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Chapter 4. Groundwater Governance Principles

4.1 INTRODUCTION

Groundwater governance institutions include many normative principles (see 2.4.2) and are central to understanding the architecture of groundwater governance. This chapter reviews these principles, their relationship to each other, and to the drivers of groundwater problems as a means of operationalizing the second element of the conceptual framework, specifically the identification and analysis of groundwater governance principles (see 2.5.1). It responds to the subsidiary question: *What are the existing groundwater governance principles; how do they support or undermine each other; and to what extent do they address the drivers of groundwater problems?* First, the concepts of governance principles are defined, elaborated, and situated within the context of this research (Section 4.2). Next, the chapter develops and explains each principle (including historical legal origins, legal status, and contestations as applicable) and the rationale for its classification within the dimensions of sustainable development (see 4.3-4.6). Finally, inferences regarding the role of principles in groundwater governance are drawn (see 4.7). The merits of a best fit approach for groundwater governance are discussed in Chapter 9.

4.2 CONCEPTS AND APPROACHES TO PRINCIPLES

Considering that principles are a key part of architecture, it is critical that the norms underlying the selection of principles are also considered as part of the architecture. Legal scholars generally apply the term ‘principle’ to an abstract rule applicable to particular concrete instances’ (Alpa 1994: 1). Therefore, my use of ‘principle’ includes principles, rights, rules, measures, and procedural principles (Conti and Gupta 2015); although strict legal positivists may avoid such a grouping. The term principle can also be applied to (1) an instrument e.g. water quality objectives; (2) an element of a discipline e.g. principles of water law; and (3) a value e.g. principle of sustainable development (Alpa 1994).

I categorize the principles according to the four dimensions of sustainable development: political, environmental, social, and economic (see 2.3). The principles may possess the characteristics of multiple subcategories, in which case a primary subcategory is assigned. The principles are always presented alphabetically, there is no implicit prioritization in their order. All principles are treated as equal, even though their status in international law may vary (see 1.4.2). The specific principles analyzed in this research were identified through both literature review and inductively through review of the groundwater governance frameworks themselves. Although, this is a functional approach, I acknowledge that actor’s instrument choice is not just technical but also political (see 1.4.2).

This research treats sustainable development and Integrated Water Resources Management (IWRM) as overarching norms rather than principles, although they can be considered both. As such, they are discussed here along with the rationale for this treatment. Sustainable development is the overarching norm that can be operationalized through principles e.g. the principles contained in the 1992 Rio Declaration (Fuentes 2002; Rieu-Clarke 2000, see Box 4.1). IWRM is a concept included in the 1992 Dublin Principles. It is also a governance principle that requires coordinated management of water-related resources (Biswas 2004; Global Water Partnership 2002: 22); incorporation of adaptive measures that can cope with the inherent uncertainties of environmental systems; and attention to inclusive actions that focus on the socio-ecological dimensions as well as equity for the marginalized and vulnerable.⁷ So not only does it overlap with sustainable development, but it also introduces potential redundancy into the analysis. Thus, to avoid redundancy and in line with the approach of Conti and Gupta (2015), the content analysis will not treat sustainable development or IWRM as individual governance principles.

⁷ IWRM is included as a principle in the ILA Seoul Rules (1986), UN Agenda 21 (1992), and ILA Berlin Rules (2004).

Box 4.1 Sustainable Development as a Legal Principle

Sustainable development is in and of itself a legal principle, the status of which is shifting and debated as it is determined by the sources of international law including treaty law, jurisprudence, state practice or custom, and scholarly writings. In terms of practice, the principle of sustainable development has been incorporated into numerous multilateral treaties following its inclusion in the UN Rio Declaration (1992). With regard to jurisprudence, the International Court of Justice specifically referenced sustainable development in its ruling of the *Gabcikovo-Nagymaros* case between Hungary and Slovakia regarding dam developments along the Danube River in the separate opinion of Judge Weeramantry (International Court of Justice 1997). Sustainable development is also included explicitly in the action agenda of the 1992 ICWE Dublin Statement. “Sustainable use” is included in the 1992 UNECE Convention, its 1999 Protocol, and the ILA Berlin Rules (2004). In 2002, the International Law Association (2002), which is an epistemic community of legal experts, adopted the New Delhi Declaration of Principles of International Law Relating to Sustainable Development, indicating that sustainable development is an overarching norm/concept in the international sphere.

