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Nora Schütze

POLYCENTRIC WATER GOVERNANCE IN SPAIN

Understanding Determinants, Patterns, and Performance of Coordination

[transcript] PoliticalScience

Nora Schütze
Polycentric Water Governance in Spain

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Nora Schütze (Dr. rer. pol.) is a research associate at University of Kassel, where she also completed her PhD dissertation. Her research interests include natural resource governance with a particular focus on water and land, as well as polycentric governance, policy analysis and institutional analysis.

Nora Schütze

Polycentric Water Governance in Spain

Understanding Determinants, Patterns, and Performance of Coordination

[transcript]

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1. Introduction

The governance of water necessarily requires coordination across policy sectors to deal with interlinkages and trade-offs between different types of water uses. In terms of water quantity, for example, it is to coordinate the often-competing demands of human resource use, such as agriculture, energy production, tourism, or urban water use; as well as balancing these uses with the protection of ecosystems. Furthermore, water crosses administrative boundaries, asking for coordination across jurisdictional scales, from the local to the national and international level. The importance of coordination has been recognized for decades, but is still seen as one of the major challenges in water governance (Pahl-Wostl 2015). This is also why the water crisis we are facing (Vörösmarty et al. 2010) is often seen as a crisis of governance rather than one of physical resources (Gupta, Pahl-Wostl, and Zondervan 2013).

To address these needs for coordination, different governance approaches are used by scientists and policymakers. These are, most prominently, the concept of Integrated Water Resource Management (IWRM), which aims at coordinating water resources across sectors and at different scales, while recognizing interests of competing user groups (Global Water Partnership 2009); as well as the Water-Energy-Food Nexus, focusing on managing and reducing trade-offs, and increasing synergies across sectors (Weitz et al. 2017; Benson, Gain, and Rouillard 2015). These approaches have certainly been important in terms of improving the understanding on interdependencies between different water-using sectors. However, despite of their strong focus on cross-sectoral and cross-level coordination, conceptualizations and theorizing of coordination remains vague. Furthermore, the WEF nexus, as well as related literature on coordination of natural resources, has been criticized for weak accounting of policy-making processes that the nexus approach ultimately aims to influence (Weitz et al. 2017); as well as for not sufficiently considering the role of institutions in shaping outcomes (Villamayor-Tomas et al. 2015), and conditions for effective coordination (Srigiri and Dombrowsky 2022).

This study therefore aims to conceptualize coordination of actors in water governance from the perspective of polycentric governance (Thiel, Blomquist, and Garrick 2019; V. Ostrom, Tiebout, and Warren 1961), building on the Bloomington School of

Political Economy. This approach analytically distinguishes between various forms of coordination, such as competition, hierarchy, or cooperation, thereby helping to understand the complexity of how actors may interact and coordinate in different contexts and governance settings. Theoretical research gaps remain on how these different forms of coordination come about, how they overlap and co-exist, as well as how they perform. This research project aims to contribute to filling these research gaps by undertaking a comparative case study of three Spanish River Basin Districts on the coordination between the water and agricultural sectors. The empirical context is the European Union (EU) Water Framework Directive (WFD) implementation, and related processes to reduce agricultural water consumption, presenting one of the main pressures on Spanish water bodies. The cases lend themselves well to the analytical framework, since reasons why environmental objectives of the WFD remain largely unachieved in Spain are often traced to the lack of cross-sectoral and cross-level coordination (Lopez-Gunn et al. 2012; Corominas and Cuevas 2017). However, it remains unclear how actors eventually interact; and where, between whom and why alleged deficiencies in coordination occur.

In the next section, I briefly introduce literature on coordination in polycentric governance. This is followed by presenting the empirical research context, i.e., the WFD implementation in Spain and measures to reduce agricultural water consumption. I then present the research questions and main aims of this study. The chapter concludes by outlining the structure of this book.

1.1 Applying polycentricity to the study of coordination in water governance

The concept of polycentricity goes back to the seminal work of V.Ostrom, Tiebout and Warren (1961), which has since inspired scholars to analyse collective-action problems related to the production and provision of public goods and services at multiple scales. Polycentric governance, as it is used in this study, relates to multiple, overlapping decision-making centres at different scales which exercise "considerable independence to make norms and rules within a specific domain" (E. Ostrom 2010b: 552). These decision-making centres take each other into account and mutually adjust to each other through processes of cooperation, competition, and hierarchy (Thiel et al. unpublished manuscript; V. Ostrom, Tiebout, and Warren 1961).

Many scholars take a normative approach to polycentricity, arguing that polycentric governance is conducive for strengthening coordination of competing resource uses (Kellner, Oberlack, and Gerber 2019), improving institutional fit (Carlisle and Gruby 2017), or more generally, for supporting sustainable use of resources (Pahl-Wostl 2015). This study, however, adopts the view that all governance arrangements and political systems are polycentric (Berardo and Lubell 2019); and, that poly-

centric governance is not a panacea, but that its performance has to be rigorously studied (E. Ostrom 2010b). Given this background, this study builds on the polycentricity framework developed by Thiel et al. (2019: 10), who use polycentricity as a "lens for viewing the world". This book thereby aims to analyse interactions of diverse decision-making centres at multiple scales; the role of, inter alia, environmental contexts, formal and informal rules, and characteristics of social problems; as well as how these actors ultimately perform in terms of producing and providing public goods and services (Thiel, Blomquist, and Garrick 2019).

In order to understand the many different nuanced ways in which actors interact and coordinate, this study distinguishes between three ideal types, or pure forms of coordination, namely hierarchy, competition, and cooperation, as well as hybrids which combine these pure forms of coordination in different ways (Thiel et al. unpublished manuscript; Bouckaert, Peters, and Verhoest 2010; Thompson et al. 1991). Further, I use three additional categories of interaction, namely exchange of information, conflicts, and gaps in interactions. Coordination is thus seen as an umbrella term for different forms of interaction.

To analyse these different types of coordination, I apply Ostrom's (2005) Institutional Analysis and Development (IAD) Framework. While the IAD has been developed to study collective action of natural resource users, it can similarly be used to study policy processes at higher analytical levels (Schlager 2007). I make use of two important conceptual tools of the IAD Framework. These are Action Situations, the corner stone of the IAD Framework, understood as social space where actors engage with each other, creating patterns of interaction and where they produce joint outcomes (E. Ostrom 2005). Further, I apply the rule typology that is equally part of the IAD Framework, to understand how different formal and informal rules shape actors' incentives, and thereby structure the different types of interaction outlined above (E. Ostrom 2005).

Many scholars have applied polycentric governance approaches to study coordination of actors in the context of interrelated natural resource uses (Villamayor-Tomas 2018; Baldwin et al. 2018). Nonetheless, important research gaps remain. First, within the polycentric governance literature, many different sub-forms of coordination are used to conceptualize actors' interaction, such as cooperation, competition, conflict and conflict resolution (Koontz et al. 2019), cooperation, coercion and competition (Srigiri and Dombrowsky 2022), or collaboration (Jordan, Huitema, Schoenefeld, et al. 2018). However, there is a research gap on how these different forms of coordination relate to each other, as well as how they co-exist and overlap. Furthermore, there has been little research on how governance structures influence processes of polycentric governance in general (Lubell, Robins, and Wang 2014), and different types of coordination in particular. A further important research gap relates to performance of polycentric governance. More empirical and theoretical research is therefore needed on how constitutional rules (Thiel 2017), interests of ac-

tors (Kellner, Oberlack, and Gerber 2019), as well as processes (Thiel 2017) relate to performance of polycentric governance.

1.2 Empirical research context

The analytical framework will be applied to three case studies on the coordination between the water and agricultural sectors in the context of the WFD implementation in Spain. The empirical focus is on decision-making processes represented as Action Situations in the context of reducing agricultural water consumption. Coordination between public, private and civil society actors of the water and agricultural sector, and from different jurisdictional levels, is thereby fundamental. The three case studies under investigation are the River Basin Districts (RBDs) Guadalquivir, Jucar, and Mediterranean Basins of Andalusia (hereafter: Mediterranean Basins).[1] The time frame of the empirical analysis ranges from 2009 to 2019. The three cases show differences regarding their governance structure as well as their performance in terms of reducing agricultural water consumption. They are studied from a comparative perspective.

Implementation of the Water Framework Directive

The WFD, adopted in 2000, defines a framework for river basin management (RBM) and can be seen as one of the most ambitious environmental regulations of the EU. It asks Member States to achieve a "good water status" of all surface and groundwater bodies by 2027. Every six years, Member States must develop River Basin Management Plans (RBMPs), presenting a thorough analysis of the respective RBD, including inter alia an assessment of main pressures on water bodies as well as a so-called Programme of Measure. The latter defines measures that are to be implemented in the respective planning cycle, and which shall contribute to achieving environmental objectives of the WFD (Art. 11, WFD). RBMPs are reported to and evaluated by the European Commission every six years. Since the WFD is a framework directive, it only defines overarching aims, while leeway is given to Member States on how they can be achieved (Newig and Koontz 2014).

The WFD has considerably changed water management in Member States by introducing the principle of integrated water management and aiming at the holistic protection of aquatic ecosystems (European Commission 2019a). This approach inter alia includes the management of water resources at the river basin level instead

1 Throughout the book, I use the term River Basin District to refer to the administrative boundaries of the WFD implementation, and thus to all three case studies. The Mediterranean Basins and the Jucar both consist of several river basins, which is why the terms River Basin Districts and river basins are not interchangeable in this work.

of at administrative scales; and asks for public participation by actively involving all interested parties in the development of RBMPs (Art. 14, WFD). The WFD was thus an important driver in enabling institutional change (Thiel 2015). Given this innovative character and the very ambitious environmental objectives, the WFD has often been praised for presenting a paradigm shift in European water protection (Voulvoulis, Arpon, and Giakoumis 2017).

In Spain, the introduction of the WFD also implied significant changes, asking authorities to move away from a focus of increasing supply for economic purposes to achieving a good status of water bodies. This indeed represented an important shift, with Spanish water management having been based on the so-called hydraulic paradigm throughout the 20th century (Sauri et al. 2001; López-Gunn 2009). Water management was thus characterized by large-scale state interventions of hydraulic infrastructure, with the overall aim to supply water for economic growth. Beneficiaries of this paradigm were, most of all, irrigators, hydroelectric companies, and public infrastructure developers (Martínez-Fernández et al. 2020). An important further characteristic of this hydraulic paradigm was the privileged access of traditional water users, such as agricultural Water User Associations (WUAs), in decision-making bodies of the different River Basin Authorities (RBAs) (López-Gunn 2009).

When introducing the WFD, Spain was able to build on a governance structure that was already in line with several principles of the WFD. Indeed, the Spanish Government set up the first RBA in the country, the *Confederación Hidrográfica del Ebro*, in 1926; RBAs for all other surface waters were introduced in the following two decades. Furthermore, irrigators and other traditional water users were included in decision-making bodies of the RBAs. Although being restricted to economic users, some participation was thereby ensured. River basin planning was then introduced by the 1985 National Water Law, leading to the adoption of the first RBMPs in 1998, i.e., eleven years before the first WFD planning cycle started.

More than twenty years after adoption of the WFD, and more than ten years after first RBMPs came into force, environmental objectives are far from achieved, both in Spain and in most of the Member States (European Commission 2019a). In Spain, 25% of groundwater bodies risk to fail good quantitative status; and 30 to 70% of natural rivers in Spanish RBDs are in a status less than good (European Commission 2019b). An important reason for failing to achieve environmental objectives of both groundwater as well as surface waters is the high water abstraction by agriculture (European Commission 2019b).[2] Indeed, agriculture represents between 70% and

2 The highest percentage of surface water bodies in Spain is affected by point source pollution from urban wastewater (37% of surface water bodies), diffuse pollution by agriculture (34%) and water abstraction for agriculture (22%). The highest percentage of groundwater bodies

88% of total water demand in the three RBDs under investigation, the Guadalquivir, Jucar and the Mediterranean (CHG 2015a; Junta de Andalucía 2015a; CHJ 2014a).

In this context, it is important to mention that water quantity issues are not directly included in the assessment of water status of surface water bodies. Baranyai (2019: 10) therefore criticizes that the WFD and other European environmental laws "almost completely ignore quantitative issues". Nonetheless, the control of water quantity is considered an "ancillary element in securing good water quality" of surface water, which is why "measures on quantity […] should also be established" (WFD Recital 19). Indeed, ecological flows are required to ensure the maintenance of particular environmental functions in a river ecosystem (Molle, Wester, and Hirsch 2010); and achieving the good ecological status is unlikely if water abstractions are significant (Acreman et al. 2010). Since the second planning cycle, Member States are therefore asked to implement ecological flows. Ecological flows are considered as a hydrological regime which is "consistent with the achievement of the environmental objectives of the WFD in natural surface water bodies" (European Commission 2015a: 3). In relation to groundwater, the quantitative status is an integral part of the assessment of water bodies.

There is broad research on cross-sectoral and cross-level coordination in the context of the WFD implementation (Junier and Mostert 2012; Hüesker and Moss 2015), as well as on reasons for the lack of achieving WFD objectives (Moss et al. 2020; Zingraff-Hamed et al. 2020). In a meta-analysis on scholarship on the WFD implementation, Boeuf and Fritsch (2016) identify a research gap on the governance of water quantity issues, which is arguably due to the fact that research is dominated by northern European countries suffering from water quality problems. Further, the link between implementation processes and environmental outcomes remains understudied (Boeuf and Fritsch 2016). Therefore, Zingraff-Hamed et al. (2020) argue for more in-depth, qualitative research on institutional barriers of WFD implementation.

Increasing irrigation efficiency and the "lack of coordination"

In the context of high water abstractions by agriculture in Spain and the failure to achieve WFD objectives, reducing agricultural water consumption seems to be crucial. Many different governance approaches exist to fostering sustainable agricultural water use. These are, for example, implementation of quotas, water pricing, subsidizing high-tech irrigation infrastructure (Perry 2019), or so-called buybacks, where water users receive financial compensation for giving up their water rights (Perez-Blanco, Hrast-Essenfelder, and Perry 2020). At the farm level, strategies to

is affected by diffuse agricultural pollution (56%) and water abstraction for agriculture (32%) (European Commission 2019b: 401).

cope with reduced water availability include changing cropping patterns to less water-intensive crops, use of drought-resistant seeds, conservation agriculture, and implementing water saving-technologies (IPCC 2022a).

The most prominent measure among these is probably the implementation of irrigation efficiency measures, in Spain but also worldwide (Venot 2017). Indeed, the implementation of irrigation efficiency in Spain has been high on the political agenda for almost three decades – usually framed and known as "modernization of irrigation" among scholars (Berbel and Gutiérrez-Martín 2017a; López-Gunn, Mayor, and Dumont 2012), and in the policy debate (WWF/Adena 2015). However, there are no clear legal definitions on what exactly is included under "modernization" (Embid 2017). Furthermore, the term modernization as such is value-laden, based on normative assumptions that something is deficient and needs to be improved. For these reasons I do not use the term throughout this book. Instead, I speak about "increasing irrigation efficiency", thereby referring to the replacement of surface and sprinkler irrigation by drip irrigation, as well as the replacement of irrigation canals and ditches with pipes.

Measures on irrigation efficiency are included in the Spanish RBMPs and are considered important to achieve environmental objectives of the WFD (MITECO 2021). They are largely financed through the European Agricultural Fund for Rural Development (EAFRD) and corresponding Rural Development Programs (RDPs) of the regions. From 2000 to 2010, the European Commission, national and regional governments, as well as farmers invested around EUR 3.815 Million in irrigation infrastructure measures in Spain, covering 1.5 Million hectares (Berbel and Gutiérrez-Martín 2017b).

The main justification for these public investments has been, and still is, the overarching aim to save water (Embid 2017). However, despite high public investments, water consumption at the basin level has increased in several Spanish RBDs (Sampedro Sánchez 2020; Lecina et al. 2010), as well as in many countries worldwide (Grafton et al. 2018). Indeed, while the implementation of drip irrigation potentially allows to use less water at the farm level without compromising in yields, these water savings do not necessarily result in savings at the basin level (van der Kooij et al. 2013).

In this context, it is important to understand the physical water cycle in agriculture. Agricultural water use consists of a consumed fraction (i.e., evaporation and transpiration), which is consumed for growing crops; as well as a non-consumed fraction (Perry 2019). The latter can be subdivided in a recoverable fraction and a non-recoverable fraction. The recoverable fraction consists of flows which return to the river system, and which can therefore be used either by downstream users or for environmental uses, such as environmental flows or aquifer recharges. The non-recoverable fraction is understood as water that is lost for further uses, such as water

flowing to the sea, or into deep aquifers that cannot be exploited either for economic or physical reasons (Perry 2019).

From the perspective of the individual farmer, the non-consumed fraction in general presents a water loss – regardless of whether some share of it can still be used elsewhere by other users. An increase in efficiency of irrigation systems thus means that more water that is applied to the field can be consumed for the growing of crops; less water is therefore "lost" for the famer. In many cases, farmers are incentivized to make use of the possibility to consume more water, either by changing towards more water-intensive crops or expanding irrigated surface area. This change in behaviour induced by efficiency improvements is known as the rebound effect (Paul et al. 2019). It results in reduced water availability downstream, and ultimately leads to a relative or absolute increase of agricultural water consumption at the basin level (Grafton et al. 2018). The European Court of Auditors (2021: 42) calls this the "hydrological paradox", where "increased irrigation efficiency may reduce the return of surface water to rivers, decreasing base flows that are beneficial to downstream users and sensitive ecosystem".

Perez-Blanco et al. (2020: 230) argue that the two goals of stabilizing agricultural production and increasing water conservation are "generally incompatible" unless complementary policy measures are implemented. These measures include establishing a water accounting system that measures withdrawals, consumption and return flows (Perry and Steduto 2017), and which makes transparent "who gets what and where" (Grafton et al. 2018: 750). Second, limits to water allocation need to be determined. Only if these two measures were fulfilled, measures such as drip irrigation could be effectively introduced with the aim of reducing overall water consumption (Perry and Steduto 2017; Grafton et al. 2018).

It is in this context that the Spanish RBMPs stipulate to accompany subsidies to increase irrigation efficiency with a reduction of water rights. Indeed, also the RBMP of the three RBDs include measures on so-called "water rights revision" (CHG 2015b; CHJ 2015a; Junta de Andalucía 2015a). Significant coordination between the water and agricultural administration is thus required. This is because subsidies for irrigation efficiency are financed through RDPs and hence also administered by agricultural administrations, while the management of water rights falls under the competency of RBAs in Spain. However, the European Commission (2015b) reported that this water rights reduction has most often not been implemented, which is seen as key reason why public investments in irrigation efficiency did not result in expected water savings at the basin level (Sampedro Sánchez 2020; Corominas and Cuevas 2017).

Scholars explain the lack of water rights reduction with deficiencies in cross-sectoral and cross-level coordination (Lopez-Gunn et al. 2012; Corominas and Cuevas 2017); and also among policy-makers, this is a recurring claim. In an interview with a representative from the Ministry for the Ecological Transition and the De-

mographic Challenge, the interviewee even states: "I think that it's difficult that this [problem of coordination] is as big as in Spain" (Interview 22/2018). Yet, also in other Member States, the failure to achieve environmental objectives of the WFD is explained by weakness in cross-sectoral communication and collaboration (Zingraff-Hamed et al. 2020). Despite this frequently mentioned criticism, it remains unclear where exactly these gaps in day-to-day decision-making regarding coordination of increasing irrigation efficiency and reducing water rights arises (Schütze, Thiel, and Villamayor-Tomas 2022); as well as which actors in the polycentric governance system are responsible for it, and what the underlying reasons are. Against this background, this work aims to open the "black box" of coordination between the water and agricultural sector, uncovering reasons and underlying incentive mechanisms that explain behaviour of actors.

Increasing water supply through desalination

A further measure to reduce consumption of freshwater in Spain has been the implementation of desalination plants, albeit being of much less empirical importance than irrigation efficiency measures. The first desalination plant in Spain was built in 1964 in Lanzarote. In 2004, the Spanish Government launched the so-called AGUA program that aimed at increasing water supply for urban needs, tourism, and agriculture through desalination of seawater and brackish water, the reuse of wastewater and irrigation efficiency measures. Desalination plants built under this program were financed by the EU, the national and regional governments, as well as private companies. Supporters see desalination plants as an opportunity to replace groundwater consumption, thereby reducing overexploitation of aquifers and contributing to the achievement of environmental objectives of the WFD. A further aim of desalination is to increase the level of guaranteed water supply in a context of climate change and reduced physical water availability (Cabrera, Estrela, and Lora 2019).

However, desalination has environmental impacts that cannot be neglected. These are, most importantly, the high energy consumption of the purification process, associated with high CO_2 emissions; as well as environmental impacts on marine ecosystems by discharging brine back into the sea (García-Rubio and Guardiola 2017). Brine results from the process of desalinating seawater and consists of concentrated salt and chemical residues. Furthermore, critics see desalination as a continuation of the hydraulic paradigm. According to Morote et al. (2017: 8), "desalination established extraordinary new techno-social configurations, while preserving the same underlying logics of developmental, growth-oriented water governance". Swyngedouw and Williams (2016: 55) argue that desalination has even become a "panacea for the country's terrestrial water woes".

Although several publicly financed desalination plants were built in the past decade, they remain largely underutilized mostly due to high price of desalinated water compared to surface water or groundwater. Reasons for these high prices are

the already mentioned high energy use; reinforced by the fact that consumption of desalinated water is not subsidized in the same way as consumption of conventional water resources (Cabrera, Estrela, and Lora 2019). Consequently, desalinated water is only purchased by those water users who grow high value-added crops and who do not have access to other types of water resources. This also explains why – unlike irrigation efficiency measures described above – desalination is of empirical relevance only in a "specific spatial and temporal context", representing 1.3% of the national water demand forecast for 2021 (del Moral, Martínez-Fernández, and Hernández-Mora 2017: 336). In relation to the River Basin Districts studied in this book, desalination is only used in the Mediterranean Basins. It is marginal in the Jucar, and non-existent in the Guadalquivir.

Due to the low demand for desalinated water, agricultural administrations in the Mediterranean Basins aim to promote the use of non-conventional water resources (Junta de Andalucía 2020a). Questions of coordination between the water and agricultural sector are thereby again of high importance, since it is ultimately about incentivizing water users to accept higher prices of desalinated water, and to give up consumption of overexploited water resources. This implies changing water rights from conventional resources to non-conventional resources. However, while in the academic literature, there are critical analyses of desalination in Spain (Saurí, Gorostiza, and Pavón 2018; Morote, Rico, and Moltó 2017), and of the reasons for low use of desalinated water (Villar-Navascués et al. 2020), issues of governance in general, and coordination in particular, have not been addressed.

These different approaches to reduce agricultural water consumption, i.e., increasing irrigation efficiency and promoting the use of non-conventional water resources for irrigation, need to be viewed in the broader context of climate change and food security. Indeed, achieving the WFD objectives is not an end in itself. In contrast, the most recent report of the Intergovernmental Panel on Climate Change (IPCC) shows that climate change will increase needs for irrigation in Europe; while at the same time, physical water availability for agriculture as well as for other sectors will be at risk (IPCC 2022a). Even in temperate regions of Europe, local water shortages have become more frequent; and studies show that Spain will be confronted with a decline in runoff by 20% to 40% by the end of this century (Centro de Estudios Hidrográficos 2017a). According to the ICPP, heat and drought will therefore lead to substantive losses in agricultural production in most European areas over the 21st century – ultimately leading to increased risks of food security (IPCC 2022a). Since not only in Spain, but also worldwide, irrigated agriculture accounts for 60–70 % of water extraction (IPCC 2022b), the reduction of water demand in the agricultural sector can certainly be seen as a highly important lever to address water quantity problems.

1.3 Aims and outline of the book

Several theoretical and empirical research gaps exist on how different forms of coordination in polycentric governance come about, relate to each other, and perform; as well as how private, public, and civil society actors in the three RBDs coordinate in the context of reducing agricultural water consumption. Against this background, the overarching aim of this study is to understand processes of cross-sectoral and cross-level coordination and their performance in the context of the WFD implementation in three Spanish RBDs. More specifically, the study aims to answer the following three research questions:

a) How do public, private, and civil society actors interact in the development and implementation of policies concerning the reduction of agricultural water consumption?
b) What are the determinants of these different patterns of interaction?
c) What are the determinants of process, output, and outcome performance of the three case studies?

To answer these questions, this study employs a comparative case study design (George and Bennett 2005; Gerring 2006), combining a *cross-case analysis* of three Spanish RBDs with a *within-case analysis* of decision-making processes in the RBDs (E. Ostrom 2005). Cases are selected by combining John Stuart Mill's method of agreement and method of difference (Gerring 2006). Data to answer the research questions is collected in stakeholder interviews and based on policy documents and grey literature; and is analysed through Process Tracing (Collier 2011) and Qualitative Content Analysis (Mayring 2000).

A theoretical framework is developed to structure the empirical analysis and answer the research questions. The theoretical framework builds on the polycentric governance framework by Thiel et al. (2019), as well as on different conceptualizations of coordination in the public sector (Thiel et al. unpublished manuscript; Thompson et al. 1991; Bouckaert, Peters, and Verhoest 2010; Peters 2018). Furthermore, Action Situations and the rule typology of Ostrom's (2005) IAD Framework are used to analyse coordination processes of actors.

The theoretical framework and research design is applied to the Guadalquivir, Jucar, and the Mediterranean Basins. Since these three RBDs are all situated in Spain, the broader socio-economic and institutional context in which cases are embedded is held constant, thereby facilitating the uncovering of causalities. Within Spain, I select cases that vary on an independent as well as on a dependent variable; with the overall aim to identify various causal pathways that may lead to an outcome (Gerring and Cojocaru 2016; Gerring 2006). More specifically, the three cases have different governance structures, with the Guadalquivir and the Jucar being so-called

inter-regional RBDs, governed by the national level; and the Mediterranean Basins as intra-regional RBD governed by the regional government of Andalusia. Furthermore, the cases show different rates of environmental performance: while in the Guadalquivir, agricultural water consumption has increased in the last decade despite huge investments in irrigation efficiency measures (CHG 2013; 2020a), a slight decrease of agricultural water consumption is reported for the Jucar (CHJ 2014a; 2019a) and the Mediterranean Basins (Junta de Andalucía 2014a; 2019a). These slight reductions are nonetheless not sufficient to achieve the environmental objectives of the WFD and water resources continue to be overexploited also in the latter two cases.

Through this study, I uncover coordination processes in the three RBDs, thereby helping to understand why environmental objectives of the WFD remain largely unachieved. The study reveals a variety of different forms of coordination across sectors and levels, thereby contradicting widespread criticism on lacks of coordination. I argue that important reasons for not achieving WFD objectives are incentive structures which were not aligned with the overall policy objective of reducing agricultural water consumption. These incentive structures were deliberately created by different actors of the polycentric governance system at the EU, national and regional level. As a consequence, neither river basin authorities nor agricultural administrations had incentives to legally enforce a reduction of agricultural water consumption; nor did most of the farmers have incentives to reduce their consumption.

Theoretically, the aim of this study is to contribute to literature on coordination in polycentric governance and public administration. In this context, this research aims to deepen the understanding of hybrid forms of coordination, i.e., how different types of coordination co-exist and overlap. Furthermore, this book seeks to provide a differentiated and contextualized understanding of the different mechanisms which explain coordination of actors and their performance. Thereby, the study aims to support the building of middle range theories in polycentric water governance.[3]

1.4 Structure of the book

In the next chapter, I present the conceptual framework. I first introduce main theories on coordination that are used for this study, namely public administration literature on coordination (e.g., Peters 2013; Bouckaert, Peters, and Verhoest 2010),

3 This study was embedded in, and funded by the research project STEER (*Erhöhung der STEuerungskompetenz zur Erreichung der Ziele eines integrierten Wassermanagements*, Increasing Good Governance for Achieving the Objectives of Integrated Water Resources Management), funded by the German Federal Ministry of Research and Education (BMBF) from 06/2017 to 09/2020.

as well as institutional analysis literature on polycentric governance (Thiel, Blomquist, and Garrick 2019) and the IAD Framework (E. Ostrom 2005; McGinnis 2011). Based on these literature strands, I develop the theoretical framework which aims at conceptualizing different types of coordination and their determinants, as well as performance of polycentric governance.

Chapter 3 introduces the methodology and research design of the study. The overarching aim of this research design is to enable the uncovering of causalities, i.e., to understand how and why governance processes performed the way they did. Furthermore, this chapter presents the research process, including the selection of case studies which is guided by the theoretical framework; data collection, consisting mainly of stakeholder interviews and grey literature; data analysis by using Process Tracing (Collier 2011; Blatter and Haverland 2014) and Qualitative Content Analysis (Mayring 2000); and lastly, the assessment of variables.

Chapter 4, 5 and 6 are devoted to the empirical analyses of the three case studies, namely the Guadalquivir, Jucar and the Mediterranean Basins. For each case study, I analyse the implementation of the WFD, focusing on the coordination between the water and the agricultural sector in the context of reducing agricultural water consumption. Each chapter follows the similar structure where I first analyse independent variables that are specific to the respective case study, such as contextual conditions and characteristics of heterogeneous actors. Then, I analyse different Action Situations by assessing independent variables that are specific to the respective Action Situation, discussing patterns of interaction that emerged in the Action Situations, and lastly, investigating their performance. Each chapter concludes by evaluating performance across Action Situations, i.e., of the overarching governance process.

In Chapter 7, I answer the three research questions of this study, explaining and comparing patterns of interaction in the processes under investigation, their determinants as well as performance of polycentric governance. I thereby build on the theoretical framework and connect and compare empirics of the three case studies. I then summarize main empirical and theoretical findings. The chapter concludes by discussing strengths and limitations of this study, and outlining avenues for further research on determinants, pathways, and performance of polycentric water governance.

2. Conceptual Framework

In this chapter, I present the theoretical framework of this study on coordination in polycentric governance, its determinants and performance. I thereby build on the polycentricity framework by Thiel et al. (2019), and draw on further literature of the Bloomington School of Political Economy. More specifically, the aim of the framework is to conceptualize different forms of coordination – cooperation, competition, hierarchy and hybrids; as well as information exchange, conflicts and gaps in interaction – of diverse decision-making centres at multiple scale; to understand in what ways the environmental context, constitutional rules, characteristics of social problems, and characteristics of heterogenous actors shape the coordination of these decision-making centres; as well as how these decision-making centres ultimately perform in terms of providing public goods. Furthermore, to study the different coordination processes, the conceptual framework integrates Action Situations as analytical tool, as well as the 7-rules typology, both derived from Ostrom's (2005) Institutional Analysis and Development (IAD) Framework.

The chapter proceeds as follows. First, I introduce classical political science and public administration literature on coordination, followed by a brief overview on institutional analysis literature on coordination, as well as outlining research gaps in these fields of study (Section 2.1). This is followed by developing the conceptual framework, organized along structure, processes and performance of polycentric governance (Section 2.2).

2.1 Introducing key theoretical concepts

This study combines two related theoretical strands of literature, namely public administration literature on coordination of public actors (Peters 2013; Peters 2018) with institutional analysis literature on polycentric governance (Thiel, Blomquist, and Garrick 2019; V. Ostrom, Tiebout, and Warren 1961) and the IAD Framework (E. Ostrom 2005; McGinnis 2011). In this section, I give a brief overview of these two academic fields; while only in the subsequent section (Section 2.2), I will elaborate on how I apply discussed concepts and approaches in my study.

2.1.1 Public administration literature and coordination

The question of how actors in the public sector coordinate is probably among the oldest debates in public administration and political science (Peters 2015). Already several decades ago, Pressman and Wildavsky stated that also among practitioners "no suggestion for reform is more common than 'what we need is more coordination'" (1973: 133) – an observation which probably still holds true today. The literature on coordination is therefore vast, but highly fragmented in terms of the used terms and concepts (Trein et al. 2021). Related concepts, which all centre around the idea that actors from different sectors or jurisdictional level need to work together, are, inter alia, collaborative governance (Emerson, Nabatchi, and Balogh 2012), collaborative management (Koontz and Thomas 2006), policy integration (Jordan and Lenschow 2010) or interplay management (Oberthür 2009).

Two perspectives on coordination are found in the literature, namely coordination as process and coordination as outcome (Greenwood 2016). Coordination as process is usually understood as interaction of actors from different policy sectors or jurisdictional levels. This interaction can range from exchanging information to resolving conflicts and concerns any stage of the policy cycle, from agenda setting to policy evaluation. More precisely, Malone and Crowston (1990: n.pag.) define coordination as "the act of managing interdependencies between activities performed to achieve a goal". Reasons on the need for cross-sectoral and cross-level coordination are, on the one hand, increasing fragmentation of the public sector due to specialization of public actors or the creation of independent agencies; and on the other, the complexity of problems such as climate change, biodiversity or sustainable development which cut across administrative boundaries and requires actors from different sectors and levels to work together (Peters 2018). Indeed, these problems cannot be solved by an individual actor.

The idea of coordination from a process perspective is thus closely interconnected with aspirations to improve policy outcomes, and also in public debates, the claim to "strengthen coordination" is frequently put forward when desired policy outcomes are not achieved. This concerns also the Spanish water governance system, where actors from local, regional and national levels interact to govern water uses from different sectors; and in relation to which many scholars argue that cross-sectoral and cross-level coordination need to be strengthened (López-Gunn 2009; De Stefano and Hernandez-Mora 2018). The underlying normative assumptions are thereby inter alia that activities can be undertaken either more efficiently through coordination and the compatibility of tasks can be enhanced (Frances et al. 1991), or that aggregated welfare can be increased (Scharpf 1994). Furthermore, it is assumed that coordination strengthens coherence of different policies (cf. Dombrowsky et al. 2022), and reduces "redundancy, lacunae and contradictions within and between

policies, implementation or management" (Bouckaert, Peters, and Verhoest 2010: 16). Expectations of what coordination can achieve are thus high.

Nevertheless, and despite the fact that coordination in the public sector is a widely studied phenomenon, there is little empirical knowledge on causal mechanisms and the impact of policy coordination (Trein et al. 2021). One of the reasons may be the fuzziness of the concept. According to Pressman and Wildavsky (1973), the term coordination is a tautology and therefore misleading since it remains unclear *what* actors should do. According to them, coordination can mean anything from exercising power – in the sense of vertical coordination within a federal system where central actors steers activities of lower-level actors – to finding consent.

Thus, in order to get a more nuanced understanding of the process of coordination, institutionalist approaches and governance literature usually distinguish between three main mechanisms or modes of coordination, namely market, hierarchy and networks (Bouckaert, Peters, and Verhoest 2010; Frances et al. 1991). According to Frances et al. (1991: 17), "any actual social analysis of coordination" will be based on these three models, either by combining or comparing them. Hierarchical coordination usually works through authority and power and relies on a central decision-making centre. Markets, in contrast, rely on competition and mutual adjustment of actors. In networks, coordination is "ruled by the acknowledgement of mutual interdependencies, trust and the responsibilities of each actor" (Bouckaert, Peters, and Verhoest 2010: 36). These three forms of coordination are usually understood as ideal forms, whereas empirically, hybrids which are combinations of the different modes of coordination usually emerge. I will elaborate below how these different forms of coordination are used in this study (see Section 2.2.2).

The second perspective on coordination is an outcome-based approach, where the idea is that elements of a system are "brought into alignment" or into "ordered patterns" (Thompson 2003: 37). A seminal definition of coordination as outcome goes back to Lindblom, who states that a "set of decisions is coordinated if adjustments have been made in it such that the adverse consequences of any one decision for other decisions in the set are to a degree and in some frequency avoided, reduced, counterbalanced, or outweighed" (Lindblom 1965: 154). The wording "to a degree and in some frequency" is important in this context indicating that the complete avoidance of contradictions, i.e., completely coordinated outcomes, may firstly neither be possible nor desirable due to the complexity and diversity of goals that exist in society, and the "inevitably contested nature of policy goals" (Greenwood 2016: 30). However, it seems that these inherent limitations to coordinated outcomes are seldomly considered in empirical studies on coordination.

Thus, while the need to understand coordination in the context of integrated natural resource management in particular, and in policy-making in general, is evident, the more classical literature on coordination of political science and public administration has its limitations. To get a more nuanced understanding of coor-

dination, their drivers and effects, institutional analysis literature and in particular polycentric governance – which by definition is about interaction of interdependent decision-making centres – seems to be suitable. In the following, I therefore give a short overview on polycentric governance literature.

2.1.2 Institutional analysis and coordination

The analysis of institutions aims at understanding the various ways in which formal and informal rules structure the behaviour of actors. While many different social science approaches exist to study institutions, such as the historical or sociological institutionalism, this study builds on institutional economics and approaches derived from the Bloomington School of Political Economy (see Baldwin, Chen, and Cole 2019).

Polycentric governance

The idea of polycentricity, as it is understood here, was introduced by Michael Polanyi and further developed by Vincent and Elinor Ostrom. The initial conceptual development goes back to the 1960s, a time when metropolitan governance was criticized by academics and the public as an "organized chaos" and as a "pathological phenomenon" due to the overlap of many different jurisdiction within one region (V. Ostrom, Tiebout, and Warren 1961). In contrast to this widespread opinion, V. Ostrom, Tiebout and Warren (OTW) (1961) argued that the fact that multiple decision-making authorities at different scales overlap and co-exist next to each other can also be productive. Reasons are that the provision and production of public goods and services can be organized at different scales and levels, and by different actors. However, also in their later work, the Ostroms did not assume that polycentric systems are necessarily more efficient; in contrast, they stressed that the performance of any governance system remains an empirical question (V. Ostrom 1999; E. Ostrom 2010a). Yet, over the decades, and through an impressive number of empirical studies of polycentric governance, they demonstrated that "complexity is not the same as chaos" (E. Ostrom 2010a: 644). Elinor Ostrom thereby referred to initial criticism on polycentricity, i.e., the one-sided view of limited efficiency of polycentric governance.

The seminal definition of polycentricity of OTW, which is the basis for much of the related literature and is also applied in this work, reads as follows:

> "Polycentric connotes many centers of decision-making which are formally independent of each other […] To the extent that they take each other into account in competitive relationships, enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts. […T]he various political jurisdictions in a [functionally interlinked…] area may function in a coher-

> ent manner with consistent and predictable patterns of interacting behaviour. To the extent that this is so, they may be said to function as a 'system'." (V. Ostrom, Tiebout, and Warren 1961: 831)

Three components of this definition are thereby particularly relevant for this work, namely structure, processes and outcomes of polycentricity. First, constituents of polycentric governance include the whole array of public sector organizations, of natural resource user groups, firms, or civil society organizations. Despite the notion of "centres of decision-making", this does not mean that to be part of a polycentric governance system, actors necessarily need to be able to enforce decision-making or compliance (McGinnis 2016). Further, actors have autonomous, but limited rights, meaning that they can be held accountable and that there is no actor with an "ultimate monopoly over the legitimate use of force in a polycentric political system" (V. Ostrom 1999: 55). The basic unit of analysis in polycentricity usually are individuals, but may also be organizations (V. Ostrom 1999), which is the focus of my work. The structure of polycentric governance in which these actors are embedded furthermore consists of a "complex system of powers, incentives, rules, values, and individual attitudes" (Aligica and Tarko 2012: 247). Institutions thereby play an important role, defined as "the rules of the game in a society [...], the humanly devised constraints that shape human interaction" (North 1990: 3). They may be formal, such as constitutions, laws, or property rights, or informal, such as sanctions, traditions, or codes of conduct. The second major component of polycentric governance relates to its procedural dimension, i.e., the mutual adjustment of actors. OTW (1961: 831) identified cooperation, competition, and conflict and conflict resolution as three main patterns, through which actors "take each other into account" and adjust their behaviour correspondingly. Third, the outcome of interaction and mutual adjustment of decision-making centres can be regularized patterns of overarching social order (McGinnis 2016). This emergent order should not be seen as something stable or in an equilibrium, but it is rather constantly reformed and reshaped by the constituents of polycentric governance (Aligica and Tarko 2012).

Research interest on polycentric governance has been steadily growing ever since and can be distinguished very broadly into two main approaches. The first approach relates to normative polycentricity theory, where authors describe from a normative perspective what should be in place for the emergence of polycentric governance, as well as the advantages of polycentricity (cf. Thiel 2017). Pahl-Wostl and Knieper (2014), for example, distinguish between four ideal-typical governance configurations, namely polycentric, fragmented, centralized coordinated, and centralized rent-seeking governance systems, depending on their degree of coordination as well as centralization. According to the authors, polycentric systems are coordinated and power is decentralized (Pahl-Wostl and Knieper 2014). Moreover, it is argued that polycentricity is conducive for adaptive capacity (da Silveira and

Richards 2013; Pahl-Wostl and Knieper 2014; Carlisle and Gruby 2017), for providing a better institutional fit (Carlisle and Gruby 2017) or for improving coordination (Kellner, Oberlack, and Gerber 2019), and supporting sustainable use of resources (Pahl-Wostl 2015).

The second broad strand of literature can be subsumed under positive polycentricity theory, where normative claims are empirically tested (cf. Thiel 2017). In contrast to the normative approach, authors argue that polycentricity is an ever-present empirical phenomenon with all policy system, "even the most hierarchical" ones, being polycentric in nature (Berardo and Lubell 2019: 7). This means that it is not possible to differentiate between polycentric governance systems on the one side and centralized on the other. Polycentricity is rather seen as a framework or a "lens" (Blomquist and Schröder 2019; Thiel 2017) to study particular empirical processes, where multiple decision-making authorities at different jurisdictional scales and sectors interact. It is argued that conditions which improve the performance of polycentric governance are to be rigorously studied, thereby departing from normative claims (Berardo and Lubell 2019; Jordan, Huitema, Schoenefeld, et al. 2018). Correspondingly, authors in this literature strand have applied and tested different theories, such as the Ecology of Games (Berardo and Lubell 2019), institutional change (Thiel, Pacheco-Vega, and Baldwin 2019; McCord et al. 2017), or concepts of power (Tormos-Aponte and García-López 2018). This study is positioned in the second field of research, aiming to understand causal relationships between context and governance structure, the behaviour of actors and resulting performance.

Independent from these different research approaches, polycentric governance has been applied mostly to environmental governance, including water (McCord et al. 2017; Villamayor-Tomas 2018; Pahl-Wostl and Knieper 2014), climate (Jordan, Huitema, van Asselt, et al. 2018), or forest governance (Andersson and Ostrom 2008); but also to metropolitan governance (McGinnis 1999), or social movements (Tormos-Aponte and García-López 2018). The reason of the broad interest of environmental governance scholars may be that a polycentricity lens is particularly well suited to study environmental problems (McGinnis 2016; Heikkila, Villamayor-Tomas, and Garrick 2018). This is because resource systems usually cross administrative and political boundaries, and environmental problems also manifest at multiple levels and scales. Moreover, due to interdependencies of natural resources and their uses, there is no one optimal scale for the governance of the respective resource, but actors from different scales and levels need to interact. While the river basin, for example, is widely considered to be the appropriate level for the governance of water (Molle 2009), actors from other scales and levels also need to be involved to deal with the complexity of water resources usages. The strong focus of polycentricity literature on the topic of water is therefore not surprising.

Theoretical and empirical research on complex policy-making processes, where multiple state and non-state actors interact at different levels, from the local to the

supranational, are not only studied under the umbrella of polycentricity. Indeed, multi-level-governance theories (Hooghe and Marks 2003), actor-centred institutionalism (Mayntz and Scharpf 1995; Scharpf 2000), intergovernmental relations (Agranoff 2001; Wright 1988), or co-governance (Tosun, Koos, and Shore 2016) analyse related questions.

However, despite this broad scholarly attention on polycentricity and related fields, important research gaps and challenges remain. These are gaps on the relationship between governance structure and processes (Lubell, Robins, and Wang 2014), as well as between different independent variables and the performance of polycentric governance. The latter includes inter alia remaining questions on how constitutional rules (Thiel 2017), interests of actors (Kellner, Oberlack, and Gerber 2019), as well as processes (Thiel 2017) relate to performance. The fact that there is no consensus on a common framework of polycentricity among scholars, as shown above, certainly is a challenge in consolidating findings concerning these questions. Further, studies often also lack precise definitions and operationalization of polycentric governance, which Heikkila et al. (2018) explain by the fact that many scholars approach polycentricity from a binary perspective.

A further research gap concerns empirical and theoretical questions on the processes of "mutual adjustment", as introduced by OTW (1961). Indeed, although many authors build on the three authors, there is neither a consensus on definitions and measurement of different patterns of interaction, such as cooperation, competition, coercion or conflict; nor on the terms as such. Other concepts to approach "mutual adjustment" used in the literature are, for example, orchestration relying on inducement and incentives (Abbott 2017); adjustment through linkages (Pattberg et al. 2018); or self-organization, mutual adjustment, experimentation, trust-building and activation of overarching rules (Kellner, Oberlack, and Gerber 2019). Furthermore, comparative studies on the different forms of coordination in polycentric governance, as well as how these different types come about and perform, hardly exist. Not surprisingly, empirical studies on hybrid forms of interaction, as well as their theoretical underpinning on how to measure them, are even more rare.

The Institutional Analysis and Development Framework

A further key element of the Bloomington School is the IAD Framework, developed by Elinor Ostrom (2005). The framework focuses on the role of institutions in processes of collective action, where humans interact with each other and with the environment, thereby producing joint outcomes. The main unit of analysis are Action Situations, defined as "social space where participants with diverse preferences interact, exchange goods and services, solve problems, dominate one another, or fight" (E. Ostrom 2005: 14). The IAD Framework has been developed to study collective action problems of natural resource uses at the local level, and has been applied to case studies worldwide (Gibson, McKean, and Ostrom 2000; Cox, Arnold, and Villama-

yor-Tomas 2010). The use of this common framework allowed scholars to develop design principles to explain the success of managing common pool resources (E. Ostrom 1990; E. Ostrom 2005; Cox, Arnold, and Villamayor-Tomas 2010).

McGinnis (2011) further developed the IAD through the so-called Network of Adjacent Action Situations, in order to study complex policy settings, where decision-making processes at differen levels occur sequentially or simultaneously and interact with each other. Action Situations are thereby "adjacent to each other when outcomes generated in one action situation help determine the rules under which interactions occur within the other action situation" (McGinnis 2011: 52). The Network of Adjacent Action Situations has been applied to study nexus questions (Kimmich 2013), and influenced further frameworks such as the Combined IAD-Social-Ecological Systems (SES) Framework (Cole, Epstein, and McGinnis 2019).

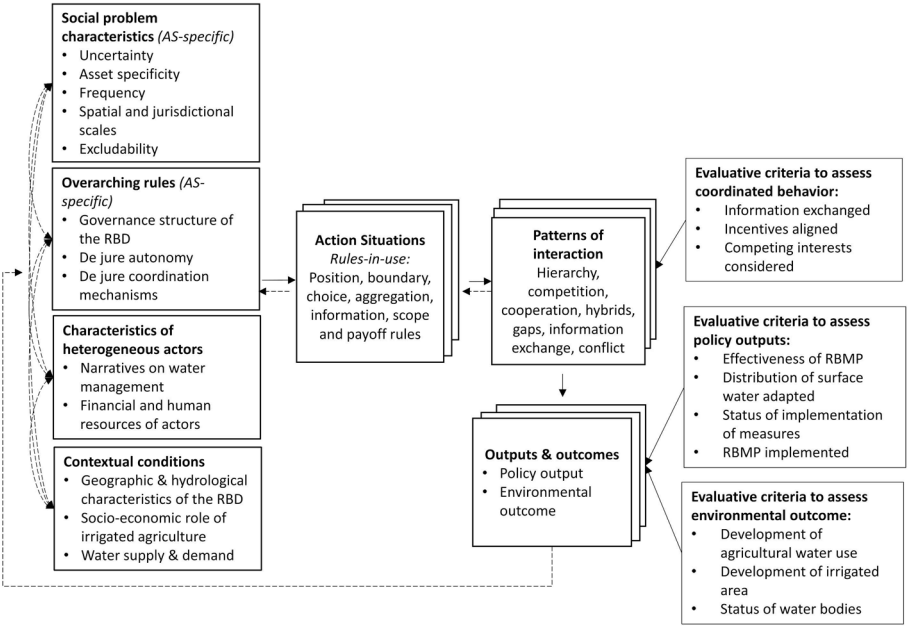
The IAD Framework is similarly applicable at higher analytical levels, such as the field of policy analysis (Schlager 2007), also aiming to understand the production of public goods or services (Heikkila and Andersson 2018). One strength thereby is the conceptual breath of the IAD which allows to apply it to any stage of the policy cycle, from planning and decision-making to implementation and evaluation (Heikkila and Andersson 2018). Furthermore, the IAD has also been used to analyse interaction of actors in polycentric governance (Koontz et al. 2019), or in the context of coordination between the water, energy and food sector (Srigiri and Dombrowsky 2022). According to Thiel (2017: 63), the IAD can be "considered an operationalization of polycentricity for local common pool resources".

2.2 Development of the conceptual framework

After having given a brief overview on different literature strands on coordination, I will in this section develop the conceptual framework that will be applied to the empirical case studies. I outline the different components of the theoretical framework as well as its variables, clustered along structure, process and performance of polycentric governance. The underlying reason is the assumption that the broader context, institutions and characteristics of actors affect human interaction and outcomes (E. Ostrom and Cox 2010). A framework, as it is understood in institutional analysis, brings together different concepts and theories which are needed to understand a particular phenomenon, and establishes general relationships among these different elements (E. Ostrom 2019; Schlager 2007). Frameworks therefore "provide a foundation for inquiry" for institutional analysis (Schlager 2007: 293) and are particularly useful in the context of understanding policy-making under high complexity (Cairney, Heikkila, and Wood 2019). Figure 1presents the conceptual framework of this study, including first and second-tier variables.

Variables included in the study's framework are expected to mutually influence each other, they interact or are configural. Combinations of different institutional rules, for example, can be more important than a rule on its own (Heikkila and Gerlak 2019). I therefore take scope conditions and configurations of variables into account in the empirical analysis. Thereby, contingency of causal relationships is highlighted, meaning that causal mechanisms depend on contexts and scope conditions (see also Chapter 3 on the understanding of causality). However, the assessment of feedback loops, i.e., the way how dependent variables again influence independent variables, is beyond the scope of this study. Variables included in the conceptual framework are selected inductively and deductively. This iterative process allowed to include preliminary insights from the case studies to adapt and refine the theoretical framework (George and Bennett 2005), thereby ensuring that variables included in the framework are of empirical relevance for the case studies.

Figure 1: Theoretical framework with first- and second-tier variables



Source: Own illustration based on Thiel and Moser (2019) and Ostrom (2005). Dashed arrows indicate potential feedback loops. They are not analysed in this study.

There are several underlying assumptions of the framework and this study which are also shared by the Bloomington School. These are firstly bounded rationality, meaning that actors are intentionally rational, but only have incomplete information, as well as limited cognitive capacity and time to process this information (Simon 1947). Nonetheless, individuals are able to change formal and informal rules in a way that outcomes can be achieved which are beneficial for the society (E. Ostrom 1990). Furthermore, the analysis is based on methodological individualism, explaining social phenomena through choices of individual actors which follow their preferences and are influenced by institutions. Individuals are conceptualized as fallible learners (Aligica and Boettke 2011), meaning that they make mistakes and may also repeat them, but are in the same time able to learn. Lastly, institutions influence perceptions and preferences of actors, and thereby their behaviour, but are not deterministic (Scharpf 2000).

In the following section, I will define variables included in the theoretical framework, embed them within the broader theoretical literature and justify their selection. The more concrete measurement of the different variables, as well as the data basis for the empirical analysis will then be discussed in Chapter 3. Whenever theoretically meaningful, I will formulate expectations on how variables are assumed to influence coordination in general, and the three pure forms of coordination that are core to this study in particular, i.e., *hierarchy, competition,* and *cooperation* (for their definitions, see section 2.2.2); as well as on how variables will influence the performance of polycentric governance. However, these expectations cannot be seen as strict hypotheses that are going to be tested but they rather justify why the different variables are considered important for the framework. The effect of the different variables on *hybrids* and *gaps of interaction* will not be addressed due to the large amount of potential hybrid forms and related research gaps; and due to research gap on determinants of gaps of interactions. However, determinants of specific *hybrid* forms as well as of *gaps of interaction* and of *conflict* that result from the comparative analysis of this work will be discussed in Chapter 7.

2.2.1 Structure of polycentric governance

In this section, I will define independent variables of the framework, justify their selection, and embed them in the theoretical literature. Variables in this study are grouped along i) contextual conditions, ii) characteristics of heterogeneous actors, iii) overarching rules, and iv) social problem characteristics. The analytical level for the empirical analysis of contextual conditions and characteristics of heterogenous actors is the river basin district; while overarching rules and social problem characteristics will be analysed at the level of Action Situations. For an overview of the study's independent variables and their definitions, see Table 1.

Table 1: Overview of the study's independent variables

First-tier variable	Second-tier variable	Definition
Contextual conditions	Geographic and hydrological characteristics of the river basin district	Location, administrative and hydrological boundaries of the river basins; geography; main ecosystems.
	Socio-economic role of irrigated agriculture	Relative importance of irrigated agriculture and the agri-food industry compared to other economic sectors for economy and society.
	Water supply and demand	Type and amount of water resources available for consumption.
Characteristics of heterogeneous actors	Financial and human resources of actors	Endowments of public, private, and civil society actors in relation to the case study focus.
	Narratives on water management	Causal and explanatory beliefs of actors regarding status and reasons of existing water management problems.
Overarching rules *(Action Situation-specific)*	Governance structure of the river basin district	Distinction between intra- and inter-regional RBDs.
	De jure autonomy	Extent of formal rights and competencies of governmental and non-governmental actors as stated by laws and regulations with respect to the case study focus.
	Formal rules for coordination	Formal institutions creating the structure for actors to interact with each other.

Social problem characteristics *(Action Situation-specific)*	Uncertainty	Complete lack of information, or insufficient information.
	Asset specificity	Investments for a specific good or service which cannot be easily transferred to alternative uses.
	Frequency	Number of times specific activities occur within a particular time period.
	Spatial and jurisdictional scale	Dimension to study a particular phenomenon.
	Excludability	Possibility to exclude additional actors from using or suffering from a produced good or service at reasonable costs.

Contextual conditions

Contextual conditions refer to the external environment in which river basin governance is embedded, and which are assumed to be stable over a relatively long period. Contextual conditions are not explicitly included in frameworks of polycentric governance as an own category (see Thiel, Blomquist, and Garrick 2019). However, conditions of the biophysical and resource environment play a prominent role in the IAD, and even more the SES Framework (E. Ostrom 2009), where they are assumed to influence any type of action situation.

First, *geographic and hydrological characteristics of the River Basin District* refer to general characteristics such as location, administrative and hydrological boundaries of the river basins, as well as affected geographical areas and important ecosystems. Administrative as well as hydrological boundaries are decisive for who is involved in, as well as affected by governance processes, thereby also influencing the coordination of actors. Further, geography and ecosystems are important factors influencing the type of agriculture, for example its production system (small- vs. large-scale farming), cultivated crops, or type of irrigation. This, then, shapes interests of involved actors, and thereby also their interaction.

Second, *socio-economic role of irrigated agriculture* refers to the relative importance of irrigated agriculture and the agri-food industry compared to other economic sectors for overall economy and society. Further, economic characteristics of different crops used in the case study, as well as their water consumption are explained. This variable builds on the SES Framework, which includes the economic value of natural resources and their importance for actors (E. Ostrom 2007). Indeed, the role of agriculture for economy and society is decisive for actors' interests and their economic resources, thereby also shaping their interaction. We can for example assume that

the higher the importance of irrigated agriculture, the more competitive processes to reduce agricultural water consumption will become.

Third, the variable *water supply and demand* refers to the type and amount of water resources available for consumption, e.g., for irrigation, industry or domestic purpose. I thereby distinguish between surface water, groundwater, non-conventional resources (i.e., desalinated resources and treated wastewater), and external resources transferred from other river basins. The amount of water supply does neither include surface water that is required for ecological flows according to WFD requirements, nor groundwater which is required to ensure good status of water bodies. This is because these amounts are, at least in theory, not available for consumption. However, in practice, these amounts could nonetheless be consumed, e.g., through illegal groundwater consumption. This would then mean that actual demand exceeds water supply, which then has implications for the governance process. Furthermore, also the type of water resources matters for governance processes. This is because the way water resources are extracted, stored, and distributed, as well as how their uses are regulated and monitored, considerably differs from one to each other. Indeed, there is broad empirical evidence that different forms of institutional arrangements are required for governing the distribution and use of groundwater (Molle and Closas 2020), non-conventional resources such as desalinated water (Williams and Swyngedouw 2018), or water transfers (Hernández-Mora et al. 2014). Management of groundwater in Spain, for example, relies on the one hand on cooperation between water users and water authorities, and on the other on regulations for monitoring and sanctioning (López-Gunn and Cortina 2006). A hybrid of negative incentives and hierarchical steering is thus used. It is to assume that state authorities, in contrast, take more hierarchical decisions to allocate regulated surface water. Last, also the amount of water is decisive for interaction of actors. Molle et al. (2010) show that in river basins where water abstraction exceeds the threshold of renewable water – which they frame as closed or closing river basins – different institutions as well as patterns of governance emerge, and are also required to fulfil societal and environmental demands. I expect for example that in closed river basins, competition or even conflicts among water users as well as between the agricultural and environmental sector is more likely than in river basins where water resources are more abundant.

Overarching rules

The functioning and emergence of polycentric governance depends upon particular overarching and constitutional rules that enable self-organization and mutual adjustment of relevant actors (V. Ostrom 1999; Thiel 2017). They create the main structure based on which the governance system is built, and thereby define which and how actors can interact (Carlisle and Gruby 2017). While authors agree on the general importance of overarching rules – which I equate with what other authors call

"constitutional rules" – there is no consensus on how exactly they affect polycentric governance. OTW (1961) see these rules as the necessary conditions for the emergence and functioning of polycentric governance. Similarly, Jordan et al. (2018) state that performance of local initiatives is highest when there are overarching rules in which the goals to be achieved are anchored, and which define how conflicts are to be resolved. Yet, Thiel and Moser (2019) argue that while they may be conducive for the emergence and proper functioning of polycentric governance, empirical knowledge on whether they present a necessary condition is lacking. Reasons for this lack of empirical evidence may be the broad range of overarching rules that are used in the literature, as well as partly missing operationalizations. Aligica and Tarko (2012), for example, identify four main overarching rules. These are rules which regulate the type of jurisdiction of decision centres (territorial or non-territorial); the role of actors in designing rules; the alignment between rules and incentives; and the mechanism to aggregate collective choice. In a review of polycentric governance literature, Thiel (2017) derived further overarching rules from normative polycentricity theory, such as rules to resolve conflicts, freedom of speech, or the independence of decision-making units. Thus, while there is a broad range of overarching rules, no consistent operationalization has yet emerged in the literature (Jordan, Huitema, Schoenefeld, et al. 2018). Further, in empirical studies, authors often do not specify which overarching rules they analyse (see for example Kellner, Oberlack, and Gerber 2019; or Carlisle and Gruby 2018), which makes it difficult to consolidate findings.

In this work, I consider overarching rules to be formal rules, which are – in contrast to informal rules or rules-in-use – formalized and written down (Heikkila and Andersson 2018). However, whether these formal rules are actually followed and implemented is an empirical question. Informal rules that will be analysed in this study are discussed below in relation to the analysis of Action Situations (see section 2.2.2). Overarching rules include three second-tier variables. First, there is the *governance structure of the river basin district,* which distinguishes between intra- and inter-regional river basin districts. The Spanish National Water Law stipulates that intra-regional basins are governed by regional authorities, and inter-regional basins by the national state through so-called *Confederaciones Hidrográficas*. This has important implications for coordination of actors since in intra-regional basins, the respective *Confederación Hidrográfica* needs to interact with all concerned regions. Garrick and De Stefano (2016) discuss coordination challenges that are specific for federal rivers, such as issues of fit, mismatch or fragmentation. More specifically for the Spanish context, empirical studies show that in inter-regional basins, conflicts between affected regions over water allocation and distribution of authority are predominant (De Stefano and Hernandez-Mora 2018). It is therefore to expect that interaction differs between inter- and intra-regional basins (see also Chapter 3 on case study selection).

The second variable is *de jure autonomy,* defined by the extent of formal rights and competencies of governmental and non-governmental actors as stated by laws and regulations with respect to the case study focus. Autonomy of actors is an essential characteristic of polycentricity, since polycentricity, by definition, is about the interaction of *autonomous* decision-making centres (V. Ostrom, Tiebout, and Warren 1961; Aligica and Tarko 2012). However, the degree of required autonomy is not self-evident (Carlisle and Gruby 2017). Authors therefore speak about "considerable independence" (Andersson and Ostrom 2008: 79) and Carlisle and Gruby (2017: 7) highlight the "context-specific nature of the necessary or appropriate degree of autonomy". *De jure autonomy* certainly shapes patterns of interaction, even though exact mechanisms are difficult to predict since de jure autonomy of actors may not necessarily be translated into de facto autonomy. De jure autonomy of actors can for example be restricted in practice due to lack of financial resources or due to power dynamics resulting from informal rules; similarly, de facto autonomy may also exceed formally granted rights for specific actors. Indeed, characterizing different patterns of interaction into *cooperation, competition* or *hierarchy* rather depends on how actors interact in practice than what is stipulated by law. Nonetheless, it is important to understand also underlying formal rules regulating autonomy of actors since it can be assumed that in a functioning constitutional state, formal rules indeed influence interaction of actors to certain degree. Thus, I assume that if an actor has formal autonomy to enforce decisions vis-à-vis other actors, *hierarchical* patterns are more likely to emerge; if actors have limited formal autonomy and therefore depend on each other, *cooperation* is more likely; and last, for *competition* to emerge, it is important that actors are independent from each other in their formal autonomy. Further research is needed though on how the quality and degree of autonomy affects performance of polycentric governance (Carlisle and Gruby 2017).

