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Groundwater Dimensions 6

Institutional Bricolage Processes of Irrigated Agriculture in Eastern Mancha, Spain

A Critical Institutionalism Study

Tatiana Molano

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Groundwater Dimensions is a publication series of the junior research group regulate – Regulation of groundwater in telecoupled social-ecological systems. The German Federal Ministry of Education and Research (BMBF) is funding regulate within the framework of the strategy “Research for Sustainability” (FONA) www.fona.de/en as part of its social-ecological research funding priority, funding no. 01UU2003A. regulate is part of the funding program “junior research groups in the field of Social-Ecological Research”. The responsibility for the content of this publication lies with the author.

Groundwater is one of the most important sources of drinking water worldwide and a key resource for food production. As a habitat for endemic species, it is also characterized by a unique biodiversity. Groundwater plays an important role for humans and the ecosystem alike. At the same time, it is threatened by climate change, and is subject to overuse and pollution. Here, influencing factors that lie beyond the boundaries of local social-ecological systems play a significant role. The aim of this series is to collect different perspectives on how groundwater bodies in Europe are (or can be) affected and shaped. These include hydrological, geographic, ethnographic and ecological, as well as inter- and transdisciplinary approaches.

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A Critical Institutionalism Study

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Abstract

Previous studies on irrigation and groundwater governance have largely focused on the actions of governments, overlooking how local practices and collective action inform governance dynamics in the context of water scarcity challenges (Zwarteveen et al., 2021; Chitata et al., 2023). Moreover, empirical findings indicate that the effects of designed irrigation institutions on governance outcomes may be overestimated (Wang et al., 2018). Consequently, further investigation is required to ascertain the impact of human actions on institutions within the local context. This thesis aims to bridge that knowledge gap by investigating the manner in which the interaction between local actors and formal institutions addressing water scarcity drives institutional bricolage processes in the context of irrigated agriculture in Eastern Mancha, Spain. The research utilizes an exploratory case study strategy, having the irrigation schemes of the region as the unit of analysis. The results of the analysis indicate that the interaction between irrigators and the introduction of formal institutions addressing water scarcity triggered processes of institutional bricolage, consequently driving changes in the local institutional framework. However, this study also identifies localized processes of bricolage that occur under different circumstances. While this study does not evaluate the outcomes of groundwater management, it provides a foundation for understanding institutional responses to challenging environmental conditions.

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1 Introduction

This study explored institutional dynamics under conditions of water scarcity in Eastern Mancha, Spain. Previous studies on irrigation and groundwater governance have largely focused on the actions of governments, overlooking how local practices and collective action inform governance dynamics in the context of water scarcity challenges (Zwarteveen et al., 2021; Chitata et al., 2023). Moreover, empirical findings indicate that the effects of designed irrigation institutions on governance outcomes may be overestimated (Wang et al., 2018). Consequently, further investigation is required to ascertain the impact of human actions on institutions within the local context. This thesis aimed to bridge that knowledge gap by shifting the focus to the dynamics of the interactions between water users and formal institutions addressing water scarcity challenges, emphasizing local logics and practices. In doing so, the analysis sheds light on how local institutional bricolage processes shape water governance. This introduction discusses the study's context, outlines the research's problem, aims, objectives, and questions, and articulates its significance.

Eastern Mancha is a region situated within the Júcar River Basin in southeastern Spain, which is subject to water scarcity as a consequence of a number of contributing factors. The region's climate is semi-arid and continental, exhibiting considerable variation in temperature throughout the year (Sanz et al., 2019). The region's monthly temperatures range from 6 degrees Celsius in the winter to 22 degrees Celsius in the summer. The region experiences extreme weather conditions, with an average of approximately 350 millimeters of precipitation annually (ibid.). As is the case with the majority of semi-arid Mediterranean areas, Eastern Mancha is frequently subject to drought and flooding (Eurisy, 2024).

The climate of Eastern Mancha is conducive to the cultivation of a variety of crops that are predominantly irrigated with groundwater from the Eastern Mancha aquifer (Marcos-Garcia et al., 2023). These crops include cereals, which occupy 40% of the irrigated area, vineyards, which account for 15%, and vegetables, which occupy 18%. Agricultural holdings in the area exceed 60 hectares (ibid.). The increasing water demand for irrigation for the last 40 years caused a drop in groundwater levels, threatening the conservation of the aquifer (Eurisy, 2024). Piezometric levels have declined by approximately 80 meters in some areas (Sanz et al., 2019).

Moreover, the excessive pumping before 2000, estimated at over 500 Mm3/year, altered the relationship between the Júcar River and the Eastern Mancha aquifer (Marcos-Garcia et al., 2023), causing not only reduced water availability in the region but also downstream (Sanz et al., 2019). This has contributed to heightened tensions between the primary agricultural regions within the basin (ibid.). Despite a decrease in pumping rates to 280–300 hm^3/year over the past decade (Marcos-Garcia et al., 2023), low water availability will likely persist, given that agriculture represents the main economic activity in the region.

Since the 1980s, the national water policy has included measures to regulate the use of water (Sanchis-Ibor et al., 2022, p. 98). However, in conjunction with agricultural policies, it has facilitated the consolidation of irrigated agriculture within the country (Sanz et al., 2019). The persistence of these measures in promoting irrigation, coupled with their laxity in controlling its expansion, has resulted in the overallocation of water rights in numerous river basins, which has contributed to processes of basin closure (Sanchis-Ibor et al., 2022, p. 98). In the Júcar River Basin, the Eastern Mancha aquifer exhibits an imbalance between the rates of water abstraction and recharge. The current rate of water abstraction for irrigation is estimated to be 300 hm^3 per year, while the estimated recharge rate is 275 hm^3 per year (Royal Decree 35/2023).

Furthermore, water scarcity could be further exacerbated by climate change. The IPCC Sixth Assessment Report (2023) indicates that Europe's warming will continue to increase at a faster rate than the global average, with significant implications for southern regions. The report identified several

potential risks, including increased water demand, agricultural production losses, and water scarcity (IPCC, 2023, p. 1819). Moreover, as global warming intensifies, the frequency and severity of climate extremes increase, thereby elevating the risk of droughts and heavy rain events (IPCC, 2023, p. 1517). The Mediterranean region is a particularly vulnerable area due to its combination of multiple strong climate hazards. This makes it a hotspot for highly interconnected climate risks (IPCC, 2023, p. 2235).

It is important to note that despite the existence of regulations addressing water scarcity, which water users are legally obliged to comply with, the public administration has limited capacity to oversee the implementation of these institutions at the local level. Due to the robust organization of irrigators in Eastern Mancha into a Users' Community, they are entrusted with specific public responsibilities. However, it remains unclear how the formal institutions interact with the agency of actors when it comes to governing on the ground.

Consequently, in accordance with critical institutionalism, which posits that institutions are dynamic entities that are operationalized by human actions, and that there is no straightforward relationship between institutional form and outcomes (Cleaver & de Koning, 2015), this thesis adopted a critical institutionalism approach. Specifically, the conceptual framework of institutional bricolage, as outlined by De Koning (2011), was employed in order to elucidate these dynamics. This approach focuses on the interactions between actors and institutions at the local level, which is particularly pertinent in this case.

Accordingly, the objective of this research was to investigate the dynamics between local actors and formal institutions addressing water scarcity in the context of irrigated agriculture in Eastern Mancha. To this end, the study examined the manner in which the interaction between actors and formal institutions drives institutional bricolage processes in this context. It was beyond the scope of this study to examine the outcome of these institutions in terms of sustainability. Instead, it provides a foundation for understanding the institutional responses to challenging environmental conditions.

This study employed a qualitative approach to gain a comprehensive understanding of the processes of institutional bricolage and the underlying drivers. To this end, the research utilized an exploratory case study research strategy to examine these processes in the context of Eastern Mancha, Spain. This method allowed for capturing nuances, patterns, and latent elements that other research methods may overlook. By focusing exclusively on Eastern Mancha, the researcher gained insights into the formal institutional framework, actors' roles, resources, and practices, as well as the local institutional structure in which they are embedded.

1.1 Research Objectives and Research Questions

General objective:

1. The general research objective is to examine how the interaction between local actors and formal institutions addressing water scarcity drives institutional bricolage processes, in the context of irrigated agriculture in Eastern Mancha, Spain.

Specific objectives:

2. Analyze the structure and function of the formal institutional framework addressing water scarcity in Eastern Mancha.
3. Identify the local actors involved in processes of institutional bricolage.
4. Characterize the specific processes of aggregation, alteration, and articulation that emerge as a result of the interaction of local actors with formal institutions addressing water scarcity.

The research questions addressed in this study are:

1. Main research question: How does the interaction of local actors with formal institutions addressing water scarcity, in the context of irrigated agriculture in Eastern Mancha, Spain, drive institutional bricolage processes?

Specific research questions:

2. What is the formal institutional structure addressing water scarcity in Eastern Mancha, and how does it function?
3. What are the local actors involved in the processes of institutional bricolage?
4. What are the processes of aggregation, alteration, and articulation that emerge as a result of the interaction of local actors with formal institutions addressing water scarcity?