The discussion of principles below is based on Sands and Peel (2012) – especially for principles originating in environmental law, Rieu-Clarke (2012) – especially for principles originating in water law, as well as the laws and policies listed in Table 4.2, Table 4.3, Table 4.4 – especially for the emerging principles with lesser degrees of codification and consensus.

4.3 POLITICAL PRINCIPLES

The principle of **common but differentiated responsibilities** and respective capabilities (CBDR) includes three elements. The first element is the common responsibility of states to protect the environment and society at all geographic levels. The second element is the differing responsibilities of states to address a particular problem taking into account their contribution to it. The third element is that it is related to the different capabilities of countries to address these issues. Given these three elements primarily relate to relationships between actors with respect to a particular problems, CBDR is categorized as political. However, there are both social and environmental aspects to it as well; social because it may impact groundwater allocation and environmental because it may impact groundwater resource protection. At the global and transboundary levels, CBDR refers to the interaction between states regarding transnational and transboundary issues (e.g. climate change and sharing of transboundary aquifers, respectively). At the national level, CBDR may be used to reinforce existing interstate commitments and/or intra-state interactions between subnational actors (e.g. ministries, provinces, or municipalities). The CBDR principle when applied to groundwater indicates that countries may have contributed differently to the problems of groundwater contamination and depletion and may also have different levels of resources available to contribute to the resolution of these problems.

The principle of **exchange of information** requires states to share scientific and technical knowledge for the purposes of capacity building and cooperation. A data and information system may also provide stakeholders access to this information, prevent loss of information, and facilitate data analysis. Thus, this principle would be applicable to groundwater resources given that states should exchange groundwater related information with each other and internally.

The principle of **notification of emergency situations** requires states to notify potentially affected parties (e.g. individuals, communities, and/or other states) during emergencies such as droughts or accidents such as industrial spills. It is applicable to groundwater in that waste spills or even geological disasters have the potential to damage groundwater quality and potentially affected parties would need to be informed.

The principle of the **notification of planned measures** would require that states potentially affected by the projects receive advance notification. Potentially affected parties should be informed if there are planned actions which may impact the state of the groundwater resource, such as diverting a recharging watercourse or abstracting groundwater during mining.

The **obligation to cooperate** requires states to cooperate ‘in good faith’ over international concerns. This principle is central to groundwater governance as it would require states to interact cooperatively regarding shared groundwater resources and could potentially form the basis for activities such as joint monitoring or data sharing.

Peaceful resolution of disputes is embodied in Article 1(1) of the UN Charter, which says that the role of the UN is ‘to bring about by peaceful means, and in conformity with the principles of justice and international law, adjustment or settlement of international disputes or situations which might lead to a breach of the peace’. Further, Article 2(3) requires that states ‘shall settle their international disputes by peaceful means in such a manner that international peace and security, and justice, are not endangered’. This principle may be implemented through a dispute resolution body, which would utilize various techniques for conflict resolution, typically with the consent of the involved parties. Sands and Peel (2012) divide the available techniques into two types: diplomatic means of dispute settlement (e.g. negotiation, consultation, mediation, conciliation, fact-finding, non-compliance procedures) and legal means of dispute settlement (e.g. arbitration or international, regional and domestic courts). Given the hidden nature of groundwater and general lack of data availability, degradation of groundwater resources could easily occur without causes or consequences being evident. This could potentially make it more prone to conflict. As such, the peaceful resolution of groundwater-related disputes at all geographic levels is a critical component of governance.