Second, *formal rules for coordination* are understood as institutions creating the formal structure for actors to interact with each other, stipulated by formal rules at different levels. These rules influence capacity of actors to solve societal problems (Scharpf 2000). On the one hand, these formal rules can take the form of what Berardo and Lubell (2019: 22) understand as policy forums, defined as the "physical spaces" where actors meet and interact. Referring to the empirical case studies, these physical spaces for instance take the form of River Basin Water Councils. Additionally, I also address formal regulations that define how actors interact regarding specific policy issues, such as regulations on fees for water usage. Policy forums as well as more specific regulations lay the foundation for *hierarchical*, *cooperative,* and *competitive* patterns of interaction (see section 2.2.2 for detailed elaboration on processes of interaction). However, whether these *formal rules for coordination* also result in actual coordination process, and in which type of interaction pattern, highly depends on informal rules. In the empirical analysis, I therefore do not classify the dif-

ferent formal rules along the pure forms of coordination; in contrast, classification into different patterns of interaction is only undertaken at the process level.

There are further overarching rules which are prominently discussed in the literature but are not included here. This is because I thereby avoid overlaps with Ostrom's 7-rule typology which I use to characterize Action Situations (see below), such as the regulation of collective choice (Aligica and Tarko 2012). Furthermore, some of the rules discussed in the literature play an subordinate role in the empirical processes, such as rules ensuring that constitutions are enforceable against those who exercise the power (V. Ostrom 1999). Nevertheless, I acknowledge that actors may be influenced by the latter, by interacting in the shadow of fundamental constitutional rules.

Social problem characteristics

Social problem characteristics are a further element of the polycentricity framework developed by Thiel et al. (2019). It builds on New Institutional Economics literature, thereby drawing on Williamson (1985), which emphasizes that the choice and design of policies strongly depends on specific characteristics of the respective social or environmental problem to be governed. Social problems are here understood as "cases where actors' observations do not correspond to what they desire as state of affairs" (Thiel and Moser 2019: 77). Also in environmental governance literature, authors argue that governance modes need to match specific problem characteristics. Ingold et al. (2019), for example, provide empirical evidence that focusing and distinguishing between different types of environmental problem characteristics is a precondition for effective governance. However, these characteristics are not fixed and may vary over time, depending inter alia on applied technologies or the institutional context (Thiel and Moser 2019). Further, they depend on actors' perception, since as Clement (2010: 138) argues, "actors' decisions depend on their perception of the world rather than on the actual characteristics of the social and ecological system they evolve in". However, while the general importance of linking specific problem characteristics with forms of governance is acknowledged in the literature, Thiel et al. (2016) observe a research gap on how these characteristics affect governance performance. Furthermore, theoretical literature seldomly seems to distinguish between the role of problem characteristics for different phases of policy-making. As I argue in the following paragraphs, it often does make a difference whether social problems relate to the phase of policy development, or whether it concerns implementation of policy decisions on the ground. In the empirical analysis (Chapter 4–6), I will therefore analyse *social problem characteristics* at the level of Action Situations, since concrete empirical problems to which problem characteristics apply differ across Action Situations.

The first characteristic is *uncertainty,* which is understood as insufficient information as well as lack of complete information. Schlager and Blomquist (2008)

distinguish between "system uncertainty", where cause-effect relationship are not known, and "scientific uncertainty" relating to the "absence of agreement among scientists about the nature of the resource system and its dynamic behaviour" (Schlager and Blomquist 2008: 5). Furthermore, in his study on hybrids, Ménard (2004) distinguishes between uncertainty in relation to input, output and the transformation process itself. In a policy context, this means that actors are confronted with lack of information or lack of scientific agreement on the extent and form of specific societal problems that are core to a policy decision (Adam et al. 2019) (i.e., uncertainty on input); on how certain problems need to be governed (Ingold et al. 2019) as well as how actors will behave during policy-making (i.e., uncertainty on the process); and on the effectiveness of policy design and related measures to solve certain problems (Adam et al. 2019) (i.e., uncertainty on the output). Furthermore, it is to assume that actors perceive but also are confronted with different levels of uncertainty, depending on their role in the policy process. Governmental actors in charge of developing a RBMP may be faced with lower levels of uncertainty regarding the output of a process than stakeholders who only participate at specific points in time. In the empirical analysis, I will therefore distinguish between *uncertainty* regarding input, process, and output; as well as consider different perspectives of main actors involved.

These different facets of uncertainty have implications for coordination of actors, such as who needs to interact when, how often, at which scale, or through which mechanisms to facilitate exchange of information. One can for instance assume that where scientific communities provide highly contradictory or conflicting data, a broader range of actors needs to be involved. Indeed, Ingold et al. (2019) for instance argue that when information is lacking, coordination of policy-makers with scientists needs to be enhanced through so-called "bridging organizations". Similarly, where policy problems depend on and are shaped by the specific local context, vertical coordination with local actors may be required. Adam et al. (2019) therefore hypothesize that the higher the degree of uncertainty, the higher the need for coordination. However, in case of systemic uncertainty, more or improved data may not necessarily reduce the level of uncertainty (Schlager and Blomquist 2008). In these situations, cooperative fora may be necessary to reach common understandings on how to deal with uncertainty. However, it could also lead to competition of actors for ideas, with lobby groups competing over how to interpret the data. In general, flexible institutions that adapt to newly generated information and knowledge seem to be important in situations of high uncertainty. Furthermore, high uncertainty on the outcome of a process may increase the likelihood of opportunistic behaviour by involved actors (E. Ostrom 2019). Kirschke and Newig (2017) also suggest that depending on the degree of uncertainty, different types of interaction, which they classify in hierarchy, deliberation, and negotiation, are required to solve societal problems. Last, uncertainty also influences policy outcomes. Indeed, the failure

to acknowledge that water governance problems are almost always driven by uncertainty is likely to lead to poor policy outcomes.

Second, *asset specificity* arises when investments for a specific good or service cannot be easily transferred to alternative uses, and therefore create lock-in effects (Williamson 1985). Asset specificity has important implications for interaction of actors by influencing the likelihood of opportunistic behaviour, understood as "deceitful behaviour intended to improve one's own welfare at the expense of others" (E. Ostrom 2019: 32). If asset specificity is high, the likelihood of actors behaving opportunistically increases and specific coordination instruments are needed to deal with these risks (Williamson 1985). In the context of policy-making, asset specificity plays out differently depending on whether it concerns the development of policies; or the implementation phase, where for example investments in drip irrigation infrastructure is unique to the respective water user and cannot be used by the neighbouring one. In the phase of policy development, asset specificity is high when target groups are heterogenous, which then increases the need for coordination (Adam et al. 2019). This is because a more diverse target group of a policy implies that a "one-size-fits-all" approach will not be effective. In contrast, policy-makers rather need to coordinate with implementers on the ground, as well as with affected actors in order to collect context-specific information (Adam et al. 2019). We can assume that high specificity of policy decisions due to heterogenous target groups does not only increase the need for coordination in general, but more specifically, also the need for cooperation. Indeed, to reduce the risk of opportunistic behaviour by actors, and incentivize them to provide required context-specific information, cooperative approaches where local actors benefit from sharing of information may be productive. Moving from policy development to the phase of policy implementation, the role of asset specificity for different types of interaction may vary. Indeed, in the case of investment in large-scale infrastructure such as a dam, for example, high asset specificity may rather reduce actors' willingness to cooperate (Steinacker 2009). The underlying reason is that risks for asset-specific investments are higher. Higher-level governments may therefore introduce legally binding hybrid mechanisms in the form of contracts through which local-level actors commit to invest as well (Feiock 2013). Thereby, opportunistic behaviour may be reduced. Thus, the way asset specificity affects interaction is very context specific; it for example depends on whether it relates to policy development which is human resource-intensive, or rather the capital-intensive building of large-scale infrastructure.

Third, social problems can also be characterized by *frequency*, defined as the number of times specific coordination activities occur within a particular time period. High frequency usually means that transaction costs per unit decrease since standardized procedures and routines can be used (McCann and Garrick 2014). In the phase of policy development, this means that if policy decisions are taken frequently, we can expect that the relative need for coordination among concerned

actors decreases. Adam et al. (2019) explain this by learning processes that occur when policy-makers interact repeatedly. However, the authors also argue that despite these learning processes, there may be high demand for coordination in situations where "congested policy spaces" emerge; thus, where multiple policies interact and where affected actors have deeply entrenched interests (Adam et al. 2019: 7). This shows that the effect of frequency on interaction of actors depends on the context, which is why a thorough empirical understanding of the respective social problem is necessary. Concerning the effect of frequency on the specific type of coordination, I assume that if frequency is high, hierarchical forms of coordination which rely on formalized procedures and clear lines of control are particularly justifiable. In contrast, the need for deliberation that is specific for cooperative patterns of interaction may rather decrease. On the other hand, though, an empirical analysis of Villamayor-Tomas (2017) on the reaction of water users to external disturbances such as climate-related events shows that if disturbances occur frequently, probabilities for cooperation within Water User Associations (WUAs) increase. I therefore again conclude that it is difficult to make general claims on how frequency impacts the need for different types of coordination.

Spatial and jurisdictional scale is a further aspect to describe social problems. Scale is defined as the dimension to study a particular phenomenon, whereas levels refer to the "units of analysis that are located at different positions on a scale" (Gibson 2000, cited in Cash et al. 2006). For my study, hydrological as well as jurisdictional scales are of particular interest, with the respective levels of basin and sub-basin, as well as the EU, national and regional level. The underlying idea is that institutional arrangements are only effective if they match the problems they address (Young and Underdal 1997). The variable is of particular relevance for polycentric governance, which is by definition about the production of goods and services at different levels. Ostrom (2012) also highlights that one of the main strengths of polycentric systems indeed is the fact that actors at multiple levels may complement each other in the production of public goods. Issues of scale affect interaction of actors in a very basic way, by determining who needs to be involved in coordination. Allocation of water at the basin level, for example, requires coordination across spatial and jurisdictional levels with irrigation districts and different state jurisdictions. Thus, more coordination is required than if the location did not matter (McCann and Garrick 2014).

Strongly related to scale is the characteristic of *excludability*, referring to whether it is possible to exclude additional actors from using or suffering from a produced good or service at reasonable costs. In the case of non-excludable goods, where it is either too costly or physically not possible to exclude actors, negative externalities may occur. This means that costs are imposed on actors that did not agree to incur them. To avoid these spatial misfits, governance needs to be organized at "scales that coincide with the level at which exclusion is possible" (Thiel and Moser 2019: 79). However, there is no straightforward answer to the question of the appropriate level

for the production of public goods. Increasing spatial fit, e.g., through the creation of a River Basin Authority as advocated by the concept of Integrated Water Resource Management, may for instance create new spatial misfits or problems of institutional interplay (Meijerink and Huitema 2017; Lee, Moss, and Kong 2014). Notwithstanding, the degree of excludability certainly affects types of coordination in different ways. The exclusion of unauthorized users from withdrawing groundwater, for example, involves relatively high costs for the state. Combining hierarchical enforcement of rules by the state with cooperative behaviour within WUAs based on trust and mutual acceptance of rules may be productive. Further, McCann and Garrick (2014) take the example of environmental flows as public good which are non-excludable. It has the effect that especially in overallocated basins – such as the three case studies under investigation – irrigators may oppose reallocation from private to environmental use due to high private costs of giving up water rights compared to the "distributed, public costs and benefits of environmental restoration" (McCann and Garrick 2014: 19). We can therefore assume that this opposition by irrigators favours competitive behaviour between the agricultural and the environmental sector. On the other hand, organizing interests on behalf of public goods such as environmental flows is usually difficult, which will then again have implications for the patterns of interaction that emerge.

Finally, it is important to recognize that social and environmental problems are usually influenced by a variety of problem characteristics. Specific coordination strategies to deal with uncertainty, such as involving a wide range of scientists, as well as local experts, may for example be too costly for policy decisions that only concern a very specific set of actors. Different configurations of social problem characteristics therefore also require a variety of combinations of patterns of interaction (Ingold et al. 2019; Villamayor-Tomas 2017).

Characteristics of heterogeneous actors

Characteristics of heterogeneous actors combine the characterization of actors as used in the SES Framework (E. Ostrom and Cox 2010) and the Politicized IAD Framework (Clement 2010) with the focus on heterogeneity among actors, as highlighted in the polycentricity framework (Thiel, Blomquist, and Garrick 2019). The fact that actors are heterogenous and have different values and preferences about public and private goods is key to the Bloomington School, aiming to understand the "institutional arrangements that make it possible for people with different values to peacefully coexist and self-govern" (Aligica and Tarko 2013: 727). Due to different interests of actors, there are diverse ways of providing for and producing public goods, which is why polycentric governance is seen as particularly well suited to do justice to heterogeneity of actors (Thiel and Swyngedouw 2019). Actors can be characterized various dimensions, including their interests, values, economic resources, or socio-cultural backgrounds. However, socio-economic characteristics of actors do not only affect

their capacities to self-organize and solve collective action problem, but also the way these characteristics differ across groups is decisive. In the context of institutional collective action dilemmas, Feiock (2013) for example argues that social, economic, structural, and political heterogeneity of actors influence their preferences for collaboration by increasing transaction costs of aggregating different preferences. Although scholars seem to agree that heterogeneity of actors influence governance processes, it remains largely "undertheorized and under-researched", as Thiel and Moser (2019: 86) write. I will analyse *characteristics of heterogeneous actors* for the overall case study, i.e., across Action Situations. Even though I acknowledge that resources as well as interests of actors are not stable but may change over time, the assumption that actors are boundedly rational also implies that interests concerning the overarching governance process are more or less consistent across Action Situations.

More specifically, I first analyse *financial and human resources* which relate to endowments of public, private, and civil society actors in relation to the case study focus. Economic attributes of actors are also included in the SES Framework (E. Ostrom and Cox 2010). It seems self-evident that financial and human resources influence the capacity of actors to participate in governance processes, to coordinate with other actors, and to implement policies in a coordinated way. Indeed, in the political debate, the lack of financial resources and trained personnel is often seen as impediment of policy coordination (UNDP 2017). Moreover, differences in resource endowments between actor groups may affect their interaction, e.g., by leading to unequal power dynamics. It is therefore to assume that actors with more financial resources have higher capacities to influence policy outcomes than others. Further, in a study on coordination in collaborative partnerships, it is shown that individuals are more likely to coordinate with actors that hold financial resources (Calanni et al. 2015). Since absolute numbers on financial and human resources are difficult to obtain, I will assess resources of actors in relative terms, meaning that I will compare amount of resources between actor groups.

Second, *narratives on water management* relate to causal and explanatory beliefs of actors. Narratives are defined as actors' causal interpretation of status and reasons of existing problems, and their corresponding solutions (Molle 2008). Narratives build on interests and political preferences of actors and have been studied particularly in political ecology scholarship; and more recently have gained importance also in policy process theories, e.g., under the Narrative Policy Framework (M. D. Jones and McBeth 2010). In institutional analysis literature, narratives relate to what authors call "mental models", understood as cognitive constructs that are used to make sense about the world and interpret the external environment (Nath and van Laerhoven 2021; E. Ostrom and Janssen 2004). Furthermore, Ostrom (2005) includes norms as delta parameter in the IAD, representing costs and benefits that actors ascribe to obeying to normative prescriptions in a particular situation. However, Clement (2010) argues that this only insufficiently considers how interests shape the craft-

ing of institutions, which is why she proposes to also analyse discourses and power in the Politicized IAD Framework, as has been applied also by other authors (e.g., Whaley and Weatherhead 2014). To understand actors' narratives in relation to the case study focus, I draw on the study of Cabello et al. (2018) who identify narratives on water management in relation to the WFD implementation in Southern Spain. More specifically, I analyse the narratives of i) supply-side management, where water scarcity is explained as problem of water infrastructure not supplying sufficient water; of ii) demand-side management, perceiving water scarcity as the result of an excess in water demand at an individual level; of iii) knowledge and governance, which defines water scarcity as problem of governance not being able to deal with water management problems; and lastly, of iv) deep ecology, where water scarcity is considered as human-induced, whereas ecosystem needs should constrain human activities (Cabello, Kovacic, and Van Cauwenbergh 2018). These narratives are by definition simplified visions of reality (Molle 2008), and therefore do not fully reflect the diversity of actors' interests and values. It seems obvious that the way how people see and perceive a particular problem and corresponding solutions affects how they interact with each other. Indeed, it is assumed that narratives influence policy formation, policy implementation as well as policy outcomes (Shanahan, Jones, and McBeth 2011), and that acknowledging values helps understanding drivers of decision-making in collective action (van Riper et al. 2018). Whaley and Weatherhead (2014) argue that actors consciously and subconsciously position themselves in relation to particular issues in an Action Situation, depending on their ideas, concepts and ways how they see the world, which I would argue then also influences their interaction. Furthermore, there is evidence on how differences in actors' narratives shape interaction. Tosun et al. (2016) state that interaction patterns of private and public actors – distinguishing between cooperation, conflictual competition and cooperative competition – depends on congruence of actors' goals. We can thus expect that when stakeholders have very different narratives on water management, competitive patterns emerge, where actors lobby for different solutions. On the other hand, higher-level actors may also initiate participatory processes aiming to build joint understanding to overcome differences in existing narratives.

2.2.2 Processes of mutual adjustment in polycentric governance

Following the above mentioned seminal definition of V. Ostrom et al (1961: 831), actors in polycentric governance "take each other into account" and coordinate their actions through processes of mutual adjustment. A key question in polycentric governance research therefore is how these processes of mutual adjustment come about and how they look like (Jordan, Huitema, Schoenefeld, et al. 2018). However, as already indicated above, there is no consensus among scholars on either what these key types of interaction are or how they are operationalized. Drawing on Thiel et

al. (unpublished manuscript), as well as on public policy and public administration literature on coordination (Bouckaert, Peters, and Verhoest 2010; Thompson 2003), I distinguish between *hierarchy*, *competition*, and *cooperation* as three different pure forms of coordination, as well as *hybrids* which combine different pure forms of coordination; and *exchange of information, conflicts,* and *gaps of interactions* as additional categories to understand interaction of actors (see Table 2 for an overview on definitions).

In line with much literature (Wildavsky 1973; Scharpf 1994; Peters 2018), I thus see coordination as an umbrella term, which can take many different forms. For the purpose of this work, I define coordination as a *process in which actors exchange information and mutually adjust their behaviour*. Whenever I use the term coordination in this work, I therefore refer to a *process*; while I use the term "coordinated behaviour" to refer to coordination as outcome (see also below, 2.2.3). This way of employing the term coordination is in contrast to scholars who see coordination as an independent category and distinguish it, for instance, from cooperation (Pahl-Wostl et al. 2020), based on the idea of measuring different degrees of acting together. The three pure forms of coordination – hierarchy, competition, and cooperation – represent ideal types in the Weberian sense. They are therefore rather used as a heuristic to analyse the complexity of governance processes, and do not present definite forms of organizations (Thompson 2003). In the real world, they will become visible through *hybrids*, where pure forms of cooperation, competition, and hierarchy overlap.

The study of hierarchy and competition (through markets) is rooted in long-standing scientific and political debates, where it was assumed that markets are the optimum institution to produce private goods, whereas the hierarchical state would be ideal to produce public goods (cf. E. Ostrom 2010a). Furthermore, hierarchy was for a long time considered the conventional and default type of coordination within administrations (cf. Peters 2013). The binary world view on markets on the one side, and hierarchies on the other, has been challenged by OTW (1961), and the subsequent work of the Bloomington School. Also in other fields, scholars argued for a "third" forms of coordination to better capture the diversity of coordination processes (Tenbensel 2005; Powell 1990). Concepts such as governance modes (Treib, Bähr, and Falkner 2007; Pahl-Wostl 2019), or co-governance (Tenbensel 2005; Tosun, Koos, and Shore 2016) received increasing attention in the meantime. This work strongly builds on the assumption that it ultimately remains an empirical question which modes of coordination are used under which conditions in different institutional settings, and how they perform.

In the following paragraphs, I outline the three pure forms of coordination, and then explain the three additional categories to understand interaction, i.e., information exchange, conflicts, and gaps in interaction. This is followed by discussing the 7-rules typology of the IAD Framework (E. Ostrom 2005), which will be used to analyse Action Situations.

Table 2: The study's intermediate variables: modes of coordination and additional categories of interaction

	Type	Definition
Modes of coordination	Hierarchy – Authority-based hierarchy – Incentive-based hierarchy	Process of alignment of activities by a superior actor vis-à-vis an inferior actor based on (formal and/or informal) authority or positive incentives.
	Competition – Idea-based competition – Price-based competition	Process of alignment of activities based on prices or ideas.
	Cooperation	Process of voluntary alignment of activities of actors to achieve a shared aim.
	Hybrid	Process of alignment of activities based on a combination of pure forms of coordination (hierarchy, competition, or cooperation).
Additional categories of interaction	Information exchange	Minimum form of coordination: One-way or two-way exchange of information among actors.
	Conflict	Disagreements or disputes of actors that are not solved through any of the three pure forms of coordination.
	Gaps in interaction	Situation where actors intentionally or unintentionally do not coordinate with each other (no information exchange, no alignment of behaviour).

Modes of coordination: hierarchy, cooperation, competition – and hybrids

The first mode of coordination is *hierarchy*. I distinguish between two forms of hierarchy, namely hierarchy based on formal and/or informal authority, and hierarchy based on positive incentives.

The first form, *authority-based hierarchy*, is the most common and more classical form of hierarchy, and is defined as process of alignment of activities by a superior actor vis-à-vis an inferior actor based on formal and/or informal authority. Coordination is thus based on power (Bouckaert, Peters, and Verhoest 2010), and is characterized by decisions taken by the superior actor that are legally binding and enforce-

able, which is why their compliance can also be monitored. These types of hierarchical relationships are inter alia characterized by clear lines of control, mutual dependence of actors, and formal decision-making procedures (Powell 1990; Thompson et al. 1991), operating through mechanisms of monitoring, scrutiny and interventions (Thompson 2003). In the definition of polycentricity of OTW (1961), the authors did not include hierarchy as distinct mode of mutual adjustment. They instead speak of conflict and conflict resolution, which has also been applied by several authors in polycentric governance (Heikkila 2019; Carlisle and Gruby 2018) and co-governance (Tosun, Koos, and Shore 2016). However, I see the concept of hierarchy as more comprehensive covering any type of hierarchical steering by a central authority which does not necessarily need to involve conflicts. Moreover, conflicts are inevitable in policy-making due to different actors' interests and values, even being described as "the *raison d'être* of politics" (Thiel and Swyngedouw 2019: 190). We can therefore expect that conflicts are resolved by all three pure forms of coordination, even though by different means. In hierarchies, conflicts can be resolved through administrative fiat and supervision (Powell 1990), or legal procedures (Pahl-Wostl 2019). In the empirical analysis, I will only use the additional category of *conflict*, whenever these disagreements are not solved through *hierarchy, cooperation* and *competition* (see also below).

As a second form of hierarchy, I define *hierarchy* as process of alignment of activities by a superior actor vis-à-vis an inferior actor *based on positive incentives*. I thereby draw on Thiel et al. (unpublished manuscript), arguing that hierarchical coordination does not only rely on authority (i.e., negative incentives) and monitoring, but a superior actor can also steer behaviour of inferior actors by providing financial incentives. In the context of the empirical case studies, this relates to state actors providing financial subsidies for water users to increase irrigation efficiency. In contrast to hierarchy based on authority, water users are free in their decision to enter the hierarchical relationship or not. However, in the case studies of this research project, subsidies are only provided by state actors, which is why their freedom of choice with whom to enter such a relationship is limited. Furthermore, once water users enter this relationship, they are bound to specific rules which can be enforced by the respective superior actor. This relates to what Brousseau (1995) understands as "hierarchical contract". He describes it as an asymmetric coordination instrument, where one party becomes the principal who "negotiates the right to implement a specialized coordination mechanism that he controls", thereby cumulating authority and supervision rights (Brousseau 1995: 426). In the remainder of this work, I will use the term hierarchy whenever referring to the more classical form of hierarchy based on formal or informal authority; and will make it explicit when I refer to the rarer form of incentive-based hierarchy.

Second, *competition* is defined in my work as a process of alignment of activities based on prices or ideas. According to the Oxford Dictionary, competition is "a

situation in which people or organizations compete with each other for something that not everyone can have". Competitors, striving for the same aim, are therefore in a rivalrous relationship and act independently from each other. Competition as mechanism of coordination in polycentric governance operates in different settings. I therefore distinguish between the two forms of *price-based competition* on a market, and *idea-based competition* among actors involved in the policy-making process. In price-based competition, sellers compete for customers on the market. Competition here relies fundamentally on free entry and exit to the market, and on freedom of choice for users of the respective service. Involved actors, i.e., suppliers and consumers, do not directly interact among each other, but rather through Adam Smith's "invisible hand". The government thereby takes the role of an external third actor by monitoring and controlling the market to avoid distortion of competition, such as the building of monopolies (Bouckaert, Peters, and Verhoest 2010). Conflicts in price-based competition may be solved through compensation payments (Pahl-Wostl 2019), or through "haggling" with the possibility to resort to courts for enforcement (Powell 1990).

In the second setting of an ideal-type of competition in polycentric governance, which is an addition to the initial concept of OTW (1961), public, private and civil society actors compete for "ideas and methods" to influence the process of policy-making (Carlisle and Gruby 2017). Underlying coordination mechanisms are different to price-based competition since means of information exchange are not prices but "ideas", presented through lobbying activities. While there may be several actors competing among each other and providing ideas, the respective state actor who is in charge of overseeing the policy process is the single "consumer", thereby being in a position of a monopsony. However, the state is here not seen as a unitary actor, but it is composed of different governmental actors across sectors, who especially in the context of cross-sectoral water resource challenges may also compete among each other.

The logic under which competition in polycentric governance occurs in the different institutional settings thus varies. Strictly speaking, mechanisms in a classical market of economic exchange cannot be directly transferred to other decision-making processes shaped by competition (Bouckaert, Peters, and Verhoest 2010). For analytical reasons, I consider both forms as competition but acknowledge the importance of being precise about the type of, and the institutional setting in which competition occurs. It may have implications for the determinants and effects of the different types of competition. Property rights, for example, are fundamental to competition on a market while the role of freedom of speech may be particularly important for actors competing for influence in the political process. However, these different forms of competition have seldomly been compared in the literature on polycentric governance, and where it has been applied, the theoretical implications

of the different forms of competitions are not addressed (see e.g., Carlisle and Gruby 2018).

A main idea of public choice literature in general (Hill 2005), and of polycentricity in particular (V. Ostrom, Tiebout, and Warren 1961) is that leaders compete for votes (Downs 1957), or that municipalities compete for residents by supplying different mixes of public goods in relation to the respective tax level (V. Ostrom, Tiebout, and Warren 1961). However, despite the theoretical importance of this form of competition, I do not integrate it in the theoretical framework since from an empirical perspective, it is not of relevance in the three case studies.

Cooperation presents the third pure form of coordination in this work, defined as a process of voluntary alignment of activities of actors to achieve a shared aim. It is based on mechanisms such as trust, reputation, loyalty and reciprocity (Thompson 2003). Cooperation is characterized by an equal status of actors, which are interdependent, but where no other actor can impose his or her will. They moreover mutually benefit from cooperation (Thiel et al. unpublished manuscript). As mentioned above, conflicts can also occur in cooperative settings, and are solved through norms of reciprocity and reputation (Powell 1990), or through mediation with the aim to reach a consensus (Pahl-Wostl 2019). While the second half of the last century was dominated by debates on hierarchy vs. market, the political and scientific interest in collaborative governance approaches have risen since the 1990s. A broad range of literature has emerged, using interrelated concepts such as collaborative public management (Agranoff and McGuire 2003), collaborative environmental management (Koontz and Thomas 2006), collaborative governance (Emerson, Nabatchi, and Balogh 2012; Newig et al. 2018), or network governance (Börzel and Heard-Lauréote 2009). The implicit assumption of much of the literature in this context is that cooperation is something inevitably good. However, it is not given that "pursuing a shared aim" will necessarily lead to the production of public goods from which all actors benefit. Jones (2018) therefore highlights that collaboration can be conspiratorial, involve disproportionate power relations or lead to collusion.

These three pure or ideal types of coordination, i.e., hierarchies, competition, and cooperation hardly exist in its pure form in the real world, which is why the study of hybrids emerged. Different approaches exist on the conceptualization of hybrids in the literature. Most notably, Williamson (1991: 281) defines hybrids as being located between the two "polar opposites" of market and hierarchy. A well-studied form of hybrids are contracts, usually understood as combining hierarchical and competition-based coordination (Powell 1990; Williamson 1991). Further hybrids discussed in New Institutional Economic literature are subcontracting, networks of firms, franchising, or collective trademarks (Ménard 2004). Pahl-Wostl (2015) takes a more normative approach to the study of hybrids, arguing that they combine the strengths of markets, hierarchies and networks in a complementary

way. It is thereby assumed that hybrids lead to more effective coordination (Pahl-Wostl et al. 2020).

In contrast to these approaches, this work relies on the understanding of *hybrids* as combining pure forms of coordination (Meuleman 2008; Bouckaert, Peters, and Verhoest 2010). Hybrids thus do not present a distinct "third" form, located between hierarchies and markets; but they rather represent different forms where two or three of the ideal types co-exist and overlap. I therefore argue that the performance of hybrids is an empirical question and varies depending on the combination of coordination modes, as well as the respective context, institutional setting, or problem to be governed. Hybrids as they are understood here – i.e., combinations of the three pure forms of coordination – seem to be understudied. Peters (2015), for example, recognizes that almost all forms of coordination in the real world are hybrids, where aspects of networking as well as hierarchy are present. However, he neither discusses methodological implications, e.g., how to identify these hybrids, nor theoretical ones, such as what it means for a concept if it basically involves any form of interaction.

Additional categories of interaction: Information exchange, conflicts, and gaps in interaction

In addition to the pure forms of coordination, I include three additional categories in the empirical analysis to understand interaction of actors, namely *information exchange*, *conflicts*, and *gaps in interaction*. The main difference to the above-described pure forms of coordination relates to the issue of alignment of behaviour. *Conflicts* and *gaps in interaction* are defined in this study as processes where actors do not align their behaviour; while in *information exchange*, actors may or may not align their behaviour.

More specifically, *information exchange* is understood as one-way or two-way exchange of information among actors. Based on Metcalfe (1994: 282), who argues that communication and information exchange is the "first step beyond independent action", I thus understand the variable as minimum form of coordination. Indeed, in order to align each other's behaviour, sharing information is necessary. This means that the three pure forms of coordination also involve sharing of information, albeit through different means. In cooperation, actors voluntarily exchange information; in competition on a perfect market, information is exchanged through prices; and in hierarchies, information is exchanged following clear orders and lines of control. However, in those instances where I only observe some flow of information, without being embedded in another type of coordination, I classify the respective pattern of interaction as *information exchange*.

Conflicts are understood in this study as disagreements of actors that are not solved through any of the three pure forms of coordination; and where actors do not align their behaviour. This is in contrast to polycentric governance literature where

conflict and conflict resolution is defined as additional institutionalized pattern of interaction, besides hierarchy and cooperation (Carlisle and Gruby 2017; V. Ostrom, Tiebout, and Warren 1961; Thiel, Blomquist, and Garrick 2019). However, as alluded to above, I see disagreements and conflicts of actors as integral part of policy-making which can also be solved through hierarchical, cooperative or competitive interaction. Based on Weible and Heikkila (2017), I rely on three characteristics of conflicts, namely divergence in positions of actors; perceived threat from policy positions of others; and the unwillingness of actors to compromise, meaning that actors do not align their behaviour. In contrast to other literature on conflicts in water governance (Wolf 2007), the understanding of this study implies that conflicts do not need to involve violence, but can also be of verbal nature.

Gaps in interaction are defined as situation where actors intentionally or unintentionally do not coordinate with each other, and thus neither exchange information, nor align their behaviour. Gaps can result because formal structures for coordination are missing, or because of informal practices of involved actors, which may also become institutionalized. Gaps in interaction have been rarely discussed in the theoretical literature on coordination so far. This is surprising since many empirical studies show insufficient or complete lack of coordination, such as in the field of water governance in Spain (Ruiz Pulpón 2012; López-Gunn and De Stefano 2014). Brisbois et al. (2019) argue that the reason for this research gap in the field of institutional analysis is the focus of scholars on action situations and related outcomes, thereby overlooking inaction and non-decisions. According to Bach and Wegrich (2018a), also public administration and political science literature emphasizes actors' attempts to coordinate, thereby assuming that they are intrinsically or extrinsically motivated to coordinate. This is reflected, inter alia, by literature on barriers to achieve coordination (e.g., Adam et al. 2019). A further explanation for the lack of research may be methodological challenges in uncovering gaps in interaction – thus, observing something that is not happening, neither formally nor informally. Moreover, since there is no "objective yardstick for assessing success and failure in the public sector" (Bach and Wegrich 2018b: 243), it is difficult to objectively define what can still be seen as some degree of coordination, and where gaps in interaction start to appear. These methodological challenges are further complicated by the fact that in academic and public debates, criticism about lacking or insufficient coordination often seems to involve some normative dimension. It is thus seldomly specified whether there really is no interaction at all, or whether the interaction that takes place just does not lead to the desired outcomes – what I define below as "coordinated behaviour". This makes sound comparisons on drivers and implications of "real" gaps of interaction difficult. In the empirical analysis, I classify *gaps in interaction* to occur when the minimum level of coordination in the form of information exchange (Metcalfe 1994) does not take place.

Analysing processes through Action Situations

To analyse these different forms of coordination in polycentric governance, I use the above-described IAD Framework of Ostrom (2005). I thereby make use of two analytical tools of the IAD Framework, by conceptualizing decision-making processes as Action Situations; and furthermore, using the so-called 7-rule typology, which affects the structure of any Action Situation and shapes behaviour of actors (E. Ostrom 2005). I thus see these rules as independent variables, directly shaping the different patterns of interaction, as well as their performance.

Applying the IAD Framework and its rule typology to the study of polycentricity is considered helpful in order to overcome challenges in relation to measurement and conceptualization of polycentricity (Heikkila and Weible 2018). Indeed, the 7-rules typology allows for a structured analysis, and for drawing comparison with other cases. Other scholars have also used them as independent variable, e.g., in a study on the effect of institutional design characteristics – assessed through rules – of River Basin Organizations on their performance (Meijerink and Huitema 2017); or on their effect on learning in environmental governance (Heikkila and Gerlak 2019). In the latter study, Heikkila and Gerlak (2019) show that more open boundary, information, scope and choice rules are particularly relevant to foster social learning. Rules have also been applied as dependent variable, e.g., in studies on the evolution of and changes in rule configurations (E. Ostrom and Basurto 2011; Villamayor-Tomas et al. 2019). It is to consider, however, that the IAD and its rules have initially been designed to study collective action problems of natural resource users at the local level. Although the IAD can be transferred to the analysis of policy-making in polycentric governance (Schlager 2007), findings on institutional design will certainly differ between collective action at the local level and more formalized governance processes studied in this work. In the next paragraphs, I introduce the different rules – boundary, position, choice, information, aggregation, payoff, and scope rule – and link them to the three pure forms of interaction, i.e., cooperation, competition, and hierarchy.

Boundary rules determine who is allowed or obliged to participate in an Action Situation (E. Ostrom 2005); *position rules* define the role participants take in an Action Situation; *information rules* regulate the exchange of information, i.e., actors' obligation, permission, or prohibition to send or receive information; *choice rules* determine which actions must, must not, or may be taken, thereby including rules on how to allocate resources (E. Ostrom and Basurto 2011); *aggregation rules* determine who takes decisions, and how they are taken concerned allowed actions; *payoff rules* assign costs and benefits to actors for certain outcomes; and lastly, *scope rules* determine which outcomes are allowed, required or prohibited in a situation, relating to performance targets (E. Ostrom 2005). *Choice* and *scope rules* both work as "all other categories", with the difference that the former targets an action, whereas the aim of the latter is an outcome (E. Ostrom 2005: 209). These rules can be studied

at three different levels of analysis, namely at the operational, the collective-choice and the constitutional level. At the operational level, day-to-day decision-making takes place, whereas collective-choice relates to decisions which affect the operational level, and constitutional-choice rules affect institutions governing collective-choice situations (Crawford and Ostrom 2005). Moreover, one can distinguish between formal and informal rules (North 1991). I understand formal rules as *de jure* rules which are formalized and written down, which may or may not be followed by actors; whereas informal rules are unwritten, but commonly accepted rules structuring behaviour in societies. Formal and informal rules mutually influence each other. Indeed, formal rules can modify, revise, or replace informal rules; similarly to informal rules, which can substitute formal rules (North 1991). However, Cole (2017) criticizes that the relationship between formal and informal rules, and the role of formal rules on rules that are actually followed has not been sufficiently addressed in the IAD Framework. In my study, I will analyse rules-in-use and rules-in-form, and mainly focus on the operational and the collective-choice level.

A main interest of this work is to understand how these formal and informal rules – together with other independent variables outlined above – influence actors' interaction. The focus thereby will not be on a rule per se, but rather on the specific design of rules, as well as on the configurations of different rules that matter. To my knowledge, there is no comparative research on how the specific design and configurations of rules affect different patterns of interaction in polycentric governance. Nonetheless, some theoretical considerations can be made on how rules influence cooperation, competition, and hierarchy. However, due to the lack of empirics and the fact that the three pure forms of interaction are ideal types, the relationship between rules and interaction, which I will discuss in the following, is rather descriptive. Further, it draws on normative assumptions on how the three ideal types should look like, which will, however, be difficult to detect in practice.

As explained above, cooperation is characterized by an equal status of actors. This may be ensured by *position rules* as well as *aggregation rules*, which ensure that all actors have an equal say in the decision-making process. *Aggregation rules* which give more power to certain actors in a group, in contrast, may harm intrinsic motivation of other actors to cooperate. A further important characteristic is the idea that actors share information voluntarily, and for mutual benefit (Thiel et al. unpublished manuscript). I therefore argue that *information rules* should be as open as possible – i.e., not forcing actors to exchange information –, strengthen transparency and reliability of data, and make information sharing less costly, e.g., by providing specific technologies. Furthermore, cooperation is characterized by actors working towards a common aim, which manes that *scope rules* according to which actors can define goals and possible outcomes jointly may be important. Similarly, *payoff rules* which assign benefits of an achieved outcome to all actors that are involved in cooperation may increase their intrinsic as well as extrinsic motivation to cooperate.

Second, in competitive relationships, actors align their behaviour based on prices and ideas. In competition, actors use information strategically, which is why they may withhold crucial information, e.g., about the manufacture of their products, or about certain aspects that make their ideas for which they are lobbying less appealing to other actors. *Information rules* will be designed accordingly, i.e., providing incentives for actors to not share information with everyone. Furthermore, to ensure free competition, certain conditions need to be fulfilled. Concerning free competition on a market, *choice rules* may need to prohibit certain behaviour, such as misleading or deceiving consumers, or colluding through price fixing. Furthermore, *aggregation rules* may need to allow actors to "vote with one's feet", i.e., allowing consumers to voluntarily decide to consume or withdraw from consuming. Concerning competition among lobby groups, *choice rules* should ensure freedom of speech of actors. Lastly, actors will only engage in a competitive relationship if benefits outweigh the costs. *Payoff rules* therefore need to be designed accordingly, i.e., by allowing actors to make profit.

Third, *hierarchical*, asymmetric relationships are defined as forced alignment of activities by a superior actor vis-à-vis an inferior one. They are first characterized by bureaucratic routines and clear chains of responsibility, which may be defined by specific set of *choice, position,* and *boundary rules*. Further, hierarchical coordination is characterized by the principle-agent, or the so-called information problem. Information exchange between local actors on characteristics of specific problems to central decision-makers may therefore be difficult, or even impossible (Scharpf 1994). To overcome this problem of information asymmetry, *information rules* may provide positive or negative (i.e., sanctions) incentives to encourage actors to share information. Similarly, *payoff rules* may incentivize the inferior actor to follow and implement decisions made by the superior decision-making centres, either through rewards or sanctions. Lastly, legitimacy of the superior decision-making centre is fundamental in hierarchical settings. Therefore, *aggregation rules* on who takes which decisions need to be transparent and justifiable. Moreover, in line with the subsidiarity principle, *aggregation rules* which allow decisions to be taken as closest as possible to the citizens might strengthen the legitimacy of hierarchical relationships.

2.2.3 Performance of polycentric governance

To improve governance, an assessment of its performance is essential. Performance assessment in (environmental) governance literature can be undertaken at three analytical levels, namely at the level of governance process, referring to the quality of the process; at the level of governance output, understood as the (usually written) decisions of a decision-making process such as a RBMP; and at the outcome level, referring to changes on the ground induced by the process or the output. Environmental governance scholars have therefore developed several conceptual frame-

works which include different forms of output-, outcome- and impact evaluation (Pahl-Wostl et al. 2020; Newig et al. 2018; Emerson, Nabatchi, and Balogh 2012). One of the challenges by comparing these frameworks, however, is that key terms such as impacts, effects, outputs, or outcomes are used interchangeably, resulting in lack of conceptual clarity. Moreover, authors have identified several research gaps in this field of study, most of all in relation to environmental outcomes (Koontz and Thomas 2006; Koontz, Jager, and Newig 2020), as well as in relation to evaluation of processes (Rauschmayer et al. 2009).

Scholarship on institutional analysis has arguably placed a stronger focus on performance assessment than environmental governance literature. Indeed, the evaluation of processes and outcomes is a central building block of the IAD Framework (E. Ostrom 2005), the SES Framework (McGinnis and Ostrom 2014), and studies of polycentric governance (Thiel, Blomquist, and Garrick 2019). Many potential evaluative criteria therefore exist. To assess processes, authors include, inter alia, accountability of officials to citizens, conformance to general morality, adaptability, user satisfaction, political representation, transparency, or equity (Thiel 2017; E. Ostrom 2005; McGinnis and Ostrom 2014). Evaluative criteria for output and outcome evaluation are for example, economic performance measures, such as efficiency; social measures, e.g., equity or accountability; or ecological ones, such as resilience or diversity (Koontz et al. 2019; E. Ostrom 2005). However, these different criteria are in a constant trade-off (Thiel 2017), which is why scoring high on all criteria is impossible. User satisfaction may for example conflict with ecological criteria, or political representation with economic efficiency of the governance process. Yet, although the Ostroms have underlined the importance to empirically analyse the performance of polycentric governance, "too many researchers seem to have forgotten this" (Jordan, Huitema, Schoenefeld, et al. 2018: 10). Important research gaps therefore also remain in this strand of literature, such as the influence of context conditions (Carlisle and Gruby 2017), constitutional rules (Thiel 2017), or the design of polycentric systems (Heikkila, Villamayor-Tomas, and Garrick 2018; Carlisle and Gruby 2017) on performance of polycentric governance.

The fact that performance has been relatively little researched in terms of its actual meaning – considering that "policy outputs are, as often claimed, what really count in political life" (Jordan and Lenschow 2010: 156) – can be partly attributed to underlying methodological challenges. First, it is difficult to establish clear causality between governance structure, processes and outcomes. Cairney et al. (2019) therefore suggest to undertake in-depth field studies guided by theoretical frameworks, including a thorough analysis of primary and secondary data. A further challenge refers to the inherent normative character of performance assessment. Indeed, since actors involved in governance pursue multiple interests and goals, they will necessarily evaluate process and outcomes differently. Furthermore, also from an external perspective, an objective evaluation on policy performance is difficult

(Bach and Wegrich 2018a), since there are "many shades of grey" in how policies are perceived (Bovens and 't Hart 2016: 655). To take the example of evaluating policies for increasing irrigation efficiency in Spain, scholars use a wide range of criteria to evaluate their performance, such as changes in fertilizer use (López-Gunn, Mayor, and Dumont 2012), in working conditions for farmers (Del Campo 2017), or the use of electricity and related costs (Berbel and Gutiérrez-Martín 2017b). It is to assume that from the perspective of farmers, policy success hinges on these factors rather than on the reduction of agricultural water consumption, which I analyse in this study. These different aspects show that a generalizable evaluation of governance processes, but also of outcomes is not possible since assessing performance of polycentric governance is a normative undertaking and will therefore never be complete. Justification of selected criteria as well as of the results is hence highly important. In the following, I outline variables for process-, output-, and outcome performance that will be used in the empirical analysis (see Table 3).

Table 3: The study's dependent variables: performance assessment

First-tier variable and level of analysis	**Second- tier variable and evaluative criteria**	**Definition**
Process performance *(Levels of analysis: Action Situation; and overarching governance process)*	Coordinated behaviour *(second-tier variable)*	Extent to which interactions lead to ordered patterns.
	– Information exchanged *(evaluative criterion)*	Extent to which information among actors within a process is exchanged; as well as to which information about the process and its output are available to outsiders of the process.
	– Competing interests considered *(evaluative criterion)*	Extent to which contradictory interests which exist in society in relation to the case study focus are taken into account.
	– Alignment of incentives *(evaluative criterion)*	Extent to which an incentive structure is established that makes it rational for actors to behave in an expected way.

Output performance *(Levels of analysis: Action Situation; and overarching governance process)*	Effectiveness of RBMP *(Level of analysis: Action Situation RBMP Development)*	Extent to which the RBMP is likely to achieve the political goal of reducing agricultural water consumption.
	Distribution of surface water adapted *(Level of analysis: Action Situation Dam Release Commission/ Management Committee)*	Extent to which surface water distribution has been adapted in the Dam Release Commission/ Management Committee, compared to what would be required in order to meet ecological flow requirements.
	Status of implementation of measures *(Level of analysis: Action Situations Increasing Irrigation Efficiency; Supply and Demand of Desalinated Water; Water Rights Reduction)*	Status of implementation of measures (reduction of water rights; irrigation efficiency measures; use of desalinated water), compared to what has been prescribed in the RBMP.
	RBMP implemented *(Levels of analysis: overarching governance process)*	Extent to which measures of the RBMP which relate to the management of agricultural water consumption have been reduced.
Environmental outcome performance *(Level of analysis: River Basin District)*	Development of agricultural water use	Change in consumptive, as well as total agricultural water use (consumptive and non-consumptive) from 2009 to 2021.
	Development of irrigated area	Change in irrigated surface area from 2009 to 2021.
	Status of water bodies	Change in the water status from 2009 to 2021 according to the WFD assessment.

Process performance

To evaluate process performance, I analyse *coordinated behaviour* of actors involved in polycentric governance. I thereby aim to understand whether and to what extent different patterns of coordination, i.e., *cooperation, competition, hierarchy,* and *hybrids,* as well as *information exchange* also lead to coordinated results. I argue that *conflict* and *gaps in interaction,* however, cannot lead to coordinated outcomes since – following the definition of this work – actors do not algin their behaviour in these patterns of interaction.

Coordinated behaviour relates to what McGinnis (2016: 5) calls a "regularized pattern of social order", or to what Thompson (2003: 37) describes as "ordered patterns", both resulting from interaction of actors. The variable is chosen since it concerns one of the defining components of polycentric governance, i.e., the establishment of ordered patterns through the interaction of many decision-making centres. The idea that interaction of actors results in "ordered patterns" can be seen as an end in itself, basically because an essential aim of governance is to establish social order. Moreover, it is assumed that coordination increases aggregate welfare in situations where joint decision-making is needed (Scharpf 1994). Many other evaluative criteria to assess process performance are used in the literature, such as social learning, individual capacity building, or the creation of trust, shared norms and networks (cf. Koontz, Jager, and Newig 2020). While I acknowledge their importance, it is beyond the scope of this study to also assess these criteria.

The analysis of *coordinated behaviour* includes three evaluative criteria, namely *information exchanged* (Thiel et al. unpublished manuscript), *alignment of incentives* (ibid.) and *competing interests considered*. However, although several scholars approach coordination also from an outcome-perspective (Pahl-Wostl et al. 2020; Thompson 2003), a generally recognized definition and operationalization does not seem to exist in the literature. First, the variable *information exchanged* is defined as the extent to which information among actors within a process is exchanged; as well as to which information about the process and its output are available to outsiders of the process. It goes back to the assumption that exchanging information is a precondition for coordination to occur (Thiel et al. unpublished manuscript). Similarly, in the so-called policy co-ordination scale, Metcalfe (1994) presents different degrees of coordination. Communication and exchange of information thereby are the basis on which all other more intensive forms or degrees of coordination are built (Metcalfe 1994). Indeed, without adequate information it is impossible for actors to align their behaviour to each other, to adapt policies to other sectoral policies or goals, or to follow decisions made by other actors in a coordinated way. Furthermore, the variable also addresses the role of information for actors outside of the respective Action Situations, based on the assumption that access to information is a precondition for actors to participate in governance processes, as discussed by Reed (2008). Furthermore, from a legal perspective, the Aarhus Convention signed in 1998 established the right of citizens to access environmental information that is held by public authorities; and the WFD asks Member States to provide access to information used for the RBMP development (Art. 14). Ensuring access to information to achieve social order therefore seems to be crucial.

Second, *aligned incentives* (Thiel et al. unpublished manuscript) is defined here as the extent to which an incentive structure is established which makes it rational for actors to behave in the expected way. This goes back to neo-institutionalist approaches where coordination is seen as an outcome that establishes particular in-

centive structures which make it rational for the different actors to behave in the way that is expected from them (Pedersen, Sehested, and Sørensen 2011). O'Toole (2012) discusses three types of incentives for public actors to coordinate and concert action, namely because actors feel an obligation to do so (i.e., based on authority); because actors share a common interest; or because actors receive something in return (i.e., based on exchange). Aligica and Tarko (2012: 256) even argue that if there is no alignment between rules and incentives, "we are *not* dealing with an instance of polycentricity". Even though I do not adopt this definition, I agree that there is no coordinated behaviour in polycentric governance if incentives are misaligned. Further, *aligned incentives* as it is understood here can be related to the idea of positive coordination introduced by Scharpf (2000; 1994), which goes beyond the simple avoidance of conflicts (i.e., negative coordination), but implies that synergies and a maximization of welfare are created by coordination.

The third evaluative criteria to understand *coordinated behaviour* is *competing interests considered* which is defined as the extent to which contradictory interests which exist in society in relation to the case study focus are considered. It refers to the understanding that coordination in polycentric governance is also about dealing with competing, contradictory interests. While the previous two evaluative criteria focus on actors actively participating in the coordination process – e.g., on those actors whose incentives need to be aligned – interests of actors outside these official processes may thereby be omitted. This is of particular relevance in the three case studies since in several Action Situations, environmental actors are formally excluded and can therefore not present their interests. This means that the exchange of information and aligning incentives of actors participating in the Action Situation would qualify for coordinated behaviour, even if environmental interests were not considered. However, since they are key in the context of achieving environmental objectives of the WFD, I argue that establishing order also depends on these interests.

I will assess *coordinated behaviour* at two levels, namely at the level of Action Situations, as well as of the overarching governance process. According to OTW (1961: 838), performance of polycentric governance "can only be understood and evaluated by reference to the patterns of cooperation, competition, and conflict that may exist among its various units". Therefore, depending on the Action Situation, the concrete empirical context and the respective pattern of interaction, different performance criteria may be of relevance; or one indicator may be relatively more important than another one (Koontz et al. 2019). In a situation where negative externalities are produced, but where actors affected by these externalities are not participating, the variable *competing interests considered* may be particularly important. Furthermore, although exchanging information and having access to information is a prerequisite for coordination as well as a democratic right of citizens, I assume that the role information plays is nonetheless also context dependent to some degree. In Action Situations which are closely interlinked and whose outputs depend on each other,

availability of information of concerned Action Situations may for example be more important compared to an Action Situation which is relatively independent and does not influence any other decision-making process. Thus, as Koontz et al. (2019: 178) state, this relative importance of one evaluative criterion against another is "not self-evident". Again, a thorough understanding of the empirical cases is required.

Notwithstanding, coordination and therefore also coordinated behaviour certainly have their limitations. Coordinated behaviour may be undesirable when costs associated with the process of coordination outweigh its benefits (Frances et al. 1991). Moreover, McGinnis (2016: 18) states that "any coordination that remains effective may be limited in scope", and that "coordination across policy sectors may be nearly impossible in practice". This is due to the complexity of the different policy sectors involved in polycentric governance. In addition to these substantive limitations to coordination, there are also epistemological concerns in the evaluation of coordinated behaviour, which are due to its normative character. Drawing on Lindblom's work, Greenwood (2016; 2018) stresses that there is neither a definitive measurement, nor a purely rational approach to analyse coordinated outcomes. According to him, "actors' views about whether coordination has been achieved will hinge on their qualitatively distinct, incommensurable ends" (Greenwood 2016: 34). Furthermore, there are also several methodological challenges. In this context, Peters (2015: 24) points to the difficulty of analysing the extent to which coordination has been achieved due to a lack of "meaningful standard of what is enough coordination". Thus, the terms ordered patterns or coordinated behaviour do not refer to a natural order that has to be achieved from an objectively defined point of view. In contrast, different forms of order are always possible. In addition, "behaviour" is, by definition, not static, but constantly evolving and changing. The object of analysis is therefore fuzzy due to the "meandering history of several dynamic streams of collaborations, consultations and lobbying struggles" (Rauschmayer et al. 2009: 169). Questions of the appropriate level or time period to measure performance (Thiel et al. unpublished manuscript) are particularly relevant in this regard, since the state of coordinated behaviour always refers to a specific time, situation and place (Siddiki, Espinosa, and Heikkila 2018). Therefore, the assessment of coordinated behaviour is limited, and cannot be generalized to the overall Action Situation evolving over many years.

Policy output performance

Policy outputs are understood here as concrete results of Action Situations, such as written decisions or plans, or tangible products, such as the status of implementation of irrigation systems. Again, several research gaps remain in this context, since scholars tend to focus on analysing governance rather than evaluating it (Greenwood 2016). It thus remains unclear whether policy coordination and integration actually improve policy outputs and outcomes (Trein et al. 2021; Jordan and Lenschow 2010).

I assess policy output performance at two levels, i.e., at the Action Situations and at the overarching governance process level, always referring to the status of implementation of respective measures. The underlying assumption is that implementation of measures will lead to changes in agricultural water consumption, as envisioned and predicted in the different RBMPs. Implementation of measures is thus seen as first approximation to gauge environmental outcomes (Jager et al. 2017; Ulibarri 2015).

As mentioned above, *intermediate output performance* is operationalized differently for each Action Situation, depending on the respective empirical output. More specifically, the policy output of the Action Situation RBMP Development will be measured through the second-tier variable *RBMP effectiveness.* Effectiveness refers to the degree to which desired goals have been attained through the process. Yet, the question of whose goals are reached is not a trivial one. Effectiveness may, for instance, be assessed against externally defined standards by a higher actor, or against goals set by actors involved in the process, such as the process initiator (Koontz, Jager, and Newig 2020; Meadowcroft 2014). Taking the example of the WFD implementation, the WFD goal to achieve good water status defined by the EU may conflict with a River Basin Authority's objective to secure access to water resources of all economic water users at a reasonable prize. In this work, *RBMP effectiveness* is defined as the extent to which the RBMP is likely to achieve a reduction of agricultural water consumption, while being aware that other well-justified goals are thereby disregarded. More precisely, I will analyse whether i) actors in charge of implementation, ii) actors in charge of financing, and iii) actors affected by the respective measure are defined in the RBMP. These three categories have been developed inductively, based on a deep understanding of the RBMP in the three case studies, and drawing on Schütze et al. (2022).

Intermediate output performance of the other three Action Situations all refer to the implementation phase and will be assessed by the status of implementation of the respective measure. More precisely, the relevant second-tier variable for the Action Situation Dam Release Commission is *distribution of surface water adapted;* and for the three Action Situations Increasing Irrigation Efficiency, Reducing Water Rights, and Supply and Demand of Desalinated Water, the variable refers to the *status of implementation of measures.* The status of implementation is assessed in relative terms compared to what has been prescribed in the RBMP. It is therefore not based on fixed thresholds or benchmarks.

At the level of the overarching governance process, output performance is operationalized as *RBMP implemented,* referring to the status of implementation of measures included in the RBMP which relate to the management of agricultural water consumption.

Environmental outcome performance

Environmental outcome performance in this study refers to the achievement of goals in relation to agricultural water use. Environmental outcomes remain understudied, as shown in a broad meta-analysis on collaborative governance literature by Koontz et al. (2020). Similarly, Boeuf and Fritsch (2016) find that in scholarship on the WFD implementation, ecological outcomes are often neglected. An exception is a study on WFD implementation in different countries by Kochskämper et al. (2017), who compare water status of the first and second planning cycle to trace improved water quality. Indeed, the WFD requirements to assess water status every six years offers a good data basis to at least approximate environmental change over time. Notwithstanding, this research gap may be explained by methodological challenges of establishing causal relationships between governance processes and environmental outcomes. Environmental systems are influenced by many different factors, that interact and unfold over long periods of time (Koontz, Jager, and Newig 2020). These factors range from natural phenomena to human interventions as well as the lack of interventions; and underlying causal processes are often partially understood, or will manifest only over a long time period (Meadowcroft 2014). Further, depending on the country and issue under investigation, specific environmental-related data is often limited, which is why Ulibarri (2015), for example, analyses the quality of governance outputs to approximate environmental outcomes. She thereby assumes that the implementation of these outputs would then also produce changes in the environment as predicted.

In this study, environmental outcome performance will be assessed at the level of the river basin district; and will be assessed through three second-tier variables. It includes first the *development of agricultural water use,* defined here as the change in consumptive, as well as total agricultural water use (consumptive and non-consumptive) from 2009 to 2021. The variable relates to one of the main empirical interests of this work, i.e., how governance processes contribute to the reduction of agricultural water consumption. This has been formulated as political aim at several levels. Indeed, all three RBMPs state the aim to reduce water consumption and increase water savings in the agricultural sector (CHG 2014a: 63; Junta de Andalucía 2014a; CHJ 2015b). Furthermore, public investments to increase irrigation efficiency included in national strategies (MARM, 2010), as well as in RBMPs (Centro de Estudios Hidrográficos 2017b) have always been justified by the overarching aim to save water (see also Embid 2017). Likewise, investments in desalinated water pursue the same objective (Junta de Andalucía 2015a).

Second, I analyse the variable *development of irrigated area,* defined as change in irrigated surface area from 2009 to 2021. The main reason to include this variable are data deficiencies concerning agricultural water use, which will be discussed in Chapter 4,5, and 6. I therefore understand irrigated area as proxy evaluation to approach the development of agricultural water use. Indeed, studies show that im-

provements in irrigation efficiency are often thwarted by an expansion of irrigated areas, thereby producing a rebound effect (Perry 2019). It is thus assumed that improvements in irrigation efficiency and the use of nonconventional water resources can only lead to an absolute reduction of agricultural water consumption if all else remains equal, including irrigated areas.

Lastly, drawing on Kochskämper et al. (2017), I assess the *change in water body status*, i.e., the change in water status from 2009 to 2021 according to the WFD assessment. This variable thus relates to the WFD's substantive goal to achieve a "good water status". The underlying assumption is that all other things being equal, a significant reduction in agricultural water consumption will lead to improvements in the status of water bodies. As discussed before (see Chapter 1), water quantity issues are not directly included in the assessment of water status of surface water. However, they are considered as "ancillary element" to secure good water quality (WFD Recital 19); and since the second planning cycle, Member States must implement ecological flows to achieve the environmental objectives of the WFD in surface water bodies (European Commission 2015a). Concerning groundwater bodies, quantitative issues are explicitly considered in the assessment of water status. I will therefore refer to the quantitative status of groundwater bodies, which is assumed to improve if agricultural consumption decreases.

However, also the presented approach to assess environmental performance has its limitations and can hence only approximate environmental outcomes. Weaknesses include mentioned data inconsistencies regarding agricultural water consumption, time lags between changes in water consumption and improvement of water status (see Chapters 4, 5 and 6), and changes in the delineation of river basin districts and water bodies (European Commission 2019b), and in the method of water status assessment.

The next chapter presents the research design and methodology (Chapter 3), thereby also building on the theoretical framework developed in this chapter.

3. Research Design and Methodology

This chapter presents the research design and methodology of this study. In the first section, I introduce the comparative case study design which combines a cross-case analysis of three case studies with a within-case analysis by focusing on Action Situations, with the overarching aim to uncover causalities (Section 3.1). In this context, I also discuss the selection of case studies, which is guided by the theoretical framework of this study, as well as the selection of Action Situations for the within-case analysis. In the second section of this chapter, I justify my methods for data collection and data analysis, namely Process Tracing and Qualitative Content Analysis, and discuss different types of assessment of variables (Section 3.2).

3.1 Comparative case study design

The empirical objective of my study, in a nutshell, is to understand how and why environmental objectives of the Water Framework Directive (WFD) have not been achieved in Spain despite strong public efforts. I thus aim to understand and explain governance processes, their determinants, as well as outcomes. To do so, a comparative case study is deemed particularly suitable. A single-case study is defined as an in-depth examination of a "spatially delimited phenomenon […] observed at a single point in time or over some period of time", with the intention to "shed light on a larger class of cases" (Gerring 2006: 19–20); whereas in a comparative case study, several single-case studies are comparatively analysed, which allows, inter alia, to detect similarities, differences, or patterns across cases. The main reason why I employ a comparative case study is that single as well as comparative case studies enable researchers to answer "how" or "why" questions (Yin 2018). Comparative case studies hence allow to explain certain phenomena by identifying causal relationships through the method of comparison (Yin 2018; Lauth, Pickel, and Pickel 2015). Furthermore, to meaningfully uncover causalities, the broader context in which causal mechanisms unfold need to be taken into account (see also next paragraph), which makes case studies particularly advantageous. More specifically, I undertake a *cross-case comparison* of three River Basin Districts (RBDs), and combine this with a *within-*

case analysis to reveal causal mechanisms unfolding within each case in the different Action Situations (George and Bennett 2005).

Since uncovering causal mechanisms is key to case studies as well as to this work, the understanding of causality underpinning this study needs to be explained. Causal mechanisms are defined in this study as unobservable physical, social, or psychological processes through which, in specific contexts, outcomes are generated (George and Bennett 2005). This definition adopts the view of contingent causal relations, meaning that causal mechanisms operate under scope conditions and are context dependent; which is why the effects of causal mechanisms also depend on interaction with other mechanisms (George and Bennett 2005). Similarly, Falleti and Lynch (2009: 1144) argue that causal explanations in social science can be identified "if and only if" the "interaction between causal mechanisms and the context in which they operate" is considered, since causal mechanisms operate differently in different contexts and under different conditions. The importance of contingency is also in line with much of the research on social-ecological systems, which understands social-ecological systems as highly context dependent; and where causality is seen as non-linear and dynamic (Preiser et al. 2021). The study's approach to identify causal pathways through which particular configurations of variables under certain conditions lead to specific outcomes thus corresponds with George and Bennett's (2005) "typological theory"; as well as with the Social-Ecological Systems (SES) framework, which is about "typologically decomposing" resource and governance systems and relating different system subtypes to outcomes (E. Ostrom and Cox 2010: 10).

