The Role of Spatio-Temporal Scales in Polycentric Governance Conflicts: The Case of Water Substitution Reservoirs in France

Baudoin, Lucie

Excelia Business School

baudoinl@excelia-group.com

Collet, François

ESADE

francois.collet@esade.edu

Schäfer, Philippe

Excelia Business School

schaeferp@excelia-group.com

Résumé :

La littérature sur la gouvernance environnementale a historiquement recommandé les systèmes de gouvernance polycentrique et participatifs afin de s'adapter aux dynamiques biophysiques des systèmes socio-écologiques (SES). Ce modèle de gouvernance est conçu, entre autres, pour canaliser les conflits entre acteurs. Pourtant, la littérature récente les défis posés par le dérèglement anthropique du système Terre, bouleversant les dynamiques spatio-temporelles des SES gouvernés. De plus, mesure que les ressources se raréfient, les conflits violents deviennent plus probables. Par conséquent, cet article se concentre sur le rôle joué par les échelles temporelles et spatiales dans les conflits de gouvernance des SES. Nous abordons ce

sujet en étudiant les tensions autour des réservoirs de substitution d'eau – ou « bassines » – dans le département des Deux-Sèvres, dans le Sud-Ouest de la France. Après des années de concertation au sein de diverses structures de gouvernance participative, ces tensions ont atteint des sommes au début des années 2020 avec des actes de désobéissance civile, de sabotage et de violence physique. En nous appuyant sur la couverture médiatique et des rapports publics, nous menons une étude de cas assistée par ordinateur couvrant plus de 25 ans.

Mots-clés : échelles spatio-temporelles, conflits environnementaux, système de gouvernance polycentrique, systèmes socio-écologiques

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ABSTRACT

The environmental governance literature has historically promoted participatory mechanisms in polycentric governance systems to match the biophysical dynamics of nested social-ecological systems (SES). Such governance model is designed, among other things, to avoid open conflict among actors. Yet recent literature emphasizes that – in the face of looming Earth System disruption – cross-scale dynamics represent a challenge for the transformative capacity of SES governance. Additionally, as resources get increasingly constrained, conflicts become more likely. Therefore, this paper focuses on the role played by temporal and spatial scales in SES governance conflicts. We approach this puzzle by studying the tensions around water substitution reservoirs – or so-called "bassines" – in the Deux-Sèvres district of the South-West of France, which – after years of concertation and deliberations within various participatory governance structures – reached a peak in the early 2020s with acts of civil disobedience, sabotage and physical violence. Building on media coverage and public reports, we pursue a computationally enhanced case study covering over 25 years.

Keywords: spatiotemporal scales; social-ecological systems, environmental conflicts; polycentric governance systems

INTRODUCTION

[After signing the concertation protocol:] *"We decided together to give hope to tomorrow's farmers to settle on a territory where they can adapt to climate change."* (President of the Irrigation Cooperative of Deux-Sèvres, 21st of November 2018)

"These millions of euros should rather be directed towards the agriculture of tomorrow, the one which is adapted to the climate of tomorrow." (Representative of movement opposing reservoirs, 31st of October 2017)

Social-Ecological Systems (SESs) – such as river basins, fisheries, or forested areas – are characterized by interconnected ecological and social processes (e.g. economic activities interacting with water quantity etc.), in dynamic equilibrium (Folke et al., 2005; Gunderson et al., 1995). These SESs are nested along spatio-temporal scales, from local ecosystems with short-term variations up to global regulatory mechanisms manifesting through slow variables (Ostrom, 2009; Rockström et al., 2023). Polycentric governance systems – meaning governance systems including "multiple governing authorities at different scales which do not stand in hierarchical relationship to each other but are engaged in self-organization and mutual adjustment" (Morrison et al., 2019, p.1) – with their multiple, overlapping centers of authority, are theoretically suited to deal with nested SESs, especially to address their complexity (Folke et al., 2005; Pahl-Wostl, 2009), and enable inclusivity and experimentation (Morrison et al.,

2019) at different levels and on different scales of nested systems. Within such governance system, participation in various fora, especially of local actors, is crucial for incorporating diverse knowledge systems, enhancing legitimacy in decision-making processes and avoiding conflict (Heikkila, 2017; Wondolleck & Yaffee, 2000), defined here as "fundamental and underlying incompatibilities that divide parties" (Lewicki et al., 2003, p.37).

Yet, most of these theories have been developed within a stable Earth System, and may not apply anymore in a post-Holocene context where most planetary boundaries have been transgressed (Richardson et al., 2023; Rockström et al., 2009). As the introductory quotes exemplify, governing SESs towards a radically and uncertain different future is very different from managing a status-quo and fairly stable ecosystem (Dietz et al., 2003), and many polycentric systems are "struggling to cope with the growing impacts, pace, and scope of social and environmental change" (Morrison et al., 2019; p.1). It is so for two main reasons: First, the transgression of planetary boundaries modifies the operational scales that are material to a focal SES in terms of space and time, meaning that ecological adversity in this focal ecosystem can emerge from biophysical mechanisms playing out on different spatio-temporal scales than what actors have been used to (Baudoin et al., 2024; Sayre, 2009). Second, in a disrupted Earth System, polycentric governance should not pursue only adaptation but long-term and large-scale transformation (Waddock, 2020), a task ripe with power struggles (Purdy, 2012) around "matter battles" (Zuzul, 2019), for which consensus-based approaches might not be well suited

(Blühdorn & Deflorian, 2019). To summarize, the increasing complexity in cross-scale dynamics represents important challenges for traditional polycentric governance systems and questions their ability to ensure peaceful adaptation or transformation in crucial SESs. For that reason, we raise the following question: *What role do temporal and spatial scales play in polycentric governance conflicts?* Through this project, we ambition to shed light on the mobilization of temporal and spatial scales in contentions which are crucial for the overall resilience of SESs.

This research project studies this puzzle focusing on the "*bassines*" conflict in the South-West of France, covering a period of over 25 years through news articles as well as public reports. After years of processes of concertation and deliberations within various collaborative governance structures about developing irrigation infrastructures to cope with local water stress, this conflict reached a peak in the early 2020s with acts of civil disobedience, sabotage and physical violence. To understand the evolution of this conflict, we look at how the actors involved positioned the controversy around these reservoirs, through their discourses and actions, on various spatial and temporal scales. We see how these actions impacted the meaning behind the word *"bassines"* through word embeddings (Aceves & Evans, 2024). At a later stage of our analysis, we will add in biophysical data such as groundwater levels to control for the role played by biophysical dynamics themselves in conflict escalation (Boons, 2013).

