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Conti, K.I.

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Chapter 9. Conclusion: Towards Normatively Coherent Groundwater Governance Across Geographic Levels

9.1 INTRODUCTION

This chapter brings the different elements in this thesis together by recalling and responding to the research questions for all geographic levels of groundwater governance.

9.2 RECALLING THE RESEARCH QUESTIONS

This research sought to characterize and assess the state of groundwater governance at multiple geographic levels. Based on the myriad challenges concerning the sustainability of groundwater resources and their link to the sustainable and inclusive development of the populations and ecosystems that depend on them, it asked the question ‘What are shortcomings of the current normative architecture for sustainable and inclusive groundwater governance and what are the key elements of a normative architecture at multiple geographic levels that are consistent with sustainable and inclusive development?’ In order to answer this question, five sub-questions were developed: How are hydrogeology, ecosystems services and the drivers of groundwater problems taken into account in the normative architecture? How have groundwater governance frameworks evolved at multiple geographic levels, from global to local? Which groundwater governance principles have been included in these governance frameworks at multiple geographic levels? How does legal pluralism manifest within and across multiple geographic levels? How do the current designs of the normative architecture contribute to sustainable and inclusive development at multiple geographic levels?

To respond to these questions, I adapted a framework for institutional analysis developed by IDGEC (see Table 2.1). Using the framework within a multi-level approach allowed me to (1) assess existing groundwater governance institutions, (2) analyze the content/principles/instruments therein; (3) pinpoint the relevant actors in groundwater governance frameworks; (4) identify the origins and drivers of groundwater problems and whether they are addressed by existing frameworks; (5) assess institutional performance through the lens of legal pluralism; and (6) based on the assessment propose a redesign of the existing normative framework that is consistent with inclusive and sustainable development. Reflections on how my theoretical and methodological choices influenced my results are provided as a starting point for the redesign in Chapter 10.

9.3 EVOLUTION OF GROUNDWATER GOVERNANCE WORLD-WIDE

I now examine *how groundwater governance frameworks have evolved at multiple geographic levels, from global to local*. Water governance instruments have developed over thousands of years, rapidly accelerating over the last 100 years due to advances in the relevant sciences, geo-political shifts, and has both influenced and been influenced by global environmental and water law and politics. Throughout history local communities have used their groundwater and made rules regarding access to, and use of, groundwater (Caponera 2007; Dellapenna and Gupta 2009). The development of technologies within the context of pursuit for ‘economic growth’ have led to major problems with groundwater requiring more formal governance approaches. I have not looked at local practices, but at the evolution of the formal groundwater governance frameworks world-wide.

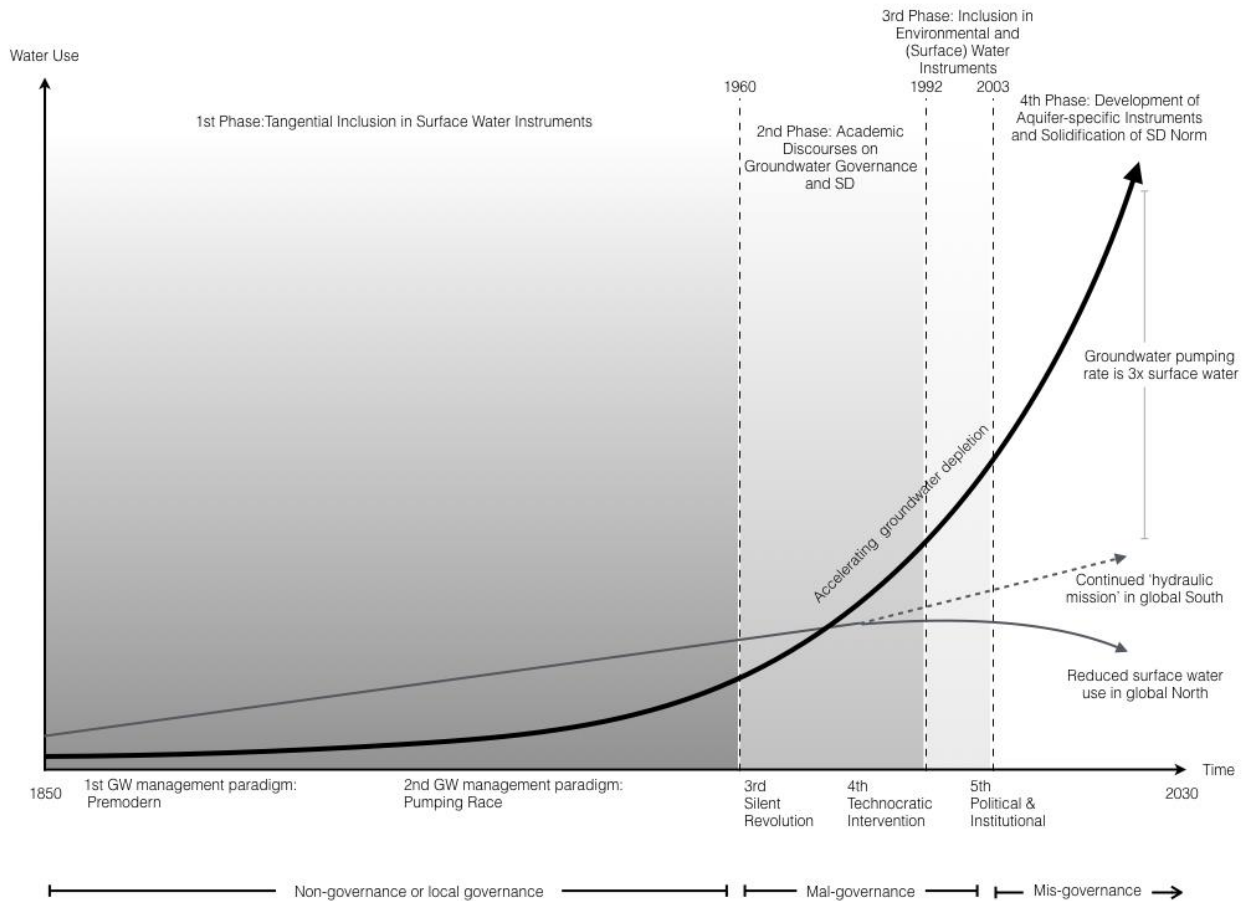
Although groundwater is 97% of all fresh water, groundwater-related developments in governance have mostly occurred within the last 50 years due to the influence of international organizations and international discourses in water policy (Conca et al. 2006; Cullet 2013). Groundwater governance at the global level is rooted in environmental and water law and policy and is now being modified to accommodate the specific characteristics of groundwater resources. Although the development of agreements has been increasing rapidly, uptake with respect to country participation has been slow. Regional-transboundary groundwater governance started roughly 200 years ago as part of river basin

agreements, which have slowly begun to incorporate groundwater into their scope. Groundwater-specific agreements have mostly emerged within the last 20 years as a consequence of international influence.