However, identifying causalities in social science research, and in my study, is not without challenges. First caveats concern the fundamental challenge of isolating one causal mechanism from another, and identifying the specific circumstances under which causal mechanisms become activated (George and Bennett 2005); or, as Steinberg (2007: 183–4) states, to "say something meaningful about isolated components […] in a world that is in fact highly connected". Indeed, fully uncovering causalities requires undertaking a perfectly controlled experiment where the researcher changes one variable to observe the effect on the outcome – an endeavour which is obviously not possible in social science research. Despite these constraints, the research of this study is designed to nonetheless approximate causalities. Indeed, small-N analysis (Steinberg 2007), comparative case studies (George and Bennett 2005), and process tracing (Blatter and Haverland 2014; Trampusch and Palier 2016) are all methods that allow, albeit to a limited extent, to capture causalities.

A second challenge of drawing (causal) inference in comparative case studies concerns the extent to which generalizations are possible. According to Gerring (2006: 79–80), case studies always "partake of two worlds: they are particularizing *and* generalizing". Thus, while in-depth understanding of the single cases is of high importance – especially because case studies are often chosen to understand a

particular empirical puzzle where existing knowledge is limited – they also allow to "generalize across a larger set of cases of the same general type" (Gerring 2006: 65). Yin (2018) thereby highlights the importance to distinguish between statistical generalizations and generalizations from case study research. The former is about drawing inferences from a population of cases, based on data collected from a sample of that population. In contrast, generalizations in case study research are analytical, i.e., they are valid for theoretical propositions rather than populations (Yin 2018). Notwithstanding, all forms of generalizations in social science have their limitations, since they are, as George and Bennett (2005: 130–131) argue, "necessarily contingent and time-bound, or conditioned by ideas and institutions that hold only for finite periods", and are therefore "increasingly narrow". Thus, once again, it is important to be specific about the different contextual conditions under which configurations of variables are at work. Therefore, in the following I explain my rationales for case study selection, as well as similarities and differences of the three cases.

3.1.1 Selection of case studies and cross-case comparison

To undertake case study research, "*the* key question" concerns the definition of criteria for case study selection, as well as the case study selection itself (Herron and Quinn 2016: 459, italics in original). Indeed, the case study selection procedure is highly important because to meaningfully compare cases, they also need to have comparable characteristics. Furthermore, generalizations that can be drawn from case studies ultimately depend on how they have been selected – thus, whether findings of selected case studies are also relevant for other cases depends on how they relate to each other. Although there is no "general theory of purposive sampling", as argued by Agrawal (2001: 1662), it is clear that "selected cases should represent variation on theoretically significant causal factors". Thus, to select cases for cross-case comparison, I undertake a theory-guided purposive sampling. The selection is hence based on particular variables of the theoretical framework of this study (see Chapter 2), combined with a thorough understanding of the empirics of the cases, thereby aiming to ensure that selected cases are also of empirical relevance in the context of the topic under investigation. By doing so, I can ensure external validity, referring to the generalizability of empirical findings beyond the single case study (Yin 2018).

A wide range of methods exists for the selection of cases (for an overview, see Gerring and Cojocaru 2016). In this study, I undertake a combination of John Stuart Mill's method of agreement *and* method of difference, which Mill frames as Joint Method of Agreement and Difference (Seawright and Gerring 2008). I thus combine the Most Different System Design with the Most Similar Systems Design. In the Most Similar Systems Design, relying on the method of difference, researchers

compare very similar cases that show differences in the outcome variable (George and Bennett 2005; Lauth, Pickel, and Pickel 2015) – which, as I will discuss below, is represented by the Jucar and the Guadalquivir in my study design. In contrast, in the Most Different Systems Design, relying on the method of agreement, researchers compare very different cases that nonetheless share the same outcome (Lauth, Pickel, and Pickel 2015) – which is reflected by the Jucar and the Mediterranean Basins (see below, Table 4).[1] Gerring (2006) calls this case selection technique the method of "diverse cases", which has also been applied in empirical research on water governance in Europe (Kochskämper, Challies, et al. 2017). However, since it has not been discussed much in literature on qualitative research methods, a generally recognized name does not exist yet (Gerring 2006); but the method resembles the "Method of Agreement and Difference" of Stuart Mill; or the "maximum variation" sampling of Patton (2015).

The main reason why I use the diverse cases selection technique is that the method allows me to identify various causal pathways that may lead to an outcome, based on the assumption of equifinality (Gerring and Cojocaru 2016; Gerring 2006). Equifinality refers to the fact that different causal mechanisms can lead to similar outcomes (George and Bennett 2005). This is because a full range of values on both, independent as well as dependent variables, can be covered through this method, facilitating to achieve a "maximum variance along relevant dimensions" (Seawright and Gerring 2008: 300). The method is thus in line with what George and Bennett (2005) understand as "typology theory". Further, a particular strength of this method is that it "probably has stronger claims to representativeness than any other small-*N* sample" (Seawright and Gerring 2008: 301). However, the abovementioned limitations of drawing generalizations in case study research similarly apply to this method.

Rationales for the selection of the Guadalquivir, Jucar, and the Mediterranean Basins of Andalusia

In the following, I explain the different steps of case study selection, guided by the study's theoretical framework while at the same time ensuring empirical relevance; which ultimately result in the selection of the Guadalquivir, Jucar, and the Mediterranean River Basins of Andalusia (hereafter: Mediterranean Basins) in Southern and South-west of Spain (see Figure 2). First, I decided to select different cases within

1 I am aware that these cases only reflect the Most Different Systems Design if I assume that the population of all possible cases includes only Spanish RBDs. Looking only at Spain, the Jucar and Mediterranean Basins indeed do show significant differences in the independent variable. However, if I enlarged the population of all cases to all European RBDs, for example, these two Spanish RBDs would need to be framed as being very similar. Compared to other European RBDs, contextual conditions would then be constant.

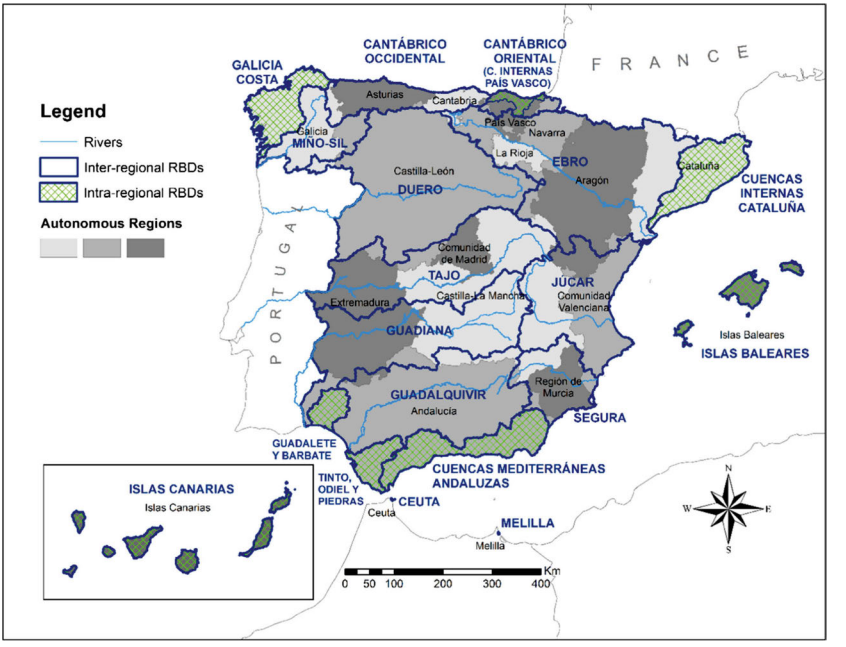
one country to keep the broader context in which cases are embedded constant. As mentioned above, an ideal setting to identify causalities is an experimental design where the external environment is strictly controlled (George and Bennett 2005). Since this is hardly possible in social sciences, the focus on one country nevertheless allows to create a relatively stable external environment and minimize confounding variables. Internal validity, referring to the correctness of the causal inference drawn by a researcher, can thereby be increased. Reasons to focus on Spain are of empirical nature: First, although the WFD implementation has been widely studied (Boeuf and Fritsch 2016), issues of water quality (see e.g., Boezeman, Wiering, and Crabbé 2020) received much higher attention than of water quantity (Acreman et al. 2010). This occurs despite the fact that over-abstraction of water is the second most common pressure on water bodies in Member States (European Commission 2012). Furthermore, the European Commission (2012: 6) highlighted already a decade ago the need to "put water quantity management on a much more solid foundation". Thus, research on governance processes to reduce over-abstraction certainly is of high empirical importance. Second, in the context of increasing irrigation efficiency, Spain is a highly relevant country, having the fifth largest sprinkler and micro irrigated area worldwide, and the second largest among the countries of the Global North, after the United States.[2]

To select cases within Spain, I aim for a variation on specific independent and dependent variables that are part of the theoretical framework; thereby following the above-mentioned method of diverse cases. Concerning the independent variable, I chose cases based on their variance along the *governance structure of the RBD*. This variable distinguishes between intra- and inter-regional river basins (see Chapter 2). While inter-regional basins are governed by regional authorities, intra-regional basins are governed by the national state through *Confederaciones Hidrográficas*. Furthermore, the legal framework differs in the two types of river basins: while the National Water Law is fully applicable in inter-regional basins, it only sets the broader legal context in intra-regional basins. Intra-regional basins can thus specify or go beyond the National Water Law through an own regional water law. Despite these differences, all RBDs are, obviously, embedded in a multi-level governance system where the EU law, and most importantly the WFD, applies. The legal status of the WFD implies, as with any other EU directive, that the EU sets specific goals which all Member States must achieve in a given period. At the same time, though, Member States have considerable leeway on *how* to achieve them. Therefore, even though all Spanish RBDs need to fulfil the same aim, we can expect to observe differences in the governance processes for WFD implementation between inter- and intra-regional RBDs. This selection criterion also means that transboundary RBDs are excluded as they have a different governance structure. The number of potential cases,

2 https://www.icid.org/sprinklerandmircro.pdf (accessed 30.06.2021)

i.e., the population of cases represented by all Spanish RBDs, can thereby be reduced from 25 to 18 cases, namely, 4 inter-regional RBDs and 14 intra-regional RBDs (see Table 14, Appendix 1 for all pre-selected RBDs).

Figure 2: Map of Spanish River Basin Districts



Source: De Stefano, Hernandez-Mora (2018)

In relation to the dependent variable, I selected cases based on their variance along the variable *development of agricultural water use,* which is also part of the theoretical framework. I chose this variable because the study's main empirical foci are processes that reduce agricultural water use; thereby representing a key explanandum. To ensure that the reduction of agricultural water consumption is also of empirical relevance in the respective RBDs, I pre-selected those that have a high share of agricultural water use. RBDs where agriculture accounts for less than 50% of total water use are therefore excluded. Followingly, six RBDs remain, namely the Guadalquivir, Jucar, and Segura as inter-regional RBDs; and the Mediterranean Basins, Guadalete-Barbate, and Tinto-Odiel-Piedras as intra-regional RBDs (see Table 14, Appendix 1). As a next step, I assessed the actual *development of agricultural water use*. I therefore analysed data from 2009 and 2016/17 included in the respective

River Basin Management Plans (RBMPs) of the first, second, and partially third planning cycle, depending on data availability in the different RBDs (see Table 15, Appendix 1). For data triangulation, and since these numbers refer to estimations of water use instead of actual water use (European Commission 2015b), I undertook scoping interviews and reviewed secondary literature (see also section 3.2). Based on these different data sources, I selected the Guadalquivir and Jucar as inter-regional RBDs, and the Mediterranean Basins as intra-regional RBD. In the following, I explain the empirical reasons for the selection of the respective cases, which are also summarized in Table 4.

The Guadalquivir was selected as a first case, representing a RBD where agricultural water use increased after the implementation of irrigation efficiency measures by 8,7%, from 2.569 hm^3 in 2009 to 2.792 hm^3 in 2016/17 (own calculations based on CHG 2013; 2020a). Furthermore, the Guadalquivir is often mentioned as an important example where a rebound effect (see Chapter 1) occurred (WWF/Adena 2015; Corominas and Cuevas 2017), and where the empirical relevance of irrigation efficiency measures is particularly high. This is because Andalusia, where almost the entire RBD is located, is the region where the largest areas were affected by irrigation efficiency measures, representing 40% of the so-called modernized area in Spain (Berbel and Gutiérrez-Martín 2017a).

The Jucar was selected as second inter-regional river basin, aiming to increase the variance on the variable *development of agricultural water use* – in line with the rationale of case selection procedure explained above. Indeed, the Jucar is the only inter-regional RBD where agricultural water use (slightly) decreased in the analysed time period, namely by 1.8% from 2009 (1.412 hm^3/year) to 2016/17 (1.386 hm^3/year) (own calculations based on CHJ 2014a; 2019a). Furthermore, the Jucar was mentioned by several interview partners from scoping and stakeholder interviews (Interview 21/2018, 22/2018, 14/2019, 15/2019) and in several empirical studies (Sanchis-Ibor et al. 2016) as an important case in Spain in terms of having prevented the rebound effect.

For the third case, I selected an intra-regional RBD, thereby increasing variance on the independent variable; as well as a case that also shows a decrease in agricultural water consumption, aiming to have a further case that contrasts the Guadalquivir. Having these criteria in mind, I selected the Mediterranean Basins, since between 2009 and 2015, its agricultural water use slightly decreased by 0.8 %, from 824 hm^3/year to 817 hm^3/year (own calculations based on Junta de Andalucía 2014a; 2019a). Even though also the RBD Tinto-Odiel-Piedras meets this criterion (see Table 15, Appendix 1), experts indicated that the political importance of increasing irrigation efficiency and reducing agricultural freshwater consumption is much higher in the Mediterranean Basins (Interview 2/2018).[3] Furthermore, agricultural

3 For the list of interviews, see Appendix 2

water use in the Tinto-Odiel-Piedras corresponds to less than half of what is used by agriculture in the Mediterranean Basins, which suggests a higher empirical relevance of the latter. The Mediterranean Basins of Andalusia include several river basins (see Chapter 4), but represents one River Basin District for the WFD implementation, which is why it composes a single case.

Table 4: Case study selection and its criteria

		Variance along the environmental outcome: Change in agricultural water use (2009–2016/17)	
		(Slight) decrease	Increase
Governance Structure of the RBD	Inter-regional RBD	**Jucar**	**Guadalquivir**
	Intra-regional RBD	**Mediterranean River Basins of Andalusia**	

Similarities and differences between case studies

To be able to meaningfully compare findings derived from case studies, it is important to know whether cases are actually comparable with each other. Furthermore, as discussed above, the possibility to generalize findings to other cases hinges on how cases relate to each other. It is therefore important to have a sound understanding of parallels and variations of case studies, in terms of variables that are considered of theoretical significance for my research. While selection criteria have been discussed for each case, in the following, I briefly present key similarities and differences of further independent variables included in the theoretical framework. More specifically, I focus on *contextual conditions* and *characteristics of heterogenous actors* which are both part of the theoretical framework (see Chapter 2 for definition of variables). *Social problem characteristics* as well as *overarching rules* are not discussed here since they apply to the level of Action Situation and therefore go beyond the scope of this chapter. The implications of these differences as well as similarities for drawing (causal) inference and deriving generalizations will be considered in the Discussion (Chapter 7). All variables will be analysed more in-depth in the empirical chapters (see Chapter 4, 5, and 6).

First, regarding *contextual conditions* of the case studies, it is to mention the second-tier variable *geographic and hydrological characteristics of the river basin district,* which are quite different among and within the three cases. Indeed, case studies show major differences concerning the size of the respective RBD, number of river basins governed within the RBD, main ecosystems, landscapes, or administrative boundaries. However, there are also important differences within each case:

all three RBDs have mountainous as well as flat areas, which considerably shape agricultural production systems; both the Guadalquivir and Jucar have protected wetlands where agriculture is restricted, as well as large-scale areas of intensive farming; and climatic conditions vary within the different RBDs, also affecting agricultural production. Concerning the second-tier variable *socio-economic role of irrigated agriculture*, cases are relatively similar. Indeed, agricultural production in all three cases depends on irrigation which plays an important role for employment as well as the social and political context in rural areas. Third, relative numbers of *water supply and demand* are alike in the three cases, with all cases having a high share of agricultural water demand, and total water demand approximating or even equalling water supply. Yet, cases differ in their absolute numbers of water demand and supply – mainly due to the different sizes of the RBDs –, as well as in their division between surface, groundwater, and non-conventional water resources. In the Guadalquivir and the Jucar, main water resources for irrigation are surface water, while groundwater and non-conventional water resources dominate in the Mediterranean Basins.

Second, *characteristics of heterogenous actors* are relatively similar in the three cases. More specifically, we can observe that in all three cases, *financial and human resources* of environmental actors are considerably lower than those of Water User Associations (WUAs). Further, financial resources also vary among WUAs, depending mostly on whether they are traditional WUAs using rainwater harvesting techniques, or financially better endowed WUAs that use regulated surface water distributed by the state. State actors in the three cases all report that they lack financial means and that they were significantly affected by the Euro crisis in 2008/09 and its consequences. However, regional actors and most importantly the Regional Ministry of Andalusia seem to have, in relative terms, lesser financial and human resources than its national counterparts, i.e., the River Basin Authorities of the Guadalquivir and the Jucar. Further, similar *narratives on water management* are used by actors in the three cases, even though the relative importance of the respective narratives vary. Actor groups in all three cases seem to agree on the problem of limited availabilities of water resources, but they identify different reasons as well as solutions to these problems, ranging from increasing water supply to improving governance or restricting water demand.

Having discussed the selection of case studies, I know turn to selection of action situations for the within case-analysis.

3.1.2 Selection of Action Situations for within-case analysis

Decision-making processes are studied in this book through Ostrom's (2005) Institutional Analysis and Development (IAD) Framework and the Network of Adjacent Action Situations (NAAS), developed by McGinnis (2011) (see Chapter 2). The

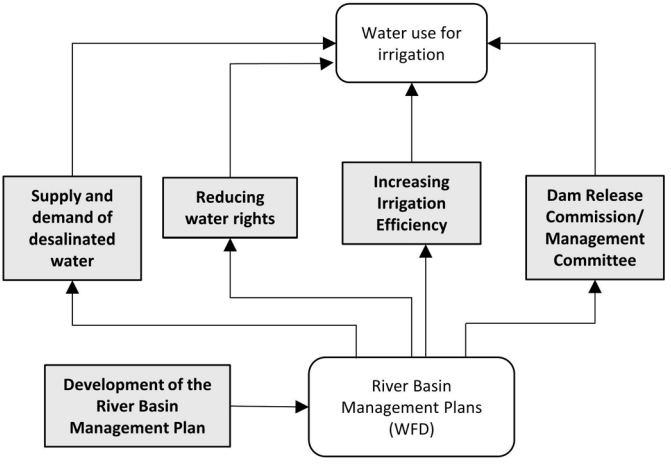
unit of analysis are Action Situations where participants interact with each other (E. Ostrom 2005). The in-depth analysis of different decision-making processes represents a *within-case analysis*. As the name suggests, a within-case analysis allows researchers to observe causal processes within a case (Goertz and Mahoney 2013). Gerring (2006: 204) even argues that it is unlikely that "one has satisfactorily explained an outcome until one has explored *within-case* evidence". In this book, I thus combine cross-case comparison of the three case studies with a within-case analysis (George and Bennett 2005; Gerring 2006) through the focus on Action Situations. Rohlfing (2012) calls such a research design an integrative comparative case study. A common method to undertake within-case analyses is process tracing (Goertz and Mahoney 2013; Collier 2011), which I will introduce below.

I selected four Action Situations that occurred in all three case studies, and one additional Action Situation that is only of relevance in the Mediterranean Basins, namely Demand and Supply of Desalinated Water. All Action Situations are embedded in the overarching processes of WFD implementation of the first and second planning cycle (see Figure 3). There are multiple ways used in the literature to delineate Action Situations, ranging from boundary drawing along governance functions (McGinnis 2011) to selecting Action Situations according to their type of social interaction (for an overview, see Oberlack et al. 2018). Thus, delineating Action Situations is left to the discretion of the researcher. In this work, I draw on the Management and Transition Framework of Pahl-Wostl et al. (2010), and delineate Action Situations broadly based on the policy cycle, albeit only regarding the phases of planning and implementation; as well as based on the type of actors participating in the different decision-making processes. The focus on the policy cycle seems suitable since the governance process stipulated by the EU for WFD implementation undergoes phases as delineated in the policy cycle (Newig and Koontz 2014). However, I acknowledge that focusing on the WFD implementation risks overlooking other and more informal processes which nevertheless may influence farmers' decision-making regarding their water consumption. Furthermore, policy processes are usually more complex than their representation in a policy cycle (Wegrich and Jann 2006). Indeed, instead of undergoing a sequence of different steps, policies may be adapted while being implemented, e.g., due to lack of finances or changed political priorities. However, since I analyse policy stages through the analytical lens of an Action Situation, I explicitly consider institutions, as well as actors' interests and incentives, which allows me to better capture the complexity of the policy process.

The selection and delineation of Action Situations was based on scoping interviews (see below). Although selected Action Situations occur in all three case studies, their relative importance varies; and formal coordination processes sometimes differ, e.g., between intra- and inter-regional RBDs. Nevertheless, for analytical purposes and to facilitate cross-case comparison, these partly varying decision-making

processes are subsumed under the same Action Situations in each case. In the following, I explain the different Action Situations and justify their selection.

Figure 3: Network of Action Situations



Source: Own illustration. The Action Situation Supply of Desalinated Water will only be analysed in the Mediterranean Basins due to little empirical relevance in the other two cases.

First, the Action Situation *Development of River Basin Management Plans* concerns the planning phase for the WFD implementation, ranging from compiling measures to participatory processes and the final RBMP approval. RBMPs need to be developed every six years, outlining all measures which will be taken to meet the WFD objectives. RBMPs are thus the cornerstone of the WFD implementation, which is why they are included as an Action Situation. Second, the Action Situation *Dam Release Commissions* (denominated *Management Committee* in the Mediterranean Basins) is about decision-making processes regarding water allocation to different groups of water users. Members of Dam Release Commissions decide on the reservoirs' filling level during the wet season and upon the schedule and volume of water storage releases during the dry season. Thereby, decisions by the Dam Release Commission may immediately affect the amount of agricultural water use. Third, the Action Situation *Increasing Irrigation Efficiency* analyses what is commonly called "modernization of irrigation" in Spain, namely the implementation of new irrigation techniques such as drip irrigation as well as the replacement of irrigation canals and ditches with pipes (see Chapter 1). These measures aim to increase irrigation efficiency and

are of high empirical importance in all three case studies. Furthermore, the Action Situation *Supply and Demand of Desalinated Water* addresses the implementation of desalination plants of seawater and brackish water, also aiming to reduce freshwater consumption in agriculture. This Action Situation only concerns the Mediterranean Basins since there are no desalination plants of empirical relevance in the other two RBDs. The last Action Situation *Reducing Water Rights* is about reducing water rights after the increase of irrigation efficiency in order to avoid a rebound effect. Furthermore, it also includes changing the type of water right in the context of desalination, i.e., replacing the right to withdraw surface water or groundwater with the right to use desalinated water. Both measures are inherently linked with the technical measures of increasing irrigation efficiency and desalinating water, which is why they are included as an Action Situation in this study as well.

Selected Action Situations can be seen as different phases of the policy cycle, as mentioned above. The *Development of River Basin Management Plans* relates to the planning phase of the policy cycle, while the other three Action Situations concern policy implementation. However, there is a main difference between a rather classical policy cycle and the policy cycle for WFD implementation. Traditionally, policy implementation is understood as bureaucrats carrying out decisions taken by political actors (Newig and Koontz 2014). In contrast, in the context of WFD implementation, those actors who are in charge of the planning phase (i.e., *Confederaciones Hidrográficas*) are also responsible for implementing the respective plans, as well as evaluating their implementation. Newig and Koontz (2014) term this the "EU's mandated participation planning approach", where the formulation of plans is mandated to subnational actors.

Having outlined the comparative case study design, including selection of case studies and of Action Situations, I describe the process of data collection and analysis in the next section.

3.2 Collection and analysis of data

This study follows a mixed methods approach even though the major focus lies on qualitative data. Mixed methods combine and integrate qualitative and quantitative data aiming to compare various perspectives drawn from the different types of data (Creswell 2014). Especially in research on social-ecological systems, mixed methods are considered useful in order to "acquire more support for a potential explanation of a complex phenomenon" (de Vos et al. 2021: 52). The study's main focus on qualitative data is due to my interest in *understanding* social and political processes and their outcomes (Lauth, Pickel, and Pickel 2015). Indeed, qualitative research allows to uncover decision-making processes in-depth by integrating different perspectives and multiple realities of persons involved in these processes (Creswell 2014),

and by analysing a broad range of variables. In addition, I use quantitative data to complement and triangulate findings from qualitative data, especially concerning the environmental outcome.

In the following, I explain the processes of data collection and data analysis in the case studies, as well as the variables' assessment. With this section, I aim to ensure reliability of the study, i.e., to provide the possibility to repeat the study and arrive at similar results (Yin 2018).

3.2.1 Data collection in case studies

Empirical data was collected through scoping and stakeholder interviews (N=53) and document analysis (Yin 2018), thereby aiming to increase the validity of the measurement. Data was collected until a certain degree of saturation was achieved, meaning that collection of new data would most probably not have revealed new insights.

Scoping interviews

I conducted scoping interviews (N=6) with scholars and external experts in October 2017 and June 2018. Scoping or key informant interviews are often used at the beginning of an empirical study to generate contextual and background information from people who hold useful knowledge for the study (Shackleton et al. 2021). Aims of the first two to three scoping interviews thus were to identify and gain an overarching insight of the main empirical field of my study, as well as to detect empirical research gaps. Subsequent scoping interviews were used to select and discuss cases and relevant Action Situations.

I selected interview partners for scoping interviews based on pre-established contacts, as well as through snowball sampling. Scoping interviews were open-ended, although guided by some general questions. They were not recorded, but detailed notes were taken during and after the respective interviews.

Stakeholder interviews

Stakeholder interviews are the main means for data gathering in this study. Through stakeholder interviews, data is collected from people who are themselves part of the case study. The main reasoning behind stakeholder interviews is that they allow to reconstruct and explain social and political processes (Gläser and Laudel 2010), i.e., to generate descriptive as well as explanatory knowledge (Shackleton et al. 2021) – thereby corresponding to the overarching rationale of this study.

More specifically, I conducted semi-structured in-depth interviews (N=47) in June 2018, October/November 2018, June/July 2019, and October 2019 for all three cases. All but one of the in-depth interviews were recorded. Interviewees were guaranteed anonymity. I excluded two of the 47 interviews at the stage of the analysis since the interviewees' expertise did not match with the Action Situations under in-

vestigation. Number of interviews are divided between the case studies as follows: 16 on the Guadalquivir, 14 on the Jucar, 14 on the Mediterranean River Basins, and three on the national level (see Table 16, Appendix 2). Interviews were conducted in Spanish and their recordings were fully transcribed by a student research assistant, also in Spanish. While I have very good Spanish language skills, the fact that I am not a native speaker may have affected the conduction of interviews, e.g., the accuracy of the questions asked. Further, there is a risk that in those cases where interviews were not recorded (scoping interviews and one in-depth interview), information may have been lost. Yet, I argue that due to the relatively high number of interviews conducted, transcriptions carried out by a native speaker, and the use of data triangulation with documents, the overall data quality of this study is not affected.

Interview partners were selected aiming to achieve a balanced representation from the water and agricultural sector operating at different levels, i.e., the local, regional and the national level. This includes national and regional public administrations, WUAs, agricultural organizations, or environmental NGOs. The identification of interview partners consisted in several steps. I first analysed RBMPs of the second planning cycle, namely participant lists of the participatory processes and written statements (*alegaciones)* submitted by actors to the RBMP. This was complemented by snowball sampling in the scoping as well as stakeholder interviews. Interview partners within the identified organisations were chosen based on their experience with the WFD implementation in the respective case study, with a particular focus on the management of agricultural water use. In many cases, these persons were in a leading position of the respective organization and were male.

As mentioned above, interviews were semi-structured, and therefore steered by an interview guideline. Semi-structured interviews are suitable when the research aim is to reconstruct social processes. The use of a guideline then ensures that all topics relevant to understand the particular process are covered, while at the same time questions can be adapted to different interview situations and emerging issues (Gläser and Laudel 2010). I tailored interview guidelines to the case study and the respective type of actor, i.e., public, private, or civil society actor. Thereby, I tried to ensure that questions related to the empirical context of the respective interviewee. Guidelines covered independent as well as dependent variables, and were developed deductively.

Documents and grey literature

Lastly, I collected policy documents and grey literature to better capture the complexity of water governance systems under investigation. Indeed, this allows to triangulate interview data as well as to integrate quantitative data to the study, thereby undertaking the mixed-methods approach. In this context, I identified policy documents and grey literature based on formal documents for WFD im-

plementation, snowball sampling as well as through stakeholder and scoping interviews. Most importantly, these documents include the RBMPs of the first, second, and third planning cycle, including the different accompanying and/or related documents such as draft RBMPs, Scheme of Important Issues, annexes, etc. Data in these documents are of qualitative as well as quantitative nature. It was mainly used to measure output performance, i.e., *political output performance* and *environmental outcome performance*, but also for some of the independent variables, such as *contextual conditions* and *overarching rules*. Further, grey literature includes inter alia press releases, public statements, or reports, mostly from the European Commission, national and regional authorities, as well as stakeholder groups which were published in the period of analysis (i.e., 2009–2019).

3.2.2 Data analysis

Process tracing

To identify causal relationships in the three case studies, I conduct process tracing and analyse primary and secondary data through Qualitative Content Analysis. I use process tracing since this method enables researchers to identify intervening causal processes between the independent and dependent variables; which is why it is particularly suitable for within-case analysis (George and Bennett 2005; Collier 2011), as undertaken in this study through the focus on Action Situations (see also above). The method has received increasing attention in political science in the last decades, which is why various definitions and forms of process tracing are used in the literature (for an overview, see Trampusch and Palier 2016). Here, it is defined as an "analytic tool for drawing descriptive and causal inferences from diagnostic pieces of evidence" (Collier 2011: 824). Furthermore, Gerring (2006: 173) argues employing "multiple types of evidence [...] for the verification of a single inference" to do process tracing, mainly based on qualitative, but also on quantitative data. The mixed-method approach applied in this study is therefore also suitable for process-tracing. In a next step, noncomparable observations drawn from different types of data need to be "ordered, categorized, 'narrativized'" (Gerring 2006: 180). This helps the researcher to uncover the timing and sequence of events or situations (Collier 2011). Breaking down the overarching process of WFD implementation into several interdependent Action Situations is thus considered helpful in this regard.

Process tracing complements the study's research design as well as its theoretical framework, since it is based on similar underlying assumptions than those of comparative case studies as well as of Ostrom's (2005) IAD Framework. Indeed, process tracing (Blatter and Haverland 2014) as well as case studies (Yin 2018) are particularly suitable to answer "why" questions, i.e., to explain outcomes. Furthermore, as Blatter and Haverland (2014) explain, process tracing is based on configurational thinking, and by focusing on contexts and intervening variables to

understand causalities, it takes contingency into account. Thus, causal paths that are identified through process tracing consist of multiple independent variables, feedback loops as well as contextual evidence. This is in line with the theoretical framework of this study, where variables are understood as being configural, interacting and mutually influencing each other (E. Ostrom 2005).

Qualitative Content Analysis

The data which is used to conduct process tracing is analysed through Qualitative Content Analysis. Qualitative Content Analysis is a research method that allows me to identify and categorize patterns in texts, and to make inferences which are replicable (Patton 2015; Krippendorff 1989). Furthermore, it is a rule-guided approach, which allows for tracing the process of data analysis also at a later stage. It combines strengths of quantitative content analysis with a more qualitatively oriented procedure for text interpretation (Mayring 2015). To carry out Qualitative Content Analysis, several methodological and analytical steps are required, from the development of codes to coding of data, and writing the analysis (Kuckartz 2019), as explained in the following.

Elaborating a coding scheme is a key part of Qualitative Content Analysis. I developed codes in an iterative way, thereby combining a "concept-driven and data-driven development of codes" (Kuckartz 2019: 185). I thus first developed codes deductively based on the theoretical framework; and added further codes during the process of coding itself, i.e., based on the interview material. Coding and developing the code book thus underwent several cycles of respective adjustments. This iterative approach on the one hand allowed me to fully consider the theoretical framework; and on the other, it was possible to incorporate all aspects that are relevant to answer the research questions, but which were not expected or unpredicted when designing the coding scheme in the first place. This approach is considered appropriate to be able to make theoretical contributions at a later stage and is in line with the iterative development of the theoretical framework. This means that changes and additions to the code book were then also considered in the theoretical framework. The code book includes all variables, except variables categorized under *social problem characteristic*. This is because I only added them at a later stage, after interview material had been coded. The analysis of these variables is thus based on a thorough understanding on and interpretation of the different Action Situations, instead of an analysis of the interview material.

In the coding process itself, I selected text segments and assigned the respective categories by using the software program atlas.ti. During this process, I additionally paraphrased every coded text segment. The purpose was to further condense the interview material, as well as to translate the content of the different text segments from Spanish into English. In a third step, these paraphrased texts severed as a basis

to write descriptive summaries of every case study, which were then used to write the empirical chapters.

According to Kuckartz (2019: 196), Qualitative Content Analysis "tries to reach a consensus – as far as this is possible – on the subjective meaning of statements". I do not assume that other researchers would code this study's interview material identically as I have done it; however, this method as well as defining codes in the code book aims to make the lens through which I analysed the data explicit. Furthermore, I discussed coded material of the Guadalquivir case with three colleagues; we therefore held several online meetings during a period of approximately two months. In this process, codes were refined as well as coded segments were refined and adapted. Therefore, some degree of intercoder reliability could be ensured. However, this subjectivity in the analysis of the data is neither due to the particular method of Qualitative Content Analysis, nor to the research design of the case study. As Gerring (2006: 69–70) points out: "All data requires interpretation, and in this respect all techniques of evidence gathering are *interpretive*. Rarely, if ever, does the evidence speak for itself. […] Social science is, of necessity, an interpretive act."

3.2.3 Assessment of variables

The final step in condensing information in this study consists of determining the value of each variable. I thereby make use of nominal as well as ordinal scales, but also qualitatively describe some variables, depending on the respective type of variable. Reasons to use nominal and ordinal scales, which I describe below, are to reduce complexity of the collected data, as well as to make the assessment more transparent. Furthermore, assigning values – such as high, moderate or low – to a variable enables to undertake a more structured comparison of the three case studies, ultimately helping to identify causal mechanisms. Similar to what I point out regarding Qualitative Content Analysis, also the method of assigning values is a subjective and interpretative act. However, by doing this exercise explicitly rather than implicitly, the procedure is made more comprehensible, thereby increasing reliability. However, the reduction of complexity which I aim to achieve through this method necessarily implies a certain loss of information. In the cross-case comparison (see Chapter 7) it is thus important to not only compare the values of each variable, but also to consider the underlying justification. In the following, I explain the three different ways to assess variables in this study. The more specific form of assessment of each variable, including the operationalization of the different scales, is displayed in Table 5. I developed the different categories for categorial and ordinal variables inductively, i.e., after having gained an in-depth understanding of the different values of every variable in all three cases (George and Bennett 2005).

The largest group of variables in this study are ordinal variables. These are variables where we can assign discrete categories that can be ranked from lowest to high-

est, but where the distance between the different ranks is without meaning (Cox 2015). I use three-point ordinal scales, defined separately for each variable (see Table 5). Examples of ordinal variables in this study are *development of agricultural water use,* where respective scores are *reduced, constant* and *increased agricultural water use;* or the variable *human and financial resources of actors*, where respective scores are *high, moderate,* and *low*. I use ordinal scales for those variables where it is possible to apply a ranking, and where also the underlying research interest is in line with this ranking exercise. To give an example, if the *amount* of financial resources of actors is of interest to me – rather than the type or source of resources – I would use an ordinal scale. To get to the respective rank, I will first qualitatively describe each variable, and then base the assignment of categories on these descriptions.

One of the main difficulties in ranking variables certainly relates to having clear benchmarks. I did not define graded statements for each variable as part of the scoring scheme, indicating how to arrive at a particular score (see e.g., Dombrowsky et al. 2022). This decision is because in the stage of defining scores and respective statements it is not possible to foresee the full complexity as well as all the nuanced differences that will arise between case studies. However, also without defining graded statements, choosing a certain score is not arbitrary. In contrast, it is based on a weighing process that considers how often certain statements were raised by different interviewees; and, more importantly, it is the result of comparing values of variables across Action Situations as well as across cases. Arriving at a final score – indicating, for example, whether behaviour of actors is highly, moderately or not/marginally coordinated – therefore is an iterative process, where results are compared, and scores weighed and re-weighed. Since each score is preceded by a qualitative description, I ensure that it is comprehensible and understandable how the respective scores are arrived at.

The second group of variables is nominal variables. These are variables whose values are also classified into discrete qualitative categories, but unlike ordinal variables, it is not possible to rank them in a meaningful way. An example is gender, where the categories male, female, or non-binary stand side by side without hierarchical meaning. In this study, this group is much smaller than those of ordinal variables, and includes, for example, the variable *narratives on water management* with the categories *supply-side management*, *demand-side management*, *knowledge and governance*, and *deep ecology.* Very importantly, modes of coordination also represents an ordinal variable, where each pure form of coordination, i.e., *cooperation,* different forms *competition,* and *hierarchy,* as well as *information exchange, gaps* and *conflict* represent discrete categories on a nominal scale. The underlying reason to use a nominal scale is that I am interested in the *type* to which I can assign a particular interaction; and not in whether an interaction is more cooperative than another, for instance. Also for this group of variables, the comparison across Action Situations and across case studies is crucial to arrive at a category. Indeed, for instance, to find out

whether a behaviour can be classified as *hierarchical* depends on if hierarchy dominates in contrast to other Action Situations. This is because traits of hierarchy are likely to be found in any type of interaction within in a multi-level governance process. However, to avoid having to classify any pattern of interaction as a hybrid of all pure forms, it seems reasonable to compare results across Action Situations and across case studies.

Lastly, there are two variables which cannot be grouped under nominal or ordinal variables. This concerns *geographic and hydrological characteristics of the river basin district,* which I describe in a qualitative way. This reason is that it is not possible to use any kind of standardized measurement approach, or to structure the variable in a reasonable way (Cox 2015). In contrast, I focus on those characteristics that were considered important by interviewees to understand water governance and their outcomes in the respective case studies. Lastly, the variable *water supply and demand* is described based on quantitative information since I am interested in absolute numbers of different types of water resources available in the case studies.

Table 5: Overview of variables and their assessment scheme

	Variable	Definition	Assessment
Contextual conditions	Geographic and hydrological characteristics of the river basin district	Location, administrative and hydrological boundaries of the river basins; geography; main ecosystems.	Qualitative description
	Socio-economic role of irrigated agriculture	Relative importance of irrigated agriculture and the agri-food industry compared to other economic sectors, for economy and society.	Ordinal scale: high importance; medium importance; low importance
	Water supply and demand	Type and amount of water resources available for consumption.	Quantitative information
Characteristics of heterogeneous actors	Financial and human resources of actors	Endowments of public, private, and civil society actors in relation to the case study focus.	Ordinal scale: high; moderate; low
	Narratives on water management	Causal and explanatory beliefs of actors regarding status and reasons of existing water management problems.	Nominal scale: supply-side management; demand-side management; knowledge and governance; deep ecology
Overarching rules	Governance structure of the river basin district	Distinction between intra- and inter-regional RBD.	Nominal scale: intra-regional RBD; inter-regional RBD
	De jure autonomy	Extent of formal rights and competencies of governmental and non-governmental actors as stated by laws and regulations with respect to the case study focus.	Ordinal scale: high; moderate; low
	Formal rules for coordination	Formal institutions creating the structure for actors to interact with each other.	Nominal scale: cooperation, competition, hierarchy, hybrids

Social problem characteristics	Uncertainty	Complete lack of information, or insufficient information.	Ordinal scale: high uncertainty; moderate uncertainty; low uncertainty
	Asset specificity	Investments for a specific good or service which cannot be easily transferred to alternative uses.	Ordinal scale: high specificity; moderate specificity; low specificity
	Frequency	Number of times specific activities occur within a particular time period.	Ordinal scale: high frequency; moderate frequency; low frequency
	Spatial and jurisdictional scales	Dimension to study a particular phenomenon.	Nominal scale: Jurisdictional levels: national, regional, local Hydrological levels: basin, sub-basin
	Excludability	Possibility to exclude additional actors from using or suffering from a produced good or service at reasonable costs.	Ordinal scale: high excludability, moderate excludability, non-excludability
Modes of coordination	Hierarchy	Process of forced alignment of activities by a superior actor vis-à-vis an inferior actor.	Category on a nominal scale: Hierarchy
	Competition	Process of alignment of activities based on prices, (economic) incentives, or ideas.	Categories on a nominal scale: Idea-based competition, price-based competition, incentive-based competition
	Cooperation	Process of voluntary alignment of activities of actors to achieve a shared aim.	Category on a nominal scale: Cooperation
	Hybrid	Process of alignment of activities based on a combination of pure forms of coordination (hierarchy, competition, or cooperation).	Combinations of different categories of interaction (hierarchy, competition, cooperation)

Additional categories of interaction	Information exchange	Minimum form of coordination: One-way or two-way exchange of information among actors.	Category on a nominal scale: Information exchange
	Gaps of interaction	Situation where actors intentionally or unintentionally do not coordinate with each other (no information exchange, no alignment of behaviour).	Category on a nominal scale: Gap of interaction
	Conflict	Disagreements or disputes of actors that are not solved through any of the three pure forms of coordination.	Category on a nominal scale: Conflict
Process performance	Coordinated behaviour *(second-tier variable)*	Extent to which different types of interaction (*cooperation*, *competition*, *hierarchy*, and *hybrids*) lead to ordered patterns.	Ordinal scale: highly coordinated; moderately coordinated; not/marginally coordinated
	Information exchanged *(evaluative criterion)*	Extent to which information among actors within a process is exchanged; as well as to which information about the process and its output are available to outsiders of the process.	Ordinal scale: information exchanged; moderately exchanged information; information not/marginally exchanged
	Competing interests considered *(evaluative criterion)*	Extent to which contradictory interests which exist in society in relation to the case study focus are taken into account.	Ordinal scale: competing interests considered; competing interests partly considered; competing interests not/marginally considered
	Incentives aligned *(evaluative criterion)*	Extent to which an incentive structure is established which makes it rational for actors to behave in the expected way.	Ordinal scale: incentives aligned; incentives partly aligned; incentives not/lowly aligned

Output performance	Effectiveness of RBMP *(level of Action Situation)*	Extent to which the RBMP is likely to achieve the political goal of reducing agricultural water consumption.	Ordinal scale: effective; moderately effective; not/marginally effective
	Distribution of surface water adapted *(level of Action Situation)*	Extent to which surface water distribution has been adapted in the Dam Release Commission, compared to what would be required in order to meet ecological flow requirements.	Ordinal scale: distribution adapted; distribution partly adapted; distribution not/marginally adapted
	Status of implementation of measures *(level of Action Situation)*	Status of implementation of measures (reduction of water rights; irrigation efficiency measures; use of desalinated water), compared to what has been prescribed in the RBMP.	Ordinal scale: measures implemented; measures partly implemented; measures not/marginally implemented
	RBMP implemented *(level of overarching governance process)*	Status of implementation of measures included in the RBMP which relate to the management of agricultural water consumption.	Ordinal scale: RBMP implemented; RBMP partly implemented; RBMP not/marginally implemented
Environmental outcome performance	Development of agricultural water use	Change in consumptive, as well as total agricultural water use (consumptive and non-consumptive) from 2009 to 2021.	Ordinal scale: reduced agricultural water use; constant agricultural water use; increased agricultural water use
	Development of irrigated area	Change in irrigated surface area from 2009 to 2021.	Ordinal scale: reduced irrigated area; constant irrigated area; increased irrigated area
	Development of status of water bodies	Change in the water status from 2009 to 2021 according to the WFD assessment.	Ordinal scale: status improved; constant status; status deteriorated

4. Empirical Analysis of the Guadalquivir

In this chapter, I analyse the case study of the Guadalquivir River Basin District (RBD). The process under investigation is the implementation of the European Union (EU) Water Framework Directive (WFD) from 2009 to 2019, thereby covering the first and second planning cycle. The empirical focus lies on decision-making processes on the reduction of agricultural water consumption. The aim of this chapter is to analyse independent and dependent variables that have been theoretically discussed in Chapter 2, and which have been embedded in the study's research design in Chapter 3.

I analyse four Action Situations in this chapter (for an introduction to the empirical context of the Action Situations, see Chapter 3), and thereby uncover various patterns of interaction. The empirical analysis reveals two *hybrids*, composed of *hierarchy* and *idea-based competition,* and one pure form of coordination, namely *incentive-based hierarchy* (for definition of the variables, see Chapter 2). Furthermore, I identify a *conflict* outside of the official governance process between non-state actors of the agricultural and environmental sector; and lastly, *information exchange* followed by a *gap in interaction* in one Action Situation. These different patterns mostly emerge from a combination of formal and informal rules. *Cooperation* has not been identified in any of the Action Situations.

Furthermore, the empirical analysis reveals relatively low levels of performance at the level of the overarching governance process, i.e., across the different Action Situations (see Section 4.3): Process performance, understood as *coordinated behaviour,* is rated low. This is, most importantly, due to a lack of alignment of incentives of irrigators to reduce their water consumption; as well as of governmental actors to enforce this reduction. Policy output performance – understood as *River Basin Management Plan (RBMP) implemented* – of the second planning cycle of the WFD implementation is low, with many measures not yet having been implemented. Last, environmental outcome performance of the process is low, due to an increase of agricultural water use and irrigated surface area in the last decade. Nevertheless, water status of water bodies according to the WFD assessment of the first and third planning cycle remained stable.

The chapter proceeds as follows. In Section 4.1, independent variables that are specific to the case study, and therefore constant across Action Situations, are characterized (*contextual conditions, characteristics of heterogeneous actors*). In Section 4.2, four different Action Situations are analysed. Thereby, independent variables specific to the Action Situation are presented first (*overarching rules, social problem characteristics*), followed by analysing patterns of interaction (*cooperation, competition, hierarchy, information exchange, conflict,* and *gaps in interaction*). Then, performance is assessed at the level of the respective Action Situation (*coordinated behaviour, intermediate output performance*). The chapter concludes with section 4.3, outlining the performance across Action Situations, i.e., at the level of the RBD (*process performance, policy output performance, environmental outcome performance*).

4.1 Independent variables specific to the case study

In this section, I describe independent variables that are specific to the case study, clustered along *contextual conditions* and *characteristics of heterogeneous actors*. Independent variables that are specific for Action Situations, i.e., *overarching rules* and *social problem characteristics*, are described in Section 4.2 before turning to the respective Action Situations.

4.1.1 Contextual conditions

Geographic and hydrological characteristics of the River Basin District

The Guadalquivir RBD is located in Southern Spain, extending over four *Comunidades Autónomas* (hereafter: region), namely Andalusia that covers more than 90% of the area, Castilla-La Mancha (7.11%), Extremadura (2.65%), and Murcia (0.12%) (see Figure 4) (CHG 2015c). The basin covers 57,184 km² with a population of 4.3 Million inhabitants, of which 98% live in Andalusia (CHG 2015a). The Guadalquivir therefore largely is an Andalusian RBD, which is why I only consider the role of Andalusia in this study and leave out the other regions.

The geography of the Guadalquivir is characterized by mountainous areas of the Sierra Nevada in the south-eastern part of the RBD, reaching altitudes between 1,000 m and 3,480 m, and by low altitudes of the valley in the west. These differences are also reflected in the agricultural production systems. In the hillier upstream part of the river, such as in Granada, irrigators are mostly smallholders, whereas the regions of Seville, Cordoba and Jaen are dominated by larger production systems of relatively water-intensive crops such as olives, rice, and cotton. The climate is Mediterranean with irregular rainfall, both temporarily and spatially, varying between 293 mm in the sub-basin of the Guadiana Menor and 1,321 mm per year in the mountainous area. The annual average of precipitation is 582 mm per year. Further,

there are long periods of drought with high temperatures (CHG 2015a). In hydrological terms, the RBD consists only of one major river basin, the Guadalquivir itself with its different tributaries (see Figure 5). Dams are located on different tributaries, which is why the different systems are all indirectly connected to each other, making the Guadalquivir one "gigantic channel" (Interview 7/2018).[1]

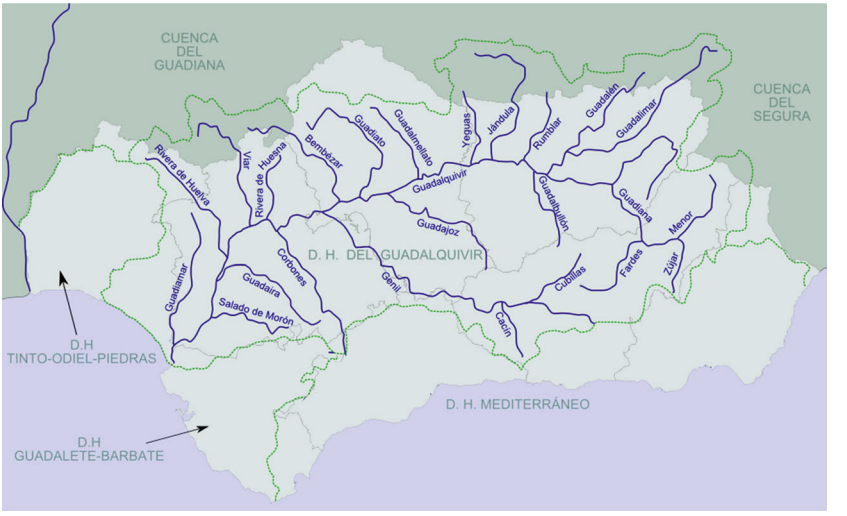
The most important ecosystems in the Guadalquivir are the Doñana wetlands, being among the largest wetlands and richest ecosystems in Western Europe. The wetlands are a UNESCO World Heritage Site, and protected under the Ramsar convention, an international intergovernmental treaty for the protection of wetlands. Doñana depends on surface and groundwater of the Guadalquivir. Its ecosystems are seriously threatened, inter alia by nearby rice cultivation in the Guadalquivir which is very water intensive (De Stefano et al. 2014). According to the WFD assessment, 36.8% of surface water bodies of the RBD are affected by point source pollution, 33.2 % by water abstraction, and 17.6% by diffuse source pollution (European Commission 2015b).

Figure 4: Administrative map of the Guadalquivir River Basin District

Source: CHG (2015c)

1 Quotes from interviews citied in this work were translated from Spanish to English by the author.

Figure 5: Map of rivers in the Guadalquivir River Basin District



Source: Modified based on image licensed under Creative Commons – Attribution – Share-Alike – 2.5 by Té y kriptonita

Socio-economic role of irrigated agriculture

In the following, I discuss the socio-economic role of agriculture for the Guadalquivir. In cases where specific numbers for the RBD are lacking, I refer to Andalusia although only 59 % of the region belongs to the Guadalquivir (CHG 2015a). Most important economic sectors in the Guadalquivir in terms of their contribution to the Gross Domestic Product (GDP) are service (70%), followed by industry (14%) including the agri-food industry, construction (6%), agriculture (5%) and lastly the energy sector (CHG 2019a). In contrast, at the national level, agriculture accounts for only 2.6 % of the national GDP (Instituto Nacional de Estadística 2018), which shows that compared to the rest of Spain, agriculture in the Guadalquivir is of relatively high importance. Further, employment in agriculture is high, with 7.4% in 2012 (CHG 2015a). While these numbers refer to agriculture as primary sector, the agri-food industry is also of high importance in the RBD, contributing to 22% of its industrial employment (CHG 2020b). Further, employment in the agricultural sector has even increased after the economic crisis of 2008/09. This contrasts with other sectors, mostly industry and construction, from which workers shifted to the agricultural sector (European Parliament 2016; CHG 2019a). Nonetheless, the crisis has hit Andalusia particularly hard, and Andalusia has one of the highest

unemployment rates in Spain with 25.5 % in 2017,[2] and one of the lowest GDP per capita with EUR 19,132 in 2018.[3]

In 2015, irrigated agriculture in the Guadalquivir covered 768,210 ha, compared to 1,897,727 ha of rainfed agriculture (CHG 2019a). Irrigated agriculture thereby accounts for 23% of Spain's total irrigated land even though the RBD only represents 11% of the country (Expósito 2018). Further, the economic role of irrigated agriculture is particularly high. According to the CHG (2019a: 184), crops like cereals, fruits, and vegetables are only productive if they are produced under irrigation; and productivity of other crops which can be produced under rainfed and irrigated agriculture is 5.5 times higher if grown under the latter. Furthermore, irrigated agriculture contributes to 64% of the agricultural production in Andalusia, generates 67% of farm income, and accounts for 63% of the agricultural employment in the region (European Parliament 2016).

Agriculture in the Guadalquivir is very diverse. Most important irrigated crops in terms of land use are olive (387,697 ha), covering 45% of the irrigated land in the Guadalquivir, followed by extensive winter crops (68,770 ha), cotton (56,280 ha), and horticulture (54,081 ha) (CHG 2015a). While these numbers show that olive cultivation is very land-intensive, it only accounts for 21.2 % of agricultural water demand (CHG 2015a). Olive cultivation is of high relevance for the agri-food industry, due to the processing of olives, olive oil and fats, which are exported to EU Member States and third countries (Junta de Andalucía 2018). In the 2000s, the olive sector underwent major structural change, shifting from rainfed to irrigated agriculture, mainly triggered by financial incentives through the EU Common Agricultural Policy (Interview 8/2018). Productivity within the olive sector nevertheless varies, ranging from high-yield groves to medium and only marginal-yield production in some mountainous regions (Berbel, Mesa-Jurado, and Pistón 2011; Junta de Andalucía 2014b). In addition, it is to mention the high socio-economic importance of rice cultivation in the downstream part of the Guadalquivir, nearby the Doñana national park mentioned above. While only covering 4.1 % of irrigated land, it is the most water-intensive crop in the RBD in relative terms, accounting for 13.4 % of agricultural water demand. Water productivity of rice, describing total sales per hectare in relation to amount of used water, is one of the lowest in the basin (0.21€/m^3), whereas citrus and olive tree have the highest rates in the basin (1.19 and 1.11€/m^3, respectively) (Berbel, Mesa-Jurado, and Pistón 2011). Rice cultivation is nevertheless considered important for the local population, being the main income source in an area which always has been "one of the poorest" in the Guadalquivir (Interview 8/2018). Yet, rice

2 https://ec.europa.eu/eurostat/cache/RCI/myregion/#?reg=ES61&ind=12-2_lfst_r_lfu3rt (accessed 27.04.2022)

3 https://ec.europa.eu/eurostat/cache/RCI/myregion/#?reg=ES61&ind=18-2_nama_10r_2gdp (accessed 27.04.2022)

farmers strongly depend on subsidies through the EU Common Agricultural Policy, compensating for low prices at the international market (De Stefano et al. 2014).

Water supply and demand

The amount of water supply in the Guadalquivir is 4,111 hm^3/year (CESUR 2021),[4] mostly composed of surface water, which is highly regulated through large-scale dams, followed by groundwater. The amount of water resources transferred from other RBDs, as well as treated wastewater resources are marginal with 23 hm^3/year in 2018/19 (MITECO 2020a). Desalinated water does not exist in the Guadalquivir.

Total water demand in the Guadalquivir is 3,815 hm^3/year, indicating that water demand approximates water supply. Agriculture represents approximately 88% of total water demand with 3,356 hm^3/year (CHG 2015a). Irrigation is based mostly on surface water (2,163 hm^3/year regulated and 334.73 hm^3/year unregulated surface water), and on groundwater with 858.84 hm^3/year (CHG 2015a: 65), which is why both types of water resources are included in this study. However, due to high illegal groundwater use in the Guadalquivir, which I will discuss below, numbers of water demand are most likely higher than predicted official numbers.

4.1.2 Characteristics of heterogeneous actors

The two most important public actors in the Guadalquivir are the River Basin Organization of the Guadalquivir, the so-called *Confederación Hidrográfica del Guadalquivir* (hereafter: CHG) which is part of the national Ministry for the Ecological Transition and the Demographic Challenge. The CHG is responsible for the WFD implementation in the RBD. Second, the Regional Department of Agriculture, Fisheries and Rural Development of Andalusia (*Consejería de Agricultura, Pesca y Desarrollo Rural*, hereafter: Regional Department) is in charge of irrigation management. These two actors will be further characterized in the following section, together with introducing other actors of the case study.

Financial and human resources of actors

The first actor group in relation to the case study focus are national and regional governmental actors, namely the CHG and the Regional Department. Broadly speaking, these governmental actors suffer from lack of financial and human resources, which was further exacerbated by the financial crisis. Since Andalusia was particularly hard hit by the crisis compared to other Spanish regions, lack of financial and human resources is also more pronounced in the Regional Department compared to the CHG.

4 In contrast to the RBMPs of the Jucar and the Mediterranean Basins, the RBMP Guadalquivir does not include numbers on the amount of available water resources for the different types of water resource.

This is because the CHG, as any *Confederación Hidrográfica,* is in addition to taxes and tariffs by water users funded by the national government (Blomquist et al. 2007). In the Regional Department, employment of new people was restricted in the last decade, and retired people were most often not replaced (Interview 7/2018). Availability of financial and human resources is particular important in the Action Situation Increasing Irrigation Efficiency; but also for organizing participatory processes in the Action Situation Development of the RBMP, which will both be discussed below.

The second important group of actors are water user associations (WUAs). In the early 2000s, there were more than thousand WUAs for surface water in the Guadalquivir, thereby being one of the RBDs with the highest numbers in Spain; and approx. 40 groundwater user associations (Ortega et al. 2009). Most of these WUAs are also organized in federations, or umbrella organizations of several WUAs. In Andalusia, there are three of them, which is relatively unique compared to other regions. These are, first, the Feragua Association of Irrigation Communities of Andalusia (*Asociación Feragua de Comunidades de Regantes de Andalucía,* hereafter: Feragua*)*, founded in 1994, who consider themselves as "leading association of Andalusian irrigation".[5] Indeed, at the level of Andalusia, they represent one third of WUAs, covering 300,000 ha. However, in the Guadalquivir, the share must be significantly higher since only few WUAs of the Andalusian intra-regional RBDs are member of Feragua. Furthermore, there are the umbrella organizations Andalusia Irrigators Association (*Asociación de Regantes de Andalucía,* hereafter: AREDA*)*, founded in 2005, covering 210,000 ha; and the Association of Irrigation Communities of Andalusia (*Asociación de Comunidades de Regantes de Andalucía,* CREA), founded in 2007 and representing WUAs of 100,000 ha. Information on their financial and human resources is not available. I therefore understand the amount of water rights as proxy, influencing the relative power of WUAs. Among the WUAs that hold a relatively large number of water rights, there are WUAs in the area of Seville, which are organized within Feragua and concentrate most of the existing water rights (Interview 14/2018); as well as the more than 1,000 rice farmers organized in the Federation of Rice Farmers, whose interests are well represented in the different authorities (De Stefano et al. 2014). In contrast, in the province of Jaen, WUAs have few or hardly any water rights and therefore depend on the annual granting of so-called extraordinary or "precarious" irrigation through the Dam Release Commission (see Section 4.2.2). Furthermore, many of these water users are additionally organized in trade unions organizations, such as the Union of Farmers and Ranchers of Andalusia (*Unión de Agricultores y Ganaderos de Andalucía,* COAG), or the Association of Young Farmers of Andalusia (*Asociación Agraria de Jóvenes Agricultores,* ASAJA*)*, both

5 https://feragua.com/ (accessed 16.08.2021)

representing small and medium-scale family farmers and cattle breeders. Agricultural water users are thus often organized under different umbrellas, i.e., in WUAs as well as in agricultural trade organizations. Besides these very well-organized water users, there are so-called historic WUAs in the mountainous areas around Granada. They rely on rainfed agriculture and are therefore more indirectly affected by river basin management planning, which is why they also participate to a lesser extent in the political decision-making processes (Interview 12/2019).

Third, there are environmental non-governmental organizations (ENGOs) and civil society organizations, including most importantly WWF España, Ecologists in Action (*Ecologistas en Acción*), and the Foundation New Water Culture (*Fundación Nueva Cultura del Agua*, FNCA). These groups have lesser financial and human resources than those in the agricultural sector, which is why their members often work on a voluntary basis, covering a wide range of topics related to water or environment. WWF thereby is an exception, having one of their two Spanish regional offices in Doñana. An important focus lies on the national park, implying that WWF allocates more financial and human resources to their work in the Guadalquivir compared to other RBDs. In general, ENGOs in the Guadalquivir are described as increasingly influential, highly skilled and with broad international networks (Interview 13/2018).

