to the rapid demographic growth (1 to 3% per annum), to the development of tertiary economic activity in the area that surrounds the city of Montpellier and to the development of tourism . This generates an increased demand for drinking water demand by households, most of which own houses with garden and swimming pools; the demand for treatment of waste water is also increased. In the same time, the demand for clean river waters and restored landscape increases as the practice of water related recreational activities become more popular (canoeing, fishing, swimming, etc). These demand of these "new" uses are now competing with traditional water uses, such as irrigated agriculture, textile industry, hydropower some of which are facing economic difficulties. In this context, the priority of public actors is to established a "forum" where the different stakeholders can debate on the objectives to be set for the medium and long term and define collectively a programme of actions to be implemented. According to experts and public actors, the key issues to be addressed are (i) the apportionment of scarce water resources in a context of high climate variability; (ii) the exploitation of karst aquifers to meet the growing demand in the region of Montpellier (located outside the river basin); and (iii) the control of surface and groundwater pollution by herbicides used by wine growers. Overall, experts and public actors do not consider the case as a situation of conflict but they anticipate that new tensions my soon emerge.

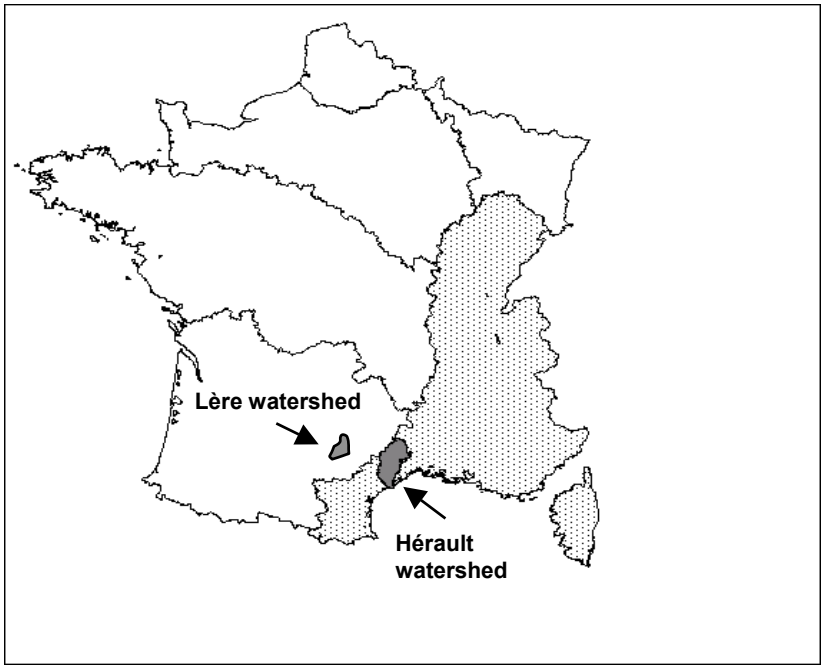

Figure 3: Location of the Hérault and the Lère watersheds.

Diversity of conflicts

The interviews reveal that stakeholders are concerned by a variety of conflicting issues. In the Lère watershed for instance, 36 of the 46 stakeholders interviewed mentioned the existence of conflicts over water use. Stakeholders are particularly concerned with : Conflicts linked to the apportionment of water in low flow period (cited 23 times); Disagreement and tensions related to

the implementation of water management tools (metering and water pricing quoted 16 times); Tensions related to water quality problems (quoted 15 times); Oppositions on the type of agriculture to be promoted (intensive versus organic production: quoted 7 times). Representative of the agricultural sector are more worried the farmers they represent : 9 of the 14 representatives interviewed think that water related conflicts are intense whereas only one third of the farmers interviewed by telephone share this opinion. This is partly due to the fact that farmers representative involved in the conflict tend to avoid communicating on this topic with they root-base which is generally not informed about existing water conflicts.