The evolution of groundwater governance world-wide can be divided into four phases, similar to the phases of IWRM outlined by Allan (2006). The first pre-1960 phase primarily focused on increasing individual and small-scale abstractions contributing to a ‘pumping race’ (see x-axis of Figure 9.1) and groundwater was tangentially included in instruments focused on surface water. The second phase (1960 – 1992) witnessed large scale abstractions especially for agricultural uses in a silent revolution and groundwater managers tried to curb groundwater depletion through technical means, e.g. reducing losses from poorly installed wells (Margat and van der Gun 2013). At the same time, academic discourses around water governance and sustainable development were emerging. A critical turning point occurred in 1992, when it became clear that institutional approaches were necessary to combat depletion, rather than a reliance upon technocratic interventions. Institutional discourses entered the policy realm at the global level and over the next ten years this also influenced the regional-transboundary levels. The third phase began in 1993 and ended in 2003, where groundwater began to be included in global and transboundary water governance frameworks designed for surface water. Now, we are in the fourth phase, wherein there is a slow realization that specific and concerted attention needs to be given to the groundwater governance institution, beyond what already exists in water institutions more broadly. Each of these phases now is discussed in greater detail along with their relationship to the use and exploitation of groundwater resources.

The first, pre-1960 phase of groundwater governance could actually be considered a pre-groundwater governance phase. There was little groundwater-specific activity at any geographic level, beyond the local. This is in contrast to numerous developments in bilateral and multilateral agreements on surface water, particularly concerning navigational uses. The early part of this phase corresponds to a pre-modern phase of groundwater use and development, where the inability to pump groundwater from great depth prevented mass exploitation. Thus, legal developments were a function of political shifts, such as the independence of nations that were former colonies or protectorates as well as delineation of new territories, rather than a response to emerging groundwater problems. However, in the later years of this phase, water technologies emerged and the pumping race began, eventually triggering a new phase of water governance.

In the second phase (1960 to 1992), global-level discourses began to emerge regarding the non-navigational uses of transboundary surface waters as well as discussions about policies addressing broader environmental sustainability challenges. Both of these discourses only addressed groundwater indirectly, with the exception of the ILA’s 1986 Seoul Rules (see 5.2). At the regional-transboundary and national levels, some countries became especially concerned with groundwater issues (Mechlem and Burchi 2005). For some countries, this was due to biophysical drivers such as long-term droughts (e.g. Sahel region) or water management challenges such as flooding in South and South East Asia. For others, it was further political shifts - such as decolonization in West Africa, the impending collapse of the apartheid regime in Southern Africa, and the dissolution of the Soviet Union – that drove the increased use of groundwater resources and the development of (ground)water governance. In many locations, the pumping race coincided with the green revolution, which combined brought on a ‘silent revolution’ in groundwater exploitation due to agricultural and energy subsidies (M. R. Llamas and Martínez-Santos 2005). The 1992 Rio Declaration marked the end of this phase, as the global community developed a set of non-binding principles for environment and development.

Figure 9.1 Evolution of Groundwater Governance World-wide

Note: Adapted from Allan (2006)

In the third phase of groundwater governance (1993-2003), the scientific and policy community garnered significant attention for broader environmental concerns and surface water resources. Consequently, some countries and regions started to include groundwater in their ecosystems protection instruments in order to address the negative consequences of groundwater depletion and pollution. As such, many instruments relevant to groundwater governance were developed during this phase, especially at the global and national levels. Globally, there were two water-specific conventions and five groundwater-relevant environmental conventions. Nationally, countries either amended or streamlined their water laws during this time in order to change the trajectory of (ground)water resources exploitation (Caponera 2007; Tarlock 2004). Yet, groundwater did not receive adequate and appropriate attention in these governance frameworks' implementation.

The fourth phase (2003-2014) was marked by four global and regional-transboundary developments. The first was the updating of transboundary and national governance frameworks as a result of the adoption of the 2003 EU WFD, which explicitly included groundwater within its scope. Second, the increased attention to groundwater in the SADC region due to the revision of its Water Protocol triggered signatories and river basin organizations to adopt more concerted groundwater policy. Third, global groundwater-specific soft law principles in the 2004 ILA Berlin Rules and the 2008 UN ILC Draft Articles provided clear guidance. The fourth was a greater push from international donor agencies to directly address issues concerning groundwater governance in the world's largest transboundary aquifers.

These developments also coincided with a second awakening regarding the need for groundwater governance to cope with the rapidly increasing rates (3%) of groundwater abstraction around the world. The utility, advantages and vulnerabilities of groundwater are gaining increasing interest, yet regulatory

frameworks and hydrogeological knowledge lag behind. And there is a notable deceleration in the development of groundwater governance instruments across all geographic levels, perhaps indicating that:

- (i) countries are acknowledging the systemic nature of water, environment, and development issues and feel that there is no real justification for a groundwater-specific regime – this could also be explained by their adoption of the SDGs which sees the different goals and targets as indivisible, interrelated and interconnected;
- (ii) countries are focusing on the implementation of existing environmental and water agreements (multi-lateral, bilateral, domestic) and/or IWRM approaches, with the intention of including groundwater in this process;
- (iii) water scarce countries are less willing to discuss groundwater challenges and are leaning back towards an absolute territorial sovereignty approach; most countries with groundwater depletion have not ratified any direct water related conventions;
- (iv) countries feel that they lack the necessary information and capacity to address groundwater problems; and/or
- (v) a lack of political will and/or pressure to address issues regarding transboundary groundwater resources; and
- (vi) countries are experiencing treaty exhaustion within the area of global environmental governance.

9.4 PATTERNS AND LEGAL PLURALISM IN GROUNDWATER GOVERNANCE

9.4.1 Patterns in Use of Principles

Based on the content analysis of groundwater governance frameworks world-wide, this section analyzes: *Which groundwater governance principles have been included in these governance frameworks across multiple geographic levels?*

The analysis in Chapter 4 showed that, there are 35 principles related to groundwater governance which have evolved from several areas of international environmental and water law/policy. They are distributed unevenly across the dimensions of sustainable development and vary in their status and the extent to which they are specifically targeted at groundwater.

The cross-level analysis of the groundwater governance principles shows that only three principles of the 35 reviewed were included in more than half of the groundwater governance frameworks: water as economic good (52%), monitoring (53%) and pollution prevention (82%) (see Table 9.1). Only 12 principles are included in one-fourth to one-half of the frameworks. This means that less than half of the groundwater governance principles are included in more than one fourth of groundwater governance frameworks world-wide. This is a clear indication of a lack of norm cohesion across geographic levels.

