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Modern and Nonmodern Waters: Sociotechnical Controversies, Successful Anti-Dam Movements and Water Ontologies

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ABSTRACT: Many new dam projects are presently being put forward, revealing both the comeback of large hydraulic infrastructure and the resilience of the modern ontology of water. To contribute to the understanding of modern water's perpetuation, this paper takes a step back in time and looks at the cases of two dam projects which were cancelled during the 1980s due to environmental protests: the Loyettes Dam on the Rhône River in France and the Gordon-below-Franklin Dam on the Gordon River in Tasmania, Australia. Previous studies in the political ecology of water have paid attention to opposing discourses, representations, imaginaries and, more recently, to ontologies when considering conflicts involving modern water. This paper further explores the contestation of modern water that occurred in the late twentieth century. It focuses not only on pre-existing ontologies of water but also on the production of water ontologies during and after sociotechnical controversies. It does so by 1) asking how modern water seeks to maintain itself, and 2) questioning the rise of alternative water ontologies. The discussion identifies different water ontologies which vary in a continuum from nonmodern to modern; it also connects them with ways of being with the environment in general. The study concludes that while controversies may result in the transformation of planning practices and changes in water ontologies, the hegemony of modern water is only partially challenged by successful anti-dam movements.

KEYWORDS: Dams, modern water, water ontologies, Gordon River, Tasmania, Australia, Rhône River, France

INTRODUCTION

Since the end of the 2000s, dam construction has entered a new period of growth, after having stalled in the 1990s. Plans have multiplied for dams, large (Best, 2019) and small (Fung et al., 2018), as well as new or refurbished (Warner et al., 2017; Bakker and Hendriks, 2019). This has led some authors to speak of a boom in dam building and in hydropower exploitation (Smits and Middleton, 2014; Zarfl et al., 2015). Recent studies in social sciences have underlined the role of the climate discourse in the reframing and resurgence of dam building (Fletcher, 2010; Ahlers et al., 2015; Warner et al., 2017), of new funding possibilities (Ahlers et al., 2015; Crow-Miller et al., 2017b), and of shifting geopolitics (Hirsch, 2016). The capacity of hydraulic institutions to re-establish their power and dominance, in particular through the production of renewable energy, has also been part of the process (Menga and Swyngedouw, 2018). Although this resurgence mostly concerns less-developed countries (Warner et al., 2017; Menga and Swyngedouw, 2018), different case studies investigated in the 2017 issue of *Water Alternatives* *The (Re)turn to Infrastructure for Water Management?* show that this return is indeed "widespread" on a global scale (Crow-Miller et al., 2017a; Perry and Praskievicz, 2017). This general recommitment to large infrastructure suggests the persistence of 'modern water' as "the hegemonic 'ontology' of water" (Linton, 2019: 57), a phenomenon which this paper seeks to explore further.

Previous studies have shown the historical development of 'modern water': "Modern water is the dominant, or hegemonic, way of knowing and relating to water, originating in Western Europe and North America, and operating on a global scale by the later part of the 20th century" (Linton, 2014: 112).

Drawing on this quote, an ontology of water can be defined as a way of "knowing and relating to water" (ibid) and, more generally, as a way of "being-with-water" (Yates et al., 2017; Wilson and Inkster, 2018). The modern ontology of water represents water as "a pure hydrologic process" (Linton, 2014: 113), that is, as abstracted from the social realm and thus available as a resource to be exploited. This leads to "disentangling" water not only from human society but also from its ecological context (ibid). Linton (2008, 2010, 2014) builds upon Latour (1991) who shows that the modern way of thinking constantly seeks to categorise objects as either natural or social. Linton and Budds (2014) show that water is in fact produced through the 'hydrosocial cycle', which can be defined as a "socio-natural process by which water and society make and remake each other over space and time" (ibid: 175). The hydrosocial cycle can therefore be considered to be a process, but at the same time it has been put forward as a scholarly framework which proposes to conceptualise water as a 'hybrid' (Swyngedouw, 1999, 2009). The hydrosocial cycle focuses our attention on the relations between 1) H₂O, that is, water in its material composition (Budds, 2009; Linton, 2010) and biophysical dimension (Bakker, 2002); 2) social structure, and 3) technology and infrastructure (Linton and Budds, 2014).

Following the hydrosocial perspective, large hydraulic infrastructures such as dams, which have previously been described as a main component of the twentieth century water paradigm (Gleick, 2000), are considered to be "instrumental to, and symbolic of, (...) the modern, twentieth-century water management paradigm" (Linton, 2010: 52). Dams embody the modern way of thinking as they "are predicated upon a technical knowledge of rivers that emphasises the spheres of human action and purpose, as separate from the natural world" (Godden, 2015: 128). More recently, Boelens et al. (2019: 5) have underlined how "the big dam regime builds on a modernist epistemological discourse". Such a modernist epistemology "tend[s] to subjugate other knowledge systems" (ibid: 1); Banister and Widdifield (2014), for example, demonstrate how the Xochimilco Potable Waters Supply Works (Mexico City) marks the debut of modern water in the Mexican capital and creates a "conceptual purification" which contributes to the disappearance of "traditional notion of water", which is understood "as a heterogeneous element expressive of diverse geographies and histories" (ibid: 37). From a sociopolitical perspective, this modernist epistemological discourse translates into a "modernist paradigm" of water governance which "overlook[s] water users, meanings, values, identities, and rights systems" (Boelens et al., 2019: 6) and leads to the weakening of pre-existing social structures (Linton and Delay, 2018). Parallel to these studies on modern water, various publications have explored the link between modernisation and the planning of hydraulic infrastructure, 'modernisation' being often defined as a social and ecological process tightly connected with the idea of progress, development, growth and emancipation (Swyngedouw, 1999; Shah et al., 2019a). From the beginning of the twentieth century, dams have been seen by states as tools to enact modernisation; they have been perceived as "technological shrines" (Kaika, 2006) which reflect scientific progress. In 1945, President Harry Truman described the completion of the Kentucky Dam as a "high point in modern pioneering in America" (Truman, 1945); Prime Minister Jawaharlal Nehru, during his visit to the Bhakra – Nangal Dam Project in 1954, explained that dams were the "temples of Modern India" (Sharma, 1989). Hydraulic bureaucracies or "hydrocracies" (Molle et al., 2009), in a tight relationship with the state, governmental institutions, and businesses with whom they dominate the social structure, have played a part in the process of modernisation (Shah et al., 2019a). Very recently, more empirical evidence has supported the perceived close connection between hydraulic projects and modernisation (Hommes and Boelens, 2018; Duarte Abadía et al., 2019; Dukpa et al., 2019; Hidalgo-Bastidas and Boelens, 2019; Hoogendam and Boelens, 2019; Stensrud, 2019; Teräviäinen, 2019).

Based on this literature, the modern ontology of water can be defined as resting on: 1) the conceptual abstraction of water from its social context, making it then available as a resource to be exploited; 2) a social structure dominated by states, hydraulic bureaucracies and businesses; and 3) hydraulic infrastructure advanced in the name of progress, development, growth and emancipation. As suggested by Boelens et al. (2019), however, since the production of water is contingent on different historical and spatial contexts, this general definition is insufficient; in fact, there "are obviously 'multiple modernities'"

(ibid: 6; building on Eisenstadt, 2002). The implication is that there may not be just one, but multiple, modern ontologies of water. In this paper, the expression 'nonmodern waters' designates the alternative waters with which modern ontologies of water are confronted. Building on the above definition, nonmodern water ontologies imply that 1) water is not conceptually abstracted from its environmental and social context, and rather is conceived of as entangled in multiple biophysical and social relations; 2) within the social structure power is shared between different groups of stakeholders, not only between states, hydraulic bureaucracies and businesses; and 3) hydraulic infrastructures can be sources of environmental and social problems.

In the hydrosocial literature, and following a political ecology perspective, previous studies have focused on the imposition of infrastructure by hegemonic stakeholders in the name of modernity or modernisation (Kaika, 2006; Boelens and Post Uiterweer, 2013; Banister and Widdifield, 2014; Duarte-Abadía et al., 2015; Swyngedouw, 2015; Hommes and Boelens, 2018; Swyngedouw and Boelens, 2018; Duarte Abadía et al., 2019; Jackson and Head, 2020). Recently, this literature has tackled the question of modified or abandoned hydraulic projects in relation to successful opposition campaigns (Dukpa et al., 2019; Hidalgo-Bastidas and Boelens, 2019; Shah et al., 2019b). In addition to the hydrosocial literature, Peyton's (2011) study on a Canadian scheme in British Columbia (launched at the end of the 1970s) sheds light on the effects of unbuilt schemes and reflects upon the "unbuilt environments" they produce.

