

Barraud, R. 2017. Removing mill weirs in France: The structure and dynamics of an environmental controversy. *Water Alternatives* 10(3): 796-818



Removing Mill Weirs in France: The Structure and Dynamics of an Environmental Controversy

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ABSTRACT: In France, as in many other parts of Europe and North America, the vast increase in the number of dam removals in order to restore ecological continuity has led to a large number of local conflicts, resulting in a significant ecological controversy. Most of these hydraulic works were connected to former water mills. This article will suggest new analytical methods to help understand and interpret this controversy through the use of two complementary approaches. The first is based on a geohistorical approach. It allows us to identify the development of the meanings and values associated with mill weirs and also to trace the development, since the 19th century, of state involvement in dealing with their ecological impact. Our second method, based on political ecology, attempts to decipher the current state of the controversy. Taking this as our objective we have undertaken a qualitative analysis of the discourse produced on a national level and also of the network of actors who make up the oppositional base to dam removal. The affective and emotional dimensions of the controversy, and also the attachment to local places, both of which are often crucial in the expression of opposition on the local scale, can be identified in the discourse. Yet, the discourse we have analysed reveals argumentative poles which translate both the opposition based on rational arguments and also an alternative vision of the development of rivers (heritage status, green and local power production). The oppositional argument which has been developed notably includes a discussion of the knowledge and scientific expertise upon which the process of dam removal is based. It also includes a critique of local consultation and decision-making methods.

KEYWORDS: Dam removal, environmental controversy, heritage, political ecology, France

INTRODUCTION

In France the environmental controversy associated with the dismantling of dams has been picking up speed since the late 1990s. Dam and weir removal has now become a flagship project in the ecological restoration of waterways. While the dismantling of large dams is a type of iconic, albeit rare, operation, conflicts seem to crystallise around the numerous removal projects of smaller-scale works, such as old watermill weirs (Mullens, 2003; Doyle et al., 2003; Barraud, 2011).

This paper specifically deals with these smaller dams (or weirs) required for the operation of water mills. Very small-scale hydropower has long formed the basis of the French productive system. These weirs are usually less than 3 metres high but can be up to 200 metres long. By the end of the 18th century about 100,000 water mills had been built along French rivers. The latest investigations reveal the resilience of these hydraulic works despite the overall decline of their former use.

Conflict associated with small dam removal seems to be a common finding across different fields of study internationally (Lejon et al., 2009; Jørgensen and Renöfält, 2012; Jorda-Capdevilla and Rodriguez-Labajos, 2015; Germaine and Barraud, 2013). Research carried out in Sweden, Spain, the UK and France brings to light a common matrix to the local opposition expressed almost systematically whenever small dam removal projects emerge. Thus, from a 'political ecology' perspective (Gautier and Benjaminsen, 2012), such conflict reveals a yawning gap between social representations and the value systems of experts, local managers and the local population (Fox et al., 2016). Most studies highlight local

explanatory drivers of the opposition to dam dismantling (attachment to places, history). They also show the asymmetry of power that may exist between users and experts – the latter often perceived as external to the local scene (Lespez et al., 2016).

Our aim is to situate the French experience of this controversy within a broader history of river and dam management (Crane, 2009). However, in attempting to map the controversy (Venturini, 2010) we do not propose to reconstruct a simplistic, teleological version of this environmental issue. We would like instead to highlight the evolution of the values, doctrines, practices and discourses that underpin public policy and regulatory change with regard to the management of hydraulic structures and their impact on resources and natural habitats (Swyngedouw, 2015).

The next section provides a conceptual and methodological framework. We then present a review of the 19th century administrative and specialist literature in addition to works by historians, geographers and sociologists. These sources allow for a history of those ideas whose persistence and transformation we assess in the following two sections. The two following sections focus first on the successive manifestations of two configurations of the controversy since the early 1970s, and second on the analysis of the contemporary configuration of the controversy. This part includes an update on the players' strategies and an analysis of the arguments of opponents to the dismantling of water mill weirs, using both parliamentary questions and specialist publications.

CONCEPTUAL BACKGROUND AND METHODOLOGICAL FRAMEWORK

This environmental controversy, which is often presented in France as the result of a mistranslation of the European Water Framework Directive (2000), is also frequently associated with the idea of ecological continuity. Nevertheless, the concept did not appear in the techno-scientific sphere until the mid-2000s, which corresponded to a period during which the French state began to undertake wide-scale reform in water and aquatic environment management (European Water Framework Directive translated into French law in 2004; new water and aquatic environment national legislation in 2006). Only a small number of French scientific studies in the field of Science and Technology Studies (STS) deal with the notion of Rivers' Ecological Continuity (REC) and the environmental controversy associated with its implementation (De Coninck, 2016; Perrin, pending; Perrin, PhD dissertation, work in progress).

The REC clearly consolidates the new paradigm of river management, based on the taking into account of fluvial physical structure and processes, which emerged in the early 1990s. Indeed, in the French context, a major shift in river-management strategy occurred during this decade. It is no longer simply a question of combating water pollution levels but also of the effective restoration of rivers' physical functionality in order to improve their global ecological state (Morandi et al., 2016). The REC is becoming a key notion and a justification for action. Restoration of the REC, in particular the reduction of transversal hydromorphological constraints, has thus emerged as the favoured means to achieve the good ecological status objective defined by the European Water Framework Directive. The REC renews old notions of 'free streamflow' and 'free circulation of fish species and sediments'.

In theory, the REC should be considered in its three dimensions at the hydrosystem level (longitudinal, lateral and vertical). In practice, public river-management policies tend to prioritise the longitudinal dimension alone and thus the remediation of ecological damage to transverse structures. The notion of REC is codified in French law (cf. article R. 214.1 of the Environment Code) on the basis of a broad acceptation incorporating sediment transport and free movement of "all living organisms belonging to the riverscape".¹ However, the French state explicitly assumed a regulatory simplification considering fish species only at the biological level, which appears to reflect a political will to optimise

¹ www.ecologique-solidaire.gouv.fr/continuite-ecologique-des-cours-deau-0

people's understanding of river restoration policy. This paper will provide further explanation of the importance of fish-preservation in the restoration of the REC implementation. Currently, in order to ensure this implementation, national and local inventories are being undertaken. Thus, a national database, maintained by the National Biodiversity Agency, includes more than 80,000 transverse hydraulic structures, many of which are mill weirs. At a local level, river and watershed managers update inventories incorporating a large set of indicators (uses, heritage and landscape values). Local assessment of the REC thereby becomes part of an integrated water management process.

In order to gain a better understanding of the controversy around the restoration of the REC (i.e. the ultimate goal of public action) and the removal of mill weirs (i.e. the means to achieve this goal) we will concentrate on a two-track scientific approach. The first one relies on a geohistorical point of view, used to track the formation of ideas regarding environmental impact assessments and river management in terms of mill weirs. This research pays particular attention to the transformation of human, non-human and hybrid objects in their tangible and intangible dimensions (Latour, 1999; Chouquer, 2008; Jacob, 2009). It is also built around concepts and is drawn from environmental history (Lowenthal, 2008; Cronon, 1996), more specifically in terms of landscape heritage and the narratives that underpin them. This genealogy of ideas on the management of rivers and the aquatic environment derives from previous studies (Haghe, 1998 and 2010; Barraqué, 2002; Ingold, 2011 and 2014). The geohistorical approach is intended to provide a synthetic and preliminary overview of the sociotechnical handling of mill weirs from the late 18th century up to the mid-20th century based on a review of international scientific literature. It also incorporates data from personal documentary research on French administrative literature and records, and certain specialist publications were exhaustively studied, such as the journal of the French Waters and Forests administration and the White Coal Journal (*La Houille Blanche*, hydroelectricity development). The geohistorical overview has been supplemented by non-exhaustive use of the archives of French parliamentary debates.