Narratives on water management

A large group of actors, consisting of the CHG and WUAs and partly also the Regional Department, adheres to the *demand-side* as well as *supply-side narrative.* In the context of the former, water scarcity is seen as a problem of excess in demand, which is why reducing water demand at the farm level is assumed to lead to an overall reduction at the basin level (Cabello, Kovacic, and Van Cauwenbergh 2018). More specifically, many private and public agricultural actors, as well as the CHG therefore lobby for the increase of irrigation efficiency (Interview 6/2018, 8/2018, 9/2018, 20/2018) (see Section 4.2.3). It can be seen as most prominent measure reflecting the *demand-side* narrative. Similarly, among mentioned actors, there is a relatively widespread perception that flood irrigation is inefficient due to its allegedly high losses of water. Actors therefore call for replacing flood irrigation by drip irrigation (see Interview 12/2019). Further, mentioned actors also support the *supply-side narrative*, assuming that the lack of water resources is due to deficiencies in water infrastructure (Cabello, Kovacic, and Van Cauwenbergh 2018). In line with the dominant hydraulic paradigm in Spain (Sampedro Sánchez and Del Moral 2014), actors thus lobby for building small- as well as large-scale infrastructure during the development of the RBMP (see Interview 8/2018, 15/2018). The CHG, for example, considers a water transfer from the neighbouring RBD Tinto-Odiel-Piedras, approved in 2017, as the most important measure to reduce over-consumption of groundwater in Doñana (Interview 8/2018). The underlying reason is the high importance of agriculture for the region which "used to be poor, has always been poor, and now, for the

first time in their history, they have a thriving, modern, agriculture. You cannot ignore this" (Interview 8/2018). An agricultural organization even calls for infrastructure that connects all Spanish RBDs to mutually exchange water among the regions, instead of unidirectional water transfers. Thereby, territorial tensions would be reduced (Interview 15/2018). The dominance of the *supply-side narrative* by the CHG on technical measures is criticized by interviewees of the Regional Department. They argue that the CHG would often equate "planning" with the construction of infrastructure in order to generate more water (Interview 13/2018), and that "all problems [the CHG] is solving, they are solving it with construction works" (Interview 7/2018).

A second group of actors composed of ENGOs and civil society organizations adheres to the *knowledge and governance narrative*. The narrative is based on the idea that water scarcity needs to be solved through improved governance and available information (Cabello, Kovacic, and Van Cauwenbergh 2018). In the context of the RBMP development, actors followingly lobby for the monitoring of groundwater use as well as the closure of illegal wells, especially in the area of Doñana (WWF 2016, Interview 11/2018). Many WUAs also support these measures, perceiving illegal groundwater consumption as threat for their future demand (Interview 16/2018, 18/2018). Furthermore, in the context of this narrative, ENGOs and civil society organizations (Interview 10/2018, 11/2018), some actors in the Regional Department (Interview 13/2018), but also certain WUAs (Interview 16/2018) advocate for the reduction of water rights after the increase of irrigation efficiency.

Beyond the analysis of narratives, it is to mention the often-conflictive relationship between the CHG and the Regional Department going back to a dispute over competencies in the 2000s. In 2009, competencies to manage the Guadalquivir were transferred from the national level to Andalusia; and in 2011, following a constitutional court ruling, again back to the national level (Thiel 2014a). This conflict is still present in the background and resurfaces especially when there are different governing parties at the two levels. Indeed, the Regional Department traces the reason for a "lack of coordination" back to the fact that a largely Andalusian RBD is governed by the national level (Interview 7/2018). In contrast, a CHG representative criticizes that decisions taken by the Regional Department in the period between 2009 and 2011, such as the granting of many water rights, still has negative impacts on their own work (Interview 8/2018).

4.2 Analysing and evaluating Action Situations

In the following, I analyse and evaluate four Action Situations, namely Development of the RBMP, Dam Release Commission, Increasing Irrigation Efficiency, and Reduction of Water Rights (for the selection of Action Situations, see Chapter 3). Every Action Situation is outlined in a different section, all of which are structured as

follows. First, I outline independent variables that are specific to the respective Action Situation, namely social problem characteristics (*uncertainty*, *asset specificity*, *frequency*, *scale* and *excludability*) and overarching rules (*de jure autonomy* and *formal rules for coordination)*. Then, the empirical process is described, focusing on the respective patterns of interactions, which are described and traced back to formal and informal rules. I thereby distinguish between *cooperation*, *competition*, *hierarchy*, and *hybrids*, as well as *information exchange, conflicts* and *gaps in interaction* (for their definitions, see Chapter 2). The analyses of each Action Situation conclude with a performance assessment at the level of the respective Action Situation, including *process performance* and *intermediate output performance*.

4.2.1 Development of the River Basin Management Plan

The Action Situation Development of the RBMP focuses on the planning phase for the WFD implementation, ranging from bilateral meetings and formal participatory processes to the approval of the RBMP by the River Basin Water Council. More specifically, in the beginning of the process, the CHG organized bilateral, informal meetings with WUAs and governmental actors to discuss main water management issues. These informal meetings were followed by formal participatory processes organized by the CHG as required by the WFD (Art. 14). In line with the WFD, the CHG presents the Draft Scheme of Important Topics (*Esquema de Temas Importantes*) (Art. 14), as well as the Draft RBMP, to which stakeholders may then submit written statements. The last step relates to the River Basin Water Council and National Water Council, which both need to approve the RBMP. Then, they pass it to the National Government which formally adopts the RBMP. As I will outline below, I identify a *hybrid* pattern of interaction in the empirical process. It is composed of *hierarchy* and *idea-based competition* between the CHG, the Regional Department, WUAs, ENGOs, and civil society representatives, based on formal and informal rules.

Independent variables specific to the Action Situation

Regarding *overarching rules* specific to this Action Situation, I look at *de jure autonomy,* defined by the 2001 National Water Law as well as the WFD. It is rated moderate for the CHG, and low for all other actors. More specifically, the CHG is in charge of development, monitoring and revision of the RBMP (Art. 23, Water Law). Furthermore, the Water Law says that all national, regional and local authorities have the duty of "reciprocal coordination", as well as "mutual information and collaboration" regarding their activities which have any impact on the general water domain (Art. 128). Similarly, following the WFD, the CHG shall "encourage the active involvement of all interested parties" as well as gather and disseminate information related to the RBMP (Art. 14(1)). Furthermore, the CHG shall allow the public to comment in writing on the draft RBMP for a period of at least six months (Art. 14(2)). These for-

mal rules thus grant considerable competencies to the CHG, but also indicate a mutual dependence of actors due to different coordination requirements. Thereby, the CHG's *de jure autonomy* is somehow restricted in the process of RBMP development. All other actors which have been characterized above (see section 4.1.2) can participate in the Action Situation and thereby contribute to the RBMP development, but have, for example, no formal authority to introduce measures into the RBMP. *De jure autonomy* of all other actors is therefore low.

Regarding the second variable, *formal rules for coordination*, there is the River Basin Water Council as main coordination instrument in this Action Situation. It includes state, private, and civil society actors and has to formally approve the RBMP. After the RBMP approval by the River Basin Water Council, the RBMP is passed to the National Water Council, which also needs to approve; and then, it is passed to the National Government, which formally adopts the RBMP.

Social problem characteristics of this Action Situation point towards medium to high coordination requirements of the CHG with involved actors. First, *uncertainty* in this context relates to the questions whether stakeholders' interests will be integrated into the RBMP (*input-related uncertainty*); whether measures will be implemented (*process-related uncertainty*); and whether the WFD goals will be achieved through the RBMP (*output-related uncertainty*). Overall, *uncertainty* is high. From the perspective of actors participating in the planning process, there is considerable *uncertainty* whether the CHG will integrate their interests into the RBMP. This may negatively affect actors' motivation to contribute to the planning process and thereby increase their opportunistic behaviour. From the perspective of the CHG, there is moderate *uncertainty* whether actors in charge of implementation of measures will comply with their commitments, and actually implement them. This is because the RBMP is not binding and the CHG has no authority to enforce implementation of measures. The non-binding character of the RBMP also implies that for other state as well as non-state actors, implementation of measures by the CHG is somehow uncertain. However, I argue that it is neither in the interest of the CHG nor of other authorities in charge of implementation to submit a completely unrealistic RBMP to the European Commission, since this would harm their credibility in the long run. Regarding the attainment of environmental objectives of the WFD, though, *uncertainty* is high. This is because on the one hand, cause-effect relationships in environmental systems which are influenced by a variety of factors are difficult to predict; and on the other, WFD objectives are also relatively ambitious, which is demonstrated by the fact that no Member State has achieved them yet. These high levels of uncertainty imply that opportunistic behaviour of actors also increase.

Further, compared to other Action Situations, *frequency* is low since the RBMP has to be developed once every six years. While this means that the *relative* need for coordination is high, we can assume that it decreases from the first to the third plan-

ning cycle. This is because the structure of the RBMP as well as the way how participatory processes are organized are similar across the three planning cycles. Third, the *scale* to which the RBMP refers is the river basin district. Since it crosses several administrative boundaries, it implies a high need for cross-level coordination. Forth, *asset specificity* is medium. In the context of policy decisions, asset specificity inter alia depends on the target group, since diverse target groups often require the development of more differentiated solutions. The target group of the RBMP is very heterogenous, including private, public, and civil society actors from different levels and sectors, representing a large variety of (local) water management problems. Measures included in the RBMP therefore need to be developed specifically to the problems of different user groups and cannot be easily transferred. On the other hand, irrigation efficiency measures, for example, are also included in the RDP and are thereby "transferred" from one policy to another (Interview 8/2018), which reduces *asset specificity*. Last, *excludability* of the RBMP is low. This is because the RBMP, in the form of a policy, presents a public good. Actors, thus, cannot be excluded from either negative or positive spillover effects of the RBMP.

Pattern of interaction: Hybrid of hierarchy and competition

In this Action Situation, I identify a *hybrid* pattern of interaction, consisting of *hierarchy* and *idea-based competition*. First, *hierarchal* patterns of interaction emerge due to an asymmetric relationship between the CHG on the one hand, and non-governmental actors as well as the Regional Department on the other hand; based on the interplay of formal and informal rules. As explained above, the CHG is ultimately responsible to compile the RBMP, which grants it the formal decision-making power, although coordination with concerned actors is required (*aggregation rule*). While formally, the CHG is therefore in a superior position vis-à-vis the other actors, this is also complemented by informal rules. Indeed, according to interviewees, many decisions were unilaterally taken by the CHG (*aggregation rule*): An ENGO representative explains that discussions during participatory processes are often based on documents that have already been internally decided upon by the CHG (Interview 10/2018). The interviewee criticizes that this would hinder actors to jointly "build a future", "define things together", or reach real agreements between the water administration, irrigators, and environmentalists (Interview 10/2018). These asymmetries, being an indicator for *hierarchical* relationships, also become apparent concerning interactions between the Regional Department and the CHG. In this context, *informal aggregation rules* are again decisive, according to which the CHG takes unilateral decisions: The Regional Department criticizes that the CHG would often put measures into the RBMP that overburden and exceed the Department's financial capacities (Interview 7/2018). A CHG representative confirms to often decide on measures on behalf of the Regional Department, but because the latter does not provide the required information: "We first go to the Regional Department to see what

they have in mind, then the Regional Department generally doesn't respond at all, then we say: 'this is necessary'... I'm [talking] ironically..." (Interview 8/2018).

These *hierarchical* traits are overlapping with *idea-based competition* between various stakeholder groups who bring forward competing interests to the CHG, based on formal *choice rules*. More specifically, stakeholders propose their usually competing ideas and demands to the CHG, either in participatory workshops or through submitting written statements. In the second planning cycle, 89 statements were submitted, including 29 from the agricultural sector, 26 from the administration, and 17 from platforms and NGOs (CHG 2015d). While some statements were indeed included in the RBMP (Interview 8/2018, 16/2018), interviewees argue that the CHG at this stage usually does not make "changes in essence" anymore, but rather adapts small details (Interview 6/2018; see also 10/2018) (*aggregation, scope rules*). The CHG thereby takes the role of a single "consumer", while between the different stakeholder groups, there is no physical interaction (*position, choice rule)*.

A further instance of *idea-based competition* concerns participatory processes that where organized by the CHG during the process of RBMP elaboration (*choice rule)*. Workshops on the first RBMP documents were organized separately for the different sectors of urban water use, industry, irrigation, and the civil society. Later workshops on the draft RBMP were organized along geographical districts, but approx. three-quarters of participants belonged to WUAs and private companies, and only a minority to the public administration, research, ENGOs and civil society (CHG 2015d) (*boundary rule)*. Physical, cross-sectoral interaction therefore hardly took place. The *competitive* behaviour therefore has the form of actors bringing forward competing claims to the CHG. An illustrative example are the competing interests regarding the management of water rights, articulated by the different user groups (see Section 4.2.4): On the one hand, there are ENGOs and civil society organizations who argue for reducing the so-called historic water rights to the amount used by water users (see Section 4.2.4); further, they argue to only carry out irrigation efficiency measures under the conditions of reducing respective water rights and allocating freed water resources to meet environmental flow requirements (WWF in CHG 2014b; Interview 10/2018, 21/2018). In contrast, FERAGUA argues to adapt allocation of water resources to respective water availabilities through the Dam Release Commission, "but not through granting of water rights with endowments that are of permanent deficiency" (FERAGUA in CHG 2014b) (see Section 4.2.2); while another group of WUAs also asks for changes in water rights, but to re-distribute them among irrigators, and to only reduce water rights of those actors that already have a high number of rights (Interview 16/2018).

This form of *idea-based competition* is additionally also present in the formal decision-making process of the River Basin Water Council, resulting from a combination of informal and formal rules. According to the National Water Law, decisions are taken by majority vote (*aggregation rule*), which is why the composition of the

Council is important: there are 76 members, including CHG staff and representatives from national and regional governments (54); WUAs, water supply companies, industrial users, and hydropower companies (26); and agricultural, environmental, and trade union organizations (6) (De Stefano 2020: 51) (*boundary rule*). According to formal rules, actors therefore *compete* for votes on the RBMP; even though informally, RBMPs are usually adopted by the River Basin Water Council without any further discussion or amendment. This implies that consensus among the majority is already reached before the official meetings (*aggregation rule)*. Although administrative actors have the absolute majority, an interviewee explains that the CHG considers votes by water users in favour of the RBMP as particularly important to have a greater political support of the RBMP (Interview 6/2018). This is, arguably, why the CHG holds informal bilateral meetings with most important water users during the process of RBMP elaboration (Interview 6/2018) (*choice rule)*. These informal meetings are also considered very important by WUAs, facilitating their own work (Interview 14/2018, 16/2018), and allowing WUAs to be in "direct relations to the CHG" (Interview 14/2018). The two opposing groups in the River Basin Water Council are the CHG and water users on the one hand, and the Regional Department as well as environmental actors on the other hand, who both voted against the (draft) RBMPs in the two planning cycles (Interview 8/2018). The voting behaviour of the Regional Department can be explained by political unanimities between the central and the regional government which go back to the conflict of competencies in the first decade of the 2000s described above (see Section 4.1.2). Further, their voting usually depends on the current parties in power at the two different levels (Interview 8/2018, 22/2018), and thereby also contrasts with the technical relationship among bureaucrats described as very positive (Interview 8/2018, 13/2018). Yet, due to the lack of deliberation during the Council meeting, this conflict is rather subtle and is not played out openly. Indeed, an ENGO representative perceives the meeting as being merely about providing information and establishes that their vote "never is decisive" (Interview 21/2018).

Performance assessment

Coordinated behaviour of this *hybrid* pattern of interaction is assessed to be medium, based on the following three criteria. First, *information exchanged* between different constellations of actors is medium, concerning the flow of information during the process itself, as well as information available on the output of this Action Situation, i.e., the RBMP. Regarding the former, information exchange between the CHG and the Regional Department (Interview 7/2018, 8/2018), and the CHG and WUAs (Interview 12/2019) is described positive. However, provision of information by the CHG to environmental stakeholders is criticized: "When they know that something is difficult, and they know that you will use it for your work… […] they always wait for the last minute [to give the information], when they think it's opportune" (Interview

10/2018). Further, cross-sectoral information exchange between stakeholders is also hindered due to the fact that participatory processes are organized separately for every sector. According to the FNCA, referring also to other RBDs, this only allows "each sector to listen to itself and maximize its sectoral demands, which [...] implies maintaining an exclusively bilateral relationship between each of these sectors and the basin organization, which in practice weakens the capacity of public participation to influence decision-making" (FNCA 2019: 10, own translation). Also the bilateral exchange between the Regional Department and the CHG is sometimes hindered due to mentioned political conflicts at higher level. An interviewee argues that some administrative actors would be "afraid of informal meetings", thereby hindering a "more fluid relation" (Interview 13/2018). Furthermore, availability of information on the RBMP is assessed differently by actors. On the one hand, the different Spanish RBMPs are very detailed, providing a "significant amount of detailed information" (European Commission 2015b: 9); but on the other, it is argued that comprehensibility of this information is limited. Indeed, environmental representatives argue that the RBMP is "a horror to read" (Interview 10/2018), and "an immense battery of data related to water, to agriculture, but then this is not easily transmitted to the citizen, and furthermore it is not transmitted either in the decision-making process." That is why the provided data "is not helpful when it is about taking a decision" (Interview 21/2018).

Second, *competing interests considered* is also evaluated as moderate. While WUAs perceive to be well represented in the informal and formal decision-making processes, as well as in the final output of the RBMP (see Interview 6/2018, 9/2018, 16/2018), an ENGO representative argues that their input to the RBMP is seldom considered (Interview 21/2018); and a Regional Department's representative criticizes the strong focus of the RBMPs on infrastructure measures (Interview 13/2018). Furthermore, only few ENGO or civil society representatives are member of the River Basin Water Council, with water users and governmental actors having a clear majority. This further hinders the equal consideration of different interests.

Lastly, *aligned incentives* refers to the question whether actors are incentivized to also implement measures of the RBMP at a later stage. It is also rated moderate. As mentioned above, the Regional Department complains about the large number of measures envisaged in the RBMP, overstraining their financial capacities (Interview 7/2018). On the other hand, I argue that evaluation reports by the European Commission (see European Commission 2015b; 2019b), and the legal obligation to comply with the WFD aims represent external incentives for the CHG and other governmental actors to also implement respective measures.

The *intermediate output performance* in this Action Situation relates to the *RBMP effectiveness*, defined as the extent to which the RBMP is likely to achieve a reduction of agricultural water consumption. The RBMP is assessed to be marginally effective. To understand the RBMP effectiveness, I analyse the way the two measures irrigation

efficiency and reduction of water rights are operationalized, namely whether actors in charge of i) implementation and ii) financing are defined, and whether iii) actors affected by the respective measures are specified (see Chapter 2). First, irrigation efficiency measures fulfil all three mentioned criteria. As I will elaborate below (see section 4.2.3), actors in charge of implementation are defined, as are responsibilities for financing. Also a budget is allocated: the reduction of pressures by water extraction represents the second most important group of measures in terms of budget allocation, after the reduction of point-source pollution (CHG 2015b). Among the former, irrigation efficiency measures are the most important ones, summing up to EUR 433 Million (CHG 2015b). Lastly, affected actors are also specified, meaning that WUAs which are going to benefit from subsidies are listed in the RBMP (CHG 2015b). However, public benefit of irrigation efficiency measures, i.e., how much water will be saved where and by whom is not discussed.

In contrast to the way irrigation efficiency measures are addressed in the RBMP, only one out of three mentioned criteria are defined for the measure water rights reduction. More specifically, the CHG is defined as actor in charge of implementation, but no budget is assigned for this measure. Further, the RBMP does not specify whose water rights will be addressed and only speaks about an "update" of water rights (CHG 2015a; 2015b), thereby concealing that the measure should be about *reducing* water rights.

Adding to that, it is to mention the general critique by the European Commission on the Spanish RBMPs, stating that "measures to satisfy water demand […] are not targeted to the WFD objectives, and might even hamper their achievement" (European Commission 2015b: 71). Furthermore, the contribution of irrigation efficiency measures to the environmental objectives "is generally not assessed and not quantified", which should be done "on a case by case basis" (European Commission 2015b: 71). Indeed, and as mentioned above, the amount of water saving has not been calculated in the RBMPs (CHG 2015b). This critique has been reiterated for the second planning cycle (European Commission 2019b). Thus, despite the fact that irrigation efficiency measures are very well specified, I assess the RBMP to be marginally effective. This is due to the broad evidence that irrigation efficiency measures risk to increase agricultural water consumption if they are not complemented by a sound water accounting system and the reduction of water rights (Grafton et al. 2018). Although measures for the reduction of water rights are included in the RBMP, the fact that they are not much elaborated in the RBMP may hamper their implementation at a later stage.

4.2.2 Dam Release Commission

This Action Situation is about decision-making processes in the Dam Release Commission, a participatory organ within the CHG, which decides on the annual alloca-

tion quota of surface water stored in dams. The Commission decides upon the filling level of reservoirs during the wet season and upon the schedule and volume of water releases during the dry season. It thereby adapts the water share allocated to the different organized user groups within the RBMP to the actual availability of water. WUAs can then decide by themselves on how to distribute water among their respective members. The Commission meets twice a year and is chaired by the CHG President. I identify a *hybrid* of *idea-based competition* and *hierarchy* between the CHG and WUAs, resulting from the combination of formal and informal rules, as well as differences between these rules.

Independent variables specific to the Action Situation

Overarching rules look at *formal rules for coordination*, which here refer to the Dam Release Commission itself, as a participatory decision-making body. In the Guadalquivir, there is only one Dam Release Commission. Members of the Commission are representatives from user associations (irrigation and municipal water use), national ministries, and CHG staff, namely Water Commissioner, Chief of Operation, and Technical Director.

De jure autonomy of Commission members is assessed as moderate since on the one hand, actors are granted decision-making power on the allocation of water resources; while on the other, actors depend on, and thereby mutually restrict each other. More specifically, the mode of decision-making is majority vote; all members except the CHG staff and its president have voting rights according to the National Water Law. Commission members with voting rights shall suggest the timing for and amount of released water from the reservoirs to the CHG staff and the President (Art. 33, Water Law). Furthermore, the law states that in case the suggestion by members is unanimous, and the CHG staff – i.e., Water Commissioner, Chief of Operation, and Technical Director – agree on it, the proposal is binding for the CHG president. Otherwise, he or she will decide on the basis of the diverging opinions (Royal Decree 927/1988) (Bhat and Blomquist 2004). Thus, these formal requirements to involve WUAs in the decision-making, as well as the respective mode of decision-making (i.e., majority vote), restricts the *de jure autonomy* of the CHG.

Social problem characteristics in this Action Situation indicate a relatively low need for coordination, compared to the other Action Situations. This is because *frequency* is medium, with the Dam Release Commission meeting twice a year. Second, *asset specificity* is also medium. Since decisions of previous years are usually the basis for the upcoming year, investments by the CHG in the Dam Release Commission are not unique to the respective meeting. Further, as argued above, *asset specificity* of policy decisions depends on the target group, which in the case of this Action Situation, are represented by water rights holder. Compared to other Action Situations, they are a relatively homogenous group. Indeed, neither the Regional Department nor ENGOs, which usually represent different interests than WUAs, are part

of the Dam Release Commission. Third, *scale* refers to the river basin district. However, the fact that the RBD cuts several administrative boundaries – which would require higher coordination – is not of relevance in this Action Situation, since regional actors are not involved. Fourth, *excludability* is high, since the decision of the Dam Release Commission basically grants the right to water users to withdraw water, thereby representing a private good. Since it is about regulated surface water, it is physically possible to prevent other irrigators to use the water.

Last, *uncertainty* is assessed again at two analytical levels. From the perspective of the CHG, *uncertainty* is low, referring to the question whether WUAs will accept and later also follow their decision. Due to the fact that the Dam Release Commission decides upon the allocation of highly controlled surface water, there is little margin for WUAs to behave in a deviant manner. This is because in contrast to groundwater, water users cannot physically extract more water than what is allocated to them. Furthermore, there is no possibility for WUAs to legally challenge the decision taken by the Dam Release Commission. From the perspective of WUAs, *uncertainty* is medium. It refers to the question whether the CHG will adapt water allocation compared to previous years. In years of reduced water availability, the CHG tends to change the quota, but the exact amount of reduction is difficult to predict for WUAs, as will be discussed below.

Pattern of interaction: Hybrid of hierarchy and competition

I classify the pattern of interaction in this Action Situation as a *hybrid* composed of *idea-based competition* and *hierarchy* between the CHG and WUAs. Prior to the Commission meetings, and concerning day-to-day management of water releases, the CHG organizes regular informal bilateral meetings with the most important WUAs and their umbrella organizations, even though the latter are not members of the Commission themselves (Interview 14/2018, 16/2018, 17/2018). Around 120 to 140 people, including members and guests, usually attend the Commission's meetings (CHG 2018a), where the CHG Technical Director announces allocation quota, which I will describe below. Decision criteria are annual precipitation rate, water level in the reservoirs, type of crops (or number of inhabitants in case of urban water supply), and existing water rights. The announcement by the Technical Director is then followed by a round of requests and questions (CHG 2018a).

The *hierarchical* pattern of interaction in this Action Situation is determined mostly by informal aggregation rules according to which the CHG, as superior actor, takes decisions that are de facto binding for WUAs, as inferior actors. Although formal rules stipulate that Commission members suggest allocation quota to the CHG president (see *de jure autonomy*), it is de facto the Technical Director who announces water allocation quota to the WUAs. Indeed, WUAs report that decisions on allocation quota are usually taken by the CHG prior to the Commission's official meetings (*aggregation rule*) (Interview 14/2018, 16/2018). According to

an interviewee, the CHG has "drawn up everything prepared from the meetings they have had previously, and everyone knows what they are going to say. The topic is closed" (Interview 14/2018; similarly: Interview 3/2018). He further continues, "we can have a lot of water user associations [on our side], but if the CHG says no… then you can fight forever…" (Interview 14/2018). I see this as a further indicator of an asymmetric, hierarchical relationship. Stakeholders therefore distinguish between the "private" and the "public", more informative, act of the Commission, where in the latter the CHG "publishes" the amount of water releases (Interview 12/2018, 16/2018). Further, suggestions by the CHG are usually not adapted, as argued by interviewees (Interview 14/2017, 16/2018) and documented in minutes (CHG 2018a; 2017) (*aggregation rule)*. These are all indicators for *hierarchy*, where the CHG has both, authority and power to enforce a decision, based on a combination of formal and informal rules. Further, this *hierarchical* pattern of interaction is also reflected in the so-called Permanent Committee of the Dam Release Commission, consisting only of the CHG staff and President. If water availability in reservoirs changes after the official decision-making, the Permanent Committee can decide to adapt previous decisions (*aggregation rule*) (Royal Decree 927/1988). Quite regularly, situations emerge where the initially granted amount of water needs to be either restricted or expanded. In the latter case, water users are asked to submit applications for so-called extraordinary irrigation, but they are not involved in the decision-making as such (Interview 8/2018, 16/2018, 18/2018).

In addition, I observe *idea-based competition* where WUAs compete among each other in presenting their preferences – in the form of suggestions on water allocation – to the CHG, based on a combination of formal and informal choice rules. The CHG, then, assumes the role of a single "consumer", deciding which suggestion will be integrated in their decision-making. Empirically, this form of competition refers to the above-described bilateral, informal negotiations between the CHG and WUAs (*boundary* and *choice rules*). Indeed, these meetings are considered particularly important in years of reduced water availability (Interview 8/2018). Moreover, it also refers to the Commission's official meetings, when stakeholders bring their ideas to the attention of the CHG. In these contexts, there are two opposing groups of WUAs, asserting their competing claims – instead of cooperating with each other and trying to reach a consensus, based on trust and reciprocity. I see this as characteristic for *competition*. Indeed, these groups have different views regarding the reduction of their own water consumption for the benefit of upcoming, potentially dryer years (Interview 6/2018). On the one hand, most of the WUAs defend the general idea to continue business-as-usual, or to even increase allocation quota (CHG 2018a; 2017). This contrasts with a minority of agricultural actors who suggest being more conservative about releasing water in order to increase the guarantee for the near future

(Interview 14/2018).[6] Additionally, they argue that social criteria should be applied when reduced amounts of water need to be distributed, such as the number of people involved, or the amount of work created by the respective WUAs. In this context, the interviewee explains:

> "You have to go down to earth a little and stop believing and trusting so much in statistics and numbers, it is the social implication that we ask the administration [CHG] for, because in the end you are dealing with people and you are releasing water that people are going to use, and they depend on it." (Interview 3/2018)

However, this form of interaction depends on the hydrological situation, since it is mostly in situations of drought, or reduced water availability, when actors tend to disagree on the allocation of water (Interview 8/2018, 16/2018).

Performance assessment

Coordinated behaviour of this Action Situation is assessed to be moderate, based on the following three criteria. First, *information exchanged* during the process as well as on the output of this Action Situation is evaluated as high. Concerning the former, stakeholders describe the availability and flow of information between WUAs and CHG on the exploitation of water resources as well as on water release of dams as very positive (Interview 9/2018, 14/2018, 16/2018). In relation to information availability on the output of this Action Situation, all minutes are publicly accessible on the CHG website. Minutes include specific information on allocation quota for the upcoming period, as well as discussion points raised by participants.[7] Furthermore, data related to water storage and water releases is updated daily, and during the irrigation campaign, some WUAs are even in daily direct exchange with the CHG about water release and storage (Interview 17/2018, 18/2018).

In contrast, *competing interests considered* is low. This is because environmental and civil society organizations as well as the Regional Department are not members of the Commission. These actors therefore ask for changing the official composition to also become a member (FNCA 2018, Interview 7/2018), which I interpret as an indicator that they do not perceive their interests to be well represented. Adding to this, even some of the WUAs criticize the CHG for putting to low restrictions, which means that future interests of irrigators may not be sufficiently taken into account. Against this background, a WUA representative explains: "We ourselves said we had to restrict, can you imagine? […] in the end it was the users themselves who told the CHG: 'establish a restriction', and they put 10%, which is very little." (Interview 6/2018).

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6 http://cuadernoagrario.com/?p=11693 (accessed 20.08.2021)

7 https://www.chguadalquivir.es/comision_desembalse (accessed 04.04.2022)

Last, *aligned incentives* are moderate. On the one hand, there is no possibility for WUAs to circumvent the decision taken by the Dam Release Commission, also because this is physically not possible. However, the CHG does not provide any incentive for WUAs to use less water than granted through the Dam Release Commission, and thereby contribute to an overall reduction of water consumption. Indeed, some WUAs ask the CHG to establish incentive mechanisms through the Dam Release Commission to save water. A WUA that uses less water than the officially allocated amount could, for example, get granted more water than others in times of water restrictions (WUA in CHG 2018b, Interview 14/2018).

Performance assessment also refers to the *distribution of surface water adapted*. This variable is rated as moderate; and it is understood as the extent to which surface water distribution has been adapted in the Dam Release Commission, compared to what would be required to meet ecological flow requirements. The assessment is difficult since there are no official calculations on the amount needed to fulfil requirements for ecological flows. I therefore rely on anecdotical evidence according to which despite several relatively dry years in a row, water allocation was reduced very late by the Dam Release Commission in 2018 (Interview 21/2018). A WUA representative confirms that there were "thousands of indicators that this would happen", referring to low levels of water in the dam during the same period (Interview 6/2018). Furthermore, in the hydrological year 2017/18, 54% of controlled surface water bodies in the Guadalquivir did not meet the requirements for minimum flow rates (MITECO 2020a). While other Action Situations certainly also influence the compliance with environmental flow rates, this high non-compliance is an indicator that the Dam Release Commission did not fulfil its purpose either.

4.2.3 Increasing irrigation efficiency

The Action Situation Increasing Irrigation Efficiency is about the implementation of measures included in the RBMP to substitute gravity irrigation by local drip irrigation, as well as canals and acequias by pipes. I identify two patterns of interaction, namely *incentive-based hierarchy* between WUAs, the Regional Department, the State Society for Agricultural Infrastructure (*Sociedad Estatal de Infraestructura Agraria S.A.*, SEIASA) and the CHG; as well as a *conflict* outside of the official policy process between ENGOs and WUAs.

Independent variables specific to the Action Situation

As part of *overarching rules*, there is first *de jure autonomy* of public actors from the agricultural sector, evaluated as moderate. It is regulated by the RBMP, the Rural Development Program (RDP) and the European Agricultural Fund for Rural Development (EAFRD). The Regional Department or the National Ministry of Agriculture are officially responsible for irrigation efficiency measures, depending on the spe-

cific measure (see also below). The latter, however, has outsourced the concrete implementation to different state-owned companies, most importantly SEIASA. According to the RBMP, approx. 70% of the costs for irrigation efficiency measures are borne by the Regional Department and the National Ministry of Agriculture, respectively, financed by the RDP of Andalusia (CHG 2015b).[8] The EAFRD thereby sets specific requirements for the funding of RDP measures by the EU, such as the existence of water metering or the potential to achieve water savings (see also below). These requirements restrict the *de jure autonomy* of the Regional and National Ministry in their implementation. Indeed, the awarding of subsidies is highly regulated, requires coordination with the CHG, among others, and allows the two actors to operate only within a clearly defined legal framework.

Regarding *formal rules for coordination*, there are contractual agreements between the implementing authority and the respective WUAs, which regulate implementation of concrete measures. Furthermore, the RDP stipulates information exchange between the CHJ, the Regional Department and WUAs regarding whether requirements for subsidies are fulfilled by WUAs.

Social problem characteristics of this Action Situation indicate a high need for coordination for main actors in charge, i.e., the Regional Department and the National Ministry of Agriculture or SEIASA. On the one hand, *asset specificity* is high: investments are unique to the respective WUAs and cannot be used by the neighbouring one. The risk of opportunistic behaviour therefore increases (Ménard 2004), which is why hierarchical agreements to reduce this risk may be necessary. *Frequency* for the implementing authority is also high due to the large number of irrigation infrastructure projects. Further, the *scale* at which irrigation efficiency measures are implemented refers to the WUA, which also indicate high needs of coordination.

On the other hand, *uncertainty* from the perspective of implementing authorities is low. There is no empirical evidence that WUAs would change their behaviour in the process of implementation, which is why implementing authorities can be relatively certain about the procedure. This is not the case for WUAs who are confronted with moderate *uncertainty* regarding the question whether measures included in the RBMP will be implemented. Indeed, interviewees report a considerable delay in implementation due to lack of funds (see also below on *process performance*). WUAs therefore often do not know the timeline of implementation, even if subsidies have already been confirmed. Last, *excludability* is high since only owners of the irrigation

8 In the period 2007–2013, larger irrigation infrastructure measures ("*actuaciones en alta*") in Andalusia where also financed through the European Regional Development Fund (ERDF), see https://www.juntadeandalucia.es/export/drupaljda/PO%20FEDER%20V.3.pdf. (accessed 01.09.21). The Operational Program of Andalusia for the period 2014–2020 did not include irrigation efficiency measures anymore.

infrastructure can make use of it, whereas other actors can be easily excluded from its consumption.

Pattern of interaction (1): Incentive-based hierarchy

In this Action Situation, I identify *incentive-based hierarchy* as main pattern of interaction shaped by formal and informal rules. The Regional Department or SEIASA offer financial incentives to water users; while the CHG exchanges information with these actors as part of the hierarchical relationship. Irrigation efficiency measures that are declared to be in the general interest of the region are implemented by the Regional Department, and measures that are in the interest of the national state – usually, larger and more expensive ones – by SEIASA (Interview 20/2018). Generally speaking, the procedure is as such that WUAs submit a funding application for irrigation efficiency measures to one of the two actors, who decide on the granting of the subsidy.

This form of *incentive-based hierarchy* is on the one hand based on the provision of subsidies for WUAs to increase irrigation efficiency. Formal rules of the RDP stipulate that up to 50% of costs are subsidized (*payoff rule*); and that those infrastructure projects are prioritized which produce net water savings, which have positive effects on the environment, and where organic farming is employed (*scope rule*) (Junta de Andalucía 2014c; and Interview 7/2018). Thereby, further incentives are created for WUA to implement irrigation efficiency that comply with these regulations.

The *hierarchical* element is also reflected by the fact that the two implementing authorities are in a superior position vis-à-vis the respective WUAs, deciding on the granting of the subsidy based on above-mentioned formal requirements by the EAFRD (*choice rule*). These formal requirements stipulate, inter alia, that in water bodies of a good water status, investments are only eligible if there is an ex-ante assessment of water savings at the farm level of at least 5% to 25 %. If investments affect water bodies whose status is less than good due to quantitative reasons, "an effective reduction in water use" shall be ensured at the farm level, amounting "at least 50% of the potential water savings made possible by the investment" (*scope rule*) (Art. 46, EAFRD). Further requirements are the existence of an RBMP at the river basin level, as well as the existence of water rights, and the use of water meters by the respective WUAs (Art. 46, EAFRD). The Regional Department or SEIASA needs to verify that these requirements are fulfilled by the respective WUAs (*choice rule)* thereby putting them again in a superior position. However, the RDP of Andalusia does not provide further information on the enforcement of the reduction of water consumption in water bodies whose status is less than good.

In addition to these formal rules, there are also informal rules shaping the *hierarchical* relationship. More specifically, in the first years of the WFD implementation, the Regional Department apparently granted subsidies to WUAs which did not possess the required water right (Interview 10/2018, 18/2018), even though this does not

seem to happen anymore (Interview 18/2018) (*scope, choice rule*). According to interview partners, the reason why the Regional Department did not follow the EAFRD requirements are a lack of knowledge (Interview 10/2018) and of awareness concerning the need to reduce water consumption, and respective ways to implement it (Interview 3/2018). Also at the national level, many justifications by SEIASA to grant subsidies were "artificial" and "lax" according to an interviewee. He argues that it often remained unclear how certain irrigation projects would meet the requirement of water savings (Interview 13/2018). However, although the Regional Department was apparently aware of these lax justifications by SEIASA and the corresponding subsidies granted to WUAs, they did not disclose these deficiencies. Otherwise, they would have risked national funds being diverted to other regions. Thereby, some "unwanted complicity" emerged between the Regional Department and SEIASA (Interview 13/2018).

The role of the CHG in this context is to exchange information with the Regional Department or SEIASA on the declaration of water saving, and to approve that the project is in line with the RBMP (*choice rule*). As a last step, the Regional Department approves the project and grants the respective funds to the WUAs. In irrigation efficiency projects implemented by SEIASA, they are also in charge of implementation and maintenance of the infrastructure, including annual inspections of the exploitation of the irrigation systems by the WUAs for a period of 50 years (Interview 13/2018, 20/2018). I consider this as a further hierarchical element.

Pattern of interaction (2): conflict

Outside of the official process, I identify a *conflict* between ENGOs and WUAs regarding the question on the effect of irrigation efficiency measures on water consumption. In this book, policy conflicts are understood as situations where actors have divergent positions, perceive positions of other actors as threat, and are unwilling to compromise (Weible and Heikkila 2017). I classify it as additional pattern of interaction within the Action Situation since ENGOs are part of this *conflict*, but not of the above-described *hierarchical* relationship.

More specifically, there has been a highly politicized debate between WWF and the National Federation of Irrigation Communities of Spain (*Federación Nacional de Comunidades de Regantes de España*, FENACORE), a nationwide association of WUAs, about whether a rebound effect occurred or not. WWF, on the one hand, published an influential report arguing that water consumption at the basin level increased (WWF/Adena 2015). The report has caused many headlines also at the national level (Interview 21/2018), produced a "trauma" within the agricultural sector and hardened front lines between the environmental and agricultural sector in the Guadalquivir (Interview 13/2018). Directly referring to the WWF, FENACORE argues in another report that agricultural water consumption has been reduced by 6.8% in Spain (Gutiérrez-Martín and Montilla-López 2018). While the report

by WWF relies on data from single case studies (WWF/Adena 2015), FENACORE uses surveys among irrigators (Gutiérrez-Martín and Montilla-López 2018). The reliability of both reports could therefore be questioned. Although these reports are not specific to the Guadalquivir but also address other RBDs, the topic is considered particularly salient in the Guadalquivir, and was mentioned in several interviews (see Interview 10/2018, 13/2018, 20/2018). Indeed, it is argued that FENACORE has had a strong impact on the discourse of denying risks of a rebound effect in the Guadalquivir – "at the level of the Mediterranean, they are leading all irrigators" in that regard (Interview 13/2018). Since the participatory processes organized by the CHG do not allow for cross-sectoral interaction, this conflict is not openly acted out. Nevertheless, both actors directly address each other – in contrast to other Action Situations, where they merely have bilateral relationships with the CHG –, and try to shape the public debate and narratives surrounding the increase of irrigation efficiency.

Administrative actors do not openly contribute to this discussion and are therefore not part of the *conflict*. According to a representative of the Regional Department, nobody would openly admit that the "rebound effect exists", even though internally, several people would acknowledge it (Interview 13/2018). At the national level, an interviewee goes in the same direction, by saying "I understand the critique [on modernization of irrigation], even more when you are selling it as 'oh, this is water saving!' Sell the complete picture" (Interview 22/2018).

Performance assessment

Coordinated behaviour of actors relates to the *incentive-based hierarchy* and is rated as low. *Coordinated behaviour* of the identified *conflict* is low by definition (see Chapter 2) – actors stick to their contrary opinions and refuse to compromise. They therefore do not align or coordinate their behaviour.

First, *exchanged information* is low. This relates to exchanged information during the process of implementation, as well as information provided about the implementation of measures. Regarding the former, WUAs perceive information exchange with the Regional Department in the phase of implementing irrigation efficiency measures as positive (Interview 14/2018). However, the CHG is more critical about it. A CHG representative explains that they would usually approach the Regional Department to ask "'tell us what you are going to do on that, and on that', and they inform us, and later, they change everything without informing us" (Interview 8/2018).

Regarding information provided about implemented measures, an interview partner criticizes lack of information on the number and amount of investments by public authorities (Interview 11/2018). Even more importantly, data on the development of water consumption before and after the increase of irrigation efficiency were neither published nor generated (Interview 13/2018). Instead of real data

on water use, data in the RBMP are based on estimations (European Commission 2015b), and actors such as SEIASA rely on survey data among WUAs (see, for example, SEIASA 2018a; 2018b). In this context, an interviewee states:

> "These are not really data of what comes out of the reservoirs, nor data of evapotranspiration, nor data of the returns. Based on this, political decisions are taken. This is no longer legitimate because it has a very important impact on the environment." (Interview 21/2018)

However, this concerns not only the Guadalquivir, but most of the Spanish RBDs and is therefore also criticized by the European Commission (2015b), ENGOs (WWF/Adena 2015), as well as in the literature (López-Gunn, Mayor, and Dumont 2012; Corominas and Cuevas 2017).

Second, *alignment of incentives* is assessed at two levels, namely for governmental actors and for WUAs. It is rated as low. At the level of governmental actors, incentives for the Regional Department and SEIASA to follow higher-level rules, i.e., EAFRD requirements, were apparently not sufficient. This is because of the above-described critique that in some cases, both actors granted subsidies to WUAs which either did not have the required water rights, or where promised water savings were unlikely to materialize. Also at the level of WUAs, incentives seem not to be aligned with rules established by the RBMP and the EAFRD. In contrast to the political aim to save water, WUAs usually decide to implement irrigation efficiency measures in order to improve their working conditions (Interview 6/2018, 9/2018, 13/2018, 22/2018).

Third, *competing interests considered* is low. This is because actors representing environmental interests are not part of this Action Situation. Although formal rules provide the possibility to conduct an Environmental Impact Assessment, which would open the Action Situation to other actors, it is hardly made use of it (Interview 21/2018). Further, so-called traditional WUAs which use unregulated surface water perceived political pressure by politicians and engineers of the Regional Department to implement irrigation efficiency measures in order to achieve water savings (Interview 12/2019). I see this as an indicator that actors representing different views concerning irrigation are underrepresented in the Action Situation. Indeed, the idea to achieve water saving through irrigation efficiency measures is described as a dominant paradigm within the public administration and among engineers (Interview 12/2019).

The second aspect of performance assessment is the *status of implementation of measures*, rated medium. Since official information on the status of implementation is, to my knowledge, not available, the assessment relies on interview data. They indicate that fewer measures were implemented compared to what has been stipulated in the RBMP. National and regional governments are required to co-finance RDP measures, but since they were heavily affected by the financial crisis, investments were reduced (Interview 7/2018, 20/2018). Thus, despite the broad range of

national and regional policies addressing irrigation efficiency, measures were limited not only in Andalusia but also in other Spanish regions to those that were subsidized through the RDPs by the EU (Gómez-Limón and Villanueva 2017). Indeed, also the Regional Department is highly dependent on EU funds (Interview 13/2018). The overall effect was that the demand of WUAs for irrigation efficiency measures could not be satisfied, and in some cases, subsidies were formally granted but projects were not implemented due to lack of funds (Interview 16/2018, 17/2018).

4.2.4 Reduction of water rights

The Action Situation Reduction of Water Rights analyses the process of reducing water rights after the implementation of irrigation efficiency measures, as well as the adaption of so-called historic water rights which exceed available water resources in the RBD. The emerged pattern of interaction is *information exchange* between the CHG and the Regional Department; followed by a *gap in interaction* among the CHG, the Regional Department and WUAs. Thus, although the CHG and the Regional Department do exchange information relevant to carry out the water rights reduction, this is not followed by any action – the CHG refuses to enter a relationship with WUAs to actually reduce their water rights. Further, the Regional Department does not respond to the lack of enforcement by the CHG either. While the *information exchange* results from formal rules, the *gap in interaction* is based on the combination of informal and formal rules, as will be explained below.

Independent variables specific to the Action Situation

To assess *overarching rules*, I first analyse *de jure autonomy* which is specified in this Action Situation by the RBMP and the 2001 National Water Law. More specifically, the RBMP states that "finally, associated with modernization, there must be a review of water rights, adapting rights to the new, reduced water consumption resulting from modernization" (CHG 2015b). This is backed up by the National Water Law which provides for the possibility to reduce water rights after the increase of irrigation efficiency (Art. 65). However, the RBMP is not legally binding for the CHG, and the National Water Law only states that water rights *may* be reduced. There is thus considerable leeway for the CHG, which is why I argue that the *de jure autonomy* of the CHG is high. Within the CHG, the Water Commissioner is in charge of taking decisions on granting, modifying and reducing water rights. Further, the Regional Department and SEIASA are also involved in this Action Situation. Their *de jure autonomy* is limited, however, to the provision of information to the CHG on completed implementation of irrigation efficiency measures; and is therefore assessed as low.

Formal rules for coordination are only marginally defined. The RDP specifies that beneficiaries of subsidies for irrigation efficiency must inform the CHG about the planned infrastructure projects after respective subsidies are granted, including po-

tential and expected water savings (Junta de Andalucía 2020b: 364). However, it is not clear how the CHG and water users coordinate for the actual reduction of water rights. Furthermore, the coordination process between the Regional Department and the CHG is not further stipulated; it is only referred to formal rules of the Ministry for the Ecological Transition which are not accessible to me. According to interview data, the Regional Department must inform the CHG about completed infrastructure projects (Interview 7/2018).

Social problem characteristics in this Action Situation point towards intense need for coordination for the CHG with the different WUAs. First, the *scale* of this Action Situation refers to the individual water user. This is also why *frequency* is high, since although the reduction needs to be carried out only once for every water user, large number of water users are addressed by this measure. Further, also *asset specificity* is high since investments by the CHG to reduce water rights – e.g., in the form of coordinating with the respective water users – are unique to the WUA. *Excludability* is high as well since water rights represent a private good. Costs for giving up these water rights are therefore high and concentrated on the individual water user. One can therefore expect that water users would rather oppose a water rights reduction.

Last, and most importantly, *uncertainty* is high for the CHG regarding the process and output of this Action Situation. This is because it is unclear whether water users will accept the reduction, or whether they will sue the CHG's decision in court – which is possible due to the strong legal protection of water rights (see also below). I argue that there is thus a high risk of opportunistic behaviour by the CHG. Additionally, *uncertainty* is also high for the individual water users. I argue that because the measure is not well specified in the RBMP (see section 4.2.1 on the *effectiveness of the RBMP*), its implementation remains unclear. Thus, although WUAs know that the CHG has not enforced water rights reduction in the past, it is uncertain whether the CHG will change its approach in the future. Indeed, empirical evidence from interviews confirms that some WUAs did not apply for subsidies for irrigation efficiency measures to not lose their water rights (Interview 14/2018).

Pattern of interaction: Information exchange, gap in interaction

In this Action Situation, I identify a sequence of *information exchange* between the CHG and the Regional Department, resulting from formal rules; followed by a *gap in interaction* between the CHG, WUAs and the Regional Department, arising from a combination of informal and formal rules. More specifically, the Regional Department informs the CHG about the completion of irrigation efficiency measures, as explained above (*information rule)*. However, this *information exchange* is not followed by action. Indeed, according to a representative of the Regional Department, they informed the CHG which subsequently "stored the reports in their desks", without reducing the respective water rights (*choice rule)* (Interview 7/2018). Similarly, a CHG interviewee explains the following:

> "What happens is that we do not exercise [the reduction of water rights] automatically to all, but to those who are arriving for any change [of water use]. Then if someone comes here for something, we change it. But the rights in practice are not exercised today because there is no water. In the case of the regulated waters of the dam, these are linked to what the Dam Release Commission says." (Interview 08/2018)

However, there is no empirical evidence that water rights were reduced at later stages. Although the Regional Department is aware of this inaction by the CHG, they explain that "what we do not do, because it is politically not [desired] either, […], is to insist" on the reduction of water rights (Interview 13/2018). Thus, while it is to acknowledge that the Regional Department does not have the legal rights to enforce a reduction by the CHG (see *de jure autonomy)*, they seemingly do not seek dialogue either. Further, the granting of subsidies for irrigation efficiency measures by the Regional Department is not affected by the CHG's inaction. I therefore classify this behaviour as mutual *gap in interaction* between the Regional Department and the CHG.

Second, the lack of reducing water rights can also be understood as a *gap in interaction* between the CHG and WUAs. Formally, the CHG is entitled to initiate the coordination procedure with the WUAs and reduce respective water rights, although it is not legally obliged to do so (formal *choice rule*). The underlying reason why the CHG does not initiate this process (informal and formal *choice rule*), though, is arguably the avoidance of conflicts with irrigators (Interview 21/2018). Indeed, the CHG explains that the reduction of water rights would be a "complicated" procedure since farmers would usually "protect that right" (Interview 8/2018). There is therefore a high risk for the CHG, but also for other *Confederaciones*, that water users will sue the CHG in court if they reduce their water rights (Interview 21/2018). Indeed, this is possible because water rights are very well protected under the Spanish Law (Interview 10/2018, 18/2018). This latent risk is reinforced by the fact that a water rights reduction is widely contested among water users in the Guadalquivir. An agricultural actor explains:

> "We honestly don't understand why. Because there's one thing that's clear, when there's water, you can use it, right? […] Irrigation itself isn't bad. So why do we have to keep reducing? If you get that decrease in water use, why can't you irrigate more hectares? […] We are trying to see how [this rule] can be changed." (Interview 12/2018)

In the same context, another interview partner explains that in areas where water rights are already very limited, they should not be further reduced after the increase of irrigation efficiency (Interview 16/2018).

A further empirical process in this Action Situation is the reduction of so-called historic water rights by the CHG, also classified as *gap in interaction*. These historic water rights can be seen as *de jure* rights which are not exercised anymore, since they exceed the availability of water resources. According to a representative of the Regional Department, they "would need an Amazonas" to supply the amount of water that is anchored in the existing water rights in the Guadalquivir to the different users (Interview 7/2018). Formal rules of the National Water Law therefore provide the possibility to the CHG to reduce these rights (Art. 65) (*choice rule)*. However, also in this context, the CHG does not carry out the administrative procedure, thereby following again a combination of informal and formal *choice rules*. Instead, a CHG representative explains that the Dam Release Commission adapts historic water rights of surface water users: "no matter what right [irrigators] have, the Dam Release Commission never says more than 6,000 [hm^3]" (Interview 8/2018). In contrast, historic water rights grant usually up to 8,000 hm^3 to the respective water users. Further, in the case of groundwater, historic water rights are not exercised by users due to high energy costs for pumping groundwater, as argued by an interviewee of the CHG (Interview 8/2018).

This approach of not reducing historic water rights is contested by some of the WUAs, as the following quote indicates: "What does AREDA ask, on what FERAGUA does not agree? […] That water rights that are very high are adapted to the reality of the crops, and that they are reduced" (Interview 16/2018). They therefore argue to put an end to "discrimination and privileges of false historic water rights" (in CHG 2014b: n.p.). The underlying rationale is that the Guadalquivir would then not be classified as a "basin in deficit" anymore, but that new water rights could be granted. Indeed, there are many farmers in the area of Jaen which do not have official water rights, but which de facto, have the legal right to use surface water for irrigation. This is because they are granted so-called "extraordinary irrigation" through the Dam Release Commission. However, irrigators depending on extraordinary irrigation are disadvantaged compared to water rights holders, since they are not allocated water until the demand of water rights holders is satisfied.

Performance assessment

Coordinated behaviour in this Action Situation is low. First, *information exchanged* is medium. On the one hand, the Regional Department and the CHG do exchange information, as explained above. Yet, there is no information provided neither in relation to the process and status of implementation, nor to the output of this Action Situation. Although the National Water Law asks to publish information on water rights in the so-called Register of Water, including also modifications of water rights, it is not accessible to the public (Interview 10/2018, 21/2018).

Second, *competing interests* are low. This is because on the one hand, actors who genuinely represent environmental interests, such as ENGOs or civil society rep-

resentatives, are not part of this Action Situation. On the other hand, some of the WUAs themselves ask to reduce historic water rights, as described above. This implies that only some interests that are represented in the agricultural sector – namely regarding the keeping of water rights – are considered by the CHG.

Alignment of incentives is also evaluated as low. In this Action Situation, *alignment of incentives* refers to the question whether there are any incentives from higher levels – e.g., in the form of rules – according to which it is rationale for the CHG to carry out water rights reduction. Yet, this does not seem to be the case. Indeed, a civil society representative explains that „the problem is not that they [CHG] have not reduced water rights, the problem is that they never thought they would reduce them" (Interview 4/2019). Thus, although the European Commission asks for a "systematic review of water rights" in order to ensure that "efficiency measures contribute to environmental objectives" (European Commission 2015b: 78), this criticism has not yet led to further action by the EU. Similarly, also the Regional Department is not incentivized to "convince" the CHG to reduce water rights.

The second dimension of performance assessment relates to the *status of implementation of water rights reduction*, compared to what has been prescribed in the RBMP. It is rated low. As discussed, water rights were not reduced in the Guadalquivir, neither after the increase of irrigation efficiency, nor in the context of historic water rights (European Commission 2015b; 2019b).

4.3 Performance across Action Situations

In this section, I assess performance in the Guadalquivir across all Action Situations, i.e., at the level of the overarching governance process on the reduction of agricultural water consumption. This performance assessment includes *process performance across Action Situations*, followed by *policy output performance* which refers to the overall RBMP implementation, and lastly, *environmental outcome performance*.

Process performance across Action Situations

Coordinated behaviour across Action Situations is rated as low. I assess it along two variables, namely *information exchanged* and *alignment of incentives*. I do not include the variable *competing interests considered* – which was addressed for the performance assessment at the level of individual Action Situations – since it does not add further insights beyond the values that have already been discussed for every single Action Situation. The other two variables, in contrast, help to uncover the interrelationship between the different Action Situations.

Information exchange at the level of the overarching governance process is rated as moderate. On the one hand, it relates to information exchanged between different Action Situations, and on the other, to information provided on the outcome of the

overarching governance process. Concerning the former, there is no evidence that information between the different Action Situations is missing. Even though *within* the different Action Situations, in particular ENGOs and civil society representatives criticize the lack of information, this does not seem to affect actors to carry out their tasks in other Action Situations.

In contrast, *information exchange* regarding the outcome of the governance process is low. This is mainly because the CHG does not provide actual data on water consumption, as discussed above (Interview 3/2018, 11/2018). Instead, numbers provided in the RBMPs rely on estimations of water consumption. Yet, these are also partly inconsistent, e.g., because of missing data on groundwater use in certain years (see CHG 2019b), or contradicting numbers between the different planning cycles. Even the Regional Department only has "impression, perceptions, but no sound data" on the amount consumed before and after the increase of irrigation efficiency (Interview 13/2018). In this context, it is to also mention the Regional Department who has the competency to provide data on irrigated surface area. However, they published the last so-called "Inventory of Irrigation in Andalusia" almost 15 years ago (Junta de Andalucía 2008), but did not update it due to lack of financial resources (Interview 13/2018). I argue that due to the lack of data provided by the CHG, it would be even more important that the Regional Department assumes its responsibility to provide data which could be used as a proxy for water consumption patterns.

Alignment of incentives also refers to two different levels, namely to whether irrigators are incentivized to reduce their consumption; and to whether governmental actors are incentivized to follow higher-level rules and enforce a reduction of agricultural water consumption. The variable is rated as low. At the level of irrigators, I identify three main instances of unaligned incentives which affect their water use, namely the increase of irrigation efficiency without providing incentives to reduce water consumption; the interplay between the Dam Release Commission and the lack of water rights reduction; and the lack of monitoring water use by the CHG. First, neither the CHG nor the Regional Department or the National Ministry established any incentive mechanism according to which it would be rationale for WUAs to reduce their water consumption after increasing irrigation efficiency. This is most importantly because water rights were not reduced. There are therefore no regulatory mechanisms that would make it rational for WUAs to reduce water consumption. However, the reduction of their own *absolute* water consumption is not necessarily in the main interest of farmers. Indeed, irrigators often decided to implement irrigation efficiency measures to improve working conditions (Interview 22/2018), or to reduce their own water losses (Interview 13/2018). In this context, it is argued that "no farmer modernizes for the environment. They modernize to get economic benefits" (Interview 7/2018). However, economic benefits rarely materialized. This is because of increasing maintenance costs of irrigation systems resulting from rising energy use, as well as increased energy costs in the aftermath of the liberaliza-

tion of the energy market in 2006 (Interview 13/2018, 14/2018). An interview partner therefore states that "it was a ruin [for the farmers] to do that modernization" (Interview 17/2018). Farmers were therefore forced to increase productivity – e.g., by changing towards more valuable, and often more water-intensive crops, or expanding irrigated surface area – in order to compensate for higher amortization and maintenance costs (Junta de Andalucía 2017, Interview 21/2018). These economic constraints to which farmers are subject present negative financial incentives for farmers to reduce water consumption. Last, positive economic incentives to save water do not exist either since water pricing is based on the irrigated surface area. The European Commission (2019b) as well as some WUAs (Interview 16/2018) therefore urge the CHG to implement water pricing which incentivizes rational water use, e.g., through prices based on the amount of consumed water.

Second, I observe *misalignment of incentives* for irrigators due to the interplay between the Dam Release Commission and the lack of water rights reduction. I argue that the strong reliance by the CHG on annual negotiations in the Dam Release Commission – instead of reducing water rights which are valid for 75 years – does not create incentives for WUAs to invest in more long-term, structural changes which could facilitate a reduction of water consumption. According to the National Water Law, the Dam Release Commission shall adapt water allocation to the current hydrological situation, to be able to react to changes of water levels. However, as explained above (see Section 4.2.4), the CHG also makes use of the Commission to reduce the amount of water stipulated in the historic water rights; and the CHG argues to adapt water allocation to the reduced demand resulting from irrigation efficiency – even though there is no further data supporting this claim. Lastly, the granting of extraordinary irrigation (see Section 4.2.4) is a further example of how the CHG relies on the Dam Release Commission as coordination mechanism, instead of carrying out the administrative procedure of granting water rights. Affected WUAs therefore repeatedly claim to get regulated rights (CHG 2018b; 2018a). These different examples indicate that the CHG (re-)negotiates on an annually recurring basis with WUAs on the allocation of surface water. I argue that by doing so, WUAs lack incentives for long-term planning. The CHG thereby may even create expectations that distributions in the upcoming years will again increase.

Lastly, I see the lack of monitoring surface and groundwater use by the CHG as a further lack of incentives for WUAs to reduce their water consumption. The monitoring of water use was not studied as an Action Situation in its own but can be seen as an important factor influencing incentives of WUAs. There is broad empirical evidence on deficient control of especially groundwater use in the Guadalquivir (Interview 8/2018, 10/2018, 21/2018); and a CHG representative also confirms that water use of irrigators with few water rights is not sufficiently controlled (Interview 18/2018). Further, unauthorized wells are rarely closed, or only with considerable delay (Greenpeace España 2018). This concerns especially the Doñana national

park, where "such a bubble of illegality has been created that it is impossible to stop it. […] How do you brush off the other 50% [illegal water use] from one day to another?" (Interview 10/2018). The difficulty for the CHG in closing these wells, however, is that farmers accused of illegal water use often defend their rights in court. Court proceedings can take up to ten years due to a legal property system giving high guarantee to water users (Interview 18/2018). Until a legal decision is taken, water users can continue to extract water from unauthorized wells. Furthermore, I argue that the fact that illegal groundwater use is not mentioned in the RBMP (see CHG 2015a) reduces the likelihood of the CHG tackling the problem in the near future. This large share of illegal groundwater use may give negative incentives for water rights holder to voluntarily reduce their own consumption, presenting a collective action dilemma.

In addition to the lack of *alignment of incentives* for irrigators to reduce their own consumption, I observe *unaligned incentives* for governmental actors to follow higher-level rules set by the EU in relation to the WFD and the EAFRD. First, I argue that the EAFRD does not provide sufficient incentives for the Regional Department to enforce water savings by WUAs. Investments in irrigation efficiency measures must comply with several conditions related to water savings, such as the ex-ante assessment of potential water savings (Art. 46). However, the EAFRD also allows for "interpretations and exemptions", such as the increase of irrigated area under certain conditions, even where water bodies are in less than good status (European Court of Auditors 2021: 51). The RBMP of the second planning cycle of the Guadalquivir indeed makes use of this regulation, by explicitly allowing an increase of irrigated surface area: "In projects of modernization of irrigation that are declared to be of general or regional interest, the Basin Organization [CHG] may allocate up to 45% of the saved water resources to future expansions within the River Basin District" (Royal Decree 1/2016, Annex VII, Art. 16; own translation). Such an increase of irrigated surface area has also been empirically observed in several Member States in the Fitness Check of the WFD by the European Commission (2019a). The European Court of Auditors (2021: 41) therefore criticizes that funding by the EU for irrigation projects has "weak safeguards against unsustainable water use", and therefore risks to "go against the WFD objectives" (European Court of Auditors 2021: 45). The fact that the Regional Department does not insist on the reduction of water rights (see 4.2.4) therefore may inter alia be explained by these weak safeguards.