The interview reveal that issues of concern widely differ from a category of stakeholders to another. In the two river basins, agricultural stakeholders are mainly concerned by the conflict over water resource sharing during low flow periods. Stakeholders from the drinking water sectors are mainly concerned by tensions related to the protection and the pollution of the resources. Institutional representative of water users, elected politicians and representatives from leisure and tourism related activities have a relatively broad and integrated vision of the different issues of conflict. *Figure 4* below uses radar graphs to illustrate this point as well as the general divergence of viewpoints in the Hérault basin: each axis represents an issue of concern and the position on the axes refers to the number of times the concern was cited by interviewees for that particular sector.

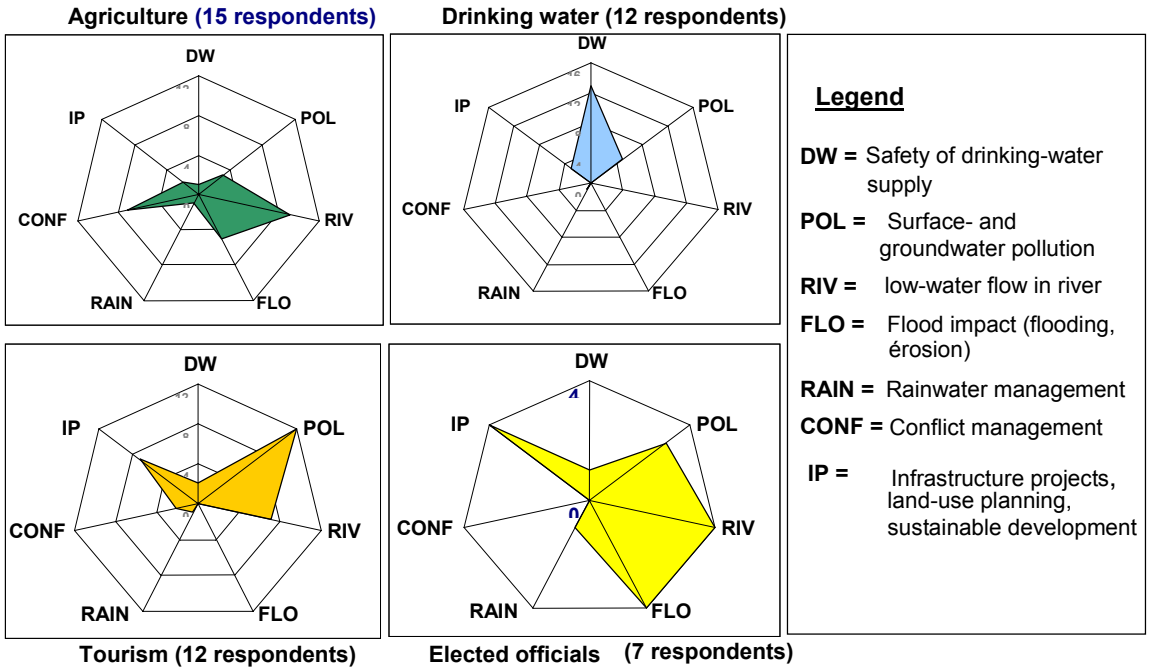

Figure 4: Concerns cited by type of stakeholder in the Hérault basin

The dynamics of conflicts

Several of the conflicts identified in the two case studies are dynamic. An example from the Lère River basin is used below to illustrate how a local interest-based conflict can rapidly evolve in a deep rooted value and power based conflict.

The conflict starts with the project of a farmer to extend its activity by constructing a large industrial pigsty. The project, submitted to the relevant local government administration, comprises a manure spreading plan which complies with the national rules and regulations. An *interest based conflict* appears opposing the farmer with two local associations grouping together actors deriving their income from tourism activities and other farmers of the area. The former fear that the tourists flee from the area because of the smell of the manure that is likely to be spread over large area; the

latter fear that the project increases the difficulties for small farmers to find fields where to spread their own manure (increased competition for recipient fields).