The second conceptual framework underlying this paper is based on an analysis of the discourse of opponents of mill weir removal through a political ecology approach. This involves bringing together discourse and actor-network analysis (Gautier and Benjaminsen, 2012; Robbins, 2012). An analysis of the discourse of dam removal opponents reveals the power imbalance they perceive in the framing and implementation of river restoration policy. The objective of the analysis was to understand exactly what this perception leads to in terms of argumentation and rhetoric, actor networks and action implementation. Lastly, a political ecology approach also requires an understanding of how scientific knowledge supports environmental public policy and how scientific findings are used and discussed in this context.

In France the controversy surrounding mill weir removal has often been analysed through case studies on specific watersheds or valleys that were based on participants' observations of dialogues regarding water management issues (Germaine and Barraud, 2013; Fox et al., 2016). Such scientific studies carried out at the local level are frequently founded on media discourse analysis (Jørgensen and Renöfält, 2012). Whilst taking into account the results of these earlier studies, in both comparative and complementary ways, we have opted for an analysis at the national level. From this perspective specialist field publications (in both paper and digital formats, web pages and blogs) edited by mill heritage associations and opponents' associations were exhaustively analysed. Finally, a corpus was set up by collecting parliamentary questions.

This original data source sheds new light on opponents' discourses. During local conflicts stakeholders, environmental authorities and even scientists stress the affective and emotional dimensions, or attachment to place, as key factors to explain anti-small dam removal positions (Fox et al., 2016). Could this be confirmed by the organisation and dissemination nationally of the opponents' discourses? More generally, how do they develop and evolve without the filter of being published in the media? Conversely, is it possible to detect the effects of political filters in parliamentary questions? Do rhetorical forms and lexical contents change over time? And, finally, to what extent do these

parliamentary questions, mostly prepared in advance by representatives of dam-removal opponents, include references to local conflicts? Sixty questions were collected from the National Assembly web archives for the period 2004 to 2017. They were found using cross-search with keywords ('mills', 'dams', 'weirs', 'ecological continuity', 'migrating fish'). The corpus under study was qualitatively analysed through a process of repeated readings, resulting in the progressive identification of key topics, the organisation and logic of arguments, and their prioritisation.

Lastly, and without making it the primary focus of this part of the paper, the discussion section allows us to introduce a critical approach to the implementation of Integrated Resources Water Management (IWRM) in France. It is not our intention to suggest a radical rethinking of all aspects of integrated management. It is nonetheless essential to take into account the results of previous studies dealing with the issue of the limitations of IWRM and of the institutional tools used for local consultation (Billé, 2006; Mermet and Salles, 2015). In this regard, we will attempt to understand what the controversy may teach us about IWRM as applied in France and long regarded as a model for this issue.

HISTORICAL BACKGROUND OF THE ENVIRONMENTAL CONTROVERSY

Dams in the productive system: From boon to harmful obstacles

The key role played by the development of water mills in river planning has already been very widely documented. Numerous authors have demonstrated the power of such a planning process and the significance of its effects on the economy, on territorial control and on the transformation of natural habitats (Downward and Skinner, 2005; Lespez et al., 2013). Weirs are tools of wealth production. But their capacity to transform the functioning of the river and valley bottom area does in fact trigger quasi-permanent conflict situations.

In the early 19th century three major developments transformed the management of mill weirs and their social representations in France. First, the revolution caused the accelerated liberalisation of waterfall purchases. Secondly, although industrialisation came comparatively late, it was to play a key role in the redevelopment of water mills and the evolution of hydraulic management methods. Thirdly, the *Ponts et Chaussées* (National Bridges and Road Administration) emerged as a key player in the regulation of the changes induced by both processes (Haghe, 1998 and 2010). Their taking over of non-state-owned waterway management triggered the production of standards, regulations and expertise involving ambivalent representations of existing dams. Vernacular management and heterogeneous forms of water development are sometimes regarded as archaisms inherited from the French Old Regime. Such a normalising effort materialised through the regulation of hydraulic works. However, the official role of the administration was restricted to modest goals (Ingold, 2014). Ensuring the free flow of water amounts to a principle of flood prevention, and dynamic flow management must prevent public safety problems associated with stagnant water (Benoit, 1993). Despite the narrow legislative foundation on which its action rests,² the administration should always guarantee a form of social peace, thus ensuring the nation's economic development. Therefore, calibrated by engineers' expertise, dams appear as tools for river enhancement, as evidenced by the words of Benjamin Nadault de Buffon (1841, p.42), the founder of the water department within the *Ponts et Chaussées*: "Between a river in its primitive state and a river with dams there is the same difference as between wild nature and cultivated nature, between a wild tree and a tree laden with fruits".³ The impact of dams on migratory

² Alice Ingold (2011, 2014) clearly highlights the mismatch between the scale of the field action conducted by *Ponts et Chaussées* engineers and this narrow legislative basis, much discussed throughout the 19th century (Haghe, 1998, Barraqué, 2002).

³ Literal translation from French to English: Jeremy Price, University of Poitiers, 2017. This applies to the whole paper.

fish was identified at a very early stage. Historians report the existence of assistance practices for the fish to climb up weirs by means of branches laid out on the sides of works or of openings (Wildam, 2013). Most of these devices were specifically dedicated to salmon in western Europe, but there are also traces of such 'fish slopes', adapted to shad, mostly in New England (Disalver, Colten, 1992). It was the invention of the 'civil engineering' fish ladder in the 1830s that was to play a crucial role in the growing awareness of the issue. The very first of these in Europe is credited to Smith, a Scotsman, who owned a distillery in Deanston, near Stirling, on the river Teith. At around the same time a ladder is also documented in New Brunswick (Canada). In Ireland the fish ladder built in Ballisodare, County Sligo, in 1852 remained for many decades a reference for engineers. The innovation opened a specific field of expertise for generations of hydraulic engineers, and later biologists.

Under the French Old Regime legislation dams were essentially viewed in terms of the effects of rising water and the potential flooding of lands upstream. Weirs were also treated as regulated fishing areas as well as potential poaching places. The issue of upstream fish migration converged with the growing awareness of decreasing fish stocks (Rainelli and Thibault, 1980). However, the River Fishing Code (1829) did not directly address the issue of fish passage. Luglia (2013, 2014) evidences the key role played in this respect by the *Société Impériale Zoologique d'Acclimatation* (Imperial Zoological Acclimatisation Society). It issued a seminal report in 1856, establishing a diagnosis of the causes of depopulation and putting forward a package of measures to ensure repopulation from a utilitarian perspective (to provide healthy, abundant and cheap food). "Factories and institutions preventing the passage of fish" were identified as the main cause of the decline in the productivity of waters. First, the report proposed compromise measures between navigation, industry and fish migration through the implementation of free passages (spillways), chutes or sluices to be opened during migration periods.⁴ In conclusion, four types of measures, to be prioritised as follows, were put forth: 1) the removal of unnecessary dams; 2) the equipment of the dams; 3) the building of tanks and ponds for the development of marine and shellfish aquaculture (as substitutes to freshwater fish for human consumption); 4) the setting up of a water-monitoring and law-enforcement programme under the aegis of the water and forest administration, and the nomination of river and fishery officers. However, dam removal was not put forward as an option by lawmakers and it was the strategy of conciliation that was to be adopted by the 1865 Fishing Bill.

This new law provided for the construction of fish ladders on a list of waterways to be established by Decree (Council of State), on the advice of the *Conseils Généraux* (*départements* or county authorities). The necessity of upstream fish migration over dams was henceforth to be integrated locally in factories' water regulations. The 1919 Act on hydraulic energy and the interdepartmental instructions arising therefrom (1927 and 1928) led to the setting up of a protective programme for reserved rivers. Some rivers were excluded from any new hydroelectric developments. Fish ladders were gradually integrated into a more comprehensive system of water conservation based on fish farming (acclimatisation, nursery and maintenance of the waterway designed to improve water productivity). This kind of water conservation can therefore be said to bear the stamp of fish resources from its very inception. What is at stake is the preservation of such resources, which imply wealth, first for fisheries but also to meet the growing demand of 'sport' fishermen who pushed for a different form of river economy based on elitist tourism practices.