Early interpretations of sovereignty understood it as ‘absolute territorial sovereignty’, meaning that states are able to act in accordance with their own will, within their own territory regardless of potential consequences for other states. A counter principle was that of ‘absolute integrity of state territory’ which enabled downstream countries to continue to demand the same amount of water they had previously received. This latter principle has been used in recent international water law. However, international environmental law shifted this interpretation of sovereignty towards one of ‘limited territorial sovereignty’, wherein sovereignty actions must not result in transboundary harm. This is further codified in Principle 2 of the 1992 Rio Declaration, which explicitly includes **sovereignty subject to not causing transboundary harm** as a single principle. In this thesis, the sovereignty principle is understood as limited territorial sovereignty, unless otherwise noted. With respect to groundwater, it could for example require states to avoid abstracting and/or contaminating groundwater resources in a manner that would have a significant impact on another aquifer state, such as rapid extraction from non-recharging aquifers; dumping of hazardous wastes in a recharge area that contributes to transboundary groundwater flows; or hydraulic fracturing (fracking). Nevertheless, the applicability of the sovereignty principle to groundwater resources has been the subject of debate (see Box 4.2).

Subsidiarity requires that resource governance takes place at the lowest appropriate administrative level. For example, it would require an aquifer that resides wholly within a province to be managed by the provincial administration rather than by the national water management agency or by multiple municipalities. It is relevant for aquifers and groundwater as it helps determine the relationship between the administrative and resource boundaries in the governance instrument. It may also effect the relationship between surface and groundwater management.

Box 4.2 Legal Debates on the Role of Sovereignty in International Water Law

State sovereignty is a central principle in international law (United Nations Charter 1945; United Nations General Assembly 1963) and has attained customary status. For some time, this principle was interpreted through the lens of absolute territorial sovereignty (the Harmon Doctrine), which in the water context meant that states could do whatever they liked with water resources located within their territories. This was countered by the principle of absolute integrity of state territory. However, the global and transboundary nature of water problems led to a more common understanding of limited sovereignty, such that states should not harm other states (Trail Smelter case 1938⁸; Rio Declaration 1992: Principles 2; also see discussion of ‘preventing transboundary harm’ principle below). Nevertheless, the applicability of the sovereignty principle to groundwater resources has been the subject of debate among international legal scholars. Some scholars believe that water should not be subject to any type of sovereignty, particularly in a transboundary context (McCaffrey 2009, 2011; McIntyre 2011) while others believe that water can be subject to sovereignty given appropriate limits namely preventing transboundary harm, and ensuring the equitable and reasonable use of domestic and transboundary (ground)water resources (Dellapenna 2011; Eckstein 2007, 2011a; Eckstein and Sindico 2014; Rieu-Clarke et al. 2012; Yamada 2011).

The 2008 ILC Draft Articles on the Law of Transboundary Aquifers (see 5.2.2) explicitly includes the sovereignty principle. The commentary indicates that countries were concerned that they would not be able to exert sovereignty over their groundwater resources in accordance with international custom and wanted to treat it like other ‘similar’ resources such as oil and gas (Eckstein 2007; International Law Commission 2004). Nevertheless, some experts view this as a reversal of decades of customary water law and the creation of a potential schism in international water law (McCaffrey 2011; McIntyre 2011; Tanzi 2011). Others argue that the sovereignty text is ‘balanced’ by the provisions of equitable and reasonable use, no significant harm and the emphasis on the need for cooperative transboundary aquifer management (Eckstein 2007; Sindico 2011; Stephan 2011; Yamada 2011).

Table 4.1 Status of political principles

NAME OF PRINCIPLE	ORIGINS	STATUS IN INTERNATIONAL LAW [Customary ^a , Agreed, Emerging.]
Common but differentiated responsibilities [and respective capabilities] (CBDR)	1992 Rio Declaration: Principle 7 ‘Common responsibility’ is rooted in treaty law, where various countries have declared shared natural resources as ‘common concerns.’ ‘Differing responsibilities’ in 1972 Stockholm Declaration and the 1974 Charter on Economic Rights and Duties of States, among others. 1992 Climate Convention	Agreed in some soft and hard law
Exchange of information	1992 Rio Declaration: Principle 9 1978 UNEP Draft Principles of Conduct 1986 Legal Principles of the WCED Legal Experts Group 2001 ILC Draft Articles on Prevention of Transboundary Harm	””
Notification of emergency situations (including accidents)	1992 Rio Declaration: Principle 18 International Atomic Energy Agency to response to Chernobyl See Sands and Peele 2012; Ramacharan 1991 1997 UN Watercourses	””
Notification of planned measures	1992 Rio Declaration: Principle 19 1960 Indus Waters Treaty 1966 ILA Helsinki Rules 1977 Mar del Plata Recommendations 1957 Lac Lanoux Arbitration 1997 Gabčíkovo-Nagymaros Case 2010 Pulp Mills Case	””