The conflict grows more bitter and evolves into a *cognitive conflict* when the opponents to the project call on an independent expert to highlight the risk that a drinking water well supplying several municipalities be polluted by manure spreading. This is followed by a debate among experts to define the size of the catchment area of the well where no polluting activity must take place. This debates involves actors representing the drinking water sector who, given the controversies which appear between experts, decide to adopt a precautionary approach and take position against the project.

The conflict takes root as the issue is taken to court and it transforms itself into *a value-based conflict*. Without waiting for the decision of the court, the two sides try to increase the legitimacy of the position they defend and they seek the support of other stakeholders to enlarge their coalitions. The arguments used increasingly refer to ideology. The promoter of the project, supported by the largest farm union (Farm Union 1), puts forward the principle of enterprise freedom and creation of wealth when a project complies with rules and regulations. Opponents advocate the risk that this type of intensive farms multiply, creating very large scale diffuse pollution of water resources as it is the case in the French region of Brittany.

Using this example as a symbol, they are joined by a small farm union (Farm Union 2) which promotes of a more sustainable agriculture. The dispute evolves towards a *power-based conflict* as the two farm union also compete for power. The decision that will be taken by the court is likely to be interpreted as an indication of the relative power of the two farm unions and the search of compromise then becomes very difficult.

The political dimension of conflicts

A simplified version of the *conflict matrix* described in the previous section has been elaborated for the Lère River basin and is presented below (Figure 5). Conflicts appear in the rows and the stakeholders involved in columns. Cells are shaded using different levels of grey. The level of grey in a given cell (***i,j***) shows the intensity of the involvement of actor ***i*** in conflict ***j*** : dark grey ***i*** used to depict a high involvement, light grey with an « m » represents a moderate involvement. The last column of the matrix shows the number of stakeholders who are highly involved in each conflict. The last row of the matrix shows the number of conflicts in which each actor is involved. In the case of the Lère river, the matrix shows that the two major conflicts are those related to diffuse agricultural pollution (9 stakeholders involved) and to the sharing of water resources in low flow periods. The matrix also shows that most of the stakeholders are involved in a number of conflicts (6 stakeholders involved in more than 4 conflicts). Due to this, the position defended by a specific actor in a given conflict is necessarily dependent on the alliances and coalition which he has formed with other actors in other conflicts. The matrix is helpful to visualise the conflicts which are likely to be inter-linked though the parties involved and thus likely to have a strong political dimension.

CONFLICTING ISSUES	STAKEHOLDERS									
	Farm Union 1	Farm Union 2	Municipalities	Government Agencies	Nature protection NGOs	Fishing Association	Consumers & riparian land owners	Professionals - tourism sector	Local Governent	French Electricity Company (EDF)
1- Diffuse agricultural pollution										
1.1- Presence of nitrates & pesticides in drinking water						m		m	m	
1.2- Construction on industrial pigsty										
1.3- Use of urban sludges in agriculture					m					
2- Sharing water ressources in low flow period										
2.1- Minimum river discharge								m		
2.2- Metering of agricultural water use										
3- River pollution by waste water treatment plants										
4- Use and upkeep of river banks										
5- Increase in water price										
	5	**5**	**5**	**5**	**4**	**4**	**3**	**1**	**1**	**1**

Figure 5 : Conflict matrix in the Lère River Basin.

Understanding this political dimension then requires to analyse the positions defended and the arguments used. In the Lère River Basin, it appears that the two major farm union defend totally different positions for the two major conflicts (sharing of water resources and diffuse pollution):