Our preliminary findings show that, in contrast with the existing literature (Juerges & Newig, 2015), conflicts between actors do not stem from an opposition of views on what is the relevant scale to govern the SES (i.e. difference in *observational scale*), e.g. opposing short vs long term or local vs global approaches (Bansal et al., 2018; Nyberg et al., 2018). On the contrary we find both proponents and opponents of "bassines" playing an opportunistic 'whatever-goes' strategy of scalar politics, trying to block or push reservoir projects on every geographical level of governance – from the very local level of decision making (land-owners), to municipalities, district, region up until national and international governance structures – and mobilizing both short- and long-term reasoning (as seen in the introductory quotes). In this context, the existence of a polycentric governance system seems to enable and fuel conflicts rather than deter it as no deliberation space or observational scale prevails as legitimate. Our word embedding analysis also shows that this opportunistic approach to scalar politics favors a "disembodiment" of debates around water reservoirs, away from the river basin at stake and from the reservoirs themselves towards large scale political confrontation, which again might hamper the transformability of existing polycentric governance systems.

1. LITERATURE OVERVIEW

1.1. POLYCENTRIC GOVERNANCE SYSTEMS AND ADAPTIVE CAPACITY

Polycentric governance systems englobe multiple overlapping and semi-autonomous centers of decision-making that interact both cooperatively and competitively (Morrison et al., 2019; Ostrom, 2010). For example, in the governance of a natural reserve, you might find local municipalities, a participatory forum dedicated to the natural reserve specifically, local state administration, but also regional parliaments, potentially up until international concertation bodies, all involved in governance practices, such as setting rules, controlling compliance or allocating public funds. As such systems foster inclusivity and experimentation (Morrison et al., 2019), they are widely regarded as essential for enhancing the adaptability of SESs, meaning the capacity of actors to influence the resilience of an SES (Folke et al., 2005; Walker et al., 2004). Such capacity is crucial in the face of dynamic and unpredictable environmental changes, such as climate change: It involves an ability to learning from the system's feedback and understand cross-scale interactions. For example, an adaptable governance system will understand and detect early on how climate change impacts rainfall or snowfall patterns on a river basin and adapt farming practices accordingly (or at least one of the decision-making bodies of the system will detect it and start experimenting with this new situation).

As centers of decision-making of a polycentric governance system are located along spatio-temporal scales (e.g. municipalities managing short term issues, or transnational concertation bodies negotiating pluriannual commitments), this increases the probability that as least one element of the governance system is paying attention to important cross scale

dynamics, such as the impact of broader global phenomena on local ecosystems (Bansal et al., 2018; Baudoin et al., 2024). Indeed, the concept of scale is not only related to the concepts of size (i.e. comparisons using unit of measurements) and levels (e.g. hierarchical structures such as local versus global) but also to relations: "Scale as relation abstract from scale as level to ask why some processes have certain spatiotemporal dimensions or -put another way- what difference those dimensions make in the outcomes of processes" (Sayre & DiVittorio, 2009; p.19). Associated to a scale is an underlying view of processes that are relevant to explain outcomes of interest. For example, the unit of measurement corresponding to physical railroad scales (i.e. tons) is associated with production processes, transport technology processes and the value of the material transported in the economy (Sayre & DiVittorio, 2009). Thus, there should be a match in governance institutions between observational scale and operational scale. Faced with emergent ecological adversity, this match is particularly difficult to obtain as scientist discovery previously unknown relations between SES components which had remained stable within civilization times (Peters et al., 2007). The observational scale of social processes pauses even greater challenges, as scale gives meanings to actions which themselves modify social processes (Nyberg et al., 2018; Swyngedouw, 1999, 2004).

By linking decision-making processes across spatio-temporal scales, polycentric governance systems ensure that governance is inclusive, context-sensitive, and responsive to cross-scale biophysical dynamics of nested SESs. Public administration research and

organization theory research shed lights on how can collaborative governance and participatory processes contribute to build common understanding of problems, knowledge and foster coordination between stakeholders (Ansell & Gash, 2008; Fan & Zietsma, 2017; Newig, 2007). Most importantly participatory processes allow social learning on multiple scales: from micro and short-term learning (from the engagement among actors) to macro and long-term learning (with the shift of formal and informal institutions) (Pahl-Wostl et al., 2007). This flexibility and connectivity is expected to enable experimentation, iterative decision-making and continuous adaptation, building resilience and enhancing the capacity of social-ecological systems to navigate uncertainties and disturbances.

1.2. Zooming in or Zooming out? The Nuanced Role of Multiple Spatio-Temporal Scales in Polycentric Governance Systems

Implementing polycentric governance systems is no panacea. Indeed, setting environmental governance at a smaller geographical scale (Ostrom, 1990) and focusing on short-term goals conducive of "small wins" (Ansell & Gash, 2008) both ease participation processes. Yet, zooming out to understand how local ecosystems are nested and regulated by bigger biophysical mechanisms is absolutely necessary to acknowledge the complexity of the systems to be governed, and avoid unfortunate surprises. From an organizational perspective, the overlapping and interweaving of various collaborative governance organizations allows a certain amount of

attention to be paid to all relevant biophysical dynamics (Bansal et al., 2018). This might balance out for the fact that these collaborative governance organizations are constrained in terms of attentional capacity, potentially missing out on critical threats (Baudoin et al., 2024).

Although existing literature has called for the polycentric and participatory governance systems, this scale multiplicity also brings complexity and potential sources of conflicts. The existence of diverse governance structures has important potential drawbacks, including allowing policy inconsistency, free-riding behaviors (Ostrom, 2010) or power struggles (Morrison et al., 2019), and potentially lead to maladaptation (Biddle & Baehler, 2019). Indeed, in general, collaborative governance is not without power disparities (Purdy, 2012) and framing conflicts (Ansari et al., 2013; Brummans et al., 2008; Gray et al., 2015). Conflict and contestations are not in themselves problematic in such multi-actor governance systems. If anything, they can be a sign of democratic quality (Arenas et al., 2020). Additionally, witnessing conflict should not lead to discard right away any governance system, as we do not have the counterfactual of how this conflict would enfold in the absence of participatory or polycentric processes (Lubell et al., 2020). Yet governance systems are expected to manage conflicts, maintaining civil order, at least by avoiding violence, defined as "actual or potential physical harm" (Costas & Grey, 2019).

Actors can disagree on which scale issues should be framed, but also in which scale issues should be governed, leading to scalar politics (Juerges & Newig, 2015; Nyberg et al.,

2018), meaning that actors disagree on the legitimacy of specific decision-making centers within polycentric governance systems, based on an argument of scale. Although polycentric governance systems have been supported by the literature with a perspective to match 'factual' biophysical boundaries of ecosystems, this claim in itself is not unquestioned and holds as well political dimensions. Indeed, constructivists work in environmental governance and geography have argued that scales are socially constructed (Marston, 2000). The literature posits scale as "not as a set of pre-given, natural, and immutable levels upon which social life occurs. Rather, [..] a fluid context for and product of power relations in society" (McCann, 2003, p.159). In water governance for example, the decision to position governance structures at the scale of river basins might be short-sighted and lead to tensions with social actors as dynamics relevant to them are not accounted for. Indeed, "the social and political factors that influence how water in a basin is shared and used (e.g., economic development strategies, water policies) are frequently associated with geographical scales (regional, national, global) far broader than that of the watershed." (Sneddon et al., 2002, p.666). This notion of the relevant scale of governance is "an intrinsically political act that has social and material consequences" (Warner et al., 2014, p.470), since, in environmental governance this 'right scale' decides who is in the room and who has a say in decision-making processes.