With respect to the political principles, only exchange of information and peaceful resolution of disputes are included in more than a third of the frameworks. CBDR is hardly included. However, given that most of the political principles are designed to deal with interstate relations, it is unsurprising that they are primarily used at the global and regional-transboundary levels and less so at the national levels; thus, potentially accounting for a slightly lower overall inclusion across levels. At the same time, if countries are expected to share water with other riparians, this could mean that such sharing principles have to be accounted in one way or another within domestic law.

Six of the thirteen environmental principles are present in greater than a third of the frameworks: aquifer/basin as the unit of management, EIA, monitoring, pollution, protected areas for (ground)water, and protection and preservation of ecosystems. Of the remaining principles, conjunctive use, invasive species, protected recharge and discharge zones, subsidiarity, and water as a finite resource are included

in less than 10% of the frameworks. This includes two of the three-groundwater specific principles. Thus, in relative terms, the environmental principles receive the most emphasis, but frameworks neglect groundwater-specific principles.

Four of the twelve social principles are included in more than 30% of frameworks: equitable and reasonable use, priority of use, public access to information, and public participation. Public education and awareness and the rights of women, youth and indigenous peoples are both included in exactly 14% of frameworks. The remaining principles are in 10% of frameworks or fewer and most of them explicitly deal with rights and equity. These findings show, that the social dimension of groundwater governance is underrepresented and focuses on intra-generational equity, equity-based distributive allocation and public involvement in water governance. The frameworks tend to ignore intergenerational equity and rights-based allocation as well as education of the public and water professionals.

The polluter pays principles and the principle of water as an economic good are included in 33% and 52% of frameworks, respectively. The polluter pays principle is more strongly emphasized at the regional-transboundary level, whereas water as an economic good is emphasized at regional-transboundary and the national levels, mainly through cost recovery regimes in the EU and national water laws. Only five frameworks explicitly include an open international economic system and three of the five are at the global level. However, as previously discussed, groundwater governance operates within a de facto neoliberal economic system that treats water as an economic good.

Overall, this shows that progressive development in principles relevant to groundwater governance have not yet permeated through the multiple levels of governance. Consequently, the principles most relevant to groundwater and to inclusive development (i.e. those contributing to relational inclusiveness) are not engrained in the architecture. Further, actors appear to favor more broad-brush, open-ended principles which could potentially be adhered to in a multitude of ways (e.g. pollution prevention), as opposed to those with specific criteria for their achievement and built in accountability (e.g. human right to water and sanitation). While this is consistent with current knowledge regarding state behavior, it has clearly less than positive implications for groundwater governance in the context of sustainable development.

Table 9.1 Patterns in groundwater governance principles across all geographic levels

	All Levels		Global		Regional- Transboundary		National		STAS Case	
	(n=184)		(n=15)		(n=23)		(n=140)		(n=13)	
	count	%	count	%	count	%	count	%	count	%
CBDR	3	2%	2	13%	0	0%	1	1%	1	7%
Exchange of Information	82	45%	10	67%	19	83%	53	38%	11	79%
Notification of Emergency Situations	35	19%	6	40%	14	61%	15	11%	7	50%
Notification of Planned Measures	28	15%	6	40%	11	48%	11	8%	5	36%
Obligation to Cooperate	27	15%	9	60%	8	35%	9	6%	8	57%
Peaceful Resolution of Disputes	73	40%	8	53%	16	70%	47	34%	11	79%
Sovereignty	52	28%	8	53%	7	30%	37	26%	6	43%
Aquifer/basin as the Unit of Management	86	47%	6	40%	13	57%	67	48%	5	36%
BATT	25	14%	2	13%	9	39%	14	10%	1	7%
Conjunctive Use	9	5%	2	13%	0	0%	7	5%	0	0%
EIA	62	34%	7	47%	12	52%	43	31%	7	50%
Invasive Species	5	3%	1	7%	0	0%	4	3%	2	14%

Monitoring	97	53%	7	47%	17	74%	73	52%	7	50%
Pollution Prevention	150	82%	8	53%	15	65%	126	90%	9	64%
Precautionary Principle	32	17%	5	33%	10	43%	17	12%	4	29%
Protected Areas for (Ground)water	86	47%	1	7%	10	43%	75	54%	0	0%
Protected Recharge and Discharge Zones	15	8%	2	13%	4	17%	9	6%	2	14%
Protection and Preservation of Ecosystems	85	46%	8	53%	15	65%	61	44%	9	64%
Subsidiarity	17	9%	0	0%	8	35%	9	6%	1	7%
Water as a Finite Resource	4	2%	1	7%	0	0%	3	2%	0	0%
Capacity Building	20	11%	5	33%	3	13%	12	9%	6	43%
Equitable and Reasonable Use	59	32%	6	40%	14	61%	38	27%	10	71%
Human Right to Sanitation	3	2%	1	7%	0	0%	2	1%	1	7%
Human Right to Water	13	7%	3	20%	0	0%	10	7%	2	14%
Intergenerational Equity	16	9%	2	13%	0	0%	14	10%	1	7%
Poverty Eradication	10	5%	4	27%	3	13%	3	2%	5	36%
Prior Informed Consent	12	7%	4	27%	4	17%	4	3%	5	36%
Priority of Use	72	39%	3	20%	3	13%	66	47%	3	21%
Public Access to Information	57	31%	6	40%	9	39%	42	30%	6	43%
Public Awareness and Education	26	14%	3	20%	3	13%	20	14%	3	21%
Public Participation	66	36%	5	33%	11	48%	50	36%	4	29%
Rights of Women, Youth, & Indigenous Peoples	26	14%	4	27%	2	9%	20	14%	2	14%
Open International Economic System	5	3%	3	20%	1	4%	1	1%	2	14%
Polluter Pays	60	33%	3	20%	10	43%	47	34%	3	21%
Water as an Economic Good	95	52%	1	7%	12	52%	82	59%	2	14%

* Only the six bilateral agreements from the STAS are added to the count of all the levels to avoid double counting of the global, regional and transboundary level texts relevant to the STAS.

9.4.2 Principles' Relation to Hydrogeology, Drivers and Ecosystems Services

This section assesses: *How are hydrogeology, ecosystems services and the drivers of groundwater problems taken into account across all geographic levels?* Chapter 3 demonstrated that the characteristics of groundwater differ from surface water in a significant way creating a definitional challenge in groundwater governance. Chapters 5-8 presented four approaches to including groundwater in the scopes of governance frameworks that occur across all geographic levels. First, including it as part of the environment; second, including it as an integral part of a surface water body, if there is a hydrological connection; third, including it as a type of water that may or may not be connected to surface water i.e. 'groundwater' generally; and fourth as a distinctly delineated resources that may have differing relationships to surface water resources (including no relationship) and administrative boundaries i.e. 'aquifer' or 'groundwater body' (see Table 9.2).