In summary, the first chapter elaborated on the study's context, objectives, questions, and the significance of the study for understanding institutional bricolage processes in the local context. The second chapter develops the theoretical framework, introducing institutional bricolage and the concepts selected for the study. The third chapter presents the research process in detail. It discusses the research philosophy, strategy, and methods, as well as the rationale for adopting a qualitative, inductive research approach. The fourth chapter delves into the research findings. Following the research questions, it touches on the formal institutional framework, actors, and processes of bricolage. The fifth chapter discusses these findings in light of previous institutional literature and outlines the limitations of the study. Finally, the sixth chapter presents the concluding remarks.

2 Theoretical Framework

This chapter presents the theoretical framework underlying the current study. It begins by introducing the critical institutionalism approach, followed by the conceptual framework of institutional bricolage and justifying its suitability for achieving the research objectives. The chapter then outlines the key concepts selected and explains how they are operationalized in the context of this study.

2.1 Critical Institutionalism

Critical institutionalism emphasizes the multi-scale complexity of institutions embedded in everyday social life (Cleaver & de Koning, 2015). These institutions are understood to have been shaped by creative human actions over time, and to exist in a dynamic interplay between formal and informal arrangements. Institutions are dynamic in that they are operationalized by human actions, and there is no straightforward relationship between institutional form and outcomes. Furthermore, institutions are not constrained by their design and do not exist in a vacuum (Wang et al., 2021). Rather, they frequently adapt, transform, and evolve in response to changes in their context. Building on this, Cleaver (2002, 2012) and De Koning (2011, 2014) present a relational approach, that attributes the outcome of institutional diversity to processes of bricolage, in which institutions are constantly invented, modified, and restructured in different ways.

2.2 Institutional Bricolage

In the context of natural resource management, institutional bricolage provides a conceptual framework to unpack the complex dynamics between actors and institutions. As Cleaver (2002) asserted, institutional bricolage is a powerful research tool that investigates how mechanisms for resource management and collective action are borrowed or constructed from existing institutions, styles of thinking, and sanctioned social relationships. In simpler terms, institutional bricolage refers to the process of modifying the nature and significance of rules, norms, and beliefs, which has the potential to impact local resource practices (De Koning, 2011).

According to Cleaver and De Koning (2015), institutional bricolage is a process that involves the conscious and unconscious assembly and modification of institutions through the utilization of available resources, regardless of their original purpose. This process entails the repurposing of existing institutions or the invention of new ones through the reuse, reworking, or refashioning of institutional components derived from diverse origins, with the objective of performing new functions. The resulting institutions are a combination of new and pre-existing elements, including habitual and adapted practices, as well as invented or borrowed organizational arrangements. In order to gain traction and legitimacy, these reworked arrangements must be familiar and fit into the accepted logics of practice and social relations (ibid.). As observed by Marin and Bjorkland (2015), institutions can be influenced by a number of factors, including changes in the political environment, discourses, and institutional arrangements over time.

Furthermore, actors play a pivotal role in institutional bricolage (De Koning, 2011). As Cleaver (2000, 2002) pointed out, actors are social agents who are deeply embedded in their social lives yet capable of analyzing and responding to the challenges they face. Individuals modify existing institutional arrangements within the constraints of their resources and social circumstances, while adhering to what is perceived as legitimate (ibid). Subsequently, "bricoleurs" are defined as actors who possess authoritative resources that aid them in achieving institutional positions or exerting influence (Cleaver, 2002). These resources can stem from socio-political status, economic resources, and personal qualities such as knowledge, eloquence, or strength (ibid.). Nevertheless, as observed by de Koning (2011),

individuals possess varying degrees of agency in their capacity to influence and modify institutions, contingent upon their available resources.

In addition, historical trajectories are crucial for understanding the processes of institutional bricolage, as they influence the development of contemporary institutions (Cleaver & de Koning, 2015). As Cleaver and De Koning (2015) noted, governance arrangements do not simply follow one another in a linear fashion. Consequently, contemporary institutional configurations may draw on the discourses and meanings of earlier periods in a patchy manner in response to the external environment or internal views (Shepsle & Bonchek 1997; Cleaver, 2002, as cited in De Koning, 2011). The concept of path dependency serves to elucidate how institutions are constituted through the sedimentation of governance arrangements in institutional bricolage analyses (Van der Heijden, 2011; Peters et al., 2012, as cited in Cleaver, 2012). In addition, the preceding period also affects the scope for invention, negotiation, and resource allocation (Sehring, 2009; Upton, 2009; De Koning, 2011, as cited in Cleaver & de Koning, 2015).

It is acknowledged that irrigation schemes often operate differently than intended, both in terms of the level of production, for instance, water consumption or crop yields, as well as in everyday functioning (Chitata, 2022). To ascertain whether this situation applies to the case of Eastern Mancha and to address the specific objectives, the concept of institutional bricolage was employed to identify formal institutions and informal institutions embedded in everyday practices and to identify potential entanglements between the two.

Moreover, the institutional bricolage perspective enables an investigation of the sociopolitical, economic, and environmental factors that either facilitate or impede the implementation of formal institutions addressing water scarcity at the local level. This provides insights into the potential conditions conducive to successful institutional implementation, as proposed by Heckathorn (1996, in Rica, 2012). Figure 1 is the graphical representation of De Koning's (2011) institutional bricolage framework, which will be explained in the next section.

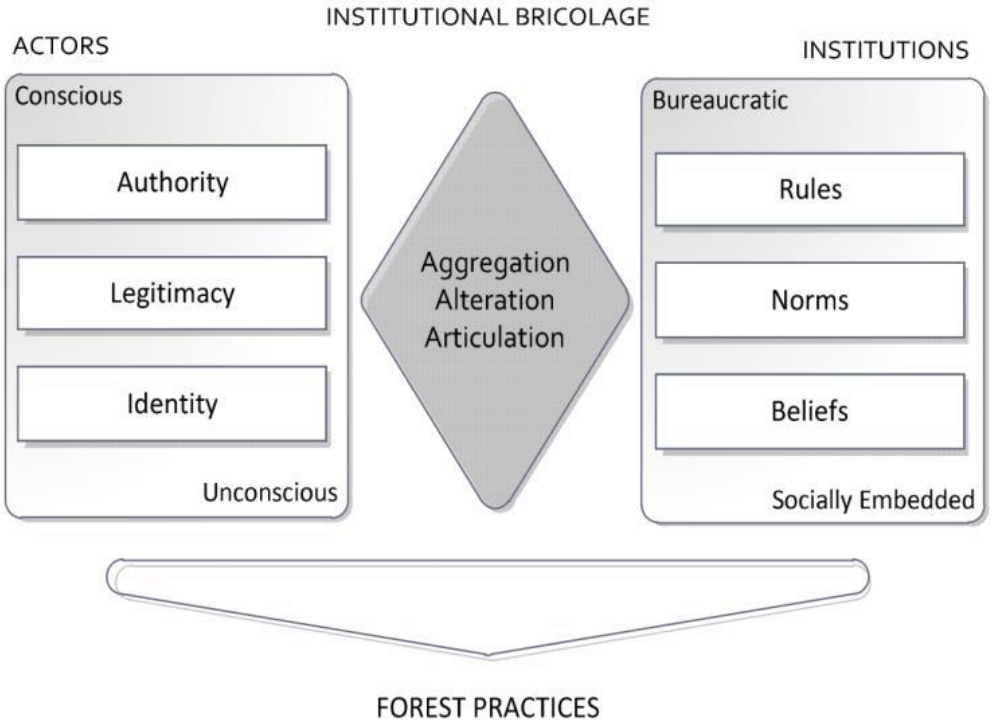

Figure 1: Institutional bricolage as a conceptual framework Source: De Koning (2011)

2.3 Conceptual Framework

This research was based on de Koning's (2011) comprehensive analysis of bricolage processes. In this section, the researcher delineates the principal concepts guiding the analysis and elucidates how she operationalized them to explore institutional bricolage processes under conditions of water scarcity in Eastern Mancha.

2.3.1 Institutions

This approach suggests that institutions not only constrain human agency but also enable it (Cleaver, 2002). Consequently, institutions serve as boundaries that actors subsequently alter. The concept of institutional bricolage underscores the importance of examining the nature and dynamics of institutional formation and adaptation at the local level. In accordance with this perspective, De Koning (2014) distinguished between two types of institutions: newly introduced institutions, which are often formal and introduced by the government, and socially embedded institutions, which are informal and already existing. De Koning (2011) defined formal institutions as arrangements based on specific organizational structures, contracts, and legal rights. Such institutions are typically established by external organizations, such as governments, development agencies, or non-governmental organizations (NGOs). In contrast, informal institutions are based on culture, social organization, and practices that have existed within the community for a certain amount of time, making them socially embedded (ibid.).

To comprehend the dynamic mechanism through which actors engage and shape groundwater governance, it was essential to identify the institutions surrounding irrigation practices in Eastern Mancha. To this end, the researcher conducted an examination of the structure and function of the formal institutional framework addressing water scarcity. This entailed an analysis of the different governmental entities involved, the legal framework, and the relevant policies. With regard to socially embedded institutions, the researcher investigated the norms and beliefs associated with irrigation practices held by the relevant actors. Given that socially embedded institutions are more implicit due to their association with routinized practices, the researcher did not consider them as separate from the actors and processes of institutional bricolage but integrated them into the latter's analysis.