1.3. Transformation and Conflict in the face of Emerging Ecological Adversity

If power struggles were until now a known perk of participation processes (Purdy, 2012), and start gaining ever more interest in the literature on polycentric governance systems (Morrison et al., 2019), it might become particularly critical in the new era of planetary disruption, as we will see in the following section. To cope with the transgression of planetary boundaries (Richardson et al., 2023) – and its countless expected and unexpected adverse outcomes on humans and non-humans – it seems clear that governance structures need to move beyond adaptability towards transformability. Transformability refers to "fundamentally altering the nature of a system", when the current equilibrium becomes untenable (Walker et al., 2004). Participatory processes might well be unable to bring about such radical change (Blühdorn & Deflorian, 2019). Transformability involves taking radical changes in current courses of action, modifying human societies on a large scale and in the long term (Clément & Rivera, 2017). It demands much more that the experimentation offered by the polycentric governance literature (Morrison et al., 2019): It requires making bets and picking a trajectory, with potentially important lock-in effects. This concretely emerges through choices in infrastructure and technological developments which can lead to "matter battles", meaning conflicts that can "give rise to long-lasting, negative emotional and cognitive dynamics that fuel collaboration failure" (Zuzul, 2019, p. 758). Arguably in such context, actors will be ever more sensitive to who gets a say in the decision-making process, once again highlighting the importance of what is deemed a relevant scale for governance (Warner et al., 2014).

Overall, extant theory suggests that temporal and spatial scale is a crucial element to understand conflicts in SES governance. Therefore, our empirical study will explore how actors mobilize different spatio-temporal scales in their discourses and action in a case of water governance, and the consequences in terms of conflict escalation.

2. EMPIRICAL ANALYSIS

We are concerned initially with how usual polycentric governance systems relate to spatio-temporal scales while guaranteeing adaptability and transformability (Walker et al., 2004) in the face of emerging ecological adversity (Baudoin et al., 2024). Epistemologically, we adopt a critical realist approach (Vincent & O'Mahoney, 2018), acknowledging scales both for partly socially constructed, but also as linked to biophysical phenomena partly independent of human perception (Bansal et al., 2018). This seems particularly fit to explore the relationship between observational and operational scale as mentioned earlier (Sayre, 2009).

We endeavor to answer our research question on the role of temporal and spatial scales in environmental conflicts in a context of polycentric governance looking at the emergence and evolution of substitution reservoirs projects in the Sèvre-Niortaise Marais-Poitevin (later on, SNMP) basin in the South-West of France. Water substitution reservoir projects involve concertation processes that include farmers, the state and environmental non-governmental organizations. These irrigation projects are a response to repeated and increasing water scarcity

problems. In our empirical setting, building these reservoirs requires public authorizations and public funding. Substitution reservoirs (also colloquially called "*bassines*" in French) are a specific kind of irrigation reservoirs: they are not fed by any existing stream but are fully artificial and off-stream. These reservoirs are plastic-lined and are filled by pumping from groundwater tables during rainy months to substitute to pumping during the dry season. The stated purpose of these substitution reservoirs is avoid putting stress on phreatic resources during summer.

In the following section, we will present briefly the data collection process and methodological approach, as well as an overview of the empirical context. Although this work of analysis is not fully completed, we will then expose our preliminary results and concluding notes.

2.1. DATA AND METHOD

We develop a computationally-enhanced case study (Aceves & Evans, 2024; Nelson, 2020) of the evolution of substitution reservoir projects in the SNMP area since 2005 until May 2023, building on media coverage and public reports. We gathered 1'448 newspaper articles in local and national press mentioning these projects for the Deux-Sèvres district (see full data collection procedure detailed in Appendix 1). Reading through these news articles, we write a detailed account of the evolution of these projects, focusing on the role played by temporal and geographical scales in the ongoing controversy. Considering the volume of data to be processed,

to control for the risk of human bias on such dataset, we add to our qualitative approach a Natural Language Processing approach, using word embeddings (Aceves & Evans, 2024). As depicted in Figure 1, 85% of the articles collected belong to a local journal. The national press is mostly absent until 2021 with the illegal demonstrations of Mauzé-sur-le-Mignon. To write the case of SNMP substitution reservoirs, we complement this analysis of the media corpus with important public documentation, necessary to understand the legal and regulatory context mentioned within news articles (again, detail available in Appendix 1).

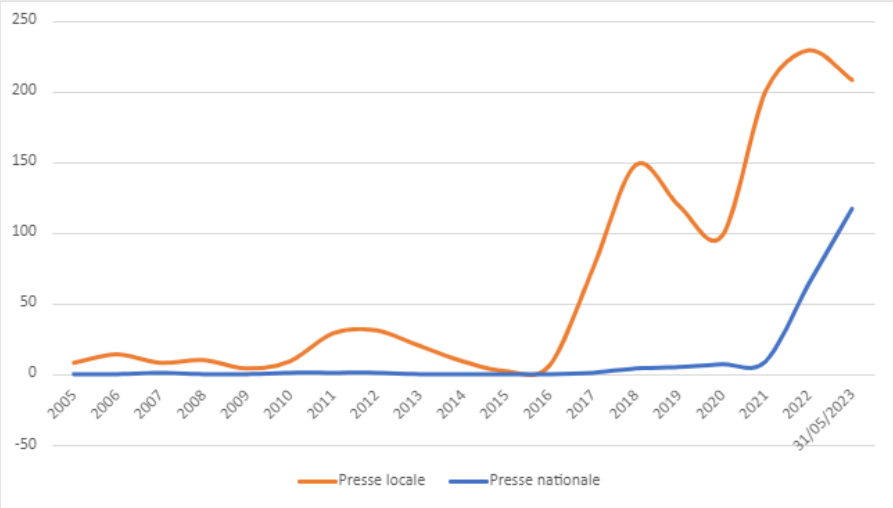

Figure 1. Number of articles published by year, between local (orange) and national (blue) press

Once we have written a detailled case of how actors involved in the controversy mobilized different scales through their discourses and action, we then apply a Word Embedding analysis (Rodriguez et al., 2023) to the media corpus to understand how these

actions led to an evolution of the meaning of "bassines" (i.e. substitution reservoir) through time (see full analysis procedure in Appendix 2). Word embedding techniques are a family of natural language processing techniques, which are based on the distributional hypothesis. According to the distributional hypothesis, "lexemes [(e.g. words)] with similar linguistic contexts have similar meaning." (Aceves & Evans, 2024; Lenci & Sahlgren, 2023, p.3). Based on this hypothesis, these techniques aim at capturing the meaning of words from the distribution of words that surround them in a corpus of text. Each word that appears in a corpus is mapped to a vector in a N-dimensional space based on the context in which it appears. Using these vectorial representations, proximity and distance between words in the embedding space capture the meaning of words and conceptual dimensions.

