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The Ageing of Infrastructure and Ideologies: Contestations Around Dam Removal in Spain

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ABSTRACT: This paper analyses the discussions surrounding dam removal in Spain and, specifically, ongoing contestations around the Toranes Dam. Engaging with scholarship about the temporalities of infrastructure and imaginaries, I show how dam removal is a trend that comes forth from temporally situated and shifting relations in the sociopolitical, technical, financial and environmental networks in which dams are embedded. More than simply a consequence of material decay and expiring use licences, dam removal is also intrinsically related to changing imaginaries about dams, rivers and nature. However, dam removal is contested. Central to it are debates about the definition of, and relations between, nature, society and cultural heritage in the past, present and future. People's subjectivities – shaped by the dam and its intended and unintended effects on the environment and hydrosocial relations – are also a source of anti-removal mobilisation. The paper demonstrates how dam removal is a fascinating topic that draws attention to the different temporalities dams hold, including the stage of material and potentially also ideological ruin. Dam removal, however, does not (yet?) represent a clear paradigm shift; rather, the reality is messy, with dam construction and removal at times being promoted simultaneously.

KEYWORDS: Dams, dam removal, temporalities of infrastructure, imaginaries, Spain

INTRODUCTION: AGEING INFRASTRUCTURE, NEW QUESTIONS

Dams, big or small, have received a lot of attention in politics, social movements, and political ecology scholarship. Scholars have focused on unpacking the actor alliances, mechanisms and modern imaginaries that form the basis of dam construction (Hidalgo-Bastidas, 2019; Hommes et al., 2016; Kaika, 2006; Menga, 2015), the conflicting knowledge paradigms and epistemological controversies surrounding mega-infrastructures (Niazi, 2019; Shah et al., 2019), as well as the fierce contestations from affected communities (Del Bene et al., 2018; Duarte Abadía et al., 2019; Flaminio, 2021). Yet other studies have shed light on the devastating effects dams can have on environments and people alike, questioning their promise of bringing modernity and development (McCully, 2001; Tortajada et al., 2012; World Commission on Dams, 2000).

Dam construction continues in some parts of the world. However, especially in North America and parts of Europe, there is an increasing promotion of the opposite: dam removal. 'Dam removal' – sometimes referred to as barrier removal – is used as an umbrella term to describe the call for the demolition of diverse, as obsolete considered in-stream barriers such as weirs, sluices and dams. Partially because of the high degree of fragmentation of European rivers – with an average of almost one barrier per kilometre of river stretch (Belletti et al., 2020) – dam removal has gained momentum (for a general overview see Schiermeier, 2018; for a study on Portuguese dam removals see Cortes et al., 2019; for cases from France see Barraud, 2017, and Germaine and Lespez, 2017; for experiences in Sweden see Lejon et al., 2009). Dam removal is often theoretically and practically embedded in river restoration efforts that include a broader range of interventions such as the (re)creation of meanders, backwaters or fish passages (European Centre for River Restoration, n.d.).

The number of dams that have been removed up to now depends on one's definition of what counts as a 'dam'. When considering all the types of in-stream structures that impede free river flow (including, for example, diversion weirs and culverts), more than 5000 have been removed in the past years according to Dam Removal Europe, a network founded in 2015 by organisations such as the World Wildlife Fund, The Nature Conservancy, Rewilding Europe, and the World Fish Migration Foundation (Dam Removal Europe, n.d.). The removal of an in-stream structure is promoted for different reasons, ranging from security and economic concerns to ecological and water quality considerations. Dam removal has proved effective in quickly re-establishing river connectivity and the movement of material and organisms, including natural sediment flows and associated benefits (Foley et al., 2017), and improving spawning grounds and other habitats that contribute to enhanced biotic diversity and abundance (Bednarek, 2001), for example for resident and migratory fish (Magilligan et al., 2016). Because of these positive impacts and its relative cost-effectiveness, dam removal is seen by its promoters as an effective tool for achieving 'good ecological status' for surface water, as requested by the European Union's Water Framework Directive (Dam Removal Europe, 2020; Schwarz, 2021). The idea received additional policy support more recently through the EU biodiversity strategy that aims to restore at least 25,000 km of rivers to free-flowing waterways by 2030 "through the removal of primarily obsolete barriers and the restoration of floodplains and wetlands" (European Commission, 2020: 12).

Dam removal as a concrete action proposal for river management is relatively new and groundbreaking. Some of the underlying ideas, however, are reminiscent of historic political-philosophical discussions, such as the quest to return to a 'more natural' and less human-modified environment. This bears a certain resemblance to the calls of Western philosophers such as Rousseau, or, even earlier, to the viewpoints of, for example, the German kings Albert I and Henry VII in the 14th century, who ordered forest restoration (for this and other historic examples, see Glacken, 1976). Perhaps most famously, in 1755 the Genevan philosopher Rousseau called for a more natural and more satisfying way of life in which people would free themselves from corrupting civilisation (Rousseau, 2019 [1755]). Within natural and water resource management there have also been calls to revive pre-industrial or pre-modern practices and conditions. In India, for example, anti-dam movements in the 1980s mobilised ancient water technology and practices to challenge modernity (and to challenge dams as its materialisation) and to provide a desirable and viable alternative that was imagined to be more equitable and more sustainable (Shah, 2012). In Peru, more recently, Incan and pre-Incan water technology has received booming attention from international agencies (Grainger et al., 2019). In the critical analysis of Shah (2008, 2012), however, such calls for a return to a pre-modern or pre-colonial past are considered to be potentially problematic, as they are based on particular imaginations of the past and the present that are not always historically accurate. They can also, Shah states, produce a binary opposition between the modern and the pre-modern.

This paper aims to critically analyse the dynamics surrounding dam removal in Spain. It scrutinises both the context in which dam removal arises as a new tool for river governance, and the discussions and contestations that this triggers. I mobilise the notion of imaginaries in order to draw attention to the underlying fundamental political-philosophical questions at stake in dam removal and, more broadly, river/nature restoration efforts – an aspect that is less explored in other studies (one exception being Jørgensen, 2017). This paper also demonstrates the importance of thinking through different temporalities of water infrastructure. This means, in other words, following an infrastructure through its life from conception to potential removal in order to unpack how it unfolds and creates complex sociopolitical, economic, ecological and hydrological connections and relations in unforeseen directions. Such a lens can contribute to a deeper understanding of conflicts around dam removal projects and can, at the same time, help to reconsider infrastructure conceptually (and practically) as dynamic and potentially finite. The latter point specifically enriches the realm of political ecology studies, which have so far largely focused on dam construction rather than removal.