2.3.2 Actors

The role of actors in institutional bricolage processes is of crucial importance (De Koning, 2011). For Cleaver (2002), actors are social agents capable of analyzing and reacting to challenging situations, whose responses to institutions are not merely rational and predictable. Actors possess a set of embedded understandings linked with ethical norms, beliefs, and traditions that inform their actions and behaviors (De Koning, 2011). These norms and beliefs exert a comparable influence on natural resource practices to that of rational survival strategies or actions based on expediency (ibid.).

Bricoleurs are actors who engage in institutional bricolage processes and possess authoritative resources (Cleaver, 2002). These attributes confer institutional position or influence upon the actors in question, and may be attributed to their socio-political position, economic resources, or personal characteristics (De Koning, 2011). The greater the number of authoritative resources an actor possesses, the more they are able to draw upon these attributes to reshape institutions. Individuals with a large number of resources may become local agents of change and influence the entire community. Conversely, individuals with fewer authoritative resources are less likely to play a significant role in bricolage processes (ibid.).

Given the focus of this study on the local institutional dynamics within which irrigated agriculture is embedded, it was essential to identify the actors who interact with the newly introduced formal institutions, as it is through this interaction that bricolage processes emerge. For analytical purposes, the term "actor" is used to refer to both individual and composite actors (groups of individuals), who engage in irrigation practices, other than governmental entities. In order to ascertain whether the actors in question could be considered bricoleurs, the researcher identified their authoritative resources, including their socio-political position, economic resources, or knowledge. It should be noted that no other personal characteristics were considered in this study.

2.3.3 Processes of Institutional Bricolage

De Koning (2011, 2014) suggested that the introduction of formal institutions into local settings can result in three distinct processes: aggregation, alteration, and articulation. Aggregation is the process of combining formal institutions with socially embedded institutions. This can result in the creation of multipurpose institutions that serve multiple functions. This process entails the deliberate or unintentional incorporation of formal institutions into existing social structures (ibid.).

The alteration process involves the adaptation of institutions to fit better specific circumstances (De Koning, 2011, 2014). This can entail the bending, renegotiation, or outright ignoring of rules to better correspond with existing informal institutions (Cleaver, 2002). This process can occur with both newly introduced institutions and socially embedded institutions (De Koning, 2011). When actors fail to acknowledge or engage with formal institutions, they tacitly accept their existence but may consider them inapplicable to the local situation. Consequently, this process is more deliberate and conscious (ibid.).

Finally, articulation occurs when newly introduced institutions conflict with socially embedded institutions (De Koning, 2011). In this process, actors make claims on traditions, which relate to routinized practices and notions of how actors have usually done things (Cleaver, 2002). The articulation of locally embedded institutions serves to act as a barrier to the introduction of formal institutions. This process may appear deliberate, particularly when actors perceive that their identity is at risk due to the introduction of new and often restrictive regulations. When new formal institutions fail to align with established practices associated with this understanding, they are often actively rejected (De Koning, 2011).

Given that the aim of this study was to examine the intricate institutional dynamics that govern irrigated agriculture, particularly in the context of water scarcity challenges, the analysis focused on the institutional bricolage processes that emerged in situations of water scarcity. This approach allowed for a deeper understanding of how institutions are formed, evolve, and adapt at the local level, and the various factors that drive these changes. Table 1 summarizes the conceptual framework.

Table 1. Conceptual framework adapted from De Koning (2011).

Concept	Category	Subcategory	Specifications
Institutions	Formal institutions	Government agencies	Ministry for the Ecological Transition and the Demographic Challenge, Community Board of the Autonomous Community Castilla-La Mancha, Júcar River Hydrographic Confederation.
		Laws	1985 Water Law.
		Policies and projects	River Basin Management Plan (2022-2027), Exploitation Plans, creation of the Central Board of Irrigators.
	Informal institutions	Social norms	Traditional norms associated with irrigation practices.
		Beliefs	Rationales that underpin the traditional norms and irrigation practices.
Actors	Composite	Central Board of Irrigators	Junta Central de Regantes de la Mancha Oriental.
		Irrigators Community not affiliated with the Central Board of Irrigators	Comunidad de regantes de Jorquera-La Recueja
	Individual	Members of either of the aforementioned irrigator communities	No further specifications.
Bricolage Processes	Aggregation	Aggregation of formal and socially embedded institutions	No further specifications.
	Alteration	Alteration of formal institutions	No further specifications.
		Alteration of informal institutions	No further specifications.
	Articulation	Articulation of socially embedded institutions	No further specifications.

3 Methodology and Methods

This chapter presents a comprehensive account of the research process conducted for the current study. It first discusses the research philosophy and type. Then, it elaborates on the research strategy and methods for data collection and analysis.

3.1 Research Philosophy and Type

The study adhered to the philosophical principles of empiricism. In accordance with Bernard (2006), empiricism postulates that individuals come to comprehend the veracity of a given proposition by way of their exposure to the relevant stimuli. Consequently, individuals are said to accrue their values, which are thus regarded as relative. Furthermore, the study followed the humanistic tradition, also known as interpretivism, which asserts that truth is not absolute but rather determined by individual human judgment. It can therefore be argued that knowledge is constructed through social interactions. This perspective acknowledges the significance of comprehending individuals' interpretations, meanings, and experiences within their social contexts (ibid.).

This study adopted a qualitative approach that is in line with the research philosophy and aims to achieve the research objectives. The research objectives required identifying and characterizing institutional bricolage processes, which involve interpreting and understanding meanings embedded in social practices, norms, and behaviors. A qualitative approach, rooted in interpretivism, allowed the researcher to delve into the subjective interpretations of participants, uncovering their underlying rationales, values, and motivations when interacting with external formal institutions.

3.2 Research Strategy

A case study was the most appropriate method for addressing the research questions and objectives, as it enabled the examination of the intricate social phenomena within the context of Eastern Mancha, Spain. A case study is a versatile and suitable method for investigating both simple and complex phenomena, with units of analysis ranging from individuals to large institutions and world-changing events (Berg & Lune, 2017, p. 14). This method involves using multiple data collection techniques and can contribute to the application of theory. By focusing on a single phenomenon, individual, community, or institution, researchers aim to uncover the significant factors that characterize it. This approach also allows for capturing nuances, patterns, and latent elements that other research methods may overlook (ibid).

As Berg and Lune (2017, p. 176) noted, case studies can be designed in a number of ways, including exploratory, explanatory, and descriptive. These categories differentiate between various research orientations. It is crucial to acknowledge that exploratory case studies are designed to generate ideas and insights for further research rather than to test hypotheses or make definitive conclusions (Berg & Lune, 2017). Consequently, an exploratory case study was conducted for the present research on the farmers located in the Eastern Mancha region, which served as the unit of analysis.

This research strategy was particularly helpful in facilitating an exploration of both visible and invisible, as well as formal and informal processes, which is essential when investigating bricolage processes. By focusing solely on Eastern Mancha, the researcher was able to gain insight into the roles played by different actors, their worldviews and interests, as well as the socio-political, economic, and environmental dynamics that inform institutional bricolage processes and their implications for water governance in the region.

3.3 Selection of Case

The researcher selected the case for analysis based on her personal experience as an intern at the Institute for Socio-ecological Research (ISOE), where she supported research on groundwater conflicts in the Eastern Mancha aquifer in Spain. Given the relevance of the case to the analysis of water governance and her personal and academic interests, she decided to build on the work she had done during her internship.

Regulate is a junior research group that investigates current challenges in groundwater management in Europe. Funded by the German Federal Ministry of Education and Research (BMBF) as part of the FONA Social-Ecological Research Framework, the project will run from 2020 to 2025. Regulate has five research foci, including telecouplings, groundwater quality and quantity, conflicts, and institutions, which are explored in five case studies across Europe: Mansfeld-Südharz and Landau, Germany; Rijeka and Krk Island, Croatia; Plitvice Lakes, Croatia and Bihać, Bosnia and Herzegovina; and Province of Albacete, Spain. The researcher's choice of the Province of Albacete in Spain for her case study aligns with the existing structure of the Regulate research projects.

3.4 Characterization of the Case Study Area

The Eastern Mancha region is an area of southeastern Spain that spans over 9,962 km² and covers three provinces: Albacete, Cuenca, and Valencia. The region is situated within two autonomous communities, Castilla-La Mancha and Valencia, and is known for its semi-arid and continental climate, which can vary significantly in temperature throughout the year. The weather can reach extreme levels in both summer and winter, with an average of approximately 350 millimeters of precipitation annually. The region's monthly temperatures range from 6 degrees Celsius in the winter to 22 degrees Celsius in the summer.

In Castilla-La Mancha, where the majority of the Eastern Mancha region is located, agriculture continues to play a significant role in the regional economy, in comparison to the rest of Spain (Esteban & Albiac, 2012). The agricultural sector contributes 8.2% to the gross domestic product (GDP) of Castilla-La Mancha, in contrast to 2.7% for the entire country. Moreover, the proportion of farm labor in the total labor force is 6.3% in Castilla-La Mancha, in comparison to 4.0% in Spain. Irrigated agriculture continues to be a significant source of income in these rural areas, where the proportion of the working population engaged in farming is close to 30% (ibid.).