- For FarmUnion A, a politically dominant farm union in favour of intensive agriculture, irrigation and the systematic use of fertilisers and pesticides cannot be avoided. For this far union, most of the small farms[3] would not have economically survived without intensifying their production, and in particular through the development of irrigation. This intensification is legitimated by the social and economic significance of agriculture, which generates a turn over 500 millions € and represents the main employer with approximately 7500 farms. To avoid environmental damages and mitigate mounting tensions between actors, it is therefore urgent that new resources be created (a dam of 10 millions cubic meter capacity) and that incentives be provided to farmers to reduce the level of input use (financial compensation for yield losses due to reduced input use).
- For Farm Union 2, policy makers and farmers have chosen the wrong path when choosing to favour the development of irrigation and intensive production systems. They plead for an agriculture that respects the environment, uses as little chemical inputs as possible and generates profit though high quality products rather than through quantity. This Union proposes that irrigation be restricted to high added value crops (vegetables, fruits and seed production) and occasionally used to avoid crop failure for fodder. They suggest that irrigation of maize crops, which represents 75% of irrigation water use, be banned and that alternative production strategies (organic farming for instance) be encouraged and supported by policy makers (research and development, organisation of the market, etc.).

In the Lère River basin, conflicts have a very strong political component and their resolution depends on political control lever which are not located within the basin itself: the Common

[3] The average farm size in the river basin is close to 30 hectares against 50 hectares at the national level.

Agricultural Policy which determines the profitability of irrigated maize crop; decisions of the Ministry of Agriculture and the Ministry of Environment, etc

Network of conflicts

In the Lère River Basin, conflicts are dispersed other the entire basin, with the exception of the conflict related to the construction of the pigsty : diffuse pollution problems affect the entire territory and water sharing related conflicts are encountered for all the stretches and tributary of the Lère River. Drawing a map of the conflict is therefore not very useful as conflicts are not interlinked spatially but through the actors.

The situation is very different in the Hérault case where most of the conflicts are localised. As shown on the map presented in Figure 6, only three conflicts (marked 3, 7 and 8) are relatively independent: conflict (3) arises over the use of the river banks and bed of the Vis river, a tributary of the Hérault river where leisure activities are very developed (fishing, swimming, canoeing); tensions are provoked by the nuisances due to the very high tourist frequentation (degradation of the site, disturbance of fish population). Conflict (7) is provoked by the pollution and the related environmental damages generated by the cooperatives; it opposes the vine making cooperatives on the one hand with government agencies in charge of the monitoring of river quality and the fishing associations on the other hand; conflict (8) is related to the management of flood risk in the downstream part of the river basin; it opposes urban dwellers to the municipalities, and the municipalities to farmers, the major issue of conflict being related to the definition of land use policy.

