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Norms in multilevel groundwater governance and sustainable development

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Chapter 2. Theoretical Background and Methodology

2.1 INTRODUCTION

This thesis uses a multi-level and institutional approach to analyze groundwater governance as (1) contributing to sustainable and inclusive development, (2) an instance of Earth System Governance, and (3) a manifestation of legal pluralism. As such, this chapter explores the theories related to these fields; combines them into a conceptual framework; and elaborates upon how the framework can be applied in the analysis. I start by discussing the ontological and epistemological positioning of this research (see 2.2). Then, the next two sections discuss the key theories and concepts used in the analysis with respect to their definitions and contestations; theoretical content; benefits, challenges and critiques in their application; and how I will use them going forward. Specifically, Section 2.3 positions sustainable and inclusive development as the guiding norm of the research, while Section 2.4 focuses on the institutional approach and how it incorporates Earth System Governance and legal pluralism. Section 2.5 discusses the methodological design including the development and application of the conceptual framework, linking it to the methods used as well as the ethical considerations taken therein.

2.2 ONTOLOGY AND EPISTEMOLOGY

I am deeply concerned with how we can merge current understandings of the state and dynamics of groundwater resources with knowledge about one of the most pressing societal issues – equitably improving the livelihoods of present and future generations whilst protecting the environment and specifically groundwater resources. Given my interdisciplinary background, I situate myself within the Earth System Governance research approach (see 2.4), which does not align itself with a particular ontology and epistemology but rather emphasizes the need for interdisciplinary approaches spanning the natural and social sciences (Biermann, Betsill, et al. 2009: 26). The complexities of bringing these disciplines together and the complexities of groundwater resources and governance problems themselves inevitably means that some aspects will not be addressed by my research. I have chosen to focus on the design of the normative framework for groundwater governance from an institutional³ and instrumental perspective. Consequently, I do not actively engage with debates and discourses regarding socio-political ideologies and powers. Nevertheless, I fully acknowledge that the norms upon which I focus have emerged from these conflicts and discourses. In doing so, I assume that ideologies and power dynamics are embedded in these norms and thus influence state practice, but I do not investigate their potential causal effects.

In my methodological approach, I combine concepts from multiple disciplines including law, geography, international relations, political science, and hydrogeology into a unified conceptual framework (see 2.5.1). The development of this methodology was greatly informed by my position as a fellow with the International Groundwater Resources Assessment Centre (IGRAC), where I benefited from their practitioners' in-depth groundwater knowledge, access to their professional network, and relevant data and materials. For my analysis, I use a mixture of quantitative, spatial and qualitative methods in an approach often called 'mixed methods' (Madey 1982; Morgan 2007; Plano Clark et al. 2010; Teddlie and Tashakkori 2009). Again, mixed methods are not linked with a specific ontology or epistemology, but rather aim at "collecting, analyzing, and mixing both quantitative, spatial and qualitative data in a study in order to understand a research problem" (Plano Clark et al. 2010: 364).

³ The Earth System Governance 'problem of architecture,' discussed in Section 2.4.2, is broadly linked to "the theoretical strand of sociological institutionalism" (Biermann, Betsill, et al. 2009: 35). It is also worth noting that global environmental governance has also been linked to new institutionalism (Young 2002). Undoubtedly, this research is also influenced by developments in these theoretical arenas.

2.3 SUSTAINABLE AND INCLUSIVE DEVELOPMENT: THE GUIDING NORM

2.3.1 History, Debates and Definitions

The tension between economic growth, environmental integrity and social wellbeing are at the heart of sustainable development and have been discussed for many decades. The global community made a first statement in this regard in the 1972 Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration 1972). Yet, it was the landmark report of the World Commission on Environment and Development (World Commission on Environment and Development 1987) that first sought to and succeeded in encapsulating these tensions in a way that had mass appeal and could be popularized. Five years later, the 1992 UN Conference on Environment and Development in Rio de Janeiro led to the adoption of the Rio Declaration on Environment and Development (Rio Declaration, 1992) and Agenda 21 (1992), both considered hallmark policies that encapsulate the global sustainable development agenda. Subsequently, UN Conferences in Johannesburg (Rio +10) and Rio de Janeiro (Rio +20) aimed to track the global community's progress in achieving sustainable development and set goals for the future.

In 2015, UN Member States adopted the Sustainable Development Goals (UNGA 2015), solidifying sustainability's place in the global development agenda (Gupta et al. 2014; Gupta and Vegelin 2016; Habtezion et al. 2015; Stevens and Kanie 2016). One of the SDGs, Goal 6, focuses specifically on water. Although, groundwater resources are only mentioned explicitly in one of the SDG targets (namely Target 6.6, “[b]y 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes”), they are interlinked with all 17 goals and 60 out of the 169 targets (UN-Water 2016). Thus, linking the dynamics of groundwater resources and principles of groundwater governance is necessary for the achievement of the SDGs.

Inclusive approaches to development emerged after the Post-World War II recognition of human rights, in combination with the pull away from the state-centric and economic-focused international system. It was fueled, in particular, by the failure of ‘trickle-down’ economics in developed countries and a debt crisis in developing countries that eventually led to massive cuts in investments in social programs and subsidies. Consequently, the 1990's marked a shift in the global community's focus towards human development and poverty reduction, which coincided with increasing attention to environmental problems under the umbrella of sustainable development. However, given the breadth of approaches that could be taken to push forward sustainable development, the concept of inclusive development was brought forth as a way of focusing on the poorest of the poor and people from marginalized communities (Sachs 2004).

In 1987, the WCED defined sustainable development as ‘development that aims to meet the needs of present generations without compromising on the ability of future generations to meet their own needs’ (World Commission on Environment and Development 1987: 43). Although, this definition is the ‘original’ definition and will be the one used in this research, it is not without contestation. In brief, these definitional contestations surround: What is sustainability? Is it simply giving a nod to the environment, ‘green washing’ or rather sustaining growth itself? What is development? Is it increased Gross Domestic Product, enhanced access to economic activity, improved livelihoods? Lele (1991) and a 2005 special issue edited by William Clark and others took on this question in particular. Nevertheless, the answer remains unclear as do many issues regarding operationalizing sustainable development as a theory and practice.

The dominant discourses surrounding sustainable development are about (1) what it is – a set of principles, a concept, a vision, an idea, and (2) its practicality and operationalizability, and (3) whether it is a goal or a process. Scholars have described sustainable development as a warm and fuzzy concept, ‘like motherhood and apple pie’ (D. W. Pearce et al. 1989: 1); ‘a grand compromise’ between environment and economy (Kates et al. 2005); a ‘multi dimensional bridging concept’ (Meadowcroft 2000: 381); being about everything and thus having the potential to be about nothing (Lele 1991: 613); and being vulnerable to ‘cockpitness’ (M. Hajer et al. 2015). Although it has been heavily critiqued for being too broad, difficult to identify and implement in practice, Hajer (1995) argues that more restrictive definitions could limit political support,

result in philosophical attrition, and that the discourse and contestation of the concept is in and of itself valuable. Consequently, many scholars are transcending these debates and researching how the concept of sustainable development has been used by actors in various governance regimes (Jordan 2008).

Hydrogeologists have already proposed various definitions of groundwater sustainability (Alley et al. 1999; Custodio 2002; Gleeson et al. 2012; Gleeson, van der Steen, et al. 2010; M. R. Llamas et al. 1992) in addition to specific guidance around pollution prevention and avoiding overexploitation of groundwater resources. Common elements of these definitions highlight that the development and use of groundwater should occur in such a way that it can be maintained for an infinite time without causing unacceptable environmental, economic, or social consequences. To support this definition, ideally, the use of principles focuses on political, economic, environmental and social aspects. However, a clear linkage still needs to be made between the physical resources and groundwater governance frameworks.