I will develop these contributions through a close examination of dam removal debates in Spain, with discussions around the Los Toranes Dam (referred to hereafter as the Toranes Dam) as a case in point. Spain has historically been shaped by a hydraulic mission to use every drop of water productively; as a result, it has among the highest number of dams per capita in the world (Lopez-Gunn, 2009; Sauri and del Moral, 2001; Swyngedouw, 2015). In the last decade, however, there has been a growing civil society mobilisation that is calling for a new water culture and a rethinking of Spanish water policy (Bukowski, 2017; Martínez-Fernández et al., 2020). One aspect of this countercurrent is the proposal to remove dams and other barriers in rivers in order to restore river connectivity. Barriers that were located in uninhabited areas have often been removed without any social debate. Other removals, however, are being fiercely contested by local populations, municipalities or employees of the river basin authorities (RBAs) themselves, such as the 2018 Yecla de Yeltes Dam removal (Noticias de Castilla y León, 2018) and the removal of the Banyeres weirs, which were in the end not demolished because of local protests (Levante, 2011) (cf. Brummer et al., 2017). None of the removal projects, however, seem to have sparked as much opposition and nationwide attention as the Toranes Dam. In that sense, this dam is unique in the Spanish context and the study of it can unravel the conflict potential inherent in dam removal projects. For that reason, I focus on this particular case in the second part of this paper.[1]

My analysis is based on research conducted between July 2020 and May 2021. It included a literature review, interviews, and participation in relevant events. As the time of research coincided with the worldwide COVID-19 pandemic, a large part of the research was desk-based and conducted online. In order to understand the political, societal and geographical context of dam removal in Spain in general, and in the Toranes Dam case in particular (for example, the actors, processes, outcomes and debates), an analysis of policy documents, promotional material, newspaper articles, social media sites and other media sources was conducted. European-level sources were also taken into account in order to understand the broader context. In addition to this, 25 semi-structured interviews were conducted with representatives of river basin authorities from different regions, with officials of the Spanish Ministry for Ecological Transition and Demographic Challenge (referred to hereafter as the Ministry for Ecological Transition), with Spanish environmental NGOs, participants in local citizens' initiatives (two in favour of removal, four opposing), with officials of a regional government, and with a representative of a European dam removal organisation. The interviews allowed the unpacking of actors' opinions, narratives and imaginaries beyond what is officially communicated in, for example, policy documents, blog posts, and newspaper articles. However, considering that field research in Spain itself was not possible due to the pandemic, the scope of this research and paper is not a representative account of *all* opinions but rather a critical analysis of the different framings, imaginaries and positions articulated by key actors. The data from both written sources and interviews was analysed using qualitative data analysis software and through the performance of content and narrative analysis. The data was coded based on a coding system that was developed partially from the predefined research questions and the conceptual framework, and partially from the data itself. This allowed for the analysis of recurring themes as well as of the relationships between these themes and the narratives in which they were embedded.

DAM REMOVAL, IMAGINARIES AND THE TEMPORALITIES OF INFRASTRUCTURE

Dam removal has been studied from different perspectives since its accelerated promotion in the 1990s. Many studies have focused on the United States – a forerunner in this subject – but studies of European cases are now also increasing. Studies from other geographical areas are scarce, with exceptions such as Chowdhury's work (2013) on decommissioning dams in India, and Hatsuko's (2004) on Japan's first dam

[1] It should be noted that even though I focus on discussions and contestations surrounding dam removal, there are also cases where dam removal is actively promoted by local initiatives. An interesting example is the association A Rente Do Chan-Pladever, which has been mobilising successfully for the removal of the Ponte Inferno Dam in Galicia because of its detrimental ecological effects (Dam Removal Europe, 2018).

removal. In terms of focus, an important part of dam removal studies in the US and Europe concentrates on the physical and ecological responses to removal projects (Bellmore et al., 2019; Foley et al., 2017).

Social science and political ecology studies of governance processes and of the discussions accompanying removal projects are scarcer, especially in the case of Europe. A noteworthy exception and important contribution was a special issue published in *Water Alternatives*, which analysed case studies from the US, Canada, France and Catalonia. The general conclusion (confirmed by practitioners interviewed during this research) is that, "the removal of water infrastructure is often lengthy, institutionally complex, and characterized by social conflict" (Sneddon et al., 2017: 648). Reasons for social conflict include the different values attached to a dam and to the dammed and undammed landscape (Brewitt, 2019; Fox et al., 2016), debates about what is natural and what is not (Jørgensen, 2017), and the process through which dam removal is promoted, wherein blueprint ideas about the ecological value of dam removal that are proposed by outside actors in local territories cause resentment among affected populations (Brewitt, 2019; Germaine and Lespez, 2017). Yet another aspect of this process – one that is highlighted by, for example, Druschke et al. (2017) and Germaine and Lespez (2017) – is the active role of fish in dam removal promotion. Concerning dam removal in Spain, the study of Brummer et al. (2017) stands out; they analyse the fierce local opposition against two dam removals in Catalonia because of the cultural, recreational and aesthetic values associated with the existing infrastructures.

The mentioned studies have helped to place dam removal on the academic as well as policy agenda and have shown some of the diverse ecological and sociopolitical implications and complications of dam removal. In this contribution, I aim to further deepen these discussions through bringing in the notion of imaginaries. This allows questions to be raised about the ideas, values and visions that underlie dam removal projects and the related debates. As I will further explain below, I understand imaginaries to be the societally and institutionally established visions about what is, what was, and what ought to be (Jasanoff and Kim, 2015). This includes imaginaries about how political, social, material, hydrological and ecological relations should be organised, for example in terms of infrastructure construction, maintenance, transformation or removal. Analysing dam removal (and also, for that matter, other environmental interventions) in terms of imaginaries allows for the unpacking of how arising contestations are often also importantly about underlying values and visions – about society, landscapes, infrastructure, water and the relations between them.

I also bring dam removal and water infrastructure studies more broadly into conversation with scholarly debates on temporalities. I argue that in order to fully grasp hydraulic infrastructures in their sociopolitical and material complexities and dynamics, it is necessary to follow infrastructures and their related imaginaries through time, that is, from their conception to their decay or removal, or throughout whatever path of life they may take. Dam removal provides an excellent opportunity to think through these 'infrastructure times'.