In future analysis, we ambition to triangulate our findings with official statements from main protagonists as well as biophysical data on the level of stress of groundwater table, to account for the importance of the biophysical dynamics themselves in conflict escalation (Boons, 2013).

2.2. OVERVIEW OF THE EMPIRICAL CONTEXT

The SNMP basin covers an area of 3700 km², including 224 municipalities, 4 administrative districts (*départements*) and 2 regions, for a population of about 255 000 inhabitants. 54.4% of its area is localized in the Deux-Sèvres district (see Figure 2 here below). It includes also part

of an important wetland area: the Poitevine Marsh (*Marais Poitevin*). Its main collaborative governance body, the SNMP water local commission (*Commission Locale de l'Eau*) is located in Niort, but the SNMP basin itself is also included into the greater Loire-Bretagne hydrographical basin, which has a basin committee located in Orléans. We are therefore in a case of polycentric collaborative governance, as exemplified by Figure 3, which depicts the variety of institutions involved in the governance of this SES on various levels, and – when applicable – their direct impact on substitution reservoir projects. Although the SNMP reservoirs are not the only project of substitution reservoirs in France, we selected the area where the most tensions emerged around these infrastructures – with illegal demonstration, intense police mobilization, sabotage and physical injuries –, leading to violence, and where the issue turn into a topic of national importance, well beyond the boundaries of the SNMP basin. These conflicts and violent events took place although this project has been discussed and validated by multiple collaborative governance structures along the years: it has been debated and validated within the SNMP local water commission, the Loire-Bretagne Agency administrative council, the Nouvelle-Aquitaine region as well as an additional concertation protocol in 2018 carried by the Deux-Sèvres state representative. Effectively, the SNMP substitution reservoirs have become a "matter battle" (Zuzul, 2019).

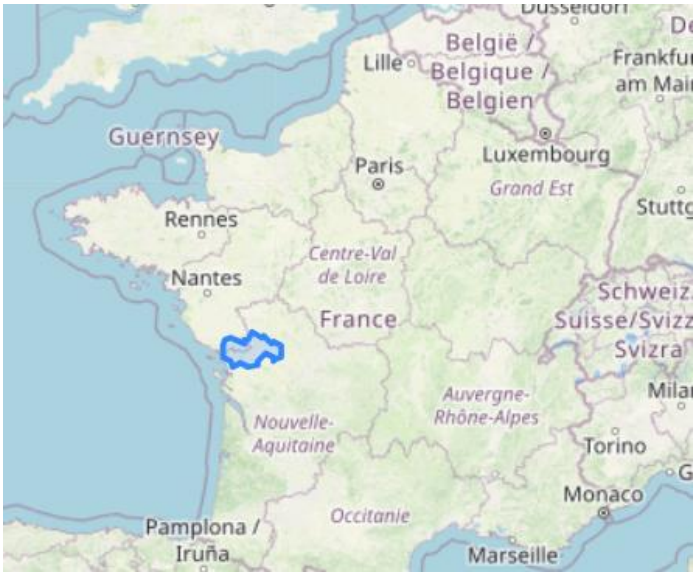

Figure 2. SNMP localization (in blue) within French territory

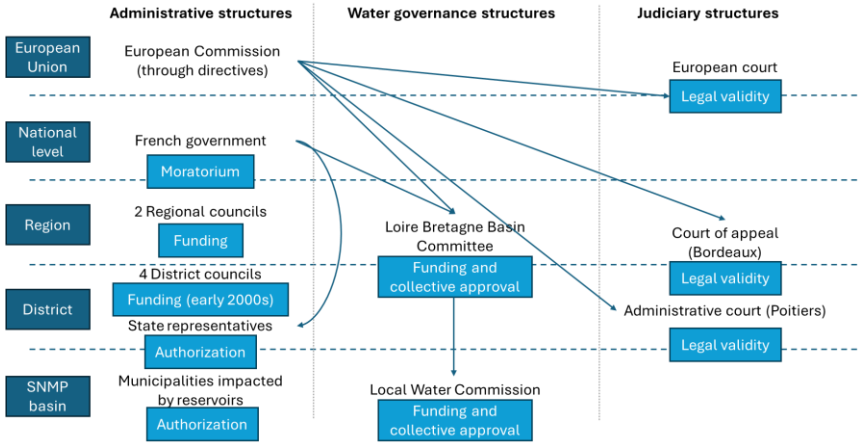

Figure 3. Governance structures involved in reservoir projects and their potential direct and indirect impact

Note: boxes depict necessary actions for reservoirs to be created, arrows depict influence between organizations through law or direct administrative authority

3. PRELIMINARY FINDINGS

3.1. AN OPPORTUNISTIC APPROACH TO SCALAR MULTIPLICITY

As we write the case of the evolution of the conflict around the substitution reservoirs, it became evident that – although the tensions around bassines emerged first locally and between local actors – it was not a case of opposition of actors who approach the issue on different scales, as seen in previous cases of scalar politics (Juerges & Newig, 2015). From the beginning on, both opponents and proponents of "bassines" resorted to any possible scale and level to justify and push for their own agenda, to the extent that national and international actors eventually joined and fed the conflict. This led to a stalemate and open conflict. We will show this evolution hereafter with a brief case summary and will then move on to see the resulting evolution of meaning of the "bassine" term in our news corpus.

Early 2000s: A territorial balance impacted by bigger socio-economic dynamics. The idea of substitution reservoirs in the South-West of France emerged in the early 2000s as a response to recurring tensions around the increased demand of irrigation in the area, putting pressure among other things on the wetland area of the Poitevin Marsh, an area holding both cultural and biological importance. In 1999, following a complaint from a local organization (*Comité de Défense du Marais Poitevin*, later on CDMP), the French state got sentenced by the EU in the name of the bird directive for not protecting enough this Poitevin Marsh, a wetland

area vital to many bird species. Following the EU sentence, a public plan on the protection of this Marsh (Roussel report, 2001) points to substitution reservoirs in the hydrological basin feeding into the Marsh, to spare groundwater tables during the summer, with an ambitioned volume of 15 million m^3 of storage. The report emphasizes that these reservoirs will require to be mainly funded by public actors in order to be profitable. Although the Roussel report also mentions as an alternative the reorientation of farmers towards less water-intensive agricultural practices, it does not explore this avenue as considered well beyond the scope of the mission of the report, and beyond actional scales:

> *"Calling into question the overall economic balance between irrigated and dry farming, would represent a significant reorientation of French, if not European, agricultural policy, and it is certainly not on the occasion of a medium-term plan covering a few hundred thousand hectares that such a vast problem can be resolved. »* (Roussel Plan, 2001, p.27)

Mid 2000's to 2018: Looking for Influence on Each Governance Scale. In the early 2000s, following this report and in a context of chronical water stress, several substitution reservoir projects are pushed forward in basins close to the SNMP, in nearby Vendée, or in the Boutonne area. These reservoirs projects go through processes of technical evaluation and public consultation and they progress tediously, alternatively blocked by a change of political affiliation (left-green) in the regional or departmental level blocking funding, and getting

attention from local ENGOs, which fill complaints on these projects in administrative courts. Irrigators also fill complaints against local limitations on water pumping during dry years. In Deux-Sèvres, the SNMP local commission agrees to a first draft of water governance plan (SAGE) including substitution reservoirs. The CDMP agrees to sign this project to avoid an "unsatisfactory status quo" (080111_NRCO).