The Eastern Mancha region is home to the Eastern Mancha Aquifer, which is one of the largest and most significant aquifers in Southern Europe (Sanz et al., 2019). The aquifer encompasses an area of 7,250 km² within the Júcar River basin, providing a vital resource for the region's agricultural, industrial, and domestic uses. The natural recharge of the aquifer is derived from four primary sources: rainwater infiltration, lateral groundwater inflow, and infiltration from the Jardín and Lezuza rivers and wastewater from the city of Albacete.

The Júcar River represents the primary groundwater discharge element within the Eastern Mancha aquifer system (ibid.). However, the progressive increase in groundwater extractions above the recharge capacity has resulted in notable changes in the underground flow and, consequently, in the relationships between the aquifer and the river. The Eastern Mancha aquifer, which previously supplied water to the Júcar River, now drains water from it (Esteban & Albiac, 2012). This has resulted in a reduction in the flow of water in aquatic ecosystems in the middle and lower Júcar River basin, with the lower Júcar experiencing severe problems with low flows and water quality degradation (ibid.).

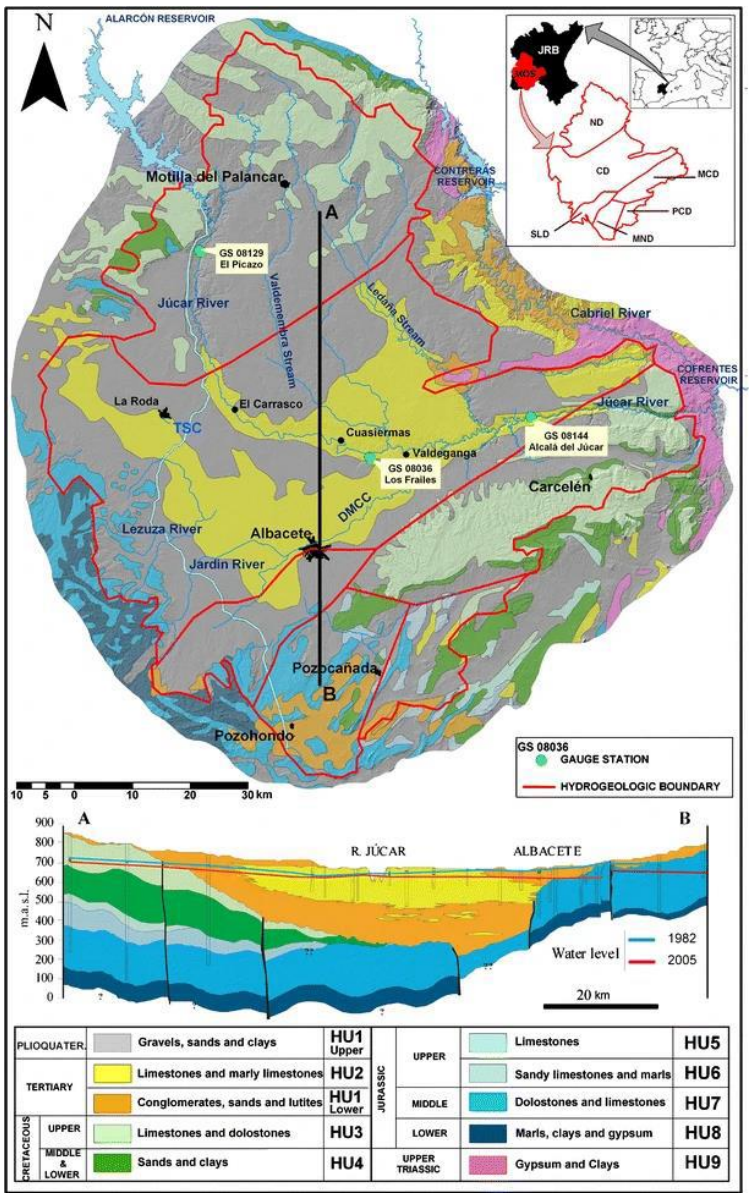

Figure 2: Map of the Eastern Mancha Aquifer Source: Sanz et al. (2019)

The Júcar River flow is regulated by the Alarcón Reservoir, which has a total capacity of 1,118 million cubic meters (Mm^3) and generates hydroelectric power and supplies water to the Valencia Plain, as well as the populations of Albacete and Valencia (Sanz et al., 2019). The river flow exhibits a pronounced seasonal pattern, with the most significant flows occurring during the autumn months and the weakest during the summer (ibid.). The Tagus-Segura transfer, which extends 140 km from north to south across the Eastern Mancha Aquifer, transfers water from the Tagus to the Segura River basin. This transfer transports water from the Alarcón reservoir to the Eastern Mancha. Since 2001, water from the transfer channel has been utilized to replace groundwater for irrigation purposes in Eastern Mancha (Sanz et al., 2019).

The Central Board of Irrigators of Eastern Mancha (JCRMO, Spanish acronym for Junta Central de Regantes de Regantes de la Mancha Oriental) is co-responsible for the management of the aquifer. In order to optimize the management of water resources in the region, the River Basin Authority recommended that all farmers in Eastern Mancha join the Central Board of Irrigators of Eastern Mancha in 2002. According to López-Gunn (2012), the vast majority of farmers in the region heeded the recommendation and joined the Board, with only approximately 5% choosing not to become members.

The JCRMO currently oversees the central area of the Júcar River basin, representing over 10,000 farmers and integrating a multitude of water uses, including irrigation, domestic supply, industrial, livestock, and recreational uses. As of December 31, 2023, the JCRMO was responsible for the management of a total of 130,345 hectares of irrigated land (JCRMO, 2023).

The majority of irrigation systems are of the sprinkler, pivot, or drip variety. Sprinkler irrigation is the most extensive, with 80% of the irrigated land (Ortega-Reig et al., 2019). The use of irrigation by flooding or gravity is a relatively uncommon practice (Gutiérrez, 2013). Of the total area under the control of JCRMO, approximately 95,066 hectares rely on groundwater for irrigation, while 20,479 hectares are subject to the provisions of Article 54.2 of the 1985 Water Law (JCRMO, 2023). Additionally, 16,528 hectares utilize a combination of different sources, and 8,215 hectares are irrigated using surface water (ibid.).

Historically, extractions have exceeded 500 hm^3 per year, with estimates of renewable resources ranging between 280 and 330 hm^3 per year (Ortega-Reig et al., 2019). However, in the last decade, the implementation of control systems has stabilized extractions to between 300 hm^3 and 350 hm^3 per year. As of the end of 2023, the total volume of the Júcar system was 888 hm^3, which is higher than the average of recent years. Additionally, the total volume in the Alarcón reservoir was 576 hm^3, surpassing the 2022 level. The evolution of the piezometric data set from 1995 to 2023 is presented in the following table (JCRMO, 2023).

The current River Basin Management Plan (2022-2027) stipulates that irrigation in Eastern Mancha should be limited to 382.4 hm^3/year. This figure is derived from two sources: a maximum of 300 hm^3/year from the Eastern Mancha aquifer, which should be reduced to 275 hm^3/year during the current planning cycle; and a maximum of 80 hm^3/year from the Júcar River for the replacement of pumping. In the event of scarcity, underground resources may be employed as a substitute for surface resources. This allocation is less than the existing 470.8 hm^3/year of rights in this demand unit, as outlined in the Júcar River Basin Management Plan (2023).

The crops cultivated in the JCRMO area are highly diverse (JCRMO, 2023). Cereals, which account for over 25% of the cultivated area, represent a traditional base. However, there has been a notable increase in the cultivation of woody crops, including vines, almonds, and pistachio trees, which now account for 35% of the surface area. Vegetables, such as garlic, onion, lettuce, broccoli, and industrial crops, including opium poppy, also play an important role in the region's agricultural production (ibid.).

3.5 Data Collection

According to Berg and Lune (2017), various data collection methods can reveal different aspects of the same symbolic reality. When multiple methods are combined, a more comprehensive understanding of reality can be achieved. This technique, called triangulation, involves using various lines of sight to verify data elements. This study employed triangulation by conducting interviews, direct observations, and analyzing gray literature such as policy documents and reports from the JCRMO and the NGO Ecologistas en acción, Albacete. The researcher gathered interview and direct observation data during a two-week field trip to the province of Albacete between March and April 2023.

3.5.1 Interviews

During fieldwork, a total of nine semi-structured interviews and four informal interviews were carried out. The selection of interviewees was based on an initial literature review, which enabled the creation of a stakeholder map. Additionally, Regulate members contacted researchers in the Hydrogeology Research

Group at the University of Castilla-La Mancha, who served as guides to the study region and facilitated a snowball sample for the research project.

3.5.1.1 Semi-structured Interviews

According to Bernard (2006, p. 212), semi-structured interviews are appropriate when there is only one opportunity to interview someone. These interviews rely on an interview guide, a written list of questions and topics that must be covered in a specific order. However, interviewers can digress and probe beyond their prepared standardized questions (Berg & Lune, 2017, p. 68). Thus, given the limited time, semi-structured interviews proved the most efficient method for gathering insights from various stakeholders on the research topic.

The interviews lasted an average of one and a half hours and were transcribed upon returning from the field, using intelligent verbatim transcription. To protect the identity of the interviews, the transcriptions were altered to delete their names. To ensure the safety of interviewees, interviews conducted within the Regulate project are pseudonymized due to necessary confidentiality agreements. Thus, in what follows, the interviewees are referred to by mentioning the organization they are affiliated with or their occupation, rather than by their names.