In infrastructural studies beyond the water realm (for example in anthropology), temporalities have received more explicit attention. This has originated from a criticism of earlier scholarship in which infrastructures – be they dams, pipes or roads – were considered as technical-political projects that start with a certain idea and ideology and end with their actual construction. In the volume *The Promise of Infrastructure*, for example, a whole section is devoted to temporality (Anand et al., 2018). The authors argue that infrastructure needs to be conceptualised as "a process over time" and as "unfolding over many different moments with uneven temporalities" (ibid: 17). They attribute these temporalities and changes in infrastructure to both the decay of construction materials and to evolving social and political relations, and they state that the last stage of an infrastructure's life may eventually be "ruin" (ibid: 18). Carse and Kneas (2019: 9) even contend that "planned, blocked, delayed, or abandoned (…) projects are (…) the norm, rather than the exception" and that their study is important for understanding the myriad ways in which infrastructure – even though not finished or even never realised – makes, remakes and maintains relationships, aspirations and identities (cf. Gupta, 2018). In a similar manner, Jensen and

Morita (2017: 3) conceptualise infrastructure as "open-ended experimental systems", pointing to the fact that infrastructure evolves over time with often unintended and unexpected outcomes (Harvey and Knox, 2015; Hommes et al., 2022).

The discussions surrounding dam removal shed light on these transformations of infrastructure and on its human and non-human surroundings. As I will show through the case study in this paper, dams and also, importantly, the dammed landscape acquire meanings, change practices, assume new uses, influence subjectivities and reconfigure place-based identities much beyond their original design, which then challenges their technically determined 'life expectancy'. In this sense, dam removal can advance our thinking about infrastructure, its temporalities (and specifically the process of ageing), and infrastructural embeddedness in hydrosocial territorial networks that span scales and times.

In the different momentums of infrastructure, a central role is played by aspirations, promises and normative visions about societal and environmental relations. As Harvey and Knox (2012), Hommes and Boelens (2018), and Oliver (2000) have shown, infrastructure projects originate from specific imaginaries about what is and what should be, socially and politically, but also, importantly, technologically and materially (Jasanoff and Kim, 2015). When mobilised and enmeshed with institutional, political and financial power, imaginaries become materialised in the form of infrastructure and territorialisation projects (Hommes et al., 2022; Oomen et al., 2021). In 'classic' dam-building efforts, political and economic motivations were central; underlying them, however, were also imaginaries of 'modernity' that were characterised by an aspiration to break away from a savage past, to dominate unruly nature through human technical ability, and to rationally design the social and environmental spheres (Scott, 1998; Hommes and Boelens, 2018; Kaika, 2006). The understanding of time inherent in these modern infrastructure imaginaries has been a linear one, that is, away from a primitive past and towards a future of progress and modern development (Appel, 2018).

The notion of imaginaries is indeed helpful for understanding the *emergence* of infrastructure projects; this contribution shows, however, that they also remain crucial throughout post-construction infrastructural life and especially in the debates surrounding dam removal. Thinking in terms of imaginaries allows for an understanding of how removal debates are embedded in wider sociopolitical questions about society, nature and infrastructure. Particularly relevant are imaginaries about what *was* (What and how was the river before dam construction?), what *is* (What is the river? What is nature? What is the dam?) and what *will and should be* (What should the future look like in terms of socionatural relations? What could the river, the dam or the surrounding landscape be in the future?). How these questions are answered and how the imaginaries are mobilised differs among actor groups and is therefore contested.

This is not to say that imaginaries are the all-encompassing force that determines which environmental projects materialise and which do not. Economic, political, technical or other factors are certainly crucial as well, but they do not account for everything that is at stake in dam removal contestations. Thinking through imaginaries invites intriguing questions about underlying, unresolved societal-philosophical issues that also place dam removal in a broader category of novel (and contested) socio-ecological relations and interventions such as river restoration more generally, rewilding initiatives, or even de-extinction debates.

DAM REMOVAL IN SPAIN: DRIVERS AND DISCUSSIONS AROUND INFRASTRUCTURAL RUIN

Shifting dam networks

Spain is well known for its historical hydraulic mission that has been deeply enmeshed with political agendas and that has led to the construction of thousands of dams across the country. Since the early 2000s, however, there have been increasing efforts to remove especially smaller weirs. By 2020, the Ministry for Ecological Transition had registered 335 barrier removals, of which 7 are dams higher than

10 metres, 96 are weirs between 2 and 5 metres, and 160 weirs are less than 2 metres in height (Magdaleno, 2020). A large share of these projects was implemented between 2009 and 2012, and implementation again resumed from 2015 onwards.

In order to fully understand this trend of barrier removal in a country like Spain, it is important to consider the infrastructure in question – from small weirs to big dams – as being embedded in networks of interconnected technical, administrative, financial, sociopolitical and ecological elements. These may be relatively stable over a period of time, but they can also shift, thus bringing about a reconsideration and questioning of the meaning and role of infrastructure. For example, in Spain, as in several other Western countries, materials of dams are decaying; this can raise safety concerns (in the case of bigger structures) and can lead to increasing maintenance costs or reduced capacity, resulting in reduced profitability (in the case of dams built for hydropower generation). This can make it unattractive for dam owners to renew licenses when they expire. In practice, however, many responsible river basin authorities in Spain have not done a strict monitoring of this in the past, meaning that licenses expired without anyone taking action.[2] Being aware of this, one of the organisations actively promoting dam removal, called the Asociación para el Estudio y Mejora de los Salmónidos (AEMS-Ríos con Vida, or Association for the Study and Improvement of Salmonids), started to regularly submit requests for dam removal to the responsible river authorities. In the first half of 2021, for example, AEMS-Ríos con Vida submitted 10 allegations related to the expiration of a water use license and/or removal of a barrier (AEMS-Ríos con Vida, n.d.). These allegations have contributed to an increased public and institutional awareness of the fleet of ageing dams.

At the same time, barrier removal in Spain is embedded in a broader policy context, with two crucial developments. First, since the 1990s a coalition of activists, academics and water managers has been demanding a new water culture (Bukowski, 2017). The second development has been the translation of the European Union's water- and biodiversity-related policies onto the Spanish territory (Martínez-Fernández et al., 2020).

The call for a new water culture was institutionalised in the form of the 2002-established *Fundación Nueva Cultura del Agua* (FNCA, or New Water Culture Foundation). It has been successful in opening up discussion about the long-dominant hydraulic paradigm that has favoured large-scale hydraulic works and other supply-side oriented investments. The FNCA has managed to question interbasin water transfers and myth about the widely promoted irrigation modernisation, and to bring topics such as ecological base flows to the agenda. In this sense, the new water culture can be seen as a result of, and in turn reinforcing, a change in how hydraulic infrastructure, rivers and nature-society relations are imagined. This paves the way for, and is strongly connected to, the promotion of dam removal.