However, the setting up of such fish ladders, potentially harmful to the economic profitability of the hydroelectric plants, was particularly slow and chaotic. At the end of the 19th century Brocchi (1896) listed 19 ladders on French mainland territory, three of which were still under construction and only five of which were actually operational. In a context of rapid development of *houille blanche* (lit. 'white

⁴ Note that even though the expression 'free movement' of migratory fish was already used, 'fish ladder' was never used in the report.

coal', i.e. water power), such a compromise strategy between uses and resource protection, based on the building of dams and the reintroduction of fish, attracted strong criticism. In addition, some high-ranking water and forest administration officials, such as L. Breton (1907), rejected the idea that the repopulation of the waters could be based on a food objective. Freshwater fish were now seen as a luxury product rather than a cheap food resource for the working class.

Early questions on heritage: Recycling, safeguarding or destroying?

In the early 20th century the use of very low falls (under 2 metres) seemed to decline steeply, with many mills transformed into farmhouses or *guinguettes* – typical riverside cafés within easy reach of cities. As part of the countryside electrification and modernisation campaigns old water mills gave rise to a first stimulus project. Thus, a study to transform these mills into local hydropower plants was carried out by Bresson (1906) and applied to part of north-western France (Normandy, north of Anjou). Indeed, several mills were then adapted to produce hydroelectricity either for their own consumption or to supply to local grids (public lighting). But this revaluation of the water mills through *houille verte* (lit. 'green coal', i.e. pico-hydropower) did not lead to any breakthrough. In the 1930s historians of the *Annales* school characterised the water mill as a thing of the past – a witness to outdated modes of territorial control and wealth production (Bloch, 1935).

Caught in the decline of the productive system and the relocation of valley bottom factories, water mills began to be seen in a different, detached light. From the 1960s onwards this new perception was to translate into very gradual recognition of the mills as a form of heritage (Bergeron, 1984; Rivals, 2000). Following the passing of the 1964 Water Act, old water mills were discussed from three different angles in parliamentary debates. First, members of parliament regularly mentioned the economic dimension of milling, which was still based, albeit very marginally, on a few hydraulic plants. Secondly, the legitimacy of the tax on waterworks applied to active water mills (only a hundred in the whole Loire basin) gave rise to heated debate in the early 1970s. For the proponents of exemption, the mills' attractiveness and their role in oxygenation were key points. Some even argued for subsidies to encourage the upkeep of such facilities (based on the contemporary German experience). However, the government defended the levy as fair compensation for the constraints the plants can impose on good water management, in low-flow as well as flood periods. Thirdly, in the early 1960s the dilapidated state of the old mills led some MPs to pass harsh judgment on such heritage.⁵ Their lack of maintenance was considered a contributing factor in heavy flooding. The scrapping of mill weirs was seen as part of a modernising effort focused on a technical reorganisation of the grid, based on the rationality of hydraulics.

⁵ An illustration of this can be found in the National Assembly debates of 24 November 1960, p. 4038, MP Fauré:

We are far from the times of the mill wheels turning slowly, ticking the miller to sleep. Undoubtedly, the fact that we are living in an era of large industrial flour mills means that dams are no longer maintained and their locks are no longer functional. Whenever a dead tree falls across the bed of a stream or small river it will cause the accumulation of earth and sand downstream, which clogs it up for one or two hundred metres. In many cases this provided the marginal element that made the disaster even more serious. We are facing a new problem. The law forces river-dwellers to dredge the rivers. It is obvious to all of us that this is no longer economically justified or economically viable.

THE CONFIGURATIONS OF THE CONTROVERSY

Salmon preservation vs. small hydropower plants: The earliest configuration of the controversy (1970-1995)

Throughout the 1960s, even as hydroelectric development efforts increased, there were renewed warnings of the decrease of salmon stocks, first by professional fishermen (including Gaves) and 'sport' anglers, then relayed to parliament by MPs.⁶ In 1972 MP Boshier also submitted to the minister the option of "removing old, disused dams, removing legal dam privileges and the systematic purchase of water rights".⁷ It is difficult at this stage of our research to quantify the Ministry of the Environment's investment potential on this thorny issue at a time when it was facing many other major issues. But it is clear that the idea of the removal of old weirs, identified as being useless, is not new. In the context of the 1970s, even though it was not the solution that was implemented, the fact remains that it was politically articulated.

It was not very long, however, before the improvement of upstream migration facilities became one of the major features of river salmon restocking programmes (Salmon Plan, 1975-1976) and the 19th-century water conservation strategy was revived, mostly unchanged. In the early 1960s the emphasis had been on water quality (reducing pollution and water quality measurement, see Bouleau, 2009) and on the hydraulic function of rivers (flood control). In the 1970s fish resource conservation policies were still in place, with special emphasis on that emblematic migratory species, the salmon. The combination of the building of fish passes on dams and of fish restocking programmes, with the support of dedicated fish farms, was again seen as the best technical solution to be implemented. The Salmon Plan was one of the first measures taken by the newly created Ministry of the Environment. Under the first stage of the plan the state invested 30 million francs (12.5 million constant euros, December 2016). Although a significant expense at the time it was fairly modest compared to the amounts currently invested in the restoration of ecological continuity. The bulk of the investments focused on juvenile repopulation. The Salmon Plan became a 'Highly Migratory Fish Plan' from 1981 onwards, by integrating other species such as eel, lamprey and shad, with a budget of 44 million francs (11.3 million constant euros, December 2016).

This second stage was marked by the enactment of the Fishing Act (1984). The new text was to play a crucial role in the 'greening' of hydropower, i.e. measures taken to minimise the impact of works management (instream) and to improve dam passage for migratory fish. Two articles of the Act (Articles 410 and 411, in Chapter 2 on the preservation of aquatic environment and fish heritage protection) explicitly deal with 'hydraulic works' and their impact on the movements of migratory species. The Fishing Act led to the renovation of the original provisions of 1865 (rivers subject to the regime of fish ladders). Both acts were followed by several protection decrees between 1904 and 1924, and between 1989 and 2002, by 'species' bylaws having also been taken in the wake of the Fishing Act between 1986 and 2002 (Pichon, 2006: 37).

Even during the consolidation of this river environment management policy, focused as it was on the preservation of fish species, the government began to implement revival policies for small hydropower plants. The sector attracted renewed interest in the wake of the two oil crises (1973 and 1979). The production potential of small weirs was brought back into the limelight following a report by Senator Pintat (1976) as part of the energy diversification programme. Local environmental associations were already concerned about the growth of micropower projects and their effects on fish migration and the

⁶ The creation in 1958 of the AIDSA (International Association of Atlantic Salmon Defence) and the TOS (Grayling, Trout and Salmon) association also points to the growing awareness of this issue.

⁷ Question # 14622, ordinary session # 2, 9 May 1972.

quality of the environment. Thus, in the early 1960s the 'Trout, Grayling and Salmon' association (TOS), formed by fly-fishermen anxious to preserve first-category rivers frequented by salmonids, warned against the harmful effects of the newly installed micropower plants (Gramaglia, 2008). The battle between fly-fishermen and independent power producers continued throughout the 1970s. From 1978 onwards environmental protection associations – including TOS – were given the right to sue for any damage they observed. The 1980 Energy Conservation Act sparked a large-scale crisis between fishermen and dam-owners. The definition of small hydroelectricity plants encompasses a wide range of dams. Indeed, even though a micropower facility is classified as such only if it is less than 8000 Kw, configurations can vary enormously, from former mill weirs to penstocks involving 400 metres of difference in height. Small hydropower plants were then presented as "a cost-effective energy alternative for the national economy, regional activity and the end-user" by the BRGM (*Bureau de Recherches Géologiques et Minières*, or Geological and Mining Research Bureau) experts appointed to study its potential (Monition and Le Nir, 1981). The same year the Fishing Act was passed by the National Assembly a symposium on the development of small hydropower plants was held in Valbonne in the south of France and the BRGM published its study on the potential of French rivers.