Table 2: List of interviews

Date	Organization / Occupation	Description
22.03.2023	Agroecological farmer	Farmer and active member of JCRMO
27.03.2023	Central Board of Irrigators of the Eastern Mancha (JCRMO)	Users' Community
29.03.2023	Ministry for the Ecological Transition and the Demographic Challenge (MITECO)	National government
01.04.2023	Irrigators Community of Jorquera-La Recueja	Traditional irrigators
01.04.2023	Ecologists in Action, Albacete Headquarters (Ecologistas en acción, Sede Albacete)	Non-governmental organization
03.04.2023	Júcar Hydrographic Confederation (CHJ)	River Basin Authority
04.04.2023	New Water Culture Foundation (Fundación Nueva Cultura del Agua)	Research Institute focused on the assessment and sustainable management of water socio-ecological systems.
04.04.2023	Office of Agriculture, Water and Rural Development (Oficina de Agricultura, Agua y Desarrollo Rural) and Water Agency (Agencia del Agua).	Regional government of the Autonomous Community Castilla-La Mancha.
05.04.2023	Prince of Spain Irrigation Community (Comunidad de Regantes Príncipe de España).	Users' Community subscribed to JCRMO, which is located in Aguas Nuevas. This municipality underwent phase 1 of the pumping substitution.

3.5.2 Observations

Various observations were made by the researcher in different instances. One such instance was the Ordinary General Assembly of the JCRMO, an informative event where all community members discussed the budget for the current year. Direct observations were made during the Assembly to understand the views of the organization about the River Basin Authority and the latest River Basin Plan.

In addition, the researcher conducted semi-structured interviews in which she made direct observations of irrigation practices. During one such interview, the researcher visited an agroecological irrigator's farm to learn about their farming practices, irrigation systems, pumping, and storage infrastructure. Similarly, the researcher interviewed a traditional irrigator in their vegetable garden in the municipality of Jorquera, in which the researcher observed traditional farming practices and the functioning of the surface irrigation system in connection with the Júcar River, which runs alongside the irrigator's land.

Finally, the researcher gained insight into the hydrogeological conditions of the area and a better understanding of the functioning of the Eastern Mancha aquifer system. This was achieved during an informal interview with a member of the Hydrological Research Group of the Regional Development Institute (IDR) at the University of Castilla-La Mancha, in which they visited several places along the river in the Albacete province.

3.5.3 Analysis of Grey Literature

The researcher analyzed multiple documents. These included the 1985 Water Law, the Júcar River Basin Management Plan (2022-2027), and the Management, Coordination, and Control Rules for Irrigation Use in the Eastern Stain during the 2022-2023 Irrigation Campaign. Additionally, the final report for 2023 from the JCRMO, along with the 2022 and 2023 reports of the Water Policy Observatory (OPPA) by the New Water Culture Foundation (FNCA), and the monitoring report of the Júcar River Basin Management Plan (2015-2021) were examined. By analyzing all of these documents, the researcher was able to incorporate real-world data and perspectives directly from actors and practitioners. This collection of gray literature enhances the study's findings, providing a solid basis for interpreting and contextualizing the primary data collected.

3.6 Data Analysis

The researcher utilized qualitative content analysis to examine the data. This method is used to systematically elucidate the meaning of qualitative data (Schreier, 2014). It involves a coding frame that encompasses all the necessary aspects for a comprehensive description and interpretation of the material. The coding frame is composed of categories that are assigned to successive parts of the data. The method has three critical features, namely data reduction, a systematic approach, and flexibility (ibid.).

One of the most crucial advantages of qualitative content analysis is its ability to reduce the volume of data to a manageable level while still allowing researchers to focus on selected aspects of meaning relevant to the overall research question (Schreier, 2014). Furthermore, the method is highly systematic, beginning with a thorough examination of all relevant parts of the material in relation to the research question. Finally, the coding frame should be flexible enough to incorporate varying proportions of concept-driven and data-driven categories while ensuring that certain categories are always based on data and accurately describe the material (ibid.).

The researcher developed a coding frame based on the conceptual framework. It included categories for actors, institutions, which were further divided into informal and formal, as well as processes of institutional bricolage. The latter was broken down into three subcategories: aggregation, alteration, and articulation. These subcodes were thematically grouped to cover topics such as water rights and water allocation. The coding process was carried out using Atlas.ti.

4 Results

This chapter presents the results of the qualitative content analysis of the data collected on irrigated agriculture in the context of Eastern Mancha. The analysis is guided by the research questions and explores the dynamics between local actors and formal institutions addressing water scarcity in this context. In this manner, the chapter is divided into three sections. The initial section of the chapter examines the formal institutional framework addressing water scarcity. The second section identifies the local actors involved in institutional bricolage processes. Finally, the third section presents an analysis of the institutional bricolage processes observed.

4.1 Formal Institutional Framework

The formal institutional framework for water governance in Eastern Mancha comprises a complex array of entities, regulations, and policies that have been established to develop rules and manage water resources at various levels of government.

4.1.1 Governmental Entities

Governmental entities are classified according to various criteria, including their geographical scope and the nature of their responsibilities. At the national level, for instance, the Ministry of Ecological Transition and Demographic Challenge (MITECO, Spanish acronym for Ministerio para la Transición Ecológica y el Reto Demográfico) is responsible for the development of state legislation on waters and coasts, climate change, protection of biodiversity, environment, forests, meteorology, and climatology (Royal Decree 2/2020). At the watershed level, the Júcar River Hydrographic Confederation (CHJ, Spanish acronym for Confederación Hidrográfica del Júcar), which is ascribed to MITECO, is the entity responsible for the management of the water resources within the Júcar River Basin, including the Eastern Mancha aquifer. This encompasses the management of the status of water bodies in accordance with the Water Framework Directive and the allocation of water to users through planning instruments such as River Basin Management Plans (Royal Decree 125/2007). At the regional level, the Community Board of Castilla-La Mancha is tasked with overseeing urban planning, agriculture, and natural heritage within the autonomous community (Law 14/2015). The Water Agency, which is attached to the Department of Agriculture, Water and Rural Development of the Community Board, is the specific body in charge of water management. At the provincial level, the Water Agency is also responsible for this function through its office in Albacete.

4.1.2 Legal and Policy Framework Addressing Water Scarcity

The 1985 Water Law represents the fundamental component of the legal framework for the management of water resources in Spain. The objective of this legislation is to regulate the use of water and the exercise of the powers attributed to the State in related matters in accordance with Article 149 of the Constitution (Law 29/1985). The 1985 Water Law established a concessionary system for the assignment of water rights to users. Nevertheless, the final water allocation is determined by the River Basin Authority through the use of planning instruments, as stipulated in Law 29/1985.

The concessionary system established by the 1985 Water Law distinguishes between three categories: concessions, allowances, and reserves. Concessions are titles that confer rights to water usage (CHJ, personal communication, April 3, 2023). When concessions are intended for irrigation, the volume is calculated based on the surface area and the maximum volume of water allowed per hectare per year in that specific region. However, the distribution of water is determined by the balance between the

available resources and the current and future demands estimated in the planning documents. Allowances are specific volumes of water designated for different users. These may be derived from groundwater, surface water, reuse, or desalination, according to the circumstances. Finally, reserves refer to volumes of water set aside for future use by specific users in specific regions. These reserves can be converted into allowances during the planning cycle if individuals who meet the eligibility criteria apply for them (ibid.).

It should be noted that there are certain instances in which the concessional regime does not apply (CHJ, personal communication, April 3, 2023). In other words, the administrative concession is not necessary. This is the case of small-scale uses, such as the utilization of rainwater or groundwater from wells, provided that the annual volume does not exceed 7,000 m³. The utilization of these water sources is contingent upon their reporting to the CHJ, which will then register them in the Water Registry. In the event that the water in question is sourced from an overexploited or at-risk aquifer, administrative authorization is still required (ibid.).

4.1.3 Relevant Policies: Planning Instruments, Projects, and Programs

The primary objective of water planning is to regulate and allocate water resources in an efficient manner to prevent any shortages (Law 29/1985). Furthermore, it must contribute to the mitigation of the effects of floods and droughts (MITECO, 2024). Water planning is conducted at the watershed level, a practice that aligns with the provisions of the Water Framework Directive. Consequently, the Hydrographic Confederation is tasked with the development, establishment, and monitoring of planning instruments such as the River Basin Management Plan and the Special Drought Plan in the Júcar River Basin.

4.1.3.1 River Basin Management Plan

The River Basin Management Plan (RBMP) is employed to determine the distribution of water resources between various uses, including urban supply, agricultural, or industrial uses, in accordance with the demands and available resources. The RBMP is a legally binding document that must comply with the provisions of the 1985 Water Law (CHJ, personal communication, April 3, 2023). In the Júcar River Basin, there have been four planning cycles with their respective RBMPs. The initial plan was implemented in 1998, followed by subsequent plans in 2010-2015, 2016-2021, and the current period 2022-2027 (CHJ, 2024).

4.1.3.2 Special Drought Plan

The Special Drought Plan (PES) is designed to mitigate the environmental, economic, and social consequences of potential drought scenarios (Law 10/2001). To this end, the PES delineates forecasting and detection mechanisms for drought occurrences. Furthermore, the PES establishes thresholds for determining the intensification of drought conditions, in other words, phases of progressive severity (MITECO, 2024). The current PES for the Júcar River Basin is that of 2023.