Furthermore, also the incentive structure for the CHG to comply with WFD requirements seem to be insufficient. On the one hand, the European Commission can initiate an infringement proceeding in the Court of Justice of the EU if it considers that a Member States does not fulfil EU obligations. In December 2020, the European Commission therefore informed Member States about potential penalties in case WFD objectives will not be fulfilled (European Court of Auditors 2021). However, several exemptions apply for the fulfilment of WFD objectives, and the time

frame to fulfil them lasts until 2027. I therefore argue that threats of an infringement proceeding are relatively uncertain, and the European Commission therefore rather operates in a shadow of hierarchy, which does not directly change the incentive structure of the CHG.

Policy output performance

The policy output evaluates the *RBMP implemented*, referring to the overall RBMP; status of implementation of specific measures have already been assessed at the level of Action Situations. It is rated as low. This is because in December 2019, only 10% of measures that were scheduled to be completed by 2021 in the Guadalquivir had actually been finished (MITECO 2020b: 130). Furthermore, only 19 % of financial resources allocated for the planning phase 2015–2021 had been spent at that time (MITECO 2020b: 130). Beyond the implementation status of water rights reduction and increasing irrigation efficiency, there is a lack of implementation of measures considered crucial to reducing water use in irrigation. This concerns the lack of monitoring groundwater use, and closing illegal wells, as well as the lack of implementing water pricing based on consumed water rather than on irrigated surface area. Adding on that, the European Court of Justice also ruled that Spain – in the form of the CHG – failed to fulfil its obligation in terms of taking measures to prevent disturbances caused by groundwater abstraction in the Doñana protected natural area (Case C-559/19, Judgment of the Court (First Chamber) of 24 June 2021).[9]

Environmental outcome performance

Environmental outcome performance is low. This is because agricultural water use and irrigated surface area increased in the last decade, although water status according to the WFD assessment remained stable. More specifically, numbers related to the *development of water use* show that agricultural water use (i.e., net consumption) increased in the analysed period by 8.7%, from 2,569 hm^3 in 2009 to 2,792 hm^3 in 2016/17 (own calculations based on CHG 2013; 2020a). However, since these numbers are only estimations (European Commission 2015b), and the RBMP does not include illegal groundwater use, actual water consumption by irrigation must even be higher. Indeed, in the above-mentioned court ruling, the European Court of Justice also found that the CHG failed to take into account illegal water abstraction in the area of Doñana in the RBMP 2015–2021 (Case C-559/19). According to the WWF, there are 1,000 illegal wells only in Doñana, situated in the Guadalquivir and the Andalusian RBD Tinto-Odiel-Piedras (WWF 2016). Second, the *development of irrigated surface area* points in the same direction. According to the third draft RBMP, irrigated

9 https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:62019CJ0559 (accessed 04.04.2022)

surface area in the RBD increased by 8.6% from 2009 to 2015, namely from 707,033 ha to 768,210 ha (own calculation based on CHG 2019a: 185).

Nonetheless, the *development of water status* has been relatively stable over the last decade. Around 60% of surface water bodies are in good status, without significant improvements over the last years; and the number of groundwater bodies in good quantitative status slightly increased in the last decade from 68% in the first RBMP to 74% in the third planning cycle (see Table 6). Due to the considerable increase in agricultural water consumption and the focus of my work on this indicator, I nonetheless assess the *environmental outcome performance* as low.

Table 6: Status of water bodies in the three WFD planning cycles (Guadalquivir)

Category	**Water status**	**Percentage of water bodies**		
		RBMP 2009	**RBMP 2015**	**RBMP 2022 (draft)**
Surface water bodies (global status)	Good	58 %	61 %	61 %
	Worse than good	42 %	39 %	39 %
Groundwater bodies (quantitative status)	Good	68 %	74%	74 %
	Poor	32 %	26 %	26 %

Source: Based on data from CHG (2019a; 2013; 2015a)

5. Empirical Analysis of the Jucar

This chapter presents the empirical analysis of the Jucar River Basin District (RBD). Similar to the previous chapter (see Chapter 4), I analyse the implementation of the European Union (EU) Water Framework Directive (WFD) implementation from 2009 to 2019, covering the first and second planning cycle, and focusing on decision-making process on reducing agricultural water consumption. I analyse independent and dependent variables that were theoretically elaborated in Chapter 2, and embedded in the research design of this study in Chapter 3.

The case study addresses four Action Situations (see Chapter 3 on the selection of Action Situations), containing different patterns of interaction. *Hybrids* are identified as dominant patterns of interaction (see Section 5.2), composed of *cooperation* and *competition,* as well as *cooperation* and *hierarchy.* Furthermore, one pattern of interaction consists of a sequence of first *information exchange*, followed by a *gap in interaction*. I also identify one pure form of coordination, namely *incentive-based hierarchy.* Most of the patterns result from a combination of formal and informal rules.

At the level of the overarching governance process, i.e., across Action Situations, the analysis reveals medium performance rates (see Section 5.3). More specifically, process performance assessed across Action Situations, operationalized as *coordinated behaviour,* is moderate. Reasons for this assessment are, most importantly, because incentive mechanisms for water users to reduce their consumption were only established in some cases; while in others, it seems not to be rationale from the perspective of water users to reduce their consumption. Furthermore, I argue that the EU does not provide incentive mechanisms for governmental actors to enforce a reduction of water consumption. Second, *policy output performance,* referring to the status of implementation of the River Basin Management Plan (RBMP) of the second planning cycle, is low. This is because in December 2019, only 21% of measures that were supposed to be completed by 2021 in the RBD had actually been finalized (see MITECO 2020b: 130). Last, *environmental outcome performance* is moderate. On the one hand, agricultural water consumption slightly decreased from 2009 to 2020. However, according to the most recent assessment of the EU Water Framework Directive (WFD), 33% of groundwater bodies are in a poor quantitative status, and 65% of surface water bodies are in a status "worse than good" (CHJ 2014b; 2019b).

The chapter's structure is the same as that of the previous chapter on the Guadalquivir (see Chapter 4): Independent variables which are specific to the case study are characterized first (Section 5.1), followed by analysing Action Situations. This includes variables that are specific to the Action Situation, patterns of interaction and performance assessment (Section 5.2). Lastly, performance across Action Situations is analysed (Section 5.3).

5.1 Independent variables specific to the case study

In this section, independent variables that are specific to the case study are described, including *contextual conditions* and *characteristics of heterogeneous actors*. For more detailed definitions and descriptions of the respective variables included in this section and below, see Chapters 2 and 3.

5.1.1 Contextual conditions

Geographic and hydrological characteristics of the River Basin District

The Jucar RBD is located in the central-eastern part of Spain and covers an area of 42,735 km^2. It extends over five *Comunidades Autónomas* (hereafter: regions), namely the i) Valencian Community, covering 49.4% of the area; ii) Castilla-La Mancha (37.6%); iii) Aragon (12.5%); iv) Catalonia (0.1%); and v) the Region of Murcia (0.1%) (CHJ 2015c: 19) (see Figure 6). The population is 5.02 Million. In this analysis, I only focus on the Valencian Community and Castilla-La Mancha, which jointly cover 87% of the RBD. The Jucar RBD, which is the administrative demarcation for the WFD implementation, includes several river basins and sub-basins (see Figure 7). They are independent from each other but managed under the same RBMP (Ortega-Gómez, Pérez-Martín, and Estrela 2018). The four most important river basins in terms of agricultural water use are firstly the Jucar (net demand of 776.9 hm^3/year), also giving the name to the RBD, Turia (183 hm^3/year), Mijares-Plana de Castellón (134.4 hm^3/year) and Vinalopó-Alcantí (111.8 hm^3/year).[1] In the following, I use the term Jucar RBD to refer to the administrative demarcation for the WFD implementation; and Jucar river to refer to the basin which forms part of the RBD.

The RBD can be divided into two main geographical areas. These are a mountainous region in the western part with an altitude mostly below 1,000 meters, where the three rivers Jucar, Turia and Mijares originate. The eastern part is characterized by coastal plains. The Jucar RBD represents a typical Mediterranean river basin, having a semi-arid climate of irregular precipitations and periods of water scarcity during summer. The annual average of precipitation is 500 mm per year.

1 https://aps.chj.es/siajucar/ (accessed: 08.09.2020)

Important ecosystems in the RBD are firstly the Albufera wetlands, a natural park on the Mediterranean coast protected under the so-called Ramsar Convention, an international treaty for the conservation and sustainable use of wetlands.[2] It is considered as most important aquatic ecosystem in the RBD. Due to its importance for biodiversity and preservation of European wetlands, the natural park is sometimes called "small Doñana" (Interview 29/2019), referring to the Doñana national park in the Guadalquivir. The Albufera is an artificial lake which depends on return flows from irrigation from the rivers Jucar and Turia, contributing approx. 60% of inputs to the Albufera (cf. Haro et al. 2014), as well as on groundwater flows. However, due to reduced return flows from irrigation and lower river flows in the downstream Jucar, the Albufera ecosystem is seriously threatened. Furthermore, the aquifer Mancha Oriental is another highly important ecosystem in the RBD, covering 7,300 km^2 and thereby being the largest aquifer in the Iberian Peninsula. Yet, it is affected by intensive development of irrigated agriculture since the early 1970s. Since the Mancha Oriental and the river Jucar are connected, groundwater overuse in the Mancha Oriental has damaged wetlands of the upstream part of the Jucar river. Further, it led to reductions in river flows in the downstream part, which then also negatively affects the Albufera (Esteban and Albiac 2012).

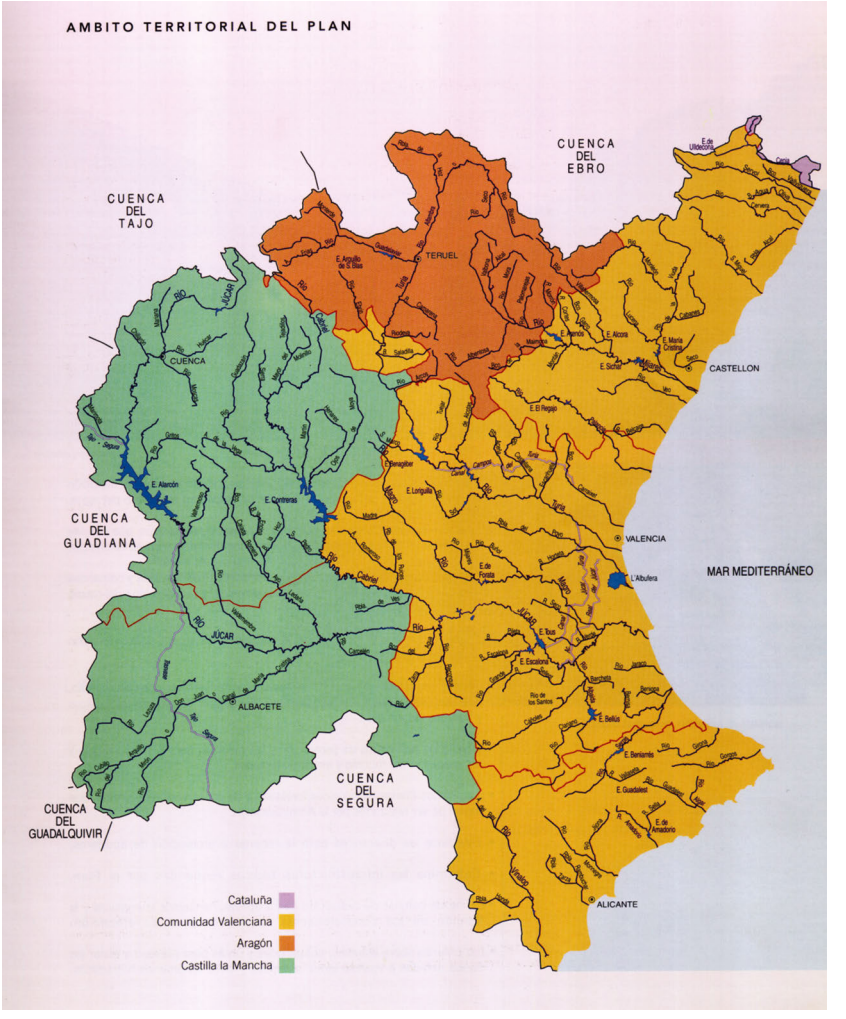
Socio-economic role of irrigated agriculture

Most important economic sectors in the Jucar RBD are service and tourism, followed by industry, and thirdly, agriculture and energy. In 2012, the agricultural sector represented approx. 2.5% of the gross value added (GVA) of the RBD. It is estimated that around 66,000 persons are employed in the agricultural sector, equivalent to 3.7% of the employed population (CHJ 2020a). Adding on that, 10% of employment in the Valencian Community belongs to the agri-food industry.

Agriculture in the RBD is very diverse. The coastline of the Valencian Community is characterized by citrus fruits cultivation in small plots of max. 1 ha (Interview 18/2019). The area has been irrigated "for centuries", dating back to the Middle Ages, and most of the population of the RBD is living there (Interview 18/2019). Agriculture in Castilla-La Mancha, in contrast, only developed in the 1970s, which was very important for the regional economy, with agriculture still representing an important source of income compared to the rest of Spain (Interview 17/2019). It consists mostly of cereals and vegetables production by relatively large farms.

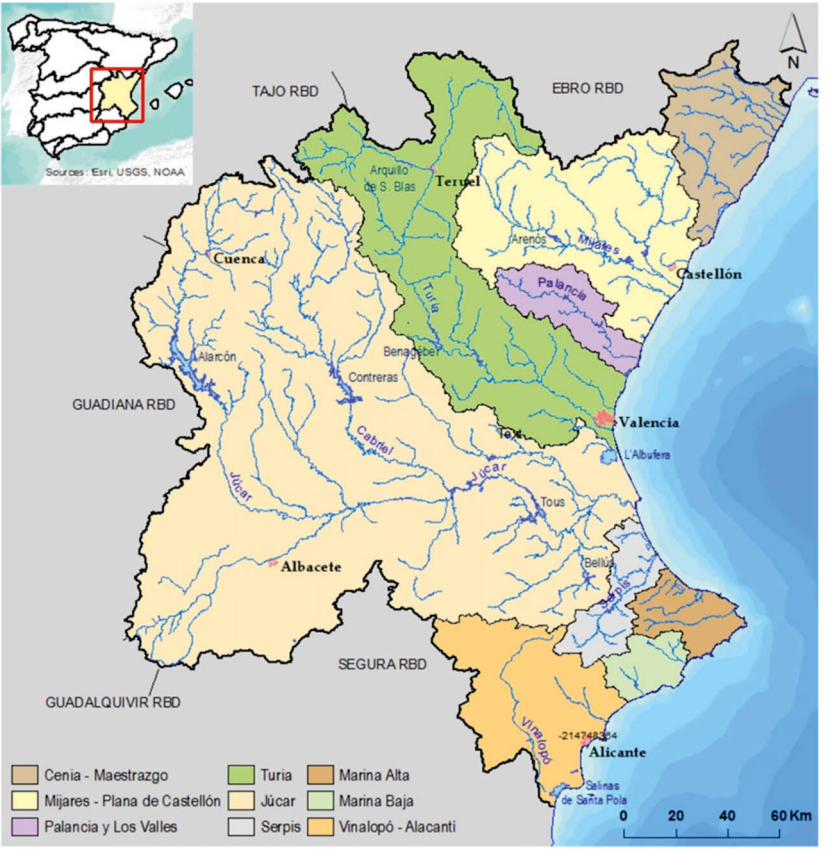
2 https://rsis.ramsar.org/ris/454 (accessed: 22.04.2022)

Figure 6: Administrative map of the Jucar River Basin District



Source: Blog Institut Cartogràfic Valencià (https://bit.ly/3K4LDoc)

Figure 7: Map of the Jucar River Basin District and its nine basins



Source: Ortega-Gómez et al. 2018

Irrigated agriculture in the RBD covers 354,138 ha, compared to 967,318 ha of rainfed agriculture located mostly in the southern part of the RBD (CHJ 2019a). Most important irrigated crops in terms of land use are citrus fruits covering 40% of irrigated surface area (130,000 ha), vine (63,801 ha), cereals (44,108 ha) and fruits (37,672 ha) (CHJ 2019a). Even though in terms of land-use, rainfed agriculture exceeds irrigated agriculture, the latter is economically much more important. Fruits, vine and olive, for example, have a productivity rate six times higher compared to production under rainfed agriculture, and citrus fruits cannot even be produced without being irrigated (CHJ 2019a: 335). In terms of water use of cultivated crops in the RBD, rice has the highest water consumption per hectare, followed by corn, and fruits (non-citrus and citrus) (CHJ 2015d). Irrigation in general, and in particular irrigation of

traditional agricultural systems in the Valencian region, is also of high social and historical importance (CHJ 2019a). In this context, interviewees argue that irrigation "is not a question of Gross Domestic Product, […] but it does have a tremendous social, territorial, and environmental value" (Interview 19/2019; also: 22/2019, 26/2019). Without the possibility to irrigate, farmers would leave the region (Interview 22/2019), and "if you take away all this [irrigated] agriculture, […] you can sink the region" (Interview 19/2019).

Water supply and demand

Water supply in the Jucar RBD amounts to 3,317 hm^3/year, and is composed mostly of surface and groundwater resources, followed by treated wastewater, imported water from water transfer, and lastly, to a marginal share, desalinated water (see Table 7). As in the rest of Spain, surface water is highly regulated through large-scale infrastructure such as dams and water transfers between different RBDs (Tajo-Segura) as well as between the different sub-basins within the RBD, namely the canal Jucar-Turia and the transfer Jucar-Vinalopó. While the former is used for urban water supply and irrigation, the latter is not operating due to conflicts over financing of water use (Interview 22/2019). It was built under the RBMP 1998, aiming to alleviate over-exploitation of groundwater bodies of the Vinalopó by providing water for urban water supply and irrigation from the Jucar.

Overall water demand in the RBD is 3,240 hm^3/year. Agriculture accounts for 79% of this water demand, corresponding to 2,567 hm^3/year (CHJ 2015b), out of which around 1,000 hm^3/year is based on groundwater (CHJ 2020b). Water demand thereby approximates water supply, which is why the Jucar RBD is an almost closed river basin with a very fragile equilibrium between water resources, water demand, and the fulfilment of environmental requirements (Interview 27/2019). This is also why most pressing water management issues in relation to agricultural water use at the beginning of the first planning cycle were over-exploitation of aquifers, particularly of the Vinalopó and Mancha Oriental, as well as reduced flow rates due to surface water extractions, mostly in the downstream part of the Jucar river (CHJ 2013).

Table 7: Water supply in the Jucar River Basin District

	Own resources	**Non-conventional resources**		**External resources**	**Total**
	Surface and groundwater	Reutilization	Desalination	Transferred water	
hm³/year	3,111	121.5	3.5	81.1	**3,317.1**

Source: Based on CHJ (2015b: 93–4). The RBMP does not include separate numbers for surface and groundwater.

5.1.2 Characteristics of heterogeneous actors

The most important public actor in the Jucar is the so-called *Confederación Hidrográfica del Júcar* (hereafter: CHJ) which is responsible for the WFD implementation in the RBD, similar to the Guadalquivir case study (Chapter 4). The CHJ belongs to the Ministry for the Ecological Transition and the Demographic Challenge. Furthermore, there are two important regional actors which are of importance for the case study. These are the Regional Department for Agriculture, Rural Development, Climate Emergency and Ecological Transition of Valencia (*Conselleria de Agricultura, Desarrollo Rural, Emergencia Climática y Transición Ecológica;* hereafter: Regional Department of Valencia); and the Regional Department for Agriculture, Water and Rural Development (*Consejería de Agricultura, Agua y Desarrollo Rural*; hereafter: Regional Department of Castilla-La Mancha).

Financial and human resources of actors

The first important group of actors includes governmental actors. As already discussed in relation to the Guadalquivir (see Chapter 4), *Confederaciones Hidrográficas* in Spain suffer from a general lack of financial and human resources (Interview 17/2019), which also applies to the CHJ (Interview 24/2019). The financial crisis in Spain, lasting from 2008 to 2014, further exacerbated the situation and slowed CHJ's work over the past decade (Interview 16/2019). In terms of human resources, an interviewee describes the CHJ as a "closed" administration of mostly civil engineers, lacking personnel that is trained in economics or ecology (Interview 17/2019). Yet, another interviewee highlights that in recent years, many young, well qualified persons have joined the CHJ (Interview 23/2019); and the CHJ is said to have more human resources compared to other *Confederaciones Hidrográficas* due to international collaboration and research projects (Interview 15/2019).

Regional agricultural administrations, i.e., Regional Departments of Valencia and of Castilla-La Mancha, also have limited financial resources (Interview

22/2019). The implementation of measures related to irrigation infrastructure is thereby slowed down (Interview 24/2019). While this concerns both, the Valencian Community and Castilla-La Mancha, it is to assume that the former dedicates more financial and human resources to irrigation management in the Jucar RBD than the latter. This is because 90.52% of the Valencian Community's territory is part of the RBD, compared to 20.31% of Castilla-La Mancha's (CHJ 2015c: 19). Moreover, the Valencian Community is located in two Spanish RBDs, namely Jucar and Segura, whereas Castilla-La Mancha forms part of seven RBDs, namely Tajo, Guadiana, Jucar, Segura, Guadalquivir, Ebro and Duero. The Valencian Community is therefore arguably more dependent on the RBD's water resources and its management.

The second major group of actors are WUAs. Since numbers on their human and financial resources are not available, I use water rights as proxy (see also Chapter 4). The *Acequia Real del Júcar* is described as one of the most powerful WUAs in the RBD, being also the largest water rights holder (Interview 24/2019). The Acequia Real was founded in 1258 and thus is one of the oldest WUAs in Spain with approx. 25,000 farmers, watering 20,659 ha. It also played an important role in the creation of the CHJ in 1932 and of the National Federation of Irrigation Communities, FENACORE, in 1955 (García-Mollá et al. 2020). A further important WUA in the RBD is the *Junta Central de Regantes de la Mancha Oriental,* founded in 1994. They unite approx. 9,000 farmers managing 130,000 ha and are important representatives of water users of Castilla-La Mancha's part in the Jucar RBD. Besides these large WUAs, there are also smaller and more traditional WUAs. These are often managed by persons of older age and lack technical capacities and training on more recent requirements, such as the need to maintain ecological flows (Interview 16/2019). Lastly, it is important to highlight that resources of WUAs differ between the two regions. As mentioned above, economy, including agriculture and irrigation, developed much later in Castilla-La Mancha than in the Valencian Community. Valencian WUAs therefore have a longer history, which is also reflected by higher amounts of water rights compared to WUAs in Castilla-La Mancha. According to an interviewee, water users in the Valencian Community would perceive themselves as "owners of the river", having "preferential use" (Interview 29/2019). This difference between the regions is also reflected in the degree of political organization of WUAs. While in the Valencian Community, the umbrella organization Federation of Water User Associations of the Valencian Community (*Federación de Comunidades de Regantes de la Comunidad Valenciana,* Fecoreva) exists since 2004, their counterpart in Castilla-La Mancha was founded only recently (Interview 26/2019). However, single WUAs, such as the Acequia Real, seem to be more powerful than Fecoreva even though the latter is organized at a higher level.

Third, there are environmental groups and civil society organizations. Similar to the Guadalquivir, an important civil society organization is the Foundation of New Water Culture (*Fundación Nueva Cultura del Agua, FNCA)*. Further, there are locally or-

ganized groups exclusively working on the river Jucar, such as *Xúquer Viu* or *Acció Ecologista-Agró*. However, no ENGOs working on other sub-basins of the RBD have been identified. This shows that these actors are underrepresented in the RBD compared to agricultural interest groups. Further, resources of these actors are very limited. They almost exclusively depend on voluntary work and external financial support (Interview 17/2019, 23/2019).

Narratives on water management

A first group of actors, consisting mostly of agricultural administration and WUAs of the Valencian Community, adheres to the *demand-side narrative* where water scarcity is perceived to be the result of an excess in water demand. Traditional irrigation systems with low efficiency rates are widespread in the Valencian Community, which is why mentioned actors consider improved irrigation infrastructure – which shall reduce water demand – as main instrument to address water scarcity. During the RBMP development, they therefore argue to include these measures in the RBMP (Interview 16/2019, 20/2019, 21/2019). Representatives of the Acequia Real stress the importance of combining irrigation efficiency measures with reductions of water rights (Interview 21/2019), thereby following a *knowledge and governance narrative*. In addition, many WUAs also support the *supply-side narrative*. They perceive water scarcity as a result of missing infrastructure, which is why water supply shall be increased through new infrastructure and technology (Cabello, Kovacic, and Van Cauwenbergh 2018). Indeed, in participatory processes for the RBMP development, groundwater users in the Vinalopó-Alcantí advocate putting into operation the water transfer Jucar-Vinalopó to replace the over-exploited groundwater through surface water (Interview 24/2019). Similarly, water users in La Mancha Oriental plead for replacing groundwater by renewable resources (Interview 29/2019).

Actors of ENGOs and civil society mostly adhere to the *knowledge and governance narrative*, perceiving water scarcity as a problem of governance. In this context, they argue for changes in the Common Agricultural Policy at the EU level. Subsidies should, for example, be linked to achievements of the WFD aims; and not include irrigation efficiency measures or support large-scale irrigated agriculture which is said to undermine efforts of river basin management, e.g., in Castilla-La Mancha (Interview 17/2019). Furthermore, aforementioned actors also use arguments consistent with the *deep ecology narrative*, which is about adapting societal activities to ecosystems conservation (Cabello, Kovacic, and Van Cauwenbergh 2018). More specifically, civil society actors demand to "drastically reduce the consumption" of agriculture and re-introduce rainfed agriculture even if this is done at the expense of competitive advantages on the international market (Interview 17/2019; also 23/2019). Further, they argue to consider requirements of river ecosystems as starting point of RBM planning, rather than agricultural needs for irrigation (Interview 23/2019). In this context, the protection of the Albufera is one of the main topics for

ENGOs and civil society organizations which they defend in participatory processes of the RBMP development (Interview 17/2019, 28/2019).

As last actor, it is to mention the CHJ which follows a combination of *demand-* and *supply-side*, as well as *knowledge and governance narratives*. Indeed, a CHJ representative argues to better align irrigation efficiency measures with the reduction of water rights, i.e., to make the latter legally binding for all WUAs that receive public subsidies to increase irrigation efficiency (Interview 27/2019). In general, allocation of water resources through the management of water rights is considered highly important (Interview 18/2019). Nevertheless, also supply-side measures, such as dams and water transfers, are important instruments for the CHJ.

In addition to these narratives, I want to discuss opposing interests of the two Regional Departments as well as their water users, reflected in an upstream-downstream conflict on the Jucar river. As already explained above, agriculture has developed at different rates in the two regions, resulting in differences in the amount of water rights. However, there is a strong interdependence of water users: WUAs in Castilla-La Mancha mainly draw on groundwater resources of the aquifer La Mancha Oriental which is connected to the Jucar river. Actors in the Valencian Community therefore accuse groundwater users in Castilla-La Mancha of reduced water resources in the downstream part of the Jucar river. On the other hand, actors in Castilla-La Mancha claim that water allocation should not be based on historic water rights, but rather on current needs that shall be balanced between the two regions. Moreover, they trace over-exploitation in the Jucar back to water transfers to the other two river basins Turia and Vinalopó-Alcantí, rather than their own consumption (Interview 25/2019, 29/2019). These water transfers within the RBD are a recurring source of conflict between users of the different river basins (Interview 17/2019).

Against this backdrop, there are also conflicting interests on RBD boundaries for WFD implementation between the two regions. Castilla-La Mancha, on the one hand, claimed that sub-basins which are located entirely within the Valencian Community should be governed by the latter as intra-regional river basins, and not within the Jucar RBD. The reason arguably is that the territory of the Valencian Community in the RBD would thereby be reduced, leading also to a decrease of Valencian Community's representatives in the CHJ's organs; and a relative increase of representatives of Castilla-La Mancha (Albiac, Calvo, and Esteban 2014). The political influence of Castilla-La Mancha over the RBD would thus increase (De Stefano and Hernandez-Mora 2018). The Valencian Community, however, refused to assume responsibility for these intra-regional basins. The underlying reason is that they are connected with other sub-basins of the Jucar RBD through water transfers; and that transferring water between different RBDs is subject to stricter legal criteria than transferring water within a RBD (López-Gunn and De Stefano 2014; Interview 17/2019). In 2011, the Supreme Court ruled in favour of the Valencian

Community. The respective intra-regional basins therefore form part of the Jucar RBD and are governed by the CHJ. This dispute still shapes the relationship of the involved regions, and claims related to this conflict are frequently put forward by Castilla-La Mancha during the RBMP development.

5.2 Analysing and evaluating Action Situations

This chapter analyses and evaluates interaction of actors within the four Action Situations River Basin Management Plan Development, Dam Release Commissions, Increasing Irrigation Efficiency, and Reduction of Water Rights (for the description and selection of Action Situations, see Chapter 3). The analysis of each Action Situation is organized similarly as in the other empirical chapters: First, independent variables specific to the respective Action Situation (*overarching rules*, *social problem characteristics*) are outlined. Since several variables are identical to the Guadalquivir case study, with both being inter-regional RBDs, I only summarize respective variables and refer to the Guadalquivir chapter to avoid duplications. Second, patterns of interactions (i.e., *cooperation, competition, hierarchy, hybrids,* and *gap in interaction* and *information exchange*) that emerged within the respective Action Situation are outlined, and traced back to formal and informal rules directly structuring the Action Situation. I thereby rely on Ostrom's (2005) rule typology (see Chapter 2). Third, the analyses conclude by assessing performance at the level of the respective Action Situations (*process performance*, *intermediate output performance)*.

5.2.1 Development of the River Basin Management Plan

The Action Situation Development of the River Basin Management Plan is regulated by formal rules of the WFD and the National Water Law and therefore undergoes the same steps as in the Guadalquivir (see Chapter 4): informal meetings; formalized participatory processes, including written consultation and presentation of the Scheme of Important Issue as well as the Draft RBMP; and final approval of the RBMP by the River Basin Water Council. In this Action Situation, I identify a *hybrid* pattern of interaction between the CHJ, the two Regional Departments, WUAs and ENGOs and civil society organization based on a combination of formal and informal rules. This *hybrid* is composed of *cooperation* and *idea-based competition:* while the CHJ builds cooperative relationships with aforementioned actors, the latter also compete for influence towards the CHJ.

Independent variables specific to the Action Situation

Overarching rules specific to this Action Situation are determined by the 2001 National Water Act and are therefore identical to the Guadalquivir case study (see

Chapter 4). To summarize, *de jure autonomy* of the CHJ is moderate. While it is in charge of the development, monitoring, and revision of the RBMP, it is restricted in its autonomy due to the requirement to coordinate with concerned actors. All other actors have no formal authority in this Action Situation and strongly depend on the CHJ, which is why their *de jure autonomy* is rated low. *Formal rules for coordination* define the functioning of the River Basin Water Council, which needs to approve the RBMP before passing it to the National Water Council and the National Government.

Social problem characteristics are almost identical to the Guadalquivir and imply medium to high coordination requirements of the CHJ with other actors. In a nutshell, *uncertainty* is assessed at different levels, and is evaluated as high: from the perspective of stakeholders, it is uncertain whether their interests will be integrated into the RBMP; from the perspective of the CHJ, there is medium *uncertainty* concerning the question whether public actors will implement measures at a later stage; and there is high *uncertainty* for the CHJ whether WFD objectives of a good water status will be achieved. Further, I argue that *frequency* is low since the RBMP has to be developed every six years only; *excludability* is also assessed to be low, with the RBMP being a public good; and *asset specificity* is medium since on the one hand, there is a very heterogenous target group, but on the other, measures are mostly financed through the RDP and are therefore transferred from one policy to another. The only difference to the Guadalquivir is the *scale*. While in both cases, the RBMP Development refers to the RBD, implications are different: the CHJ needs to coordinate with two regions, i.e., with the Regional Departments of Castilla-La Mancha and of the Valencian Community.

Pattern of interaction: Hybrid of cooperation and competition

I identify a *hybrid* pattern of interaction in this Action Situation, consisting of *cooperation* and *idea-based competition*. First, *cooperation* results mostly from informal rules according to which the CHJ acts as orchestrator promoting mutual understanding and strengthening trust among actors in order to reach joint goals of the WFD. Empirically, this concerns official participatory processes as well as informal meetings between the CHJ and stakeholders. Regarding these participatory processes, the CHJ organized four so-called "territorial tables" for the different basins and subbasins to present the Scheme of Important Issues and to receive feedback by stakeholders (*choice, information rules*) (CHJ 2015e: 20). All stakeholder groups were invited, i.e., administrations, water users, trade unions, ENGOs and universities from the respective area (*choice, boundary rules*) (Interview 16/2019, 23/2019). Second, 14 intersectoral meetings were organized by the CHJ to present the draft RBMP, consisting of two rounds. Actors discussed main problems of water status of groundwater and surface water bodies, as well as possible measures to achieve environmental aims. Topics raised by participants were inter alia increasing irrigation efficiency in

the Turia and the Jucar, environmental flow requirements, and the need to improve monitoring of water use (CHJ 2015e). Prior to these participatory processes, information is provided by the CHJ (*information rule)* (Interview 26/2019). In addition, informal meetings are organized by the CHJ. These are on the one hand bilateral meetings with administrations, WUAs, ENGOs and civil society representatives, respectively; and on the other, cross-sectoral trilateral meetings to unite different actors, such as WUAs and ENGOs, to jointly discuss specific topics (*choice, boundary rules*). These meetings continue after the planning process, and usually take place twice a year with the different actor groups that are also part of the official CHJ bodies (*choice, boundary rules)* (Interview 23/2019, 27/2019).

There are two main reasons to classify this empirical process as *cooperation*, namely the building of trust and promoting consensus among involved actors; as well as the CHJ's intention to build a relationship in which actors have an equal status. More specifically, the importance of trust-building for the CHJ is reflected in the fact that above-mentioned bi- and trilateral meetings are considered key for the RBMP development: "In the end a lot is resolved in meetings and there is a part that is trust and working together, which is key to making it work" (Interview 16/2019). Similarly, another CHJ representative explains that river basin planning relies fundamentally on two main aspects, which are "rigorous technical studies" and to "talk a lot with the people" (Interview 27/2019). The CHJ therefore only suggests rough measures to the two Regional Departments, which are then further elaborated by them (*choice rule*) (Interview 20/2019, 25/2019). Reasons for this approach by the CHJ is to strengthen regional government ownership and avoid the expectation that the national state will fund respective measures; both is considered crucial by the CHJ to ensure implementation of measures at a later stage (*aggregation* and *payoff rules*) (Interview 16/2019). Similarly, the CHJ also aims to foster understanding of water users on the need to restrict agricultural water use at the benefit of environmental needs to ensure their compliance with these restrictions (Interview 16/2019).

The second indicator of *cooperation* in this context is the building of relationship between actors with a more or less equal status. Indeed, according to an interviewee, all actors participate equally in the planning process, having the same opportunity to raise voice and being heard during the process (*position, boundary rule)* (Interview 26/2019). Further, the CHJ sees itself in the "role of mediation" (*position rule*), which resonates well with statements by other actors describing the CHJ as "arbitrator" (Interview 15/2019, 20/2019). More specifically, a CHJ representative explains to balance between the individual and the general interest, with the overall aim to achieve a "reasonable equilibrium" between agricultural demands on the one hand, and the fulfilment of environmental objectives of the WFD on the other (*scope rule)* (Interviews 27/2019; also 16/2019). A further CHJ representative describes that actors "all pull in their own direction, and we, […] what we have to do is to be more objective and deal with some pretty complicated realities, because we are in the middle" (In-

terview 16/2019). I see this as indicator that the CHJ aims to consider all interests equally in the process.

Second, the *hybrid* consists also of *idea-based competition* between the two Regional Departments, WUAs and ENGOs, which compete for influence towards the CHJ, inter alia by submitting written statements on the Initial Documents, on the Scheme of Important Issues and the draft RBMP (*choice rule)*. The submission of statements in early phases of the planning process is thereby considered particularly important, since later, it is difficult to put new topics on the agenda (Interview 24/2019). For the RBMP 2015–2021, 122 actors submitted written statements, which were mostly water users (64), followed by public administration (24) and ENGOS and civil society organizations (14) (*boundary rules)* (CHJ 2015e: 69). Topics which were addressed the most are distribution of water resources (23%), Program of Measures (17%) and environmental objectives and ecological flows (15%) (CHJ 2015e: 71). Based on these written comments, the CHJ again holds bilateral meetings with the different groups to discuss to which extent the respective statements can be integrated into the RBMP, and to suggest corresponding measures (*choice rule)* (Interview 16/2019, 26/2019).

There are two illustrative examples of actors *competing for influence* towards the CHJ. First, there are the Regional Departments of Castilla-La Mancha and the Valencian Community, as well as the respective WUAs. Discussion concerns how water allocation within and between the different river basins shall be regulated in the RBMP (Interview 26/2019). This goes back to the above-mentioned conflict between fostering rural development of Castilla-La Mancha and maintaining and complying with traditional water rights of the Valencian Community (Interview 16/2019). More specifically, the Regional Department of Castilla-La Mancha as well as water users of that region ask to only fulfil water demands within the Jucar River, rather than transferring water to other basins within the RBD as well as to the Albufera. They thus consider water transfers as reason for overexploitation in the Jucar, instead of overuse within the Jucar River itself (Interview 29/2019). On the other hand, WUAs of the Vinalopó-Alcantí in the Valencian Community request to put into operation the water transfer Jucar-Vinalopó and to overcome "historical interests" of the "surplus basin", i.e., the Jucar River (Interview 24/2019). Every region therefore aims "to try that [they] are the least affected" by river basin planning (Interview 26/2019). However, this conflict also plays out at the political level, which is why administrations themselves can hardly solve it (Interview 19/2019).

Furthermore, also WUAs on the one hand, and ENGOs and civil society representatives on the other, *compete for influence* towards the CHJ. Empirically, this is most evident in their discussion on water allocation for environmental needs, i.e., maintaining ecological flows and recovering groundwater, and irrigation; with the increase of irrigation efficiency in the Jucar River as important example (see also Section 5.2.3 and 5.2.4). ENGOs and civil society argue that higher efficiency rates

lead to a reduction of return flows to the Jucar, which ultimately reduce ecological flows in the Jucar and the Albufera. Saved water should therefore be directly transferred to the Albufera (CHJ 2015f). According to affected WUAs, this transfer is already happening; and increasing irrigation efficiency thus contributes to achieving environmental objectives (Interview 21/2019). However, agreements between these two actor groups are difficult to reach due to the very "disparate ideas on the subject of water" (Interview 29/2019). A CHJ representative therefore explains that "these conflicts are very complicated, which in the end… I almost think that, I'm not going to say irresolvable, but a little bit yes…", where the CHJ has "to be there mediating and fighting, but the conflict will always be there" (Interview 16/2019).

Idea-based competition is also reflected in the River Basin Water Council, emerging from a combination of formal and informal rules (*aggregation rules*), similar to the Guadalquivir case study (see Chapter 4). As explained in the previous chapter, the River Basin Water Council votes on the RBMP to give a non-binding recommendation to the national government (*aggregation rule)*. Traits of *competition* are observable between the different informal coalitions supporting the RBMP on the one hand, and those voting against the RBMP on the other. Voting behaviour of regional administrations is thereby particularly important, usually depending on the respective parties in power at regional and national level, instead of relations between the respective administration and the CHJ (Interviews 16/2019, 17/2019). The RBMP 2015–2021 was approved with 48 votes in favour of the BRMP, 27 against, and 5 abstentions (CHJ 2015e: 74). Dissenting votes came inter alia from Castilla-La Mancha due to the conflict with the Valencian Community on water allocation; and from ENGOs because of disagreement on environmental flow regulations and allocation of water for the Albufera (*choice rule)* (Interview 17/2019, 25/2019, 29/2019). Although the Valencian community usually supported the RBMP, they changed voting behaviour after a new regional government came into power, which was "a shock" for the CHJ (Interview 17/2019). However, it is important to note that agreements are usually already reached informally, prior to the River Basin Council's meeting (Interview 16/2019, 29/2019) (*aggregation rule*).

Performance assessment

Coordinated behaviour of this hybrid form of interaction is evaluated as high. First, *exchange of information* is assessed as high, concerning flow of information between concerned actors and information available on the process as well as the outcome of this Action Situation, namely the RBMP. Regarding the former, interviewees describe information exchange with the CHJ as very positive. A regional administration representative explains: "If I'm asking the *Confederación* 'listen, I need data about this', they immediately give me the data" (Interview 19/2019; also 25/2019). Similarly, according to an ENGO representative, information exchange with the CHJ helps to understand the otherwise very complex RBMP (Interview 23/2019). Moreover, cross-

sectoral exchange between WUAs and civil society improved due to the territorial, instead of sectorial, meetings (Interview 17/2019, 29/2019); and their relationship is described as good and respectful, with the possibility to enter a dialogue (Interview 17/2019, 21/2019, 23/2019). This is also reported for the relationships between the CHJ and different interest groups (Interview 27/2019), and the CHJ is said to be easily accessible (Interview 20/2019). Indeed, the planning process in the Jucar RBD was rated by Transparency International as the second most transparent one in Spain, after the Basque Country.[3] Nonetheless, it is to mention the complexity of the information provided (Interview 26/2019), also due to the amount of information included in the RBMP (Interview 17/2019, 23/2019). According to an interviewee, the CHJ "[wants] to flood us with information so we don't know [anything]" (Interview 23/2019).

Consideration of competing interests is rated as moderate. On the one hand, private and public actors from both sectors claim that their own interests are underrepresented (see 21/2019, 22/2019, 23/2019, 25/2019). More specifically, an ENGO criticizes that written statements have been hardly integrated into the RBMP (Interview 23/2019); whereas representatives of WUAs condemn that too much attention is paid to environmental interests (Interview 21/2019; also 22/2019). As interests contradict each other and thus cannot all be considered equally, I see this as indicator that these different interests are all represented to some degree. Further, in the context of irrigation efficiency measures, the CHJ represents a differentiated picture by acknowledging the risk of a rebound effect (Interview 16/2019, 18/2019, 27/2019). On the other hand, distribution of seats in the River Basin Water Council is highly unequal, with ENGOs and civil society actors being in a clear minority. According to an interviewee, the high representation of irrigators means that they basically "have the power over the water" (Interview 23/2019).

Last, *alignment of incentives* relating to the question whether actors are incentivized to implement measures of the RBMP at a later stage, is rated as high. On the on hand, measures are usually agreed upon jointly and in consensus with regional actors, which is deemed crucial for successful implementation (Interview 19/2019); and a consensus is usually achieved among competing parties regarding the allocation of water resources stipulated in the RBMP (Interview 18/2019). Nonetheless, it is to acknowledge that funds allocated to the RBMP are not sufficient (Interview 23/2019), which is likely to hinder implementation. Furthermore, the CHJ needs to better convince the Regional Departments regarding the importance of implementation of measures. In this context, an interviewee explains: "I mean, the plan is given green light and then they oppose it" (Interview 19/2019). Administrations

3 https://transparencia.org.es/puntuaciones-de-cada-organismo-de-cuenca-en-las-seis-areas-de-transparencia-2015/ (accessed 18.12.2020)

therefore need to understand that "the plan belongs to everyone, and the measures belong to everyone" (Interview 19/2019).

Intermediate output performance of this Action Situation refers to *RBMP effectiveness*, which is rated as moderate. I analyse whether actors in charge of i) implementation, ii) financing, and iii) actors affected by the respective measures are specified (see Chapter 2). Regarding irrigation efficiency measures, all three criteria are fulfilled. As I will elaborate below (see Section 5.2.3), actors in charge for implementation are defined. The financing is specified as well, with planned investments for increasing irrigation efficiency up to EUR 431 Million in the time period 2015–2027. This represents 19.2 % of the overall budget of the Program of Measures, and is to a large share allocated to the basins Turia and Jucar (CHJ 2015a: 44). Affected actors are also defined in terms of water users that will receive subsidies as well as in terms of specifying the public benefit by these measures. Concerning the former, priority is given to users of traditional irrigation systems of the *Ribera del Júcar*, and to the replacement of pumps of la Mancha Oriental. Furthermore (and in contrast to the Guadalquivir), the RBMP also addresses public benefit of irrigation efficiency measures. More specifically, the RBMP specifies that the increase of irrigation efficiency is expected to realize brut water savings of 240 hm^3/year (CHJ 2015a: 86). Some part shall be used to increase environmental flows of the Albufera, and another to allocate it to other water users (CHJ 2015c). It is noteworthy that the RBMP also mentions the potential risk of increased water consumption after increasing irrigation efficiency. Furthermore, it is stated that "gross [water] savings […] in no way resemble net savings, which are much lower" (CHJ 2015a: 193, own translation). Additionally, the effect of increased irrigation efficiency on quantity and quality of return flows in the Albufera will be studied (CHJ 2015a).

Concerning the reduction of water rights, two out of three criteria are fulfilled. The CHJ is defined as actor in charge of implementation, and a budget of EUR 3 Million is assigned in the RBMP for "processing, revising, and updating water rights" (CHJ 2015a). On the other hand, although affected actors are mentioned, it remains quite broad. Indeed, it is argued that water rights will be revised where "the generation of additional resources suggest a change in the source of existing water rights" (CHJ 2015a, own translation) – a paragraph identical to the National Water Law, without entering into details.

In addition, it is to mention the critique by the European Commission (2015b) that irrigation efficiency measures included in Spanish RBMPs may hamper the achievement of the WFD objectives (see also Chapter 4). However, the amount of water savings is calculated, and risks of increasing irrigation efficiency are discussed in the RBMP. I therefore argue that the request by the European Commission (2015b) to evaluate how irrigation efficiency measures will contribute to the environmental objectives has been taken into account to a certain extent. This is also why I assess *RBMP effectiveness* as moderate.

5.2.2 Dam Release Commissions

The Action Situation Dam Release Commissions is about decision-making on water allocation to different groups of water users. Similar to the Guadalquivir, members of the Commissions decide upon the filling level of dams during the wet season as well as upon the schedule and volume of water storage releases during the dry season. I identify a *hybrid* pattern of interaction among members of the Commissions, composed of *hierarchy* and *cooperation*. The former result from formal rules, according to which decisions from other Action Situations must be followed through (*scope rule*); while the latter can be explained by informal rules according to which the CHJ acts as arbitrator, mediating between different interests, and trying to reach a consensus among water users (*position rule*).

Independent variables specific to the Action Situation

Overarching rules first look at *formal rules for coordination,* regulating the composition and functioning of the Dam Release Commission. These formal rules are defined by the National Water Law, but there is an important difference to the Guadalquivir. This is because national regulation stipulates that different Dam Release Commissions shall be created if there are several reservoir systems within one RBD that are not directly connected to each other (Royal Decree 927/1988, Art. 46). This results in 12 Dam Release Commissions in the Jucar RBD, corresponding to its hydrological characteristics. While the general composition of actor groups represented in each Dam Release Commission is identical to the Guadalquivir (i.e., CHJ president, CHJ staff, national administration, and agricultural, urban, and industrial water users), the number of respective representatives in each Commission is smaller.

De jure autonomy is identical to what has been elaborated for the Guadalquivir: Water users are involved in the decision-making about water allocation but need to coordinate among each other. Their *de jure autonomy* is thus moderate. Further, *de jure autonomy* of the CHJ is also moderate, since it needs to involve Commission members in the decision-making procedure.

Social problem characteristics are to a large extent identical to the Guadalquivir, with some few exceptions. Overall, coordination requirements of this Action Situation derived from social problem characteristics are low to medium. To summarize, *frequency* is medium, with two meetings per year; *asset specificity* is medium, since decisions of previous year are often the basis for the upcoming year; and *excludability* is high with the allocated surface water representing basically a private good. However, in contrast to the Guadalquivir, the *scale* at which decision-making is organized relates to the level of different reservoir systems, resulting in 12 independent Commissions. While this indicates higher coordination requirements by the CHJ across the entire RBD, we can expect that coordinating different interests *within* one Commission may be easier due to the smaller number of affected water

users. Lastly, *uncertainty* from the perspective of the CHJ is low since water users can hardly deviate from decisions taken in the Commission. From the perspective of WUAs, *uncertainty* is also low – in contrast to the Guadalquivir – since decisions are largely predetermined by the RBMP and the Special Alert and Eventual Drought Plan (hereafter: Drought Plan), as will be elaborated below.

Pattern of interaction: Hybrid of cooperation and hierarchy

In this Action Situation, I identify a *hybrid* pattern of interaction, composed of *hierarchy* and *cooperation* between the CHJ and water users. Meetings are scheduled at least twice a year, but depending on water availability, they meet more often to coordinate respective restrictions (*choice rule)* (Interview 20/2019). Furthermore, meetings are used by the CHJ to share information on the hydrological and climate situation with water users (Interview 27/2019).

Hierarchical traits of interaction in this Action Situation are largely determined by formal scope rules of the RBMP and the Drought Plan, as well as informal *aggregation rules*. The RBMP and the Drought Plan stipulate in advance the range of water volume that can be distributed in periods of reduced water availability (see CHJ 2015g). Based on these clearly defined ranges, Dam Release Commissions thus adapt water allocation if necessary (*scope rule)* (Interview 18/2019). In this context, an interviewee explains that "there is less and less room for manoeuvre. […] Things are more and more planned, more studied, so you [only] have ranges in which you move…" (Interview 27/2019). Interview partners agree that since "it's practically all arranged" through the Drought Plan, little discussions within the Dam Release Commissions are required (Interview 20/2019). The CHJ therefore "[doesn't] have to argue so much with irrigators or anything", also because the distribution furthermore depends on existing water rights (Interview 27/2019). CHJ representatives therefore consider the Dam Release Commissions of limited importance (Interview 18/2019, 27/2019) and explain that also water users would ascribe a higher importance to the planning process of the Drought Plan and present written comments there (Interview 18/2019). Thus, in contrast to formal rules of the National Water Law which grant decision-making power to water users (see *de jure autonomy*), decisions are rather taken hierarchically by the CHJ based on the two planning documents which gained considerable importance in the last decade.

A further indicator of the *hierarchical* pattern of interaction is that the first meeting of the hydrological year, taking place in October, is described as merely informative, without the possibility to influence decision-making (Interview 18/2019). Furthermore, even though water users are asked to share expectations about water distribution in the second meeting in February (*information and choice rules*) (Interview 18/2019), there is no evidence that real voting by Commission members takes place as stipulated by the National Water Law (*aggregation rule)*. Informal *aggregation rules* thus deviate from formal rules.

Nonetheless, some traits of *cooperation* are also observable in this Action Situation. This is firstly influenced by informal *position rules*, which determine that the CHJ is again in the position of an arbitrator, trying to reach consensus among water users. Indeed, according to an interviewee, the CHJ is "in the middle of trying to bring those interests together so that […] in the end everybody wins, and everybody loses" (*position rule)* (Interview 20/2019). The intent to reach consensus is also reflected by the fact that members of the Commissions are said to always agree on allocation quota despite existing conflicts of interest (Interview 29/2019). Furthermore, members of the Commissions seem to share same aims regarding water allocation. Indeed, an interview partner explains that "what we are clear about is one thing: that we cannot use the years of recovery to spend more [water]" since aquifers as well as dams need to be refilled in humid years (Interview 29/2019). Statements of a CHJ representative go in the same direction, since even before the Drought Plan was introduced – restricting leeway for decision-making – water users "always collaborated with the *Confederación*" to reduce water allocation in periods of drought (Interview 18/2019).

Performance assessment

Coordinated behaviour of this Action Situation is evaluated as moderate. First, *exchange of information*, relating to process and output of the Dam Release Commission is moderate. On the one hand, Dam Release Commissions are used as fora to provide information to water users, and WUAs are in permanent exchange with respective dam managers to communicate amount of water needed (Interview 18/2019). On the other hand, availability of information on the output, i.e., decisions taken in the different Commissions, is limited. Indeed, meeting minutes are only available for the year 2014.[4]

Second, *competing interests considered* is medium due to the fact that environmental groups are not officially represented. An interviewee therefore criticizes that "no external party" controls environmental flows, which according to National Law pose a restriction to any type of water use (Interview 17/2019). Nonetheless, the interview partner also acknowledges an increasing awareness for environmental flows due to EU regulations (Interview 17/2019). Although regions are not represented in Dam Release Commissions either, an interviewee of a Regional Department explains that this would not be necessary either (Interview 20/2019). I see this as an indicator that decisions taken in the Dam Release Commission are at least not contrary to interests of the regional administrations.

Last, *alignment of incentives* refers to whether water users are incentivized to reduce their consumption in periods of drought, based on decisions taken in the Dam

4 https://www.chj.es/es-es/Organismo/organoscolegiados/Paginas/OrganosdeGestion.aspx (accessed 15.11.21)

Release Commission. I evaluate it as high due to the high consensus by actors regarding the decisions taken. While during periods of normal water availability or during the RBMP planning phase, it is usually difficult to reach agreements, an interview partner explains that "when the drought comes, and you see the drought and you see the reality, in the end we always come to an agreement" (Interview 21/2019). Similarly, another interviewee explains that "there is conflict, there is always conflict, but when something is agreed upon, even with conflict […] everything is fulfilled. […] Everyone complains, but when you reach and reduce 15%, everyone complies" (Interview 29/2019).

The second aspect of performance assessment refers to *distribution of surface water adapted,* understood as the extent to which surface water distribution has been adapted in the Dam Release Commission compared to what would be required to meet ecological flow requirements. The variable is rated as medium, even though its assessment is difficult due to the lack of meeting minutes. However, interview data indicates that water allocation got reduced during periods of drought through the different Dam Release Commissions (Interview 21/2019). On the other hand, the share of water bodies where minimum flow requirements were not fulfilled in the period between 2016/17 and 2019/20 ranges from 22% in 2016/17 to 40% in the following year (MITECO 2020c). Although other Action Situations certainly also influence compliance with environmental flow rates, the reduction of water allocation through the Dam Release Commission was apparently not sufficient either.

5.2.3 Increasing irrigation efficiency

This Action Situation analyses the implementation of new techniques such as drip irrigation, as well as the replacement of irrigation canals and ditches with pipes in order to increase irrigation efficiency. Similar to the Guadalquivir, I identify *incentive-based hierarchy* as pure form of coordination between regional and national agricultural administrations, WUAs and the CHJ. This pattern results from formal rules regulating the granting of subsidies to WUAs to implement irrigation efficiency measures; and which put the agricultural administration in a superior position vis-à-vis the WUAs.

Irrigation efficiency measures are particularly relevant in the downstream part of the two rivers Jucar and Turia, flowing through the Valencian community (CHJ 2015a: 47). Traditional irrigation systems, mostly consisting of flood irrigation and open canals of relatively low irrigation efficiency, are dominant in that area (Interview 18/2019, 27/2019). In the upstream parts of the two rivers, flowing through Castilla-La Mancha, irrigation systems are more efficient, which is why the RBMP includes less measures for this area (*boundary rules)* (Interview 27/2019). In the first planning cycle, EUR 405 Million were invested in increasing irrigation efficiency,

and EUR 431 Million are assigned for the second and third planning cycle (CHJ 2015a: 44).

Independent variables specific to the Action Situation

Overarching rules consist of *de jure* autonomy, which is defined by the RBMP, the European Agricultural Fund for Rural Development (EAFRD), and the Rural Development Programs (RDPs) of the two regions, Castilla-La Mancha and the Valencian Community. Similar to the Guadalquivir, actors officially responsible for implementation are the two Regional Departments of the Valencian Community and Castilla-La Mancha, respectively; or the National Ministry of Agriculture, depending on the type of measures. Yet, the National Ministry delegated responsibility for concrete implementation to state-owned companies such as the State Society for Agricultural Infrastructure (*Sociedad Estatal de Infraestructura Agraria S.A.*, SEIASA) and acuaMed (*Aguas de las Cuencas Mediterráneas, S.M.E.,S.A.*) (CHJ 2015a). While in the first years, SEIASA was carrying out most of the projects of national interest, various companies and financial schemes exist now, offering more selection options to WUAs (Interview 17/2019, 24/2019). Similar to the Guadalquivir, *de jure autonomy* of these actors is evaluated as moderate, being restricted by the EAFRD and the RDPs setting clear rules for investment eligibility criteria. However, concrete rules vary between the regions, which will be discussed below.

Formal rules for coordination consist of contractual agreements between the implementing authority and the respective WUAs. Furthermore, the RDPs of the Valencian Community and Castilla-La Manche regulate formal information exchange between the CHJ, WUAs and the agricultural administrations concerning requirements to get subsidies for irrigation efficiency measures.

Social problem characteristics are identical to the Guadalquivir, indicating a high need for coordination of involved actors. In a nutshell, this means that *asset specificity* is high since investments are unique to the respective WUAs. *Frequency* and *excludability* are also high due to the high number of WUAs applying for the measures, as well as the private good character of drip irrigation. *Scale* refers to the level of WUAs; and lastly, *uncertainty* is low for implementing authorities since WUAs usually do not change their behaviour in the process of applying and implementing irrigation efficiency measures, while it is high from the perspective of WUAs due to delays in implementation.

Pattern of interaction: Incentive-based hierarchy

In this Action Situation, *incentive-based hierarchy* as pure form of coordination is identified, emerging between the agricultural administrations at the regional and national level, WUAs and the CHJ. This pattern of interaction results from formal rules.

As also argued in relation to the Guadalquivir, subsidies present a form of incentive for WUAs to implement irrigation efficiency measures (see Chapter 4). WUAs that decide to modernize their irrigation systems thus enter an exchange relationship with the administration. The Valencian Community subsidizes up to 70% of investment costs, with the rest being borne by WUAs themselves (*payoff rules)* (Interview 20/2019; Generalitat Valenciana 2019: 252) – yet only under the condition that several rules which will be described below are met. In Castilla-La Mancha, the level of subsidies depends on the amount of generated water savings (*scope, payoff rule)*. More specifically, public subsidies cover at least 45% of total costs, but the higher the amount of effective water savings, the more subsidies can be increased (*payoff and scope rules)* (Castilla-La Mancha 2020: 106). The incentive-based mechanism is thereby further reinforced. The concrete tasks for the Regional Department or state companies, respectively, after subsidies are granted vary. WUAs can for example opt for Build-Operate-Transfer Contracts, where the respective company is only in charge of building new irrigation infrastructure, which is then transferred to the WUA; or for Operation & Maintenance Contracts, where the company is usually also contracted for operation and maintenance of the newly constructed infrastructure (*boundary, position rules)* (García-Mollá et al. 2020).

Similar to the Guadalquivir, the *hierarchical* element is shaped by formal rules of the European Agricultural Fund for Rural Development (EAFRD) (*scope* and *choice rule*) (see Chapter 4), as well as by additional rules of the two RDPs. These rules give implementing authorities a superior position over WUAs. To recap, the EAFRD sets the following minimum requirements for granting of subsidies: ex-ante assessment of potential water saving of at least 5 to 25% in water bodies of a good status, existence of water rights and water metering; and in water bodies in a status less than good, an effective reduction of at least 50% of the potential water savings shall be ensured at the farm level (*scope, choice rule)* (EAFRD, Art. 46). In addition – and in contrast to Andalusia – the Valencian Community and Castilla-La Mancha, respectively, have included further rules in their RDPs which strengthen the *hierarchical* element: In the Valencian Community, during a period of three years, WUAs must certify the amount of effective water savings based on measurement of consumed water before and after the increase of irrigation efficiency (*information rule)* (Generalitat Valenciana 2017); and beneficiaries in Castilla-La Mancha must inform about water consumption for five years upon completion of the infrastructure project (*information rule)*. Furthermore, the Valencian Community requires an ex-ante condition of at las 10% of water saving (Generalitat Valenciana 2017) instead of 5% as stipulated in the EAFRD. In Castilla-La Mancha, sanctions may be imposed to WUAs if the objective of the subsidy is not fulfilled, and WUAs may have to repay subsidies (*payoff rule)* (Castilla-La Mancha 2019, Interview 26/2019). Furthermore, beneficiaries must commit themselves to the reduction of water rights in order to get subsidies (*payoff rule)* (Castilla-La Mancha 2020) – a requirement not included neither

in the Valencian Community nor in Andalusia. However, information on who these commitments by WUAs are enforced at a later stage is not available, since when interviews were conducted the rule was introduced only recently.

The CHJ is involved insofar as it is informed by the agricultural administrations about planned infrastructure projects and corresponding estimated water savings during the implementation process (Interview 20/2019, 27/2019), as well as about changes in water use after the implementation (Interview 20/2019, 26/2019). Furthermore, the RDPs of both regions stipulate that the CHJ has to proof whether requirements that fall under its competency, such as the existence of water meter or water rights, are met (Castilla-La Mancha 2019; Generalitat Valenciana 2017).

In line with these formal rules, representatives of the regions as well as the CHJ confirm that their overall aim indeed is to generate water savings (Interviews 18/2019, 20/2019, 26/2019). These water savings shall then be dedicated to increase the guarantee of the system through higher availability of water resources, as well as for environmental purposes (*scope rule)* (Interview 18/2019). The most important example in this context is the case of the Acequia Real, where water savings were attributed to environmental uses in the Albufera, as well as to the not yet operating water transfer Jucar-Vinalopó (*scope rules*) (Interview 21/2019, 24/2019).

Performance assessment

Coordinated behaviour of the *incentive-based hierarchy* is moderate. First, *information exchanged* is medium, relating to exchanged information during the process of implementation among involved actors, and information provided about the output. Concerning the former, interview partners report frequent information exchange e.g., through bilateral meetings between the respective Regional Department on the one hand, and WUAs and their regional umbrella organizations on the other (Interview 20/2019, 22/2019). WUAs and the Regional Department of Valencia are described to be working "hand in hand" with each other (Interview 22/2019), and an interviewee explains that "our wish is to reach consensus […] and collaborate" with the administration (Interview 21/2019). Furthermore, there is fluent information exchange also between the two Regional Departments and the CHJ (Interview 26/2019, 27/2019). In relation to data provided on the status of implementation, information on planned, ongoing and finalized infrastructure projects to increase irrigation efficiency are accessible on the CHJ website.[5] However, data on the development of water consumption before and after the implementation of measures is based on estimations, as in all Spanish RBDs, and not on real measurements (see also Chapter 4) (European Commission 2015b).