In the context of the Anthropocene, inclusive development is development that includes marginalized people, sectors and countries in social, political and economic processes for increased human well-being, as well as environmental sustainability and empowerment (Gupta et al. 2015: 546). Inclusive development emphasizes poverty alleviation, giving attention to marginalized people. One of inclusive development's central tenants says that unchecked economic growth in neo-capitalist frameworks may lead to social exclusion and increased economic and ecological disparity. These effects are already being witnessed today with some of the world's most rapidly growing economies being those marked with the least equitable income distributions, visible social exclusion and even human rights violations as well as degraded ecosystems. With inclusivity being highlighted as a key element required for successful implementation of the SDGs, the concept is receiving increased attention in academic literature. Nevertheless, the concept is still being developed empirically and conceptually and is not without contestation. One aspect that is contested is whether inclusive development should be exclusively pro-poor or should also capture environmental issues given the often-close relationship between the poor and the environment.

2.3.2 Operationalization

In this thesis, sustainable development is used as a “nirvana concept,” i.e. a concept that underpins overarching frameworks and supports particular narratives (Molle 2008: 131). In this context, sustainable development provides the analytical framework for assessing the state of groundwater governance. The *Report of the World Summit on Sustainable Development* (United Nations 2002) outlines three ‘pillars’ of sustainable development that have since been widely used in the literature - the social pillar, the environmental pillar and the economic pillar. This research will refer to them as ‘dimensions’ rather than pillars because they are ‘interdependent and mutually reinforcing.’ A political dimension to sustainable development captures the roles, relationships, and interactions between stakeholders that can affect sustainability. James et al. (2015) captures a similar notion in their ‘circles of sustainability’ concept, which includes a ‘political’ dimension. This research also responds to the call of Kanie et al. (2012) for enhanced horizontal harmonization between institutions and vertical integration between the three (in this case four) dimensions (Cash 2000). Gupta and Nilsson (2017) argue that implementing the SDGs requires regimes across levels and actors targeting drivers of change at the appropriate scale and ensuring horizontal and vertical coherence in outcomes, which is systematically applied to governance.

For my research, an inclusivity focus entails ensuring equitable and inclusive access to groundwater resources and allocation of the associated rights, risks and responsibilities. I contend that a focus on inclusivity can potentially enhance compliance with groundwater governance frameworks. When stakeholders believe rules are the outcomes of an inclusive or equitable process, rather than one outside of themselves, they are more likely to adhere to these rules in practice (Young and Zürn 2006). Considering the essential role that groundwater will play in development across the world, taking an inclusive perspective is essential. Thus, I operationalize inclusive development by focusing on the axis of sustainable development that links the social and environmental dimensions and by giving it three sub-dimensions: social

inclusiveness, environmental/ecological inclusiveness, and relational inclusiveness (Gupta and Vegelin 2016). I understand social inclusiveness as requiring that the focus must shift from only generating economic wealth flow to focusing on social worth, i.e. ‘reproducible capital; human capital; knowledge; natural capital, population, institutions, and time (Gupta et al. 2015; UNU-IHDP and UNEP 2012: 13). I see ecological inclusiveness as requiring the management of ecosystems services in a manner that is equitable across peoples and generations. And finally, relational inclusiveness means that democracy, distribution of resources, and participation are viewed as necessary to prevent reinforcing marginalization and poverty (Gupta et al. 2015; Mosse 2010; Oxfam 2014; Sachs 2004). As discussed in the focus and limits, the power element will not be a focus here but rather understanding how the groundwater governance framework itself is structured to cope with power.

To synthesize, this thesis uses sustainable and inclusive development as the key norm and the main analytical lens focusing specifically on the nexus between sustainable and inclusive development and groundwater. Sustainable development considers the political, environmental, social and economic dimensions equally and simultaneously. Inclusive development focuses on the political, environmental, and social dimensions, thereby emphasizing social issues, ecological protection and well-being and de-emphasizing neo-liberal capitalist growth. It also emphasizes the need for political debate because groundwater governance may require the redistribution of resources in accordance with the physical constraints of groundwater availability.

2.4 AN INSTITUTIONAL APPROACH TO GROUNDWATER GOVERNANCE

2.4.1 Groundwater Governance as an Instance of Earth System Governance

“The fundamental problems regarding environmental governance have to do with institutional matters.”
- Oran R. Young (2002:29)

This research focuses on the nexus of groundwater governance and sustainable and inclusive development. As such, I have chosen to anchor it in the Earth System Governance (ESG) concept. ESG is “the sum of the formal and informal rule systems and actor-networks at all levels of human society that are set up in order to influence the coevolution of human and natural systems in a way that secures the sustainable development of human society” (Biermann 2007: 326). Here, I will briefly discuss the origins of Earth System Governance and its link to International Relations (IR), and distinguish it from Global Environmental Governance in order to show the advantages of using it as the analytical basis for this thesis.

The origins of ESG can be traced to the analytical concept of Global Environmental Governance, which is rooted in regime theory and situated within the IR discipline. IR’s regime theory was born out of the need to better describe the interactions among states, as they were neither completely anarchic nor entirely a function of a hierarchical command and control system. Krasner (1982: 185) defined regimes as “principles, norms, rules, and decision making procedures around which actor expectations converge in a given issue-area.” As the definition indicates, a key proposition of regime theory is that there will eventually be a convergence of state practice, wherein actors develop common terms with which they relate and that influence their behavior in a particular issue area.

Later, Young (1989: 5) defined regimes as “authoritative social institutions embodying roles and rules.” The inclusion of the words, “social institutions” indicates a critical theoretical turn, wherein regime theory is explicitly linked to the institutionalist tradition in Political Science.⁴ Institutions can be considered ‘systems

⁴ Institutionalism is rooted in developments in Political Science occurring in the 1960’s and 70’s. The purpose was to understand the role institutions play in the outcomes of social and political processes (Hall and Taylor 1998). This thesis follows the understanding of institutionalism highlighted by (Immergut 1998: 8). She indicates that “old” and “new” institutionalisms are so closely related that it is often preferable to speak of the “institutionalist tradition.”

of established and imbedded social rules that structure social interaction' (Hodgson 2006: 18). The narrower definition I will use in this research is "a set of rules, decision-making procedures, and programs that define social practices, assign roles to the participants in these practices, and guide interactions among the occupants of individual roles" (Young 2002: 5). Scholars, primarily from the IR field, began to operationalize the theoretical linkage between regimes and institutions to analyze global environmental problems such as ozone depletion, climate change, and the Arctic as a common concern of human mankind. This field of research has been termed Global Environmental Governance (GEG).

Morin and Orsini (2013: 563) refer to Global Environmental Governance as a "thematic island of the IR archipelago." Several scholars explicitly linked Global Environmental Governance with institutionalism (Young 2002; Zelli and Asselt 2013) and have looked at how multiple institutional arrangements address the same issue area from within the environmental theme (Biermann, Pattberg, et al. 2009) as well as how institutions lead to norm-compliant behavior (Cortell and Davis 1996; Schmidt 2008 r.e. norms in discursive institutionalism; Skjærseth et al. 2006). However, Global Environmental Governance goes beyond regime theory by taking into consideration the importance of non-state actors, while still seeing states as a central point of authority (Ford 2003).