4.1.4 Planning Instruments Exclusive to Eastern Mancha

4.1.4.1 Exploitation Plans

The objective of the Exploitation Plans is to regulate the consumption of water on each farm, whether groundwater or surface water, in order to achieve compatible usage with the available resources (JCRMO, personal communication, March 27, 2023). In this plan, farmers delineate the type of crop, area, and irrigation systems that they intend to utilize on their plots. It is the responsibility of the Central Board of Irrigators to establish an annual Exploitation plan with its farmers and subsequently present it

to the CHJ (Royal Decree 1/2016). Annually, the River Basin Authority establishes a set of criteria for the utilization of water, which are intended for users integrated into the JCRMO to adhere to. To operationalize these criteria, the JCRMO has developed management, coordination, and control standards.

4.1.4.2 Project for the Replacement of Groundwater Pumping

The replacement of pumps represents an initiative that aims to replace groundwater extractions for irrigation with superficial water from the Júcar River (JCRMO, personal communication, March 27, 2023). This is intended to maintain the piezometric levels of the aquifer and to improve the river-aquifer relationship. Additionally, the objective is to increase energy efficiency in crop irrigation. Infrastructure works have been carried out to transport water from the Tagus-Segura canal to the plots since 2001. The RBMP (2022-2027) stipulates a maximum of 80 hm3/year for this purpose.

The project is divided into four phases, with only phase 1 completed so far (JCRMO, 2023). Phase 1 of the project was implemented in the region of Los Llanos de Albacete and La Herrera, covering 35 hectares. Phase 2, which covers the remaining 55 hectares, was projected to begin at the start of 2024. The RBA anticipates that the socioeconomic impact of reducing groundwater pumping on local communities will be minimized through the recommendation of alternative water sources (CHJ, personal communication, April 3, 2023).

4.2 Actors

In Eastern Mancha, actors are organized into Irrigators' Communities, which are formed according to the geographical area. Irrigators' Communities are collective management bodies that are involved in the management and distribution of the water resources allocated to agricultural users in their specific locations. The majority of these Irrigators' Communities are integrated into the Central Board of Irrigators of Eastern Mancha. The primary objective of the JCRMO is to collectively manage the Eastern Mancha aquifer and oversee the implementation and effective control of the Exploitation Plans, which are developed under the supervision of the CHJ. Consequently, it is obligatory for all users who extract water from the aquifer to integrate into the Central Board of Irrigators. Nevertheless, at least one Irrigators' Community in the region is not affiliated with the JCRMO. This is the Community of Irrigators of Jorquera-La Recueja. The former is associated with the Hydrographic Confederation of the Júcar River, given that it is the officially recognized Users' Community of Eastern Mancha, while the latter is not.

4.2.1 The Central Board of Irrigators of Eastern Mancha

The Central Board of Irrigators of Eastern Mancha is a public law corporation attached to the Júcar Hydrographic Confederation (JCRMO, 2023). It is endowed with a series of administrative powers that confer upon it the legitimacy to manage and control the water resources of Eastern Mancha. It has been operational since 1994. The JCRMO groups not only the Irrigators' Communities but also the rest of the water users in Eastern Mancha. Furthermore, the JCRMO represents irrigators before public administrations (ibid.).

4.2.2 Community of Irrigators of Jorquera-La Recueja

The Irrigators' Community is responsible for the management of water resources in Jorquera, a municipality in the province of Albacete, situated on a spur bordered by the Júcar River. In this region, traditional irrigation has played a significant historical role. The first ordinances of the Community of

Irrigators of Jorquera-La Recueja were enacted on May 10, 1839 (Hermosilla Pla & Antequera Fernández, 2022). This implies that they have been operational prior to the establishment of the JCRMO and have operated independently of it since its inception.

4.3 Processes of Aggregation, Alteration, and Articulation

In Eastern Mancha, there is evidence of various local processes of aggregation, alteration, and articulation that are associated with the development and implementation of the River Basin Management Plan (2022-2027), the Exploitation Plans, the creation of the Central Board of Irrigators of Eastern Mancha, and Article 54.2 of the Water Law. The following section presents these findings.

4.3.1 Aggregation

De Koning's (2011, 2014) definition of aggregation posits that it is the recombination of newly introduced and locally embedded institutions, which results in the conscious or unconscious acceptance of formal institutions. This process was observed regarding the project for the replacement of groundwater pumping in the area.

4.3.1.1 Aggregation Related to the Project to Replace Groundwater Pumping

The first phase of replacement of groundwater pumping in Los Llanos de Albacete and La Herrera was met with approval due to the financial aspect, which was a significant factor in the decision-making process (Community of Irrigators' Príncipe de España, personal communication, April 5, 2023). The cost was not a concern, as the subsidy made it affordable. The farmers were amenable to the replacement plan, provided that they were granted the requisite amount of water from surface water sources. In Aguas Nuevas, where the Community of Irrigators Príncipe de España is responsible for water management, 80% of the water supply is derived from the Tagus-Segura canal, while 20% is sourced from groundwater. Nevertheless, the high cost of electricity has presented a challenge. Efforts are currently underway to install solar panels with the backing of European funding.

Consequently, this represents a process of aggregation of the replacement of pumping in which farmers accepted the implementation of the project and complied with it without significant resistance. Since their livelihoods were not at risk as a consequence of the newly introduced rule, they integrated irrigation with surface water into their irrigation practices. After more than twenty years of the project being in place, it is now a locally embedded institution, and farmers are satisfied with the outcome. As long as the farmers are receiving the amount of water they are entitled to from the CHJ, the source of the water is not a concern for them. This suggests that their main priority is securing their livelihoods rather than addressing environmental concerns. However, it is in their best interest to conserve the aquifer, as the cost of pumping groundwater increases as the water table lowers.

4.3.2 Alteration

De Koning (2011, 2014) defined alteration as the adaptation or reshaping of institutions to specific circumstances. This can occur with both newly introduced institutions and socially embedded institutions. It can entail the bending, renegotiation, or outright ignoring of rules to better correspond with existing informal institutions (Cleaver, 2002). This process was observed in the establishment of the River Basin Management Plan (2022-2027), the implementation of the exploitation plans, and Article 54.2 of the Water Law.

4.3.2.1 Alteration Related to the Exploitation Plans

The JCRMO and the CHJ have indicated that individuals may not always adhere to water extraction rules by failing to comply with the water volumes they committed to in their exploitation plans (JCRMO, personal communication, March 27, 2023). For instance, they may assert that they will employ supplemental irrigation, which entails the addition of limited quantities of water to essentially rainfed crops, when in fact they will utilize conventional irrigation. The JCRMO asserts that it is possible to detect these instances of excessive water usage by analyzing vegetation indexes through satellite imagery.

In contrast, the CHJ states that the only way to do so is by controlling the water meters. According to CHJ, remote sensing can only assist in measuring surface area and identifying types of crops. However, there are no water meters installed in the wells of Eastern Mancha, which means that monitoring and control are based on estimates and not actual water usage. In this regard, the JCRMO asserted that controlling water meters is ineffective due to the manner in which this is carried out in Spain. Farmers are the owners of the water meters and are responsible for installing and maintaining them. This means that the meters are vulnerable to manipulation by users.

Consequently, this represents a process of alteration of the Exploitation Plans in which farmers are bending the rules by exceeding their permitted water withdrawal rights. The rationale behind these practices may be attributed to convenience. Individuals attempt to exploit the lack of water meters in their wells to their advantage, exceeding the water allocations they are entitled to and subsequently enhancing their yields. It appears that those involved believe they can provide inaccurate information to the Central Board of Irrigators and the River Basin Authority, given the lack of a factual way to prove their water usage.

The CHJ and JCRMO assert that wells designated for minor uses, or those with a capacity of 7000 m^3, must be metered to ensure that they do not exceed the permitted volumes. However, the interviews did not provide clear evidence that these wells are indeed metered in practice. The traditional farmer interviewed stated that this is not the case (Traditional irrigator, personal communication, April 1, 2023).

4.3.2.2 Alteration Related to Article 54.2 of the 1985 Water Law

In Spain, the use and exploitation of groundwater are regulated by either administrative concession or legal provision (iAgua, 2011). Article 54.2 of the 1985 Water Law delineates the conditions of use by legal provision, which are distinct from those subject to the concessionary system. Article 54.2 stipulates that water from springs and groundwater on a given property may be utilized for minor uses, provided that the total annual volume does not exceed 7,000 cubic meters. Nevertheless, in aquifers that have been designated as overexploited or at risk of becoming so, no new works falling under the purview of this section may be undertaken without the requisite authorization (Royal Decree 1/2001). This practice is permitted without the necessity of a concession, provided that individuals report any extraction to the CHJ and that wells are equipped with water meters. This disposition was initially intended solely for human consumption (CHJ, personal communication, April 3, 2023).

Despite the lack of new concessions for water extraction in Eastern Mancha since 1997, according to the JCRMO, there has been a significant increase in the number of wells for minor uses (JCRMO, personal communication, March 27, 2023). The CHJ has confirmed the existence of a considerable number of these wells, which represents one of the most significant challenges in Eastern Mancha (CHJ, personal communication, April 3, 2023). This has prompted concerns among both the government and farmers. On the one hand, the increase in the number of wells has the potential to increase the water extracted from the aquifer, thereby placing it at risk. Conversely, a reduction in water levels has the effect

of increasing the cost of extraction for farmers, due to the additional expenses associated with it in terms of electricity and equipment.