5 https://www.chj.es/es-es/medioambiente/proyectos/Paginas/Obras.aspx (accessed 01.12.2021)

Second, *alignment of incentives* relates to the level of governmental actors as well as of WUAs and is evaluated as moderate. Regarding governmental actors, an interviewee explains that the control of EAFRD and RDP requirements is of high importance for the two Regional Departments (Interview 26/2019); and there is no evidence that these requirements were not sufficiently controlled. At the level of WUAs, the variable relates to the question whether irrigators are incentivized to follow rules established by the EAFRD and the RDP, i.e., to produce water savings at the farm level. On the one hand, most water users agree on the aim to save water (e.g., Interview 21/2019). They are described to be "increasingly aware" of, and "beginning to internalize" the need to reduce water consumption after increasing irrigation efficiency (Interview 27/2019). On the other hand, Sanchis-Ibor et al. (2017) provide evidence that farmers in the Valencian Community increased irrigation efficiency to facilitate watering, e.g., by avoiding night irrigation and reducing time spent on irrigating, as well as to improve efficiency of fertilizer. None of the farmers mentioned water saving as incentive to implement irrigation efficiency measures (Sanchis-Ibor, Boelens, and García-Mollá 2017).

Last, *consideration of competing interests* is also moderate. On the one hand, environmental interests are not represented by any third actor; and only in few cases, environmental impact assessments are required (Interview 29/2019). However, areas have been designated where irrigation efficiency measures are prohibited, aiming to preserve irrigation systems that are considered historically valuable (Interview 20/2019). Furthermore, critique on irrigation efficiency measures is also acknowledged in the RBMP (CHJ 2015c), as discussed above, which I see as an indicator of considering competing interests.

The second variable of the performance assessment relates to the *status of implementation of measures* and is rated moderate. Since data on the status of implemented irrigation efficiency measures is not available, the share of investment from the RBMP is used as proxy. According to most recent data, only 38.2% of investment foreseen to be implemented by December 2018 for measures to reduce pressure on water bodies through water extraction – as part of the Program of Measures 2015–2021 – has actually been realized at this date (CHJ 2020b: 442). Concerning irrigation efficiency measures in the Acequia Real, only 6.12% of planned investment has been made for the same time period (CHJ 2020b: 444).

5.2.4 Reduction of water rights

The Action Situation Reduction of Water Rights is about reducing water rights after the implementation of drip irrigation. I identify two patterns of interaction: the first one is a *hybrid* composed of *cooperation* resulting from informal rules, and *hierarchy* based on a combination of formal and informal rules. The second pattern includes a

sequence of action, namely *information exchange* which is followed by a *gap in interaction*.

Independent variables specific to the Action Situation

Overarching rules include first *de jure autonomy* which is mainly defined by the National Water Law – and is therefore identical to the Guadalquivir – and the RBMP. To reiterate, since the National Water Law only stipulates that water rights "may be revised" (Art. 65), the CHJ in the form of the Water Commissioner has considerable autonomy to carry out, or not carry out, a reduction. Similarly, measures on the "revision of water rights" are included in the RBMP, but due to the nature of the RBMP, they are not legally binding for the CHJ, and therefore again provide considerable leeway. *De jure autonomy* of agricultural administrations is limited to provision of information to the CHJ on the status of implemented irrigation efficiency measures.

Second, *formal rules for coordination* are only marginally defined. Concerning coordination between the CHJ and water users, neither the RDPs nor the RBMP define how actual reduction of water rights shall be exercised. RDPs of the two regions only specify that beneficiaries must inform the CHJ about infrastructure projects carried out (Generalitat Valenciana 2019; Castilla-La Mancha 2020).

Social problem characteristics are identical to the Guadalquivir, indicating high need of coordination for the CHJ with the different WUAs. To sum up, *scale* refers to the individual water user; *frequency* is high due to the high number of WUAs addressed by the measure; *asset specificity* is high since investments are unique to the respective WUAs; *excludability* is high with water rights being a private good; and lastly, *uncertainty* is high for the CHJ as well as for the WUAs. While the CHJ does not know whether the respective WUAs will accept the decision, WUAs do not know whether water rights will be reduced due to the non-binding character of the measure.

Pattern of interaction (1): Hybrid of cooperation and hierarchy

The first pattern of interaction in this Action Situation is a *hybrid* of *cooperation* and *hierarchy* between the CHJ and the Acequia Real, which presents the most prominent example. More specifically, through a *cooperative* process, the CHJ and the Acequia Real jointly agreed to reduce water rights, which in itself presents a *hierarchical* administrative procedure. This pattern emerged from the combination of formal and informal rules.

The joint *cooperative* agreement to reduce water rights resulted from informal *choice rules*. The key indicator for *cooperation* between the Acequia Real, its members, and the CHJ is that actors reached a consensus on the need to reduce water rights. More specifically, the General Secretary of the Acequia Real took the initiative by convincing WUA members that only a reduced amount of water rights would be needed after increasing irrigation efficiency (*choice rule*) (Interview 16/2019, 21/2019).

The General Secretary is seen as having played an outstanding role in the process; and a CHJ representative explains that the reduction was only possible "because of this collaboration" between the CHJ and the Acequia Real (Interview 16/2019). The main reason for the need of a reduced amount of water – of which water users could be convinced – are specific characteristics of the irrigation systems: Through a special construction, water of the new irrigation system is taken from a reservoir 40 meters above the irrigated area, thereby generating pressure which is used for irrigation. No additional costs for energy consumption are therefore imposed on the WUA. Furthermore, due to a special agreement between the Acequia Real and the state, infrastructure projects were basically "for free" for the WUA (Interview 24/2019). The Acequia Real therefore have "one of the few irrigation systems that are modernized, save water and do not generate an increase in energy consumption" (Interview 21/2019). Members of the Acequia Real are therefore "totally in favour of modernization" since "it is more comfortable with less costs" (Interview 21/2019).

Based on this *cooperation*, the CHJ carried out the administrative, *hierarchical* proceeding of a water rights reduction, resulting from a combination of formal and informal choice rules. The *hierarchical* element consists of a superior relationship between the CHJ vis-à-vis the Acequia Real, with the former being in the position to enforce the reduction of water rights. This reduction was contractually stipulated between the CHJ and the Acequia Real in 2015/16 as well as in 2020, with the consent of all WUA members (Interview 16/2019). In addition, the CHJ and Acequia Real agreed that water rights would also be reduced for future irrigation efficiency measures; and that this must be done up to three years after the completion of construction works.[6] Since the National Water Law only provides the possibility to carry out a water rights reduction, choice rules applied by the CHJ are of formal and informal nature.

While this pattern of interaction is not representative for the Jucar RBD, it is nonetheless of high empirical relevance with the Acequia Real being the largest water rights holder in the RBD (Interview 18/2019). Further, it indicates an important approach by the CHJ since in the future, they aim to "make a deal" also with other WUAs before infrastructure measures are implemented (*choice rule)* (Interview 27/2019). This is because a reduction of water rights is facilitated if water users themselves agree to it (Interview 16/2019). The CHJ itself attaches high importance to the reduction of water rights since without reduced water rights, "there's nothing to force them to consume less" (Interview 27/2019).

In this context, it is to also mention the RDP of Castilla-La Mancha which includes a legal passage on water rights revision, as explained above. More specifically, if water bodies in a status worse than good are affected, water users need to agree in advance that a reduction of water rights corresponding to the amount of saved

6 https://www.acequiarj.es/entidad/concesion/ (accessed 23.11.2021)

water will be automatically conducted (Castilla-La Mancha 2019). This agreement is part of the overall contract between the Regional Department of Castilla-La Mancha and the respective WUAs. However, as this was a relatively recent legal change, no information is found as to how this agreement is coordinated with, and ultimately enforced by the CHJ.

Pattern of interaction (2): Information exchange, gap in interaction

I identify a second pattern of interaction in this Action Situations, which consists of a sequence of *information exchange* between the agricultural administration and the CHJ based on formal rules; which is then followed by a *gap in interaction* resulting from a combination of informal and formal rules. This pattern of interaction is similar to what has been observed in the Guadalquivir case study (see Chapter 4).

After irrigation efficiency measures are completed, the respective Regional Department reports changes in water uses to the CHJ (*information rule)*; which is characterized as *information exchange.* However, this information exchange is followed by a *gap in interaction*. Indeed, the CHJ representatives explain that due to the lack of legally binding rules in the National Water Law, an automatic water rights reduction after the implementation of irrigation efficiency measures is difficult (Interview 27/2019) (*formal and informal choice rules*). The underlying rationale is similar to what has been explained for the Guadalquivir: water users may sue the CHJ in court due to the high legal protection of water rights. Many WUAs therefore kept their water rights. This was also confirmed by a WUA representative, explaining that water rights "were already so low that you don't have to lower them much further either. They were already very limited" (Interview 29/2019). The CHJ therefore foresees to make the reduction of water rights after the increase of irrigation efficiency legally binding in the third planning cycle (CHJ 2020b; Interview 27/2019).

Performance assessment

Coordinated behaviour of the two patterns of interaction is moderate. First, *information exchanged* is high. On the one hand, this concerns information exchange between involved actors, i.e., the CHJ, WUAs, and the agricultural administrations, which is described as positive (Interview Generalitat). Furthermore, also information about the process as such as well as the status of implementation is accessible for outsiders: the CHJ addresses achievements and challenges concerning water rights reduction in planning documents (see CHJ 2020b); the Water Register is accessible online and contains information on amount and type of water rights for every WUA, as well as the respective surface area;[7] and the Catalogue of Private Water publishes informa-

7 https://www.chj.es/es-es/ciudadano/Informacionmedioambiental/Paginas/IncripcionesdeAprovechamientosdeAguas.aspx (accessed 28.09.2020)

tion on changes in private water rights.[8] On the other hand, while progress has been made, the CHJ still aims to further increase transparency on water rights (Interview 27/2019).

Second, *competing interests considered* is moderate. On the one hand, there is evidence for some degree of consensus on the need to reduce water rights within the public administration (Interview 18/2019, 27/2019), as well as among WUAs (Interview 21/2019, 24/2019). However, although the reduction of water rights is subject to a public procedure and actors have the possibility to submit written statements (Interview 21/2019), there is no evidence that actors with potentially competing interests, such as environmental interests, are participating in this Action Situation.

Last, *alignment of incentives* referring to whether the CHJ is incentivized to carry out the reduction of water rights is moderate. On the one hand, the CHJ stresses the importance to reduce water rights (Interview 16/2019, 18/2019, 27/2019), and has also done so in the Acequia Real. However, the lack of legally binding rules at the national level is seen as a major constraint and is pointed out as a main reason why water rights were not automatically reduced at a larger scale (Interview 27/2019).

The *status of implementation of water rights reduction*, compared to what has been stipulated in the RBMP, is rated as moderate. On the one hand, water rights of the Acequia Real were reduced in 2015/16 from 398 hm^3/year to 214 hm^3/year (Interview 18/2019, 21/2019, 22/2019, 27/2019); and to 199 hm^3/year in 2020.[9] This is equivalent to 8% of agricultural water use in the RBD and therefore of considerable empirical relevance. On the other hand, though, water rights of other WUAs have not been reduced (Interview 27/2019). Consequently, the volume of water rights at the RBD level still slightly exceeds the amount of resources available. Also in the most recent planning documents of the third cycle, the CHJ explains that some WUAs still hold water rights which are higher than what they consume, inter alia due to improvements in irrigation efficiency or the switch to less water-intensive crops without a concomitant reduction of water rights (CHJ 2020b: 338–9).

5.3 Performance across Action Situations

In this section, I assess overall performance at the river basin level, i.e., across all Action Situations. This includes *process performance across Action Situations*, followed by *policy output performance* which refers to the overall RBMP implementation, and lastly, *environmental outcome performance*.

8 https://www.chj.es/es-es/ciudadano/informacionmedioambiental/Documents/ActualizacionesCat%C3%A1logoAguasPrivadas.pdf (accessed 26.04.2022)

9 https://www.acequiarj.es/entidad/concesion/ (accessed 26.04.2022)

Process performance across Action Situations

Coordinated behaviour across Action Situations is rated as moderate. It is assessed along two variables, namely *information exchanged* and *alignment of incentives*. The variable *competing interests considered* is identical to what has been discussed at the level of individual Action Situations and is hence not discussed here (see also Chapter 4).

Information exchanged at the level of the overarching governance process is evaluated as moderate. It refers to information exchange of actors between Action Situations, and to information provided on the outcome of the governance process. Regarding the former, it is described as positive. Interviewees confirm, for example, that information exchange between the CHJ, WUAs, and the agricultural administrations concerning the implementation of irrigation infrastructure and changes in water use patterns is positive (Interview 20/2019, 27/2019). Moreover, there is no evidence that actors lack information from specific Action Situations to carry out tasks in an interlinked Action Situation. However, information regarding the outcome of the governance process is only moderate. This is on the one hand because data on water use relies on estimations instead of actual numbers of water consumption (European Commission 2015b) (see also Chapter 4). On the other hand, in most recent planning documents, the CHJ provides information about the status quo of implemented measures, and openly discusses challenges in its implementation (see CHJ 2020b). Thereby, access to information about the overarching governance process is facilitated.

Alignment of incentives is assessed at two levels, namely at the level of WUAs – referring to whether they are incentivized to reduce their consumption – and at the level of governmental actors, referring to whether they have incentives to follow higher-level rules. It is rated as moderate. At the level of WUAs, there are two important instances where incentives are only moderately aligned, with the first concerning the reduction of water consumption after the increase of irrigation efficiency. On the one hand, many WUAs could keep their water rights after irrigation efficiency had been increased. Similar to the Guadalquivir, this means that there are no regulatory mechanisms according to which it would be rational for respective water users to reduce their consumption. This is further accentuated by the fact that maintenance and amortization costs often increased. To compensate for increased costs, water users were then forced to increase their productivity (see also Chapter 4). However, an interviewee points out that the decrease of labour costs, leading to relatively stable costs for farmers, is often neglected in the debate (Interview 20/2019).

On the other hand, in some cases, incentives for WUAs were created that made it rational to reduce their water consumption after increasing irrigation efficiency; or at least to not increase it. This is, first, because the reduction of water rights in the case of the Acequia Real presents an important regulatory incentive mechanism. This is further reinforced by the fact that negative financial incentives – i.e., finan-

cial pressure to compensate for increased costs – are not present in this specific case: Due to the particularities of their irrigation systems, costs for water users remained constant. This means that amortisation costs do not exist, and maintenance costs did not increase. A second incentive mechanisms is represented by the RDP of Castilla-La Mancha. As mentioned above, it stipulates that to get subsidies for irrigation efficiency, water users must commit to adapt water rights if their water rights are not in line with the RBMP measures; and if affected water bodies are in a status worse than good, they must agree on reducing their water rights (Castilla-La Mancha 2019). This may considerably reduce incentives of WUAs to legally oppose a reduction of water rights by the CHJ at a later stage.

A second instance of moderately aligned incentives for water users refers to the control of water use. 80% of surface water use, 90% of treated wastewater use, and 100% of desalinated water use is controlled by the CHJ. However, this only applies to 35% of groundwater use in the RBD (CHJ 2020a: 32). This is explained by lack of financial and human resources of the CHJ (Interview 22/2019). Nevertheless, groundwater control in the La Mancha Oriental aquifer is often quoted as positive example in terms of self-regulation, even beyond Spain (European Court of Auditors 2021; Esteban and Albiac 2012). Indeed, through a collaboration agreement between the CHJ and the *Junta Central de Regantes de la Mancha Oriental*, self-control by water users was strengthened and overextraction of water resources thereby reduced (Interview 22/2019).

For governmental actors, i.e., the CHJ and the two Regional Departments, *alignment of incentives* to follow higher-level rules of the EAFRD and the WFD is low. The argumentation is the same as in the Guadalquivir case study (see Chapter 4): EAFRD requirements for water savings of irrigation projects allow for considerable exemptions by Member States and their regions (European Court of Auditors 2021); and the fact that Member States have to fulfil WFD objectives only until 2027, makes the threat of an infringement proceeding by the European Commission relatively uncertain. I therefore argue that there are no external incentives for governmental actors to enforce a reduction of agricultural water consumption.

Policy output performance

The assessment of the policy output refers to *RBMP implemented*, i.e., to the overall RBMP. It is rated as low, reflected by the statement of the CHJ: "the current pace of implementation of the measures of the Programme of Measures in force does not comply with the provisions of the RBMP itself" (CHJ 2020a; own translation). More specifically, in December 2019, 21% of measures scheduled to be completed by 2021 in the RBD had been completed; and 19% of the budget allocated for the planning phase 2015 – 2021 had been spent at that time (see MITECO 2020b: 130). Besides the already mentioned lack of implementation regarding irrigation infrastructure, also the implementation of larger infrastructure projects, such as dams (Interview

25/2019) or the water transfer Jucar-Vinalopó are delayed (Interview 24/2019). Lastly, a civil society representative criticizes that more fundamental changes of the water governance systems towards integrated water resource management – in line with the WFD – are very slow. According to him, the administration realizes only slowly that it is not only about introducing a "new language", but rather about more fundamental changes of the existing hydraulic paradigm (Interview 17/2019). This concerns, for example, the lack of introducing water pricing based on consumed water instead of irrigated surface area.

Environmental outcome performance

Environmental outcome performance is moderate since agricultural water consumption only slightly decreased, and environmental objectives of the WFD remain unachieved. First, numbers concerning the *development of water use* show a slight decrease. More specifically, the consumptive agricultural water use (i.e., net consumption) decreased by 1.8% from 2009 (1,412 hm^3/year) to 2016/17 (1,386 hm^3/year) (CHJ 2014c; 2019b); and total agricultural water use (i.e., brut consumption) decreased by 6.5%, from 2009 (2,553.7 hm^3/year) to 2017/18 (2,388.5 hm^3/year) (own calculation based on CHJ 2014b; 2019b). Against this backdrop, a representative of the National Ministry identified the Jucar as most important RBD in Spain where water savings were achieved (Interview 22/2018). However, while the CHJ also explains that the increase of irrigation efficiency is a reason for reduced water demand, it also highlights that there have been changes in the methodology of water metering, making comparison difficult (CHJ 2019a: 183).

In relation to the *development of irrigated surface area*, there is no clear empirical evidence. On the one hand, RBMP numbers show an increase of irrigated surface area by 4.75% from 2009 to 2018, from 384,225 ha to 403,019 ha (CHJ 2014b; 2019b). Yet, the CHJ again states that due to changes in the applied methodology, numbers are not strictly comparable (CHJ 2019b: 36). Furthermore, according to interview data, both factors, water use and irrigated surface area, remained relatively stable (Interview 20/2019, 23/2019). Similarly, Sanchis-Ibor et al. (2016) show that at the level of the Jucar river, crop intensification and expansion of irrigated surface area had been prevented by geographical and agronomic conditions of the region. This is also confirmed by a civil society representative referring to the level of the RBD: "a rebound effect as it had happened in Andalusia, there is no evidence that this has also happened here in a generalizable manner" (Interview 17/2019).

Last, the *development of water status* for groundwater slightly deteriorated according to the WFD assessment, with 33% of groundwater bodies in a poor quantitative status in the first cycle, and 36% in a poor status in the third planning cycle (2019a; CHJ 2014b). In addition, water extraction in some groundwater bodies is more than three times higher than the amount of renewable resources allows (CHJ 2020a). Further, 51% of surface water bodies are in a status "worse than good" according to as-

sessment of the third planning cycle (CHJ 2022) (see Table 8). However, a comparison between the cycles is not meaningful here since 24% of surface water bodies were not evaluated in the first planning cycle. Moreover, due to changes in delimitation of water bodies and methodology, numbers are not comparable, neither between the first and second (CHJ 2015b: 378), nor between the second and third planning cycle (CHJ 2019a). Indeed, a MITECO representative explained that improvements in the water status from the first to the second planning cycle were highest in the Jucar RBD compared to the other Spanish RBDs. However, since the CHJ also applied stricter indicators regarding hydromorphology, these improvements are not reflected in the official numbers (Interview 22/2018). To summarize, a civil society representative states that "over-exploitation [was] maintained […] meaning that none of the environmental problems were solved" and the increase of irrigation efficiency "did not help to improve the flow of the river, there is no doubt" (Interview 17/2019).

Table 8: Status of water bodies in the three WFD planning cycles (Jucar)

Category	**Water status**	**Percentage of water bodies**		
		RBMP 2009	**RBMP 2015**	**RBMP 2022**
Surface water bodies (global status)	Good	43 %	35 %	49 %
	Worse than good	33 %	65 %	51 %
	Not evaluated	24%	-	-
Groundwater bodies (quantitative status)	Good	66 %	66 %	64 %
	Poor	33 %	33 %	36 %

Source: Based on data from CHJ (2014, 2015, 2022)

6. Empirical Analysis of the Mediterranean Basins of Andalusia

In this chapter, the empirical analysis of the third case study, the Mediterranean Basins of Andalusia (hereafter: Mediterranean Basins) is conducted. As in the two previous chapters (see Chapter 4 and 5), the process under investigation is the implementation of the European Union (EU) Water Framework Directive (WFD) from 2009 to 2019. The empirical focus is on decision-making processes to reduce agricultural water consumption.

The analysis of this case study addresses five Action Situations, with one additional Action Situation compared to the two previous cases, namely the Supply and Demand of Desalinated Water. Within these Action Situations, I identify four *hybrid* patterns of interaction, consisting of *hierarchy* and different forms of *competition*. In addition, I identify *cooperation* and *incentive-based hierarchy*, both as pure forms of coordination; as well as *information exchange* and a *gap in interaction*. Most of the patterns of interaction result from a combination of formal and informal rules (see Section 5.2).

The analysis reveals low performance levels across all Action Situations (see Section 5.3): *Coordinated behaviour*, referring to process performance, is low since there is lack of information on the outcome of the overarching governance process, as well as unaligned incentives for water users to reduce water consumption. Further, the policy output performance, understood as the status of implementation of the River Basin Management Plan (RBMP), is also low due to severe lack of and delays in implementation of measures. Lastly, environmental outcome performance is rated low because agricultural water use and irrigated surface area increased in the last decade, although status of water bodies improved.

The chapter is structured similarly to the two previous chapters: I first describe independent variables which are specific to the case study (Section 5.1), and then analyse Action Situations (Section 5.2). This includes assessment of variables that are specific to the Action Situation, of patterns of interaction and performance of the respective Action Situation. Lastly, I evaluate performance across Action Situations (Section 5.3).

6.1 Independent variables specific to the case study

In this section, independent variables that are specific to the case study are described, including *contextual conditions* and *characteristics of heterogeneous actors*. For more detailed definitions and descriptions of the respective variables included in this section and below, see Chapters 2 and 3.

6.1.1 Contextual conditions

Geographic and hydrological characteristics of the River Basin District

The Mediterranean Basins is the southernmost River Basin District (RBD) in Spain, extending over 20,010 km^2 with a population of 2.7 Million.[1] It covers four Andalusian provinces, namely Malaga, Almeria, Granada and Cadiz (Junta de Andalucía 2015a) (see Figure 8). As indicated by the name, the Mediterranean Basins includes those basins whose rivers flow into the Mediterranean Sea. Its designation refers to administrative boundaries for the WFD implementation and includes several river basins and sub-basins. These are, most importantly, Almanzora, Andarax, Guadelfo and Guadalhorce, and are categorized into six so-called "systems", including multiple surface and groundwater bodies. Although these basins are independent from each other in hydrological terms, they are managed under the same RBMP, and in the same RBD. Water management problems of one system or sub-basin are thus independent of those within another basin (Interview 2/2019). In the following, I use the term river basin to refer to the different hydrological (sub-)basins, and RBD to the administrative boundaries of WFD implementation, i.e., the Mediterranean Basins.

1 I use the singular form when referring to the Mediterranean Basins, since the term pertains to a single River Basin District for the WFD implementation.

Figure 8: Map of the Mediterranean Basins of Andalusia

Source: Junta de Andalucía (2014)

Physical characteristics and climate conditions vary across the river basins. In general, the RBD is very mountainous, especially in the north-eastern part where the Sierra Nevada reaches almost 3,500 meters. This contrasts with the coastal plains where most of the population and economic activities are concentrated. Precipitation rates range from 2,000 mm/year in the west, to rates lower than 200 mm/year in the east, belonging to the areas with the lowest rainfall in Europe, and thus a subtropical and semiarid climate (Junta de Andalucía 2015b).

Socio-economic role of irrigated agriculture

Most important economic sectors in the RBD in terms of their contribution to the Gross Domestic Product (GDP) are service (76.9%), construction (10.9%), industry (7.8%), and agriculture (4.5%). In contrast, at the national level, agriculture contributes to 2.5% of the GDP (Junta de Andalucía 2015a), reflecting the relatively high importance of agriculture in the Mediterranean Basins. Particularly in rural areas, "there are not many alternatives", and economy and society are very dependent on agriculture (Interview 2/2019). Employment in agriculture represents 7.1 % (Junta de Andalucía 2015a).

Irrigated agriculture in the Mediterranean Basins covers 179,600 ha, and rainfed agriculture 435,300 ha (Junta de Andalucía 2015a). However, official numbers date back to 2008, and interview data suggests that irrigated surface area has increased

in the meantime (Interview 4/2019, 5/2019). In terms of land use, most important irrigated crops are citrus (49,400 ha), olive (39,400 ha), greenhouses (30,300 ha), fruits (19,800 ha) and subtropical fruits (19,200 ha) (Junta de Andalucía 2015b). Numbers for the corresponding water use per crop is not available.

Agriculture in the Mediterranean Basins is very heterogeneous due to climatic and geographical diversity. Interview partners therefore almost unanimously stressed that it was not possible to compare the different river basins, and usually distinguished the area of Sierra Nevada, and the two provinces of Almeria and Malaga (e.g., Interview 8/2019, 12/2019). In Sierra Nevada, located in the Northern part of the RBD, agriculture relies largely on traditional irrigation systems and subsistence farming. The area is of little economic importance and confronted with rural abandonment (Interview 2/2019). In Malaga, where the river basin Guadalhorce lies, main economic activities are agriculture in the interior – based mostly on citrus and subtropical fruits – and tourism on the coast, with the latter leading to an increase of urban settlements and golf courses. Thereby, pressure on water resources increased in the last decades, and growing demands for urban water supply are often met at the expense of irrigation (Duarte-Abadía and Boelens 2019). In Almeria, agriculture is characterized by intensive horticulture and high-tech greenhouses, relying almost exclusively on drip irrigation. More specifically, the coastal area of Nijar is dominated by small-scale farming of around 30,000 family farms with an average size of holdings of 1.5 to 2.4 ha; and the Northern part of the province by large-scale farming of orange and vegetable cultivation, owned by four to five big companies (Interview 3/2019). Almeria is very dependent on agriculture: "The engine of the economy, without any doubt, is agriculture" (Interview 5/2019). During the economic crisis, this dependence has become even more pronounced (Valera et al. 2016). Indeed, 19% of the working population in Almeria is employed in the agricultural sector (Junta de Andalucía 2015b). 70% of agricultural production is exported, mostly to Germany, France, the Netherlands and the United Kingdom (Valera et al. 2016), which is why Almeria is often referred to as the "vegetable garden of Europe" (Interview 3/2019, 5/2019). Also for Spain, Almeria plays an important role since 25% of all fresh fruits and vegetables exports from Spain are produced in Almeria. Lastly, it is also the province with the highest GDP per capita in Andalusia with EUR 20,465 in 2017 (Instituto Nacional de Estadística 2019). The high economic performance of agriculture in Almeria can be traced back to its productivity in terms of land use, being 30 times higher than the EU average (Egea, Torrente, and Aguilar 2018). Ideal climate conditions in greenhouses allow for several cropping seasons per year. Farmers therefore do not depend on subsidies through the EU Common Agricultural Policy, receiving very low direct payments (Interview 4/2019). Lastly, the high socio-economic importance of irrigated agriculture is also reflected in local politics (Interview 3/2019). An interviewee therefore explains that "everybody lives from water, directly or indirectly, and when there is the moment of voting, voting

for municipal, regional or national representatives, the number of votes related to agriculture and water is very important" (Interview 5/2019).

Water supply and demand

Water supply is based on groundwater resources as the largest water resources in the RBD, followed by regulated and non-regulated surface water, and to a much lesser extent, non-conventional resources (see Table 9). The supply of desalinated water is very particular to the Mediterranean Basins compared to the rest of Spain. Five desalination plants are in operation, three of which are Almeria, and two in Malaga; two further plants in Almeria are not operating due to technical reasons; and additional plants are currently planned or under construction (Junta de Andalucía 2015a). Official numbers regarding quantity of desalinated water date back to 2012 (see Table 9), and more recent data is not available (Junta de Andalucía 2019a: 71–72). According to interview data, the amount of desalinated water is more than double as high as official numbers suggest, with an average of 80 hm^3/year of desalinated water produced only in Almeria (Interview 3/2019, 6/2019).

Table 9: Water supply in the Andalusian Mediterranean Basins

	Conventional resources			**Non-conventional resources**		**Water transfers**		**Total**
	Regulated surface water	Non-regulated surface water	Groundwater	Desalination	Reutilization	Import	Export	
hm^3/year	335.9	302.2	401.6	43.8	27.3	43	56	**1,097**

Source: Based on Junta de Andalucía 2015b: 101

Total water demand in the Mediterranean Basins is 1,392.6 hm^3/year (Junta de Andalucía 2015b), and thereby exceeds water supply by 295 hm^3/year. Water demand is unequally distributed across river basins, and over-extraction is relatively higher in Almeria compared to the other provinces. Agriculture accounts for 70% of water use, corresponding to 973.09 hm^3/year (Junta de Andalucía 2015b: 78). Numbers between river basins again vary. In Almería, irrigation represents approx. 85–90% of water demand, with lower numbers in other provinces (Interview 3/2019, 5/2019). In addition to these official numbers, there is high illegal groundwater consumption (Interviews 3/2019, 4/2019, 6/2019). While the RBMP acknowledges that "irregular

uses [are] very numerous in wide sectors of the River Basin District", official numbers are lacking (Junta de Andalucía 2015a).

Water demand for irrigation in Almeria is almost exclusively based on groundwater, and at a lower rate on non-conventional resources, with two of the three operating desalination plants in Almeria being used for irrigation (Junta de Andalucía 2015a). Although technical capacities of existing plants are higher, desalinated water remains "largely underutilized" due to its high price compared to other water resources, and "instead, groundwater is being overexploited" (Junta de Andalucía 2015a). In Malaga, water demand for irrigation is based on regulated and non-regulated surface water; the two above-mentioned desalination plants are used exclusively for urban water supply (Junta de Andalucía 2015a). In Sierra Nevada, irrigation is based on non-regulated surface water (Interview 12/2019).

6.1.2 Characteristics of heterogeneous actors

Most important governmental actors in the context of the case study focus are first the Directorate-General (DG) Planning and Water Resources (hereafter: DG Planning), belonging to the Regional Department of Agriculture, Livestock, Fishery and Sustainable Development (hereafter: Regional Department).[2] DG Planning is the competent authority for WFD implementation in all three intra-regional river basin districts of Andalusia, namely Andalusian Mediterranean Basins, Tinto-Odiel y Piedras and Guadalete y Barbate. Further, DG Agricultural and Livestock Production (hereafter: DG Agricultural Production) oversees implementing irrigation efficiency measures; and DG Water Infrastructure is in charge of larger water infrastructure, such as the management of dams. Thus, water-related competencies are distributed across different DGs within the Regional Department and organized along administrative boundaries instead of boundaries of the river basin.

Financial and human resources of actors

The first group of actors are governmental actors under the Regional Department, most notably DG Planning and DG Agricultural Production. On the one hand, actors are described as very well qualified (Interview 7/2019, 8/2019). Nonetheless, interview partners observe major lack of financial and human resources of these DGs (Interview 2/2019, 4/2019). Also the Regional Department highlights in an evaluation report that the "Andalusian water administration lacks the necessary structure and means to adequately carry out its work" (Junta de Andalucía 2020a). The Regional Department therefore outsourced tasks related to river basin planning to private

2 The Regional Department combines the formerly two separated Departments of Agriculture, Fishery and Rural Development and the Department of Environment and Territorial Planning.

companies (Interview 7/2018, 4/2019). Reasons for lacking resources are first the financial crisis by which Andalusia was severely hit, with a decline of GDP by 10% from 2008 to 2013, compared to a decline of 8.6% in Spain in general. New positions in the Andalusian administration were therefore not advertised, and vacancies remained unfilled (Interview 7/2018). Although the economy is slowly recovering, the effects on administration and the public sector are still lasting.

In addition, there have been several institutional changes within the Andalusian water administration in the last decades that have had negative impacts on its financial and human resources. Formerly, the Mediterranean Basins was managed as inter-regional RBD *Cuencas del Sur* (Southern Basins) by the *Confederación Hidrográfica del Sur* under the competency of the National Ministry of Environment. In 2005, after long negotiations between the central and regional government, competencies to manage the RBD were transferred to the regional government. In this context, the Andalusian Water Agency (*Agencia Andaluza del Agua)* was founded to govern three Andalusian intra-regional RBDs. Furthermore, in 2009, exclusive competencies over the Guadalquivir were transferred from the national level to Andalusia. However, only two years later, the constitutional court annulled the decision and responsibilities fall back to the central government (Thiel 2014b) (see Chapter 4). Consequently, the budget of the Andalusian water administration substantially decreased (Cabello, Kovacic, and Van Cauwenbergh 2018). Furthermore, it triggered administrative restructurings, eventually leading to the dissolution of the Andalusian Water Agency. The Andalusian water administration was thus integrated into today's Regional Department of Agriculture, Livestock, Fishery and Sustainable Development, which has been renamed and restructured twice in the meantime (Law 1/2011). Due to these reforms, the Andalusian water administration arguably has lower institutional capacities than other *Confederaciones Hidrográficas* (Hernández-Mora and De Stefano 2013).

A second important group of actors are Water User Associations (WUAs), which have different organizational backgrounds and thus also financial resources. In the Sierra Nevada, water users are mostly organized in so-called traditional WUAs, using unregulated surface water. They do not rely on water from larger irrigation infrastructure and therefore operate quite independently of the water administration. They are described as having relatively few financial and human resources and are not represented by any type of political interest group (Interview 7/2019). In Almeria, WUAs have only recently been established, which is why they are said to have lower degree of organization than WUAs in other RBDs where they have existed for many decades or even centuries (Hernández-Mora and De Stefano 2013). Since they are relying mostly on groundwater, they also manage and use water resources relatively independent from the water administration (Interview 6/2019). Third, WUAs in Malaga use regulated surface water, and therefore depend on large-scale irriga-

tion infrastructure and distribution of water resources through the water administration. Yet, their financial resources are also limited (Interview 12/2019).

WUAs are organized at higher level in political interest groups. At the provincial level, there is most importantly the Federation of Irrigators of Almeria (*Federación de Regantes de Almería,* FERAL). At the regional level, several WUAs are also formal members in umbrella organizations, such as FERAGUA or AREDA (see Chapter 4). However, de facto, these organizations play a minor role in river basin planning of the Mediterranean Basins. Since many water users in the Mediterranean Basins are small-scale farmers, there genuine interests are not represented in lobbying activities of FERAGUA, for instance (Interview 7/2019, 13/2019). Yet, there is no other umbrella organization representing water users at the RBD level. In addition, there are agricultural organizations also representing interests of water users, such as the Union of Farmers and Ranchers of Andalusia *(Unión de Agricultores y Ganaderos de Andalucía*, COAG), or the Andalusian Union of Small Farmers and Cattle Breeders (*Unión de Pequeños Agricultores y Ganaderos de Andalucía,* UPA). However, these organisations have relatively few financial and human resources allocated at the provincial level, and their respective personnel are responsible for all issues related to agriculture, not just river basin management or irrigation (Interview 11/2019).

The third group of actors are environmental non-governmental organizations (ENGOs) and civil society associations, such as Ecologists in Action Almeria (*Ecologistas en Acción Almeria*) or the Mediterranean Ecologist Group *(Grupo ecologista mediterránea*), as well as the Foundation New Water Culture (*Fundación Nueva Cultura del Agua,* FNCA). These groups are engaged at provincial, local or sub-basin level (Interview 3/2019), but do not cover the entire Mediterranean Basins with their work. I see this as indicator for limited financial and human resources.

Narratives on water management

Regional and local administrative actors follow several narratives, namely *supply-* and *demand-side management*, as well as *knowledge and governance narrative*. More specifically, they consider increasing the supply of non-conventional water resources, i.e., desalinated and treated wastewater, as most important measure in the context of the RBMP (*supply-side narrative)*. However, these actors stress the importance of combining the supply of non-conventional water resources with stricter controls of water use; as well as with changes in water rights, aiming to ensure that freshwater resources are replaced by non-conventional resources (*knowledge and governance narrative*) (Interview 2/2019, 5/2019). Additionally, in line with the *demand-side narrative*, irrigation efficiency shall be increased in areas where it is still low. However, this measure shall not be applied to irrigators in Sierra Nevada, using traditional irrigation systems. Traditional irrigation systems are characterized by high return flows and thus can maintain local ecosystems, which is why irrigation efficiency measures are not seen as solution (Interview 2/2019).

Second, WUAs and agricultural organizations follow the *supply-side narrative* arguing that increasing demands shall be addressed by increasing water supply through new infrastructure and technologies (Cabello, Kovacic, and Van Cauwenbergh 2018). Indeed, in relation to the RBMP, an agricultural representative explains that "what mainly interests us […] is infrastructure" (Interview 13/2019). More specifically, interviewees stressed the need to expand desalination plants for seawater and brackish water (Interview 9/2019, 10/2019), as well as water transfers from Granada (Interview 10/2019) and sewage treatment plant with tertiary treatments (Interview 13/2019). According to interview data, agricultural actors, especially in Almeria, acknowledge the need to stop overexploitation of aquifers (Interview 9/2019, 13/2019, 21/2018). In this context, an interviewee argues that irrigators "want to give back to the environment what they have borrowed […] so that aquifers return to their original state, that they recover" (Interview 9/2019). Replacing groundwater by non-conventional resources is therefore deemed crucial (Interview 9/2019). The *demand-side narrative* is only relevant in Malaga, where WUAs see irrigation efficiency measures of high importance (Interview 4/2019, 12/2019). In contrast, in Almeria, irrigators already use drip irrigation for several decades and in Sierra Nevada, irrigators aim to maintain traditional irrigation systems to support local ecosystems that depend on high return flows (Interview 15/2018, 7/2019).

Third, there are ENGOs and civil society representatives, which I classify as following *supply-side* and *knowledge and governance narratives*. Interviewees argue to increase the use of non-conventional resources on the condition that water demand remains stable (Interview 21/2018). Furthermore, interviewees propose governance-related measures such as introducing fees for groundwater use (Interview 4/2019); introducing changes to the CAP, e.g., by incentivizing rainfed irrigation and strengthening agriculture and livestock farming in the context of climate change; increasing monitoring of groundwater use and closing illegal wells; and lastly, decreasing agricultural production (Interview 7/2019).

6.2 Analysing and evaluating Action Situations

This section analyses and evaluates interaction of actors within five Action Situations, namely Development of the RBMP, Management Committee (equivalent to the Action Situation Dam Release Commission in the other two case studies), Increasing Irrigation Efficiency, Demand and Supply of Desalinated Water, and Reducing Water Rights (for the description and selection of Action Situations, see Chapter 3). Action Situations are structured similarly as in the other two empirical chapters: First, I characterize independent variables which are specific to the respective Action Situation (*overarching rules*, *social problem characteristics*). For variables identical to the other two case studies, I only summarize them and refer

to the Guadalquivir and/or Jucar chapter. Second, I outline patterns of interactions (i.e., *cooperation, competition, hierarchy,* and *hybrids;* as well as *information exchange, conflict,* and *gap in interaction*) that emerged within the respective Action Situation and trace them back to formal and informal rules. Third, I conclude each section by assessing performance at the level of the respective Action Situation (*process performance*, *intermediate output performance*).

6.2.1 Development of the River Basin Management Plan

The Action Situation Development of the RBMP concerns the planning phase, from compiling measures to participatory processes and the final approval of the plan. It is an iterative process consisting of informal bilateral exchange with public, private, and civil society actors; organization of public events and workshops for each of the four provinces to present the Draft Scheme of Important Issues and the draft RBMP, respectively; and phases of written consultation (Junta de Andalucía 2015c).

I observe two patterns of interaction in this Action Situation. The first pattern is a *hybrid* composed of *hierarchy* and *competition* between the water and agricultural administration, WUAs, and ENGOs and civil society; and based on formal and informal rules. The second pattern of interaction consists of *cooperation* among WUAs and agricultural actors that emerged outside of the official planning process, following informal rules.

Independent variables specific to the Action Situation

Overarching rules specific to this Action Situation are defined by the 2001 National Water Act, the WFD and the 2010 Andalusian Water Law. While the National Water Act sets the overarching legal framework which is applicable also to intra-regional RBDs, the Andalusian Water Law regulates its more concrete implementation. Thereby, it sometimes also goes beyond national regulations. *De jure autonomy* of DG Planning, under the Regional Department, which is in charge of the elaboration of the RBMP, is rated as moderate. Active participation by water users and stakeholders needs to be ensured; and the RBMP needs to be coordinated with land-use and environmental policies, as well as policies from any sector that affects water use (Art. 20, Andalusian Water Law (ALW)). Thus, similar to the Guadalquivir and Jucar, although important competencies are granted to DG Planning, its *de jure autonomy* is restricted by intensive needs for coordination. *De jure autonomy* of all other actors that participate in this Action Situation is assessed as low, since actors strongly depend on DG Planning and have no final say in the decision-making process.

Formal rules for coordination are also determined by the Andalusian Water Law, regulating the composition, and functioning of several coordination bodies that are of relevance for the RBMP development. There is first the Andalusian Water Council (*Consejo Andaluz del Agua)*, a consultation and advisory body for the Andalusian

Government, which shall report on the RBMP. Further, the River Basin Water Council of the Mediterranean Basins of Andalusia (*Consejo del Agua de la Demarcación)* is in charge of providing information related to river basin planning, as well as to propose the RBMP to the competent water department, which will then submit it to the Governing Board for its final approval (Decree 477/2015). The Andalusian Water Observatory *(Observatorio del Agua)* is a participatory and consultative organ at the regional level, aiming to generate and distribute water-related data. It is composed of administrative representatives from the regional, provincial, and local level; water users, agricultural organizations, trade unions, neighbourhood organizations, and environmental groups. Last, there is the Commission of Competent Authorities of the intra-regional river basins of Andalusia, an organ composed of administrative representatives from the regional, provincial, and local level. It aims to strengthen cooperation of all administrative actors involved in water governance of the intra-regional river basins in Andalusia (Decree 14/2012).

Social problem characteristics of this Action Situation indicate moderate coordination requirements of DG Planning with other actors. Most social problem characteristics are similar to the Guadalquivir and the Jucar, with some differences standing out. Characteristics that are similar are *frequency,* which is low compared to other Action Situations since the RBMP has to be developed every six years only; low *excludability* since the RBMP represents a public good; and medium *asset specificity* due to the heterogenous target group of the RBMP on the one hand, but the possibility to transfer measures between policies on the other hand, i.e., from the Rural Development Program (RDP) to the RBMP (see Chapters 4 and 5).

I observe differences to the other two case studies concerning *uncertainty* and *scale. Uncertainty* is assessed from different perspectives, and its overall value is medium. Similar to what I argued for the other two case studies, stakeholders are confronted with high *uncertainty* regarding whether their interests will be integrated into the RBMP; and DG Planning is confronted with high *uncertainty* regarding the likelihood of achieving environmental objectives of the WFD. A main difference, however, is that there is low *uncertainty* for DG Planning concerning the question whether governmental actors will implement measures of the RBMP at a later stage. This is because Directorates-General (DGs) in charge of implementation of measures are all operating under the same Regional Department. Thus, I assume that interests represented by different DGs are more alike compared to interests represented at different jurisdictional levels, as in the case of the Guadalquivir and Jucar. The lack of contradicting interests may thus facilitate implementation of measures. Lastly, *scale* refers to the river basin district. Since the Mediterranean Basins is an intra-regional basin and therefore only crosses administrative boundaries at the provincial level – and not regional boundaries – DG Planning must coordinate with less actors.

Pattern of interaction (1): Hybrid of competition and hierarchy

In this Action Situation, I identify a *hybrid* pattern of interaction, composed of *idea-based competition* and *hierarchy*, resulting to a large extent from formal rules (*information, choice, aggregation rules*), but also from informal ones (*choice rule*).

First, *idea-based competition* results from formal rules, according to which stakeholders are first informed about river basin management planning through participatory processes (*information rule*); based on which they then submit written statements (*choice rule*). More specifically, several workshops addressing stakeholders from all sectors were organized in the provinces, where topics of provincial interest were discussed (Interview 2/2019, 4/2019) (*boundary, choice rules)*. Attendances ranged from 17 participants at the first event in Granada, to 106 in Malaga at the second workshop (Junta de Andalucía 2015c: 28–29). Meetings were accessible to all, and the aim of the DG Planning was to have open meetings, "the more open, the better" (*boundary rule)* (Interview 2/2019). Furthermore, there are bilateral, informal meetings with different private and public actors from all sectors (*choice rule)* (Interview 2/2019). Actors on both sides, i.e., participants as well as DG Planning as process organizer, describe these informal and formal meetings as opportunity to provide and receive information (Interview 2/2019, 8/2019). DG Planning thereby sees itself in the role of a "notary", "[taking] note of what society wants in the plan" (*position rule)* (Interview 2/2019).

These workshops and meetings are followed by the submission of written statements by stakeholders to DG Planning (*choice rule)*, through which stakeholders compete among each other for their interests to be integrated in the RBMP (see also Chapters 4 and 5). Public, private and civil-society actors submitted statements on initial documents of the RBMP, the Draft Scheme of Important Issues (13), and the draft RBMP (92) (Junta de Andalucía 2015c: 31 ff.) (*boundary, choice rule*). Furthermore, *idea-based competition* is also observable in bilateral meetings of DG Planning and private and civil society actors, such as WUAs, urban water supply, ENGOs, or civil society representatives (Interview University 7/2019; Junta de Andalucía 2015c) (*choice rule*). The *competitive* character of stakeholders presenting opposing interests – yet without directly interaction among each other – is reflected by the following statement of an administrative representative. According to him, stakeholders are always

> "demanding more for themselves. Any group in front of the administration wants more water, more environmental protection, more of this, more of that. The important thing is that the groups come to understand each other and know that, well, more of everything you cannot get, that you have to come to a line of understanding." (Interview 2/2019)

Based on the different ideas presented by stakeholders, DG Planning decides which measures to integrate into the RBMP, thereby following formal rules (*aggregation rule)*. I characterize this as *hierarchical* pattern of interaction since the decision-mak-

ing power lies with DG Planning. Furthermore, measures of the RDPs which are related to water management are also integrated into the RBMP (Interview 2/2019; Junta de Andalucía 2015c: 40). This can be seen as mere administrative procedure based on clear lines of control and is therefore also classified as *hierarchical* type of interaction.

In addition, it is to mention that several formal coordination instruments are not implemented, such as the Andalusian Water Council, River Basin Water Council, and the Andalusian Water Observatory (see *overarching rules*) (Interview 2/2019, 4/2019). Informal choice rules thus deviate from informal ones. According to the Regional Department, "public participation is indispensable today, and yet we find that practically none of the participation bodies provided for by the Water Law […] are in operation" (Junta de Andalucía 2020a; own translation). An interviewee therefore criticizes that "multidisciplinary debates about water topics don't exist" (Interview 5/2019). The reason arguably is the lack of financial resources by the Regional Department (Interview 4/2019).

Pattern of interaction (2): Cooperation

Outside of the official planning process, I observe *cooperation* among agricultural actors in the province of Almeria, resulting from informal rules. More specifically, in 2017, WUAs, agricultural trade unions, and agronomists founded the so-called Roundtable Water of Almeria (*Mesa del Agua de Almería)* (Interview 4/2019, 13/2019). Actors meet regularly and organize public discussions and meetings with politicians and representatives of media and the Regional Department (*choice rule)* (Interview 5/2019, 9/2019). The reason of this private initiative was major discontent with river basin management. Agricultural actors therefore aimed to unite their interests and strengthen their lobbying activities towards the Regional Department and local administration (Interview 10/2019, 13/2019) (*aggregation, scope rules)*. Indicators for *cooperation* are that actors have agreed on a common goal of lobbying towards an expansion of water transfers and water desalination (Interview 9/2019, 10/2019, 21/2018). Further, they are described as "vindicative group" of relatively homogenous actors (Interview 13/2019). While concrete outputs and impacts of lobbying activities are difficult to identify, the private initiative is described as successful in terms of uniting interests and speaking with a "single voice" in the area (Interview 9/2019). According to an interviewee, regional politicians would perceive the Roundtable to be an "interlocutor in Almeria to solve the water problems in the province" (Interview 9/2019). However, efforts by ENGOs to join the Roundtable or participate in related debates were not successful (Interview 8/2019) (*boundary rule)*.

Performance assessment

Coordinated behaviour at the level of this Action Situation, including both patterns of interaction, is rated as moderate. First, *information exchanged* in relation to the pro-

cess as well as the output of this Action Situation is moderate. While exchange of information between the public administration and non-governmental stakeholders is evaluated positively (Interview 10/2019), there is little exchange between environmental representatives and the agricultural sector (Interview 10/2019). Also within the society, a debate on water-related topics does not exist (Interview 4/2019) or is described to be very limited: "The only debate is the lack of water […]. The debate which exists is that water transfers are missing, and that desalinated water should be for free or very cheap" (Interview 5/2019). Likewise, although the Roundtable Water is in touch with local authorities and regional politicians, they are neither in exchange with DG Planning, nor with ENGOs and civil society, i.e., other actors of this Action Situation (Interview 8/2019, 9/2019).

Concerning information provided within the RBMP, as output of this Action Situation, interviewees have different perceptions. While agricultural actors perceive the provision of information in the RBMP as good and easily accessible (Interview 13/2019), an ENGO representative criticizes that data on water status of specific aquifers is difficult to access (Interview 8/2019). Environmental actors therefore repeatedly sought access to this data through other venues, namely the Andalusian Council for Transparency and Data Protection, or the Andalusian Ombudsman (Interview 1/2019, 8/2019).

Second, *consideration of competing interests* is assessed as low. On the one hand, DG Planning is said to be very accessible also for stakeholders of less economic relevance, such as traditional WUAs (Interview 15/2018, 7/2019). However, a DG Planning representative condemns that "in the participatory processes it is very difficult to reach out to normal citizens. […] It is the hyper-motivated, economically, or environmentally motivated citizen who always comes, and goes to all the meetings". According to the interviewee, this would result in an "excessively focused exchange" (Interview 2/2019). He further adds that in terms of representation, "usually, environmental interests are very marginal" in contrast to economic interests which "weigh heavily" (Interview 2/2019). In addition, due to the non-implementation of almost all formal participatory bodies, possibilities for different actors to raise their voice is restricted.

Last, *alignment of incentives* refers to whether governmental actors are incentivized to implement measures at a later stage and is rated as high. The main reason is that actors in charge of planning and implementation of measures are operating within the same Regional Department. I therefore argue that interests of these administrative actors should be relatively coherent, creating incentives to also implement measures. Furthermore, the political will from the higher level is identical for all actors in charge of implementation. Last, measures to increase irrigation efficiency are "copied" from the RDP to the RBMP, meaning that they will be implemented also independently of the RBMP; and similar to the other two cases,

evaluation reports by the European Commission on the WFD implementation in the RBD may operate as external incentive to implement RBMP measures.

Intermediate output performance of this Action Situation relates to *RBMP effectiveness* and is rated as low, meaning that the RBMP is evaluated to be marginally effective. More specifically, I analyse whether actors in charge of i) implementation, ii) financing, and iii) actors affected by the respective measures are specified, all three in relation to measures on I) irrigation efficiency, II) reduction of water rights and III) managing the use of desalinated water (see Chapter 2). Regarding I) measures to increase irrigation efficiency, all three criteria are defined. First, a budget of EUR 49,731,000 is assigned to "modernization measures" corresponding to approx. 5% of the overall budget of the RBMP (Junta de Andalucía 2015a). Regional and national administrations are in charge of implementation, and actors affected by these measures are broadly defined, namely by mentioning different zones of the RBD. However, public benefit of the measure in terms of amount of water savings is not mentioned. Thus, the critique by the European Commission (2015b) (see also Chapter 4) that the contribution of irrigation efficiency measures to achieve WFD's environmental objectives is not explained also applies to the RBMP of the Mediterranean Basins.

Concerning II) desalinated water, several measures on the construction of new desalination plants are included in the RBMP and spelled out in relation to the three criteria mentioned above. However, measures on the management of using desalinated water, i.e., how water users can be incentivized to change from groundwater to more costly desalinated water, are not included.

In relation to III) measures on the reduction of water rights, two of the mentioned criteria are fulfilled, but only very broadly. The RBMP does not mention the reduction of water rights as stand-alone measures, but they are included under "Management measures for the establishment of ecological flow rates (studies, adaptation of networks, water rights regime, etc.)" (Junta de Andalucía 2015a, own translation). The Regional Government is responsible for implementation, and a budget of EUR 30,000 until 2021 is assigned for this overarching measure (Junta de Andalucía 2015a). Yet, by using the broad term of "water rights regime", implications of the measure remain unclear. Addressees of the measure are thus not defined, and the interconnection between increasing irrigation efficiency and the need to reduce water rights to avoid a rebound effect is not discussed; similarly, the need to change type of water rights from groundwater to desalinated water is not mentioned either (Junta de Andalucía 2015a). Thus, for similar reasons which were discussed in relation to the Guadalquivir (see Chapter 4), I assess the RBMP as marginally effective: Due to the high importance of reducing water rights after increasing irrigation efficiency (Grafton et al. 2018), as well as adapting the water rights regime to the use of desalinated water, it is unlikely that infrastructure measures alone will lead to a reduction of agricultural water consumption.

6.2.2 Management Committees

This Action Situation is about decision-making in the Management Committees, which are equivalent to Dam Release Commissions in the Guadalquivir and Jucar, even though functioning slightly differently. Indeed, it is not only about the allocation of regulated surface water, but also about coordinating exploitation of groundwater. I identify *information exchange* as dominant pattern of interaction. This results from the use of informal rules as well as associated non-compliance of formal rules.

Independent variables specific to the Action Situation

In relation to *overarching rules*, it is to first mention *formal rules for coordination* which in this Action Situation regulate the Management Committee. The main function of Management Committees is to coordinate exploitation of hydraulic works, i.e., the allocation of regulated surface water; but also of any other type of water resource, which is different to the previous two case studies. According to formal rules, the participatory organ shall propose a regime for filling and releasing water from reservoirs, as well as a regime for groundwater exploitation to DG Planning and DG Water Infrastructure. Existing water rights thereby need to be considered (Decree 477/2015). Committee members are representatives of the Regional Department and local administrations, water users (agriculture, urban water supply, tourism, industry, and hydroelectricity), trade unions, and environmental organizations (Junta de Andalucía 2019b). Committees are headed by a representative of the respective Territorial Delegations.

De jure autonomy of all involved actors, i.e., DG Water Infrastructure and members of the Committee, is moderate. On the one hand, they are involved in decision-making on the allocation of water use at the provincial level; but on the other, they need to coordinate among each other and thereby restrict each other's *de jure autonomy*.

Social problem characteristics imply moderate needs for coordination of the Territorial Delegations with Committee members. There are some similarities of social problem characteristics with the Guadalquivir and Jucar. These relate to *frequency*, which is medium with two meetings per year; and medium *asset specificity* since decisions of previous year are often the basis for upcoming years. Differences to the two previous case studies concern *excludability*, *scale*, and *uncertainty*. *Excludability* is medium: while it is possible to exclude water users from using additional surface water, this is not the case for groundwater. *Scale* at which decision-making is organized relates to administrative boundaries, i.e., provinces and counties. There are thus four independent Committees, namely Malaga, Granada, Almeria, and Campo de Gibraltar, including several hydrological subsystems. This administrative structure may reduce coordination requirements across administrative boundaries. Nonetheless, coordinating needs across different types of water usages may

be higher since the river basin unit is not maintained. Lastly, *uncertainty* from the perspective of the respective Territorial Delegations as head of the Committee is medium. Although surface water users can hardly deviate from decisions taken in the Committee, this is not the case for groundwater users. From the perspective of WUAs, *uncertainty* is high since Committees are not operating consistent to formal rules, as will be explained below.

Pattern of interaction: Information exchange

The pattern of interaction consists of *information exchange* between the Territorial Delegation on the one hand, and public and private stakeholders on the other. It results from differences between formal and informal rules. As explained above, Committee members shall decide on the allocation of regulated surface water and the exploitation of groundwater. However, Committees were not constituted until April and May 2020 (Junta de Andalucía 2020c), with a delay of approx. five years. In the meantime, informal meetings had taken place twice a year with same participants that are also official members (Interview 11/2019, 12/2019) (*boundary rule*). These informal meetings are described as being merely informative (Interview 11/2019, 12/2019). More specifically, the Territorial Delegation informed about availability of water resources and dam levels, as well as the distribution of regulated surface water and the exploitation of groundwater (Interview 11/2019, 12/2019, 13/2019) (*information rules*). This was followed by topics raised by participants, such as establishing and legalizing WUAs, improving use of treated wastewater, or water price (Interview 12/2019, 13/2019) (*position, information, and choice rules*). However, stakeholders did not have the possibility to voice their interests regarding water allocation to the Territorial Delegation, either during the meeting or at informal venues.

Performance assessment

Coordinated behaviour for this Action Situation is rated as low. First, *exchange of information* is low. On the one hand, WUAs are informed by the respective Territorial Delegations about availabilities of water resources and their allocation in informal meetings (Interview 12/2019). Nevertheless, since Committees have been founded only recently, it is not possible to trace back official information, neither about the process nor about the output. Indeed, minutes are only available until 2015.[3]

Second, *consideration of competing interests* is low. Although the formal composition of the Committees is very inclusive (see *formal rules for coordination*) – in particular in contrast to the composition of Dam Release Commissions in inter-regional river basins – there is no evidence that any stakeholder is consulted in advance of, or involved in actual decision-making.

3 https://bit.ly/3qUsnCm (accessed 7.01.2020)

Lastly, *alignment of incentives* is moderate. Decisions on water allocation of surface water are usually accepted by water users – even though they are not taken by the Committees – and water users usually agree on the need to reduce water allocation in periods of water shortages (Interview 12/2019). There is no evidence that these informal Committee meetings play any role concerning the distribution of groundwater (see Interview 9/2019, 10/2019).

The second aspect of performance assessment refers to *water distribution adapted*, understood as the extent to which surface and groundwater distribution has been adapted compared to what is needed to meet ecological flow requirements, as well as healthy groundwater. The assessment is not possible, though, due to lack of data on these informal meetings. Although interviewees explain that surface water allocations have been reduced in periods of water shortages (Interview 2/2019, 12/2019), there is no information about groundwater allocation. In addition, interview data cannot be triangulated due to lack of minutes.

6.2.3 Increasing irrigation efficiency

The Action Situation Increasing Irrigation Efficiency is about the implementation of measures included in the RBMP to substitute gravity irrigation by local drip irrigation, as well as canals and acequias by pipes. It only refers to Malaga, which is why its scope is limited compared to the other Action Situations. This is because irrigation efficiency measures are not of empirical relevance in the other areas: Almeria already has the highest irrigation efficiency rate in Spain (Luis Caparrós-Martínez et al. 2020); and in Sierra Nevada, irrigators prefer to maintain their traditional irrigation systems (Interview 2/2019, 7/2019). Indeed, the RBMP only includes irrigation efficiency measures covering 19,063 ha, compared to 50,712 ha in the period between 2007 and 2014 (Junta de Andalucía 2015a). Also the relative budget of irrigation efficiency measures of 5% is low compared to the other two case studies. In the Action Situation, *incentive-based hierarchy* between WUAs and the Regional Department emerges, shaped by formal rules.

Independent variables specific to the Action Situation

Overarching rules include first *de jure autonomy*, which is defined by the RDP Andalusia and the European Agricultural Fund for Rural Development (EAFRD) and is therefore similar to the Guadalquivir. Thus, as in the Guadalquivir, the Regional Department through the DG Agricultural and Livestock Production is in charge of implementing irrigation efficiency measures of the region's general interest, including managing respective subsidies. Administrative proceedings are carried out by the respective Territorial Delegations at the provincial level. In contrast, measures that are in the State's general interest are managed by the National Ministry of Agriculture who outsourced its tasks to the State Society for Agricultural Infrastructure (*So-*

ciedad Estatal de Infraestructura Agraria S.A., SEIASA). *De jure autonomy* of these actors is restricted by requirements for the funding of measures stipulated by the EAFRD and the RDP, such as the existence of water meters and wate rights (see Chapter 4).

Second, *formal rules for coordination* are also identical to the Guadalquivir: contracts between the respective implementing authorities and WUAs regulate coordination between actors; and DG Agricultural Production and DG Planning must exchange information on whether EAFRD requirements are fulfilled. In contrast to the Guadalquivir, coordination with an external actor outside of the Regional Department, such as the CHG, is thus not required.

Social problem characteristics indicate a moderate to high need for coordination of involved actors. They are mostly identical to the Guadalquivir and Jucar: *asset specificity* and *excludability* are both high since investments are unique to the respective WUAs and other users can be easily excluded. Further, WUAs are confronted with high *uncertainty* due to delays in implementation; while for public authorities, it is low since WUAs usually do not change their behaviour after applying for subsidies. *Scale* relates to the respective WUAs. The only difference to the other two case studies is that *frequency* from the authorities' perspective is only moderate in the Mediterranean Basins due to the restricted scope of irrigation efficiency measures. There are therefore far fewer actors applying for subsidies compared to the other case studies.

Pattern of interaction: Incentive-based hierarchy

The dominant pattern of interaction in this Action Situation is *incentive-based hierarchy* between the Regional Department or SEIASA as superior actor; and individual WUAs as inferior one. This pattern is shaped by formal rules (*choice*, *scope,* and *payoff rule*). The pattern of interaction is to a large extent similar to the respective Action Situation in the Guadalquivir, where formal rules as stipulated in the EAFRD and RDP of Andalusia also play an important role (see Chapter 4). I thus only summarize main characteristics.