There has also been a focus on the role of law as an institution in Global Environmental Governance. Multilateral environmental agreements and associated treaty-based organs have been critical to enhancing the performance of environmental resources by elaborating and applying norms; ensuring compliance; and coping with challenges posed by shifting environmental dynamics (Brunnée 2002; Morin and Orsini 2013). According to Hey (2007: 750–751) an analogous influence can be observed in domestic environmental law. International legal scholars would refer to this as 'norm convergence,' which could be considered the legal analogue of the convergence of state practice in IR literature. It would be logical to question the importance of environmental agreements in contexts lacking rule of law and enforcement capabilities. However, Young and Zürn (2006) and Allott (1999) show in their respective studies that legal institutions still have measurable effects in settings where legal procedures are underdeveloped and enforcement is rare. As such, environmental law can be seen as a central component in Global Environmental Governance in all political contexts.

The International Human Dimensions Programme (IHDP) established a 10-year multi-disciplinary institutional program (The Institutional Dimensions of Global Environmental Change [IDGEC]) to analyze how institutions can govern the global environment. They prepared a methodology for analyzing existing institutions and improving them, which has served as the inspiration for my method (see 2.5.1). They argue that such analysis should focus on causality (to what extent is a problem caused by institutions), performance (which institutions work and which do not in specific contexts, given specific drivers), and design (how can one improve institutions based on the previous analysis).

The follow-up decadal global program is called Earth System Governance and builds on these developments in Global Environmental Governance by (1) integrating multiple ontologies and epistemologies into issues of global environmental governance; (2) encouraging research that analyzes the relationship between governance frameworks at multiple geographic levels; and (3) integrating the political, environmental, social and economic aspects by positioning sustainable development as the overarching norm for its research objectives. ESG structures its core concepts within its 2009 Science Plan (Biermann, Betsill, et al. 2009) and centers its research questions around five core problems (architecture, agency, adaptiveness, accountability, and access and allocation) and four cross-cutting themes (power, knowledge, norms and scale). As discussed in the focus and limits, this research focuses on the problem of architecture and does not address in detail the problems of agency, adaptiveness, accountability or issues of power.

This thesis embeds groundwater governance within ESG's 'analytical theme' of architecture and focuses on norms within the architecture, namely normative architecture. As such, both 'architecture' and 'norms' are defined and further elaborated in the sub-sections below. The problem of allocation and access can be viewed as 'the problem of who gets what, when, where, and how' (Biermann, Betsill, et al. 2009: 58). Access is

defined as achieving a minimum amount of resources for survival while allocation is defined as the distribution of resources within and between countries (Gupta and Lebel 2010). Empirically, it is primarily examined in the assessment of the case study, although some links are also drawn to it when assessing the groundwater governance architecture. The cross-cutting issues of knowledge (scientific understanding of groundwater resources) and scale (which groundwater governance issues are addresses at which geographic levels and why) arise throughout the analysis.

2.4.2 Architecture of Groundwater Governance

A key aspect of governance is the study of its architecture (Biermann and Pattberg 2009; Young 2002). Architecture is ‘the interlocking web of widely shared principles, institutions and practices that shape decisions at all levels in a given area of earth system governance’ (Biermann, Betsill, et al. 2009: 31, similarly defined in Mitchell 2002; and Young 2001). In other words, it is the overall structural design composed of individual governance frameworks. Within ESG, architecture is considered to have a scalar component. The concept of ‘scale’ is used across many disciplines and often interchangeably with ‘level.’ However, I use them in accordance with GEG and ESG literature wherein scale is defined as “the spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon” and level as “the units of analysis that are located at the same position on a scale,” which may or may not be hierarchical (Biermann, Betsill, et al. 2009: 73; Gibson et al. 2000: 218). In order to assess the architecture of groundwater governance, I take a normative focus and incorporate elements from three scales: (1) geographic/spatial, (2) biophysical, (3) and temporal. I discuss the purpose of a normative-focused analysis and each of the scales. I elaborate on the methods in Section 2.5.2 and the elements of the geographic/spatial scale in this section, the biophysical scale (i.e. groundwater resources) in Section 3.4 and the temporal scale in Chapters 5-8.

I define norms as the dimension of governance which articulates a “standard of appropriate behavior for actors with a given identity” (Finnemore and Sikkink 1998: 891). Governance architectures, and the institutions therein, are influenced and shaped by the “collection of norms and mix of rules and practices that structure these institutions” over time (Biermann, Betsill, et al. 2009; Finnemore and Sikkink 1998). Although there is vast political science and legal literature attending to norms (also called values, ideals, principles), the precise naming or identification of specific norms is rare (Kooiman and Jentoft 2009). Norms are frequently an analytical dimension used to measure and study governance, particularly in international relations (Beyerlin 2007; Cortell and Davis 1996). As discussed above, I position sustainable and inclusive development as the key norm in this research. In understanding how norms influence and are imbedded in governance architecture, it is important to understand how they have evolved and developed across time. Thus, the temporal scale is integrated into the analysis.

Governance architecture is composed of norms, principles and other institutions included at multiple geographic levels. Thus, the concept of multi-level governance (MLG) becomes an important link to ESG in that it delineates the levels of the spatial scale. MLG can be defined as ‘political structures and processes that transgress the borders of administrative jurisdictions, aiming to cope with interdependencies in societal development and political decision making which exist among territorial units’ (translation of Benz 2006 as cited in Newig and Fritsch 2009: 1999). The literature distinguishes two types of MLG: Type I and Type II (Marks and Hooghe 2004). Type I focuses on general-purpose jurisdictions with a wide range of functions, that have nested territorial membership in a limited number of levels with a system-wide architecture. In Type II MLG, jurisdictions have distinct functions, intersecting territorial membership, many jurisdictional levels (e.g. polycentric governance) and ‘flexible design’ (Marks and Hooghe 2004). Given this distinction, I use Type I MLG in my analysis because it is explicitly linked with IR literature and addresses governance architectures. Consequently, the levels of the geographic/spatial scale are delineated according to the global, regional, transboundary, national, and sub-national (e.g. provincial and municipal) administrative jurisdictions. However, these levels in the geographic/spatial scales do not typically coincide with the biophysical scale of groundwater. Further, countries are not always neatly nested in the transboundary level.

As such, understanding these biophysical and administrative scales and their relationship to governance is explored in this thesis.

MLG literature has synergies with ESG. The analytical problem of architectures emphasizes the importance of ‘increasing understanding of the vertical interaction of governance mechanisms and the notions of multilevel governance’ (Biermann, Betsill, et al. 2009: 31). The MLG concept has also been applied to various aspects of Earth System Governance, including water governance (Gupta et al. 2013; Gupta and Nilsson 2017; Knüppe and Pahl-Wostl 2011; Pahl-Wostl et al. 2010). It can also be used along with temporal, spatial, and biophysical scales (Moss and Newig 2010) as is done in this research. Several empirical studies in the European Union have also explored the relationship between MLG and sustainable development, indicating that this is an emerging area of conceptual linkage (Gibbs and Jonas 2001; Jordan 1999, 2008).

ESG literature discusses the need to appropriately scale norms and institutions up and down administrative levels. It also demonstrates that often at the global geographic level, norms are of special relevance since they are framed as principles of international environmental law (Biermann, Betsill, et al. 2009). Thus, MLG is an important point of convergence between ESG and geography, as it facilitates understanding around how geographic levels of governance and the delineation of groundwater resources interact in space as well as how that interaction can influence the definition of groundwater problems, the drivers of those problems and the appropriate groundwater governance principles to counter those drivers. In this research, I analyze governance architectures (including principles) along each geographic level. In doing so, I acknowledge that at a single geographic level, there may be multiple governance framework that simultaneously include different, and possibly incongruent or incoherent, principles. The relationship between these different governance frameworks within a given jurisdiction impacts the achievement of the key norm – sustainable and inclusive development. This phenomenon is captured by the concept of legal pluralism.