The second important policy shift is related to the involvement of the European Union and particularly to its 2000 Water Framework Directive (WFD) and the recently published biodiversity strategy (European Commission, 2020). The Directive has, among other things, opened up space for more participatory and transparent decision-making, making the sphere of water management and policy accessible to new actors and civil society (Hernández-Mora et al., 2015). This provides opportunities, for example, for environmental organisations to comment on the river basin authorities' six-year plans and to participate in public water-related debates. The WFD also obliges member states to draft programmes of measures to improve the chemical and ecological status of surface waters. In this context, in Spain (and in other countries) barrier removal is seen as an outstandingly cost-efficient way to reach the prescribed and regularly monitored EU objectives (Gough et al., 2018; Verheij et al., 2021). This led the Ministry for Ecological Transition (formerly the Ministry of the Environment) to initiate the 2006 National Strategy for River Restoration (González del Tánago et al., 2012). The EU Directive thus provides a framework and motivation for river restoration and barrier removal. The Directive mandates that programmes of

[2] I will use the term 'river basin authorities' (RBA) as an umbrella term for the Spanish *confederaciones hidrográficas* (hydrographical confederations) and *agencias del agua* (water agencies) that are responsible for water management at the river basin level.

measures are drafted, however there is flexibility to choose the type of measures to be implemented. This flexibility results in varying frequencies of barrier removal across Spain because of diverse geographies, political agendas and political will.

EU policies can likewise be contradictory and contested; for example, hydropower as a source of renewable energy is promoted in parallel with the restoration of river connectivity. The blueprint nature of EU policies is also a common criticism among those that defend dams or weirs against removal. A member of the *Asociación para la Conservación y el Estudio de los Molinos* (ACEM), an association that advocates for the conservation and study of historic mills throughout Spain, mentions that,

> [w]hen the WFD came out, the river basin authorities made plans to improve the status of the rivers. (…). They considered that dams are part of the problem because they interrupt rivers. Then they said that you have to remove *all* of them, without selecting which ones to remove and which ones not (ACEM, Interview, 12 August 2020; emphasis added).

In conclusion, dam removal is not simply a 'logical' step resulting from material decay; it is also a sociopolitical choice made possible in part by the actual material ageing of infrastructure and in part by social and political developments (cf. Grabowski et al., 2017).

In this section I have analysed these societal and institutional developments and shifts in dam networks. I will now show how – at a deeper and more hidden level – dam removal debates also embody a tension between traditional yet 'ageing' imaginaries about dams and socionatural relations, and newer alternative visions and ideologies.

Contested dam removal and river imaginaries

As mentioned, Spain has long been shaped by a hydraulic paradigm that has been dominated by massive state-led infrastructure projects aimed at making sure that no water would ever be 'lost to the sea' (Lopez-Gunn, 2009; Sauri and del Moral, 2001; Swyngedouw, 2015). Even though some scholars already see the "end of the hydraulic age" (Sauri and del Moral, 2001: 351) or a "transition" away from the hydraulic paradigm (Martínez-Fernández et al., 2020: 556), when analysing barrier removal many of the interviewed actors stated that the old hydraulic paradigm is still present and influential. Social opposition from local populations or from within the state's water institutions is often attributed to the idea that dams are monuments, that they are there to stay, and that they are the representation of engineering grandeur. As one interviewee stated,

> [Infrastructural] works are considered a heritage. They are considered something to keep, not to remove. They are considered a source of wealth and power (…). This is the approach that still prevails today. (…) Questioning a hydraulic work still does not enter the minds of many today (AEMS-Ríos con Vida, Interview, 16 July 2020).

Linked to this worshiping of dams is an imaginary of nature as a resource to be harnessed for productive purposes and of rivers as canals that convey water from one place to another. Such a conception is not unique to Spain; it has been central to many modern hydraulic projects spearheaded by civil engineer hydrocracies (Molle et al., 2009; Teisch, 2011). In Spain, river basin authorities have also been traditionally dominated by civil engineers who are dedicated to technical-productive water management that focuses on dam building, river canalisation, and irrigation modernisation. Dam removal proponents see this long tradition of civil engineering as a major hindrance to a true paradigm shift towards a new water culture. As stated by a member of Ecologistas en Acción,

> They do not want to [remove dams] because there is an insistence on reservoir construction that is inherited from parents to children since the beginning of the 20th century. If you are asking for the demolition of an infrastructure, you are acknowledging a failure of a work of your grandfather or your father or someone you know (Ecologistas en Acción, Interview, 14 July 2020).

This demonstrates how dams are deeply enmeshed with specific individual and group subjectivities. Dam removal then potentially becomes a personal assault on a person, on a tradition, and/or on a long-held belief system. The fierce contestations surrounding dam removal thus often go much beyond mere technical or apolitical considerations. In order to understand their deeply personal and often hidden aspects, it is important to understand the enmeshed and coproduced nature of infrastructures, landscapes and people.

River basin organisations are responsible for officially starting the expiration procedure for infrastructures' water use licenses and can initiate removals of abandoned river barriers. In the last years, the members of these organisations have become more diverse in terms of professional background and average age. This is partially due to the retirement of older civil engineers; and also has to do with the fact that public service positions are now open to a wider range of disciplines. This change in the composition of professionals within these organisations is perceived as being key to making dam removal and river restoration imaginable. According to one interviewee from a river basin organisation, "Incorporating [biologists] into a basin organization that is traditionally dominated by civil engineers [has led to a] change of mentality and [to] beginning to interpret, as requested by the WFD, rivers as fluvial ecosystems not as mere channels that provide services" (RBA, Interview, April 2021). Thus, dam removal also becomes a viable possibility because of changes in personnel and specifically in professional backgrounds that are, in turn, associated with different subjectivities, and different river and dam imaginaries (cf. Espeland, 1998).

In this context, some see dam removal as a symbolic act that breaks with earlier dam imaginaries and ideologies. According to Brufao (2006: 14), "One of the main objectives of the demolition of dams is to end the myth of the hydraulic works as a subsidized redeemer of hardships that has to remain eternally as a monument". When put into practice, however, it becomes clear that dam removal as a symbolic act is not implemented on an empty territory; rather, it personally affects those people who relate to a dam through livelihoods, everyday practices, memories and/or subjectivities. In cases such as the Toranes Dam, the impression then that the dam removal is not so much about one specific dam but rather about 'proving a point' generates local discontent.

Local, practical and symbolic ideas about dam removal and its meaning are also not homogenous among people and institutions. The idea that dam removal shifts encrusted water management paradigms is one that is prevalent among environmental NGOs. Those working in the river basin authorities have a more practical point of view. As expressed by a RBA interviewee,

> We are not the champions of demolitions, we are a public body that complies with the law, we do not have a special desire to demolish dams (…). When there is an obstacle that is abandoned, that has no type of use anymore but that has enormous impact, and if it is possible to remove it, we remove it. But we do not promote to remove dams just for the sake of removing dams" (RBA, Interview, April 2021).