The deviation of farmers from the withdrawal rules associated with wells for minor uses represents an illustration of a process of alteration of Article 54.2 of the 1985 Water Law. A significant number of individuals have exploited this measure to use pumped water for purposes other than the intended use, which was human consumption, such as feeding cattle and primarily for irrigation on a massive scale (Interview with CHJ, 2023). In other words, they have modified the formal institution in a way that better fits their livelihoods. Historically, irrigators have asserted that their endowment is exceedingly limited. Consequently, they claim that they rely on these wells because their current water allowances are insufficient (ibid.).

4.3.3 Articulation

De Koning (2011, 2014) defined articulation as the process by which actors articulate socially embedded institutions in the face of a new formal institution. When new formal institutions conflict with local identities or fail to align with established practices associated with community norms or beliefs, they are often rejected (De Koning, 2011). This process was observed in the creation of the JCRMO, the establishment of the River Basin Management Plan (2022-2027), and concerning Article 54.2 of the Water Law.

4.3.3.1 Articulation Related to the Creation of the JCRMO

The Community of Irrigators of Jorquera-La Recueja employs surface irrigation for their vegetable orchards, utilizing water directly from the Júcar River. Surface irrigation entails the distribution of water over the soil surface by gravity, with ditches serving as the conduits for the water from the river and its subsequent transport to the plots. This type of irrigation has been practiced in this area at least since 1839, as evidenced by the first ordinances of the Community of Irrigators of Jorquera-La Recueja, which date from this year.

The irrigators of Jorquera-La Recueja posit that water runoff returns to the river, thereby contributing to the river's flow. Furthermore, they argue that the water that runs through the ditches supports the surrounding vegetation, which is essential to the overall ecosystem. In contrast to other farmers in the region, who cultivate both crops and fodder, the irrigators of Jorquera specialize in the production of food crops, both for subsistence and as a source of income. Consequently, they assert that their irrigation and farming practices are socially and environmentally sustainable in comparison to those of the irrigators in the rest of the region.

Although initially, the affiliation of users to the JCRMO was voluntary, the 1998 RBMP established that all water users of Eastern Mancha should join a single community of users to ensure coordinated management of the water resources in the area (JCRMO, 2023). In subsequent resolutions, it was determined that the aforementioned community must be JCRMO. Notwithstanding the aforementioned regulations, the irrigators of Jorquera elected not to affiliate with JCRMO. They held the JCRMO responsible for the significant depletion of the aquifer, attributing this to the conventional farming and irrigation practices employed by their members. Consequently, they deemed them unfit to oversee aquifer management.

The resistance of the irrigators of Jorquera to joining the JCRMO provides an illustrative example of the process of articulating traditional community norms. They advance claims on traditions in order to differentiate themselves from other farmers in the region, asserting that their irrigation practices have

been in place for over a century. The rule requiring all water users in Eastern Mancha to join the JCRMO is at odds with their local identities, as their irrigation practices do not align with those of the JCRMO. Consequently, they have actively chosen to reject it.

Moreover, their socially embedded irrigation practices and community norms of water usage and distribution have persisted in the face of the establishment of the rule requiring them to subscribe to the Central Board of Irrigators. Some of the irrigators of Jorquera are affiliated with the environmental NGO Ecologists in Action (Ecologistas en Acción) of Albacete. This organization has been highly critical of the management carried out by the JCRMO, which is indicative of their irrigation practices aligning with more ecological beliefs.

4.3.4 Other Institutional Bricolage Processes

The irrigation schemes in Eastern Mancha have shown intriguing evidence of localized processes of aggregation and alteration that occur under unique circumstances not considered by De Koning (2011). In the following section, these findings are presented in greater detail.

4.3.4.1 Aggregation in the Absence of the Implementation of a Formal Institution

The Júcar River Basin experienced a prolonged drought between 1993 and 1995 (Agroecological irrigator, personal communication, March 22, 2023). The extensive use of groundwater for agricultural purposes in the years prior to the drought in Eastern Mancha resulted in a substantial decline in the water table of the aquifer. This, in turn, led to disruptions in the river's water flow, which was further exacerbated by the drought and affected farmers downstream in Valencia. In response, the irrigators of Valencia requested that water extraction in Eastern Mancha be restricted in order to ensure that the aquifer would continue to contribute water to the river and flow to the lower part of the basin. However, this request was met with opposition from Eastern Mancha's irrigators, who relied heavily on this water for the cultivation of their crops.

Since irrigators in Valencia are considered traditional by law, as opposed to irrigators in Eastern Mancha, they possess greater political influence than their counterparts (Agroecological irrigator, personal communication, March 22, 2023). This political power enabled Valencian farmers to advocate for the closure of wells in Eastern Mancha. Moreover, during the same period, the River Basin Authority implemented restrictive regulations on water use in the neighboring Guadiana River Basin due to a portion of the river having dried up as a consequence of the drought and the poor management of the water resources (JCRMO, personal communication, March 27, 2023).

In order to avoid the potential closure of their wells and the imposition of restrictive regulations by the River Basin Authority, users in Eastern Mancha organized themselves to collectively manage the aquifer. To this end, they conducted an inventory to determine the number and location of the wells in the area, utilizing both on-site field visits and satellite imagery. Additionally, they adopted the voluntary use of Exploitation plans to regulate their water use. The Central Board of Irrigators was officially established in the same year (JCRMO, personal communication, March 27, 2023).

Furthermore, remote sensing is the official tool for controlling water use in Eastern Mancha, and the implementation of Exploitation plans is a mandatory requirement for the implementation of the RBMP (JCRMO, 2023, p. 29). It can be argued that both remote sensing and Exploitation plans were not rules introduced by the government to address water scarcity. Rather, they were the result of the initiative of the users. These cases can be seen as particular instances of aggregation, where community norms

have been accepted and subsequently institutionalized by government agencies in the absence of the introduction of a rule.

Moreover, the founding members of the JCRMO were equipped with the requisite academic and technical knowledge to implement these tools and contribute to their formalization (FNCA, personal communication, April 4, 2023). In other words, given that they possessed the authoritative resources to engage in processes of institutional bricolage and influence the entire community to self-regulate, they can be considered bricoleurs. Conversely, the CHJ demonstrated a high level of receptivity, which was partly attributed to the fact that its president was a hydrogeologist, a rare occurrence in Spain at the time (ibid.).

Upon initial examination, it appears that individuals engaged in these processes of institutional bricolage were motivated by the imminent risk to their livelihoods. This risk originated from the threat of having their wells shut down as a consequence of the pressure exerted by the Valencian farmers or from facing more restrictive measures by the River Basin Authority. However, it is important to note that they were driven to pursue the collective interest of managing the aquifer appropriately to avoid further water scarcity.

4.3.4.2 Alteration related to the River Basin Management Plan (2022-2027)

The Community Board of Castilla-La Mancha made allegations to the RBMP (2022-2027) on behalf of irrigators in Castilla-La Mancha to enable them to exercise their withdrawal rights (Office of Agriculture, Water and Rural Development and the Water Agency, personal communication, April 4, 2023). Initially, the plan only allowed the use of a maximum of 355 hm^3/year of water for irrigation, of which 275 were to be derived from groundwater and 80 from surface water. Nevertheless, because of the regional government's endeavors, irrigators can now utilize the total volume from groundwater sources in the event of a potential drought. In other words, the irrigators would be guaranteed a total of 355 hm^3/year of groundwater at least until the end of the current planning cycle (ibid.).

Furthermore, the RBMP has reduced the number of water reserves from 100 to 50 in comparison with the former plan (Office of Agriculture, Water and Rural Development and the Water Agency, personal communication, April 4, 2023). The allocation of reserves is contingent upon the completion of the pumping replacement project, which has been suspended for the past six years. If the pumping replacement project had remained suspended, irrigators would have been deprived of their right to access the water reserves. Nevertheless, the regional government was able to successfully persuade the River Basin Authority to initiate the bidding process for the completion of the pumping replacement works, which are now estimated to be completed within the next two to three years (ibid.).

The negotiations between the CHJ and the regional government resulted in the alteration of the RBMP (2022-2027), which sought to curtail irrigators' water usage. The regional government was able to engage in this negotiation and ensure a beneficial outcome for the farmers because of its authoritative resources. Given their political position, they are able to exercise authority and engage in a more egalitarian discussion with another governmental entity, thereby increasing the likelihood of their demands being acknowledged and accepted. Consequently, these instances illustrate institutional shifts in the rules to better correspond to the locally embedded irrigation practices.

5 Discussion

This chapter delineates the interpretations of the results, discusses the implications and the limitations, and gives recommendations for future research.

5.1 Formal Institutional Framework

The formal institutional framework for water governance in Eastern Mancha comprises a complex array of entities, regulations, and policies established to develop rules and manage water resources at various levels of government. Governmental entities are classified according to their geographical scope and the nature of their responsibilities. These entities range from national, watershed, regional, and provincial levels.

