7. Comparative Analysis and Conclusion

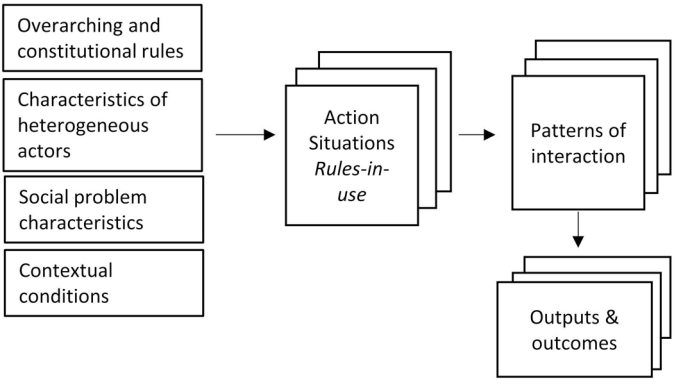
The aim of this study is to understand governance processes and their performance in the context of the implementation of the European Union (EU) Water Framework Directive (WFD) in Spain, focusing on the reduction of agricultural water consumption. Three sub-questions structured my study, namely: i) 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.