2.4.3 Legal Pluralism in Earth System Governance

Definition and Origin of Legal Pluralism

Although authors use different language to define legal pluralism based on their disciplinary backgrounds, the essence of the definition is similar. Essentially, different rules created by different actors may have differing significance, relevance and ramifications for the same populations and the resources upon which they rely. Therefore, I use the definition provided by Bavinck and Gupta (2014: 1) who define legal pluralism as a ‘condition whereby different rule systems apply to identical situations and legal jurisdictions.’ To proceed, I will discuss the theoretical origins of legal pluralism; link it to ESG and MLG; and then discuss briefly how I operationalize it in my analysis.

Historically, legal pluralism was used to describe the interaction between traditional legal systems and encroaching colonial rule (Benda-Beckmann 2001; Ehrlich 1936; Malinowski 1926). Recently, it focuses on understanding pluralism dynamics (Nobles and Schiff 2012; Zumbansen 2012) through investigating (a) the fragmentation of the (international) legal order (Koskenniemi and Leino 2002) or (b) the co-existence of multiple legal orders in a single jurisdiction (Tamanaha 2011). Legal pluralism can occur ‘horizontally,’ due to multiple rules developed at the same geographic level of governance or ‘vertically,’ due to multiple rules developed at the different geographic levels of governance (Conti and Gupta 2014). Thus, several disciplines, such as anthropology and law, use the legal pluralism concept but with different foci and methodological approaches. I focus on the legal and water governance fields and how they frame legal pluralism at different geographic levels.

At the global and regional levels, the influence of Communities of Practice has increased plurality and informality in global administrative law (Cullet 2013). At the national and subnational levels, traditional local water use can differ from codified laws affecting access to and allocation of water (Boelens 2009; Gupta and Lebel 2010). These issues are often complex and, in different environments, they can result in different outcomes, such as the progressive development of legal systems (Nobles and Schiff 2012) or incongruences

in principles applied at the same geographic level (Biermann, Pattberg, et al. 2009; International Law Commission 58th Session 2006; Koskenniemi and Leino 2002; Zelli and Asselt 2013). Unfortunately, the growing legal pluralism discourse on water has focused on surface water (Prakash and Ballabh 2005), but hardly on groundwater (an exception being Conti and Gupta 2014).

Linking Legal Pluralism to Governance Architectures

ESG explicitly highlights three key aspects of legal pluralism in relation to architecture. First it links norms to law and policy by saying that many overarching norms are formulated as general legal principles, especially in international laws (Beyerlin 2007). Second, it states that global environmental governance regimes are increasingly pluralistic (Bernstein and Cashore 2012). Third, it acknowledges that various historical influences, particularly (neo)colonialism, have led to the co-existence of different norms in many locations (Biermann, Betsill, et al. 2009: 73). In the context of Earth System Governance, legal pluralism raises issues of fit, interplay and scale (Young 2002).

Interplay issues arise when the norms in groundwater governance frameworks may or may not be aligned within and across geographic levels. This is analogous to the vertical and horizontal legal pluralism discussed above. Fit is a challenge when the norms included at a particular geographic level do not match the physical properties of groundwater resources. This is also an instance of legal pluralism because a single groundwater resource may be defined or delineated differently according to the laws and policies originating from different actors and/or from different geographic levels. The issues of interplay and fit are in fact also issues of scale because they indicate mismatches between biophysical, administrative and spatial scales in groundwater governance. These mismatches are also affected by political and knowledge developments over time (i.e. the temporal scale).

The issues of interplay, fit and scale point back to the groundwater resource problems of data dearth and glocalization (see 1.2). Lack of data and information regarding groundwater resources at various geographic levels presents a large gap in hydrogeological knowledge that impedes groundwater governance. This is compounded by the fact that aquifers are not universally accepted as the unit for groundwater governance and even when they are used, their precise physical dynamics may not be well understood. Despite the glocal nature of groundwater problems, groundwater is not directly governed as a global resource; rather it is indirectly influenced by other global governance frameworks focused on climate change, trade, and biodiversity (Hoff 2009; Vörösmarty et al. 2015). As such, laws applicable to groundwater developed at the global level do not have a direct fit because they do not deal with the global/transnational aspects of groundwater governance but rather focus on transboundary aquifers or international watercourses with hydrological linkage to groundwater resources (Conti and Gupta 2015).

2.4.4 Synthesis

In summary, the justification for using ‘architectures’ within the context of Earth System Governance reaches back to regime theory and GEG and their emphasis on institutions and the principles, norms and rules therein. The shift from understanding spatially-specific governance frameworks toward their interactions in a multi-level context leads to the integration of the multilevel governance concept. As norms undergird the design of governance institutions, this research focuses on assessing the existing norms of groundwater governance and redesigning them to make them consistent with sustainable and inclusive development and assessing the role of relevant actors (e.g. countries, intergovernmental and non-governmental organizations, and epistemic communities of scholars). Taken together, the abovementioned theoretical and conceptual developments justify analyzing groundwater governance frameworks at multiple geographic levels with a view to promoting sustainable development and inclusive development.

2.5 RESEARCH METHODOLOGY AND CONTEXT

2.5.1 Conceptual Framework for Analyzing the Institution of Groundwater Governance

This section introduces the conceptual framework used to carry out this research. The terms conceptual framework and theoretical framework have been used interchangeably in the literature (Maxwell 2012). A conceptual framework can be defined as a visual or written product that explains the key concepts to be studied and their relationships. Such a framework also captures the assumptions, expectations, beliefs and theories underlying the research in order to place the results in the appropriate context (Miles and Huberman 1994; Ravitch and Riggan 2011; Robson 2011). Concepts bridge this research's empirical emphasis and its theoretical implications. This is in alignment with Ravitch & Riggan's (2011) proposition that using a conceptual framework leaves room for critical engagement with these underlying theories based on empirical evidence.

I use a conceptual framework adapted from IDGEC's methods for the institutional analysis of environmental governance regimes (Young 2002). The objective of my research is to diagnose the state of groundwater governance and elaborate a moderately generalizable baseline for groundwater governance principles that should be contextualized. However, such contextualization may need to rely on certain assumptions about the state of groundwater resources and the motives of groundwater use due to data limitation. Young (2002: 176) describes that advantage of his diagnostic approach as follow:

“It is useful to treat this approach as an exercise in midrange generalization, coupled with liberal use of *ceteris paribus* assumptions. Instead of attempting to identify a given problem as a generic problem type (e.g., CPR) and then applying conditions regarded as necessary to successful treatment of all instances of that type, the diagnostic approach attempts to disaggregate environmental issues, identifying elements of individual problems that are significant from a problem-solving perspective and reaching conclusions about design features necessary to address each element.”

IDGEC's framework consists of six parts: (1) institutions, (2) instruments, (3) actor-pressure, (4) institutional drivers, (5) resource performance, and (6) institutional redesign. Operationalizing the frameworks first requires an analysis of anthropogenic and natural drivers causing problems in the environmental system (#4 in Table 2.2). Second, it requires an analysis of the institutions of groundwater governance at multiple administrative levels. Third, it requires the identification of institutional causes (instruments) of groundwater problems, such as weak incentives or insufficient penalties. These institutional causes influence human behavior resulting in problems to the environmental system, given the contextual drivers. Based on analysis of which institutional incentives work and which do not, institutional responses can then be (re)designed.

I have adapted this model to focus on groundwater governance. First, I focus on governance institutions in terms of laws, policies, or programs. If there are multiples laws, policies and programs contributing to governance within a single jurisdiction, I refer to them collectively as a framework. In accordance with my adaptation of the IDGEC framework and understanding of ESG architecture, I use content analysis to identify the principles as key components of the architecture (see 4.2).