In this paper, I seek to pursue the discussion on modern water and hydraulic infrastructure by posing the following questions: What are the effects of unbuilt dams on the modern ontology of water? What becomes of modern water if its production cycle is challenged by successful anti-dam campaigns? Do controversies contribute to the production of alternative water ontologies? If so, are these alternative ontologies truly nonmodern?

The following section of the paper summarises some recent advances in the hydrosocial literature and the growing interest in multiple water ontologies. The existing literature on multiple ontologies has shown how conflicts may reflect pre-existing opposing ontologies. To address the production of ontologies during and after anti-dam protests, this section introduces science and technology studies on sociotechnical controversies (Callon, 1981; Lascoumes, 2002; Callon et al., 2011). The subsequent section of the paper presents the two case studies, the Gordon-below-Franklin and Loyettes Dam projects; it summarises the material (interviews and archives) that was produced and collected to address the research questions. This is followed by a section which analyses two simultaneous struggles: the struggle to maintain modern water and its dominance and the struggle of those who oppose the dams and who contribute to the production of alternative water ontologies. While analysing these struggles, the section focuses on the evolution, during and after the controversies, of the relationships between and towards the three key components of the hydrosocial cycle (hydraulic infrastructure, social structure, and H₂O). The paper then summarises the different modern and nonmodern water ontologies produced and enacted during controversies and explains where they lie along a nonmodern-to-modern continuum. Three conclusions are drawn: 1) successful anti-dam movements may result in the transformation of planning practices without fully challenging the hegemony of the modern ontology of water, notably because hydraulic agencies have not entirely distanced themselves from modern water; 2) controversies on hydraulic infrastructure participate in the production and enacting of alternative water ontologies but these alternative ontologies may still rest on the modern separation between the social and the natural realms; 3) since anti-dam narratives rarely represent H₂O as purely hydrological and separate from its environmental context, it could be useful to consider the production not only of alternative water ontologies but also of alternative environmental ontologies.

BRIDGING THE HYDROSOCIAL LITERATURE WITH MULTIPLE ONTOLOGIES AND SOCIOTECHNICAL CONTROVERSIES

From discourses, representations and imaginaries to ontologies: Insights from the hydrosocial literature

The literature on hydrosociality sheds light not only on the materiality of the production of water but also on its less-tangible dimensions such as the "discursive representations" (Budds et al., 2014) which are "internalised" within water (Lafaye de Micheaux et al., 2018). Indeed, "[d]ifferent meanings of water emerge as the product of this process: '[w]ater' is the particular type, discourse, construction, idea, or representation of H₂O that pertains to any given assemblage occurring as a moment of the hydrosocial cycle" (Linton and Budds, 2014: 176).

For this reason, previous studies mobilising the hydrosocial cycle have focused their analysis on specific discourses or representations relating to water (Budds, 2008; Bouleau, 2014; Fernandez, 2014). The literature on hydrosocial territories has also strongly illustrated the role and the power of discourses (Boelens and Post Uiterweer, 2013; Boelens et al., 2016), imaginaries (Boelens et al., 2016; Duarte-Abadía and Boelens, 2016; Hommes and Boelens, 2017, 2018), representations (Boelens, 2014; Duarte-Abadía and Boelens, 2016), and framings (Hulshof and Vos, 2016). Often inspired by a Foucauldian perspective, these bodies of literature have also raised epistemological questions in relation to water and have studied the role of knowledge in the production of water, social structures and territorial projects (Boelens et al., 2019).

These bodies of literature also hint at ontological questions. Towards the end of Linton and Budds' (2014: 179) seminal article on the hydrosocial cycle, the necessity for studying the ontology of water is suggested:

We argue that the hydrosocial cycle directs attention to three principal areas of insight: First, the hydrosocial cycle demands that we ask what water is. This ontological question builds on theoretical work on dialectical and relational thought that draws attention to how the nature of water internalizes social relations.

More recently, some studies have further tackled ontological questions in relation to water, moving from a post-structuralist perspective towards an ontological turn. This turn is mostly fuelled by anthropology and science and technology studies (Linton, 2019) and proposes that "we take seriously the existence of diverse ways of being and knowing within and with multiple worlds" (Wilson and Inkster, 2018: 518). The hydrosocial literature has particularly been influenced by the seminal work of Mol (1999) and Blaser (2009) on political ontology. Political ontology, which stems from the ontological turn, can be defined as a "field of study that focuses on the conflicts that ensue as different worlds or ontologies strive to sustain their own existence" (Blaser, 2009: 877). Such a field of study sheds light on the modern ontology while focusing on the nonmodern and, more specifically, on Indigenous ways of conceptualising and enacting the world (Blaser, 2009). Blaser (2013) indeed asks us to listen to the 'stories' of others – to alternative ontologies which modern ontologies have silenced.

The growing interest in considering multiple ontologies in water studies may stem from ontology's capacity to include representations, discourses, imaginaries and knowledges, and to also consider practices (Linton, 2019) and enactments (Götz and Middleton, 2020). Yates et al. (2017: 798) illustrate how multiple ontologies contribute to the "highlighting [of] multiple water realities and ways of being-with-water, not just different perceptions of or knowledge systems tied to water's (singular) material existence".

Following Blaser (2009, 2013), studies on multiple water ontologies have until now focused on colonial settler contexts and on modern water's hegemony over Indigenous modes of knowing, relating to, and practising water (Yates et al., 2017; Wilson and Inkster, 2018; Linton, 2019; Götz and Middleton, 2020; Jackson and Head, 2020); these studies could, however, extend beyond these sociopolitical contexts. In

the conclusion of their study on hydrosocial change in the Murray – Darling Basin, Jackson and Head (2020: 54-55) express the need for new hydrosocial studies to "go beyond revealing the social nature of modern water and examine its entanglements with non-modern waters, including endogenous hydrosocial relations and management practices that directly challenge modern hydrosocial discourse and its destructive effects". This paper seeks to contribute to this discussion while considering that the conflicts on modern water concern both settler colonial and non-settler colonial contexts.

Conflicts, controversies, and the production of water ontologies

A large part of the hydrosocial literature which considers imaginaries, representations, knowledge, framings, and discourses focuses on conflicts related to water. This can also contribute to explaining the growing interest for political ontology in the field of political ecologies of water. Indeed, Blaser (2013: 547) invites us to study "ontological conflicts", that is, "conflicts involving different assumptions on 'what exists'".

Building on Joronen and Häkli (2017), Yates et al. (2017: 799) emphasise that conflicts are "not necessarily about how water should be used or managed. Rather, they are ontological disjunctures – conflicts over the very essence and being of water". In their paper on the suppression of Indigenous water, Wilson and Inkster (2018: 516) stress that "water conflicts are rooted in ontological differences between Indigenous and settler views of water". In their study of dam projects on the Salween River in Myanmar, Götz and Middleton (2020) underline that these projects offer examples of ontological politics as they reflect the "collision" between different water ontologies. Moreover, the building of hydraulic infrastructure projects will most likely contribute to the reinforcement of modern water and the undermining of other water ontologies (ibid).

While the francophone science and technology studies (STS) literature on sociotechnical controversies (for example, Callon, 1981, 1986; Lascoumes, 2002; Callon et al., 2011) does not mention the notion of ontologies, this literature has engaged with "assumptions on 'what exists'" (Blaser, 2013: 547). It has paid attention to the production of knowledge and has shown that scientific and technical knowledge cannot be considered to be plain truths, as they are constantly discussed and renewed. This literature highlights that sociotechnical controversies play a role in the renewal of knowledge and, more generally, of opinions. Knowledge, opinions and arguments are not always formalised before controversies take place, but they can be produced during controversies. Sociotechnical controversies can therefore be considered to be socially productive (Lascoumes, 2001); they can contribute to the reordering of social relations (Lascoumes, 2002). Indeed, controversies offer "opportunities for social actors to question certain hitherto established power relations and beliefs, to redistribute among themselves 'magnitudes' and power roles" (Lemieux, 2007: 192). By combining the literature on multiple ontologies and the literature on sociotechnical controversies, the focus can be directed not only at pre-existing ways of knowing and relating to water, but also at how water ontologies can be produced during controversies.