The energy alternative represented by micro-hydro facilities was to arouse the interest of developers after the first experimental attempts carried out on the river Mayenne by EDF (*Electricité de France*, the French national electricity producer) in the 1950s and 1960s. It was in the late 1970s that this option was specifically studied by geographers from the University of Limoges (Lacotte, 1982), which is located in a relatively remote region, then facing unprecedented abandonment of agricultural land. As part of its educational and research/action programmes the Department of Applied Geography selected the topic of 'renewable energy in rural areas'. This was how the issue of the (re)development of the Limousin valleys, based on micropower facilities, returned to the academic agenda. Several generations of geographers, essentially those of the 'ruralist' school, began promoting this mode of development, taking the Gartempe Valley (Bouet and Balabanian, Ardillier-Carras) as their experimental ground. No new plants were involved there and the idea was to reactivate the old water mills that dot the valley.

The presentation of the Gartempe development plan lays out a contrast – one that is somewhat far-fetched but most instructive on the evolution of social demand – between development proponents and "those who want to enjoy nature, especially wild nature, that is to say first and foremost environmentalists, fishermen, canoeists and some tourists who are very keen on natural environments". The authors propose a cursory, obviously debatable, presentation of the emerging controversy. "Productivists or economists" (i.e. mill or dam owners) are contrasted with "environmentalists", i.e. naturalists and river users (fishermen and canoeists). The two geographers then make their case for micropower facilities, prioritising the causes of environmental degradation: 1) pollution, 2) major works. The environmentalists' point of view is expressed as follows (Bouet and Balabanian, 1982: 283):

Environmentalists and fishermen have no words to describe the dangers. For them, the multiplying of micropower facilities will turn our torrents and whatever rivers are still wild into water staircases; they describe our rivers as invaded by concrete and iron, bristling with pylons supporting thousands of kilometres of electrical wires. For them, micropower facilities will cause irreversible environmental damage; in particular, flora and fauna will be seriously impacted; fish migration will become completely impossible. In addition, it will cause tourists and sportsmen (canoeists and kayakers) to abandon territories that have become inhuman.

Three years later the same authors voiced their concerns about the red tape that constrains the development of small hydroelectricity (Bouet and Balabanian, 1985: 248):

All in all, the official policy is, to all intents and purposes, opposed to the development of small hydroelectric plants. However, the hostility is more or less intense depending on the region. In some

regions everything is done to discourage the setting up of such facilities. In other regions it can take years before a project comes to fruition.

The authors then addressed opponents' criticism by focusing their analysis on the ecological effect of micropower facilities operating along rivers. Thus, they argued, weirs under two metres in height do not raise any passage problems for migratory fish, especially since they can be equipped with fish passes. The pollution associated with industrial activities and resulting from wastewater discharge (sanitation) was considered the real cause of environmental degradation. This line of argument has been a relatively constant discursive pattern throughout the controversy. Lastly, the Limoges ruralists also focused on the cost and inefficiency of fish pass programmes for mill dams (Ardillier-Carras, 1997). Well before the emergence of the notion of ecological continuity and even before the consolidation of the paradigm of the physical management of waterways, what we have here are the first seeds of the controversy over the value, management and future of mill weirs.

The mill as living heritage vs. ecological restoration of rivers: The second configuration of the controversy

The example of the Gartempe Valley case helps us to understand how mill owners gradually entered the scene and began to participate in the controversy. The earliest days of that controversy are well documented in the journal published by the French Federation of Friends of the Mills. In the late 1970s the Federation's newsletter regularly featured articles on hydropower production, as well as a 'legal' section. Later, in 1987, in an editorial, the president of the Federation summarised the missions and challenges facing mill preservation associations:

(...) working to defend [mills] against the natural elements, but also, first and foremost, against the (always unconscious?) attacks they have to face from the authorities... simply through contradictory provisions from various and misunderstood interests which, in the final analysis, miss their target. Water rights, holding ponds, fish reserves, angling, free fish movement, public property and private property... and eventually water mills, were all blamed for preventing the salmon from swimming upstream.

The safeguarding of mills generates a lot more interest from the mid-1960s, when the associative movement was being organised nationally and internationally.⁸ At the very beginning of the 1980s it was the rapid emergence of industrial history that caused French National Heritage researchers to turn their attention to hydroelectric power plants at a time when the country was suffering the earliest effects of deindustrialisation. Water mills then became a genuine heritage item. But associations were particularly intent on rejecting any form of 'mummification' of this heritage and any backward-looking vision that would freeze their object. Instead, members were keen to acknowledge their rights as river residents – owners and holders of water rights guaranteeing the hydraulic exploitation of their sites. Many of them were water mill owners facing the rise of recreational use. Some were in the process of buying back and restoring abandoned sites, thereby introducing a new residential mindset in valley floors hitherto wide open to collective use. From the early 1980s onwards certain local governments did their best to upgrade their rivers, and proved sensitive to the tourist and heritage potential of water mills. This entire process helped mobilise various conflicting players around the water mill and its hydraulic structure, against a backdrop of a valley floor characterised by complex land ownership status.

From the early 1990s onwards the situation was to 'harden', incorporating new elements in the process. The 1992 Water Act provided for the establishment of an integrated management programme that was supposed to encourage a cooperative approach to water resources of aquatic milieus at

⁸ Symposium of Cascais (Portugal), in 1965: foundation of the International Molinological Society (TIMS).

regional and local levels. This was a clear shift towards a holistic approach to river management, thus confirming the abandonment of hydraulic management in favour of a physical management paradigm. This new framework involved a renewed hierarchy of factors explaining the quality of environments. The physical integrity of rivers was related to their organic quality. In this approach fish, particularly 'umbrella' species (such as highly migratory species), became indicators. The 'Salmon' strategy clearly became a public restoration action plan for 'Highly Migratory' populations. Concrete, symbolically powerful actions were taken: in the Loire river basin, for example, salmon fishing was prohibited in 1994 and in the next three years the first great dams which prevented salmon from passing towards the headwaters and reaching spawning grounds were dismantled. The 19th-century concept of the 'enhancing' hydraulic structure was definitively undermined. Planning documents urged local officials to conduct inventories of existing hydraulic works and find solutions to minimise their impact. However, the preferred solutions still seemed to be fish passes and management optimisation. The Water Act does not renew riparian rights on non-state-owned waterways. In line with water legislation since the Civil Code (1804), it recognises and protects such rights as were previously acquired, especially water rights associated with mill ownership.

During the period between 2000 and 2012 there was a new legislative and regulatory cycle. The WFD, and its translation into French domestic law (2004), marked the beginnings of this cycle. It was followed by the enactment of a new law on water and aquatic environments (2006). The latter introduced the notion of ecological continuity (as already defined and explained above). The Eel Plan (2007), the laws enacted after the French Environment Summit (2009 and 2010) and the resulting Action Plan for the Restoration of Ecological Continuity (PARCE, 2010) reflect increased government handling of these issues. Prescriptive diagnoses formulated by experts then collided with impact assessment approaches and the local interests of hydraulic sites. More specifically, French expert diagnoses on water flow have emphasised the link between the hydromorphological status of rivers and their biological and ecological condition. This focus on hydraulic works and the recommendation to dismantle them for river restoration echoes dam-removal policies which have been increasingly implemented in the United States since the late 1990s (Doyle et al., 2003; Lowry, 2003; Barraud, 2011).⁹ Local voices struggle to make themselves heard in this context of dominant prescriptive technical approaches which tend to depoliticise the debate (Germaine and Barraud, 2013; Lespez et al., 2016). The cycle, which highlights the restoration of ecological continuity, follows a clear programme, setting objectives in the spirit of the WFD. The classification of rivers in terms of fish migration was revised for the third time since the 1865 Act. Rivers are now classified into two lists based on the objective of ecological continuity preservation (list 1) or ecological continuity restoration (list 2). List 2 is committed to the implementation of restoration measures (removal instead of fish passes) in the five years following the publication of a list of target species. The expertise and intervention programmes of funding agencies (Water Authorities and Local Authorities) have been redirected in order to meet objectives for ecological continuity restoration. Such focusing also reduces the risk of projects being elaborated on a purely local basis.