My second difference is that, due to data limitations, IDGEC's framework in its most orthodox application would establish a causal link between the implementation of an institutions' norms and principles, how they drive or cause changes to human behavior, and thus affect the performance (or physical state) of an environmental resource. However, as discussed in Section 1.2, the state of groundwater governance and understanding of groundwater resources at all geographic levels is severely hampered by a lack of hydrogeological data and cross-cutting social sciences analysis. Therefore, I only apply this model empirically in the case study, see 8.5). The other chapters deemphasize causality and implementation outcomes and emphasize understanding the narrative and norms to assess whether the institutional causes

actually are able to influence human activities given the drivers of groundwater problems towards sustainable and inclusive development.

In the adapted conceptual framework, the first element remains institutions, namely the institution of groundwater governance (as discussed in Section 2.4). The second element remains instruments (discussed in Chapter 4). The ‘big-picture’ focus means that actors selecting and implementing these instruments are the focus rather than actor pressure which focuses on behaviors. Consequently, the role of politics, agency and power dynamics in actor behavior is also limited (see 1.4.2). The third element analyzes the actors and their participation in groundwater governance institutions, but does not focus on actor pressure or behavior. The fourth element examines drivers and to a limited extent the behavior behind the drivers. Yet, it does not look at institutional drivers as proposed by IDGEC since there is a lack of data that provides causal link between institutions and the state of groundwater resources. Instead, it focuses on human activities and biophysical shifts that may result in groundwater problems through the lenses of hydrogeology and ecosystems services (see 3.5). So instead of addressing human behavior explicitly, the adapted framework considers it implicitly as the impetus behind anthropogenic drivers. The fifth element of my framework, institutional performance, adapts IDGEC’s notion of resource performance. Resource performance is based on how the presence of institutions has effected the performance or state of the natural resource the institutions govern. Again, a lack of data preempts drawing a causal link between existing groundwater governance institutions and the state of groundwater resources. As such, the adapted framework uses legal pluralism as a performance indicator in lieu of resource performance indicators (e.g. level of pollution or depletion).⁵ Redesign becomes the sixth element and focuses on adjusting the institution of groundwater governance to become consistent with the normative goal of sustainable and inclusive development. Details regarding the operationalization of the framework are discussed immediately below.

Table 2.1 Original versus adapted conceptual framework

ORIGINAL IDGEC FRAMEWORK		ADAPTED FRAMEWORK APPLIED TO GROUNDWATER	
Element	Definition	Element	Definition
(1) Institutions	The set of rules, decisions-making procedures, and programs that define social practices	(1) Institutions	Specific laws/policies/customs governing a groundwater resource
(2) Instruments	Specific rules/principles/measures in the above institutions used to influence behavioral change	(2) Principles	Principles/rights/rules/measures used in the above institutions to influence behavioral change
(3) Actor pressure	Anthropogenic behaviors that affect a resource (e.g. over-use, polluting)	(3) Actors	Persons/communities/organizations/states participating in or affected by institutions
(4) Drivers	Causes of anthropogenic behaviors or biophysical phenomenon that affect actor behavior (e.g. economic growth, climate change)	(4) Drivers	Anthropogenic or biophysical causes of groundwater problems
(5) Resource Performance	Biophysical condition of the resource (e.g. pristine v. polluted)	(5) Institutional Performance	Degree of comprehensiveness and coherence of the principles design (e.g. legal pluralism) in meeting sustainable and inclusive development
(6) Redesign	Improve existing institutions/principles to address continuing actor pressure and drivers	(6) Redesign	Improve existing institutions/principles to address drivers, resolve contradictions emerging from a legal pluralist analysis and achieve sustainable and inclusive development.

⁵ Kooiman and Chuenpagdee (2005: 337) say that institutional design can be a measure of performance in governance.

2.5.2 Integrated Analytical Approach

This section explains how I applied the conceptual framework and methods. Details regarding the procedure for applying individual methods are discussed immediately below. The integrated analysis used a layered approach in accordance with the research questions, the conceptual framework, and the elaborated research design (see Figure 2.1). I worked abductively and iteratively, using qualitative data to validate quantitative data and the used qualitative data to construct categories that can support analysis of quantitative data (Onwuegbuzie and Leech 2005).

I used literature and available databases to assess the physical characteristics of groundwater resources and identify groundwater resources problems. Focal topics for the literature review included the state of groundwater resources at the global and transboundary levels, ecosystems services of groundwater and groundwater's link to climate change. I also used data on groundwater resources available in public databases to map the problems spatially using GIS. Some of the findings from my research have been published and or presented at international conference, and comments from reviewers, editors and conference participants have helped to further refine those findings (Conti 2016; Conti and Gupta 2014, 2015).

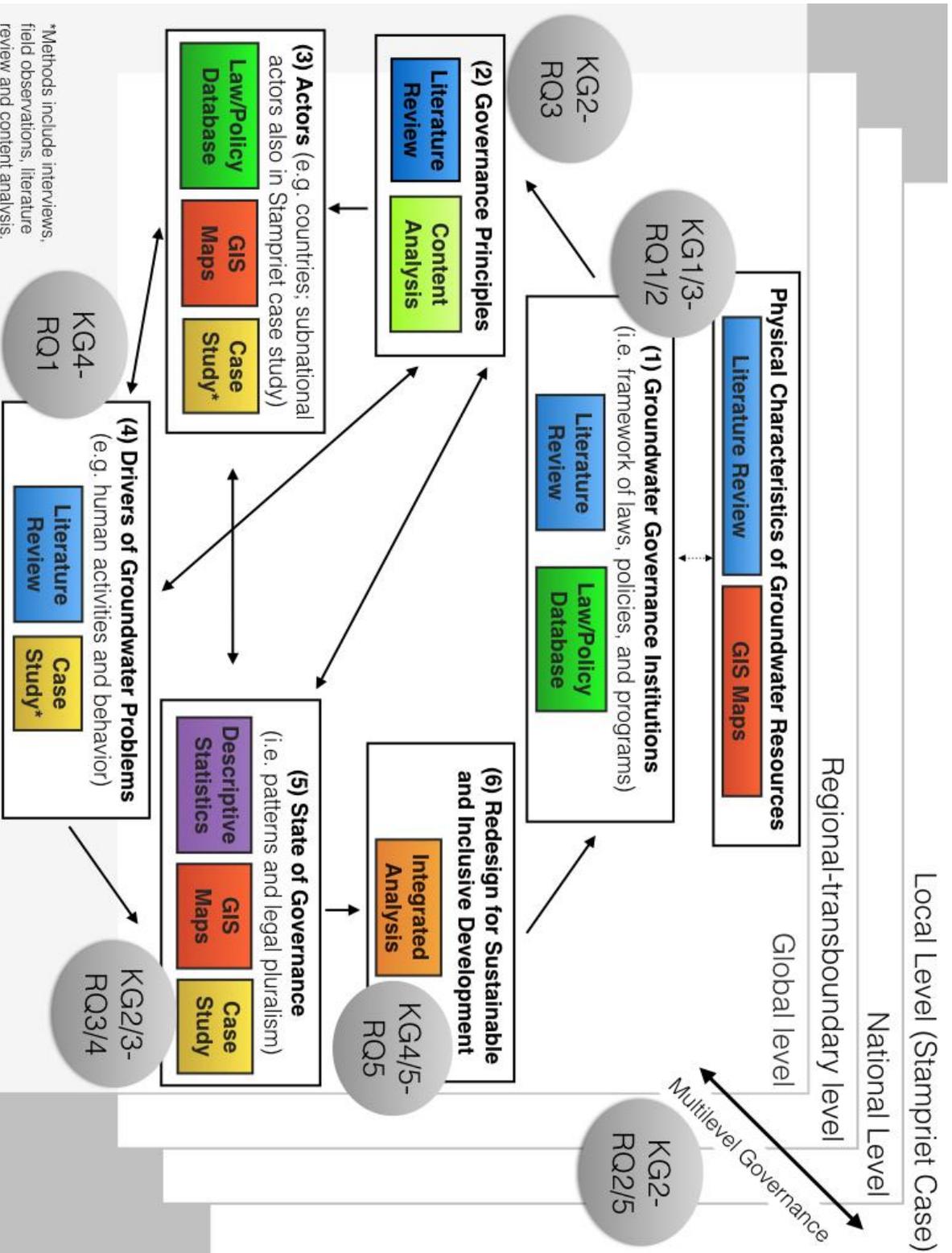
The institution of groundwater governance is composed of individual governance frameworks, which were identified through literature about groundwater governance and groundwater law as well as a search of legal databases. I also took into consideration informal inputs from experts in groundwater resources management with whom I interacted at international conferences as well as in IGRAC-related project and research activities (see list in front matter). All laws, policies and programs identified as having relevance to groundwater were assembled into a groundwater governance database spanning the relevant geographic levels.