In 2010, to circumvent the positions of left-green regional and district councils against funding "bassines" projects, the national government, favorable to reservoirs with a right-wing party under the Sarkozy presidency, demands that Water Agencies fund these structures up to 70%. In 2011, the Loire-Bretagne Water Agency finally votes in favor of funding substitution reservoirs if they are part of a local agreement (validated by a local water commission). Local mobilizations start to emerge, through petitions and small-scale mobilizations. In 2012, following years of deliberations, the SNMP local water commission votes a project including 27 reservoirs. The project is carried by a private farming cooperative (later on *Coop 79*), with public funding from the Loire-Bretagne water agency and the region. Yet this very same year, on a national level, the left wins the presidential election, bringing to the ministry of the environment Delphine Batho, a green politician from Deux-Sèvres, who sets a moratorium on public funding of substitution reservoirs. After a year, and following intense lobbying from national farmer federations such as the *FNSEA*, Delphine Batho is replaced and the moratorium removed. After a technical study, the project is brought down to 21 reservoirs and a public

consultation started in 2017. Local NGOs contest the favorable result given after the public consultation although it led the project size to be revised down to 19 reservoirs. They especially mention the lack of consideration for climate change. These NGOs join forces in a common movement, called "Basins, no thank you" (*Bassines non merci*, later on BNM), and start organizing demonstrations, especially when the Loire-Bretagne Water Agency agrees to fund the project. Meanwhile, locally, some municipalities refuse to sign construction authorizations. 2018 is marked with a host of demonstrations, both from irrigators and BNM activists as everyone awaits the funding approval from the regional council. This regional council requests the organization of an additional concertation protocol before funding. After a fast-track procedure in less than one year, gathering irrigators, local authorities and local NGOs, the protocol is signed in December 2018. The reservoirs are brought down again to 16, and farmers who want to access the stored water will need to implement agroecological practices such as planting hedgerows.

From 2018 on: Breach of Trust and Post-Concertation 'Resistance'. Instead of settling debates, the concertation protocol has sparked strong reactions, with the first occurrences of illegal actions (sabotage of irrigation tools in August 2018, public insults in December 2018). Among NGOs, there is a strong divide between NGO who agreed to stay within protocol discussions, and those who left them to go to frontal opposition. Among local opponents of

bassines, the signature of the protocol representative by emblematic actors such as Delphine Batho and other NGO representatives was experienced as a breach of trust.

"Many fishermen felt cheated on." (190415_NRCO)

The BNM movement announces openly that it will organize "resistance", and looks for "convergence of struggles", as they get closer to national trade unions and other social movements (*gilets jaunes*) contesting the national government, as well as to other alternative international movements (ATTAC). National political parties such as France Insoumise, the Green party, increasingly take stances on the matter. Illegal actions from both opponents and proponents become more frequent (including death threats, damage on material goods, intrusion on private property).

"The goal is to include a local struggle against basins within a global struggle." (200210_NRCO_2)

While the project moves closer to construction, judiciary procedures are launched against the protocol. In Mauzé-sur-Le-Mignon, the first substitution reservoir to be built, construction work began in September 2021, sparking illegal demonstration and sabotage as BNM openly embraces a discourse of civil disobedience. After violent confrontation with police forces, the reservoir was finally completed with commissioning in June 2022. Initially led by a local collective, BNM and farmers from the territory, in 2022 the protest takes a much bigger proportion with the appearance of other structures, such as the Uprisings of the Earth

(*Soulèvement de la Terre*) or the national federation of community-supporting agriculture (AMAP). Since the first illegal demonstrations, the controversy also played out on the semantic register. While the BNM collective refers to a "water war" to harden the movement since the late 2010s, the government denounces opponents as "ecoterrorists" following the clashes of October 2022 in Sainte Soline, another reservoir under construction. During this clash, some 1500 policemen and 8 helicopters were in charge of enforcing the prefectural decree prohibiting all demonstrations. In March 2023, a new demonstration also led to very violent clashes between opponents of the mega basins and the police, again in Sainte-Soline.

As we see with this brief summary, opponents and proponents of reservoir substitutions have mobilized various scales alternatively, as well as extensive judiciary procedures to push for their own agenda. At the end of the period studied, deliberations around these reservoirs are closed and the conflict still goes on, this time around involving national actors. The following section shows how this evolution plays out in terms of meaning of the "bassine" term in media outlets.

3.2. A 'DISEMBODIED' MATTER BATTLE AND INTRACTABLE CONFLICT

The first series of results are the 20 nearest neighbors to the word "bassine" (French vernacular term for substitution reservoir) across time. Table 1 provides a snapshot of 3 years that illustrates how the word bassine was conceptualized at three different points in time. Overall, we observe a drift from a word associated with water management, resources and solutions to

address issues of water scarcity towards debates centered on financing, ministerial intervention to end-up being an object and physical violence.

Table 1. 20 Nearest neighbors of the word "bassine" (reservoirs) using cosine similarity measures for 2005, 2014 and 2023. The words are ordered in decreasing order of proximity.

2005	2014	2023
1. eau (water)	1. coût (cost)	1. Zadistes (activists who block construction work)
2. irrigation (irrigation)	2. moratoire (moratorium)	2. Sivens (Name of a contested dam)
3. ruissellement (runoff)	3. financement (funding)	3. Zad (Area to Defend – illegal occupation)
4. ressources (resources)	4. projets (projects)	4. Mobilisations (mobilizations)
5. nappes (aquifers)	5. irrigation (irrigation)	5. ATTAC (Association for Taxation of International Transactions)
6. alimentées (supplied by)	6. Batho (Ecology and Sustainable Development Minister)	6. Manif (short form for protest)
7. rétention (retention)	7. retenues (reservoirs)	7. Manifestants (protesters)
8. retenues (reservoirs)	8. futures (future)	8. Écologistes (environmentalists)
9. gestion (management)	9. prolonger (extend)	9. Manifestation (protest)
10. irrigants (irrigators)	10. euros (euros)	10. Dénonçant (denouncing)
11. bassins (river basins)	11. programmes (programs)	11. Militants (activists)
12. artificielles (artificial)	12. diminuer (decrease)	12. Appelant (calling for)
13. rivières (rivers)	13. coopérative (cooperative)	13. Darmanin (Interior Minister)
14. agriculteurs (farmers)	14. millions (millions)	14. Insoumise (LFI party)
15. collinaires (hillside)	15. niortaise (niortaise district)	
16. rechargées (recharged)	16. cubes (cubic volume)	
17. solutions (solutions)	17. réserves (storages)	
18. collectivités (local authorities)	18. pourraient (could)	
19. pluie (rain)	19. mise (put)	
20. subventions (subsidies)		