The direct incrimination of mill weirs as harming fish passage, accompanied by media coverage of dismantling as the preferred solution (presented as being the least costly and most effective), has crystallised tensions. Heritage preservation associations, as well as mill owners' associations, have become involved, and are providing strong opposition. Distrust of the authorities reached a peak in 2016, in the run-up to an election, with the dissemination of a moratorium on implementing the water classification process and the ecological continuity restoration policy. The controversy is not a simple face-off between a few heritage protection associations and the authorities. It involves everyone in

⁹ While a few large works have been affected, in the majority of cases removal concerns weirs and former mill chutes, generally referred to as small dam removal.

river management, including scientists. Having examined the development of the controversy over the long term, we will now decode its evolution over the past 20 years.

THE CHARACTERISTICS AND DYNAMICS OF THE OPPOSITION TO THE DISMANTLING OF DAMS

The opponents and their means of action

First led by associations for the protection of mill heritage, until the early 2000s opposition to a form of ecological standardisation of the management of old hydraulic works was focused on improving hydraulic management (protected flow rates, conditions for hydropeaking) and building fish passes. The grouping of opponents to the dismantling of dams now includes mill owners' unions, representatives of small hydroelectric power plants and even local fishing clubs, and the connections between the various actors have certainly become more complex with the increase in protest and conflict. As we do not have room in the present article to examine in detail the discourses and actions of all the stakeholders we have decided to focus on the key players in the opposition: the mill preservation associations and local residents' associations.

This heritage movement was established internationally in 1965 (TIMS) and in France is represented by two national federations. The first is the *Fédération Française des Associations de Sauvegarde des Moulins* or FFAM (French Federation of Mill Preservation Associations), the successor to the *Société des Amis des Vieux Moulins* (the Society of the Friends of Old Mills) founded in 1928. The FFAM now claims to host a network of a hundred or so local and regional associations with a total of 10,000 members. The second federal structure is the *Fédération des Moulins de France* or FDMF (the Federation of French Mills), which split from the FFAM in 2002 and is based on a network of a score of regional associations. These two key players have websites and publish journals and newsletters. They have developed a partnership with the *Association des Riverains de France* or ARF (the French Association of Riparian Residents), a grouping of riparian property owners. The ARF, which was quick to establish relations with the FFAM, was founded in 1979 during a time which saw the emergence of new policy for aquatic environments based on contracting and local measures (the 'Clean Rivers Operation' in 1974 and 'River Contracts', from 1981 onwards; Brun, 2010). The first form of controversy (migratory fish/micro-hydroelectric plants) led to the first cooperation between these actors for the purpose of preserving property rights and rights of use. Their coordination was achieved by setting up a liaison committee for aquatic interests (*Comité de Liaison des Intérêts Aquatiques* or CLIA), which brought together mill preservation actors, riparian owners and independent hydroelectricity producers. The CLIA would appear to have played a decisive role in the preservation of rights earlier recognised under the 1992 French Water Act. The relationship between the mill preservation associations and the micro-hydroelectric industry has been maintained and even reinforced throughout the conflict. Their objective is to preserve rights of use, as well as to maintain economic potential (by resisting regulatory and administrative constraints and opposing the classification of rivers). Moreover, the aesthetic and symbolic value of water mills is fully exploited in their arguments despite the fact that small, traditional mills are not fully representative of active micro-hydroelectric plants.¹⁰

Since the end of the last legislative and regulatory cycle (2000-2012) the oppositional base has grown significantly through local initiatives. For example, the Hydrauxois Association was formed in the *Département* of the Côte d'Or (Semur-en-Auxois) in 2012, following a local movement against dam-removal projects, but soon grew. The president of the association (Charles-François Champetier) runs a

¹⁰ There are 1800 sites in France (< 4500 Kw), 570 being members of the French Hydro Electricity Union, of which only sixty or so have a power output of < 150 Kw (i.e. in the range of the mills present on average rivers) as demonstrated by the use of the mill icon to present the benefits of small hydroelectric production in the document for the promotion of France Hydroelectricity: www.youtube.com/watch?v=oSQd2HhRps4

very active blog, which reports on local movements throughout France and analyses scientific publications on the ecological restoration of rivers more generally. Champetier also runs a second blog, *L'observatoire de la Continuité Ecologique*, or OCE (Observatory for Ecological Continuity), along with Philippe Benoist, who manages the *Centre d'Etudes pour le Développement d'une Pisciculture Autonome*, or CEDEPA (Centre for the Study of the Development of Independent Fish Farming) in Corrèze. Based at the site of the Moulin de la Selve (Selve Mill), the CEDEPA is even more specifically dedicated to the analysis of ecological continuity. It has reintroduced into the debate another form of promotion of former hydroelectric sites by associating them with ecological freshwater fish farming. OCE, Hydrauxois and the CEDEPA have made a significant contribution to the current dynamics of the controversy by basing their arguments on high-level scientific and legal monitoring and using electronic media (blogs rather than static websites, Facebook and Twitter). One example of the new modes of mobilisation is the OCE website's interactive map of dismantled or threatened sites based on user input.¹¹ Referred to as the 'shaming map', it is widely available on the websites of those collaborating against dam removal. This is clearly an effective and spectacular tool intended to influence elected officials and local communities. The opposition base has been further strengthened with the arrival of actors involved in the protection of mill site heritage and micro-hydroelectric power production, for example *La Veille Juridique des Moulins*, a legal monitoring association¹² assisted by a professional lawyer, and *le Réveil des Moulins* (the Awakening of the Mills), a blog dealing with the issue of energy production.

The various actors tend to unite through joint initiatives. Legal monitoring is sometimes extended to support the active defence of members' rights in case of conflict (particularly with the authorities). Mobilisation and awareness – nationwide and locally – also operate in varied ways: publications in the regional daily press, petitions, seminars and training courses, and the lobbying of elected officials and institutions. The latter strategic lobbying action has led to direct discussion with the French Ministry for the Environment and to the use of parliamentary officials to relay important information to the French National Assembly. On occasion the FFAM has employed a lobbying firm (Athenor) in order to influence the text of the French Heritage Act of 2015. The synergy of actors making up the platform of opposition to the dismantling of dams and ecological continuity manifested itself in spectacular fashion in 2015/2016 with the publication of a request for a moratorium on the implementation of the restoration of ecological continuity policy. According to the OCE, who launched the move, it was "supported by 12 national partners, 275 institutions and 1200 elected officials" and, by March 2016, it was claimed to "have already obtained 1800 important signatures in seven months, including 29 members of parliament and more than 500 mayors".¹³ Earlier, following the presentation of the PARCE, the mobilisation of mill owners had led to a study by the *Conseil Général de l'Environnement et du Développement Durable* (French Council for the Environment and Sustainable Development). The results were published in 2012 in a report containing 11 recommendations. While addressing the expectations of the associations, the report has had limited impact on the ground and has thus failed to curb the rise of nationwide opposition. But rising opposition and a semi-permanent flow of parliamentary questions on the subject may lead to changes in the government's attitude, all the more so since it also faces major conflict over two large dams in the Sélune Valley (cf. Germaine and Lespez, in this Issue).

Notwithstanding the unity of the pro-weir movement that emerged from the demand for a moratorium, divergent views existed on the action to be taken. Thus, at the end of the CGEDD report mill preservation associations are implicitly invited to negotiate with the services of the Ministry for the

¹¹ <http://continuite-ecologique.fr/carte-sites-detruits-menaces/>

¹² <http://www.veillejuridiquemoulins.fr>

¹³ OCE, 29/03/2016: <http://continuite-ecologique.fr/dossier-de-presse-moratoire/>

Environment in order to draw up a 'Mills Charter'. The NGO France Nature Environment (*France Nature Environnement*) and the French national fishing federation also participated in these discussions. The dialogue and draft charter, strongly challenged by Hydrauxois, were eventually abandoned following serious disagreements regarding the content. Despite differing attitudes, the protest movement against ecological continuity restoration policy has managed to influence government. Ecological continuity is being debated in relation to the law on the restoration of biodiversity, nature and landscapes (8 August 2016). That same month a parliamentary briefing paper on the assessment and application of the 2006¹⁴ water law contained an entire chapter on ecological continuity, which suggested that a change of direction is necessary in order to "move away from dogmatism towards discernment and pragmatism" by returning "to consultation on a case-by-case basis".