⁸ The *Trail Smelter Arbitration* was one of the first inclusions of the “no harm principle” to environmental law. An international arbitral tribunal found Canada legally and financially responsible for damages caused in the US (AJIL 1939 & 1941). Principle 2 of the Rio Declaration also offers further codification (UN 1992).

Obligation to cooperate	1992 Rio Declaration: Principle 7 1945 UN Charter: Article 74 1949 Corfu Channel case 1941 Trail Smelter case 1972 the Stockholm Declaration 1982 World Charter for Nature	Customary Although “[t]he obligation to co-operate is affirmed in virtually all international environmental agreements of bilateral and regional application and global instruments” Sands and Peel (2012: 204), its customary status and consideration as legal <u>obligation</u> are debated (Reiu-Clark et al 2012; Wouters 2005).
Peaceful resolution of disputes	1992 Rio Declaration: Principle 24 1910 PCA 1945 UN Charter, esp. establishing ICJ	Customary
Sovereignty subject to not causing transboundary harm	1992 Rio Declaration: Principle 2 1945 UN Charter 1928 PCA Palmas Case 1938 ICJ Trail Smelter Case 1972 Stockholm Declaration 1985 Vienna Convention for the Protection of the Ozone Layer 1963 UNGA 1938 Trail Smelter ^c 1992 Biodiversity Convention 1992 UNECE Water Convention 1997 UN Watercourses Convention 1939 & 1941 US AJIL	Customary^b Applicability to groundwater resources debated by international lawyers (see Box 4.2)
Subsidiarity	EU law generally	Agreed in soft and hard law

^a Customary status refers to “the collection of international behavioral regularities that nations over time come to view as binding on them as a matter of law” (Goldsmith & Posner 1998: 1116).
^b See McIntyre 2011, Sands and Peel 2012, 1996 ICJ Advisory Opinion on The Legality of the Threat or Use of Nuclear Weapons

4.4 ENVIRONMENTAL PRINCIPLES

Using **the aquifer/basin as unit of management** would require water resource management agencies to operate at the resource scale (e.g. river basin, lake basin, aquifer) for policymaking and implementation as opposed to the administrative scale.

Water users and managers should use the **best available technology and/or technique(s)** (BATT) to reduce harm to groundwater resources from contamination. BATTs can be defined as technologies or techniques in the latest stage of development which can practically and suitably limit discharges, emissions and waste.

Conjunctive use and management should be used to account for hydrological relationships between surface and groundwater resources in management and policy decisions.

Invasive species would require water management authorities to take actions to reduce or eliminate the presence of invasive species that may have a negative effect on (ground)water availability or the health of groundwater-related ecosystems.

Monitoring of groundwater resources would require governments to establish a network of wells that would measure the state of groundwater resources (quantity and quality) at regular intervals. Monitoring, particularly via *in situ* techniques, is an essential activity for groundwater resources as this is the most accurate way to assess their state.

Environmental Impact Assessment (EIA) is a process through which decision-makers, and ideally interested/potentially affected parties, are informed in writing about the potential environmental consequences of a proposed activity, such as land use changes or infrastructure construction. EIA is also seen as a governance instrument in addition to being a principle. Conducting EIA's would allow countries to account for the potential consequences of any harm a project may cause to the environment, and for the purposes of this analysis, groundwater (Rio Declaration 1992: Principle 17).

Pollution prevention would require all those using potentially hazardous or harmful materials to prevent their dispersal into groundwater resources. Specific formulations of this principle may include one or more of

the following: waste and/or wastewater discharge regulations, water quality standards (including those specific to the protection of public health), and regulating construction to prevent contamination.