Incentives for WUAs are defined by the RDP: subsidies usually cover 50% of investment costs, while the remaining part needs to be paid by WUAs (Junta de Andalucía 2020b). Additionally, WUAs can apply for loans with duration of 30 to 40 years (*payoff rules)* (Interview 2/2019).

The *hierarchical* element is reflected by formal requirements by the EAFRD, as well as the RDP of Andalusia, putting the authorities in a superior position vis-à-vis WUAs. Most of irrigation efficiency measures included in the RBMP are under the competency of the Regional Department (Junta de Andalucía 2015a), which is why projects managed by SEIASA are of less empirical relevance in the Mediterranean Basins. Thus, WUAs apply for subsidies to the respective Territorial Delegations, who need to verify whether EAFRD and RDP requirements are met, and therefore exchange information with DG Planning (*choice rule*). Requirements are, inter alia, the existence of water meters, or an ex-ante assessment at water savings at the farm

level (*scope rule)* (Art. 46, EAFRD). If conditions are fulfilled and DG Planning confirms, subsidies are granted to the respective WUAs who carry out the implementation (*choice rule*) (see Chapter 4).

Performance assessment

Coordinated behaviour of this Action Situation is assessed as low. *Information exchanged* again relates to the process as such, as well as to information provided about the output. Regarding information about the process, a WUA representative criticizes that construction works were delayed and stopped, and that DG Agricultural Production did not provide information about whether works will be continued or not for almost a decade (Interview 12/2019). Regarding information about the output, and as also explained for the other two case studies, there is no data about water consumption patterns before and after increasing irrigation efficiency (European Commission 2015b) (see Chapter 4). According to interview data, calculations are based on outdated 2008 irrigated surface area data, leading an interviewee to state that "data of [river basin management] planning are quite ridiculous and grotesques" (Interview 5/2019).

Alignment of incentives also relates to two levels, namely WUAs and governmental actors and is assessed as moderate. Concerning WUAs, it refers to the question whether they are incentivized to reduce water consumption after increasing irrigation efficiency, as stipulated in the RBMP. While main reasons for farmers to increase irrigation efficiency usually are to improve working conditions and reduce labour costs (Interview 3/2019) (see Chapter 4 and 5), they also seem to acknowledge the need of saving water (Interview 12/2019). Concerning governmental actors, there is no evidence that EAFRD requirements were not fulfilled, i.e., that DG Agricultural Production had incentives to not follow higher-level rules.

Lastly, *consideration of competing interests* is low. This is because there is no external actor that represents environmental interests; and there is no evidence that Environmental Impact Assessments are carried out. This adds up to the observation that the RBMP does not mention any risk associated with increasing irrigation efficiency. Further, interviewees reported that Regional Department's representatives as well as infrastructure companies exerted pressure on WUAs to apply for subsidies (Interview 15/2018, 7/2019) (*choice rule*).

Status of implementation of measures is low. A large share of respective measures planned for the period 2015–2021 had not started in 2019 (see Junta de Andalucía 2020d). An interviewee even explains that "more than half of the infrastructure" measures related to irrigation of the first RBMP has not been implemented in 2019 (Interview 13/2019). Also delays in providing subsidies for irrigation efficiency measures are criticized (Interview 9/2019).

6.2.4 Demand and supply of desalinated water

The Action Situation Demand and Supply of desalinated water is about the provision of desalinated water to WUAs based on seawater and brackish water. The Action Situation thus concerns the exploitation of already existing desalination plants but does not include the building of new plants. Empirically, the Action Situation only concerns Almeria, where due to lack of surface water and restricted availabilities and low quality of groundwater, water users also rely on non-conventional water resources. First desalination plants in Almeria were built in the 2000s under the framework of the national AGUA programme (Royal Decree 2/2004). They were publicly financed by the national government and the EU through the European Regional Development Fund as well as the Cohesion Fund (García-Rubio and Guardiola 2017). Currently, there are two operating, state-owned desalination plants for irrigation purposes in the Mediterranean Basins, both in Almeria. Furthermore, the RBMP includes the building of new desalination plants for irrigation purposes, as well as fixing the two existing plants which are not yet operating (Junta de Andalucía 2015a). The overall aim of desalination is to substitute freshwater resources, especially groundwater, with desalinated water and thereby contribute to achieving environmental objectives of the WFD (Junta de Andalucía 2015a). In the following, I only focus on the exploitation of state-owned desalination plants.

I identify a *hybrid* pattern of interaction. It is composed of *hierarchy* determined by formal *choice* and *aggregation* rules; as well as *price-based competition* shaped by formal *payoff rules*.

Independent variables specific to the Action Situation

Overarching rules relate first to *de jure autonomy,* regulated in the National Water Law. It stipulates that the Ministry for the Ecological Transition (MITECO) or state-owned companies are in charge of exploiting desalination plants that are in the State's general interest. Further, MITECO must set minimum and maximum prices of desalinated water, which need to include amortization costs of the infrastructure (Art. 13(5), Water Law). MITECO hence has high *de jure autonomy* in relation to the management of desalination plants. *De jure autonomy* of state-owned companies depends on the respective contract under which it is commissioned to carry out the exploitation. In general, though, their *de jure autonomy* is only moderate. This is because although they are authorized by MITECO to carry out respective tasks, they strongly depend on it (see Art. 123, Water Law). To use desalinated water, WUAs need to close contracts with the actor in charge of the respective desalination plant. The Andalusian Water Law also regulates the management of desalination plants which are in the region's general interest, but there are none in the case study region.

Social problem characteristics indicate a moderate need for coordination between WUAs and the respective authority in charge of the desalination plant; represented in this case study by the state-owned company *Aguas de las Cuencas Mediterráneas, S.M.E.,S.A.* (acuaMed). First, there is high *uncertainty* from the perspective of WUAs due to high costs of desalinated water compared to other water resources. WUAs are therefore confronted with considerable risk as to whether investments will pay off in the long term. Desalinated water is therefore usually used for high-return crops from greenhouses such as tomato and pepper. From the perspective of acuaMed, *uncertainty* is moderate since contracts with WUAs guarantee the purchasing of desalinated water for a fixed time. On the other hand, though, problems of storage capacities of desalinated water may make it difficult to manage fluctuations in production and consumption of desalinated water. *Asset specificity* is moderate since desalinated water produced within a specific desalination plant can be used by several WUAs. Investments by public actors in desalination plants are therefore not unique to one WUA. *Scale* refers to the local level, where desalination plants are operating. However, national actors are involved in their management. *Excludability* is high since users can easily be excluded due to the requirement of specific infrastructure, i.e., canals and pipes, that transfer water from desalination plants to the respective WUAs.

Pattern of interaction: Hybrid of hierarchy and competition

In this Action Situation, I identify a *hybrid* pattern of interaction, which manifests itself in different contracts between WUAs and the state-owned company acuaMed on maintenance and operation of desalination plants. The contract includes elements of *hierarchy* based on formal choice and aggregation rules; and *price-based competition*, following formal and informal payoff rules.

On the one hand, contracts between WUAs and acuaMed contain *hierarchical* elements since their formal rules (*choice, aggregation rules*) put the latter in a superior position vis-à-vis the former. As explained above, acuaMed is commissioned by MITECO to plan, build and manage desalination plants. The *hierarchical* element of the contract consists in the fact that WUAs commit themselves to purchase desalinated water for several years at a fixed price (*choice, payoff rule*), and hence enter a dependency relationship with acuaMed. Thus, once desalination plants are built, WUAs and acuaMed form contracts which set conditions and responsibilities for operation and maintenance, as well as tariffs for the use of desalinated water. Each contract has different provisions, depending on the respective desalination plant, required infrastructure, amount of water to be supplied, etc.

The desalination plant *Carboneras* exemplifies the *hierarchical* relationship. The WUA *Sociedad Espartos de Agua* undertakes to purchase desalinated water in a quantity of 1hm^3/year at a tariff of 0.55€/m^3 for five years (*choice, payoff rules*). In addition, the parties agree that if labour or energy costs increase, water price will be

adjusted unilaterally by acuaMed (*payoff, aggregation rule*); and the WUA must communicate consumptions regimes for one year in advance (*information rule)*, as well as pay guarantees equal to water supplied for three months (*choice rule)* (see AcuaMed 2015). Empirical evidence from the Murcia region even shows that contracts between acuaMed and WUAs sometimes stipulate that WUAs have to pay for desalinated water whether or not they consume it; or that WUAs have to pay higher relative water prices (i.e., price per cubic meter) in subsequent months if they consume less than contractually agreed upon (*payoff rule)* (Ricart et al. 2020). I argue that particularly *choice* and *aggregation rules* (i.e., that water users must consume certain amounts of desalinated water; and that prices are adapted by acuaMed) put WUAs in an inferior position vis-à-vis acuaMed. Furthermore, acuaMed is commissioned by the State and is the only company in charge of desalination plants included in the RBMP. It therefore has the position of a monopoly, which in turn increases dependency of WUAs on acuaMed. I see this as further *hierarchical* element.

Hierarchy is overlapping with *price-based competition* in a (distorted) market, following formal and informal *payoff rules*. According to these rules, prices are decisive factors whether WUAs and acuaMed enter a contractually regulated exchange relationship. Indicators for *competition* are thus mutual interdependence of involved actors and steering of their behaviour by prices. On the one hand, lack of and low quality of groundwater forces WUAs to purchase desalinated water. On the other hand, since exploitation of desalination plants is below their technical capacity (Junta de Andalucía 2020d), acuaMed needs to set a price on which WUAs agree (*payoff, choice rules)*. Indeed, low exploitation levels are due to a "resistance of potential users […] due to the higher cost [of desalinated water] than other sources of water supply" (Junta de Andalucía 2020d; own translation). Interviewees confirm that the price of desalinated water, as regulated in the contract, is seen as most important factor in farmers' decision-making on whether to use desalinated water or not (Interview 4/2019, 5/2019). In contrast, physical constraints of water availability are decisive for farmers' decision-making on groundwater or surface water use. Desalination, therefore, has "fundamentally changed the rules of the game" (Interview 5/2019). Prices for desalinated water in Almeria are approx. 0.60 €/m^3 (Interview 6/2019), while groundwater in Almeria costs around 0.25 €/m^3, and average prices for surface water in all over Andalusia are only 0.09 €/m^3 (Junta de Andalucía 2008). Reasons are high use of energy in the purification process of seawater as well as lower rates of subsidies compared to surface water, which is indirectly subsidized through state-owned large-scale irrigation infrastructure and dams. Nevertheless, also the use of desalinated water is partly subsidized, with EU funds covering part of the amortization costs (Interview 3/2019, 5/2019). To reduce costs, WUAs usually mix desalinated water with low-quality groundwater (Interview 10/2019).

Performance assessment

Coordinated behaviour is assessed as moderate. First, *information exchanged* between authorities and WUAs is rated as high, with WUAs assessing it positively (Interview 9/2019). Second, *competing interests considered* is moderate. Although Environmental Impact Assessments for the building of desalination plants have been carried out as formally required (Fuentes-Bargues 2014), there are no indicators that potential negative impacts of using desalinated water have been debated in the context of the WFD implementation. Most of all, these potential negative impacts relate to high energy consumption of desalination plants combined with high CO_2 emissions; as well as negative effects on marine ecosystems due to brine discharge, i.e., the pumping of remaining water with high salt saturation back into the ocean. The RBMP does not address these topics either (Junta de Andalucía 2015a).

Last, *alignment of incentives* is low due to the high prices of desalinated water compared to groundwater. Indeed, no incentive scheme at the river basin or provincial level has been established to make desalinated water more attractive, e.g., by adjusting costs of groundwater and desalinated water.[4] Usually, WUAs in Almeria only switch to desalinated water once groundwater is not available anymore or its quality is too low (Interview 4/2019).

Status of implementation of measures relates to the use of desalinated water compared to the amount calculated in the RBMP and is assessed as low. According to the Regional Department "little progress has been made in recent years" due to reluctance of WUA to pay higher prices (Junta de Andalucía 2020d: File 3, p.12, own translation). Thus, although water users have access to non-conventional resources, they continue extracting water from overexploited aquifers (Junta de Andalucía 2020d). Indeed, during the 2017 drought – periods when demand for desalinated water usually increases – only 72% of capacity of desalinated water was used (Martínez-Alvarez et al. 2019).

6.2.5 Reduction of water rights

This Action Situation comprises the reduction of water rights after the implementation of irrigation efficiency measures – similar to the two previous case studies; and additionally, changing the type of water resources from the right to use groundwater to the right to use desalinated water. I identify two patterns of interaction. These are a *hybrid*, composed of *hierarchy* based on formal rules (*information, choice rules*); and *idea-based competition* between WUAs and the regional administration, based on

4 Local examples exist, e.g., in the *Poniente Almeriense,* where water users agreed to purchase all water resources at a uniform price, thereby counterbalancing price differences (Interview 9/2019). However, it is of limited scope which is why it is not discussed here.

formal rules (*choice rules*). The second pattern of interaction is a *gap in interaction* due to non-consideration of formal rules.

Independent variables specific to the Action Situation

De jure autonomy, as part of *overarching rules* is regulated by the 2001 National Water Law and the Andalusian Water Law. Regarding the reduction of water rights after increasing irrigation efficiency, *de jure autonomy* of DG Planning is assessed as moderate. The National Water Law stipulates that water rights may be revised after changes in technology have been made (Art. 65, Water Law) (see Chapters 4 and 5). The Andalusian Water Law goes further by indicating that water rights of all water rights holders that have already benefitted from irrigation efficiency measures *will* be revised without being compensated (Art. 45(8), Andalusian Water Law). Furthermore, in future irrigation efficiency projects, the respective subsidy is determined together with corresponding amount of water savings, and once irrigation efficiency measures are completed, DG Planning will reduce water rights (Art. 45(9)). One of the aims of the Andalusian Water Law as stated in its explanatory memorandum even is to establish a legal connection between irrigation efficiency measures and the revision of water rights (Art. IV). Basically, this means that a reduction of water rights shall become legally binding for water users. Thus, there is no leeway provided to DG Planning on whether to reduce water rights or not, which is why its *de jure autonomy* is relatively restricted.

Additionally, the Andalusian Water Law provides that water rights will be reduced if water rights holders do not use the quantity granted for three consecutive years; or for in total five years in a period of ten years (Art. 45(5)). Nonetheless, in contrast to these specifications of the Andalusian Water Law, the RBMP does not include water rights reduction – or "revision" as it is called in the National and Andalusian Water Laws – as measure. The only reference is the measure "water rights regime", aiming to establish an environmental flow regime (Junta de Andalucía 2015a). However, as already mentioned above (see 6.2.1 on performance assessment) it is neither spelled out what it entails, nor is there a link to irrigation efficiency measures.

Regarding desalinated water, DG Planning and respective Territorial Delegations have high *de jure autonomy.* The National Water Law stipulates that resources of desalinated water are part of the water regime and therefore under a public property regime as any other water resource in Spain. Consequently, water users require rights to use desalinated water, which are granted by DG Planning according to the Andalusian Water Law (Art. 8). Although the official aim of building desalination plants is to reduce pressure on groundwater resources (Junta de Andalucía 2020d), there is no legal provision that states that rights to use desalinated water are only granted in exchange for renouncing water rights from conventional resources. Furthermore, measures to reduce groundwater rights for users of desalinated water are not included in the RBMP (Junta de Andalucía 2015a). Nonetheless, the National and

Andalusian Water Law provide the possibility to reduce rights if its purpose can be fulfilled with lower allocation.

Formal rules for coordination are defined by the RDP of Andalusia, and are thus similar to what has been discussed for the Guadalquivir (see Chapter 4). In a nutshell, formal rules stipulate that beneficiaries must inform DG Planning about planned infrastructure projects (Junta de Andalucía 2020b: 364). However, information exchange within the Regional Department is not further specified.

Social problem characteristics are to a large share similar to the other two case studies, and also indicate high need for coordination. *Asset specificity* is high since a decision to reduce water rights is unique to the respective water user; *frequency* is high since many water users are affected by a change in water rights, either due to a reduction after increasing irrigation efficiency, or due to the use of desalinated water; *excludability* is high since water rights are a private good; and *scale* refers to the individual water user. The only difference to the other two case studies is *uncertainty* which is medium. From the perspective of WUAs, it is medium due to inconsistent legal regulations: According to the Andalusian Water Law, the reduction of water rights after increasing irrigation efficiency is legally binding; yet, it has neither been explicitly integrated as measure in the RBMP, nor does the RDP require a reduction of water rights as a condition to receive subsidies or to use desalinated water. From the perspective of the water administration, there is also medium *uncertainty* regarding the behaviour of water users. As already explained in previous chapters, there is a risk of water users litigating the administration after a reduction of water rights (see Chapters 4 and 5). However, due to the legally binding character of this administrative proceeding, at least after increasing irrigation efficiency, I argue that this risk is lower compared to the other two cases, also reducing *uncertainty* for the administration.

Pattern of interaction (1): Hybrid of hierarchy and competition

The pattern of interaction is a *hybrid* of *hierarchy* and *idea-based competition* between WUAs and the administration. However, there is some ambiguity involved in this assessment due to contradicting statements by interviewees, as well as lack of secondary data and lack of details in the RBMP, both hindering data triangulation.

On the one hand, based on statements of some interviewees, interaction between WUAs and the Regional Department can be described as *hierarchic,* following formal *information* and *choice rules*. According to these rules, WUAs are subject to an administrative, hierarchical proceeding carried out by higher levels. More specifically, DG Water Infrastructure informs DG Planning to reduce water rights after irrigation efficiency measures are completed (*information rule)* (Interview 2/2019). Formally, DG Planning takes the decision to reduce water rights, which is then carried out at the local level by the respective Territorial Delegations (*choice rules)* (Interview 6/2019, 11/2019). Similar administrative procedures apply for the use of desalinated

water, where the Territorial Delegation substitutes the right to use groundwater to the right to use desalinated water; as well as for cases where water users have not used the amount of water stipulated in their respective water right for three years (Interview 6/2019) (*choice rule)*.

These *hierarchical* relationships are overlapping with *idea-based competition* between WUAs and the regional administration. As a reaction to the administrative proceeding, irrigators often submit either official claims to the administration (*alegaciones)* or challenge the administrative decision in court (*position and choice rules*) (Interview 2/2019, 6/2019). As explained in previous chapters, there is a "large resistance" of WUAs to lose water rights, even if they do not use them anymore (Interview 2/2019) (see Chapter 4 and 5). According to an interviewee, irrigators often win court cases since the Spanish judiciary perceives water as an "essential resource for development, for prosperity, for jobs" without considering environmental needs (Interview 6/2019). WUAs and the regional administration therefore *compete* for the allocation of water rights in these court proceedings. Since no data on court proceedings is available, it is not possible to go into details regarding the type of interaction.

Pattern of interaction (2): Gap in interaction

On the other hand, other interviewees explain that the reduction of water rights after increasing irrigation efficiency has not been implemented by DG Planning (Interview 4/2019), which would imply a *gap in interaction*. It is difficult to evaluate these contradictory statements since there is no secondary data such as research or press articles on the Mediterranean Basins, which could be used for data triangulation. Nonetheless, the status of implementation (see below) also implies a severe lack of implementation.

Performance assessment

Coordinated behaviour of this Action Situation is low, even though it is again difficult to evaluate due to lack of data. *Information exchanged* can only be assessed in terms of information available about the output, which is low. This is because it remains unclear to which extent water rights have been revised, indicating lack of information. *Competing interests considered* is low, since there are no indications that actors representing environmental interests are part of this Action Situation.

Third, *alignment of incentives* is also low. From the perspective of administrative actors, I argue that incentives to reduce water rights after increasing irrigation efficiency are unaligned due to inconsistencies between the Andalusian Water Law on the one hand, and the RDP and RBMP on the other. Although according to the former, a reduction is legally binding, the latter two do not discuss interlinkages between irrigation efficiency and water rights (Junta de Andalucía 2015a; Junta de Andalucía 2020b). In relation to reducing groundwater rights for users of desalinated

water, incentives are also unaligned due to lack of legally binding requirements. Further, I argue that the unspecific terminology of the measure "water rights regime" does not incentivize Territorial Delegations to enforce a reduction of water rights – without clear targets, actors cannot be held accountable for not implementing certain measures. From the perspective of WUAs, I see the fact that they often challenge administrative decisions in court as indicator for a lack of alignment of incentives. Since WUAs are apparently often given justice, other WUAs also have an incentive to challenge administrative decisions.

As second performance dimension, the *status of implementation of water rights revision* is assessed as low to moderate, even though reliability of this assessment is unclear due to lack of data and unprecise measure description in the RBMP. As explained above, there are contradictory statements to whether water rights were reduced or not. However, concerning rights to use desalinated water, documents of the third planning cycle do acknowledge that there is "resistance of water users to give up their old [groundwater] rights". Instead, they would prefer to "maintain both", rights to use groundwater as well as desalinated water, "which makes it impossible to achieve the initial objective of reducing pressures on groundwater" (Junta de Andalucía 2020d: n.p., own translation). Furthermore, and more generally, it is also stated that "an effort was made" with respect to the revision of water rights aiming to "adapt the use of water to the actual water availability", but that it is still an ongoing process (Junta de Andalucía 2020d: n.p., own translation). However, it remains unclear whether this revision of water rights refers to a reduction due to increased irrigation efficiency; to changes of water resources from groundwater to desalinated water; or to other types of revisions which are included in the Andalusian Water Law.

6.3 Performance across Action Situations

In this section, I assess overall performance at the RBD level and across all Action Situations. This includes *process performance across Action Situations*, followed by *policy output performance* which refers to the overall RBMP implementation, and lastly, *environmental outcome performance*.

Process performance across Action Situations

Coordinated behaviour across Action Situations is rated as low, mostly due to lack of information on the outcome of the governance process, as well as unaligned incentives for water users to reduce their consumption. *Coordinated behaviour* is assessed along the variables *information exchanged* and *alignment of incentives*. The variable *competing interests considered* is not considered here, since it is identical to what has been discussed at the level of individual Action Situations.

Information exchanged across Action Situation, i.e., at the level of the overarching governance process, is moderate. Information exchanged between the different Action Situations is described as positive (Interview 2/2019). Further, there are no indications that actors lack information generated in other Action Situations to accomplish tasks in their respective Action Situations. However, information provided on the outcome of the governance process is low since numbers on water use and its changes rely on estimations instead of measurements (European Commission 2015b) (see Chapters 4 and 5). Indeed, a governmental representative himself criticizes lack of statistics and sound databases and explains: "we do estimations on what they are really using, which is what appears in the plan, and later, we modify this quantity based on the [...] savings that we foresee in irrigation" (Interview 2/2019). Most recent planning documents only include estimations from 2015, which is why changes of estimated water use between the second and the third planning cycles cannot be assessed either (see Junta de Andalucía 2019a: 292).

Alignment of incentives is again assessed from the perspective of WUAs in terms of whether it is rational to reduce own water consumption; and from the perspective of governmental actors to follow higher-level rules. Its overall value is low. From the perspective of WUAs, I identify three instances of low levels of *alignment of incentives*. The first example refers to opposing incentives induced by water prices which has been raised by many interviewees (Interview 21/2018, 4/2019, 10/2019, 12/2019), and is due to different prices for groundwater and desalinated water in Almeria. Although costs for groundwater use compared to surface water are relatively high, this results from high energy costs for pumping of the very deep wells in the region. Actual water fees, e.g., for cost recovery or taxes, have not been implemented (Interview 2/2019). There is therefore an important price difference between the two types of water resources (Interview 4/2019). Water users hence have little incentives to consume the more expansive desalinated water, and efforts to increase availability of non-conventional resources have thus not changed patterns of groundwater use (Junta de Andalucía 2020d). Fees for groundwater use are therefore considered as important mechanism to encourage water users to change the type of water resources (Interview 4/2019). Indeed, also an agricultural representative stresses the important role of prices incentivizing water users to reduce groundwater consumption: "it is not because one has an environmental consciousness, but because of the cost, it's mainly for the cost" (Interview 13/2019). Similarly, scholars argue that an overarching, unified payment scheme for all types of water resources is needed to increase the use of desalinated water in Spain (Cabrera, Estrela, and Lora 2019). Adding on that, also surface water users in Malaga are calling on DG Planning to implement a volumetric water pricing system, and to thereby comply with the WFD and the Andalusian Water Law (see also below). Against this background, irrigators would complain that if there are no financial benefits, "for what do we save water?" (Interview 12/2019).

Second, I argue that the lack of groundwater control as well as lack of reducing water rights present negative incentives for water users to reduce their own consumption – similar to what happens also in the Guadalquivir, and partly the Jucar (see Chapters 4 and 5). Indeed, interviewees report lack of groundwater control in the RBD (Interview 5/2019, 6/2019), which is also officially acknowledged by the Regional Department (see Junta de Andalucía 2020d). In this context, a local government representative explains that water rights management is thwarted by limited control of water use: "This must be accompanied by physical management of the public water domain because what is the point of my disallowance if I do not have land management?" (Interview 5/2019). Concerning insufficient water rights reduction, the argument presented in the other two case studies also holds in the Mediterranean River Basins: Without reducing water rights, there are no incentives for water users to reduce water consumption after increasing irrigation efficiency, in particular because they are often economically forced to compensate amortization and higher maintenance costs (see Chapters 4 and 5).

Third, unaligned incentives for water users also stem from deficiencies in the overarching water governance system. This is first because several regulations by the Andalusian Water Law are not enforced. In many instances, the Andalusian Water Law goes further than the National Water Law, e.g., concerning legal obligations to reduce water rights; water pricing of groundwater and surface water based on extracted volume instead of irrigated surface area; or the integration of environmental representatives in several participatory bodies. Yet, these regulations only remain on paper, and the Regional Department even states that the "Andalusian Water Law has become obsolete, in many cases it is an unnecessary over-regulation" (Junta de Andalucía 2020a, own translation). Further, many measures of the RBMP have not been implemented (see also below), creating frustration among water users: "It is true that there is a lot of discouragement. And we were the ones who were encouraged, now we are discouraged because we do not see anything… we understand one, two, three years, but already ten…" (Interview 12/2019). Stakeholders therefore lost motivation to participate in the planning process (Interview 13/2019), to submit official documents to the draft RBMP (Interview 12/2019), or to review implementation progress (Interview 8/2019). Adding on that, it is to mention that the RBMP of the second planning cycle was cancelled by the Supreme Court in March 2019 due to formal errors of the Andalusian Government.[5] Therefore, in the period between the court ruling and the effective date of the third RBMP, thus for almost three years, the RBMP of the first planning cycle was in force. I argue that the lack of enforcing legally binding norms of the Andalusian Water Law and implementing RBMP measures, as

5 Judgment of 25 March 2019, of the Third Chamber of the Supreme Court (BOE no. 107 of 4 May 2019). Formal error consists in the non-consideration of a report of the Andalusian Council of Local Governments on the RBMP, which was mandatory.

well as legal discrepancies regarding river basin management planning may in the long run reduce water users' trust in the water governance system, and thereby also reduce incentives to follow higher-level rules.

Alignment of incentives for governmental actors is identical to the assessment of the Guadalquivir and the Jucar, and therefore rated as low (see Chapters 4 and 5): Since EAFRD requirements concerning water savings allow for exemptions (European Court of Auditors 2021), and the threat of an infringement proceeding by the European Commission is relatively uncertain due to the long time period until 2027, there are little incentives for actors to follow higher-level rules and enforce a reduction of agricultural water consumption.

Policy output performance

The assessment of the policy output refers to *RBMP implemented*, i.e., to the overall RBMP, which is low. According to the Regional Department, the overall implementation of measures is "slower than would be desirable": out of 21 measures which should be finished by 2021, only 10% have been implemented in 2020, and 23% are in progress (Junta de Andalucía 2020d: File 3, p.20). Further, only 5% of the planned budget for the second planning cycle has been invested in 2019, compared to an average of 14.4% in the other Spanish RBDs (MITECO 2019: 128).

Environmental outcome performance

Environmental outcome performance is low since there is certain evidence that agricultural water use as well as irrigated surface area increased. However, status of water bodies according to the WFD assessment slightly improved.

First, *development of water use* is difficult to assess since numbers included in most recent planning documents are based on 2015, and are therefore identical to those of the second planning cycle (see Junta de Andalucía 2019a: 292). Nonetheless, the Regional Department admits that dynamics of growing demand for agricultural water use "have not stopped" (Junta de Andalucía 2020d: 25; file 6). Furthermore, irregular and uncontrolled water uses exist "to a greater or lesser extent throughout the river basin district", and is a "fairly widespread problem" regarding intensive agriculture in the east (Junta de Andalucía 2020d: File 6, p. 15, own translation). This is also reflected by the *development of irrigated area*. First remote sensing data by the Regional Department suggest that irrigated area has increased by 23,800 ha from 2009 to 2018 (Junta de Andalucía 2020d: n.p.), representing an increase by 14% (see Junta de Andalucía 2014a). Interview data also confirms that in Malaga, there is a "certain tendency [of irrigators] to want to grow" (Interview 2/2019; also: 8/2019).

However, the *development of water status* improved over the last decade (see Table 10). Surface water bodies in a good global status increased from 44% in the first to 61% in the third planning cycle; and groundwater bodies in a good quantitative status from 53% to 64% in the same time period.

Table 10: Status of water bodies in the three WFD planning cycles (Mediterranean Basins)

Category	**Water status**	**Percentage of water bodies**		
		RBMP 2009	**RBMP 2015**	**RBMP 2022 (draft)**
Surface water bodies (global status)	Good	44%	52%	61%
	Worse than good	55%	48%	39%
	Not evaluated	1%	-	-
Groundwater bodies (quantitative status)	Good	53%	64%	64%
	Poor	47%	36%	36%

Source: Based on data from Junta de Andalucía (2014, 2015d, 2019b)

7. Comparative Analysis and Conclusion

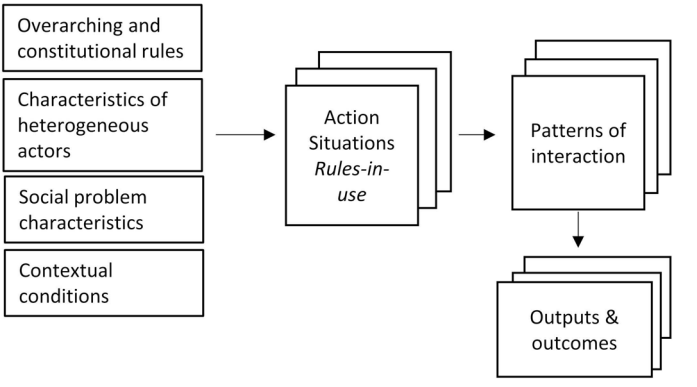
The aim of this study is to understand governance processes and their performance in the context of the implementation of the European Union (EU) Water Framework Directive (WFD) in Spain, focusing on the reduction of agricultural water consumption. Three sub-questions structured my study, namely: i) How do public, private, and civil society actors interact in the development and implementation of policies concerning the reduction of agricultural water consumption? ii) What are the determinants of these different patterns of interaction? And lastly, iii) what are the determinants of process, output, and outcome performance of the three case studies?

In this study, I first developed a theoretical framework that combines literature on policy analysis and public administration with institutional analysis, polycentric governance, and New Institutional Economics (Chapter 2). Figure 9 presents the condensed theoretical framework. The research design of this study is a comparative case study, combining a cross-case analysis of three case studies and a within-case analysis by focusing on identified Action Situations (Chapter 3). In the empirical analysis, I compared governance processes of three Spanish River Basin Districts (RBDs) – namely, the Guadalquivir, Jucar and Mediterranean Basins of Andalusia (hereafter: Mediterranean Basins) – on the coordination of river basin management and irrigated agriculture (Chapter 4, 5 and 6).

This chapter aims to answer the research questions by drawing on the theoretical framework and making use of the comparative case study design. The first question which aims at identifying patterns of interactions will be answered for each individual case, as well as together for the three cases. The other two research questions which involve issues of causality will be answered from a comparative perspective, arguing that causal factors can best be identified through such a comparison, but not so much by analysing individual cases. The chapter proceeds as follows. I first discuss patterns of interaction that emerged in the different Action Situations (Section 7.1), identify causal mechanisms which link independent variables and patterns of interaction (Section 7.2), and discuss how patterns of interaction relate to governance and environmental performance (Section 7.4). The chapter concludes by summarizing main empirical and theoretical conclusions (Section 7.5), discussing

the study's strengths and limitations (Section 7.6), and outlining avenues for further research (Section 7.7).

Figure 9: Summary of theoretical framework



Source: Own illustration

7.1 Characterizing patterns of interaction

In this section, I present findings on patterns of interaction of public, private, and civil society actors in the development and implementation of policies on the reduction of agricultural water consumption, thereby answering the first research question. Patterns of interaction that were used in the empirical analysis were discussed and defined in Chapter 2. To recall, in this study, I focused on three pure forms of coordination, namely *cooperation*, *competition* (including *idea-based* and *price-based competition)*, and *hierarchy* (*authority-based* and *incentive-based hierarchy*); as well as *hybrids* which are understood as process where pure forms of coordination co-exist and overlap. As additional categories of interaction, I analysed *information exchange, conflicts,* and *gaps in interaction*. For the definitions of these patterns of interaction, see Chapter 2, as well as the following paragraphs; and for information on measurement of these variables, see Chapter 3.

In the three case studies, I altogether analysed 13 Action Situations, in which I identified 17 patterns of interaction, out of which there are eight *hybrids*. In all 17 patterns of interaction, including the *hybrids,* I found *hierarchy* (10) as most common form, followed by *competition* (6), *cooperation* (4), *information exchange* (3), *gaps in interaction* (3) and *conflict* (1). Table 11 provides an overview of the identified patterns for each Action Situation in all three case studies. It is important to recall, however,

that these categories necessarily simplify the complexity of different forms of interaction. There may be – and actually are – important differences between the cases as well as between Action Situations even if patterns of interaction are classified identically. Differences in interaction concern, for example, degrees of certain patterns of interaction; or what type of actors are involved.

In the following, I first discuss patterns of interaction across case studies on a more general level, and then turn to individual particularities of the three case studies in relation to these patterns.

Table 11: Overview of patterns of interaction in each Action Situation in the case studies

Action Situation	**Guadalquivir case study**	**Jucar case study**	**Med. Basins case study**
Development of the River Basin Management Plan	Hybrid: Idea-based competition and hierarchy	Hybrid: Cooperation and idea-based competition	(1) Hybrid: Idea-based competition and hierarchy (2) Cooperation (*outside of governance process*)
Dam Release Commission/ Management Committee	Hybrid: Idea-based competition and hierarchy	Hybrid: Cooperation and hierarchy	Information exchange
Increasing Irrigation Efficiency	(1) Incentive-based hierarchy (2) Conflict (*outside of governance process*)	Incentive-based hierarchy	Incentive-based hierarchy
Demand and supply of desalinated water	–	–	Hybrid: Hierarchy and price-based competition

Action Situation	Guadalquivir case study	Jucar case study	Med. Basins case study
Water rights reduction	Information exchange, gap in interaction	(1) Hybrid: Cooperation, hierarchy (2) Information exchange, gap in interaction	(1) Hybrid: Hierarchy, idea-based competition (2) Gap in interaction

Source: Own elaboration. The Action Situation Demand and supply of desalinated water was only analysed in the Mediterranean Basins due to little empirical relevance in the other two cases.

7.1.1 Comparison of patterns of interaction across cases

Hierarchical interaction is observed in most of the Action Situations. *Hierarchy* is defined in this study as process of alignment of activities by a superior actor vis-à-vis an inferior actor, based either on formal and/or informal authority; or on incentives (see Chapter 2). The more classical form of *hierarchy* based on authority has been identified in all three case studies, in altogether seven Action Situations, while *incentive-based hierarchy* only occurred in the Action Situations Increasing Irrigation Efficiency (all cases). In the latter case, the state offers financial incentives to Water User Associations (WUAs), which are then bound to specific hierarchical rules, which will be discussed below.

The different forms of *hierarchy* are of high empirical importance in all three case studies. This is reflected by the facts that there are only two Action Situations where *hierarchy* is fully absent due to the lack of implementation of formal rules (Water Rights Reduction, Guadalquivir; Management Committee, Mediterranean Basins); and only one *hybrid* pattern which does not include *hierarchy* (RBMP Development, Jucar). This prevalence of *hierarchy* on the one hand confirms findings by Héritier and Rhodes (2011) who show that diverse governance modes are adopted in the "shadow of hierarchy". Similarly, in an empirical study on coordination of water governance across many cases worldwide, Lukat et al. (2023) identified a dominance of hierarchical modes of coordination. On the other hand, it is to consider that processes under investigation in this study represent official processes of policy development and implementation where state actors play a crucial role. The importance of hierarchical interaction may be different in other contexts, such as local processes of common pool resource management.

Second, patterns of interaction of *competition* have also been identified in all case studies. Competition is defined in this study as process of alignment of activities based on prices or ideas (see Chapter 2); I thus distinguish between *idea-based* and

price-based competition. While the former occurred in all three case studies, the latter has only been identified once (Demand and supply of desalinated water, Mediterranean Basins). In both forms of *competition,* the state plays a crucial role. Indeed, in *idea-based competition,* it is mostly private and civil society actors who compete among each other for gaining influence in political processes. The respective River Basin Authority (RBA) thereby is in the role of "consuming" different ideas presented by these actors. Since the RBA is the only consumer, it takes the role of monopsonist. A monopsony refers to imperfect market conditions where one consumer controls the entire market.

In *price-based competition,* WUAs take the role of consumers of desalinated water offered by state-owned companies, which hence operate in the role of suppliers (Mediterranean Basins). State actors also set the price of desalinated water, indicating imperfect market conditions once again. Thus, state actors – in the form of state-owned companies – assume the role of monopolists. The possibility for WUAs to choose between different options offered on the market is thereby highly restricted.

Given the important role of the state in both forms of *competition,* it is not surprising that this pattern of interaction is always observed in combination with *hierarchy,* except for one Action Situation (RBMP Development, Jucar). This finding also has some theoretical implications. First, it shows that ideal textbook types of competition arguably do not exist in water governance, which is almost always characterized by a central role of the state. Furthermore, the findings also demonstrate that conceptually as well as empirically, it makes sense to differentiate between the different forms of competition since actors assume different roles depending on the type of competition. Lastly, the high occurrence of *idea-based competition* in the three case studies is also revealing. Scholars in the field of public administration (Bouckaert, Peters, and Verhoest 2010; Meuleman 2008) as well as water governance (Pahl-Wostl 2015) usually use the concept of markets where actors' behaviour is steered by prices and economic incentives. However, the notion of competition used in public choice literature (Hill 2005) as well as polycentric governance literature (Thiel, Blomquist, and Garrick 2019; V. Ostrom, Tiebout, and Warren 1961) seems more comprehensive since it also includes the empirically significant form of competitive behaviour of state as well as non-state actors outside of classical markets.

Third, *cooperation* within the official governance process was identified in three Action Situations in the Jucar, as part of *hybrid* patterns of interaction. Additionally, there is one instance of pure form of *cooperation* among water users in the Mediterranean Basins; yet, it occurs outside of the official process and therefore has a relatively restricted scope. *Cooperation* is understood in this study as process of voluntary alignment of activities of actors to achieve a shared aim (see Chapter 2). The findings show that compared to *hierarchy* and *competition, cooperation* is underrepresented in the Guadalquivir and the Mediterranean Basins. This may be explained by the underlying understanding used in this study that coordination of actors only qualifies

as *cooperation* if actors strive towards the same aim. Especially in the Guadalquivir, but also the Mediterranean Basins, interests across sectors are very diverse, while at the same time there are no external actors trying to unite these often-competing interests.

In addition to these so-called pure forms of coordination – which, however, hardly occurred in their pure forms in the case studies –, this study additionally conceptualized *information exchange*, *gaps in interaction,* and *conflicts* as categories of interactions. More specifically, I identified several instances of *information exchange,* which is understood in this study as one-way or two-way exchange of information among actors (see Chapter 2). It is important to remember, however, that in any other pattern of interaction – except from *gaps in interaction* – actors also exchange information. They do so, for example, through prices, or by passing on information within the administration, thereby following hierarchical procedures. Based on Metcalfe (1994), I see information exchange as minimum form of coordination; and thus only classified it as an additional pattern of interaction where exchange of information was not linked to, or integrated into other patterns.

Three *gaps in interaction* were identified, understood as situation where actors intentionally or unintentionally do not align their behaviour (see Chapter 2). All three gaps occur in the Action Situation Water Rights Reduction (all cases). This finding reveals the peculiarity of the process to reduce water rights compared to any other Action Situation, which I will address below (see 7.3.1). Furthermore, it is remarkable that in two case studies, these gaps occur in a sequence with information exchange. More specifically, this means that governmental actors exchanged information, but did not use this information at a later stage anymore; they just "stored reports in their desks", as highlighted by an interviewee (Interview 7/2018). Thus, gaps in interaction in the case studies do not occur because actors lack certain information to carry out a task. In contrast, despite availability of information, actors seem to deliberately decide not to act (see 7.3.1). This demonstrates the importance to analyse gaps in interaction as well as information exchange; two patterns of interactions often overlooked in empirical studies. Furthermore, this finding corresponds to literature on non-coordination arguing that rejection or absence of coordination often emerges from "intentionally rational behaviour of bureaucratic organizations operating in political contexts" (Bach and Wegrich 2018a: 5).

Last, there is one *conflict* taking place outside of the governance process on effects of irrigation efficiency measures (Guadalquivir). Thus, the widespread assumption that risks of conflicts about shared water increase under high water scarcity (Wolf 2007) may not apply if highly regularized governance processes are in place.

Several theoretical and empirical reflections can be made based on this comparison of patterns of interaction of the three case studies. From a theoretical point of view, it is to discuss first the prominent role of hybrids. As mentioned above, a large majority of patterns of interactions consists of *hybrids*, whereas only few pure forms

of coordination exist. This confirms the observation by scholars that ideal types of coordination rarely exist in the real world, but that they are almost always combined and overlapping (Bouckaert, Peters, and Verhoest 2010; Meuleman 2008). However, although many scholars recognize the importance of hybrids, it seems that they have hardly found their way into empirical work on natural resource governance. Furthermore, also under the umbrella of hybrids, authors often analyse governance modes in isolation (Bednar and Henstra 2018), and do not examine how these modes overlap. The empirical dominance of *hybrids* thus raises some questions: What are determinants of specific constellations of hybrid forms, such as the combination of cooperation and hierarchy, or of competition and hierarchy? Under which conditions do pure forms of coordination nonetheless evolve? And what does it mean for the concept of coordination if it only occurs through hybrids? My findings on the empirical dominance of hybrids also challenge more normative arguments of some scholars (Pahl-Wostl 2019; Lukat et al. 2023), assuming that the combination of different modes of coordination produce more effective coordination outcomes compared to pure forms of coordination. However, if empirically, we only observe hybrids, it seems to make sense to examine more closely *which* combinations of coordination modes lead to more effective coordination outcomes, and under which conditions.

Case study findings also show that *hierarchy* and *competition* occur quite often among these *hybrids* – in contrast to rather few instances of *cooperation*. This is surprising in so far as there seems to be a trend in environmental governance literature on different types of cooperative governance, such as collaborative governance (Ulibarri et al. 2020; Emerson and Nabatchi 2015; Koontz, Jager, and Newig 2020), adaptive co-management (Armitage et al. 2009) or participatory and deliberative governance (Newig et al. 2018). A reason for this academic focus may be that more classical command-and-control approaches are considered unlikely to be effective in the context of managing social-ecological systems which are characterized by complexity and uncertainty. Therefore, more innovative governance forms that strengthen learning, integration of different types of knowledge, or group decision-making are deemed crucial to solve so-called wicked problems. From a normative perspective, I agree on the importance of more inclusive forms of governance; and from this normative perspective, this academic focus can also be justified. However, given the empirical importance of a variety of different types of coordination, it seems important to address them more thoroughly in theoretical and empirical research as well. In this context, Meuleman (2007: 96) also raised the critique on the "conceptual crowd" of literature on network governance. He demands to include all governance modes in research since they all play a role in practice; and since cooperative modes of coordination – what he defines as "network governance" – may not be suitable to solve all different types of problems bureaucrats are facing (Meuleman 2007).

From an empirical perspective, it is remarkable that only two patterns of interaction were identified that did not happen within the official governance processes of the WFD implementation, and thus were not steered by governmental actors. These are a *conflict* (Guadalquivir) and *cooperation* (Mediterranean Basins), both among private actors, and happening in external venues. This finding shows that river basin governance in Spain is highly regulated, with most of the interaction being embedded within formalized processes. Indeed, river basin management has a long history in Spain, involving (economic) water users in decision-making bodies of RBAs since the early 20th century (Saurí et al. 2001) (see Chapter 1). This finding also reflects the importance of formal rules in Spanish water governance.

On the other hand, however, there is only one Action Situation where an identical pattern of interaction emerged across all three cases, namely, *incentive-based hierarchy* (Increasing Irrigation Efficiency). Thus, despite this high formalization and regularization – and even though actors are confronted with similar challenges of reducing agricultural water consumption – the type of interaction among public, private, and civil society actors does vary. These differences between case studies thus also stress the importance of informal rules in Spanish water governance. Indeed, in a study on intergovernmental interactions over water in Spain, De Stefano and Hernandez-Mora (2018) also show that RBAs and regional governments often use non-regulated venues for coordination. The authors emphasize the importance of informal interaction for building trust and reaching consensus. However, they criticize that these meetings "are based on the goodwill of individuals and linked to existence of favorable political conditions", and that they would reduce transparency and accountability in decision-making (De Stefano and Hernandez-Mora 2018: n.pag.). The role of formal and informal rules, as well as their interplay will be discussed below in relation to the different determinants of interaction (see section 7.2).

7.1.2 Patterns of interaction in individual case studies

After having compared patterns of interaction across cases and thus at a more general level, this section briefly presents some specificities of the three individual case studies in relation to the first research question. Underlying reasons as to why these patterns of interaction occur will be explained below (see Section 7.2).

The Guadalquivir shows some particularities regarding the identified patterns of interaction. This is because it is the only case where no *cooperation* has been identified; while at the same time, it is also the only case where a *conflict* occurred. Furthermore, *idea-based competition* occurs more often than in the Jucar; and it plays out between the River Basin Authority of the Guadalquivir (*Confederación Hidrográfica del Guadalquivir,* CHG) on the one hand, and the Regional Department of Andalusia on the other (RBMP Development, Dam Release Commission). This is in contrast to

idea-based competition in the other case studies, which is characterized by disagreements between non-governmental actors. In a similar vein, I found that *hierarchical* relationships in the Guadalquivir are shaped by the CHG taking unilateral decisions that are against the interests of the Regional Department of Andalusia (RBMP Development). More specifically, the CHG integrated measures on behalf of the Regional Department into the RBMP that arguably exceeded capacities of the latter. Patterns of interaction in the Guadalquivir are thus characterized by friction between the two main state actors.

The Jucar case study stands out first in terms of *cooperation*. Indeed, the River Basin Authority of the Jucar (*Confederación Hidrográfica del Júcar,* CHJ) cooperates with either state or non-state actors in three out of four Action Situations. This contrasts with the other two cases where no cooperation within the governance processes occurred. A further particularity of the Jucar is the finding that *idea-based competition* is considerably shaped by competition between two regions, the Valencian Community and Castilla-La Mancha. The CHJ thereby assumes the role of a mediator.

The Mediterranean Basins is the only case study where *cooperation* is observed outside of the official governance process. Water users and agricultural organizations thereby aimed at strengthening their lobbying activities, which I see as indicator that actors were not satisfied with water management by the government. Furthermore, an important difference is the occurrence of *information exchange* in the Action Situation Management Committee. In contrast to the other two case studies, actors were neither involved in the decision-making process, nor could they communicate their views and interests.

7.2 Linking independent variables and patterns of interaction

The second research question of this study aims to reveal determinants of patterns of interaction. In line with the theoretical framework (Chapter 2), I focus on the role of contextual conditions, overarching rules, characteristics of heterogeneous actors, social problem characteristics, and the 7-rules typology developed by Ostrom (2005) in shaping different forms of coordination. As discussed before (Chapter 2 and 3), the study is based on the understanding that variables mutually influence each other and are configural (George and Bennett 2005); and that causal mechanisms can vary and do not always produce same outcomes (Trampusch and Palier 2016). Instead of isolating effects of single variables, I thus focus on configurations of multiple variables and the causal mechanisms that accompany them.

In the following, I discuss determinants of the three pure forms of interaction as well as of the additional categories (i.e., *gaps in interaction, information exchange,* and *conflict*). For analytical reasons as well as feasibility, I thereby focus on individual patterns and not on their combinations – even though almost all identified patterns of

interaction are *hybrids*, as shown above. It is important to consider, however, that determinants of pure forms of coordination would probably differ. This is because given that pure forms hardly exist in the real world, we can assume that they only emerge under very specific circumstances. A pure form of price-based competition on a perfect market where the state does not play a role at all, for example, certainly has very specific determinants that differ from determinants of price-based competition on a distorted market, where the state acts as only supplier. Furthermore, it is to recall that most of patterns of interaction discussed here are embedded in official governance processes, where the state assumes a key role. This has important implications for the role of *hierarchical* patterns of interaction in the case studies. As already mentioned above, it is to assume that determinants of interaction that occur outside of an official process, e.g., in relation to common pool resource management by local water users, would also be different.

7.2.1 Variables supporting hierarchy

Hierarchical relationships are present in all three cases and across all types of Action Situations. Evidence from the case studies illustrate that determinants of *hierarchy* based on formal and/or informal authority and *incentive-based hierarchy* differ, which is why I discuss the two forms separately.

Before discussing variables supporting the emergence of *hierarchy* in the case studies, I like to recall some specificities of the WFD implementation. In the classical understanding of policy implementation, bureaucrats carry out decisions made by higher levels, i.e., the executive branch implements decisions of the legislative branch. In contrast, in the context of the WFD, same actors in charge of developing a RBMP, i.e., RBAs, are also responsible for its overall implementation. Newig and Koontz (2014: 250) therefore argue that the RBMP implementation "comes closer to mandated self-governance than to classical policy implementation". At the same time, RBAs in Spain, for example, have no legal authority to issue orders or instructions to the regional agricultural administrations which are in charge of implementing irrigation efficiency measures. This means that findings on determinants of hierarchy of the three cases may be difficult to transfer to contexts of more traditional, top-down policy implementation.

Authority-based hierarchy

Authority-based hierarchy – in combination with other pure forms of coordination – has been observed in all three cases, namely in the Action Situations RBMP Development (Guadalquivir, Mediterranean Basins), Dam Release Commission (Guadalquivir, Jucar), Water Rights Reduction (Jucar) and Demand and Supply of Desalinated Water (Mediterranean Basins). In these empirical contexts, *hierarchy*

is mainly shaped by formal and informal rules (*aggregation, scope rules*), conflictive relationships and *narratives* of actors.

Empirical findings suggest that formal and informal *aggregation rules* influence *hierarchical* relationships (all cases). Empirically, formal *aggregation rules* are reflected in the Action Situation Demand and Supply of Desalinated Water, where state-owned companies are entitled to unilaterally set and change the price of desalinated water (Mediterranean Basins). This confirms the argument by Bouckaert et al. (2010) that contractual relationships where the state is involved almost necessarily remain hierarchical to some degree.

In addition to formal *aggregation rules,* I also find that the combination of formal and informal *aggregation rules* can be decisive. This is reflected by unilateral decision-making by RBAs in the context of compiling measures for the RBMP (Guadalquivir, Mediterranean Basins). Since according to the National Water Law, RBAs are ultimately responsible for RBMP development, unilateral decision-making can indeed be partly attributed to formal *aggregation rules.* However, in the Jucar, the CHJ does not take these unilateral, hierarchical decisions (see below on *cooperation,* Section 7.3). This absence of *hierarchy* in the Jucar implies that it is not only formal rules which are decisive in the Guadalquivir and the Mediterranean Basins, but informal *aggregation rules* must also be at play.

Indeed, the use of these informal *aggregation rules* in the Guadalquivir – according to which the CHG takes unilateral top-down decisions regarding measures to be included in the RBMP – can be explained by conflictive relationships between state actors. Political conflicts between the regional and national level, especially in periods when different parties are in power, as well as the past conflict on competencies over the Guadalquivir (Thiel 2015) considerably shape administrative relations between the CHG and the Regional Department of Andalusia. In this context, De Stefano and Hernandez-Mora (2018: n.p.) explain that tensions on the (re-)distribution of authority in Spain that are "experienced in the constitutional arena spill over to water-related discussions and decisions". These tensions indeed influence day-to-day decision-making of the CHG and the Regional Department, reflected by certain level of mutual distrust. This also partly explains why the CHG does not involve the Regional Department in the decision-making procedure, but rather makes use of informal *aggregation rules*.

These informal *aggregation rules* shaping *hierarchical* decision-making are also observed in the Dam Release Commission (Guadalquivir, Jucar). Even though the National Water Law stipulates that WUAs must be actively involved in the decision-making procedure by voting on water allocation quota, these formal *aggregation rules* are not exercised. In contrast, unilateral decisions are taken by the respective RBAs – thus, again relying on informal *aggregation rules*. In the Jucar, this can be explained by formal *scope rules: Hierarchical* decision-making by the CHJ is based on clear requirements of the RBMP and the Drought Plan which specifies quotas

for water allocation depending on water levels in dams. Hence, regulations for involving water users in the decision-making stipulated in the National Water Law have been replaced by very specific environmental requirements by the EU. These EU regulations restrict the CHJ's autonomy regarding water allocation, and thereby also the involvement of water users in the decision-making process. The CHJ is thus bound to specific higher-level *scope rules* and consequently takes predetermined, *hierarchical*, decisions, following clear administrative procedures. This is different to the Guadalquivir (see below on *idea-based competition*, section 7.2.2).

Last, I find that sharing same *narratives* combined with certain social problem characteristics (*uncertainty, asset specificity*) also shapes *hierarchical* decision-making (Jucar). This is exemplified in the Action Situation Water Rights Reduction. More specifically, the CHJ reduced water rights through a *hierarchical* administrative procedure. This was possible due to previous cooperative agreements with the respective WUAs – and thus sharing same interests and narratives (see below on *cooperation*). Furthermore, RBAs are confronted with high *uncertainty* due to the likelihood of WUAs taking legal actions against the enforcement of reduced water rights; combined with high *asset specificity*. Therefore, the CHJ stresses the importance to make a reduction of water rights after increasing irrigation efficiency legally binding and asks to change the National Water Law – thereby, *uncertainty* would be reduced and coordination with WUAs would be facilitated in the future.

Incentive-based hierarchy

Incentive-based hierarchy occurs as a pure form of coordination in the three case studies (Increasing Irrigation Efficiency). The hierarchical element is characterized by the state offering financial incentives to WUAs; while at the same time, the state takes the role of a principal who can enforce rules that are linked to the respective subsidy (see Chapter 2). As I will elaborate in the following, empirical findings suggest that combinations of all seven formal rules (*boundary, position, choice, scope, information, payoff, aggregation rules*), as well as social problem characteristics (*asset specificity*) shape *incentive-based hierarchy* in the case studies.

All formal rules are identified in these Action Situations. Yet, three of them seem to be of particular importance, namely *payoff, boundary,* and *position rules*. First, *payoff rules* provide the basis on which private actors decide to enter this hierarchical relationship with the state. Indeed, *payoff rules* stipulated in the different Rural Development Programs (RDPs) define financial incentives in the form of subsidies for irrigation efficiency measures. WUAs are free in their decision whether they want to enter this relationship or not; but once they enter by accepting financial incentives, they are bound to several further formal rules. Furthermore, *boundary* and *position rules* define that the relationship is composed of a WUA on the one hand, and a state actor on the other; and that the state is entitled to enforce mentioned rules linked to the subsidies.

Further formal rules shaping *incentive-based hierarchy* are *choice, scope, information,* and additional *payoff rules* (all cases). More specifically, the European Agricultural Fund for Rural Development (EAFRD) defines formal requirements, such as the existence of water rights, or an ex-ante assessments of water savings (*choice rule*); and in cases where water bodies in a status less than good are affected, there must be the possibility to achieve effective reductions in water use (*scope rule)*. In addition, *scope rules* define that projects are prioritized that may produce net water savings (RDP Andalusia); and that higher subsidies are offered depending on the amount of potential water savings (RDP Castilla-La Mancha). Furthermore, in Castilla-La Mancha and the Valencian Community, WUAs are obliged to inform the agricultural administration about water consumption patterns (*information rule*). The asymmetric relationship between the agricultural administration on the one hand, and WUAs on the other is further strengthened by formal *payoff rules* of the RDP of Castilla-La Mancha. It stipulates that subsidy recipients must commit themselves to a reduction of water rights; and sanctions may be imposed on recipients if water savings are not achieved.

Social problem characteristics also help explaining why state actors make use of these *hierarchical* mechanisms: Irrigation efficiency measures are characterized by high *asset specificity,* meaning that investments cannot be easily transferred from one WUA to another one. Implementing authorities are thereby put at risk since they depend on loan repayments by WUAs. To reduce associated risks of implementing authorities, some degree of hierarchy is considered important (all cases). This is in line with transaction costs literature, arguing that mechanisms which rely on contractual enforcement or governmental authority are suitable in the context of high asset specificity (Feiock 2013).

I draw some observations regarding the role of formal and informal rules in the context of *incentive-based hierarchy.* First, findings show that informal rules are not relevant for explaining this pattern of interaction in the case studies; and hence, it is only formal rules which shape the asymmetric relationship between state and non-state actors. This contrasts with the high relevance of informal rules for *authority-based hierarchy,* as discussed above. Thus, it seems indeed fruitful to distinguish between different types of hierarchy. In addition, discussed findings show that all seven rules defined by Ostrom (2005) regulate *incentive-based hierarchy*. While this does not mean that all rules must necessarily be included, it does illustrate the complexity of these relationships. Nonetheless, some rules are of specific empirical importance: the combination of *boundary* and *position rules* enable state actors to enforce rules that are linked to subsidies, thereby setting the ground for *hierarchical* relationships; and *payoff rules* are particularly productive in strengthening this *hierarchical* element. Indeed, by defining a sanctioning regime for WUAs which do not fulfil their obligations, dependency of WUAs is further enhanced.

7.2.2 Variables supporting competition

Idea-based and *price-based competition* were both identified across the three case studies, although *idea-based competition* occurred more often. They are both influenced by different variables and causal mechanisms: *idea-based competition* is shaped by competing *narratives,* informal and formal rules, *geographic characteristics* and social problem characteristics; and *price-based competition* is only shaped by formal rules (*payoff rule*). These different determinants demonstrate that from a conceptual point of view, it does make sense to differentiate between these two forms of competition.

Idea-based competition

Idea-based competition has been identified in all three cases in different Action Situations and is shaped by competing *narratives* of actors, formal and informal rules (*boundary, choice, aggregation rule*), *geographic characteristics of the RBD,* and social problem characteristics (*scale, uncertainty*), which I will discuss in the following.

Competing stakeholder *narratives* are the underlying reason why *idea-based competition* emerges in all three cases; while formal rules, which I identify below, provide the opportunity for actors to compete among each other. More specifically, there are on the one hand WUAs, regional administrations and RBAs which follow supply- and demand-side narratives, even though to different degrees (all cases). They argue to increase water supply, e.g., through large-scale infrastructure or desalination of water; and to implement irrigation efficiency measures to reduce demand at the plot level, which will then lead to reduced demand at the basin level. However, this does not imply that the agricultural sector is a monolithic actor. In contrast, in the Guadalquivir, different umbrella organizations of WUAs were established due to conflicting interests concerning water allocation; and in the Jucar, conflicts of interest prevail between upstream and downstream users. In contrast to these supply- and demand-side narratives, there is the knowledge and governance narrative of environmental non-governmental organizations (ENGOs) and civil society representatives (all cases), as well as partly also of RBAs (Jucar, Mediterranean Basins). These actors focus on governance measures such as reducing water rights, monitoring groundwater use, or closing illegal wells. In addition to these divergences of interests in terms of content, *idea-based competition* is also shaped by above-mentioned conflicts at the constitutional level between political actors (Guadalquivir, Jucar).

Case study evidence shows that formal and informal rules (*choice, boundary, aggregation*) lay the ground for *idea-based competition*. However, they do not determine a specific pattern of interaction, but only unfold in this way – and thus shape *idea-based competition* – when being used in situations characterized by competing interests of actors. To take an example, formal *choice rules* in the Action Situation RBMP Development define that "active involvement of all parties" shall be ensured, which must include, inter alia, the possibility for the public to comment in writing on the

draft RBMP (WFD, Art. 14) (all cases). Hence, actors presented different, mostly competing, interests in the form of written statements to the respective RBAs, who chose which statements to include. Furthermore, informal *boundary rules* reinforce actors' competitive behaviour (Guadalquivir): In the Action Situation RBMP Development, the CHG organized separate workshops for each stakeholder group; and in the Dam Release Commission, WUAs are asked to propose water allocation quota in bilateral, informal meetings with the CHG. These informal *boundary rules* strengthen bilateral relationships between individual stakeholder groups and the CHG, but they do not provide the opportunity to actors with diverging interests to interact. As a result, conflicts of interest or, in some cases, rivalries between actors cannot be resolved. *Competitive* behaviour is thereby fostered. Moreover, formal *aggregation rules* influence *idea-based competition* in the River Basin Water Council, where an absolute majority of Council members is needed for RBMP approval (Guadalquivir, Jucar). Indeed, it seems likely that *idea-based competition* arises if actors pursue conflicting goals *and* decisions are taken by majority vote.

Last, I find that *geographic characteristics of the RBD* in combination with social problem characteristics (*scale, uncertainty)* also shape *competitive* behaviour of actors, as illustrated in the Action Situation Dam Release Commission (Guadalquivir). The Guadalquivir is one large major river, in contrast to several sub-basins in the other two cases (*geographic characteristics*). The *scale* at which decision-making of the Dam Release Commission is organized therefore refers to the entire RBD. This implies that a larger number of WUAs is involved in, and affected by the Commission's decision-making; and that political and economic interests are more diverse due to the large size of the RBD. Indeed, scientific literature considers group size as important factor to explain natural resource management by communities (E. Ostrom 2003). In addition, there is high *uncertainty* for WUAs whether the CHG will reduce or rather expand water allocation within the Dam Release Commission. Interviewees explained that decisions taken by the CHG were difficult to predict, especially in periods of reduced water availability. This arguably incentivizes WUAs to lobby for their interests and compete among each other. This argument is reinforced by comparing patterns of interaction in the Guadalquivir and the Jucar: In the latter, the CHJ explains to follow pre-determined requirements of the RBMP and the Drought Management Plan (formal *scope rules*); an approach which has not been mentioned in the Guadalquivir. Furthermore, number of involved water users in the Dam Release Commissions is much smaller in the Jucar, since Commissions are organized at sub-basin level. This may explain why no *idea-based competition* has been observed in the Jucar.