TWO CASE STUDIES: MODERN WATER AND THE LOYETTES AND GORDON-BELOW-FRANKLIN DAM PROJECTS

Context: Water before the dam projects

The empirical part of this study is based on the analysis of two controversies, both of which took place during the 1980s; this was a time when, globally, few dam projects had yet been cancelled due to environmental protests. I chose to focus on two case studies rather than one, in order to highlight singularities (particular traits and phenomena which can be found in different cases) rather than uniqueness (Castree, 2005), and also to point to processes (Baxter, 2016) which are not merely local or national. The two controversies took place in two different countries: France – as part of Western Europe, one of the birthplaces of modern water (Linton, 2014) – and Australia, a settler colonial context where modern water is hegemonic (Jackson and Head, 2020). I use different material to analyse the production

of water *during* the controversies (in the 1980s) than I do to examine how it is remembered nowadays, more than 30 years after the events.

The first case study relates to the Loyettes Dam project on the Rhône River in France (Figure 1). The hydroelectric plant and dam project was released by the Compagnie Nationale du Rhône (CNR) in 1979 (Bravard, 1982; Michelot, 1990; Pritchard, 2011). The dam was to be the twentieth on the Rhône River and would have almost completed the transformation of the Rhône into a "hydraulic staircase" (Bravard, 1982), with only one more dam, the Miribel-St-Clair Dam, remaining to be built. The dam was small in height (10 metres) but necessitated the construction of over 10 km of canals; it was planned in a rural area that was being incorporated into the growing city of Lyon. The dam site, at the confluence of the Rhône and Ain Rivers, was considered to be unspoiled because the two rivers formed an interior delta, an original landscape which hosted rare birds and fish. Because of its negative aesthetic and environmental consequences, the project was opposed by local and regional actors, including an environmental organisation, the Fédération Rhône-Alpes de protection de la nature (FRAPNA), and its local branch, the Coordination pour la défense du fleuve Rhône et de la rivière d'Ain (CODERA). These organisations managed to gain the support of the French Ministry for Environment. The project was halted in 1982, and it was finally abandoned in 1990 when the then French Prime Minister Michel Rocard approved the protection of the site. Although the project and its attendant controversies and outcome involved the most powerful French river (Bravard et al., 1992), national politicians, and a powerful hydrocracy built on the model of the Tennessee Valley Authority (Pritchard, 2011), the history of the project and its consequences have only been mentioned in broader studies (Pritchard, 2011; Bouleau and Fernandez, 2012); nevertheless, for regional water managers the decision to cancel the dam seems to have been considered a landmark (AScA, 2013).

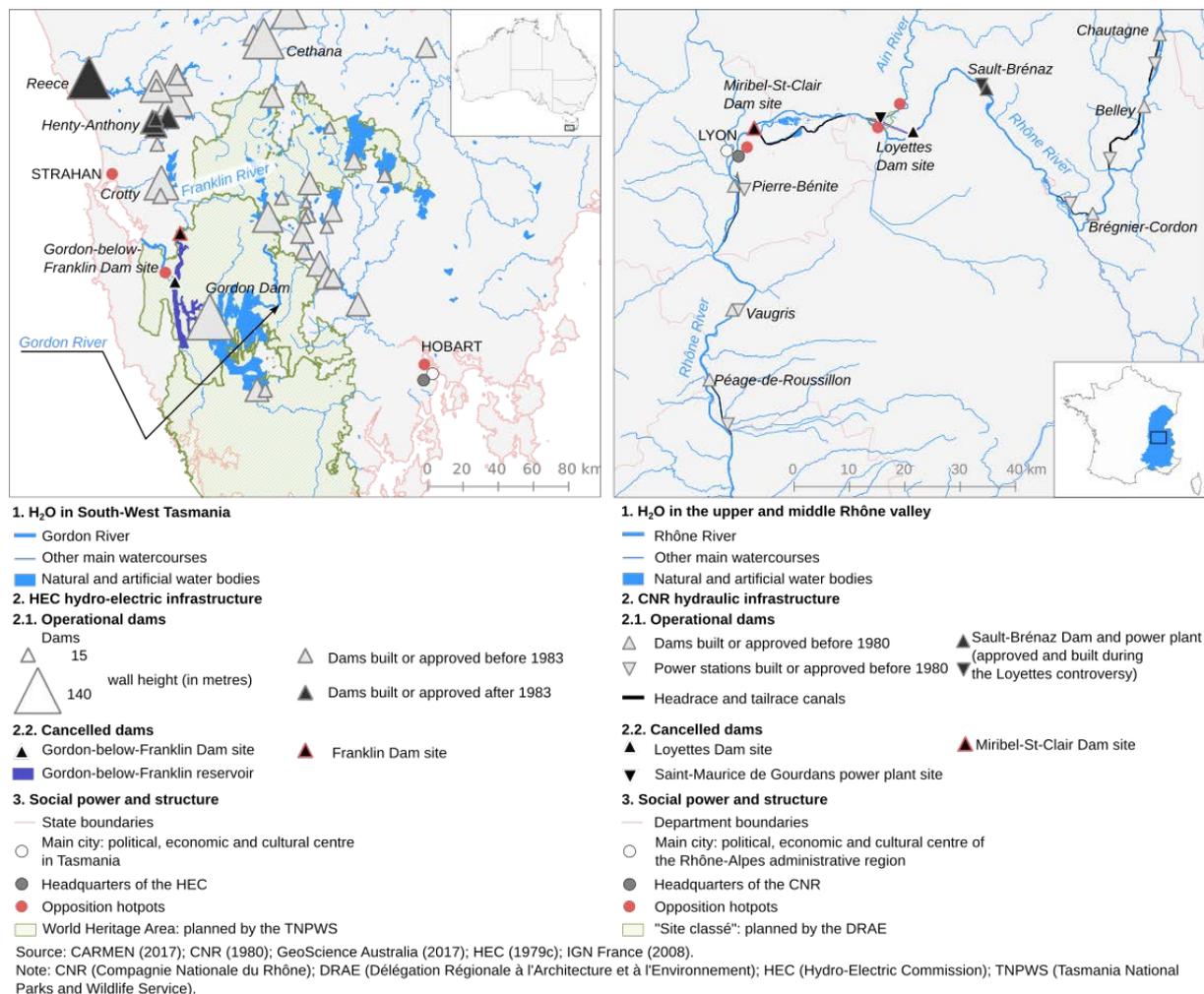
The second case study concerns the Gordon-below-Franklin Dam project in the state of Tasmania, in Australia. The dam project was planned for the Gordon River, the fourth-most-powerful Australian river and the primary Tasmanian river in terms of yield (DPIPWE, 2000). The project involved the building of a 105-metre-high rockfill dam at the confluence of the Gordon and the Franklin Rivers (Figure 1). The Gordon-below-Franklin was part of an integrated scheme which included four other dams that had already been built. The scheme also included the possibility of building of one more dam, the Franklin Dam, on the upper reaches of the Franklin (Figure 1). The project was put forward by the Hydro-Electric Commission of Tasmania (HEC)¹, a state-owned but very autonomous agency (Smith, 1998) which was sometimes said to be "a government within the government" (Thompson, 1981; Davis, 1995). The project was planned in an area considered to be wild, the closest village being 80 km from the dam site.

The region also had significant cultural importance to Tasmanian Aborigines. Many Tasmanians and mainland Australians, led by the Tasmanian Wilderness Society (TWS), became involved in the defence of the Franklin and Gordon Rivers. In the summer of 1982/83, the dispute reached a peak with a blockade preventing the preliminary work. It ended in July 1983 with a verdict from the Australian High Court which deprived the state of Tasmania of the power to exploit its resources, and with the establishment of a World Heritage Area whose integrity would now be protected by both federal and international law. The history of the project and the controversy have been thoroughly researched in different fields, including 1) in the political sciences, which considered the effects of the debate on the political system and on the relationship between the Australian states and the federal government (Baidya, 1984; Kellow, 1983, 1989; Doyle and Kellow, 1995); 2) in law, which focused on the legal consequences of the dispute and the High Court's decision (Sornarajah, 1983; Thomson, 1985; Genovese, 2015); 3) in media studies, which looked at the role played by the controversy in the establishment of a model for environmental protests and which examined its media coverage in Australia (Hutchins and Lester, 2006). The case has also been brought up in comparative studies that have been conducted in the political sciences and in geography

¹ In 1998, the Hydro-Electric Commission of Tasmania was divided into three government-owned enterprises: Hydro Tasmania (power generation), Transend (transmission and distribution) and Aurora (for retail).