In a similar vein, the idea of the life cycle of a hydraulic infrastructure with a determined end is often evoked. As one technician puts it,

> an engineering work has a life cycle (…) [which] means that a work is done to meet certain needs, it fulfils them and when it is no longer useful the river must be returned to its initial state, which is a river without a dam (RBA, Interview, August 2020).

This idea is also embedded in the Spanish law, which establishes that once an infrastructure's use concession expires, the owner of that infrastructure is obliged to demolish the structure at their own expense (Article 101.1 of Law 33/2003 of Patrimony of Public Administrations). This shows part of the legal and material considerations that come to play in the promotion and execution of removal projects. At the same time, it does not mean that imaginaries do not play a role as well, consciously or unconsciously. The mentioned references to EU policies, the law, and an infrastructure's technically finite life cycle importantly allow for dam removal to be rendered apolitical, without ideology, and merely

technical. This may help avoid complications, conflict and more substantial (and thus controversial) questioning of the role of dams. Dam removal becomes a last management intervention rather than a proof of the dam's failure to meet promises or a political challenge to the still-prevalent water engineering tradition.

This technification of dams, however, is precisely one of the aspects that sparks protests and criticism, for example from people and organisations that are concerned with cultural and industrial heritage. In their view, certain dams and weirs are part of a cultural historic landscape; they are witnesses of history and past developments (see for example Izaga Reiner and Herreras Moratinos, 2016), and are an integral part of a 'new nature'. Old river infrastructures are seen as no longer separable from nature and are at times even portrayed as ecologically valuable. Rivers, nature and society are viewed as part of the same socionature (cf. Swyngedouw, 1996). As explained by a representative of the cultural department of a regional government in Southern Spain,

> In some cases, the *azud*[3] has been in this place for more than 1000 years. It is true that its construction altered the ecosystem, of course it did, but the ecosystem immediately readapted to the new water circulation patterns. I insist [that the *azudes*] are not a form of industrial water circulation, they are pre-industrial. (…). And what [the removal proponents] don't want to see is the ecosystem, the biotopes that have evolved around those structures that have always been there (Interview, July 2020).

There are thus diverging ideas about the (historical, cultural and ecological) value of river infrastructures and modified landscapes, about which ones can and should be removed and which ones deserve protection and conservation. Ideas about the riverine and infrastructural past are reflected in language. 'Barrier' (a term common among removal promoters) is a purely technical term that has a negative connotation as it implies the impeding of something; terms such as *azud*, on the other hand, hint at a cultural component. As the above-cited regional government representative analyses,

> I have come to see many projects that do not speak of *azudes* (…), that is, they do not use the historical name. (…). If you speak of *azudes* or *acequias* then from the outset you acknowledge their age. [Instead, they speak of] transversal barrier. (…). Transversal barrier, that has no character, it does not carry valuing connotations from the cultural point of view. (…). From the outset it is denying patrimony when they use that language (Interview, July 2020).

Language here inherently mirrors specific imaginaries of barriers/*azudes*/infrastructure, which in turn manifest in removal projects or opposition to their removal.

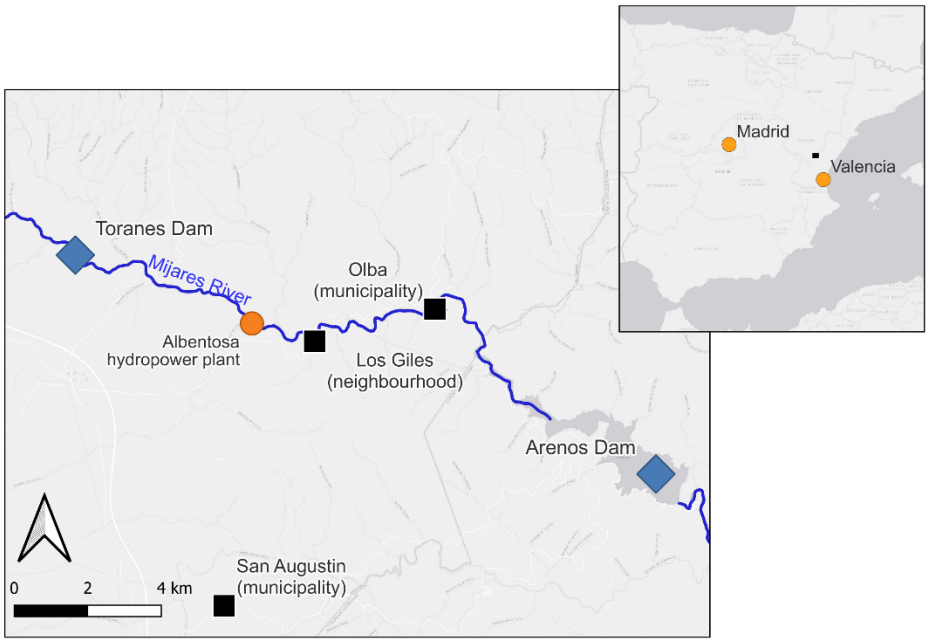
CONTESTATIONS AROUND AN AGEING DAM, NATURE AND THE FUTURE

The Toranes Dam and the proposal to remove it

The Toranes Dam is 14 metres high and 38 metres long. It is in the upper stretches of the Mijares River in the province of Teruel in Eastern Spain (see Figures 1 and 2). The Mijares River is 156 km long and springs up in the mountainous area of Sierra de Gúdar at 1600 metres above sea level. It drains into the Mediterranean near the coastal city of Castellón de la Plana. Along its upper course, the river passes through a Natura 2000 zone as well as over various dams, the biggest one being the Arenós Dam, which has a storage capacity of 132 hm3. Much smaller, but coming recently to attention, is the Toranes Dam, which was constructed in 1954 to generate hydropower. From the dam, the water is conducted through a 7-km-long tunnel to the hydropower plant of Albentosa, which has a production capacity of 11.84 megawatts and has been owned and operated by the Spanish electricity giant Iberdrola since 1998 (Amoedo Fernández, 2019). Just above the Albentosa power plant, a small amount of the water is

[3] *Azud* is a term commonly used in Spain for weirs. In some cases they are Moorish structures, in other cases they are newer structures situated where Moorish structures previously existed.

Figure 1. Location of the Toranes Dam and other relevant sites.



Source: Author's own elaboration.

Figure 2. The Toranes Dam after the official closure of the water intake.