This synthesis indicates that groundwater has received a very different treatment in the scopes of groundwater governance frameworks and that actors tend towards certain approaches at each geographic level. At the global level, there is no clear approach (cf. Aureli and Eckstein 2011; Mechlem 2011); at the regional-transboundary level actors tend to delineate groundwater resources separate from surface water, as feasible, but do not necessarily create groundwater-specific frameworks (Conti 2014; Mechlem and Burchi 2005); at the national level, groundwater is considered as one of the types of water

resources included in the overall water governance frameworks, but are rarely addressed in dedicated portions of the laws (even in the EU where countries are required to delineate groundwater bodies separately). The STAS case study serves as a microcosm of this multilevel issue, wherein different approaches within and across levels imply that multi-level governance approaches may become challenging as more countries begin to actively govern their groundwater (see Mechlem 2016 r.e. multilevel challenges in groundwater institutions). In order to ensure compliance with multiple frameworks, operating at different geographic levels will require actors to develop context-specific policy guidance to ensure continuity.

A potential fifth type of scope for consideration in groundwater governance frameworks include laws, policies and programs focused on the ecosystems services of groundwater. Existing frameworks that could fall under this category include the 1971 Ramsar Convention on Wetlands, the Mura-Zala Aquifer framework, and national level frameworks that focus exclusively on water services provision. These laws and policies regulate the end uses of groundwater but not necessarily the resources themselves or the drivers that motivate the uses. Additional examples include frameworks regarding agriculture, balneology, geothermal resources, drinking water, MAR and carbon sequestration. As discussed in Section 1.4.2, these types of laws, policies and programs fall outside the scope of my content analysis, but are considered non-groundwater policies that may drive groundwater problems.

There is no conclusive trend regarding whether the normative framework for groundwater governance addresses the direct drivers of groundwater problems (see Table 9.3). The drivers of pumping and pollution by individuals, local authorities, companies and agriculture are to some extent dealt with at the relevant geographic levels. The STAS case study shows that pumping and pollution by industry and agriculture are addressed by central government regulators, but pumping and pollution by local authorities was more difficult to address because enforcement has to occur via the parastatal water providers. The other direct drivers, i.e. land use strategies and natural changes in available water quantity, vary in the degree to which they are addressed by the existing principles in the frameworks. At the national level, seven countries use land use planning provisions as a part of water resource management and eleven countries require inter-ministerial coordination to enhance the sustainability of water resources. Further, although one of the 35 governance principles indirectly addresses natural changes in water quality and quantity (i.e. protection of recharge and discharge zones), 92 countries include provisions to limit groundwater abstraction during drought or other times of low availability, indicating that such limitations might be an emerging principle (see Table 10.1).

For the indirect drivers, at the global and the regional-transboundary levels, the customary principles of international law are designed to address the political dynamics between states. But in practice, the Mountain (Western) and Guaraní Aquifers show that broader political challenges can undermine groundwater governance despite the presence of these principles. Groundwater governance neither addresses climate change nor are policies climate proofed. Some indirect policies on adaptation have

Table 9.2 Categories of groundwater in scopes of governance frameworks

	GROUNDWATER AS TYPE OF ENVIRONMENTAL RESOURCE	GROUNDWATER AS TYPE OF WATER	GROUNDWATER (ONLY) HYDROLOGICALLY CONNECTED WITH SURFACE WATER	DELINEATED GROUNDWATER RESOURCE
GLOBAL	1971 UNESCO Ramsar Convention 1972 Stockholm Declaration 1992 Rio Declaration 1992 Convention on Biodiversity 1992 UN FCCC 1994 UN Desertification Convention	1977 UN Mar del Plata 2010 UN HRC/ UNGA Resolutions 2015 UN SDGs	1966 ILA Helsinki Rules 1997 UN Watercourses Convention	1986 ILA Seoul Rules 1992 UNECE Water Convention ^a 2004 ILA Berlin Rules 2008 ILC Draft Articles
REGIONAL-TRANSBOUNDARY	African Convention on Nature ASEA Agreement on Nature	--	Orange-Senqu River Basin ^b SADC Revised Water Protocol	Abbotsford-Sumas Aquifer Al-Saq/Al-Disi Aquifer Bolson de Hueco-Valle de Juarez Aquifer Canadian-American Great Lakes Basin Danube River Basin Aquifers Dinaric Karst Aquifers European Union WFD & GWD Franco-Swiss Genevese Aquifer Guaraní Aquifer System Iullemeden Aquifer System Lake Chad River Basin Aquifers Mekong River Basin Aquifers Mountain Aquifer Mura Zala Aquifer North-western Sahara Aquifer System Nubian Sandstone Aquifer System Sava River Basin Scheldt River Basin Aquifers Upper Rhine Basin Aquifers

NATIONAL	Afghanistan	Albania	Germany	Oman	--	Bahrain
	Colombia	Algeria	Ghana	Oman		Barbados
	Dominican Republic	Argentina	Grenada	Palestine		Botswana
	Equatorial Guinea	Armenia	Guinea	Panama		India
	Guyana	Australia	Guyana	Papua New Guinea		Mauritius
	Iceland	Azerbaijan	Honduras	Guinea		Oman
	Ireland	Belize	India	Paraguay		Qatar
	Japan	Benin	Indonesia	Peru		South Korea
	Jordan	Bolivia	Iran	Philippines		Turkey
	Liberia	Bosnia & Herz.	Iraq	Romania		United Arab Emirates
	Macedonia	Botswana	Ireland	Russia		
	Marshall Islands	Brazil	Israel	Rwanda		
	Myanmar	Burkina Faso	Jamaica	Samoa		
	New Zealand	Brunei	Japan	Saudi Arabia		
	Seychelles	Burkina Faso	Jordan	Senegal		
	Sierra Leone	Cambodia	Kazakhstan	Sierra Leone		
	Singapore	Cameroon	Kenya	Slovenia		
	Sri Lanka	Canada	Kyrgyzstan	South Africa		
	Sweden	Cen. African Republic	Lao	Spain		
	Thailand	Chad	Latvia	Sudan		
	United Arab Emirates	Chile	Lesotho	Swaziland		
	Yemen	China	Lithuania	Switzerland		
		Comoros	Luxembourg	Syria		
		Cook Islands	Madagascar	Tajikistan		
		Costa Rica	Malawi	Tanzania		
		Cote d'Ivoire	Mali	Togo		
		Cuba	Malta	Trinidad & Tobago		
		Czech Rep.	Mauritania	Tunisia		
		Djibouti	Mexico	Tunisia		
		Dominica	Moldova	Uganda		
		Dominican Rep.	Mongolia	United Kingdom		
		Ecuador	Morocco	United States		
	El Salvador	Myanmar	Uruguay			
	El Salvador	Namibia	Vanuatu			
	Estonia	Nepal	Venezuela			
	Ethiopia	Netherlands	Vietnam			
	Fiji	Nicaragua	Yemen			
	Finland	Niger	Zambia			
	France	Nigeria	Zimbabwe			
	Gambia	North Korea				
		Norway				

a Recent Model Provisions indicate groundwater will be addressed at the aquifer scale

b In practice, not in code

Table 9.3 Degree to which groundwater governance frameworks address drivers of groundwater problems