The legal framework addressing water scarcity is based on the 1985 Water Law, which represents the fundamental component of the governance of water resources in Spain. The 1985 Water Law established a concessionary system for the assignment of water rights to users, which is replicated in the planning instruments to regulate the allocation of water resources. However, there is a pressing challenge in various river basins to carry out such distribution due to the overallocation of water rights. In the Júcar River Basin, the Eastern Mancha aquifer exhibits an imbalance between the volume of water rights granted (470 hm^3/year), the volume of water rights permitted (382.4 hm3/year), and the volume of water resources available (275 hm^3).

In this context, planning instruments and projects have been designed, among other things, to regulate water use and prevent water shortages. These instruments encompass both watershed-level plans and localized plans for the Eastern Mancha region. The River Basin Management Plan of 2022-2027 addresses the distribution of water in the Júcar River Basin, while the Special Drought Plan of 2023 focuses on the implementation of measures to mitigate the potential effects of droughts in the structural situation of water scarcity in the basin. In the Eastern Mancha region, the Exploitation Plans are designed to regulate the consumption of water on each farm, whether groundwater or surface water, to achieve compatible usage with the available resources. Moreover, the project for the replacement of pumping aims to replace groundwater extractions intended for irrigation from the Eastern Mancha aquifer with surface water from the Júcar River to maintain the piezometric levels of the aquifer.

5.2 Actors

The actors in Eastern Mancha are organized into Irrigators' Communities, which are formed according to the geographical area. The majority of these Irrigators' Communities are integrated into the Central Board of Irrigators of Eastern Mancha, which is ascribed to the Hydrographic Confederation of the Júcar River. The Central Board oversees not only irrigators but all water users. As a public law corporation, it is responsible for the administration of water resources at the local level. Consequently, the evidence indicates that there is a high level of co-management between the Users' community and the River Basin Authority. Co-management is understood as the management that involves both users and the state, in which tasks for the allocation and use of resources are shared among multiple stakeholders (Molle & Closas, 2020, p. 2). This is evidenced by the fact that the JCRMO and the CHJ are responsible for the coordination of regulations in regards to allocation, control, monitoring, and sanctioning of water resources.

5.3 Aggregation, Alteration, and Articulation

The analysis of the interaction between the agency of local actors and introduction of formal institutions in the context of water scarcity in Eastern Spain suggest that the introduction of such rules triggered processes of aggregation, alteration and articulation, consequently, resulting in changes in the local institutional framework.

The process of aggregation that resulted from the introduction of the project to replace groundwater pumping suggests that a new hybridized institution emerged, in which the newly introduced formal institution to address water scarcity and the community norms that guided previous irrigation practices were patched together. Thus, groundwater and surface water irrigation are practiced in parallel and without significant resistance. Moreover, the processes of modification of the Exploitation plans and Art. 54.2 of the 1985 Water Law, in which farmers exceed their authorized water abstraction rights, result in the coexistence of these formal institutions dealing with water use with persistent irrigation practices that have long existed within the community and are therefore socially embedded. Furthermore, the articulation of the traditional community norms of water use by the community of irrigators of Jorquera-La Recueja shows how their socially embedded irrigation practices have persisted in the face of the establishment of the rule requiring them to join the Central Board of Irrigators.

In contrast to De Koning's (2011) framework, which places a strong emphasis on the role of new rules in driving institutional bricolage, this study identified localized processes of aggregation and alteration that occur under unique circumstances. These processes were not initiated by the introduction of formal rules; rather, they originated from bottom-up initiatives in the absence of a new formal institution. The researcher identified aggregation in the absence of the introduction of a new rule in the creation of the Central Board of Irrigators of Eastern Mancha, the use of remote sensing for control and monitoring, and the development of exploitation plans.

Moreover, the analysis indicated that institutional bricolage processes occurred at various levels of governance, which contrasts with De Koning's (2011) perspective on institutional bricolage as a consequence of the interaction between local actors and newly introduced formal institutions. This study identified instances of alteration that occurred when newly introduced formal institutions interacted with entities at the meso level rather than with local actors. One such instance is the negotiations between the Community Council of Castilla-La Mancha and the Hydrographic Confederation of the Júcar River Basin associated with the River Basin Management Plan (2022-2027). However, in line with De Koning's (2011) contributions, these nuances underscore the need for context-specific approaches to studying institutional dynamics.

5.4 Enabling and Constraining Factors

Water scarcity in Eastern Mancha is a structural issue. The Eastern Mancha aquifer is characterized by a fragile imbalance between the rates of water abstraction, recharge, and water rights. The current rate of water abstraction for irrigation is approximately 300 hm^3 per year, while the estimated recharge rate is 275 hm^3 (Royal Decree 35/2023, p. 21050). In contrast, the volume of water rights granted is 470 hm^3 per year, while the volume of water rights permitted is 382.4 hm^3 per year. Despite the existence of numerous laws, regulations, and policies addressing the issue of water scarcity, the results were not sufficiently conclusive to affirm that water scarcity played a significant role in people's motivations to comply with the rules. This may be due to the fact that this has been the state of affairs for many years. However, the 1991-1995 drought demonstrated the potential for sudden events to facilitate processes of institutional bricolage, as evidenced by the bottom-up initiative of the irrigators to organize collectively to manage the aquifer, which resulted in the creation of the JCRMO.

These results corroborate the findings of Rica et al. (2012), who identified problem severity as one of the most prevalent factors in the emergence of groundwater user groups in Spain. According to Rica et al. (2012), problem severity can be triggered by external events such as droughts or by the threat of the implementation of command and control measures, such as the declaration of aquifer overuse. Similarly, Molle and Closas (2020) posit that groundwater users were compelled to organize in response to a credible threat to the status quo. However, this assertion does not apply in this case, as the drought experienced between 1991 and 1995, rather than the perceived credibility of the threat of facing stricter regulations, challenged the status quo in the first place.

5.5 Limitations

A case study was the most appropriate methodology for addressing the research questions and objectives, as it enabled the examination of the intricate social phenomena within the context of Eastern Mancha, Spain. Nevertheless, the irrigation schemes in Eastern Mancha were deemed to be an unwieldy unit of analysis due to the constraints of a master's thesis in terms of time and resources. The scale proved challenging to uncover the everyday practices and processes of bricolage that may be occurring at a more localized level. These processes may be more readily identified through participant observation than through interviews. In this context, an ethnographic approach could provide further insights into the interactions between actors and formal institutions on the ground. As a consequence of the aforementioned limitations, it was challenging to discern in many instances the motivations of individuals to comply or not with the rules imposed by public authorities, with the exception of livelihood- or economic-related reasons. It was not always straightforward to identify the emotional and moral motivations underlying people's actions.

5.6 Future Research Directions

The results indicated the potential for further study of bricolage processes that may be taking place by drivers other than the introduction of formal rules. Given the nature of irrigated agriculture and the necessity for infrastructure to support it, analyzes focused on the processes of bricolage related to the use of material infrastructure could further enhance the results found in this study. Empirical studies in this direction have already been conducted concerning irrigation modernization and the subsequent introduction of drip irrigation in other regions (Mirhanoğlu et al., 2023; Benouniche et al., 2014).

Similarly, a further avenue for research could be the processes of bricolage that occur at levels of governance other than the local level. This is an area that Cleaver and De Koning (2015) have begun to elaborate on, suggesting that a promising direction for critical institutionalism is in examining institutional change that occurs at the meso level of institutions. According to their argument, between different organizational levels, between individual, community, and state action, a great deal of bricolage work is carried out in order to navigate between different interests and reconcile discrepancies between regulation and practice (ibid.).

6 Conclusion

This research aimed to investigate the manner in which the interaction between local actors and formal institutions addressing water scarcity drove institutional bricolage processes in the context of irrigated agriculture in Eastern Mancha. The results of the analysis, based on qualitative content analysis of the data, suggest that the interaction between irrigators and the introduction of formal institutions addressing water scarcity triggered processes of institutional bricolage, including aggregation, alteration, and articulation. Consequently, changes in the local institutional framework were observed.

The processes of institutional bricolage generated changes, as evidenced by the emergence of new institutions, the coexistence of new rules, and socially embedded norms and practices. Additionally, there was the persistence of socially embedded institutions despite the implementation of new institutions. However, in contrast to De Koning's (2011) framework, this study identified localized processes of aggregation and alteration that occur under unique circumstances. These processes were not initiated by the introduction of formal rules; rather, they originated from bottom-up initiatives in the absence of a new formal institution. Likewise, institutional bricolage processes occurred at various levels of governance, challenging the assumption that it is triggered by the interaction between local actors and newly introduced formal institutions.

While the scale of the irrigation schemes in Eastern Mancha limited the availability to uncover the everyday practices and processes of bricolage that may be occurring at a more localized level, obscuring emotional and moral motivations underlying people's actions, this study underscores the need for context-specific approaches to studying institutional dynamics at the local level. To better understand the implications of these results, future studies could address processes of bricolage related to the use of material infrastructure in irrigated agriculture, such as modern irrigation systems. Likewise, a potential avenue for research could be the processes of bricolage that occur at the meso level of institutions, which has been suggested as a scale where a great deal of bricolage work (Cleaver & De Koning, 2015).

It is acknowledged that while this study does not evaluate the outcomes of groundwater management in Eastern Mancha, it provides a foundation for understanding institutional responses to challenging environmental conditions.

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