6. Empirical Analysis of the Mediterranean Basins of Andalusia

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

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

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

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

6.1 Independent variables specific to the case study

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

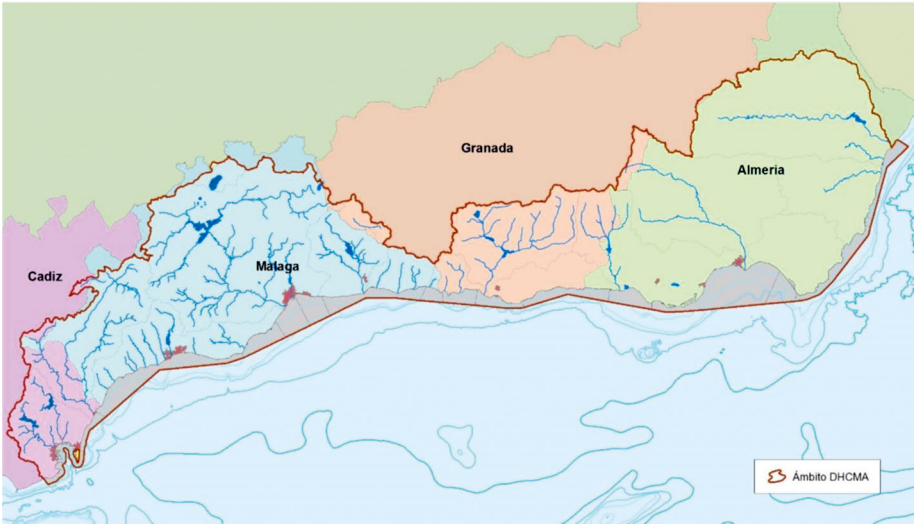
6.1.1 Contextual conditions

Geographic and hydrological characteristics of the River Basin District

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

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

Figure 8: Map of the Mediterranean Basins of Andalusia



Source: Junta de Andalucía (2014)

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

Socio-economic role of irrigated agriculture

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

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

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

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

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

Water supply and demand

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

Table 9: Water supply in the Andalusian Mediterranean Basins

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

Source: Based on Junta de Andalucía 2015b: 101

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

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

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

6.1.2 Characteristics of heterogeneous actors

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

Financial and human resources of actors

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

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

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

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

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

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

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

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

Narratives on water management

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

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

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

6.2 Analysing and evaluating Action Situations

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

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

6.2.1 Development of the River Basin Management Plan

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

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

Independent variables specific to the Action Situation

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

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

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

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

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

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

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

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

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

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

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

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

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

Pattern of interaction (2): Cooperation

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

Performance assessment

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

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

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

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

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

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

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

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

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

6.2.2 Management Committees

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

Independent variables specific to the Action Situation

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

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

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

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

Pattern of interaction: Information exchange

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

Performance assessment

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

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

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

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

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

6.2.3 Increasing irrigation efficiency

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

Independent variables specific to the Action Situation

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

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

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

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

Pattern of interaction: Incentive-based hierarchy

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

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

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

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

Performance assessment

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

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

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

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

6.2.4 Demand and supply of desalinated water

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

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

Independent variables specific to the Action Situation

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

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

Pattern of interaction: Hybrid of hierarchy and competition

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

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

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

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

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

Performance assessment

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

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

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

6.2.5 Reduction of water rights

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

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

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

Independent variables specific to the Action Situation

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

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

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

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

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

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

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

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

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

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

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

Pattern of interaction (2): Gap in interaction

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

Performance assessment

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

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

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

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

6.3 Performance across Action Situations

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

Process performance across Action Situations

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

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

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

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

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

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

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

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

Policy output performance

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

Environmental outcome performance

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

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

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

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

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

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