To analyze the governance frameworks, I used the documents contained in the database using content analysis. The content analysis procedure was informed by literature (see 2.5.5). The objective was to identify the governance principles in the frameworks. The content analysis also linked particular principles to actors (i.e. countries or sets of countries). For the Stampriet transboundary aquifer, the laws and policies were also included in the database, but analysis of the case study included a more detailed account of the actors involved through stakeholder interviews and field observations.

At each geographic level, the state of groundwater governance was assessed in four ways. First, the temporal evolution of groundwater governance was discussed and the resulting differences in the framework according to characteristics of legal pluralism were characterized. Second, the patterns in the use of groundwater governance principles were identified using descriptive statistics (e.g. frequency). Third, the principles' relationship to groundwater problems at that level were explored with GIS mapping. Fourth, the horizontal legal pluralism analysis allowed the various laws, policies and programs related to groundwater to be analyzed on the basis of their characteristics and implications for governance using an adapted version of the heuristic types discussed in Section 2.4.3 (see Table 2.1). This gives an indication of the relationship between these governance texts and facilitates understanding of how it may affect their contribution to sustainable and inclusive development.

Each of these portions of the integrated analysis was also carried out for the case study of the Stampriet Transboundary Aquifer System. The case study analysis used desk study and preliminary discussions with experts to understand the groundwater governance principles presented in law and policy in the Stampriet. Field work examined these principles in practice through interviews and field observations. It also served to identify new drivers and principles necessary to cope with them (see Chapter 8). Patterns and legal pluralism analysis revealed where the existing framework may face challenges with regard to achieving sustainable and inclusive development.

Figure 2.1 Research Design Schematic



In order to propose a redesign of the groundwater governance framework, Chapters 5-8 analyze patterns, legal pluralism and drivers to assess the degree to which the groundwater governance framework at that level may support sustainable and inclusive development. To do so, the principles' potential to counter drivers and support ecosystems services is discussed specifically with respect to sustainable and inclusive development.

Then principles that are sufficiently present in the frameworks to support sustainable and inclusive development; that are absent and/or undermine sustainable and inclusive development; and that are incongruent with each other and may prevent sustainable and inclusive development are discussed. Finally, the manifestations of legal pluralism and their implications for sustainable and inclusive development are elaborated. Chapter 9 then integrates these findings across all levels. Chapter 10 discusses the key elements and considerations for redesign.

2.5.3 Literature Review

The literature review was used to systematically and critically analyze published knowledge by way of summary, classification and comparison. It formed the foundation for understanding the current state of knowledge on a groundwater governance and helped situate the topic and approach within this landscape. Often a literature review includes documents from both primary and secondary sources, with a focus on academic literature from books and peer-reviewed journals.

Going beyond identifying knowledge gaps, the relevant theories, and substantiating the conceptual framework, the thesis uses the literature as a key source of data to identify the drivers of groundwater governance (see 3.2), identify existing groundwater governance principles (see 4.3-4.6) and trace how groundwater governance has evolved over time and what factors have influenced its development at multiple geographic levels (see 5.2, 6.2, 7.2, and 8.3). It also supports the analysis of empirical data gathered from legal and policy texts as well as interviews, in accordance with the conceptual framework (see 5.3, 6.3, 7.3, and 8.3).

An iterative approach was taken in conducting the literature review. In general, the literature search focused on the legal, political science, geography, and hydrogeology literature. Initial searches in the ScienceDirect database, using Boolean search criteria using two sets of key words shown in Annex B related to: (1) the groundwater resources and (2) groundwater governance. Initial keyword searches did not always yield a robust set of results. Therefore, the keywords and reference lists of frequently-cited, peer-reviewed academic texts were used to construct subsequent rounds of search criteria in order to acquire the list of references used for further analysis.

I was exposed to relevant grey literature as a result of my relationship with IGRAC and through contact with experts in a range of fields related to groundwater governance at congresses such as Stockholm World Water Week and the Earth System Governance Conference; meetings and consultations for projects conducted by the Global Environment Facility and the Dutch Scientific Research Council (NWO); and academic training courses such as those offered by CERES (a full list of congresses, projects and trainings is available in front matter). Grey literature was produced by experts in (ground)water governance, organizations specialized in (ground)water governance issues and projects specifically dedicated to (ground)water governance research. Common sources include the World Bank, Global Environment Facility, United Nations, and International Groundwater Resources Assessment Centre. Additionally, publications from national organizations specialized in groundwater including the German Geological Survey (BGR), British Geological Survey (BGS) and United States Geological Survey (USGS) were used. Conducting the literature review showed that there is no common terminology for researching various aspects of groundwater governance. It also showed that both academic and grey literature make significant contributions to the body of knowledge on groundwater governance.

2.5.4 Assembling a Groundwater Governance Database

In the initial stages of research, I gathered all the groundwater laws at the global, transboundary and national levels as the basis of my data analysis. At that time, preliminary literature review and information available in the IGRAC Global Groundwater Information System (GGIS) indicated that there were eight relevant laws at the global level, five at the transboundary level and over eighty at the national level (nearly a third of which were not available in one of the research languages). The main criteria for including documents in the analysis was that they needed to be considered ‘soft law’ or ‘hard law’ documents and that they needed to explicitly include groundwater resources in their scope. However, the initial data analysis indicated that these criteria needed to be broadened in order to accurately characterize the normative architecture for groundwater governance.

At each geographic level, slightly different criteria, based on information gathered from a more comprehensive literature review, were used to expand the search. At the global level, literature indicated that there is an inherent link, and sometimes a dependence between groundwater resources and other natural resources (e.g. wetlands) and that (ground)water resources are increasingly ‘glocal’ in character (see 1.2). As such, global environmental conventions governing water-related resources and climate were included in the database.

The transboundary level became the regional-transboundary level, since there were four regional laws dealing with groundwater or groundwater-related environmental resources. At this level, there was indication that groundwater governance was occurring in more transboundary aquifers than the five commonly cited in literature. With the help of IGRAC staff and other groundwater professionals, I was able to identify an additional fourteen instances of groundwater governance that were occurring by way of projects, within the context of international river basin organizations or through informal legal agreements, such as Memorandum of Understanding.

At the national level, expanding the search to also environmental laws and policies that explicitly include groundwater in their scope resulted in over 170 countries having laws relevant for the analysis. Several countries had multiple documents relevant to groundwater and roughly 40 countries’ documents were not available in the research languages. A key source for the national-level documents was the UN Food and Agriculture Organization’s legal database (Food and Agriculture Organization of the United Nations (FAO) 2015).