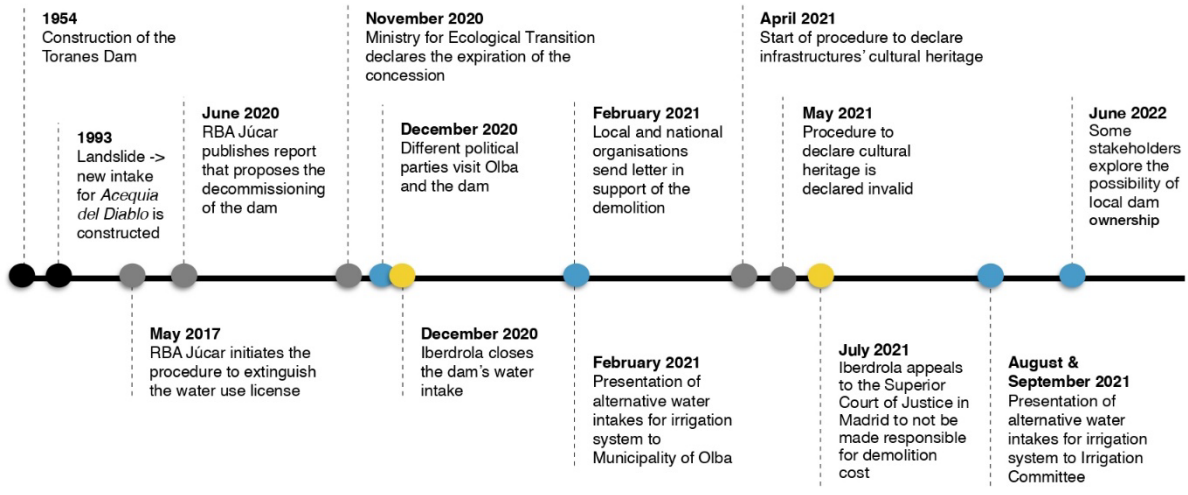
Source: Author's photo (May 2021).

diverted to a local irrigation canal called Acequia del Diablo, which can be freely translated to Devil's Canal, which has its origin in the 12th century Moorish period (Hermosilla Pla, 2011). The canal's original intake was a weir further upstream, which was destroyed by a landslide in 1993. Since then, the new intake from the power plant's tunnel has been in use for the irrigation of small fruit and vegetable orchards in neighbourhoods of the municipalities of San Augustín and Olba, for example in the Los Giles neighbourhood (Confederación Hidrográfica del Júcar, 2020). The newly installed intake was never officially approved or recognised by the responsible river basin authority, the Confederación Hidrográfica del Júcar; nevertheless, in practice and materially, it has linked the local irrigation system to the hydropower company's infrastructure. This dependency is one of the principal reasons why the proposed removal of the Toranes Dam has sparked fierce opposition.

The proposal to remove the Toranes Dam emerged when its use license expired after 75 years. This led the Júcar RBA to start the administrative procedures for the declaration of expiration of the water use right in May 2017 (for an overview of key dates in the removal debate, see Figure 3). In theory, the current owner of the infrastructure, Iberdrola, would have been able to renew the use right; however, this would have required full compliance with current environmental and water legislation, entailing among other things the installation of a fish ladder and the continuous discharge of legally established environmental flows. These measures implied investment costs and reduced production. Because of this and because of the fluctuating electricity prices, the already (by design) relatively low production capacity, and the advanced age of the dam and the power plant, Iberdrola eventually decided to not prolong the water use right. At the same time, different local and national environmental organisations started to argue for the environmental benefits of the expiration of rights and the associated dam removal, such as improvements for water quality and the fluvial ecosystem in general (AEMS-Ríos con Vida, 2018).

After the initiation of the expiration procedure, different events took place in which the responsible Júcar RBA, affected municipalities, local citizens, local and national environmental NGOs and other interested parties interacted via official technical reports, written allegations, inspection visits and by other means. In November 2020, the expiration of water rights was officially confirmed by the Ministry for Ecological Transition (which has the ultimate decision-making power in such cases). The following month, Iberdrola opened the gates of the dam and closed the water intake, which left the Acequia del Diablo without water. This set off intense local contestations around the dam and, importantly, around the biophysical network it had created (including the irrigation system).

Figure 3. Timeline with some of the key events in the Toranes Dam removal debate.



Source: Author's own elaboration. Note: RBA = river basin authority.

The Toranes Dam in transformation: Emerging material and hydrosocial relations

As mentioned, over the years the dam has become connected to the irrigation of small orchards. This was a result of unforeseen adjustments: a landslide and the alternative water intake that was subsequently installed established a clear link between nearby neighbourhoods and the fate of the dam.[4] However, as the following poem (translated by this paper's author) by a resident of Olba (Irrigation Committee Mijares Olba, 2021b) demonstrates, the relationship of the area's inhabitants to the dam appears to be ambivalent and characterised by dependence as well as a critical view on past dam building:

> (…) As in the case of the dams of the river, which are not very beautiful.
> But, hey, they're done, and with quite a bit of pain.
> Is it not better to take advantage of them, if removing them is worse?
> The Toranes Dam, which in its time was a horror,
> It also brought light to the town, and work and comfort. (…)
> There are things that we do not choose, they impose them and that's it.
> But, if we realize it, should we not avoid it?
> Let us take care of our acequias, which others will inherit.
> And in this case, the dam, and the canal, and the [hydropower] central,
> Well, the Devil's Canal alone will not work.

So it is not necessarily an approval or defence of the dam per se, but specifically the possibility for irrigation water intake provided by the dam. The *acequia* itself has, in turn, come to be framed as a symbol for much more than the irrigation of a limited number of small-scale orchards. It is presented to form a key piece of local history; a place for communal work and interaction; the possibility for attractive living in the valley and thereby a tool for the repopulation of the area (which was heavily affected by earlier rural-to-urban migration); a sustainable local food supply; and a greening lifeline throughout the area (Acequias Vivas, n.d.). Accordingly, protest banners that are put up along highways and around the town offer slogans that equate the defence of the dam to the defence of the acequia and the above-mentioned benefits (see Figure 4). The protest against the removal of the Toranes Dam has thus become to be portrayed as the defence of local place identity and practices, even though at the core of this is – technically speaking – not the dam itself but the irrigation water that it provides for local orchards.

The actors involved in this contestation include, among others, a local environmental association, a newly established temporary platform for affected people, the mayor of Olba (who is also the president of a local irrigation committee) and citizens. Together they have managed to attract significant media attention (see, for example, RTVE, 2021; Sánchez, 2021) and to take the issue to higher political levels. Especially after the water intake was closed in early December 2020, regional representatives of all major political parties came to Olba to learn about the discussions. The only political party that expressed itself as being in favour of removing the dam was the left-wing Podemos (Podemos Aragón, 2020). The mayor of Olba and two (of four) municipal council members belonging to the Partido Socialista Obrero Español (Socialist Workers' Party, or PSOE) strongly opposed the dam's removal, despite belonging to the party that is currently ruling in Madrid and promoting river restoration on a national scale. Even within the same political party there seem to exist diverging perspectives between the national and local level when it comes to dam removal.