Price-based competition

Price-based competition was identified only in one Action Situation, namely the Supply of Desalinated Water (Mediterranean Basins), where it occurs in combination with

hierarchy. The *competitive* element of this interaction purely results from formal *payoff rules*. These *payoff rules* determine the price that is to be paid by WUAs to purchase desalinated water, which is contractually agreed between WUAs and the respective state actors. Since desalinated water is much more expensive than any other water resource available in the case study, prices are indeed decisive for water users in their decision-making on whether to purchase desalinated water or not.

7.2.3 Variables supporting cooperation

Cooperation within the governance process was observed in three Action Situations in the Jucar (RBMP Development, Dam Release Commission, Water Rights Reduction); and outside of the official process in the Mediterranean Basins (RBMP Development). Empirical findings illustrate the importance of informal rules (*position, choice rules)*, actors sharing same *narratives*, as well as specific social problem characteristics (*scale, uncertainty)* combined with contextual conditions *(socio-economic role of irrigated agriculture*) for *cooperative* behaviour.

Concerning the role of different rules, the Jucar shows that informal *position* and *choice rules* are particularly relevant, while formal rules were not identified. More specifically, according to these informal rules, different actors take the role of a mediator (*position rule*), aiming to bring together different interests (*choice rule*). Empirically, this has been observed in the Action Situation Water Rights Reduction, where water rights of the *Acequia Real del Júcar*, one of the most important WUAs in the Jucar RBD, have been reduced. More specifically, the president of Acequia Real initiated a *cooperative* process by mediating between water users and the CHJ. Furthermore, in the Action Situations RBMP Development and Dam Release Commissions, the CHJ acted as arbitrator mediating between different stakeholders and organizing trilateral meetings. Thereby, equal status of all involved actors was strengthened. Similarly, informal *choice rules* enhance *cooperation* in the Mediterranean Basins, where WUAs and private agricultural actors established a platform to strengthen cooperation within the agricultural sector by organizing regular meetings.

Case study findings show that the sharing of common interests and *narratives* partly explains the use of these informal rules leading to *cooperation* (Jucar, Mediterranean Basins). In the case of the Roundtable Water (Mediterranean Basins), only those agricultural actors who had a common vision for river basin management in the area were included; and the Acequia Real President and the CHJ shared the belief that reduction of water rights after increasing irrigation efficiency through public subsidies was necessary (Jucar). These interests can be explained by specific characteristics of irrigation systems in the Acequia Real, leading to a favourable cost-benefit ratio of irrigation efficiency measures for water users.

Furthermore, the use of above-mentioned informal rules can be attributed to some extent to particular social problem characteristics. First, the *scale* at which

decision-making is organized may facilitate *cooperation*. This is exemplified by the fact that *cooperation* in the case studies takes place at a more local level, i.e., at the sub-basin (Dam Release Commission, Jucar; RBMP Development, Mediterranean Basins) or at the level of WUAs (Water Rights Reduction, Jucar) – compared to many other decision-making processes organized at the basin level. Thus, there is a smaller number of actors involved than in other Action Situations, which are, in addition, relatively homogenous. It seems reasonable that cooperation among individual WUAs is easier to achieve than across the entire RBD. In addition, high *uncertainty* combined with high *asset specificity* may motivate actors to invest into *cooperative* relationships (Jucar, Mediterranean Basins). Empirically, this is shown in the Action Situation Water Rights Reduction (Jucar). As already explained above (see 7.2.1), consequences of a water rights reduction are unpredictable from the CHJ's perspective due to the likelihood of WUAs taking legal action. This is the reason why the CHJ invested into *cooperation* with the Acequia Real, since reaching a joint understanding with water users is crucial to reduce the risk of opportunistic behaviour by water users. Similarly, water users in Almeria, in the Mediterranean Basins, are arguably faced by the highest *uncertainty* concerning future agriculture activities compared to the other cases due to the severe lack of water resources in the area. Adding to that, *socio-economic role of irrigated agriculture* is particularly high in Almeria, with 19% of the working population being employed in the agricultural sector (Junta de Andalucía 2015b). I argue that high economic importance combined with high uncertainty regarding their economic activities motivates actors to invest into *cooperation* among water users. This is in line with findings by Herzog (2020) who shows that if actors share the perception of being highly affected by environmental problems, the formation of cooperation in the water sector is facilitated.

I draw three main observations from these findings. First, there is no formal rule that plays a role in establishing *cooperation* in the analysed Action Situations, but it is purely built on informal rules. This is also reflected by the fact that *cooperation* within the governance process only emerged in the Jucar, but not in the other two cases. Consequently, it is not the formal governance setup – being similar in the other two cases – which triggers *cooperation* in the Jucar. This finding relates to the Bloomington School's perspective on public choice, which is about "the ways in which individual preferences, values, and decisions [...] intertwine and co-evolve with the institutionally constructed environment and governance system" (Aligica and Tarko 2013: 740). Decision-making of bureaucrats thus does not merely depend on formal rules but is also shaped by their preferences and values. Furthermore, the authors explain that "the public" cannot be determined ex ante, but it rather emerges out of an "ongoing, collective process of adjustment" (Aligica and Tarko 2013: 740).

Second, findings show that there are two main factors fostering *cooperation:* the sharing of interests and the existence of a person that – according to informal *position rules* – initiates and steers the process of actors building trust and working

towards a common aim. The other identified factors, i.e., social problem characteristics as well as contextual factors, may facilitate this process but are arguably not sufficient.

Third, the cases illustrate that from a theoretical perspective, it makes sense to differentiate between cooperation which occurs within an official, often state-led, governance process; or outside, initiated and led by private actors. This is because their determinants differ: In the Mediterranean Basins, high economic dependence on water combined with uncertainty regarding future water availability motivated agricultural actors to invest into *cooperation* outside of the official governance process. It seems reasonable that when there is no established framework for interaction and transaction costs for cooperation are higher, stakeholders must face higher problem pressure in order to cooperate with each other.

7.2.4 Variables supporting further patterns of interaction

In addition to the three pure forms of coordination presented above, patterns of interaction in the case studies also include *gaps in interaction, information exchange* and a *conflict*.

Gaps in interaction

Three *gaps in interaction* were identified across the cases studies, all of them occurring in the Action Situation Water Rights Reduction (all cases). These gaps can be mainly attributed to high coordination requirements resulting from specific configurations of social problem characteristics (*frequency, asset specificity, uncertainty, excludability*) combined with considerable *de jure autonomy* of actors in charge of coordination.

Social problem characteristics are important factors shaping *gaps in interaction* in the Action Situation Water Rights Reduction; this applies to all cases but is more salient in the Guadalquivir. From the RBAs' perspective, reducing water rights is characterized by high *frequency* (reductions need to be carried out for every individual water user); high *asset specificity* (investments by the RBA in coordination with water users are unique to the respective water users); and, very importantly, high *uncertainty. Uncertainty* here refers to the question of RBAs whether water users will accept the administrative decision or rather challenge it in court. This is because water rights are a private good and therefore *excludable;* and costs to give up water rights are hence very high for individual WUAs. This increases the likelihood of irrigators behaving opportunistically, i.e., legally opposing the reduction of water rights. These social problem characteristics result in high coordination requirements and high political costs for the respective RBAs, which consequently makes it more likely that RBAs themselves behave opportunistically, and hence do not carry out the water rights reduction.

The likelihood of opportunistic behaviour by RBAs is reinforced by the fact that a water rights reduction after increasing irrigation efficiency is not legally binding, neither under the National Water Law nor under EU regulations. The CHG and CHJ thus enjoy high *de jure autonomy*, meaning that their decision of non-coordination is not in breach of any legal provision. In the Mediterranean Basins, this is different since water rights reduction is legally binding according to the Andalusian Water Law. Yet, the Andalusian Water Law is basically not in force, neither in relation to water rights reduction nor to any other legal requirement that goes beyond the National Water Law (see Chapter 6). One can hence argue that the Regional Department of Andalusia enjoys at least high *de facto* autonomy in this context.

The three cases thus show that if coordination is costly due to specific social problem characteristics, but actors are not legally obliged to coordinate, they are also likely to choose not to do so. Informal *choice rules* are therefore decisive. The high importance of social problem characteristics in this context can be underlined by findings from the Dam Release Commission (Guadalquivir). There, social problem characteristics require much less coordination due to low *asset specificity* (decisions on water allocation are based on previous years); low *uncertainty* (water users cannot deviate from decisions taken in the Commission) and medium *frequency* (Commission meetings are twice a year). Political costs for the CHG to reduce water allocation through the Dam Release Commission are thus much lower compared to reducing water rights – which may explain why the CHG actually also makes use of the Dam Release Commission in this context.

Information exchange

As mentioned above, *information exchange* has been identified in the Action Situation Management Committees (Mediterranean Basins); and in the Action Situation Water Rights Reduction, where it occurred in a sequence with *gaps in interaction*, as explained above (Guadalquivir, Jucar). These patterns of interaction are shaped by formal and informal *information rules*.

Formal *information rules* play a role in the Action Situation Water Rights Reduction (Guadalquivir, Jucar). Actors mutually exchange information based on rules stipulated in the EAFRD. In contrast, informal *information rules* associated with a non-compliance of formal rules explain *information exchange* in the Action Situation Management Committee (Mediterranean Basins). This is reflected by the finding that water users were only informed by the Regional Department about water allocation, without being involved in decision-making as formally regulated. Reasons are lack of *financial and human resources of actors* combined with changes in overarching rules (*governance structure, formal rules for coordination*). More specifically, this played out by the harsh impact of the financial crisis on Andalusia; as well as administrative restructurings in the Andalusian water administration due to the dissolving of the Andalusian Water Agency in 2011 and requirements of the 2010

Andalusian Water Law to (re-)establish participatory bodies. Thus, these factors may explain why the Management Committee is only used as a tool to provide information rather than being a means for participation.

Conflict

Only one *conflict* has been observed across the three case studies, namely in the Action Situation RBMP Development (Guadalquivir). It can be explained by conflictive *narratives* of actors, combined with informal rules (*boundary*, *position*, *information rules*).

Conflicting *narratives* of actors from the environmental and agricultural sector concern the question whether increased irrigation efficiency was followed by a rebound effect at the basin level. Actors' opinions on that issue are indeed diametrically opposed to each other. However, although diverging interests are a defining characteristic of conflicts (Weible and Heikkila 2017), these are not sufficient – as demonstrated by the fact that conflicts did not materialize in the other two case studies despite similar differences in interests. Two further factors were thus important: First, due to limited *boundary* and *position rules* in the Action Situation RBMP Development (Guadalquivir), deliberation among stakeholder groups on the risk of rebound effects was not possible. It may explain why these actors chose a venue outside of the official governance process to deal with their conflicting interests, namely by influencing the public with influential publications and lobbying activities. Furthermore, informal *information rules* restricted public actors to openly address potential negative effects of irrigation efficiency measures. Indeed, risks of a rebound effect were openly denied by the CHG as well as the Regional Department of Andalusia. Furthermore, real data on water consumption were lacking in the RBMP. The lack of legitimized data thus contributed to a polarization of actors on the question of what impact irrigation efficiency measures had on the environment.

7.3 From patterns of interaction to performance

The third research question asks for determinants of performance in the three case studies. To recall, performance was assessed in this study in relation to process performance understood as coordinated behaviour; to output performance, relating to tangible outputs of the different Action Situations as well as of the overarching governance process; and to environmental outcome performance relating to the achievement of political goals in relation to agricultural water use (i.e., the reduction of agricultural water use) (see Chapter 3). Process and output performance were assessed at the level of Action Situations as well as of the overarching governance process, while environmental outcome performance was only analysed in relation to the latter.

To answer the question on determinants of performance, I discuss the influence of patterns of interaction on process and output performance at the level of Action Situations; as well as the relation between the three performance criteria at the level of the overarching governance process. Table 12 provides an overview of process and output performance for each Action Situation (see Chapter 4, 5 and 6), which will be discussed more in-depth below.

It is to consider that I do not examine the influence of independent variables (i.e., the left side of Figure 9) on case study performance. The reason is the assumption that independent variables such as contextual conditions or actor characteristics unfold in and shape governance processes, but do not directly influence outputs and outcomes. In addition, I do not link patterns of interaction to environmental performance, but only analyse how the latter is influenced by process and output performance. This is because environmental outcomes are influenced by a variety of natural and human processes which evolve over time, include feedback loops and time lags. Thus, it is already difficult to measure the impact of governance processes on environmental performance; but to link different patterns of interaction, such as competition or hierarchy, to environmental performance seems to be not meaningful.

7.3.1 Role of patterns of interaction for process performance

Process performance in this study was evaluated as coordinated behaviour, which was operationalized along three evaluative criteria, namely *information exchanged*, *competing interests considered* and *incentives aligned*. While there are many different legitimate criteria to assess policy processes (see Chapter 2), this focus seems particularly suitable with coordination being at the heart of this study. Process performance at the level of Action Situations across the three cases is low to moderate. There is only one Action Situation which scores high (RBMP Development, Jucar), while seven Action Situations have moderate levels of coordinated behaviour, and five show low levels.

Case study findings show that there are no generalizable trends between patterns of interaction and process performance (see Table 12). Indeed, there are Action Situations where different patterns of interaction evolved, but which show same level of coordinated behaviour; and conversely, there are Action Situations with same patterns of interaction but distinct levels of coordinated behaviour.

Nonetheless, there is evidence on causal relationships between certain patterns of interaction and individual evaluative criteria of coordinated behaviour: First, by comparing the three cases, I find that *cooperation* positively influences the level of *alignment of incentives* (Jucar). In all three Action Situations where *cooperation* was identified, the CHJ took decisions in consensus with water users (Water Rights Reduction, Dam Release Commission) or state actors (RBMP Development). I argue

Table 12: Process and output performance at the level of Action Situations in the case studies

Action Situation	**RBMP Development**			**Dam Release Commission/ Management Committee**		
	Guadalquivir	**Jucar**	**Med. Basins**	**Guadalquivir**	**Jucar**	**Med. Basins**
Pattern of interaction	Idea-based competition and hierarchy	Cooperation and idea-based competition	Idea-based competition, hierarchy Cooperation	Idea-based competition and hierarchy	Cooperation and hierarchy	Information exchange
Coordinated behaviour	Moderate	High	Moderate	Moderate	Moderate	Low
– Information exchanged	– Moderate	– High	– Moderate	– High	– Moderate	– Low
– Competing interests considered	– Moderate	– Moderate	– Moderate	– Low	– Moderate	– Low
– Incentives aligned	– Moderate	– High	– High	– Moderate	– High	– Moderate
Policy output	RBMP not/marginally effective	RBMP moderately effective	RBMP not/marginally effective	Surface water moderately adapted	Surface water moderately adapted	*No data available*

Action Situation	Increasing Irrigation Efficiency			Supply and demand of desalinated water	Water Rights Reduction		
	Guadalquivir	**Jucar**	**Med. Basins**	**Med. Basins**	**Guadalquivir**	**Jucar**	**Med. Basins**
Pattern of interaction	Incentive-based hierarchy Conflict	Incentive-based hierarchy	Incentive-based hierarchy	Hierarchy and price-based competition	Information exchange, gap in interaction	Cooperation, hierarchy Information exchange, gap in interaction	Hierarchy, idea-based competition Gap in interaction
Coordinated behaviour	Low	Moderate	Low	Moderate	Low	Moderate	Low
– Information exchanged	– Low	– Moderate	– Low	– High	– Medium	– High	– Low
– Competing interests considered	– Low	– Moderate	– Low	– Moderate	– Low	– Moderate	– Low
– Incentives aligned	– Low	– Moderate	– Moderate	– Low	– Low	– Moderate	– Low
Policy output	Measures partly implemented	Measures partly implemented	Measures not/marginally implemented	Little demand for desalinated water	Water rights not reduced	Water rights moderately reduced	Unclear: low to moderate reduction *(few data available)*

that these agreements as well as increased trust between the CHJ and third actors had the effect that interests have converged, which then positively influenced the alignment of incentives. Indeed, in the example of Water Rights Reduction, water users agreed on a reduction and thus did not legally oppose it in the aftermath.

Furthermore, *information exchange* is associated with low levels of *alignment of incentives* and *consideration of competing interests* (all cases). However, it is important to bear in mind that this only concerns those instances where *information exchange* occurs as minimum form of coordination, and where it is thus not integrated into another pattern of interaction. Empirically, the mere exchange of information in the Action Situations Water Rights Reduction (Guadalquivir; partly Jucar) and Management Committees (Mediterranean Basins) means that a two-way flow of information between water users and RBAs did not take place. It seems reasonable, however, that some form of deliberation is required to consider different interests of water users in the first place, and followingly align their incentives. Similarly, scholars have shown that simple information provision and consultation is not sufficient for stakeholders to shape processes and outputs (Kochskämper, Jager, et al. 2017). Nonetheless, it is important to note that the relationship between information flows and coordinated behaviour arguably depends on context and constellation of problems. In a situation where actors have opposing interests and where distributional issues are at stake, a mere exchange of information does not seem to be sufficient. This may be different if interests of actors are alike.

7.3.2 Role of patterns of interaction for policy output performance

Policy output performance refers to tangible outputs of Action Situations, and was evaluated in relation to externally defined goals, such as the status of implementation of measures compared to what has been stipulated in the RBMPs. In general, policy outputs across all Action Situations are rated as low to moderate: six Action Situations have a low policy output, seven a moderate one; and no Action Situation was evaluated as high (see Table 12).

Similar to what has been shown for the influence on patterns of interaction on process performance, there is no clear trend between different patterns of interaction and policy output performance either. This is because same patterns of interaction lead to different levels of policy output; and reversely, different patterns of interaction lead to identical policy output. Thus, none of the patterns of interaction automatically leads to high – or low – performance levels of processes or policy outputs.

However, although there are no general trends, I do observe indications for causal relationships between patterns of interaction and policy outputs in individual Action Situations. First, I identify a causal relationship between the *hybrid* of *hierarchical* and *cooperative* behaviour, and the moderate policy output in the Action

Situation Water Rights Reduction (Jucar). Indeed, due to the *cooperation* between the Acequia Real and the CHJ, water users agreed on a reduction of water rights, which allowed the CHJ to implement the decision through a *hierarchical*, administrative procedure – leading to a moderate level of policy output. Furthermore, it is to assume that strengthening the *hierarchical* component of the interaction, e.g., by making a reduction legally binding, would simplify the administrative procedure and lead to an even higher number of reduced water rights.

Furthermore, one can assume that *cooperation* has had a positive influence on the policy output in the Action Situation RBMP Development (Jucar). In contrast to the other two cases, the Jucar RBMP is assessed to be moderately effective, mainly because it integrates and discusses water rights reduction as well as reallocation of saved water to increase environmental flow rates. The fact that the CHJ actively involved actors from different sectors and organized cross-sectoral meetings may have influenced the content of the RBMP, by integrating more diverse views. Similarly, in a study on WFD implementation in different countries, Kochskämper et al. (2017) show that intensive communication and power delegation to stakeholders strengthened environmental quality of the respective RBMPs.

Although I do not analyse the influence of independent variables on policy output performance, it is to acknowledge that the lack of financial resources influenced lack of implementation of measures (European Commission 2019a), in particular regarding irrigation efficiency measures. On the other hand, in the Guadalquivir, reducing water rights is considered to be the most cost-effective measure compared to all other measures aiming at a reduction of water extraction (CHG 2015b). This reminds us that the (non-)allocation of funds for a particular measure is ultimately a political decision, which is often obscured with the narrative of insufficient resources.

7.3.3 Relation between process, output, and environmental outcome performance

Having examined how process and policy output performance at the level of Action Situations are shaped, I now turn to the relation between all three performance indicators, i.e., *process, output,* and *environmental outcome performance* at the level of the overarching governance process.

Process performance as well as environmental outcome performance is rated low in the Guadalquivir and Mediterranean Basins, and moderate in the Jucar; and output performance is low in all three cases (see Table 13). In the following, I first discuss how process and output performance relate to each other, followed by the link between process and environmental outcome performance, and between output and environmental outcome performance.

Table 13: Process, output, and environmental outcome performance across Action Situations in the case studies

		Guadalquivir	Jucar	Med. Basins
Process performance	**Coordinated behaviour**	Not/marginally coordinated	Moderately coordinated	Not/marginally coordinated
	– Information exchanged – Alignment of incentives	– Moderately exchanged information – Incentives not/marginally aligned	– Moderately exchanged information – Incentives partly aligned	– Moderately exchanged information – Incentives not/marginally aligned
Output performance	**RBMP implemented**	RBMP marginally implemented	RBMP marginally implemented	RBMP marginally implemented
Environmental outcome performance	**Environmental outcome**	Low	Moderate	Low
	– Development of agricultural water use – Development of irrigated area – Development of status of water bodies	– Increased agricultural water use – Increased irrigated area – Constant status	– (Slightly) decreased agricultural water use – Increased irrigated area – Constant status	– Increased agricultural water use – Increased irrigated area – Status improved

First, empirical findings show that in two cases, low levels of process performance (i.e., coordinated behaviour) correlate with low levels of policy output performance (i.e., status of implementation of the RBMP) (Guadalquivir, Mediterranean Basins). Thus, if behaviour in the different governance processes is not coordinated, implementation of measures is less likely. Reasons may be that either regional actors do not feel incentivized to implement measures, or that water users do not agree on the respective measure, such as in the case of water rights reduction. On the other hand, in the Jucar, a moderate level of coordinated behaviour is also correlated with a poor policy output. Consequently, although the three cases perform differently in terms of coordination, they all score the same for policy output, i.e., they demonstrate a lack of RBMP implementation. This points towards limitations of coordination, namely that a (moderately) coordinated governance process does not necessarily lead to good policy outputs.

Second, in the analysed cases, I observe a correlation between process performance and environmental outcome performance at the case study level (all cases).

More specifically, the Guadalquivir and Mediterranean Basins show low levels of process and environmental outcome performance, while the Jucar ranks moderate on both variables. Furthermore, evaluative criteria similarly correlate with each other, namely the *alignment of incentives* and *development of agricultural water use* (all cases). It is reasonable to argue that these second-tier variables do not only correlate, but that there is also some causality involved. Indeed, the failure to design incentives for water users in a way that would make it rational for them to reduce their consumption – either because it is in their own interest, or because they feel obliged to do so –, as well as for governmental actors to enforce such a reduction may at least partly explain why agricultural water consumption has increased in two cases (Guadalquivir, Mediterranean Basins). From the perspective of water users, this misalignment of incentives at the case study level is reflected by deficiencies in reducing water rights after increasing irrigation efficiency as well as the failure to control groundwater use (both cases). Further, the lack of establishing financial mechanisms to make the expansive desalinated water more attractive (Mediterranean Basins) as well as allowing the increase of irrigated surface area in the RBMP after the implementation of irrigation efficiency measures (Guadalquivir) may similarly present negative incentives for water users. The Jucar case study, which shows moderate levels of incentive alignment and a slight decrease of agricultural water consumption confirms these observed causalities. Empirically, agricultural actors may be more incentivized to reduce their consumption since some had to give up their water rights; and a higher monitoring of water use by the CHJ may disincentivize illegal water consumption. This helps explaining why agricultural water consumption at least did not increase, particularly compared to the other two cases. In the literature, it is also argued that creating incentives for water users to contribute to meeting environmental flow goals is crucial, especially in the context of subsidizing irrigation efficiency measures (Grafton et al. 2018). More specifically, Grafton et al. (2018) argue to charge water fees if recoverable flows are reduced, or to create financial benefits for water users who reduce their consumption.

From the perspective of state actors, misalignment of incentives may also affect the *development of agricultural water use*. More specifically, empirical evidence shows that EU agricultural as well as water policies do not sufficiently incentivize state actors to enforce a reduction of agricultural water consumption (all cases). In this context it is to mention the EAFRD which does not, in legal terms, strictly link subsidies for irrigation efficiency to actual water savings at the farm level; and under certain conditions, even allows for extension of irrigated area. This critique has also been raised by the European Court of Auditors (2021) and acknowledged by the European Commission (2019a). With regards to EU water policy, enforceability of the WFD, i.e., holding Member States accountable for non-achievement of WFD objectives is limited (European Commission 2019a). Reasons concern first the time period for WFD implementation: On the one hand, the time frame to achieve WFD objectives is

relatively long, which may have the effect that potential infringement proceedings after 2027 are not perceived as threat by concerned administrations. On the other hand, rehabilitation of European waters will probably need several decades, which is why scholars criticize the "mismatch between the legal expectations of the Directive and the ecological timeframes required to facilitate an achievement of good ecological status" (Voulvoulis, Arpon, and Giakoumis 2017: 363). One could thus also argue that if achieving WFD objectives is anyway unlikely, RBAs may be less incentivized to undertake stricter measures. In addition, enforceability is hampered by the complexity of the WFD, with many Member States lacking mechanisms to control and enforce implementation (European Commission 2019a). Similarly, scholars criticize that the WFD gives much space for exemptions, extensions and derogations (Moss et al. 2020). I argue that limited enforceability of the WFD by the European Commission diminishes incentives for RBAs to comply with WFD requirements. This is especially true in a socio-economic context where reducing agricultural water consumption implies profound structural changes with major distributional consequences, and thus involves high political costs.

Third, I observe a correlation between low policy output and low environmental outcome performance in two cases (Guadalquivir, Mediterranean Basins). Theoretically, a causal relationship between lack of RBMP implementation and the non-achievement of WFD goals in the Guadalquivir and Mediterranean Basins – both in relation to water quantity issues –, seems reasonable. However, due to several flaws in the design of the RBMPs, I evaluated both as marginally effective in terms of their likelihood to achieve a reduction of agricultural water consumption (see Table 12). Consequently, a higher implementation rate of the RBMP in the two case studies – where, for example, the reduction of water rights is very unspecific – might not necessarily lead to better environmental performance. Also the European Commission (2019a: 50) argues that a major obstacle in achieving environmental objectives by Member States is the fact that "programmes of measures are not always based on the integrated planning approach required under the Directive". The Jucar deviates from this pattern, with low policy output but moderate environmental performance.

7.4 Summarizing the evidence: theoretical and empirical conclusions

7.4.1 Theoretical conclusions

This study has shown, perhaps most importantly, the complexity of interaction, their determinants and performance of polycentric governance. Each case, as well as each Action Situation reveal multiple factors and complex mechanisms on how and why actors interact in a certain way, as well as how these ultimately influence governance outputs and environmental outcomes. In the following, I summarize main theoret-

ical findings concerning i) patterns of interaction, ii) their determinants, as well as iii) their performance.

Concerning i) patterns of interaction, I draw three main conclusions. First, a multitude of different patterns of interaction were identified in this study, which almost always occur in hybrids. This underlines the need to deepen the empirical knowledge on how modes of coordination are combined and overlapping, rather than analysing them in isolation, as it is often done in research on coordination. Furthermore, identified patterns of interaction almost all deviate from ideal types of coordination, albeit to varying degrees. This can be illustrated for example by different forms of distortion of *competition*, where state actors for example hold a monopoly position; or where agricultural actors have privileged access to the RBAs and thereby have a more powerful position while competing with environmental actors. In contrast, in an ideal-type of *idea-based competition*, for example, all actors would have same starting conditions to compete. Nonetheless, theoretically, ideal types have proven productive in opening the "black box" of coordination of actors.

Second, a dominance of hierarchy and competition has been observed in this study, compared to rather few instances of cooperation. This finding may be specific to the context of the study – being embedded in an official governance process where state actors play a major role; and treating a fundamentally distributional question, where some parts of the society will almost necessarily loose. Nonetheless, the dominance of hierarchy and competition is somehow in contrast to the strong scientific focus on collaboration and cooperation in literature on natural resource governance as mentioned above; and therefore highlights the need to more profoundly address all types of coordination in empirical research.

Third, the study highlights the usefulness of examining information exchange as minimum form of coordination, as well as gaps in interaction. In the analysed cases, I could thereby show that inaction results from actors' deliberate decisions not to act. This contrasts with the critique of different sectors working in silos, which is the starting point of much coordination literature, as shown by Tosun and Lang (2017).

In relation to ii) determinants of patterns of interaction, the case studies revealed many different causal factors to explain interaction of actors. Each of the analysed Action Situations in fact showed complex mechanisms and factors, which can only be understood by closely examining the respective context in which interactions unfolded. It is hence not possible to draw generalizations on how certain patterns come about. Nonetheless, some general remarks can be made on the role of independent and intermediate variables in the three cases. It is thereby important to note that I only focus on how different variables influence the emerging *type* of interaction. Resources, for example, are key determinants of any behaviour of stakeholders, but they do not necessarily determine whether actors cooperate or follow hierarchical decisions.

The following list summarizes key findings on the role of independent variables for the different patterns of interactions as has been outlined in more detail above (section 7.2). Although I discuss the role of each variable separately, none of the variable has been identified as sufficient for a particular type of interaction.

a) Contextual conditions: Case study findings show that contextual conditions, i.e., *geographic characteristics* as well as *socio-economic role of irrigated agriculture,* are important in shaping interests of actors; and thereby also influence the emergence of *idea-based competition* and *cooperation* in the case studies. It makes, for example, a difference whether actors are located within a relatively small sub-basin (Jucar, Mediterranean Basins), or whether they all depend on each other within a large RBD (Guadalquivir). However, contextual conditions have not been identified to influence other patterns of interaction.
b) Overarching rules: Within the three case studies, overarching rules were not identified as determinants of specific patterns of interaction. Although they establish the baseline for interaction – e.g., by setting up coordination mechanisms in which actors interact, or defining formal rules based on which actors enter contractual relationships – these variables say little about what *kind* of interaction occurs. Indeed, empirical findings show that within the same governance setting, such as a Dam Release Commission, actors may either compete or cooperate with each other. This, however, depends on many other factors, such as informal rules, or actors' interests. Similarly, this study showed that if actors have high *de jure autonomy,* such as in the example of water rights reduction, the question whether and how actors coordinate – thus, whether or not they follow overarching rules – depends again on many other factors. This makes it difficult, however, to predict which type of interaction occurs.
c) Social problem characteristics: Empirical findings of the case studies underline the high importance of social problem characteristics in shaping all three pure forms of coordination. Among the different social problem characteristics, the combination of high *uncertainty* and high *asset specificity* has been identified as most salient one, followed by the *scale* at which decision-making processes are organized. However, while high *uncertainty* and high *asset specificity* imply intense needs for coordination, the type of coordination varied in the different Action Situations. In some cases, these high coordination requirements strengthened the emergence of *cooperation* (Water Rights Reduction, Jucar), but it also contributed to *gaps in interaction* (Water Rights Reduction, all cases). Furthermore, high *asset specificity* also facilitated *incentive-based hierarchy* (Increasing Irrigation Efficiency, all cases). Thus, while social problem characteristics have been highly important in the three case studies, their specific effect is very contingent and context-specific.

d) Characteristics of heterogenous actors: These variables play an important role for *cooperation* and *idea-based competition* in the case studies, but were not identified to shape other patterns of interaction. More specifically, shared *narratives* contributed to the emergence of *cooperation*, while competing *narratives* influenced *idea-based competition*. In addition, *resources of actors,* and particular a lack of human and financial resources, partly explain low levels of implementation (i.e., policy output), but they do not directly influence which pattern of interaction emerge.
e) All 7 rules developed by Ostrom (2005) in different constellations influence patterns of interaction in the case studies. In most of the cases, formal and informal rules are both important (see also below). However, *cooperation* is shaped by only informal rules, and *incentive-based hierarchy* merely by formal ones. More specifically, *payoff rules* are particularly important for *incentive-based hierarchy* and *price-based competition; aggregation rules* are mainly shaping *authority-based hierarchy,* but also *idea-based competition; scope rules* are crucial for both forms of *hierarchy;* and lastly, *position rules* play a key role in *cooperation*. For each of these rules, the concrete formulation matters. Taking the example of aggregation rules, it makes an important difference for the respective pattern of interaction whether decisions are taken unilaterally, by majority or by consensus.

Some further, more general reflections on the determinants of interaction can be made. First, the study demonstrates that only an analysis of formal and informal rules allows to meaningfully identify different patterns of interaction. This is reflected by the fact that although the three cases are embedded in similar governance systems, and are thus governed by similar formal rules, patterns of interaction between the cases often vary. This concerns, in particular, differences between (idea-based) competition and cooperation of actors. It seems reasonable that whether actors cooperate and therefore try to achieve similar aims, or rather compete among each other for influence in a political process is hardly explainable by formal rules. Case study findings show that in many instances, formal rules set the ground whether interaction takes place and who interacts in which settings; while the specific type of interaction is then often determined by informal rules. These are, in turn, shaped by actors' interests, geographic characteristics, or social problem characteristics – thus, a configuration of various interrelated variables. Indeed, interaction of the CHG and CHJ often differs, despite having the same organizational structure and being guided by same overarching political aims. This finding can be linked to theory of bureaucratic politics, postulating that administrations are political actors in their own right, and do not merely implement decisions taken by legislatures. The approach suggests that bureaucrats are driven by diverse interests and thereby considerably shape policy processes and outcomes (Hart and Wille 2012). However, this raises the question of how profound changes in water

governance – which on the one hand may not be in the interest of the respective administration, but on the other may be necessary to achieve the WFD objectives – can occur in the case studies in the near future.

In addition, and in line with Thiel and Moser (2019), empirical findings underline the relevance of social problem characteristics for understanding polycentric governance; as well as how social problem characteristics and patterns of interaction mutually influence each other. More specifically, the study illustrates how actors choose forms of interaction to deal with certain social problem characteristics, which then can lead to changes in the structure and characteristics of the problem at hand. This is exemplified by the CHJ closing contracts with WUAs to reduce water rights – which then reduced uncertainty concerning WUAs' behaviour, initially faced by the CHJ. In the scientific literature, Ostrom (2003) as well as other new institutional economists (McCann and Garrick 2014) discuss the possibility to change natural resources attributes, e.g., strengthening excludability of a good by introducing physical infrastructure. However, in the realm of (environmental) policy-making, empirical question of how characteristics of social problems and modes of coordination mutually influence each other and change over time seem to be underresearched.

Furthermore, it seems important to combine the analysis of social problem characteristics with actors' narratives, shaped by the broader context in which actors interact. Indeed, empirical findings show that social problem characteristics alone are not sufficient to explain how certain patterns of interaction evolve, but they must be examined in combination with actors' interests. Although the CHG and CHJ, for example, are confronted with almost identical problem characteristics in the context of reducing water rights, they chose different approaches for interaction as well as different coordination fora to deal with an excess of water rights. Yet, it seems that these interrelations have not been discussed much in the scientific debate. Recent literature on policy mixes, for example, discusses governance strategies to address characteristics of wicked problems (Kirschke and Kosow 2022), but does not seem to consider the politics of designing policies, such as how diverse interests of actors shape feasibility of governance strategies.

Last, concerning the iii) performance of coordination, this study shows that none of the patterns of interaction serves as panacea to solve coordination challenges in water governance. While this finding seems unsurprising, much literature is in fact based on the assumption that coordination (Pahl-Wostl 2015; OECD 2011), or cooperation and collaboration (Herzog 2020; Imperial 2005) facilitates successful water management. Also in public administration literature, coordination is often portrayed as universal remedy for problems cutting administrative boundaries (Bouckaert, Peters, and Verhoest 2010). However, I observe many nuanced differences on how patterns of interaction influence coordinated outcomes, policy outputs or environmental outcomes. Further, similar outcomes in the case studies

can often be traced back to different causal mechanisms. Nonetheless, causalities among performance indicators have been identified in the case studies. This concerns, in particular, the relationship between levels of coordinated behaviour and the environmental outcome. More specifically, the failure to incentivize water users to reduce their consumption, and to incentivize state actors to enforce such a reduction, helps explaining increases in agricultural water consumption in two cases.

The finding that there are no generalizable relationships between patterns of interaction and performance indicators confirms the study's underlying assumption that effectiveness of coordination is an empirical question; and that suitability of different coordination modes depends on many different factors. Ostrom's diagnostic approach (E. Ostrom and Cox 2010; E. Ostrom 2007) which aims at understanding under which conditions which types of governance arrangements may solve different types of environmental problems is therefore productive. To produce meaningful recommendations on how to solve coordination problems in water governance, it is thus important to consider the specific context in which governance processes are embedded. This is also the reason why I decided to not derive empirical policy recommendations based on the findings of the three case studies within the scope of this book.

Furthermore, this finding also points towards limitations of coordination. As discussed before (see Chapter 2), this study adopts the view that effectiveness of coordination is always limited due to the complexity of affected policy sectors (McGinnis 2016); and that completely coordinated outcomes are neither possible nor desirable due to the contested nature of societal aims (Greenwood 2016). This holds especially true for the political aim to reduce agricultural water consumption, which raises fundamental distributional issues. As already mentioned above, it is highly unlikely that in such a context a win-win-situation emerges where all actors benefit equally from coordination, and where thus all assess performance of coordination equally.

Despite limited knowledge on the effects of coordination, as well as its inherent limitations, I nonetheless consider coordination as a value in itself – independently of whether it leads to improved policy outputs or environmental outcomes. I do so because from a normative perspective, sharing of information in the context of policy-making, considering different and competing societal interests in governance processes, or aligning one's behaviour to overarching political and societal aims all seem fundamental for a functioning democracy. Indeed, providing information to citizens, for example, is fundamental for their participation and allows them to hold administrations accountable at a later stage. In this context, Baldwin et al. (2018) also highlight the interconnection between coordination, trust and legitimacy of governance process in polycentric systems.

7.4.2 Empirical conclusions

From an empirical perspective, the purpose of this study was to explain why the political aim to significantly reduce agricultural water consumption in the context of the WFD implementation is still far from being achieved – despite huge public efforts to increase irrigation efficiency with the overarching rationale to achieve water savings at the basin level. Scholars explain that irrigation efficiency subsidies did not achieve their objectives because "agricultural and water departments remain disconnected systems" (Lopez-Gunn et al. 2012: 91). Also in other Member States, the lack of WFD implementation is traced to a lack of cross-sectoral communication (Zingraff-Hamed et al. 2020). My study contradicts these findings, revealing that agricultural and water sectors do communicate and share information with each other in all three cases. Other scholars argue that the dominant hydraulic paradigm as well as lack of political will is the main impediment for more successful WFD implementation in Spain (Martínez-Fernández et al. 2020). On the one hand, empirical evidence from the three cases supports this finding: widespread supply- and demand-side narratives among agricultural actors and partly also RBAs help explaining why more integrated approaches of river basin management are not being pursued. However, this explanation does not uncover why these various interests in favour of the agricultural sector unfolded and ultimately prevailed in the governance process. In the following, I summarize main empirical findings to demonstrate that this can only be understood by considering the overarching polycentric governance system in which RBAs and agricultural administrations are embedded.

First, case study findings show that at the EU level, the EAFRD and the WFD do not sufficiently incentivize agricultural as well as water administrations to enforce a reduction of water consumption. First, EAFRD requirements for the granting of irrigation efficiency subsidies allow for considerable exemptions, such as the increase of irrigated surface area under certain conditions (European Court of Auditors 2021). Furthermore, the EAFRD remains unspecific concerning how "potential water savings" of water bodies in a good status, as well as "effective reduction in water use" in water bodies whose status is less than good, shall be achieved in practice (Art. 46, EAFRD). Second, the WFD also allows for exemptions and derogations (Moss et al. 2020) and its enforceability is limited, as acknowledged by the European Commission (2019a). Furthermore, although severe shortcomings are observable in Spain's RBMPs, e.g., with regards to the lack of providing real data on water consumption, efforts by the European Commission to request this data have been limited.

Second, at the national level, the legislative branch also contributes to a legal framework where RBAs are unlikely to enforce reductions of agricultural water consumption; at least if such a reduction is not consistent with water users' interests. This relates to the failure of the national governments which have been in power since 2009 – led by both, the Spanish Socialist Workers' Party, as well as the con-

servative People's Party – to change national water legislation. Since RBAs are not legally obliged to reduce water rights after increasing irrigation efficiency, water users have considerable leeway to take legal action against such a reduction. This then also increases incentives for RBAs to not implement a reduction of water rights. Indeed, also the non-binding "Green Book of Water Governance in Spain", an initiative by the National Ministry for the Ecological Transition to transform the current water governance system in Spain, asks to make the reduction of water rights obligatory (MITECO 2020d).

Third, at the regional level, there are also important deficiencies of RDPs, which are developed by agricultural administrations and approved by respective regional governments. In theory, RDPs could go beyond EAFRD requirements. However, apart from the most recent RDP of Castilla-La Mancha, there are no clear legal connections between subsidies for irrigation efficiency measures and the political aim to achieve water savings at the basin level. This may be an important reason why regional agricultural administrations in the three case studies continue to subsidize irrigation efficiency measures although being aware that water rights are not, or only partly, reduced by the respective RBAs. Considering these findings, it is surprising that although many scholars critically discuss irrigation efficiency measures and their limited effectiveness in Spain (Sampedro Sánchez 2020; López-Gunn, Mayor, and Dumont 2012), they tend to focus on the lack of water rights reduction by RBAs. However, issues such as the flawed design of the EAFRD, and the role of various actors in the polycentric governance system, from different sectors as well as different levels, have hardly been discussed.

Lastly, to understand why (significant) reductions of agricultural water consumption have not been achieved, it is to also mention the underlying conflict of interest in the context of irrigation efficiency measures between water users on the one hand, and the public providing subsidies on the other. As explained before (see Chapter 1), an increase of irrigation efficiency has the effect that more water delivered to the farm can actually be *consumed* by farmers; which motivates farmers to also make use of these additional resources (Perry 2019). However, an increase in the consumed fraction of used water also means that flows returning to the river system necessarily decrease. This is because, as Perry et al. (2009: 1518) stress, water "'losses' at the scale of an individual field or an irrigation project are not necessarily 'losses' in the *hydrological* sense because […] the 'lost' water may be available for use at some other point in the basin, or from an aquifer". Furthermore, still from the farmers' perspective, the question remains why they should be interested in reducing their consumed fraction. This holds especially true if they are confronted with high costs of investment, amortization, and of increased energy consumption, as has been the case in Spain (Berbel and Gutiérrez-Martín 2017b). On the other hand, there is the public interest to generate water savings at the basin level. Indeed, subsidies in irrigation efficiency in Spain (Embid 2017) as well as worldwide (Zwarteveen 2017)

have always been justified by the overarching objective to achieve water savings. These strongly conflicting interests reveal fundamental distributional questions: if the political and societal aim really is to reduce agricultural water consumption (and not only to make it more efficient), who will incur associated costs? And who will benefit from such a reduction – the environment? Or other water users? These questions, however, were neither resolved, nor openly discussed or acknowledged by water and agricultural administrations. Adding on that, clear visions about alternative agriculture models do not seem to exist – neither among the administration, nor WUAs or environmental and civil society organizations.

7.5 Strengths and limitations of this study

In this study, I undertook a structured comparison of three case studies, which allowed to identify causal mechanisms to explain deficiencies in achieving the WFD objectives. The selection of three cases within one country, which are all confronted by similar socio-economic and environmental challenges regarding irrigated agriculture, contributed to internal validity of the study (Cox 2015). Furthermore, the approach of analysing similar networks of adjacent Action Situations (McGinnis 2011) in the three studies enabled to not only compare findings across three cases, but also compare different Action Situations. Thereby, the number of sub-cases was increased, strengthening external validity (Cox 2015). In addition, the theoretical framework which guided the empirical analysis allowed to not only analyse a list of individual variables, but to rather focus on configurations of multiple independent and intermediate variables. This was also facilitated by the relatively high number of analysed Action Situations. Lastly, this study assessed different types of performance, including environmental performance, thereby addressing socially and politically important, yet under-researched questions.

With this study design, the study aimed at contributing to a differentiated, contextualized understanding of the different mechanisms that explain interaction of actors and their performance; and thereby to the building of middle range theories in water governance. Middle range theories are not too specific to only be of relevance for a particular case, nor are they too general to be "only superficially applicable" to many different cases (Cox 2015: n.p.). Findings of this study may therefore be of relevance to other Spanish RBDs, as well as other cases embedded in comparable polycentric water governance systems dealing with cross-sectoral and cross-level coordination in the context of water quantity.

Nonetheless, this study is not without limitations. First, at a very general level, this study took an institutional analysis approach, putting a strong emphasis on the role of formal and informal institutions in shaping behaviour of actor. However, since resources to conduct this work were limited, as is always the case, and because

my aim was to deepen a theoretical approach rather than to go into breadth, other important approaches to understand human-environment relationships were unattended. This concerns, for example, conceptualizations of power relations from a political ecology perspective – e.g., how power structures in society, as well as discourses, relationships or identities influence the access to and control over water resources (Bennett et al. 2018) – which could have been important to deepen the understanding of the case studies.

Furthermore, there are also several limitations with regards to the research process. First, cases were selected based on differences along independent and dependent variable, identified based on preliminary knowledge. However, during the in-depth analysis of the three cases, some of the initial assumptions proved to be wrong. More specifically, although data from the first and second planning cycle indicated a (slight) decrease of agricultural water consumption in the Mediterranean Basins, more recent planning documents as well as interview data show an increase in the last decade. Furthermore, while differences in *overarching rules* of inter- and intra-regional RBDs were important for case study selection, these differences played out to be of minor relevance in practice due to lack of implementation of the Andalusian Water Law. Yet, in a research process, intensive data gathering can produce results that differ from initial expectations (George and Bennett 2005).

Another limitation concerning the research process relates to the coding procedure. As mentioned above (see Chapter 3), I discussed coding scheme as well as assigned codes for the Guadalquivir case study with colleagues. However, this was not done for the other two case studies due to limited time availabilities. Thus, although some degree of inter-coder reliability could be ensured, and I also integrated learned lessons into the coding procedure of the other two case studies, this approach should have been extended to all case studies.

In addition, in relation to the assessment of variables, the use of nominal and ordinal scales and the corresponding assignment of values needs to be evaluated critically. Although I provided a detailed overview of definition of variables and their assessment scheme (see Chapter 3), thresholds can never be clear-cut, and selecting values always involves some degree of subjectivity. Furthermore, while complexity could be reduced by assigning values to the different variables – such as high, moderate, or low –, informational content is thereby reduced. Indeed, more nuanced differences between the cases thus become invisible.

A further limitation relates to the subjectivity involved in categorizing and evaluating patterns of interaction as well as performance. Regarding the former, the categorization of actors' interaction into cooperation, competition or hierarchy was not always straightforward. Indeed, whether particular behaviour is, for example, cooperative or not also depends on the perspective a researcher takes. Furthermore, also the threshold is difficult to determine: Up to what point do actors compete for

the best ideas, and when does this interaction become hierarchical because an actor unilaterally imposes his or her ideas?

Similarly, the assessment of performance also involves several challenges, already alluded to in Chapter 3. By analysing *coordinated behaviour* as main indicator for process performance, other important aspects were left out, such as the positive influence of irrigation efficiency measures on working conditions of farmers (Del Campo 2017). The question of whether behaviour is coordinated is a normative one and again depends on the perspective, as well as the scale of aggregation (Thiel, Pacheco-Vega, and Baldwin 2019). I assessed performance against the achievement of WFD objectives in relation to water quantity issues. However, individual stakeholders who participated in the different governance processes would probably evaluate processes as well as outcomes differently, depending on their interests and preferences. Lastly, it is to mention difficulties in the assessment of planning outputs and environmental outcomes due to changes in the measurement of water status, or the delineation of sub-basins and water bodies.

A last challenge relates to questions of temporality of the analysis. As McGinnis (2016: 9) argues, interaction within polycentric systems is a "radically dynamic process" that can "generate, regenerate, or transform the structures underlying polycentricity itself". However, although processes under investigation span over a decade, independent and intermediate variables were treated as static – I thus did not consider changes in independent variables, nor in patterns of interaction. Furthermore, also independent and intermediate variables can mutually influence each other and produce feedback loops, which were not examined in this study. In addition, it is to assume that the type of interaction changed within the period of observation. Indeed, due to dynamics involved in any relationship, the period of observation influences perceptions of interviewees on the respective relationship and their interaction with other actors. Lastly, also the way actors evaluate polycentric governance may change over time (Thiel and Swyngedouw 2019).

7.6 Further research

Findings from this study suggest several avenues for future research. An interesting path certainly is to apply a similar theoretical framework to other cases. First, it may be worthwhile to broaden time range and geographical coverage. By including, for example, the implementation of the third planning cycle until 2027, it would be possible to observe whether recently introduced changes in Castilla-La Mancha, such as to make a reduction of water rights compulsory, make a difference. Thereby, the effect of changes in constitutional rules – which present a further research gap – could be investigated. Broadening the time frame would also allow to better observe effects of the WFD implementation on environmental performance, since en-

vironmental changes are usually slow to become visible. Furthermore, it would be interesting to apply the framework to other countries within the EU to understand whether identified causal mechanisms in this study can also be observed in other institutional settings.

Similarly, it may be useful to apply the theoretical framework to other types of coordination problems in water governance. This study confirmed the importance of social problem characteristics; it showed that although the overall problem of reducing agricultural water consumption was identical in all cases, more specific problem characteristics of respective Action Situations differed and indeed made a difference for coordination of actors. It would be interesting to analyse coordination challenges which, for instance, do not concern fundamental distributive questions, e.g., issues of water quality instead of water quantity. In addition, applying the framework to more "successful" cases in water governance could be an interesting endeavour in order to understand whether findings of this study are particular to cases where performance is rather moderate, if at all.

Findings of this study also indicate several research gaps. This concerns first the role of hybrids in polycentric governance. More specifically, it may be fruitful to analyse determinants of particular combinations of coordination modes, such as hierarchy and cooperation, or hierarchy and competition. Furthermore, one could advance the study of hybrids from methodological and theoretical perspectives since it is not trivial to understand where pure forms of coordination end and where hybrids start. Furthermore, since categorizing patterns of interaction involves some subjectivity, sound theoretical and methodological approaches to ensure reliability of the assessment are crucial. A second research gap concerns the role of social problem characteristics in the context of environmental governance, and how modes of coordination and social problem characteristics mutually influence each other and change over time. Lastly, it may be interesting to expand research on the issue of non-coordination or policy inaction, which has been neglected so far in most of the literature on coordination.

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List of abbreviations and acronyms

acuaMed	*Aguas de las Cuencas Mediterráneas, S.M.E., S.A*
AREDA	Andalusia Irrigators Association (*Asociación de Regantes de Andalucía*)
CHG	River Basin Authority of the Guadalquivir (*Confederación Hidrográfica del Guadalquivir*)
CHJ	River Basin Authority of the Jucar (*Confederación Hidrográfica del Júcar*)
DG	Directorate-General
EAFRD	European Agricultural Fund for Rural Development
EU	European Union
ENGO	Environmental Non-Governmental Organization
Fecoreva	Federation of Water User Associations of the Valencian Community (*Federación de Comunidades de Regantes de la Comunidad Valenciana*)
FENACORE	National Federation of Irrigation Communities of Spain (*Federación Nacional de Comunidades de Regantes de España*)
FERAGUA	Feragua Association of Irrigation Communities of Andalusia (*Asociación Feragua de Comunidades de Regantes de Andalucía*)
FNCA	Foundation New Water Culture (*Fundación Nueva Cultura del Agua*)
IAD Framework	Institutional Analysis and Development Framework
IWRM	Integrated Water Resource Management
IPCC	Intergovernmental Panel on Climate Change
Mediterranean Basins	Mediterranean River Basins of Andalusia
MITECO	Ministry for the Ecological Transition and the Demographic Challenge
NAAS	Network of Adjacent Action Situations
OTW	V. Ostrom, Tiebout and Warren
RBA	River Basin Authority
RBD	River Basin District

RBMP	River Basin Management Plan
RDP	Rural Development Program
SEIASA	*Sociedad Estatal de Infraestructura Agraria S.A.*
SES Framework	Social-Ecological Systems Framework
WEF nexus	Water-Energy-Food Nexus
WFD	Water Framework Directive
WUA	Water User Association

Appendix 1: Case selection process

Table 14: Agricultural water demand in inter- and intra-regional River Basin Districts to preselect case studies

	River basins	Agricultural water demand in hm^3/year	Total water demand in hm^3/year	Agricultural water demand/ total water demand (%)
Inter-regional river basin districts located in Spanish territory	***Guadalquivir***	3,374.7	3,797.6	88.8
	Segura	1,487.1	1,692.9	87.8
	Jucar	2,580.6	3,240.8	79.6
	Western Cantabrian	99.8	461.5	21.6
Intra-regional river basins	***Mediterranean basins of Andalusia***	983.3	1392.7	70.6
	Guadalete-Barbate	306.8	438.2	70
	Tinto-Odiel-Piedras	191.8	309.2	62
	Canary Islands (Includes 7 RBDs)	210.7	455	46.3
	Balearic Islands	103.3	252.9	40.8
	Catalonia	378.8	1,046.4	36.2
	Galicia Costa	52.3	368.8	14.1
	Eastern Cantabrian	99.8	461.5	21.6

Source: Own calculations based on CEDEX 2017: 57–58. Italics refers to RBDs with more than 50% of agriculture water demand compared to total water demand. Transboundary RBDs are excluded.

Table 15: Changes in agricultural water use in pre-selected River Basin Districts for final case study selection

	River basin Districts	Agricultural water use 2009 (hm^3)	Agricultural water use 2016/17 (hm^3)	Change 2009–2015
Pre-selected inter-regional river basin districts	***Guadalquivir***	2,569	2,792	+ 8.7%
	Jucar	1,412	1,386	- 1.8%
	Segura	1,105	1,293	+ 17%
Pre-selected intra-regional river basins	***Mediterranean Basins of Andalusia***	824	817*	- 0.8 %
	Guadalete-Barbate	319	304	- 4.9 %
	Tinto-Odiel-Piedras	149	170	+ 14.3 %

Source: Own calculations based on RBMPs of the first and third planning cycle. RBDs in italics were selected for the empirical analysis. *Refers to year 2015. More recent numbers are not available.

Appendix 2: List of interviews

Table 16: List of interviews

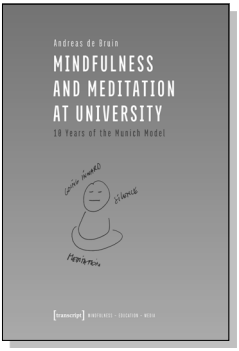
Interview	Date	Place	No.
Scoping interviews			
Civil Society Organization 1	19.10.2017	Madrid	1/2018
University of Cordoba	05.06.2018	Cordoba	2/2018
University of Sevilla	07.06.2018	Sevilla	3/2018
Civil Society Organization 2	11.06.2018	Sevilla	5/2018
Polytechnic University of Valencia	08.07.2019	Valencia	14/2019
Private water management company	09.07.2019	Valencia	15/2019
Guadalquivir case study			
Agricultural Organization Andalusia 1	07.06.2018	Sevilla	4/2018
Agricultural Organization Andalusia 2	08.06.2018	Sevilla	6/2018
Water User Association Guadalquivir 1	11.06.2018	Sevilla	7/2018
Regional Department of Agriculture, Fisheries and Rural Development of Andalusia 1 (*Consejería de Agricultura, Pesca y Desarrollo Rural de la Junta de Andalucía*)	11.06.2018	Sevilla	8/2018
River Basin Authority Guadalquivir 1 (*Confederación Hidrográfica del Guadalquivir*, CHG)	11.06.2018	Sevilla	9/2018
Water User Association Guadalquivir 2	12.06.2018	Phone interview	10/2018
Environmental non-governmental organization Andalusia 1	12.06.2018	Hinojos	11/2018
Environmental non-governmental organization Andalusia 2	12.06.2018	Sevilla	12/2018

Agricultural Organization Andalusia 3	29.10.2018	Sevilla	13/2018
Regional Department of Agriculture, Fisheries and Rural Development of Andalusia II (*Consejería de Agricultura, Pesca y Desarrollo Rural de la Junta de Andalucía*)	30.10.2018	Sevilla	14/2018
Water User Association Guadalquivir 3	31.10.2018	Sevilla	15/2018
Water User Association Guadalquivir 4	08.11.2018	Sevilla	17/2018
Water User Association Guadalquivir 5	09.11.2018	Isla Mayor	18/2018
River Basin Authority Guadalquivir II (*Confederación Hidrográfica del Guadalquivir*, CHG)	12.11.2018	Sevilla	19/2018
Environmental non-governmental organization Andalusia 3	06.06.2018	Castril	*Excluded of analysis*
Private actor	11.06.2018	Puebla del Río	
Mediterranean River Basins case study			
Water User Association Med. Basins 1	06.11.2018	Granada	16/2018
Defensor del Pueblo Andaluz (Andalusian Ombudsman)	19.06.2019	Sevilla	1/2019
Regional Department of Agriculture, Fisheries and Rural Development of Andalusia, Directorate-General Planning and Water Resources (*Consejería de Agricultura, Pesca y Desarrollo Rural de la Junta de Andalucía, Dirección General de Planificación y Recursos Hídricos*)	20.06.2019	Sevilla	2/2019
Environmental non-governmental organization Almeria 1	25.06.2019	Almería	3/2019
Civil Society Organization Almeria	25.06.2019	Almería	4/2019
Local government of Almeria	26.06.2019	Almería	5/2019
Territorial Delegation of Agriculture, Livestock and Fisheries in Almeria *(Delegación Territorial de Agricultura, Ganadería y Pesca en Almería)*	27.06.2019	Almería	6/2019
Universidad de Granada	28.06.2019	Granada	7/2019
Environmental non-governmental organization Almeria 2	01.07.2019	Almería	8/2019
Water User Association Med. Basins 2	01.07.2019	Almería	9/2019
Water User Association Med. Basins 3	02.07.2019	Nijar	10/2019
Agricultural Organization Malaga	03.07.2018	Malaga	11/2019

Water User Association Med. Basins 4	04.07.2019	Alhaurín	12/2019
Agricultural Organization Almeria	05.07.2019	Vícar	13/2019
Jucar case study			
River Basin Authority Jucar I (*Confederación Hidrográfica del Júcar*, CHJ)	24.09.2019	Valencia	16/2019
Civil Society Organization Valencia	24.09.2019	Valencia	17/2019
River Basin Authority Jucar II (*Confederación Hidrográfica del Júcar*, CHJ)	25.09.2019	Valencia	18/2019
Dirección General del Agua Generalitat Valenciana	26.09.2019	Valencia	19/2019
Regional Department of Agriculture, Rural Development, Climate Emergency and Ecological Transition of Valencia, Directorate General of Agriculture, Livestock and Fisheries *(Conselleria de Agricultura, Desarrollo Rural, Emergencia Climática y Transición Ecológica de la Generalitat Valenciana, Dirección General de Agricultura, Ganadería y Pesca)*	27.09.2019	Valencia	20/2019
Water User Association Jucar 1	27.09.2019	Valencia	21/2019
Water User Association Jucar 2	30.09.2019	Valencia	22/2019
Environmental non-governmental organization Valencia 1	30.09.2019	Alboraya	23/2019
Water User Association Jucar 3	01.10.2019	Villena	24/2019
Regional Department of Agriculture, Water and Rural Development of Castilla-La Mancha, Water Agency *(Consejería de Agricultura, Agua y Desarrollo Rural de la Junta de Comunidades de Castilla-La Mancha, Agencia del Agua)*	03.10.2019	Toledo	25/2019
Regional Department of Agriculture, Water and Rural Development of Castilla-La Mancha (*Consejería de Agricultura, Agua y Desarrollo Rural de la Junta de Comunidades de Castilla-La Mancha)*	03.10.2019	Toledo	26/2019
River Basin Authority Jucar III (*Confederación Hidrográfica del Júcar*, CHJ)	07.10.2019	Valencia	27/2019
Environmental non-governmental organization Valencia 2	02.10.2019	Valencia	28/2019
Water User Association Jucar 4	01.10.2019	Albacete	29/2019

National level *(addressing several River Basin Districts)*			
State Society for Agricultural Infrastructure (*Sociedad Estatal de Infraestructura Agraria S.A.*, SEIASA).	16.11.2018	Madrid	20/2018
Environmental non-governmental organization Spain	16.11.2018	Madrid	21/2018
Ministry for the Ecological Transition and the Demographic Challenge (*Ministerio para la Transición Ecológica y el Reto Demográfico*)	19.11.2018	Madrid	22/2018

Social Sciences



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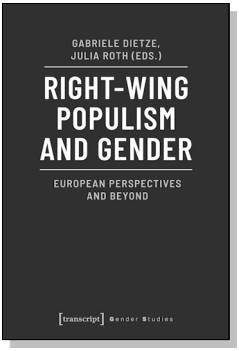

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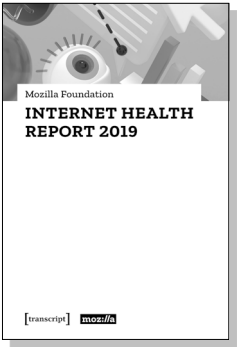

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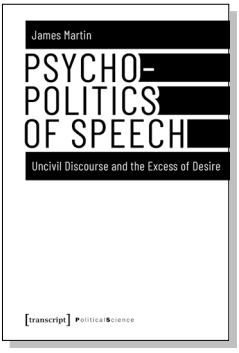

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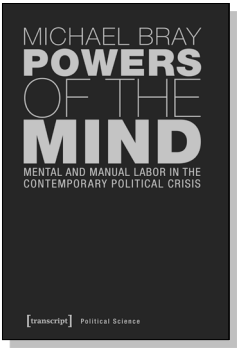

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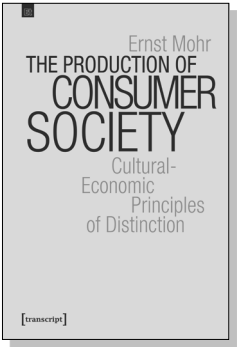

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