	20. nouvelles (news)	15. Violences (violence) 16. Contestation (dispute) 17. Activistes (activists) 18. Manifestante (female protester) 19. Manifestations (protests) 20. Dénoncent (denounce)

Looking at the first column for 2005 in Table 1, bassine is closely related to its technical purpose. "Bassines" are closely related to water, irrigation, runoffs, supply, management, rain and corn agriculture. In 2014, we observe a shift in the words that are close to "bassine". The functioning and purpose of bassine are no longer central. "Bassine" is primarily an object of financial concerns. Further politics at the national level come into play. The nearest neighbors are words like "cost", "financing", "euros", "moratorium". The name of the minister for Ecology and Sustainable Development who proposed a moratorium on the construction of bassine, which was later suspended, occurs frequently in the vicinity of the "bassine", which is an empirical trace of the rising political tension around the topic. There is a drift from bassine as an object of managing water to an object of ideological disputes. The third column of Table 1 clearly shows that by 2023, "bassine" has become a object of political tension. Activists who block construction work (i.e. "zadistes") is the term that is the most closely aligned with the word "bassine". The list of nearest neighbors words comprises the name of a dam (Sivens dam) where illegal protests led to the death of a protester. The name of the government minister most

closely aligned with the word bassine is no longer the name of the Minister for Ecology and Sustainability but the Interior minister who has the command of national police forces. Words associated with the management of water have been replaced by words associated with protest: mobilization, protesters, activist, area to defend (i.e. "ZAD"). Political parties (i.e. left wing "Insoumise") have high proximity. Overall, this first stage of the word embedding analysis suggests that the bassine change from being an object of debates to manage water to an object of debate ideological dispute about the economy and the environment that overshadow its practical definition and purpose.

The examination of the evolution of the cosine similarities between specific words and the word "bassine" provides further empirical trace of the trends observed in the nearest neighbor analysis and information about the pace of evolution and specific turning points. The general drift toward an object of political struggle is also observed at the level of individual word as illustrated in Figures 4 to 9. Figures 4 to 6 show the evolution of the proximity between "bassine" and specific words "water" (i.e. "eau"), "substitution" and "runoff" (i.e. "ruissellement") over time. The higher the cosine similarity between two words, the greater the semantic proximity between these two words. "Water", "substitution" and "runoff" are associated with the management of water as a resource. The specific word "substitution" refers to the principle of pumping water from phreatic tables during the winter, when levels are high, storing it in bassines (i.e. reservoirs) and using the stored water for irrigation during the summer

month when water levels in phreatic tables and rivers are low. The term "runoff" refers directly to the water resource and to its flows.

Overall, the observed pattern in Figures 4 to 6 is a decline of the proximity between terms that relate to the quantitative management of water and the word "bassine". From 2011 on, a year of severe drought, the word "bassine" is every year less proximate to the word "water". This suggests that bassine is associated with other concepts. The decline of the cosine similarity between "substitution" and "bassine", which starts around 2014, also suggests that the word bassine is not as much associated with the idea of storing water in the winter as it used to be in previous years. Last, the distance between "runoff" and "bassine", which is another important word related to retaining water, also declines.

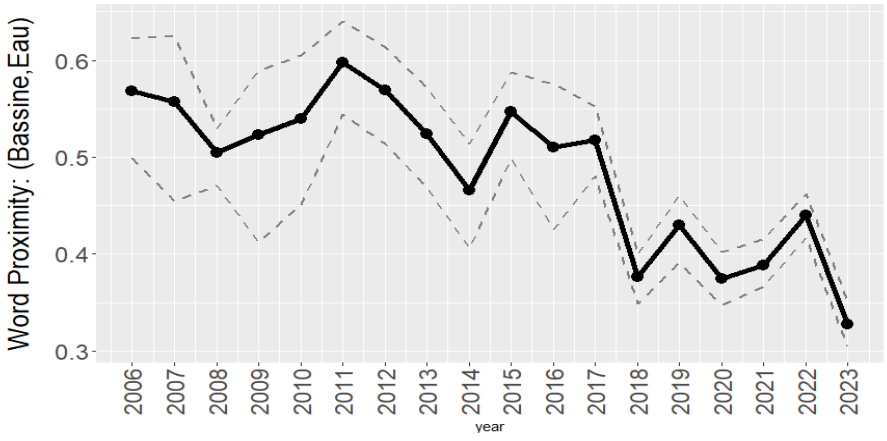

Figure 4. Word proximity (measured by cosine similarity) between "bassine" (i.e. reservoir) and "water" over time.

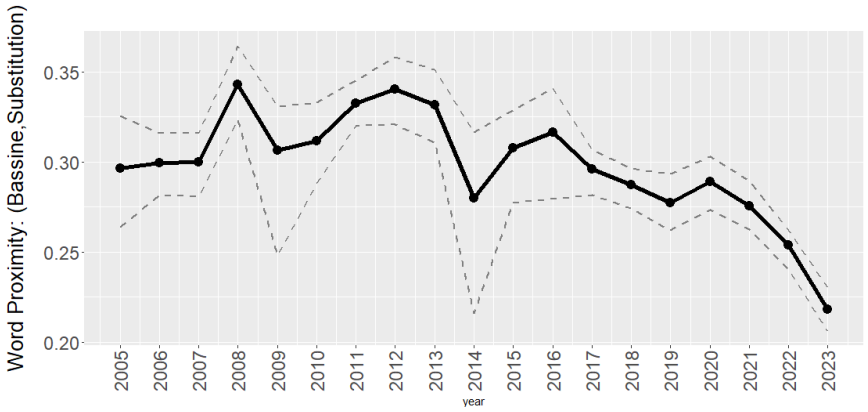

Figure 5. Word proximity (measured by cosine similarity) between "bassine" (i.e. reservoir) and "substitution" over time.