Gathering the documents according to the aforementioned criteria significantly expanded the number of documents being assessed and at the completion of the database assembly, there were sixteen global level documents, over one hundred transboundary level documents, and 180 national level documents available in English, Spanish, French or Arabic. The references for these documents are available in Annex C. Country participation in the global, regional and transboundary laws, policies and programs is in Annex D.

2.5.5 Content Analysis

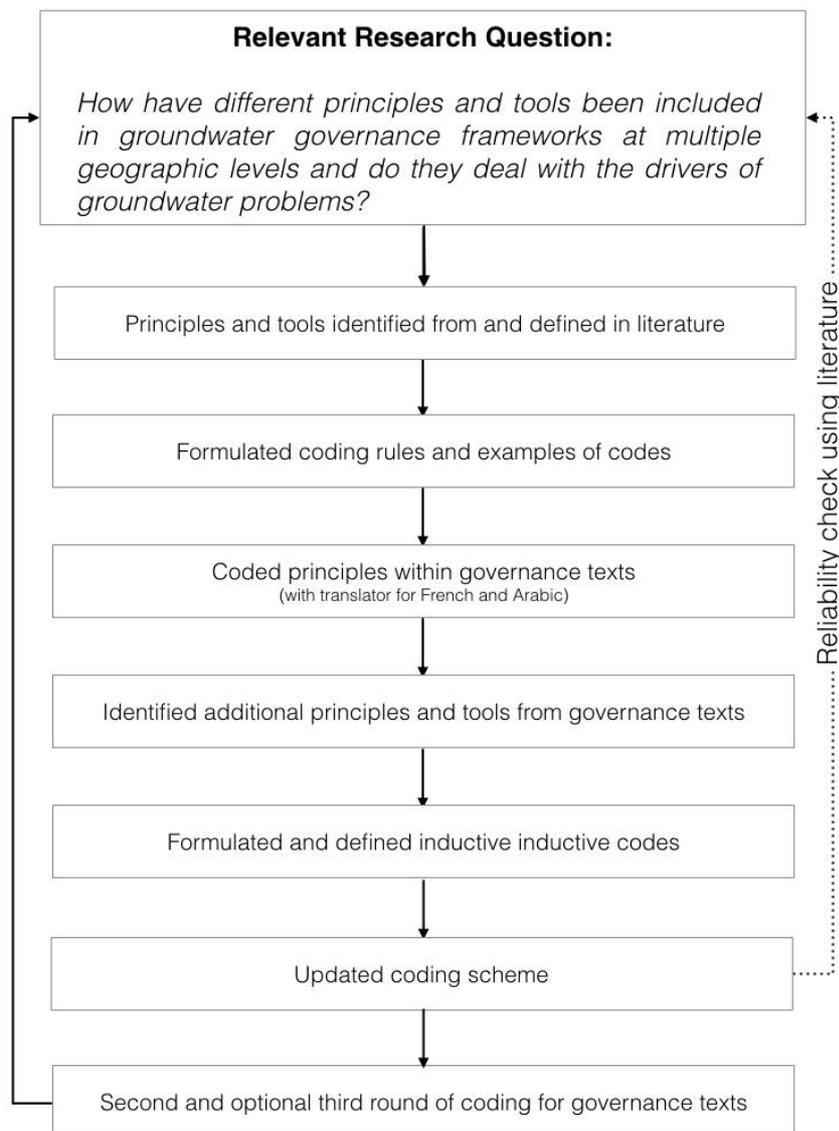
This thesis used content analysis to systematically synthesize sections of text into categories based on explicit coding rules or protocols (Berelson 1952; Crowley and Delfico 1996; Krippendorff 2012). The purpose of content analysis is the systematic examination of informational materials (Jenner et al. 2004). It originated from the communications discipline but is now used across the social sciences including the analysis of legal and legislative texts (e.g. Nelson 2012). A key advantage of the content analysis approach is that it devises a replicable method of identifying the attributes of the set of texts. It allows categories to arise out of the literature or empirical data inductively and to be applied deductively (Mayring 2000).

Critiques of content analysis state that it does not adequately capture ‘latent contents’ (Altheide and Schneider 2012; Jenner et al. 2004; Mayring 2000) such as those that might be captured with traditional legal analysis or discourse analysis. However, neither of these methods suit the objectives of this thesis, as

discussed in 1.4.2 and 2.2. Further, filtering out latent content is actually advantageous in my research approach, since the overall goal is to draw out the core normative content of groundwater governance documents through the analysis of the principles therein.

This research analyzed the governance documents from the database (i.e. law, policies, and projects) using the approach depicted in Figure 2.2. Doing so, provided relevant findings for three elements of the conceptual framework: identifying principles, assessing performance via legal pluralism, and drawing conclusions regarding redesign for sustainable and inclusive development. The analysis occurred in four main steps, which had to be slightly altered when examining data from different geographic levels because of varying types of data inputs and availability. For the international, regional/transboundary, and national levels the steps were executed as follows. First, the abductive model of category development and application was applied. Principles emerging from the literature review (i.e. deductive categories) were identified in the documents. Simultaneously, potential additional categories (i.e. inductive categories) were noted. Additional rounds of review of the texts were required to capture all inductive and deductive categories and code them (see Figure 2.2). The iterations resulted in clear coding criteria for each category (see Annex E). Second, the document codes were grouped in categories, referenced geographically (i.e. TBA or country), and imported into statistical analysis software and a GIS for further analysis.

Figure 2.2 Process Diagram for Determining Categories in Content Analysis



For the global and transboundary levels, content was tracked in a simple spreadsheet. However, the volume of data produced during the national level analysis required use of a qualitative analysis software (Atlas.ti). I was only able to code documents available in English and Spanish myself. Documents in French and Arabic were coded by translators under my direct guidance and supervision. This coding process resulted in nearly fifty potentially emerging principles being identified inductively, namely being present in the texts themselves but not yet identified in legal scholarly literature (see Chapter 4). These potential principles were not further analyzed but are used as points of reflection in Chapter 10, see Table 10.1. After several iterations of refining the coding and re-checking the documents, the aggregate results were exported from both the spreadsheets and qualitative analysis software into a quantitative analysis software and a spatial analysis software for further analysis.

2.5.6 Spatial Analysis and Mapping

I used a Geographical Information System (GIS) and statistical analysis software to visualize the spatial distribution of groundwater resource problems globally and analyze spatial patterns in groundwater governance frameworks at multiple geographic levels. GIS is capable of spatially analyzing and visualizing many types of data from many sources and is used to help understand and identify spatial and geographic relationships, patterns and trends. To apply GIS, I converted the results of the content analysis into quantitative metrics, processed and imported the data into a database (Microsoft Excel), and visualized the data spatially using ArcGIS 10.0. The rationale for using GIS mapping for this analysis was threefold. The first motivation for using GIS is to analyze and visualize large amounts of data collected at different geographic levels and the spatial patterns therein. Second, it draws upon first efforts to integrate qualitative data with GIS (Knigge and Cope 2006; Kwan and Ding 2008) as well as previously completed statistical analysis of legal concepts (La Porta et al. 2008). Third, mapping serves as a tool for reflection regarding the production and management of spatial knowledge and data (Baud et al. 2014).

Within the GIS software, the results of the content analysis were integrated with two maps for visualization: a transboundary aquifer map and a country boundary map. Combinations of graduated colors and symbols, unique values and dot density were used to show relationships between multiple types of data. The symbology of various attributes was also adjusted to include solid colors, stripes and hashes in the cases where this added clarity to the visualizations.