The **precautionary principle**, as laid out in Principle 15 of the Rio Declaration (1992) states that “[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” The precautionary principle is important to groundwater governance, given the lack of groundwater quality and quantity data for individual aquifers. If the condition of a groundwater resource is unknown, yet it is currently being utilized by one or more states, the management approach necessitates a precautionary approach including provisions that protect the qualitative and/or quantitative status of the resource.

Establishing **protected areas for groundwater** would limit land uses and activities that would jeopardize the integrity of groundwater resources. This may include establishing physical barriers around these sensitive areas, such as national and transfrontier/transboundary parks or even protective perimeters around groundwater abstraction points. Creating protected areas for groundwater would likely include, but may not be limited to, protecting recharge and discharge zones. It may also include restricting pumping in areas susceptible to depletion or mobilization of natural contaminants.

Principle 7 of the 1992 Rio Declaration calls upon states to ‘conserve, protect, and restore’ ecosystems. I refer to this as the ‘**protection and preservation of ecosystems.**’ This principle is relevant to groundwater governance in that it acknowledges that protecting a range of resources, such as forests and rivers, also plays a role in protecting the quantity and quality of groundwater and vice versa.

Protection of recharge and discharge zones is another type of buffer zone. It would prevent various types of land uses and activities from occurring in these areas. This would include activities that may either reduce recharge (e.g. deforestation or paving large areas) or potentially result in contamination.

Treating **water as a finite resource** requires that (ground)water is governed under the main premise that its availability is limited. This principle is important for all groundwater since the speed at which it moves through the hydrological cycle is typically slower than that of other types of water. But it is also particularly important for fossil groundwater, since it cannot be renewed at that particular location.

Table 4.2 Status of environmental principles

	ORIGINS	STATUS IN INTERNATIONAL LAW [Customary ^a , Agree, Emerging]
Basin as unit of management	1966 Helsinki Rules 1997 UN Watercourses Convention	Agreed in soft and hard law
Best available technology and/or technique(s) (BATT)	Best available technology: 1974 Convention for the Prevention of Marine Pollution from Land-based Sources 1992 Baltic Convention 1992 UNECE Water Convention Best available Technique: 1979 LRTAP Convention 2001 Stockholm Convention on Persistent Organic Pollutants 1992 OSPAR Convention	“ “
Conjunctive use and management	2004 Berlin Rules	Emerging
Environmental Impact Assessment (EIA)	1992 Rio Declaration: Principle 17 2010 ICJ Pulp Mills 1972 Stockholm Conference on the Environment 1982 UN Convention on the Law of the Sea 1991 Espoo Convention 2003 Strategic Environmental Assessment Protocol 1999 Antarctic Environment Protocol 1992 Biodiversity Convention	Agreed in some soft and hard law May or may not be customary, see ICJ Pulp Mills 2010, para 204; Eckstein & Sindico 2014; McIntyre 2011
Invasive species	1997 UN Watercourses Convention	Agreed in soft and hard law

Monitoring	1959 Antarctic Treaty 1982 UNCLOS 1992 OSPAR Convention 1992 UNECE Water Convention	Agreed
Pollution prevention	1997 UN Watercourses	Agreed , often as part of preventing harm
Precautionary principle	1992 Rio Declaration: Principle 15	Agreed in some soft and hard law May or may not be customary, see Rieu-Clark et al 2012; McIntyre 2011; Bodansky 2012
Protection and preservation of ecosystems	1992 Rio Declaration: Principle 7 1982 UNCLOS 1997 UN Watercourses Convention	Agreed in some soft and hard law
Protected areas for groundwater	1940 Western Hemisphere Convention	Environmental protection areas generally agreed
Protection of recharge and discharge zones	2004 ILA Berlin Rules 2008 ILC Draft Articles	Emerging
Water as a finite resource	1992 Dublin Principles: Principle 1	Emerging

^a Customary status refers to “the collection of international behavioral regularities that nations over time come to view as binding on them as a matter of law” (Goldsmith & Posner 1998: 1116).