	GLOBAL	REGIONAL- TRANSBOUNDARY	NATIONAL
DIRECT			
Pumping and pollution by individuals to meet household and subsistence needs		+	+
Pumping and pollution by local authorities for service provision		+	+
Pumping and pollution by small-scale and commercial agriculture		+	+
Pumping and pollution by industry (e.g. manufacturing, energy, mining, bottled water)		+	+
Land use strategies of different actors and how it affects recharge		--	-
Natural changes in available water quality		--	--
Natural changes in available water quantity (e.g. drought or flood)		--	+
INDIRECT			
Climate change	+*	-	-
Culture affecting access rights and pollution behavior			
Demography (population growth and migration and how this affects groundwater access)	--	--	--
Economy (the focus on economic growth without taking water limits into account)	--	--	-
International trade (e.g. 'globalization' or trade in virtual water)	--	--	-
Non-groundwater policies on agriculture, manufacturing, mining, energy, spatial issues, trade, and economic growth		--	-
Political dynamics between states	+	+*	
Poverty		--	-
Technology		--	--
Grey = Driver not applicable at geographic level			
* = Driver is dealt with indirectly			
+ = Driver is dealt with by principles at this level			
- = Driver is not thoroughly dealt with by principles at this level			
-- = Driver is completely neglected by principles at this level			

been adopted in the transboundary Nubian Sandstone Aquifer System framework and in Guyana, New Zealand, Peru, the Philippines, and Zambia. Cultural drivers affecting access rights and pollution behavior could potentially be dealt with through capacity building, and public education and awareness. However, only 10% of frameworks include the former and 14% the latter.

Although the polluter pays principle requires internalization of environmental costs and thus addresses the drivers of economy and trade, the principle of an open international economic system and considering water as an economic good promotes the commodification of water; and the principle itself is more often than not inadequately implemented (Bakker 2010). The drivers of non-groundwater policies like agriculture, industry, technology and poverty are not addressed through transboundary water principles with the exception of a few transboundary aquifers where agricultural and energy policies are taken into account (e.g. the Abbotsford-Sumas, Hueco-Bolson, and the Mura-Zala). At the national level, there are measures addressing emerging technologies for managed aquifer recharge and geothermal energy; however, there was little mention of drilling or (ground)water purification technologies.

Demographic growth and migration will increase the pressure on groundwater (Vorosmarty et al. 2000); however, water policy does not deal with this issue in terms of suggesting how to adapt to increasing demand. The STAS case study shows that migration to water-poor areas increases water stress, but policies to deal with this were not observed during content analysis or fieldwork.

The last two interconnected drivers of water use - land tenure and colonial legal legacies – affect water because land tenure may include rights to water, and colonial legal legacies may privilege certain types of entitlements or groups (see Konrad-Adenauer-Stiftung and Namibia Institute for Democracy 2004; McCusker et al. 2015 r.e. land tenure in Namibia and South Africa). These issues are not dealt with at the global level. At the transboundary level, several frameworks require modified allocation of groundwater resources, thus changing past ownership patterns. At the national level, 82 countries explicitly make the state the custodian of water resources and separate water and land rights indicating an emerging principle for groundwater governance (see Table 10.1).

The relationship between drivers of groundwater problems and ecosystems services was not thoroughly addressed by the frameworks. While groundwater does not provide direct ecosystems services at the global level, the drivers undoubtedly affect ecosystems services at the other geographic levels. Groundwater resources at the regional-transboundary and national levels have experienced shifts in ecosystems services as a result of unchecked drivers. In many cases, these shifts have catalyzed the development of governance frameworks.

At the regional, transboundary level the Franco-Swiss Genevese and Bolsón del Hueco – Valle de Jaréz aquifer cases show that very targeted responses to the drivers through context-specific principles and activities (e.g. MAR and allocation regimes) created positive outcomes (De los Cobos 2010; Eckstein 2011b). Efforts in the Abbotsford-Sumas showed that overcoming economic drivers could not be done through the existing principles in combination with stakeholder engagement alone but likely needs additional principles and strategies to be successful.

At the national level, climate change buffering is an ecosystems service that could assist local populations to cope with unanticipated changes in surface water availability. Yet, without a stronger linkage between groundwater and climate in the governance principles, taking advantage of and preserving these beneficial characteristics of groundwater could prove a significant challenge. Further, the fact that governance frameworks ignore many of the (inter)national drivers could result in reduced quality or quantity of available groundwater and potentially permanent depletion. As such, the principles put in place to prevent pumping and pollution by individuals, local authorities, agriculture and industry could be undermined by these unchecked drivers; thus, diminishing ecosystems services.

9.5 LEGAL PLURALISM AND SUSTAINABLE DEVELOPMENT

Using the eight characteristics of legal pluralism (see 2.4.3), this section responds to the question: *How does legal pluralism manifest within and across multiple geographic levels?* It focuses on the areas of incoherence and contradiction among the groundwater governance principles across geographic levels and examines the role that processes, actor participation and politics of scale has on normative architecture. My analysis reveals five key areas of incoherence and two key areas of contradiction with regard to the appropriate content for the normative architecture of groundwater governance.

9.5.1 Incoherence and Contradictions in Principles across Geographic Levels

Incoherence in the Framework

The first two areas of incoherence concern the principles in the political dimension of groundwater governance, namely the (1) inconsistent treatment of sovereignty across geographic levels and (2) the lack of attention to CBDR. These inconsistencies also present a politics of scale issue.

At the global level, the UN Watercourses Convention emphasizes territorial integrity rather than territorial sovereignty (McCaffrey 1987); the Draft Articles on Transboundary Aquifers explicitly include limited territorial sovereignty but also mention territorial integrity (Eckstein 2007), whereas the remaining agreements include limited territorial sovereignty. At the transboundary level, there is also a strong explicit preference for sovereignty in the Americas but not in other regions. At the national level, only a quarter of countries explicitly include sovereignty. But, European countries show the strongest preference for sovereignty in their national frameworks (42%), African countries have a very weak preference (17%) and the remaining regions' countries moderate preference.