To supplement the information communicated using the maps, additional visualization tools were necessary (Monmonier 1996; Tufte 2001). The statistical software was used to create these complementary data outputs. Within the software, all principles were given binary codes concerning their presence in the groundwater governance texts: 1 for present and a 0 for absent. The counts of these codes were generated in groupings per geographic level/region and per dimension of sustainable development. The resulting histograms, timelines, and contingency tables complement the spatial visualization in order to bring out additional patterns that otherwise would not be seen.

2.5.7 Case Study

Purpose of Case Study

A case study is an “empirical enquiry that investigates a contemporary phenomenon (the “case”) in-depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident” (Yin 2014: 6). This research uses a layered, single case study design. Some researchers believe single case studies lack generalizability and external validity (Easton 2010; Ragin 2014). Nevertheless, a single case study gathers multiple sources of information during an in-depth and holistic investigation (Creswell 2012), while also contributing to the conceptual validity in the study of complex phenomena (George and Bennett 2005), such as governance. It does so by considering contextual factors that cannot be taken into account using quantitative methods. This is consistent with George and Bennett’s (2005)

idea of contingent generalizations or mid-range theories. Yin (2014) further contends that findings from single case studies can be used to generalize towards theories.

Case Selection

Given the multi-level nature of this research, using a transboundary groundwater resource as a case study served to assess the interaction of several groundwater governance frameworks within a single hydrogeological context. Given that only one transboundary aquifer was selected from several cases available, the aquifer is not representative of the world of possible cases but rather an illustrative case of how governance regimes develop and evolve. It is particularly useful in understanding how governance regimes may cause groundwater change. It also enables research to trace how the particular regime is performing against pre-defined criteria for effective groundwater governance. The location, aquifer size, number of aquifer states, rigor of groundwater governance frameworks, and importance of actors at various levels were considered during selection. Language and potential to access information were also taken into consideration. As such, the Stampriet Transboundary Aquifer Systems (STAS), divided across Botswana, Namibia, and South Africa, is the case study presented in this research (see maps in Chapter 1).

The STAS was selected because of its specific attributes and challenges, but also its potential representativeness for other transboundary aquifers across the globe. First, many large transboundary aquifers are located in arid climates and have human populations reliant on them as the sole source of water supply. Second, there are numerous transboundary aquifers where the groundwater volumes are not equally distributed among the countries and there are severe data limitations in one or more states. Third, many transboundary aquifers face challenges with respect to asymmetric uses between states and shifting demographics as is the case between the STAS states. Fourth, the STAS is potentially being depleted, which is also the scenario for an increasing number of transboundary aquifers in the world. Fifth, formal governance mechanisms are in the early stages of development and informal governance frameworks are operating.

Desk Study

Prior to completing fieldwork in the STAS, a search for existing information and literature was conducted via a desk study. The majority of documentation regarding the STAS was related to the hydrogeological characteristics of the aquifer, specifically the Namibian portion. There was no peer-reviewed academic literature available regarding the socio-economic conditions in the aquifer or groundwater governance in the research area. Consequently, key information resources included a 2008 report from the German Development Agency (Alker 2008), a report from the Japanese Development Agency (2002), and a 2014 report from the United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2014). The former focused on groundwater governance in transboundary aquifers around the world, one of which was the Stampriet. The latter was written in preparation for a Swiss Development Agency Project on governance and management of the STAS. While valuable, these resources and the others evaluated did not paint a complete picture of the hydrogeology or ecosystems services, the existing normative framework, or the potential for sustainable and inclusive development. Therefore, data gathering at the aquifer level was necessary to answer the research questions posed.

Interviews

Interviews with various stakeholders on the ground were a key method used for data collection and validation because they elucidated the characteristics of existing and/or emerging governance frameworks. Purposive sampling and snowball sampling methods guided the selection of interviewees. In purposive sampling, interviewees are selected on the basis of specific characteristics rather than as a randomized representation of a given population (Tongco 2007). Snowball sampling is driven by referrals from interviewees that are in the population or area of interest and includes interviewees that otherwise would have been excluded using purposive sampling (Atkinson and Flint 2001; Biernacki and Waldorf 1981). Purposive and snowball sampling are used in tandem to reduce the biases inherent in both techniques and increase validity.

The criteria used for interviewee selection during purposive sampling were expertise in (ground)water governance and/or groundwater resources management, involvement in relevant projects or initiatives (including policy processes), and geographic, sectoral, and disciplinary diversity. The expertise criterion was determined on the basis of seniority in current and past employment, participation in ongoing and past initiatives, and in some cases publication history. Targeted groups included academics, practitioners, and officials from governmental and intergovernmental agencies. All interviews were semi-structured in format to enhance freedom in expression and viewpoints over that of a fully structured interview (Bryman 2012). There were 60 semi-structured interviews conducted between May and June 2015 - 42 were selected via purposive sampling and 18 via snowball sampling. A coded list of interviewees, their professional backgrounds and country of residence at the time of interview are available in Annex F.

Analysis Procedure

The case study was analyzed using the conceptual framework presented. Data from relevant governance texts was indexed and catalogued to the extent possible in accordance with the system used described in the discussion on content analysis above, as were new governance principles unique to the Stampriet context. Interview data was analyzed to identify linkages to the findings from the content analysis as well as to highlight common threads that revealed new information. Findings of the case study were then linked to the broader literature. Gaps and overlaps that exist between the concepts and the empirical case were elucidated to understand how the analysis and result might be useful in another context.

2.5.8 Ethical Considerations

I considered and reflected upon ethics with respect to my dual affiliation with the University of Amsterdam and IGRAC which is a UNESCO Category II Centre located in Delft, Netherlands. IGRAC funded my research and provided office space for me during my research. They also supported my presentations at several conferences (see front matter) and facilitated my workshops attendance for UNESCO and GEF projects related to my research. As a result, I was in close and consistent contact with a range of groundwater professionals throughout the world. Although I did not formally interview my colleagues or persons I met in these contexts as part of my methodology, I did take note of their various insights and perspectives as well as the emerging and common discourses in these contexts. When attending events and workshops, I always disclosed that I was undertaking doctoral-level research regarding groundwater governance and often received suggestions regarding my research, which also likely had an influence on me, my methods, and the conclusions I draw from my analysis. As I became more integrated into this epistemic community, I felt that my notions of groundwater problems and groundwater governance shifted away from a pure focus on the sustainable use of groundwater resources themselves and towards understanding the underground consequences of above-ground activities (see 10.5). Undoubtedly, this shift has affected this research project in ways that I am perhaps still unaware of.

In addition to the ethical considerations taken while in Amsterdam and Delft, I took additional and specific considerations into account during my fieldwork. I understand that my position as an outsider and of United States nationality, who was only entering the research context briefly, played a role in my interaction with those who supported my efforts. I also recognize that my affiliation with IGRAC and an ongoing Swiss Agency for Development and Cooperation (SDC) and UNESCO project on the Stampriet Transboundary Aquifer System (see 8.1) affected how my work was perceived in and of itself and in light of each country's own priorities and objectives within the context of the project. To some extent, the dynamics became similar to those faced by action researchers. From the outset, I established myself as a PhD researcher studying groundwater governance in the Stampriet. I indicated that my methods and analysis would occur outside of the context of the SDC and UNESCO project but if requested by the countries, could supplement the findings of the project if desired. This information was explicitly communicated in writing and/or in-person. At the beginning of each interview, I indicated that all interviewees would remain anonymous and asked for consent to interview them, take notes, and record the interview. Many interviewees did not want to be recorded but

all agreed to note taking. I then described the objectives of my research, the aims of my fieldwork and indicated that my findings would be made available to them in digital or hard copy format at the conclusion of my research.