4.5 SOCIAL PRINCIPLES

Capacity building would provide all states and people the education and training necessary to enhance their understanding of environmental problems and how to address them. Given that groundwater knowledge and fundamental understanding of the physical dynamics of groundwater resources, as well as the consequences of their use, is significantly lacking, capacity building is a critical component to participation and decision-making in groundwater governance.

Equitable and reasonable use would require waters, especially transboundary waters, to be allocated equitably and used within reason according to its purpose. The normative implications of this principle are important for groundwater governance, as it provides an aspirational goal regarding the allocation of groundwaters.

Box 4.3 Debates regarding the principle of equitable and reasonable use

The equitable and reasonable use principle is complex and debated because the meaning of the words ‘equitable’ and ‘reasonable’ are imprecise conceptually, legally and philosophically. Equity is a key principle in national and international law (see Sands and Peel 2012). Nevertheless, equitable right to access is not synonymous with equal allocation. Allocation can be equitable without the volumetric quantities being equal. The 1997 UN Watercourses Convention and the 2008 Draft Articles lay out factors that should be considered when determining equitable and reasonable use (e.g. population, contribution to flows/recharge, existing and planned uses, etc.). What constitutes a reasonable use does not necessarily mean the most efficient or technologically advanced, but rather should be considered against an ‘objective standard’ (Rieu-Clarke et al. 2012). However, the ability to determine such an objective standard and whether it could truly be objective is questionable.

The **human right to water and sanitation** is a legal concept that applies a positive human rights perspective to accessing safe potable water and improved sanitation resources (see Box 4.4). Groundwater resources could impact, or be impacted by, actions taken to fulfill any of these rights. In fulfilling the human right to water and sanitation, an increased abstraction of groundwater resources may be required in order to supply potable water. Or groundwater may be subjected to increased risk of contamination if improved sanitation facilities are not properly installed.

A key part of sustainability is ensuring **intergenerational equity** such that present-day development does not preclude that of future generations. This is highly important for groundwater since overexploitation can result in permanently reduced aquifer recharge capacity or can release naturally occurring contaminants. It is even

more imperative to consider this in the cases of non-recharging aquifers where all extraction constitutes permanent depletion and reduce availability for future generations

Box 4.4 Debates regarding the content and status of the human right to water and sanitation

In the context of the **human right to water and sanitation**, the word ‘right’ is used in (international) law. This confers duties upon both state and non-state actors. The right includes four basic components: availability, quality, affordability and accessibility (United Nations Economic and Social Council 2003). In other words, any state that recognizes the human right to water could be legally obligated directly or indirectly to provide water of a high enough quality to prevent disease and chronic illness and in sufficient quantity to provide for basic needs. If a state fails to meet this obligation, its citizens could take legal action against it. The human right to water has been included implicitly and/or explicitly in several UN human rights conventions. It has been elaborated in the 2002 ECOSOC General Comment 15, ‘the 2010 UN Human Rights Commission Resolution on human rights and access to safe drinking water and sanitation, and the 2010 UNGA Resolution on the human right to water and sanitation. Although its status as a binding human right has not been settled (Bluemel 2004; Gleick 1998; McCaffrey 1992; Ziganshina 2008), many legal scholars seem to be agree that the right has now evolved into customary international law but there is jurisprudence to this effect as yet (Obani and Gupta 2015).

Poverty eradication requires countries to take measures to advance the economic standing of those living in impoverished conditions. Improved access to groundwater resources has been linked to poverty eradication and economic development more broadly. In many areas, increasing groundwater use would reduce the burden of water collection, especially for women, so that they can pursue educational and income generating activities. It could also increase attendance of school children, particularly that of girls and increase agricultural yields because of the more consistent availability of groundwater resources.

If states are conducting activities that may have negative impacts on individuals, communities or another states, **prior informed consent** requires that the potentially affected parties are informed about these impacts and consent to the proposed activity. Prior informed consent has also been applied to protect the rights of indigenous peoples as a component of the right to self-determination (Ward 2011). This principle is relevant to groundwater governance because it would require those engaging in activities that might negatively affect groundwater resources to disclose the nature of those effects and receive their permission to conduct the planned activity.