Looking across levels, there are two instances which bring up multi-level issues. The Guaraní Aquifer Agreement was closely modeled after the 2008 ILC Draft Articles, but does not explicitly mention sovereignty; thus, mirroring a territorial integrity approach of the UN Watercourses Convention. BUT, like the Draft Articles, it is still stalled and awaiting ratification from Brazil. This scenario presents a clear counter example to the concerns of legal scholars about the sovereignty principle, yet leaves unanswered questions regarding why these agreements cannot move forward. Further, while the EU WFD does not explicitly include sovereignty, it includes both domestic and transboundary groundwater bodies in its scope. However, a significant percentage of European countries emphasize sovereignty within their own water laws and policies. Thus, it begs the question of whether efforts to deemphasize sovereignty at the EU level actually result in countries seeking to re-emphasize it in their own legislation.

Also noteworthy is the absence of the CBDR principle. It is only included in the 1992 UN Rio Declaration and the UN FCCC framework at the global level and the Tanzanian framework at the national level. It is absent from the regional-transboundary level. CBDR is relevant both within and between states and can be particularly important for groundwater where, even within the same aquifer, there can be significant differences in the availability and accessibility of the groundwater as well as potential for contamination (see hydro-hegemony literature generally, e.g. Zeitoun and Allan 2008). The political and economic differences between state and non-state actors requires a differentiation of responsibilities in governing a common resource. Social equity issues may arise if there is a common commitment to provide access to groundwater differentiated responsibilities and capabilities between and/or within states to achieve this objective. As such, this principle deserves more attention in groundwater governance frameworks.

The third area of incoherence is with respect to the groundwater-specific principles, namely conjunctive use; establishing protected areas for groundwater, and protection of recharge and discharge areas. Protected areas for groundwater are included in nearly 50% of frameworks, mostly at the regional-transboundary and national level. Most frameworks do not protect areas explicitly for groundwater but rather water in general. As such, there is a chance that, in practice, protected areas are not designated based on the location of vulnerable groundwater zones but rather surface water, underscoring the need for specific protection for recharge and discharge zone. However, both conjunctive use and protection of recharge and discharge zones are included in less than 10% of frameworks overall. None of the regional-transboundary frameworks include conjunctive use, while protected recharge and discharge zones appear at least once at each level. This indicates that focused attention on groundwater is still emerging both in terms of normative content and in practice.

The content analysis along the social dimension presents the fourth area of incoherence, namely approaches to access and allocation of groundwater resources. The analysis revealed that there are two distinct, but compatible approaches to groundwater allocation: (1) a rights-based approach combined with priority of use to guarantee minimum access and (2) an equity-based approach to address broader allocation issues. Notwithstanding the fact that rights and equity are not mutually exclusive and even perhaps inextricably linked, actors tended to pursue one or the other approaches.

At the global level, the 1997 UN Watercourses Convention and 2008 ILC Draft Articles require states to equitably and reasonably distribute (ground)water resources in accordance with socio-economic and climatic factors. Agreements directly related to water also include, to a more limited extent, intergenerational equity and priority of use. However, only three of the water-specific laws and policies at the global level include the human right to water (McIntyre 2012; Obani and Gupta 2014). At the regional-transboundary level, equity approaches are emphasized with equitable and reasonable use, included in 61% of frameworks, but priority of use is only included in 13% of frameworks and intergenerational equity not at all. At the national level, equitable and reasonable use is present in 27% of frameworks, priority of use in 47%, and intergenerational equity in 10%, while the human right to water and sanitation is in less than 10% of the documents. Therefore, indirectly actors seem to prefer equity-based distributive approaches over CBDR access approaches. Having said that, it is also argued that the human right to water and sanitation has become customary international law and thus needs to be implemented irrespective of what is in the existing legal documents.

The fifth area of incoherence is in actors' approaches to economic aspects of groundwater governance. Maintaining an open international economic system is almost completely absent from all frameworks, at all levels. Yet, as discussed previously, an open international system is the *de facto* state of the global economy (Vörösmarty et al. 2015). Given the absence of a counteracting principle, actors have either (1) chosen to accept this *de facto* state and do not feel compelled to further emphasize it in their groundwater governance frameworks, or (2) purposefully exclude the principle from their frameworks in order to emphasize the political, environmental and social dimension. Based on the content analysis, the former is a more likely scenario since 52% of frameworks explicitly designate water as an economic good, particularly those in the Americas and Europe. This implies that actors have accepted the *de facto* state of the global economy and are caught between the need to use water in all sectors to enhance national 'growth' while minimizing the need for implementing environmental or social principles to ensure sustainable and equitable use of the resource. They are seeking to place an economic value on groundwater in order to incentivize or discourage its use through economic means.

Contradictions in the Framework

The inferences from Chapter 4 indicate that there are ongoing debates regarding the principles that potentially conflict or undermine each other, without clear guidance to actors regarding how to reconcile them. The first contradiction in the content of the groundwater governance framework is the one between equitable and reasonable use and sovereignty. According to some water (law) scholars one is potentially achieved at the cost of the other (see Box 4.1). This would imply that actors typically choose between equitable and reasonable use and sovereignty. At the global level, the pattern analysis shows that five of the six legally-binding texts include both the principle of equitable and reasonable use and sovereignty. The UN Watercourses Convention is the only legally-binding text that includes equitable and reasonable use, but not sovereignty in an effort to explicitly emphasize territorial integrity.

In the regional-transboundary frameworks, equitable and reasonable use is included by twice the number of frameworks as sovereignty, with African and European frameworks emphasizing equitable and reasonable use over sovereignty and American frameworks doing the reverse, except in the case of the Guaraní which includes both principles. Similarly, in Asia, the Mekong agreement includes both principles. As such, there is little agreement regarding these principles across and within the regional-transboundary frameworks.

At the national level, there are significantly more countries claiming ownership/custodianship of groundwater and/or establishing licensing/permitting regimes than requiring equitable and reasonable use and/or establishing a priority of use. This contrast indicates that countries want to ensure governmental control over (ground)water resources, without necessarily having guidelines and priorities for allocation. Thus, the analysis shows that this theoretical tension between equitable allocation and

sovereignty has not been resolved empirically as actors either include both principles simultaneously without providing guidance for reconciling them or choose a preferred approach and operate within it.