(Aiken and Leigh, 1986; Sewell, 1989; Mertha and Lowry, 2006; Chen and Hay, 2006). Together, this literature illustrates the extent to which the dispute is considered to be a turning point in environmental and social movements (which also includes the recognition of Tasmanian Aboriginal identity). Despite this abundant scientific literature, however, the topic of water and rivers has hardly ever been addressed. The Gordon-below-Franklin case is described in two handbooks on water (Smith, 1998; Pigram, 1986). Pigram asks, in 1986, what might be the possible impact of the controversy on water planning and management (Pigram, 1986), but in the updated version of his handbook (Pigram, 2007) the question of the controversy's impact finds no answer. While considering this second case study, therefore, the aim was to question the role of the Gordon-below-Franklin controversy in the production of water.

Figure 1. Water in South-West Tasmania and in the middle Rhône valleys.



Despite their differences, the Loyettes and Gordon-below-Franklin controversies present some interesting commonalities. First, the controversies took place in countries where modern water was hegemonic in the 1970s. France has a long history of dam building (Bordes, 2010) for the purpose of serving the country's modernisation (Bodon, 1997). In settler colonial Australia, "water dreaming became reified through the physical manifestation of building dams on rivers" (Godden, 2015: 127) and the country's thirst for dams can be considered to be "the inheritance of modern thinking about the natural world that came with European civilisation" (ibid: 128). Second, both dam projects were part of integrated developments that were already partly in place and which had been controversial in the past

(Michelot, 1990; Comby, 2015; Davis, 1972; Hay, 1994). Third, the stakeholders involved in both cases were similar and adopted comparable strategies: 1) the projects were put forward by powerful public institutions defended by some regional and national politicians and contested by others; 2) state employees came up with protected area projects to prevent the dam projects from going through; 3) during the debates, scientists were involved in producing knowledge about sites on which little ecological data had existed prior to the controversies; and 4) the final decision to abandon the projects is explained by the intervention of national politicians.

Material collected on the dam projects and their contestation

The paper is primarily based on a series of interviews conducted in 2015/16 with stakeholders who were to varying degrees involved in the controversies at the time; these included: politicians (7); employees who were at the time working for public institutions for environmental protection (7); engineers working for the hydraulic bureaucracies at the time (7) and who, in some cases, defended an anti-dam position in 2015/16; dam opponents (26), some of whom were part of environmental organisations; and scientists (9), who were mostly opposed to the dams. More interviews were carried out in Australia (n = 49) than in France (n = 17).² Second, the paper draws on archival documents, which gave a better vision of narratives produced at the time of the controversies. In Australia, most of the archival research work took place at the office of the Wilderness Society in Hobart (Tasmania).³ In France, archived documents on the project and its contestation were examined at the National Archives (Pierrefitte-sur-Seine), the Archives of the Rhône department (Lyon), the archives of the regional section of FRAPNA (Lyon), and the archives of the Municipality of Anthon.

THE CONTROVERSIES AND THE EVOLUTION OF THE RELATIONSHIP TO INFRASTRUCTURE, SOCIAL STRUCTURE, AND H₂O

The analysis focuses on the (re)production of water during the controversies and after the success of the two anti-dam campaigns. Building on pro and con narratives, the three following subsections focus on the evolving relationships towards the three main components of the hydrosocial cycle that play a part in the production of water (infrastructure, social structure, and H₂O)⁴ and their entanglement with modernity.

Infrastructure: Modern 'hydraulic fix' or environmental degradation?

When the projects were put forward, they were presented as a response to growing needs and thus a contribution to society's "betterment" (Swyngedouw, 1999) and to regional and national development. The "hydro-industrialisation" (Davis, 1995) of Tasmania defined a specific "modern project" (Kaika, 2006) whose aim was to fight the geographical imaginary of a marginalised area and present it as a new frontier for Australia's energy production and industrialisation. To demonstrate the necessity of the project, the HEC predicted the load forecast and then argued that no alternative scheme could respond to the growing demand for electricity. They claimed that, "[t]he recommended scheme meets the Load Forecast, the alternative scheme does not" (HEC, 1979b: 55). Here, growth (Gleick, 2000) played a role in the framing of the infrastructure's purpose while the agency presented its forecast as objective (Boelens et al., 2019). When opposition to the Gordon-below-Franklin Dam intensified, the HEC emphasised the negative consequences that alternative projects would have on Tasmanian society as a whole:

² The difference between the number of interviewees can be explained by the fact that fewer people were involved in the Loyettes controversy than in the Gordon-below-Franklin dispute; a sense of saturation of knowledge (Bertaux, 1981) was reached sooner in the Loyettes case than in the Gordon-below-Franklin one.

³ The Tasmanian Wilderness Society had gathered many documents from other institutions and organisations (such as the HEC).

⁴ The definition of H₂O adopted in this section is based on the literature presented in the first section (Bakker, 2002; Budds, 2009; Linton and Budds, 2014), which uses the chemical formula to designate the material and biophysical dimension of water.

No amount of minor manipulation of these alternative development programmes can overcome the major economic and energy production disadvantages which are inherent in a decision not to use the potential of the Franklin River. (...). The cost of electricity to the general consumer will rise because of the decision to exclude the potential of the Franklin River (HEC, 1980: 2-3).

In summary, the HEC's argumentation rested on the rhetoric device, 'There is no alternative' (Crow-Miller et al., 2017a).

In France, on the other hand, while the CNR did not go so far as to say that the Loyettes Dam was the only option for responding to the regional or national demand for energy, the institution did argue that, "[n]ot only are these infrastructures [that is, the Sault-Brénaz and Loyettes Dams] of national economic interest, they also are useful at a regional scale" (CNR, 1982: 6). The CNR promoted its plans for dam and hydroelectric infrastructure using a discourse that was anchored in both the general interest of the nation and in regional development, a discourse that the CNR had been advocating since at least World War II (Comby et al., 2019). The quotes from the HEC and CNR reports illustrate the relationship between hydraulic bureaucracies and infrastructure. They do not, however, define strictly identical modernisation projects; for example, unlike Tasmania, the region of the Rhône River was not considered to be a marginalised area, and such an argument was never brought up to defend the Loyettes Dam project. Nevertheless, both agencies framed their hydraulic infrastructure as tools for prompting modernisation; therefore, the two projects appear to have been 'hydraulic fixes', that is, hydraulic projects branded by their supporters as being paths to ensuring growth, bringing about social change and economic development and, in fact, contributing to the reproduction of the existing hydrosocial configuration (Swyngedouw, 2015).⁵

The opponents of these dam projects rejected the idea of infrastructure as a fix and by doing so refused a relationship to dams which had been dominant since the end of the nineteenth century both in Australia and in France; in their narratives, dams were portrayed as forms of environmental degradation rather than as solutions. During both controversies, the protesters contested all kinds of infrastructure and all the alternative dams. In 1981, the Tasmanian government organised a referendum asking whether Tasmanians preferred the Gordon-below-Franklin Dam or its most profitable alternative, the Gordon-above-Olga Dam (Hay and Haward, 1988); the voters could thereby only choose between two options.⁶ In 2016, some dam opponents still recalled the extent to which their radical opposition to dams had been ignored by the hydraulic agency and the government. As stated by an interviewee who had opposed the dam, "the Labor government put out a referendum: 'Which dam would you like?', stupid. So stupid, to ask the population on an engineering [matter] 'do you want this dam or that dam?' (...), it was just crazy, of course there was only one response (...) 'no dams'" (Interview 38, 2016). The organisation opposed to the Loyettes Dam also rejected any possible alternative project; as stated in a 1983 CODERA memorandum, "we claim without hesitation that the only positive alternative to the initial project is the 'naught alternative', i.e. the absence of any kind of infrastructure which would be damaging for the confluence" (CODERA, 1983: 11). During the controversies, iconography played an important role in the redefinition of the relationship to hydraulic infrastructure. In various issues of the Wilderness Society's newsletter, *Wilderness News*, dam walls were often sketched or photographed, as were pylons, taps (rather than sluice gates), tunnels, canals, and the machine tools necessary for the construction. During the Gordon-below-Franklin debate, the machinery involved in dam building – and particularly bulldozers – were recast as symbols of environmental destruction. In the 28 issues of *Wilderness News*

⁵ Building on Harvey's (2001) and Smith's (1984) writings on 'fixes', Swyngedouw (2015) combines 'fix' with different terms such as hydrological, hydraulic, sociotechnical, technosocial, socio-ecological, socationatural, hydrosocial, and hydrosocial. In his studies on Spain (see, for example, Swyngedouw, 2015), he shows how the state and specific stakeholders suggest changes (such as the implementation of new hydraulic projects) which are painted as solutions while contributing to the reproduction of the existing hydrosocial models (for example, the productivist water logic).