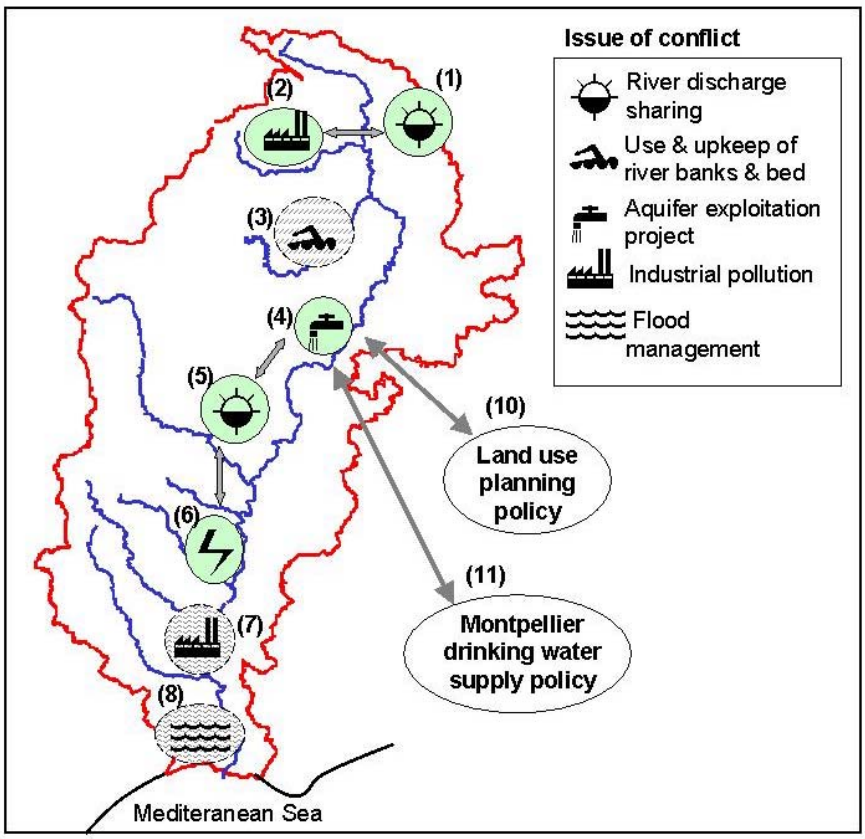

Figure 6 : Map of conflicts in the Hérault river basin with interconnections between them.

Other conflicts are all characterised by some degree of interdependence. For instance, conflict (1) and (2) are interconnected though the water resource. Conflict (1) opposes farmers growing vegetable in the valleys of the Cévennes ills with fishing associations, the dispute being due to the

over-abstraction of water by farmers in low flow period and the related impact of fish populations. Conflict (2) opposes textile industries (which pollute a tributary of the Hérault River with effluents from a dying process) with representatives of the tourism industry (tourists swimming in the river are occasionally dyed in blue…). The pollution problem which causes conflict (2) is further exacerbated by the over-abstraction of water from the rivers by farmers causing conflict (1). This creates an interdependence between the two conflicts which cannot be solved independently.

The interaction between conflict (4), (5) and (6) are similar by nature. Conflict (4) occurs between opponents and supporters of a project aiming at exploiting a karst aquifer to supply water to the city of Montpellier, located outside the river basin. Opponents fear that the exploitation of the karst aquifer could reduce the discharge of the karstic springs in the Hérault River, with negative impact on (i) Hérault river flow, (ii) water quality in bathing places and (iii) the attractiveness of the river for canoeing. Opposition is also motivated by the fact that some stakeholders consider that the aquifer should be preserved and be exploited locally when future needs make it necessary. Conflict (5) is another case of dispute over river flow sharing. An ancient irrigation canal diverts up to 3.5 cubic meters per second from the Hérault river, sometimes reducing in-stream flow to less than 1 m^3/s during low-water periods. This causes tension between farmers and recreational users – fishermen, swimmers and canoe renters. Conflict (6) is due to the river flow disturbances generated by the small hydropower plants established along the river : when the river discharge is low, the hydraulic turbine are operated discontinuously, which generates significant variations in the water flow and water levels downstream; the parties involved are the hydropower plant managers and the fishing associations. It is easy to see, from this brief description, that the intensity (and the resolution of each conflict is dependent on the others. The intensity of conflict over the operation of power plants (6) depends on the discharge in the Hérault river which depends on the diversion of water by the irrigation canal (conflict 5) which in turn depends on the kart aquifer exploitation project (conflict 4).

The map also shows that one conflict is tightly connected to debates occurring on non water related issues, outside the watershed. The case of the karst aquifer exploitation issue for instance is related to a broader (conflicting) debate on the regional development and land use policy to be implemented at the county[4] level (marked 11 on the map). Elected politicians of the municipalities located in the middle Hérault valley refuse that their towns be considered as “dormitory towns”, where most of the population consists in commuters working in Montpellier. They wish to develop an independent economic development policy. Although the water resource they currently exploit are still sufficient to satisfy the need of a fast growing population, they would like to preserve the possibility to exploit the karst aquifer resources in the future. It is therefore obvious that the conflict related to the exploitation of this aquifer cannot be understood neither solved without analysing the broader debate that takes place at a larger scale.

DISCUSSION AND CONCLUSION

Using the results of two case studies conducted in southern and south-western France, this paper highlights that conflicts over water use are frequently interconnected, forming networks woven at the watershed –and sometimes at the regional- level. We argue that conflicts can therefore not be analysed independently and we propose a systemic approach for conflict analysis, together with a simple and operational tool-box to implement it. Examples used clearly show that the understanding of the interdependencies between conflict can help analysing the positions defended by actors and the arguments they use, the coalitions formed and the opposition. The paper also stress the dynamic nature of the conflicts and it shows how latent conflicts anticipated by actors can be responsible for the emergence of strategic behaviours in negotiations.