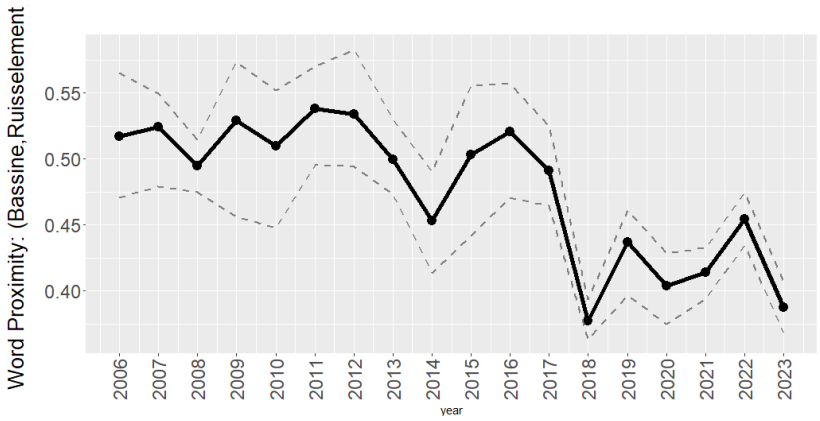

Figure 6. Word proximity (measured by cosine similarity) between "bassine" (i.e. reservoir) and "ruissellement" (i.e. runoff) over time.

By contrast, Figures 7, 8 and 9 show a clear switch towards political conflict from 2018 on (i.e. after the last concertation protocol) that mirrors the decrease of references to the physical and practical purpose of the substitution reservoirs. Just as the distance between a word

like "runoff" and "bassine" increases (i.e. lower cosine similarity), there is a continuous sharp increase of proximity (higher cosine similarity) between bassine and the word "demonstration" and "violence" starting around 2017 and even more sharply in 2018. Bassine becomes a national political object as illustrated by the increase in proximity with "Insoumise", which is the name of a left-wing French political party. Overall, the analysis of the evolution of cosine similarity confirms and enriches the patterns observed in the analysis of the nearest neighbors and the close reading of the text. Substitution reservoirs, which were initially associated with notions of water management have gradually become a political object associated with ideological struggles at the national level, moving away from the scale of the local environment to a more global contestation.

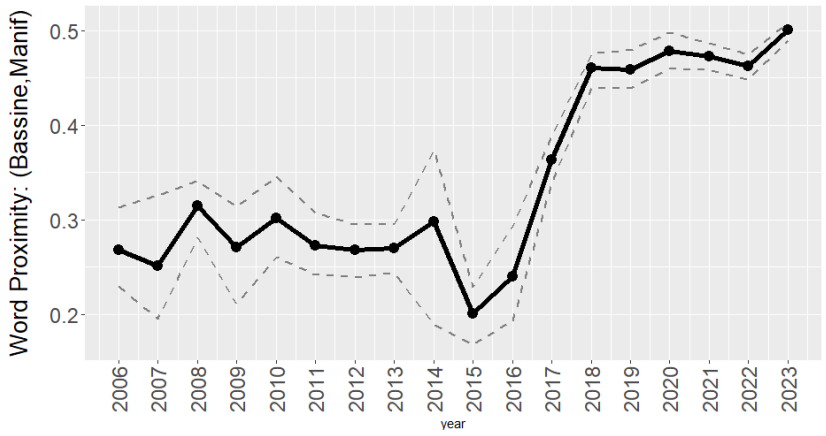

Figure 7. Word proximity (measured by cosine similarity) between "bassine" (i.e. reservoir) and "manifestation" (i.e. demonstration) over time.

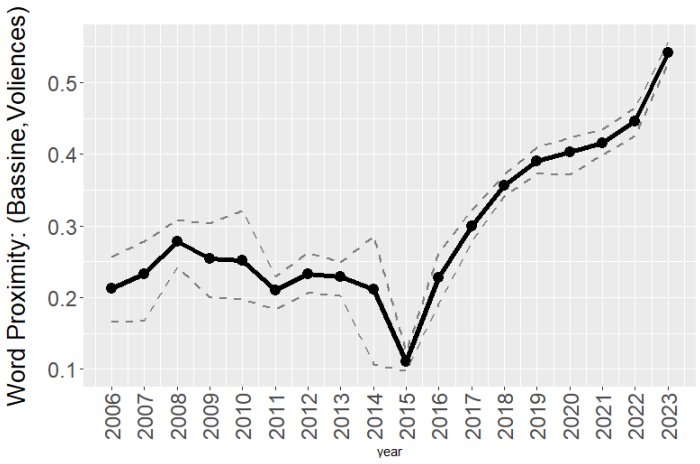

Figure 8. Word proximity (measured by cosine similarity) between "bassine" (i.e. reservoir) and "violences" (i.e. violence) over time.

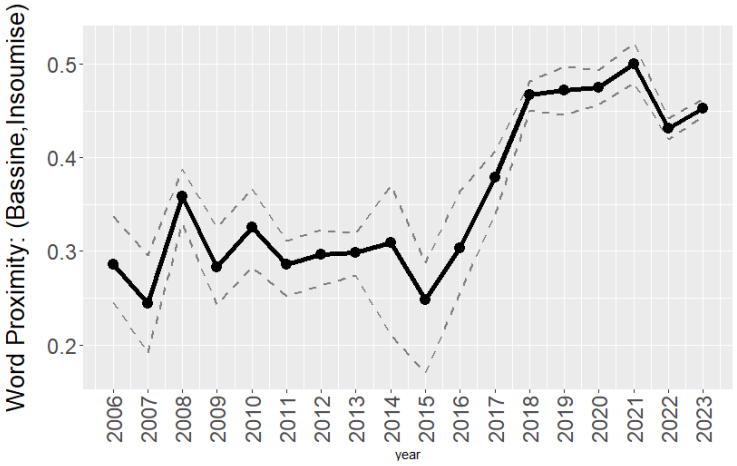

Figure 9. Word proximity (measured by cosine similarity) between "bassine" (i.e. reservoir) and "Insoumise" (i.e. Left wing political party) over time.

To summarize on our empirical findings, the written case exemplifies how, in contrast with the existing literature (Juerges & Newig, 2015), conflicts between actors do not stem from a difference of observational scale, e.g. opposing short vs long term or local vs global approaches (Bansal et al., 2018; Nyberg et al., 2018). On the contrary, we find both proponents and opponents of "bassines" playing an opportunistic strategy of scalar politics, trying to block or push reservoir projects on every possible scale of governance - from the very local level up until international governance structures. In this context, the existence of a polycentric governance system seems to enable and fuel conflicts rather than deter it as no deliberation space prevails in the end. Decisions taken in the local water commission can be threatened by a vote in the regional council, or a decree from the national government and vice-versa.

Additionally, our word embedding analysis shows that this multi-scale strategy leads to a "disembodiment" of debates around water reservoirs – at the same time as these reservoirs take concrete forms with construction sites – away from the water issues at stake and from the reservoirs themselves towards nationwide political confrontation. In a sense, "bassines" become matter battles that are not materially debated anymore, hence turning into an intractable conflict resisting concertation endeavors (Lewicki et al., 2003).

4. CONCLUDING NOTES

Although the data analysis and conceptual development of this paper is still ongoing, we can already draw some insightful observations from our empirical context. First, our analysis of the

SNMP water reservoir projects shows how an environmental conflict persist in a context of polycentric governance system. Indeed, also substitution reservoirs have been voted and financially supporting by multiple governance bodies on both local and regional levels, the decisions taken lack legitimacy for a significant part of actors, leading to civil disobedience and instances of violence.