The second contradiction lies between the emerging principles of water as an economic good and water as a human right although neither has been adopted in legally binding direct water related laws. At the global level and particularly after 1992, states and scholars place slightly more emphasis on the human right to water and sanitation than establishing water as an economic good. This was perhaps an active effort to counter the prevailing neo-liberal context and push for commodification of water resources. Yet these principles are only included in one-quarter of texts. At the transboundary level, water as an economic good is included in twelve frameworks (mostly in Europe), whereas the human right to water and sanitation is absent. Similarly, at the national level, 82 countries treat water as an economic good and only ten included in as a human right (excluding in court judgements), which has serious implications for social equity and inclusive development. However, as mentioned above, water as a human right is fast becoming a customary right and water as an economic good seems to be embedded in the de facto economy. Together, these findings show a high level of incoherence regarding actors approaches to water services provision because they typically choose either neo-liberal or human rights-based approaches to allocation, with most actors preferring the former.

9.5.2 Process, Participation, and Politics of Scale

The status of groundwater governance instruments ranges widely, as was shown in previous chapters. The ratifications and participation of countries in these governance instruments are show in Annex D. All groundwater-related laws, policies and programs analyzed in this research are considered as having a bearing on governance regardless of whether they have legally-binding status (see 1.4.2). Thus, I will use the concept of politics of scale to discuss three key relationships: (1) how definitions of groundwater resources relate to actor participation (2) discontinuities in the geographic level of framework design and framework implementation and (3) how processes and actors affect the frameworks' normative content. First, the analysis shows a loose relationship between these definitional issues and country participation. Groundwater-specific instruments are rare and generally not legally binding, except at the national level. They also have very limited geographic coverage and include a limited range of principles, typically focusing on monitoring and notification. At the global level, there is no legally-binding, groundwater-specific text. The 2008 ILC Draft Articles is currently being evaluated by the UNGA, but focuses on issues related to sharing transboundary groundwater aquifers rather than having a holistic, sustainability focus (McIntyre 2013; Rieu-Clarke 2000; Wouters et al. 2005). This is reflected at the regional-transboundary level, where most frameworks are functional – focused on pollution prevention and control or data gathering and information sharing. Further, almost half of the frameworks do not contain any texts with binding character, implying that countries are hesitant to deal with groundwater-specific issues in a formal way.

Frameworks dealing with water more broadly have a more developed legal status and broader geographic and issue coverage. As discussed above, the extent to which groundwater is included in the scopes of these broad frameworks varies greatly because of definitional issues. The speed at which (ground)water-specific instruments at the global level are adopted by countries is comparatively slower than that of other types of environmental instruments (Eckstein and Sindico 2014; S. M. A. Salman 2007). The UN Watercourses Convention took 30 years to enter into force and although the UNECE Water Convention was open globally in 2013, no countries outside Europe have acceded to it. This implies that countries may have both substantive and procedural concerns with the content of a global water agreement and prefer to deal with water-sharing issues bilaterally, multilaterally, or regionally. At the national level, most countries address groundwater resources together with surface water resources, apparently giving groundwater governance instruments very wide geographic coverage. However, the content analysis shows that only a very small proportion of national laws explicitly consider

groundwater-specific issues (see Table 9.2). This implies that water-specific instruments may give a false impression regarding the state of groundwater governance. Groundwater is typically included in their scope in some form or another, but the geographic and issue coverage of groundwater related issues remains superficial and perfunctory.

Environmental laws and policies have by far the broadest geographic and issue coverage at all levels. Further many environmental agreements have legally binding status and even operational bodies that support implementation and compliance (Breitmeier et al. 2011; Vogler 2003). However, the advantages of their more advanced legal status may be countered by the potential for groundwater challenges to become secondary or tertiary to those that have caught the attention of particular states or the international community. This implies, that making groundwater more prominent in environmental instruments that already have significant momentum and support could be a critical point of leverage for advancing groundwater governance. However, this would require elevating the political will for groundwater governance at all geographic levels as well as better supporting scientific efforts to collection of groundwater data.

Second, there are discontinuities between the geographic level at which the laws and policies are designed and the level at which they are applicable. At the global level, one might have expected that the global-level issues affecting groundwater governance would be addressed. However, the existing in-force global water governance texts directly govern the relationships and actions of countries sharing transboundary groundwater resources, thus operating at the transboundary resource level.

Governance at the global resource level occurs via the environmental laws and policies focused on climate change, biodiversity, wetlands, and desertification wherein the texts identify and address the nature of the global-level problems and then create a unified process through which implementation can be financed and down-scaled. The fact that the UN Watercourses Convention does not adopt this approach indicates that the discourse and argumentation of (ground)water being a local resource (see 1.2.3) had sufficient support for the agreements to focus on transboundary resources. Yet, the same arguments could have easily been presented for biodiversity, wetlands and the effects of desertification. The UNECE Water Convention has a process-oriented approach although it faces the challenges of legitimacy (as an originally regional convention) and of overlap with the UNWC.

At the regional-transboundary level, the existing cases of governance show that over time, the design of groundwater governance frameworks has been increasingly delegated down to lower geographic levels. Regional agenda setting for environmental resources in Africa, Asia, Europe, and Latin America in the 1980's and early 1990's led to the creation of regional framework agreements or programs of action that influenced the design of location-specific frameworks such as the Mekong Agreement. In other cases, such as those of the Abbotsford-Sumas, Bolsón del Hueco-Valle de Juárez, and Genevese aquifers, transboundary groundwater issues are small and localized. Thus, in the first two cases, engendering action at country level was challenging and initial activities occurred at the subnational levels. In the case of the Genevese, the agreement originally signed by the countries was later scaled down to local authorities in keeping with subsidiarity and to facilitate adaptiveness.

Third, the analysis shows that political dynamics drive perceptions of legitimacy and norm dispersion. The political status of actors and hard and soft power can affect the design and implementation of governance frameworks (e.g. Mountain, Genevese, and Bolsón del Hueco -Valle de Juárez aquifers). Additionally, shifts in political geography can convert national aquifers into transboundary aquifers (e.g. aquifers of the Sava and parts of the Danube river basins) through the creation or dissolution of states and possibly cause norm dispersion (e.g. the spread of IWRM from Europe to Africa through post-colonial development and capacity-building programs). Further, the creation of supranational organizations such as the EU and regional organizations such as SADC can determine the units that will be used to govern groundwater resources (i.e. from aquifer to groundwater body) and the principles that will be included in the subsidiary frameworks (i.e. national water laws and river basin agreements).

At the national level, all arrangements put forth at the other geographic levels will inevitably be ratified, integrated and implemented. As such, the challenges of reconciling national laws with international obligations under international treaties; of reconciling national laws with emerging discourses on human rights and sustainable development; and of dealing with the globalization of products and data manifest most concretely at the national level. Challenges regarding reconciling national laws with international obligations can be observed through the lack of ratification of laws for transboundary aquifers (see 6.2.2); or the fact that less than 1% of countries include the principle of CBDR. Further, content analysis of national laws showed that only 16% explicitly state that they will uphold and take into consideration their obligations under multilateral and bilateral (ground)water agreements.