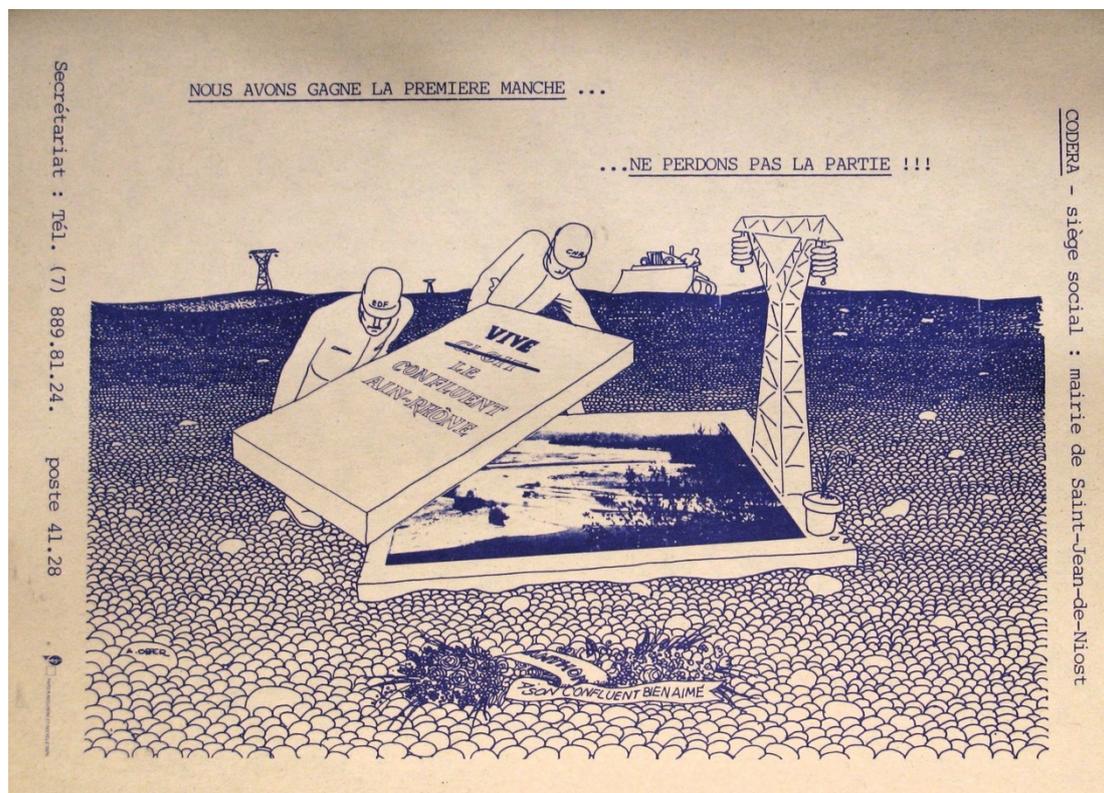
⁶ *Gordon River Hydro-Electric Power Development (Referendum) Act*, 1981 (No. 58 of 1981), http://classic.austlii.edu.au/au/legis/tas/num_act/grhpda198158o1981624/.

published between 1979 and 1983, 13 representations of bulldozers can be found. In the 1990s, at the Visitor Information Centre of Strahan (a small port on Tasmania's West Coast, Figure 1), an exhibit on South-West Tasmania was set up, with a section introducing the history of the controversy. Quotes from different stakeholders, pro- and anti-dam, were staged in a rusty bulldozer bucket. This last example of the Gordon-below-Franklin controversy shows that, even today, bulldozers in connection with dams are presented as tools of environmental degradation.

The iconography on the Loyettes controversy is much less rich, though bulldozers and pylons do appear on some flyers (Figure 2). While the Loyettes Dam and the hydroelectric facility would not have been very impressive in size, the concrete canals would have irremediably divided the Rhône River and separated it from the Ain River over a distance of at least 10 km. The materiality of the canals arose repeatedly in the interviews; the canals epitomised both the ecological relevance of the water level and quality, and concern for preserving the aesthetics of the area. In both cases, the controversies contributed to the building of a negative view of dams. In Australia in particular, the cancelling of the Gordon-below-Franklin project led to the development of a 'no dams' discourse and, according to some stakeholders, even to a 'no dams' water planning paradigm. The national newspaper, *The Australian* regularly publishes articles in which it explains that since the 1980s a 'moratorium' on dams is in force:

Not only did this action save the Franklin [River], it also set the political agenda for the next two, and possibly up to five, decades. (...) no political leader since that event has proposed the building of a major new dam (...). State politicians believe that the surest way to be voted out of office is to propose the building of a new dam, so they avoid the subject altogether (Salt, 2005).

Figure 2. A flyer against the Loyettes Dam.



Source: CODERA (n.d.).

In 2016, a pro-dam Tasmanian politician explained that, not immediately but nonetheless in connection with the controversy, "governments of all persuasions Australia-wide became very scared about building dams" (Interview 13, 2016). Nevertheless, some projects were built by the HEC in Tasmania as compensation measures for having abandoned the Gordon-below-Franklin Dam, although the Franklin Dam project, planned upstream of the Gordon-below-Franklin was never brought up. After 1993, no more hydropower dams were erected, but the number of irrigation dams continued to grow; between 1984 and 2008, 35 were built. In France, the abandoning of Loyettes led the CNR to redefine its planning of the Rhône River; the cancellation of the Loyettes project also led to the abandoning of another dam, the Miribel-St-Clair Dam; nevertheless, its consequences in relation to dam building on other French rivers were not suggested by the interviewees and did not appear in the archived documents. In both cases, the interruption of the dam projects had direct material implications on the river-corridor scale since it prevented further dam developments. From a less material perspective, the Gordon-below-Franklin controversy is considered to have contributed to changing the relationship of Australian society to dams whereas the Loyettes controversy is not clearly recognised as having played such a role.

The social structure: From the uncovering of the power of the hydrocracies to their transformation

The opposition to the Loyettes and Gordon-below-Franklin dams is not merely linked to the environmental degradation that dams represent; it also reflects the rejection of a social structure in which hydrocracies present themselves as heroes. During the controversies, the relationship between hydrocracies and the rest of society was questioned, leading, at least in part, to the reordering of social relations. In Tasmania, the controversy created a profound divide within society; this was not simply because of the conflicting relations to, and representations of, the dam project, but also because the HEC was considered by some to be a dominant stakeholder, which threatened the proper functioning of democracy. In 1981, for example, the Australian journalist and project officer for the Australian Conservation Foundation, Peter Thompson, denounced what he considered to be an excessively powerful corporation, stating that, "A single organisation, the Hydro-Electric Commission has played a virtually unchallenged role as Tasmania's economic, social and land-use planner. (...). Twenty-four bureaucrats, the senior officers of the HEC, have taken control of the future of the State's most distinguished resource, the South-West wilderness" (Thompson, 1981: 11). The power of the CNR was also underlined by people who took part in the protest against the Loyettes Dam. During an interview, a former member of the institution in charge of establishing a protected area near the dam site⁷ insisted on the weight and power of the CNR, commenting that, "In the Rhône-Alpes region, the CNR is an institution (...). They are extremely powerful people" (Interview 16, 2015). Democracy is also a key element in the opponents' narratives. The human, financial and technological means that the CNR was able to invest in defence of its project were highlighted by the stakeholders who were interviewed, and such means were feared by the dam opponents. In an interview, a local politician opposed to the dam stated that, "The CNR came to the meeting with lots of material, they had the resources to do so, they had a big table, they had trestles and they had seven or eight engineers behind the table. It was big. I was on my own" (Interview 2, 2015). Statements made by citizens who attended meetings on the Loyettes Dam showed that they doubted the independence of the public inquiry conducted on the dam. A local resident reported that during a meeting with different stakeholders she heard the person appointed by the departmental authorities to conduct the public inquiry admit that he was not completely independent from the CNR.⁸ One of the main booklets produced by the dam opponents showed that they also viewed the Loyettes project as a

⁷ During the 1980s, the Délégation régionale à l'architecture et à l'environnement (DRAE) – a decentralised state service representing the Minister for Environment – was in charge of establishing a protected perimeter around the site where the dam was planned.