Our data shows intriguing patterns in terms of scale mobilization, pointing to potentially rich conceptual contribution: While previous literature points that "conflict over the most appropriate governance scale can be based on different perceptions of what the conflict is about and which scales of action are required" (Juerges & Newig, 2015, p426), we find that actors mobilized in the conflict resort to any scale available to them, both temporally and geographically to justify their own position. In doing so, they bring in other protagonists historically disconnected from the focal river basin, as well as broader political movements. This opportunistic strategy sidelines the existing participatory structures, such as the local water commission, partly through systematic judiciary procedures repeatedly invalidating collaborative decisions. Additionally, the notion of *"bassine"* itself evolves from a factual irrigation tool, which could be debated on technical grounds, to a political symbol of contestation, leaving little room for debate and deliberation. Paradoxically, *"bassines"* have become both a "matter batter" (crystallized in violence with the first construction sites being vandalized) and a disembodied notion. Rather than much-needed transformability (Walker et

al., 2004), in the context of SNMP, the multiplicity of scales in actors' positions seem to lead to stalemate, a perilous position in the face of impending climate change.

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Appendix 1 – Corpus Creation

The media coverage of substitution reservoir projects in Deux-Sèvres constitutes the core of our datasets. Newspaper articles were collected via the Europresse platfom, between 2005 up until May 2023, on a selection of newspapers presented in Table A.1. Our search terms were TEXT="bassine"AND TEXT= "Deux-Sèvres", which resulted in a corpus of 1'435 press articles. To account for the fact that some actors only refer to substitution reservoirs through their technical name – uncommon in news outlets – we did an additional search for TEXT="retenue de substitution"AND TEXT= "Deux-Sèvres". This extra step added 13 articles to the corpus. We ignored from our collection procedures articles who made no reference to the substitution project in the end, for example when they talked about other "basins" than irrigation reservoirs (117 articles ignored in total).

Table A.1 – News outlet selection and number of articles per newspaper selected

National newspapers	**# articles**	**Local Newspapers**	**# articles**
La Croix	29	Nouvelle République du Centre-Ouest	1121
Les Echos	11	Ouest-France	114
Le Figaro	48		
L'Humanité	28		
Libération	30		
Le Monde	42		
La Tribune	28		
Le Parisien	3		

To understand the legal and regulatory context mentioned within news articles, we add to this corpus critical public reports and regulation. Table A.2 provides an overview of this additional corpus.

Table A.2 – Additional documentation from public sources

Source Category	Source Name	Type of Data
National Government Departments	• Cours des Comptes (Controller and Auditor General). • Ministry of Sustainable Development, Transport and Housing). • General Council of the Environment and Sustainable Develoment • General Council for Food, Agriculture and Rural Spaces • BRGM (Bureau de Recherches Géologiques et Minière)	• Roussel report on the Poitevin Marsh's future • Public policy evaluation reports on water governance. • Report on quantitative water management. • Ministerial instructions on the quantitative management of water. • Public inquiry reports on the construction of substitution reservoirs. • Legal Guidelines for the construction of substitution reservoirs. • Environmental impact of substitution reservoir report.
Legislative Branch	• National Assembly • Senate	• Parliamentary inquiry report on the construction of substitution reservoirs. • Senate commission report on water governance

Academies, Research Institutes and Consultative Bodies	• Academy of Technologies • Academy of Agriculture • Economic, Social and Environmental Council • Scientific Expertise Resource Center of Britanny • National Institute of Public Administration	• Report on water governance • Synthesis of scientific literature of environmental impact of water reservoirs • Report on the use of technology in the provision of water. • Report on irrigation. • Report on the management of conflict over the construction of substitution reservoirs

Appendix 2 – Detailed Word Embedding Procedure

Pre-processing

The preprocessing of the corpus prior to estimating word embeddings consists in removing specific markers (e.g. "http") and high frequency stop-words (e.g. "the", "a"), which provide limited or no information about meaning. Stop-words are replaced with blank tokens. Replacing stop-words by blank tokens, by contrast with simply removing words, is required because the "A la carte" embedding of a focal word should be calculated based on words that are in its vicinity in the original text. If stop-words were simply removed, words that are not in the vicinity of the focal word would be used to estimate the embedding of the word, which would bias the embedding (Rodriguez et al., 2023).

A la carte embeddings. One of the challenges of traditional embeddings is that they require large bodies of text (e.g. Wikipedia) to produce a meaningful mapping of words onto a vectorial space. However, many corpora are of small size, instances of the words rare and the meaning of words may be context specific. Recent advances in word embedding address this issue. "A la carte" (later on, ALC) embedding techniques produce meaningful vectorial representation of words in their specific context even in small corpus (Khodak et al., 2018; Rodriguez et al., 2023). The implementation of ALC embeddings is available in the R package ConText. The method uses the word embedding of a large corpus as reference (e.g. Wikipedia). The embedding of a specific word in the context of a body of text is calculated based on the

embedding of the words that appear in the vicinity of the word in the corpus. More specifically, the embedding of a focal word (e.g. "bassine") in the corpus is estimated by calculating a weighted average of the reference embeddings (e.g. embeddings in Wikipedia) of the words in its vicinity in the corpus of interest (Khodak et al., 2018; Rodriguez et al., 2023). For example, let's consider a specific sentence: "For the critics of the bassine, the trauma remains" and assume that the context of the focal word bassine is a window of size 3. The context of the word bassine in this specific instance is "critics of the" on the left hand-side and "the trauma remains" on the right hand-side. Because stop-words "the" and "of" have been removed and replaced by empty tokens, the context words used to calculate the embedding of "bassine" are "critics", "trauma" and "remains". The context specific embedding for "bassine" in the context of the corpus is a weighted average of the embeddings of these 3 words in the reference corpus (e.g. Wikipedia). Further, given that there are several instances of the word "bassine" in the corpus, the embedding of "bassine" in the context of the corpus is the arithmetic average of all the ALC embeddings using the procedure described above for a single instance across all instances in the corpus.

Nearest Neighbors and Proximity. Given an embedding, the proximity between two words is calculated as the cosine similarity between their embeddings, which can range between -1 to 1 (Rodriguez & Spirling, 2022). A value close to 1 suggests that the two words have a very similar meaning (e.g. car versus automobile). A value of 0 suggests orthogonality, that is

there is no relationship between the two words. Last, a value close to -1 means that the two words have opposed meaning (e.g. hot vs. cold, moral vs. immoral). To map the evolution of the proximity of between the word "bassine" and other words, ALC word embeddings are calculated for each sub-corpus that corresponds to each year. Using this technique, it is possible to obtain the nearest neighbors of a focal word using cosine similarities measures to assess variations in the meaning of a word over time. Further, by calculating the cosine similarity between a focal word another word, one can get a fine-grained insight into the evolution of the meaning of a word of interest over time.