In late 2016/early 2017 new developments accentuated the 'political' takeover of the issue of ecological continuity. It was on the initiative of OCE, in association with the Secretary of the Parliamentary Committee for Sustainable Development, that a roundtable of scientists was organised in the National Assembly. The scientists unequivocally criticised the gap between scientific uncertainty (on the concept of ecological continuity and the effects of dam removal) and dogmatic interpretation of the law. The roundtable represented a thunderclap by contesting not only the foundations but the implementation of a policy which was being presented as scientifically grounded. The roundtable, filmed and made public, constituted a key moment in the ongoing controversy. The experts' analyses were immediately picked up on and exploited by the opponents of small dam removal, illustrating how science can contribute to the redirection of an environmental controversy and how it can be used (or misused?) by the opposition. Lastly, between December 2016 and February 2017 the government took two interim decisions regarding water mills. The first is from the draft law on creation, architecture and heritage. Article 33(a) provides that "the balanced management of water resources does not constitute an obstacle to the preservation of hydraulic heritage, in particular hydraulic mills on protected rivers, lakes and seas" (historical monuments and provisions of the law on urban development). Secondly, under the law on self-consumption of electricity and the production of electricity from renewable energy sources, Article 3b provides that "water mills equipped by their owners to produce electricity which are located on category 2 rivers (i.e. listed for ecological continuity)" are no longer subject to the obligation to provide fish passes.

The structure and dynamics of the argument

The arguments deployed across the country by opponents of mill weir removal are structured around seven complementary poles (or discursive repertoires), which we will review below. These arguments have been identified in three complementary sources: 1) parliamentary questions raised from 2004 to 2017 (a total of 60 questions) presented to the National Assembly (see Table 1), 2) publications by mill preservation associations since 2000, 3) online publications by the Hydrauxois and OCE blogs from 2012 on. We offer two types of analytical reading of these corpora, the first looking at the structure of the argument and the second at its dynamics (the evolution of key themes, the prioritisation of the arguments, defence-criticism balance/alternative proposals). Figure 1 provides an overview of the structure and dynamics of the arguments, including the first step of the controversy (1970-1995).

¹⁴ Report produced by Senator Rémy Pointereau (a member of the French right-wing UMP party) on behalf of the commission for territorial and sustainable development: www.senat.fr/notice-rapport/2015/r15-807-notice.html

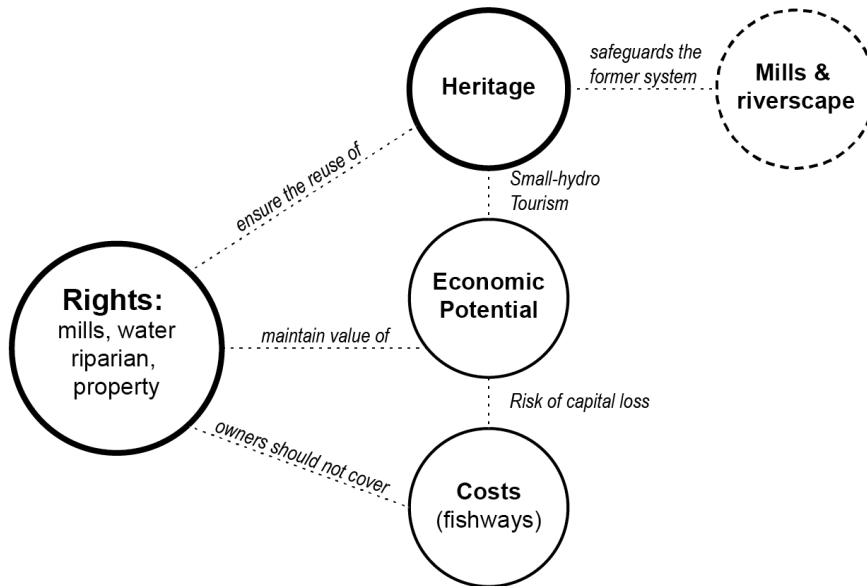
Table 1. Anti-dam removal discursive repertoires: insights from parliamentary questions (2004-2017, 60 questions)

Year	Nb. of questionnaires	Discursive repertoires (number of mentions per argumentative pole)						Regulatory/Legislative process
		Rights: water mills; riparian properties	Ecological restoration costs	Mills/nature Ecosystem services*	Heritage	Economic potential	Technocratic Undemocratic	
2000								Water Framework Directive (WFD)
2004	10	2	3	4	6	4	3	Incorporation of WFD into national law Initial assessment of the water bodies
2005	2	2	1	2	1	2	0	
2006								French law on water and aquatic environments Introduction of the notion of Ecological Continuity
2007								Recovery of European Eel (European regulation) Grenelle Environment Forum
2008	1	0	1	1	0	0	0	Salmon Management Plan
2010								Grenelle Act (2) Action Plan for the Restoration of Ecological Continuity (PARCE), circular
2011	12	6	0	10	6	4	8	Fish Migration Regulation (River Classification System: revision). PARCE: implementation report
2012	7	3	1	6	7	6	5	
2013	6	2	4	5	4	2	5	
2014	7	1	1	6	1	8	2	
2015	13	5	6	8	9	10	9	
2016	5	2	4	4	5	5	5	Recovering Biodiversity and Landscape Act Parliamentary information report on the assessment and application of the 2006 water law Interim decisions regarding water mills

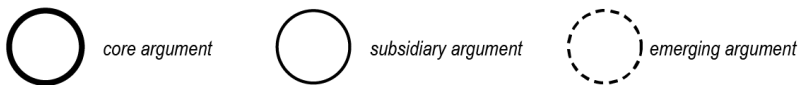
Note: * Fusion of former argumentative poles 3 and 6 (in the text)

Figure 1. To be against mill weir removal and defend an alternative riverscape project: Overview of the arguments and their evolution

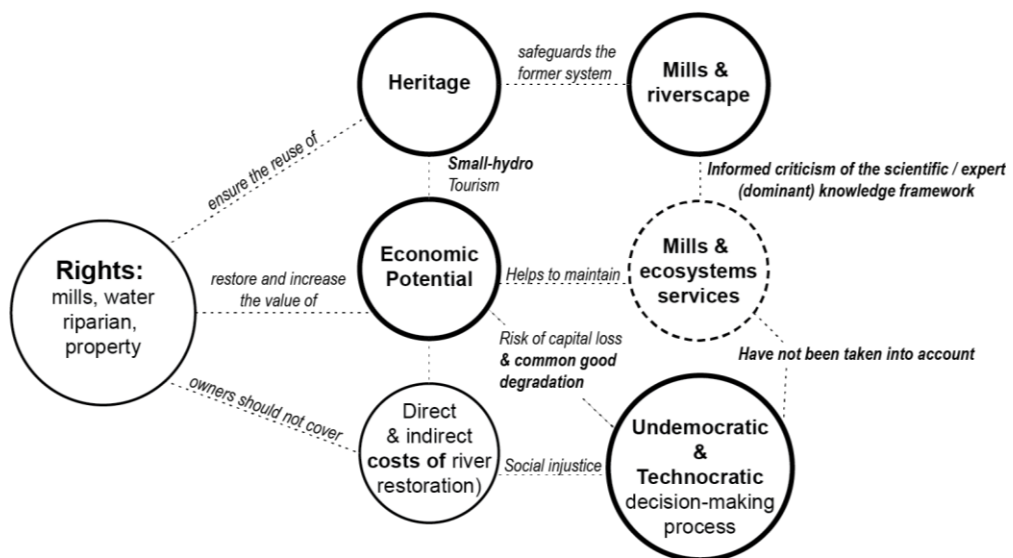
A- First configuration of the controversy (from 1970s to the mid-1990s) - migrating fish vs micro-hydro development



Interpretation :



B- Second configuration of the controversy (recent developments, 2004-2017) - the mill as living heritage vs small dam removal