⁸ Letter from a local resident who attended a public meeting on 1 January 1982 to FRAPNA, letter dated 8 February 1982; from the archives of FRAPNA (Lyon, France).

solution proposed by the hydraulic authority to ensure its own "perpetuation" (CODERA, 1983). As some archived documents reveal, such a statement was not unfounded. It appears that the director of the CNR told his employees that if the Loyettes Dam and any other construction works were not carried out, the agency would have to be restructured, if not dissolved. "[W]e will no longer be able to borrow money, capital will be cut back from 1988. On that date, theoretically, the agency will be dissolved. Our backs are against the wall" (Section CFDT-CNR, 1986).⁹

The archival documents and interviews therefore show how the power of the hydrocracies was rendered explicit and became contested during the controversies. The outcomes of the controversies are often tightly linked with changes in the power of the hydrocracies and in their relations with the social structure. As a former geologist from the HEC puts it, "the Hydro as an institution going ahead and building scheme after scheme had been defeated. I think people [working at the Hydro] felt defeated. I think that was a huge change in the culture of Hydro Tasmania" (Interview 12, 2016). Moreover, former engineers also expressed the feeling that their institution had lost the power it had had in the political sphere while becoming more dependent on economic interests. As stated by a former hydrologist from the HEC, "40 years ago (...) it was just engineers who ran the Hydro and told the government what to do. Now there are more business people running the Hydro. (...) it's an electricity generator who wants to sell electricity" (Interview 28, 2016). This 'new' way of running the agency is particularly criticised by the former engineers of the institution. According to one interviewee, "the whole Hydro has changed. With the removal of the engineering it has become a purely commercial sort of organisation" (Interview 8, 2016).

Since the CNR and its employees were unaccustomed to strong opposition, the decision to cancel the dam for environmental reasons came as a surprise (Section CFDT-CNR, 1990). As a result, to quote one engineer, "It left its mark on people's minds in terms of taking the environment into account" (Interview 10, 2015). Nevertheless, the same engineer also explained that this sole event could not entirely account for the changes which the company went through. "[I]t [the abandoning of the Loyettes Dam project] is not the only thing that obliged us to take the environment into account, it was more generally the state" (Interview 10, 2015). In both cases, there appears to have been a decline in the degree of autonomy of hydraulic bureaucracies from political institutions. In the case of the Gordon-below-Franklin, new relations between the HEC and economic stakeholders seem to have shaped the production of water after the controversy.

The relationship between the hydrocracies and the environment seems also to have evolved after the controversies and this evolution was, in part, a result of the controversies. According to some interviewees, the Loyettes controversy allowed for the introduction of scientific knowledge on river ecology into the management practices of the CNR. The CNR does not directly foreground the role of Loyettes in the changes that the institution went through since the 1990s; nevertheless, at least part of the change in its practices has come about since the agency became more actively involved in mitigation measures such as ecological restoration (Riquier et al., 2015). The HEC, in contrast, directly highlights the social productivity of the Gordon-below-Franklin controversy when presenting the history of the commission; one Hydro Tasmania document states that, "out of the days of environmental conflict came a deepened commitment by the Hydro to environmental planning, re-vegetation and site restoration" (Hydro Tasmania, 2014: 5). The two agencies seem to have gone through an "ecological turn" (Disco, 2002), though this does not necessarily imply that the hydraulic agencies no longer conceive of water as a resource. Duncan and Hay (2007) showed that, indeed, since 2005, in the context of the liberalisation of the energy sector in Australia, the flow of the Gordon River in Tasmania has been directly connected to the whole Australian energy market. The sluices of the Gordon scheme are opened at the hours in which Hydro Tasmania can maximise its financial profit and the environmental flow chosen as a

⁹ The speech of the director of the CNR was transcribed in a report by the CNR section of the Confédération française et démocratique du travail (a trade union).

mitigation measure appears to be minimal (ibid). Both cases show that social relations were profoundly affected by the controversies and that these controversies contributed to changes within the hydraulic bureaucracies, thus influencing the production of water ontologies. These changes, however, do not mean that growth is no longer promoted by the hydraulic agencies or that the agencies no longer conceive of water as purely hydrological. The next section continues the exploration of the production of water during and after the controversies by focusing more specifically on stakeholders' different relationships to H₂O.

H2O: Different degrees of abstraction

In both cases, H₂O (that is, the material and physical dimension of water) – unlike infrastructure or the hydraulic institutions' power – is not an entity which is omnipresent in the interviews and archival documents. Without seeking to overestimate its significance, this last analytical section explores the relationship between the different stakeholders involved in the controversy, the different dam proponents and opponents, and H₂O. More specifically, the section focuses on the extent to which H₂O is abstracted from its social context and on how the degree of abstraction varies according to the different stakeholder groups.

In the Loyettes case – more than during the Gordon-below-Franklin controversy – different actors opposing the project expressed concerns regarding water's physical dimension. First, some environmentalists and scientists were concerned that after the dam was built and most of the water flow was diverted into a canal, the yield of the river would be too low in the old riverbed (the 'Vieux Rhône'). According to these stakeholders, H₂O would be harnessed for energy production, leaving too little for the environment; this argument was present in some of the anti-dam iconography produced by CODERA. Figure 2 shows their view of the confluence of the Rhône and Ain rivers under the effect of the planned dam; the most striking element of the illustration is the paved riverbed where no water runs. Second, not only the quantity of H₂O was a concern, but the degradation of its quality due to the dam's implementation was also debated. As soon as the project was announced, some opponents put forward the possibility of an increase in water temperature due to the presence of the Bugey Nuclear Power Plant a few kilometres upstream from the projected dam. Local residents also believed that the sewage pollution would no longer be diluted and evacuated by a Rhône River whose yield was to be seemingly reduced. Groundwater was also a concern as it was anticipated that the hydroelectric plant and the canals could contribute to a lowering of the water table; farmers dreaded that they would no longer be able to pump water from the aquifer. Dam opponents expressed concerns about the different changes that could affect the physical water flow in terms of quantity and quality, longitudinally and vertically; these concerns reflected the different types of relationships to H₂O. The scientists – whose research was used by the environmentalists during their campaign – mostly engaged with H₂O by producing new knowledge on the rivers' geomorphology and ecology; water was viewed as part of the river and the environment and as part of an ecosystem that needed to be cared for and protected; if water was not viewed as a resource by these scientists, they nonetheless considered it to be 'natural'. For the farmers and riverside residents who were concerned with changes regarding their interactions with H₂O, water was not merely a resource. Their concerns included possible interference by the hydraulic agency in their use of H₂O to water their crops; changes in how H₂O looked and smelled from their houses or farms; and being no longer able to bathe in H₂O on a sunny Sunday afternoon. Although some of these groups of opponents were concerned about H₂O's ecological value, they mostly viewed it as a component of the environment in which they lived.

None of the stakeholders I interviewed described H₂O as being a major component of the Gordon-below-Franklin anti-dam narrative and few opponents to the project detailed their relationship towards H₂O; nevertheless, it was not entirely absent from the anti-dam campaign. The Wilderness Society badges

(Figure 3), stickers, and photographs¹⁰ used during the campaign often represented free-flowing water. This free-flowing H₂O was rarely separated from its environmental context, that is, the Franklin and Gordon Rivers, their riverbanks, valleys, ravines, rocks, and vegetation. At stake was not merely the water quality or water quantity but all the components of the environment with which H₂O interacted. During the controversy, some opponents to the dam's construction became more directly engaged with the materialities of water and the rivers. Many rafting and kayaking trips were organised, which helped consolidate opposition to the dam. A woman interviewed in 2016 explained how her experience of rafting down the Franklin River and interacting with the river motivated her involvement in the anti-dam campaign:

When I finished that trip – it was very exhilarating, it was very good fun (...) my life started to change (...). The river got into my head, the river got under my skin, I was not sure about saving the river or damming it (...). And I started talking to people (...), we [my friends and I] were very open. (...). We were 18-19 years of age, very young, we decided we'd organise a public debate, we didn't know what we wanted but we wanted information and we wanted to make up our mind. (...), we invited the conservationists, we invited the academics, we invited the economists, we invited the Hydro (...). And this occurred at the Town Hall (Interview 38).