[4] Territorial unit called “Département” in France.

The understanding of the nature of conflicts and their interdependencies is a crucial piece of information for actors in charge of organising participatory decision making. It can indeed determine the choice of conflict resolution approaches to be implemented as well as the organisation of the debate and discussions that precede the decision making process: identification of the concerned parties; establishment of a hierarchy of issues to be addressed and problems to be solved; organisation of working groups (or commissions) per type of water use or per region; identification of the interconnected issues which should be negotiated jointly (search of a global compromise for all the interconnected conflicts).

Whether organising a restitution of the results of the analysis to the stakeholders involved in the conflict is an issue of debate. On the one hand, such a restitution is likely to generate a mutually shared knowledge of the problems, interests at stakes and other constraints which bound the negotiation space. In that sense, the restitution could represent a form of social learning process where the parties involve learn about each other (Maarleveld and Dangbegnon 1999). On the other hand, our own experience of restitution shows that stakeholders may oppose to it for several reasons.

Firstly, stakeholders may refuse to publicly acknowledge the existence of conflicts (particularly when those are at an early stage) fearing that this be interpreted by others as a implicit sign that they have not been able to handle problem, anticipate evolutions on time or listen at other parties involved. Also, power based conflicts can not explicitly be mentioned in public arenas where the debate can only refer to universally accepted values such as social welfare, democracy, equity, transparency, etc. Government agencies and stakeholders alike therefore do not appreciate that conflicts be publicly described, highlighting oppositions in values and rivalry for power. They prefer that the debate focuses on technical issues. Although discussions on information gaps may implicitly refer to knowledge based-conflicts and those on economic studies refer to interest based conflicts, conflicts per se are not an issue of debate.

Secondly, the actors involved may be reluctant to share information with others for strategic reasons. If stakeholders may feel relatively free to expose their vision of the conflicts in face to face discussion with researchers (confidentiality of the information, neutrality of the researcher), they react much differently in a public arena. This point can be illustrated by an example taken from the Hérault river basin: during the interviews conducted by the authors, the manager of a canoe renting company of in the Hérault river basin described a deep rooted conflict opposing canoe rental companies with a large irrigation association on issues related to the apportionment of river discharge in summer; during the restitution organised few months later where the farmers where present, the same person minimised the importance of this conflict. He preferred to focus the discussion on another conflicting issue where he was defending the same position as the irrigation association : the transfer of water from the river basin to Montpellier city (who was not represented in the debate). Another example is that of farmers opposing to the water metering in agriculture in the Lère River basin. During the individual interviews, they explicitly refused this principle, considering that it would be used in the future as a basis for taxing farmers (unacceptable perspective). When, however, the results of the analysis were presented to the farmers, they all refused that this position, on which they all agreed, be publicly stated. A collective discussion then took place among farmers of the group to define a more moderate position that could be presented to other stakeholders. These two examples show that collective restitution has been used by certain stakeholders in their negotiation strategy, either to create coalitions or to construct arguments that could be officially stated (and published). The restitution process can therefore be seen as part of the negotiation itself and can be criticised in this respect.

Notwithstanding these reservations about the usefulness of the restitution, the detailed conflict analysis remains a prerequisite to conflict resolution and an indispensable information for any actor responsible for mediation. A condition for successful conflict analysis is that the mediator collecting the information benefits from a widely accepted legitimacy. In some cases, it might prove necessary that the mediator guarantees confidentiality for the information and the arguments expressed which

are thought to be strategic by the actors. Looking at the organisation of water management planning negotiation and conflict mediation procedures in Europe, it clearly appears that this is generally not the case, as the mediation is organised by government agencies or public utilities which can themselves be considered as parties involved.

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