The first argumentative pole is decidedly defensive, and focuses on defending rights. This legal approach to the defence of rights (for property, riparian status and water rights) has been present from the very beginning of the controversy. These rights also include obligations (maintaining hydraulic works, observing water regulations, maintaining banks and riverbeds in accordance with the spirit of local customs and the 1898 Act). But the inclusion of these obligations also reinforces the individual status and role of the mill owners. This law made the mill owners players in local water management. But the expression of their rights is, according to opponents, faced with: repeated attacks by the authorities, competition from other users, and lack of recognition of their rights by the other actors involved. At the beginning of the second phase of the controversy the European directive was used by the authorities to justify or explain the necessary changes to hydraulic works. But within a short period of time the opponents also read the texts and challenged specific/restrictive interpretations of the framework directive. While 'Europe' is still often brandished as a scarecrow by stakeholders in conflict situations, this argument is no longer used at the national level.¹⁵ Lastly, reading between the lines, the defence of rights can underpin a fear of the collectivisation of the valley bottom. This aspect of the protest, evident in the discourse of heritage associations, was identified very early on in the controversy (as seen earlier). Generally speaking, it is the authorities' interference (which, it is argued, is not justified, despite the fact that their actions are subsidised) in private areas, which is perceived as the fundamental issue by some leaders opposing public ecological restoration measures. Intervention by public and environmental associations is deemed illegitimate regarding private waterways, being contrary to private property values (human rights) and the recognition of water rights as one of the achievements of the French Revolution.¹⁶

The second pole of the argument, which has been well relayed by parliamentary questions, concerns the cost of ecological restoration. The first element which is contested is the responsibility for the removal operations, which, it is argued, would fall upon the mill owners. The actual cost of the operation is also increased by the potential, or actual, loss of earnings in terms of hydroelectric production. It is a very old argument, used by industrialists in the 19th century and also in the 1980s and 1990s by micro-hydroelectric plant owners and mill owners. But the issue of ecological restoration costs is also challenged more generally. If the costs which must be borne by the owners are deemed unacceptable, then those to be borne by the public are equally unacceptable, or so the argument goes.

The third pole of the argumentation concerns the relationship between the mill – and the modified river more generally – and ecology. The improving effect of the hydraulic works inherited from 19th-century engineering, later paradoxically enhanced by fishermen themselves (restocking strategy, managed by fishing associations and based on the use of the millstream), is reused by fishermen in rivers dominated by coarse fish (i.e. in second category rivers: French river fishing classification system). Unmaintained hydraulic works are a source of disorder, but, when well managed (by fishermen) they are beneficial to maintaining the banks, and to water oxygenation. The owners of hydraulic works present themselves as the guardians of the river, being in a position to identify pollution and maintain the river environment. The presence of such hydraulic works is today constantly associated with a form of abundance (the productivity of deep, slow-moving water) and the protection of living species (shelter and constant water supply). One of the mill owners' lines of defence consists in understating the ecological effects, either by challenging the systematic nature of those effects or by comparison with the effects of large dams. In addition, opponents adopt a scientific argument in order to demonstrate the ecological advantages of the long-term coevolution between natural and technical systems (see

¹⁵ Some parliamentary questions highlight the key role of the directive in 2004-2005, while experts carry out a diagnosis of the ecological state of French waters.

¹⁶ Cf. Michel Des Accords's analysis in his article "Le contexte actuel des droits d'eau et de riveraineté et les moyens de leur défense", *Le Monde des Moulins*, n°26, octobre 2008.

science-based approach of reference condition: Dufour and Piégay, 2009; Bouleau and Pont, 2015). They have now managed to use the ever-growing scientific data on the link between dam removal and changes in biodiversity. This is one of the most significant developments in the logic presented by opponents: while ecological restoration has been presented as scientifically based, they are currently consolidating their message by using the accumulated data produced by scientists. Another argument, used more recently, is based on a comparison with the damage caused by agricultural land consolidation (large-scale removal of embankments, hedges and ditches). The scars of the 1960s and 1970s landscape consolidation actions in *'bocage'* areas (farmland criss-crossed by hedges and trees), has remained in French collective memory. This was one of the foundations for the construction of the contemporary French ecological movement. This agricultural consolidation has come to embody the excesses of a technical and administrative system locked in a rationale of modernity. The suggestion of a parallel between hedge and dam removal therefore carries strong implications. The potent idea of 'hydraulic consolidation' plays on another idea which is also very effective: that the naturalisation of mills and dams is similar to the *bocage* hedges and their environmental virtues. The effectiveness of the argument is reinforced by the use of electronic postcards with the caption: "Is it right to suppress local heritage which is 10 centuries old?"

The fourth pole of the argument is based on the heritage dimension of water mills. Preservation associations often present the mill as part of a triptych of elements typical of the French landscape: church, castle and mill. The latter (wind and water) are, it is argued, the third most visited type of monument in France. The water mill's heritage value is composite. It conjures up a certain image of the traditional countryside and its long-term implications have enabled a wide variety of heritage interpretations, ranging from archaeology¹⁷ to the history of techniques and memory (associated knowledge), via the ethnological dimension. The mills and millstreams are sometimes used to illustrate a positive form of humanisation of the environment and as a testimony of the work of/by nature carried out by previous generations. But the transmission of that heritage requires that it be promoted in the present, which is another way of promoting the mill as living heritage. This constitutes the core of the following argumentative pole.

Indeed, the fifth pole promotes the economic potential of the mill (hydroelectricity, fish farming, even tourism in some cases). This argument has been present since the first attempts to promote very low waterfalls by developing water energy and is also a common thread in the controversy. The debate between proponents of ecological restoration on the one hand and hydraulic heritage advocates on the other focuses on production potential and the public interest in exploiting this energy. This controversy is thus embedded within another over the sustainability of hydroelectric energy (in general but also more specifically for small hydroelectric plants) (Silber-Coats, 2017; Armstrong and Bulkeley, 2014). It is a point that relates to all the others in a positive way. The law allows such exploitation and protects the untapped potential, while exploitation generates an economic system which sees factory owners maintaining the sites and which allows wealth production. This decentralised production is presented as virtuous since it should support development in the local area and facilitate energy transition. Exploited sites may generate means which provide support for environmental externalities. According to this argument, in the use of the property the plant owner is recognised as a river manager who is part of a wider network (coordination and solidarity).

The sixth pole of the argument revolves around the functions and services provided to the public by water mills. It overlaps with some of the previous axes but is formally a separate category that allows for greater media coverage of the argument. As is the case for the use of scientific data, the use of a 'services rendered' kind of rhetoric (for ecosystems) mocks expert discourse. Indeed, ecosystems

¹⁷ All the archaeological and historical explorations (whether ancient, medieval, modern or industrial) pertaining to the mill itself, as well as to the millstone extraction sites, for example.

services assessment is now an integral part of the implementation of public environmental management policies. In France this is particularly the case for policies relating to water and aquatic environments (Lespez et al., 2016). Until now the use of such grids of reading has been relatively unfavourable for the opponents' case because the cultural values and those of non-use were poorly integrated within the studies. In the context of the moratorium request filed in 2015, however, the use of a 'services' vocabulary, and the formalisation of a summary grid contrasting rivers with and without dams, no doubt played a role in the changing of the government's attitude.¹⁸

The last pole of the argument focuses on the technocratic and anti-democratic dimension in the implementation of ecological continuity restoration. It revolves around the idea that removal is the preferred technical solution to achieve good water status. In the early 2000s removal was part of a spectrum of solutions, but regulatory pressure and water agencies' action programmes were not excessively restrictive. Relatively quickly, however, even in case-by-case approaches, the spectre of wholesale mill destruction was brandished by removal opponents. There was a clear will to scare owners into action, whether or not they belonged to one of the preservation associations. The vocabulary used in the specialist press was unequivocal (threat, danger or destruction). The logic of the opposition movement was radical since their objective was to defend all hydraulic works, even disused ones, as long as it could not be proven that they were derelict. The movement referred to the number of water mills in operation at the start of the 19th century – a time when water use was at its peak (they claim there were 100,000 mills). The idea of removing a hydraulic structure to restore a river was simply not acceptable in their view. In the second phase (starting in 2006) the administrative interpretation of legislative measures contributed to highlighting the removal option. Water agencies clearly provided greater financial support to owners who were more ambitious in terms of ecological continuity restoration. Local owners were thus caught between requests for technical and financial partners and those of their opponents. From 2015 onwards the same technique was used: media coverage suggesting the survival of 15,000 hydraulic works would be in peril by 2018.¹⁹ Regulatory pressure, the increasing number of studies and incidents, all contributed to a significant increase in public mistrust. But there is a paradox in the opponents' position. They criticise the authorities' instructions but also often boycott any local consultation meetings organised by the authorities, claiming that it is biased. Prescriptive diagnostics and the frequently rushed nature of local consultation over new river listings may justify the opponents' position.

