1. Introduction

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

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

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

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

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

1.1 Applying polycentricity to the study of coordination in water governance

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

Many scholars take a normative approach to polycentricity, arguing that polycentric governance is conducive for strengthening coordination of competing resource uses (Kellner, Oberlack, and Gerber 2019), improving institutional fit (Carlisle and Gruby 2017), or more generally, for supporting sustainable use of resources (Pahl-Wostl 2015). This study, however, adopts the view that all governance arrangements and political systems are polycentric (Berardo and Lubell 2019); and, that polycentric governance is not a panacea, but that its performance has to be rigorously studied (E. Ostrom 2010b). Given this background, this study builds on the polycentricity framework developed by Thiel et al. (2019: 10), who use polycentricity as a "lens for viewing the world". This book thereby aims to analyse interactions of diverse decision-making centres at multiple scales; the role of, inter alia, environmental contexts, formal and informal rules, and characteristics of social problems; as well as how these actors ultimately perform in terms of producing and providing public goods and services (Thiel, Blomquist, and Garrick 2019).

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

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

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

1.2 Empirical research context

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

Implementation of the Water Framework Directive

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

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

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

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

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

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

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

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

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

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

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

Increasing irrigation efficiency and the "lack of coordination"

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

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

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

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

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

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

In this context, it is important to understand the physical water cycle in agriculture. Agricultural water use consists of a consumed fraction (i.e., evaporation and transpiration), which is consumed for growing crops; as well as a non-consumed fraction (Perry 2019). The latter can be subdivided in a recoverable fraction and a non-recoverable fraction. The recoverable fraction consists of flows which return to the river system, and which can therefore be used either by downstream users or for environmental uses, such as environmental flows or aquifer recharges. The non-recoverable fraction is understood as water that is lost for further uses, such as water flowing to the sea, or into deep aquifers that cannot be exploited either for economic or physical reasons (Perry 2019).

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

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

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

Scholars explain the lack of water rights reduction with deficiencies in cross-sectoral and cross-level coordination (Lopez-Gunn et al. 2012; Corominas and Cuevas 2017); and also among policy-makers, this is a recurring claim. In an interview with a representative from the Ministry for the Ecological Transition and the Demographic Challenge, the interviewee even states: "I think that it's difficult that this [problem of coordination] is as big as in Spain" (Interview 22/2018). Yet, also in other Member States, the failure to achieve environmental objectives of the WFD is explained by weakness in cross-sectoral communication and collaboration (Zingraff-Hamed et al. 2020). Despite this frequently mentioned criticism, it remains unclear where exactly these gaps in day-to-day decision-making regarding coordination of increasing irrigation efficiency and reducing water rights arises (Schütze, Thiel, and Villamayor-Tomas 2022); as well as which actors in the polycentric governance system are responsible for it, and what the underlying reasons are. Against this background, this work aims to open the "black box" of coordination between the water and agricultural sector, uncovering reasons and underlying incentive mechanisms that explain behaviour of actors.

Increasing water supply through desalination

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

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

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

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

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

1.3 Aims and outline of the book

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

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

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

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

The theoretical framework and research design is applied to the Guadalquivir, Jucar, and the Mediterranean Basins. Since these three RBDs are all situated in Spain, the broader socio-economic and institutional context in which cases are embedded is held constant, thereby facilitating the uncovering of causalities. Within Spain, I select cases that vary on an independent as well as on a dependent variable; with the overall aim to identify various causal pathways that may lead to an outcome (Gerring and Cojocaru 2016; Gerring 2006). More specifically, the three cases have different governance structures, with the Guadalquivir and the Jucar being so-called inter-regional RBDs, governed by the national level; and the Mediterranean Basins as intra-regional RBD governed by the regional government of Andalusia. Furthermore, the cases show different rates of environmental performance: while in the Guadalquivir, agricultural water consumption has increased in the last decade despite huge investments in irrigation efficiency measures (CHG 2013; 2020a), a slight decrease of agricultural water consumption is reported for the Jucar (CHJ 2014a; 2019a) and the Mediterranean Basins (Junta de Andalucía 2014a; 2019a). These slight reductions are nonetheless not sufficient to achieve the environmental objectives of the WFD and water resources continue to be overexploited also in the latter two cases.

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

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

1.4 Structure of the book

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

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

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

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

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

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