In the course of the discussions, centre stage has come to be taken up with debates about nature, heritage, and the future and present meaning and use of the dam. Like other debates surrounding barrier removals in Spain, an important aspect is the issue of what nature is and what it is not and, accordingly, what should and should not be protected. On the one hand, there is the idea that a more free-flowing river is more natural, and thus ecologically healthy and valuable. According to a joint letter from 47 NGOs to the Ministry in 2021,

[4] One family depends on the water for its domestic water supply and camping area.

Figure 4. Banner of protest in the neighbourhood of Los Giles ("YES to conservation of our heritage, functioning acequias, vibrant villages").

Source: Author's photo (May 2021).

> A Mijares River freed from the dam and more naturalized (…) will bring wealth and prosperity to the Olba Valley and its surroundings, it will generate green employment, promote environmental education and the dissemination of the values of care and protection of nature, and will preserve one of the most valuable Mediterranean river landscapes.

In this view, nature is the free-flowing river where sediments, fish and other materials and organisms can move without impediment and where the local population enjoys this naturalised riverine environment.

On the other hand, the Irrigation Committee argues that the dam itself and the connected canal have created an ecosystem that deserves protection and that the idea about nature held by dam removal proponents is an eco-centric notion that is detached from the territory. As stated on their Facebook page,

> They refer to the environment from a mechanistic approach, from their offices, missing a holistic and integral vision that also considers people. Destroying the Toranes Dam is damaging this natural, territorial, and social ecosystem in which we live, it is destroying an organized community (Irrigation Committee Mijares Olba, 2021a).

A representative of the local environmental organisation opposing the removal voiced a similar sentiment, saying that,

> when we talk about the environment we are talking about everything not only about the river but also about the valley and its population, including the human population that lives close to that river, and the balance that we believe exists between people and nature. That is what we try to promote (Mijares Vivo, Interview, April 2021).

These claims thus call for a consideration of nature as something that inherently includes humans, and thus also human-made interventions such as infrastructure. This imaginary of a socionature then also challenges promises of the ecological benefits of dam removal:

> We understand that dams are not good for rivers. If we were talking about building dams, we would all be against it, but no matter how much they want to sugar-coat it and use big and eloquent phrases about liberating the river and recover[ing] I don't know what, really what they intend to do is destroy the ecosystem that there is right now with the hope that in a while the river will regenerate an ecosystem similar to the one that existed 100 years ago (Mijares Vivo, Interview, April 2021).

Different views on nature are mobilised for the defence of the Toranes Dam and the irrigation water intake. These also relate to the criticism of dam removal as a blueprint idea that does not sufficiently take into account the local context and local dam usage and meanings. As mentioned earlier, part of the dispute thus seems to be arising from a technical view on dams and dam removal vis-à-vis lived practices and the dam's embeddedness in the surrounding material, hydrological and sociopolitical territory.

The dam's new uses and meanings are now well known by all involved actors; however, the new irrigation water intake has never been officially approved by the responsible RBA. This leaves the irrigation community with no actual legal base on which to demand the maintenance of the dam and the intake. The debate is therefore also about which use of the dam is officially legitimate and thus to be taken into account. On paper, the license for hydropower generation expired; the dam was thus classified as 'out of use' and removal was therefore a logical next step. In practice, however, the dam's unforeseen linkage to an irrigation system throws its technically established lifespan into question.

At the same time, it is interesting to note how, in the course of the debate about the removal of the Toranes Dam, there has been a continual evolution of the meaning of the dam and the way this meaning is mobilised and framed. In early 2021, for example, the dam increasingly came to be presented as cultural heritage and the General Director of Cultural Heritage of Aragón eventually requested that the dam, the hydropower plant and the Acequia del Diablo should be declared inventoried assets of Aragonese cultural heritage. It may have been largely a strategic move to have an additional argument and legal backing against the removal, but the discussions sparked by this request are telling in terms of the diverging dam imaginaries. In the resolution itself, the infrastructure complex is described as forming part of the "humanized and emotional landscape of the territories of the Mijares River (…), identified by the communities (…) as an identifying element of their local heritage, as well as a small milestone in the history of the Mijares basin" (Departamento de Educación, Cultura y Deporte, 2021). In contrast, the ecological organisation AEMS-Ríos con Vida, in their response to the resolution, remarked that, "the Toranes Dam, no matter where you look, is still a vulgar dam of concrete as there are dozens in Aragón, hundreds in Spain and thousands in the world" (AEMS-Ríos con Vida, 2021: 8). The dam's value in terms of cultural heritage is thus disputed as is the weight that this should be given.

The process of declaring the infrastructures cultural heritage was officially archived a month after its initiation (Boletín Oficial de Aragón, 2021). The related discussion nevertheless shows how the dam is strategically framed as an integral part of the socionatural landscape and place-based subjectivities and how, in turn, such a view is challenged. It makes explicit how the dam, throughout its existence but particularly in the face of possible removal, acquires multiple meanings and is transformed from a mere tool for hydropower production, to a precondition for local irrigation practices, to a site of cultural heritage. During interviews with national practitioners, such dynamics were mentioned in relation to other cases as well: a dam being a rather 'silent artefact' in the background of people's lives for most of its existence, but coming to the foreground when threatened with removal.

The struggle to retain the Toranes Dam has come to be presented as also a struggle for future possibilities in the least-populated region of Spain, where Olba is one of the few places that has actually experienced an in-migration in the last years. On the (temporary) website of the platform Acequias Vivas (Living Canals), for example, there are multiple references to the future. The central slogan is "Without the *acequias* there is no future: Solution now" and the canal is described as, "an essential tool for the existence and development of our region". The website also states that, "this decision will mark the future of this area of Teruel, and add it to another uncertain destiny in the Emptied Spain" (Acequias Vivas, n.d.).

'Emptied Spain' is a term used to critique the depopulation of rural Spain and the increasing gap in opportunities for rural as opposed to urban areas. It is blamed on inadequate policies to support rural socio-economic development. In the context of the Toranes Dam, the reference to emptied Spain alludes to potential opportunities that the dam and acequia could hold for the future of the area from the perspective of removal opponents. The president of the Acequia del Diablo is quoted by the PSOE party as saying that, "we are talking about a depopulated Spain, and this is one more example of eliminating opportunities that could contribute to people settling down in the area" (PSOE Aragón, 2020). This connection of dam removal to an 'emptied Spain' has probably contributed to the impressive politicisation of the issue. As a local ecologist promoting the removal puts it,

> There is a lot of attention for the question of the Emptied Spain, which has been used by demagogic, populist politicians who basically do not care much about water but [instrumentalise] the issue (…). Then in the context of this victimhood that forms part of the Emptied Spain discourse, everything is magnified. In this case there are no more than 10, 15, maximum 20 people affected (Interview, April 2021).