It is necessary, however, to qualify the relationship between dam removal opponents and the public authorities. We mentioned above that some actors (mill preservation associations and the French riparian association) were able, notably through the CLIA, to enter into dialogue with the ministries. But their objective was to establish a favourable balance of power and to influence the writing and interpretation of the law. In recent years certain actors, such as the president of the FDMF, have argued for a "critical but constructive"²⁰ position. The latter also recommended "avoiding the use, in these meetings, of strong-arm tactics which may antagonise territorial civil servants and therefore close doors".²¹ The objective of these meetings is to make the mill owners' knowledge of the situation on the ground available in order to further the debate, on the condition "that they be presented as representatives and not as opponents" (op. cit. Footnote 20). Lastly, criticism of local water management may reveal two different attitudes. The first, and most radical, is a refusal to recognise the

¹⁸ The grid can be seen at: http://continuite-ecologique.fr/wp-content/uploads/2015/07/Services_rendus.pdf

¹⁹ In fact there is some ambiguity because parliament systematically denies prioritising removal, but the technical and financial actors are not as clear on this point.

²⁰ A phrase used repeatedly by the president of the FDMF from 2011 onwards in the editorial section of the journal, *Le Monde des Moulins*.

²¹ Alain Eyquen, *Le Monde des Moulins*, n°35, juin 2011.

legitimacy of local authority management. The second involves a distrustful attitude due to errors in integrated water management and dissatisfaction at having been passed over for procedural arrangements, such as land use and water management plans. Many mill preservation and riparian representatives indicate that they do not participate in the local water authority community.²²

DISCUSSION AND CONCLUSIONS

This article set out to explore the situation in France, from a longer historical point of view, regarding the current controversy over the dismantling of former water mills. The current controversy does not correspond to any teleological logic which might lead to the conclusion that the implementation of certain structures of the conflict in the 19th century would have inevitably led to the current controversy. We have shown that this controversy did not simply emerge ten years ago with the introduction of the concept of ecological continuity. Yet it is this blurred and unstable notion which has driven the dynamics of protest during the last decade. The controversy developed from a combination of the legacies of land use and ideas. Our analysis shows that this last component is too often overlooked, leading to an oversimplification of the discussion on the material and technical dimension of these hydraulic systems. Objects exist through their materiality but also through the meaning(s) with which they are imbued at a given time. The ambivalence of the values associated with dams (hydraulic works which improve or degrade rivers), as well as the very individual ownership status of privately owned waterways in France, affects the trajectories of the balance of power between users and actors in water management. The legacies of ideas also characterise public policies and the non-human elements which they involve. Thus, while the recognition of dams as potential obstacles is very old, ('pre-ecological', it might be suggested), the meaning of remediation (fish ladders), the connection with migratory species and the objective of preservation policy are very different from those identified for the present period. Justified by the preservation of cheap food resources and the economics of fish farming, utilitarian policy has repeatedly shifted. The disqualification of salmon, and of freshwater fish in general, as a food source, in addition to their scarcity, has transformed them into a luxury product, now the object of elite fishing practices. Luxury fish – salmon in particular – were in fact reclassified as a resource based on a tourist economy of sport fishing (as early as the late 19th century). Yet for at least thirty years migratory fish have become ecologically significant: firstly, some are considered 'umbrella' species (as is the case for salmon), and these species have become bio-indicators. Conversely, coarse fish (cyprinids) are associated with devalued fishing practices, and their abundance indicates an ordinary, or even poor-quality, environment. Within this framework, migratory fish, and sediments, have become legal arguments justifying the implementation of ecological restoration programmes.

Our analysis shows the effects of excessive division between environmental objects and problems. Modernism led to such unwanted divisions (Latour, 1999) that act as "cluster bombs" (Chouquer, 2002). The division between the political treatment of the mills' energy use and its environmental implications clearly illustrate the difficulties in dealing with hybrid objects (nature/culture). The recent form and intensity of the controversy are largely due to a splitting of the inherited object of the 'hydraulic system' (mill-weir-mill race). Environmental policy only recognises obstacles which affect ecological continuity. This reclassification of the object (the 'water mills') nullifies their social and cultural values and meanings. Indeed, it leads to their disqualification as a place, and, therefore, a lack of recognition of the inhabitants of these places. The technical approach tends to reduce the environmental problem to a question of engineering; whereas valley development decisions are a political issue. Inversely, opponents overvalue the argument that dams are equated with water mills. Among the 60,000

²² The inclusion of residents' and mill owners' representatives at all levels of water management bodies was requested in the demand for a moratorium on the implementation of ecological continuity policy.

obstacles to ecological continuity currently identified by the French National Water Agency, a significant proportion are no longer, or have never been, associated with water mills.

The power of technical expertise and its fish tropism have led to a reduction of the room for political debate and an undermining of the scope for local consultation. However, it seems impossible to interpret the controversy too narrowly in its current form – as being the result of the domination of the technical sphere – using ecology knowledge and ecosystem services rhetoric. On the one hand, an in-depth analysis of the controversy demonstrates that there is a certain degree of violence in the discourses and modes of action on both sides. The dismantling may be experienced as an act of violence (Fox et al., 2016). Further semantic analysis would help account for naturalisation or personification of objects in pro-dismantling and the anti-dismantling discourses. On another level of argumentation, when mill preservation proponents are described as irrational they reply that the experts in charge of the development of ecological restoration projects are guilty of scientism.

In addition, the removal opponents' sometimes highly virulent attacks against public measures, as well as the pressure placed upon river technicians or water bailiffs locally (shows of force, belittling or questioning their integrity) have put them under considerable strain. The use of legal action also places strain on those affected. Describing removal opponents as "subjugated nice guys" certainly does not correspond to the capacity of long-term and organised self-defence and attack which they have demonstrated they are capable of. The exploitation of fear, anxiety and misrepresentation is part of the arsenal used by removal opponents. Lastly, the latter fully justify their lobbying actions, which are used in ambiguous fashion to serve a wider collective project (launching a renewal of hydroelectric energy) and strictly private interests.

It is often precisely the fear of these users and their attitudes, which may delay or compromise the achievement of environmental quality objectives, that have led to their marginalisation in consultation arrangements (Eden and Tunstall, 2006). In the final analysis, even if it reflects the power struggle, the room for expression that has emerged from the controversy has contributed to circumventing the current limitations of river management modes. The practice of common heritage management (as described by Calvo-Mendieta et al., 2014; Petit, 2015) has not come of age in many parts of France, but the controversy demonstrates the capacity of local actors to pick up the issue (Jasanoff, 2004).

ACKNOWLEDGEMENTS

The research presented here was supported by the French National Research Agency (ANR) and the University of Poitiers (RURALITES research team, EA 2252). We would like to acknowledge the support of Marie-Anne Germaine and Chris Sneddon for coordination of the special issue, and the encouragement of François Molle. I would especially like to thank Jeremy Price and Jean-Charles Khalifa (English translation). Finally, we would like to thank all the participants of the international workshop: Dam removal: New environments and new landscapes? Social, Cultural and Political Issues (Poitiers, 4-5 December 2015: <http://reppaval.hypotheses.org/1767>).

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