9.6 IMPLICATIONS FOR SUSTAINABLE AND INCLUSIVE DEVELOPMENT

I now address the question, *How does the current design of the normative architecture contribute to sustainable and inclusive development at multiple geographic levels?* I use a multi-level analysis to assess whether the frameworks have sufficiently balanced principles across the dimensions of sustainable development, if the principles respond to the drivers and whether, in combination, the frameworks can contribute to sustainable development.

Sustainable Development

This thesis 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’ (WCED 1987:43) and analyzed it across four dimensions: political, environmental, social, and economic. Taken together, the groundwater governance frameworks show that a combination of political priorities and dynamics and global water policy and development discourses influence the distribution of principles. Global and regional-transboundary laws, policies, and programs predominantly emphasize political principles that address relationships and interactions between countries and broader environmental protections but give less emphasis to groundwater-specific challenges or social equity. Neither level places a strong emphasis on the economic principles beyond the polluter pays principle. At the national level, countries focus on environmental and social principles, nevertheless placing a slightly greater emphasis on the environmental principles.

Although, political principles such as the exchange of information, dispute resolution and sovereignty are relatively frequent and have been increasingly included over time, the lack of attention to CBDR has strong implications for the frameworks’ ability to address drivers and to be inclusive at all levels. At the global level, actors should distinguish between net groundwater importers or exporters as well as net GHG emitters, net carbon-sequesters, and countries not significantly contributing to either but nevertheless experiencing the detrimental effects of climate change. At the transboundary and national levels, actors would ideally understand the recharge and discharge dynamics of their groundwater resources and distribute responsibilities for groundwater protection and allocation accordingly.

The analysis showed that at all geographic levels, environmental principles were included more frequently as compared to the overall distribution of groundwater governance principles. Thus, the relatively strong inclusion of environmental principles across the frameworks indicates that this is a key area where sustainable development is supported. However, there are three caveats. The first is regarding the lack of inclusion of groundwater-specific principles, which occurred across all geographic levels. The second is that, in general, the governance frameworks have not addressed potential trade-offs between the environmental principles; for example, the distribution of best available groundwater exploration technologies resulting in rapid and inequitable depletion of non-recharging aquifers. Third, the environmental principles do not address the potential effects of climate change and other natural/geogenic drivers of groundwater problems. In locations vulnerable to drought and natural pollution – both of which are predicted to increase with climate change – this could present a serious challenge to sustainability.

Examining the inclusion of social principles across geographic levels indicates that actors take very different approaches to the social aspects of sustainable development, both within and across levels. Across levels, social principles are included to a lesser degree than how they are represented in the overall distribution of principles. At the global level, social principles were not strongly present but their inclusion is increasing over time. At the regional-transboundary level, they were hardly included, especially not the rights-based allocation principles (i.e. HRWS and rights of marginalized groups). At the national level, they were the second most common type of principle in the frameworks. Although actors indicated that public engagement was a priority, they show very different preferences in terms of rights based approaches and inter- and intra-generation equity. The Stampriet case study is a particularly clear example of this, wherein all actors framed challenges along the social dimension as a key area of concern. The actors prefer rights-based allocation approaches, but there are significant challenges to implementation. Further, the underlying issue of equity in groundwater allocation between states and the potential for long-term depletion could potentially undermine these aspirations. Thus, the analysis indicates clear weaknesses in the social dimension with potentially negative implications for hard sustainability.

The economic dimension is the dimension with which the actors were the least engaged; although, inclusion of economic principles did increase as the geographic level decreased. This suggests that as actors govern closer to the ground, they are more likely to explicitly accept and operate within a neo-liberal context by accepting water as an economic good and/or use economic incentives/disincentives to alter stakeholder behavior (i.e. the polluter pays principle or impose fines for over-abstraction) but they may interpret these principles in a weak manner if the overarching goal is to increase short term economic growth. At present, the principles do not explicitly address the economic drivers of groundwater problems. This indicates a critical weakness in the framework that would prevent groundwater governance from contributing to hard sustainability.

Inclusive Development

In focusing on the sub-dimension of inclusive development (i.e. social, relational and environmental inclusiveness), additional strengths and shortcomings of the framework come to light. The potential for the frameworks to contribute to relational inclusiveness decreases with geographic level. At the global level, actors significantly include the principles addressing interstate interaction and intra-state interaction with the public. At the regional transboundary level, frameworks range widely in the extent to which they include the political and social principles addressing inter and intra state interaction. While at the national level, states focus on interactions with the public, they neglect other issues related to relational inclusiveness such as notification and prior informed consent. The Stampriet framework was a clear empirical example of these findings as notification, prior informed consent and EIA (where social impacts would need to be assessed) were hardly included, while there is more attention in the frameworks to the principles of public access to information and public participation.

To a limited extent, the existing principles could contribute to social inclusiveness by using public education and awareness and capacity building to re-focus from wealth creation to human and natural capital and population. However, these principles receive very little attention in the governance framework (included in less than 15% of the documents). Further, the demographic drivers that may address groundwater governance are not countered by the existing principles. In the Stampriet, social inclusiveness is weakly supported by the framework and possibly undermined by the tension between cost recovery and the human right to water. Additionally, several interviewees indicated that it was an area requiring increased support.

While environmental principles are one of the strengths of the existing framework, environmental inclusiveness has limited potential because of the lack of groundwater-specific principles that would protect ecosystems services as well as unreconciled issues around intergenerational equity (e.g. use of non-recharging aquifers) and economic growth. This is particularly true at the global and regional-

transboundary level. At the national level, environmental inclusiveness has moderate potential to focus on issues of pollution prevention, monitoring, and establishing protected areas for groundwater. However, the absence of conjunctive use and the protection of recharge and discharge zones as well as intergenerational equity limits prospects along this sub-dimension.

Overall, the analysis shows that the principles necessary to address many of the key drivers of groundwater problems, besides pumping and abstraction, are either incoherent or absent. Further, the degree to which these principles are included in various frameworks and their geographic distribution indicates that the framework in place at a given location is unlikely to be sufficiently robust or context-specific to address all the present drivers. The analysis indicates that actors, especially at the national level, select principles primarily based on political and economic circumstances rather than environmental factors resulting in a mismatch between the key drivers of groundwater problems and the selection and creation of principles. There are also unreconciled contradictions in the principles related to equitable allocation and sovereignty as well as water as a human right and water as an economic good – implying that countries see trade-offs between the two. Therefore, it is difficult to foresee that implementation of the existing frameworks alone could contribute to sustainable or inclusive development.