Wider political relations and discussions about the future of the area are thus enacted through the contestations surrounding the dam. In parallel, the case of the Toranes Dam removal has been placed in the national debate about the increasing number of ageing dams in Spain and how to deal with them (Sánchez, 2021; cf. Marcos, 2021).

Interestingly, several technical possibilities for alternative water intakes from the Mijares River have been proposed, which would allow for the maintenance of irrigation practices *and* the removal of the dam. This could be done, for example, through the recuperation of the original water intake of the Devil's Canal or through pumping water from the river to the fields (González Cebollada, 2021; Heraldo, 2021). Upon separate requests from two environmental associations (El Mijares No Se Toca and Asociación Gugaia), engineers from the Polytechnic University of Valencia and the University of Zaragoza explored these alternatives. A first proposal was presented to the Municipality of Olba in early 2021; subsequent proposals were presented – by different constellations of actors – to the irrigation community and the general public in August (El Mijares No Se Toca, 2021a) and September 2021 (Heraldo, 2021). The irrigation committee has rejected all of the alternatives, however, because of concerns about investment costs, the actual technical feasibility of the proposed solutions, and the long-term maintenance and operation requirements (Ayuntamiento de Olba, 2021; González Cebollada, 2021; Irrigation Committee, Interview, January 2021). The engineers and organisations involved in the studies about alternative water intakes argue that these concerns are unsubstantiated and that they were mobilised for underlying personal and political reasons (El Mijares No Se Toca, 2021a, 2021b; González Cebollada, 2021). Curiously, the conversations about the alternatives are little discussed in media reports and political parties' communications, with an exception of the above-cited references that were published in August and September 2021 after the meetings were held.

Now, in the summer of 2022, the contestations have taken yet another turn with a proposal by two affected municipalities, the irrigation committee, and a local environmental organisation to transfer dam ownership and management into public hands (Diario de Tereul, 2022; Heraldo, 2022). Arguments presented by the involved stakeholders in favour of this proposal centre around the diverse benefits this may bring to the region, for example in terms of additional financial resources, locally produced renewable energy, and forest fire response. The Acequia del Diablo – which has been central to earlier anti-removal arguments – is now mentioned as only one of several reasons for maintaining the dam.

The shifting meanings ascribed to the dam, as well as the arguments against or in favour of the dam's removal, point to its spatial and thematic flexibility. The debate moves between and among different dam imaginaries and transcends geographic and political scales, sometimes in a seemingly contradictory manner. This clearly points to how the temporalities of a dam do not only include a change in the condition of the material structure, but also changing meanings, users, uses and related subjectivities, and political signification – all of which have been little envisaged in initial designs. In consequence, the

project to remove a dam that is on paper obsolete, no longer cost-efficient, and incompatible with environmental goals becomes contested. At the core of the discussions, similar to those around dam construction, are questions about what the territory should look like, which – and importantly *whose* – values and perspectives should be taken into account, how we as humans relate to nature, and what role infrastructure should play in the future of the particular hydrosocial territory.

At the time of this research, the demolition project was waiting for a decision by the Superior Court of Justice in Madrid. It had received an appeal from Iberdrola, who agrees with transferring dam ownership but rejects paying for the removal, even though Spanish law actually requires concession-holders to restore the river to its original state once the concession has expired (Sánchez, 2021).

CONCLUSION

In this paper, I have analysed the discussions triggered by the promotion of dam removal in Spain on the national and local level. I have shown how the idea of dam removal comes forth from the temporally situated and shifting sociopolitical, technical, financial and environmental relations associated with river infrastructures.

At the same time, as analysed in the case of Spain and specifically the Toranes Dam, removal projects are often conflictive and contestations have diverse causes. This contribution has specifically highlighted the role of diverging imaginaries in these discussions (about, for example, dams, dammed landscapes, nature and society). Thinking in terms of imaginaries sheds light on the underlying and wider sociopolitical discussions that are at stake. The fact, for example, that dam removal initiatives sometimes imagine dams and their removal as a technical matter, clashes with some individuals' day-to-day practices as well as with imaginaries of dams and landscapes that attest to the enmeshment of infrastructures with local culture, history and possible futures. In that sense, an analysis of dam removal exemplifies how academic debates on the coproduction of society and nature – or socionature – play out in concrete, on-the-ground practices and dilemmas.

This also calls for considering infrastructures as dynamic and evolving throughout their 'lifespan'. Users, uses, embeddedness in local landscapes and identities, as well as meanings attached to an infrastructure are not set in stone. What a dam (or other hydraulic infrastructure) was, is, and can be changes with time because of unforeseen natural and social adjustments (such as, in the Toranes case, the new irrigation intake that was constructed after a landslide), or because of the threat of potential removal which triggers the emergence and/or public defence of new and old meanings and representations of the dam in question.

This co-existing territorial and infrastructural stability *and* dynamism needs to be more explicitly considered in water infrastructure studies (cf. Joniak-Lüthi, 2019). If we want to fully understand infrastructure, we need to 'follow it' throughout its life and scrutinise not only how it comes to be constructed but also how it transforms with time, how its connected sociopolitical and material relations shift, and how infrastructure may become materially and ideologically challenged (or defended) to the point of removal (Barry, 2015).

Lastly, dam removal as an action proposal does not represent a clear paradigm shift or the end of dam (and other hydraulic infrastructure) construction. As Crow-Miller et al. (2017: 195) put it, "large-scale infrastructure development has remained largely unswayed by the 'ecological turn'". Nevertheless, in its ambition to rethink nature-society relations, dam removal relates to other alternative water and environmental approaches that are increasingly promoted around the world, such as the rights of rivers, river restoration, or rewilding movements. Situating dam removal within this broader category of environmental interventions and then comparing them may provide valuable entry points for future studies. How do these approaches relate? Where do they coincide and where do they differ? What are the underlying imaginaries, ontologies and epistemologies? What different or similar discussions and

conflicts result from these interventions in practice? Raising these questions could provide interesting insights for ecological restoration literature, which often lacks deeper engagements with social theory. At the same time, it could place dam removal in broader – current and historic – philosophical and political debates about nature and socionatural relations. This is not only philosophically intriguing; it may also further illuminate the underlying ideas, ontologies and imaginaries, and the contestations arising around them.

Dam removal and the related discussions animate countries, water agencies and communities in Spain and beyond and are likely to stay with us in years to come. Recent reports have warned about a "mass ageing" of dams that is likely to become an "emerging global development issue" (Perera et al., 2021: 4). It is thus an interesting and highly relevant topic for water governance and infrastructure scholars to explore.

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