Figure 3. An advertisement for a Gordon-below-Franklin anti-dam badge.



Source: TWS (1980).

During the 'Franklin Blockade' in the summer of 1982/83, which took place near the construction site, many activities were organised on the river itself. Another interviewee explained how he was involved in organising river trips for politicians to make them experience "what was going to be flooded". He recalls his trip with a member of the Tasmanian Upper Chamber: "[The politician] actually said [after kayaking down the river] 'This is the biggest decision I have got to make'. And it did make a big impact on him, you could tell he really enjoyed himself wandering off in the camp and collecting rocks and just enjoying it, relaxing I suppose" (Interview 21, 2016). Dam opponents sought to relate to H₂O differently from dam planners during the controversy, but their relationship to H₂O cannot be separated from the experience of wilderness which was unequivocally recognised as being at the centre of the debate. For a former Tasmanian Minister of National Parks who protested against the project, the Gordon-below-Franklin debate was "really about 'what an extraordinary area, the South-West is!' So the Franklin River was an aspect of a wider environment which people wanted to save, which I wanted to save, I wanted to save the whole South West" (Interview 2, 2016). In 2016, some former opponents of the Gordon-below-

¹⁰ *The Franklin and Lower Gordon Rivers*, a book of photos compiled by Bob Brown (1979), constitutes one of the most eloquent examples of river photography and its political usage during the anti-dam campaign.

Franklin project underlined some of the environmental consequences of the Gordon basin dams which had since been observed, including the release of cold water from the depths of their reservoirs (which can negatively affect the fish population) and hydropeaking; they also recognised that these had not been a major concern at the time. In the years since the Gordon-below-Franklin cancellation, some stakeholders had developed a deeper concern for H₂O quality and quantity; this concern had not motivated their involvement in the original controversy.

Interviews carried out with former engineers revealed some differences in the relationship to the materiality of water; these differences suggest "multiple modernities" (Boelens et al., 2019). Former engineers from the CNR described the infrastructure plans in great detail, constantly referring to the Rhône River and its vertical drops but barely mentioning H₂O; former HEC employees, on the other hand, referred regularly to H₂O. They used different expressions which revealed a "quantitative" view (Jackson and Head, 2020) of "water-as-a-resource" (Yates et al., 2017). Interviewee 4 (2016) referred to "the moving of water", "water levels", "releasing water", "managing water", and "water diversion"; Interviewee 8 (2016) referred to "picking up the water" and "the flow of water"; Interviewee 12 (2016) mentioned "pumping water"; and Interviewee 28 used the phrases "measuring water resources" and "working out the water levels". At the same time, describing H₂O as a resource also leads to representing it as a purely social entity and to abstracting it from its ecological context. In the archival documents consulted in Tasmania and the interviews carried out with former HEC employees or with dam proponents, H₂O is depicted as an "energy resource" (HEC, 1979a: 2) which has an economic value. According to a (now retired) engineer of the HEC, "water in storage is like money in the bank" (Interview 8, 2016). A former Tasmanian Minister for Energy who regretted the abandonment of the dam project highlighted the economic advantage of building an integrated scheme:

If you build a dam on a river and leave it at just that, then the value of the water is X, if you put another dam further down so the water goes down through it as well the value of the water is now 2 X, and if you put another one and another one, the value is then 3 X and 4 X (Interview 19, 2016).

These examples of the relationship between different groups of stakeholders and H₂O show that the process of the abstraction of water is ambiguous and extremely diverse. Sometimes H₂O is considered to be a purely natural element, an entity which is extracted from its environmental and social contexts to the point of even being forgotten or ignored; at other times it is converted into economic goods and into a resource. In the latter case, water is not abstracted from its social and economic context but from its natural one. In most of these cases, water is not viewed as a socionatural hybrid entangled in biophysical and social processes. Moreover, H₂O is not always an entity which matters, for its own sake, to opponents and proponents of the dams; this is revealed by the narratives of the Gordon-below-Franklin opponents, the Loyettes proponents – for whom the hydroelectric resource was not H₂O itself but the Rhône River or the vertical drops in the riverbed – and, to a lesser extent, the Loyettes opponents. Nevertheless, the controversies offer opportunities for dam opponents to either strengthen existing relationships to H₂O or produce new ones.

DISCUSSION: FROM DIVERSE AND CHANGING RELATIONSHIPS TO DAMS, HYDRAULIC AGENCIES AND H₂O, TO NONMODERN (WATER) ONTOLOGIES?

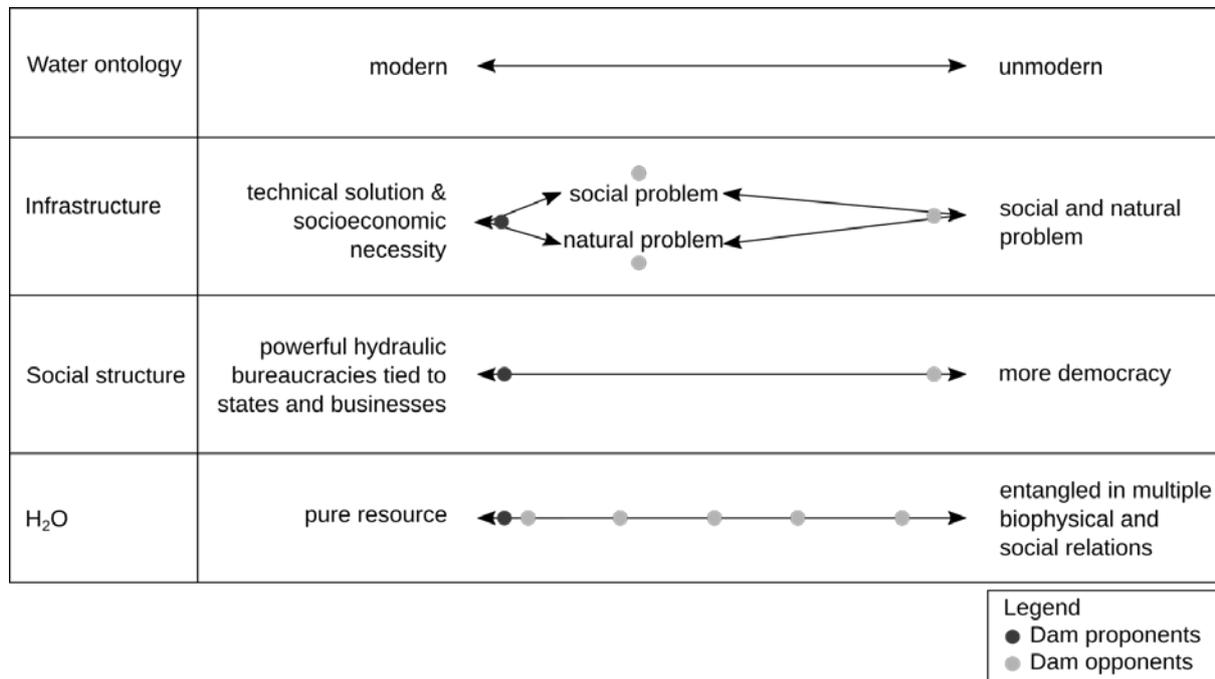
The analysis of these two cases sought to "go beyond revealing the social nature of modern water" (Jackson and Head, 2020: 54) by further contributing to the characterisation of modern and nonmodern waters, notably through the study of sociotechnical controversies leading to unbuilt dams.

Modern water is understood in its multiple facets as a water ontology that rests on 1) the conceptualisation of water as a purely hydrological resource, 2) a social structure in which hydraulic bureaucracies play a prominent role, and 3) the building of hydraulic infrastructure in the name of progress, development, growth and emancipation. The analytical section of this paper shows, first, how

this conceptualisation of modern water was enacted by hydraulic companies and dam proponents during the Gordon-below-Franklin and Loyettes controversies. The archival material on the two projects, plus the interviews, corroborate the conclusions of papers which establish links between modern water and a discourse on dams and hydraulic infrastructure more generally. This linked discourse is applicable on an international scale; it frames large hydraulic infrastructure as a solution and applies it to discourses on growth (Gleick, 2000), progress and development (Shah et al., 2019a). Dams are indeed portrayed as solutions; they are put forward in the narratives of hydraulic agencies as 'hydraulic fixes' (Swyngedouw, 2015). The narratives and interactions of the hydraulic agencies and their employees' with the rivers and H₂O rest on technical knowledge (Godden, 2015); the CNR's project draft evokes mostly the infrastructure's technical characteristics and the Rhône River's hydrology, while the HEC's draft also does so but goes further by explicitly presenting H₂O as a resource. Former employees of the HEC (some of whom are today anti-dam) speak of water mostly in quantitative terms. The HEC's relationship to water also reflects the complexity and paradoxes of modern water. Indeed, water is abstracted from its social context and viewed as purely hydrological, enabling it to be used as a resource; from there, it can also be separated from its ecological context and represented as a financial or economic resource. Finally, the analysis suggests that despite having gone through transformations after the controversies, the hydraulic agencies have not entirely distanced themselves from modern water; rather, these transformations have led them to support and to realise different modern water ontologies, which are less based on the building of large infrastructure projects and which integrate some environmental concerns, but which still consider water as a resource.

Second, the analysis shows that the controversies and their aftermath produced and enacted new relations to 1) infrastructure (no new dam projects were carried out on the Franklin and Rhône rivers despite existing plans; an anti-dam discourse was developed in Australia); 2) to the social structure (the power of the hydraulic agencies was contested; anti-dam groups overturned dam projects), and 3) to H₂O (alternative relations to H₂O were developed). Evidence suggests that the controversies influenced the production of alternative water ontologies. Do these new relations to water amount to nonmodern water ontologies? In both case studies, as shown in Figure 4, the dam opponents mostly shared the same view of the social structure, as revealed in their contesting of the hegemonic power of the hydraulic bureaucracies; however, as also shown in the figure, all dam opponents did not relate the same way to infrastructure during the controversy. For the archaeologists in Tasmania and Australia and for the Tasmanian Aborigines, the dam principally raised a social problem, the recognition of Aboriginal heritage and identity; for the Loyettes farmers, infrastructure primarily represented a threat to their livelihoods; for many environmentalists, infrastructure was broadly viewed as causing environmental degradation and was therefore seen as a natural problem; finally, some environmentalists, riverside residents, and state employees working in the environment and protected areas departments, described infrastructure as posing both environmental and social problems. The relationships to H₂O enacted during the controversies were also diverse, varying on a continuum from a pure resource to a hybrid entity. The farmers involved in the Loyettes controversy were in part concerned that they would no longer be able to freely use H₂O for agricultural purposes; this recalls the modern water ontology and its quest to "separate and distinguish water according to different uses" (Yates et al., 2017: 803). By seeking to protect the dam sites from human activity, scientists and environmentalists involved in the Loyettes and Gordon-below-Franklin controversies tended towards opposing human activity and nature. Other dam opponents, through their everyday interactions with the river (such as observing the Rhône during a walk), or through more isolated experiences with it (such as rafting down the Franklin) conceived of H₂O as entangled in biophysical and social processes. While the water ontologies of the dam opponents are different from the modern water ontologies sustained by the dam proponents, they are extremely diverse and some of them still seem to rest on the modern separation between the social and natural realms (Figure 4).

Figure 4. The multiple water ontologies produced and enacted during the controversies.



Third, despite these differences, the anti-dam narratives rarely represented H₂O as purely hydrological and abstracted from its environmental context. The "essence and being of water" (Yates et al., 2017: 799) is seldom separated from the essence and being of rivers and of the environment of which they are a part. Rather than merely revealing the assertion and enactment of specific relationships to H₂O before or during the controversies, the dam opponents' narratives show their interactions with the environment as a whole. This suggests that the anti-dam stakeholders may have more broadly contributed to the production of alternative environmental ontologies. Most dam opponents were less concerned with defending "ways of being-with-water" (Yates et al., 2017) other than modern, and were more concerned with defending ways of being-with-the-environment which did not rest on exploiting resources. These ways-of-being-with-the-environment include promoting alternative kinds of interactions with a diversity of other-than-human entities: with H₂O but also with the rivers, their banks, sediment, fish, vegetation, etc. The dam opponents who most clearly conceptualised H₂O and the production of water were the scientists involved in the Loyettes controversy, whose research specifically focused on aquatic environments; they were even more concerned, however, with the interactions between H₂O, sediment, vegetation and non-human living entities. These results corroborate the current scholarly efforts to integrate other components of the physical environment when adopting a hydrosocial approach (Lafaye de Micheaux et al., 2018) and also support McDonnell's (2014: 226) argument on the "infeasibility of isolating water". While controversies relating to water are indeed rooted in ontological differences (Wilson and Inkster, 2018) which can be reinforced or even produced during the conflictual process, such differences are not always literally related to water as an isolated entity; the essence and being of water is intertwined with other socionatural entities.

CONCLUSION

The current literature on hydraulic infrastructure illustrates that modern water is still today hegemonic as new projects are being put forward (Fletcher, 2010; Ahlers et al., 2015; Crow-Miller et al., 2017a; Perry and Praskiewicz, 2017; Warner et al., 2017; Menga and Swyngedouw, 2018). To contribute to the

understanding of modern water's perpetuation, this paper takes a step back in time and asks what can be learned from the study of two dam projects which were among the first in the world to be cancelled due to environmental protests. While some studies in the hydrosocial literature have begun to identify the reasons for success in anti-dam campaigns (Dukpa et al., 2019; Shah et al., 2019b), this paper analysed the evolution of water ontologies during and after controversies which led to the abandonment of dam projects.

The existing literature on river planning and management, as well as the data collected on the Gordon-below-Franklin and Loyettes cases, shows that before the controversies, in both Australia and France, modern water was hegemonic. Dams were proposed one after the other and framed as tools for the enactment of development and modernisation; hydraulic institutions were supported by the political and business spheres and only marginally challenged by environmentalists; H₂O and rivers were viewed by dam proponents as resources. The Gordon-below-Franklin and Loyettes controversies occurred at a moment when anti-dam movements were starting to gain momentum on an international scale (McCully, 2001). The analysis of these specific cases shows that some changes took place during and after the controversies with regard to the production of water: 1) new relations to hydraulic infrastructure were produced and hydraulic infrastructures were no longer undisputedly viewed as solutions – 'fixes' – but were also regarded as being forms of environmental degradation; 2) the power of hydraulic institutions was contested and the agencies went through transformations; 3) relations to the biophysical environment (and H₂O) which were not based on resource exploitation were produced and enacted. To some extent, these changes resulted in alternative water ontologies; they showed that for many stakeholders water was not merely hydrological. These alternative water ontologies did not seem to be shared by all the diverse dam opponents and they were not entirely nonmodern. This diversity of ontologies and the fact that the alternative ontologies are not all entirely nonmodern may contribute to explaining the endurance of modern water; furthermore, as noted in the analysis section, Duncan and Hay's (2007) work on hydropower in Tasmania seems to suggest that water is still viewed as a resource to be exploited. Regarding the Rhône, in June 2019 in the context of the liberalisation of the European energy market, the CNR put forward a new dam project (the Saint-Romain-de-Jalionas project) some kilometres upstream from where the rejected and then abandoned Loyettes Dam project had originally been planned. By proposing such a project (prior to any independent environmental and social assessment) the CNR appears to be ignoring the history of the social and ecological production of the last undammed kilometres of the Rhône River. From a political ecology perspective and in the context of the recommitment to hydraulic infrastructure, it seems important to pursue the unravelling of hydraulic agency discourses, of the ontologies which sustain them, and of alternative water and environmental practices and representations which seek to challenge them.

Finally, and from a theoretical point of view, this paper contributes to current discussions within the hydrosocial literature. First, the paper shows that during sociotechnical controversies, alternative relationships to infrastructure, the social structure and H₂O are produced and enacted. Bridging the hydrosocial literature with literature on multiple ontologies and sociotechnical controversies therefore allows for highlighting that dam controversies not only reflect pre-existing water ontologies but also contribute to the production of new alternative ones. Second, by stating that during hydraulic infrastructure controversies the essence and being of water is seldom separated from the essence and being of the environment of which they are a part, the paper calls for a reflection on the connections between water ontologies and environmental ontologies.

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precious advice. I would also like to thank the reviewers for their insightful comments. Figure 2 is reproduced with the permission of FRAPNA. Figure 3 is reproduced with the permission of the Wilderness Society.

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