Priority of use originates in Islamic law (see Caponera 2007) and may prioritize vital human needs before all other uses in water allocation. Such a prioritization may also take the form of a social reserve as a counterpart to an ecological reserve. Established priority of uses are widely reflected in existing transboundary and national water law (see Box 4.5). The 1997 UN Watercourses Convention (UNWC) introduced ambiguity regarding this well-established principle into the global (ground)water governance framework by saying that there was no priority of use. The move towards the adoption of the human right to water and sanitation discussed above has, however, clarified that priority should at least be given to those two elements (Bourquain 2008).

Box 4.5 Emergence of No Priority of Use

Article 10 of the UN Watercourses Convention states:

“1. In the absence of agreement or custom to the contrary, no use of an international watercourse enjoys inherent priority over other uses.

2. In the event of a conflict between uses of an international watercourse, it shall be resolved with reference to Articles 5 to 7, with special regard being given to the requirements of vital human needs.”

In doing so, it rejects the priority of use principle, allows countries to allocate according to their own national priorities, and in the event of conflicts over uses, requires countries to prioritize ‘vital human needs’. Yet, this framing is ambiguous in two key ways.

First, vital human needs are defined as ‘sufficient water to sustain human life, including both drinking water and water required for the production of food in order to prevent starvation’ (ILC 1994: 110). However, this does not include water for hygiene i.e. household and personal cleaning and washing, which is included in the UN ECOSOC definition of the human right to water. And it is unclear whether these essential uses would also be considered in implementation of the UNWC and, if not, doing so could be considered a conflict with human rights law.

Second, the phrase ‘special regard’ could indicate that human needs would “almost certainly” take priority over other uses unless an alternate source for domestic supply could be identified (Rieu-Clarke et al. 2012: 130). Yet, this special regard would only be invoked in the case of conflict and legal scholars offer different interpretations of what this phrase would mean in practical terms (Bourquain 2008).

Public access to information is elaborated in Article 10 of the 1992 Rio Declaration, which states that ‘each individual shall have appropriate access to information concerning the environment that is held by public authorities.’ Public access to information is particularly important for groundwater, given that changes to the resource are rarely observable with the naked eye. Therefore, changes in its quality or quantity that may affect livelihoods should be publicly available.

The 1992 Rio Declaration and Agenda 21 requires **public awareness and education** in three key ways, namely educating children about sustainable development, promoting training of decision makers and local technicians regarding the environment and environmental services, increasing public awareness through media and entertainment, and integrating indigenous knowledge into education and training. Public education and awareness is related to groundwater sustainability because users and regulators would need awareness of the potential consequences of activities on the resources.

The principle of **public participation** ensures that all citizens are allowed to contribute to decisions about the management of groundwater resources, including about matters of allocation. However, it also has a political element as the quality of participation is dependent on communication and information exchange between actor groups.

The **role of women, youth, and indigenous peoples** are discussed in the 1992 Rio Declaration. Although the 1992 Rio Declaration addresses the global community’s responsibilities towards these groups, the rights of women, youth and indigenous peoples have also been acknowledged in international human rights laws (see Table 4.4). The 1992 Rio Declaration specifically points to the essential role these groups have in sustainable development; however, state responsibilities in this regard are articulated slightly differently: women’s participation in environmental management and development is made ‘essential;’ the creativity, ideals and courage of youth are to be mobilized; and the identity, culture, interests and participation of indigenous peoples should be mobilized. Valuing the role of women, youth and indigenous peoples is critical because of their potential vulnerabilities; these populations should be accounted for in allocation regimes and in design of projects affecting groundwater resources within their territory.

Table 4.3 Status of Social Principles

	ORIGINS	STATUS IN INTERNATIONAL LAW [Customary ^a , Agree, Emerging]
Capacity building	1992 Rio Declaration: Principle 9	None
Equitable and reasonable use	Equity in international law: 1982 Continental Shelf Case 1927 Diversion of the Waters from the Meuse case 1984 Gulf Marine Case Equity for shared waters: 1997 Gabčíkovo-Nagymaros Case 1997 UN Watercourses Convention 2008 ILC Draft Articles	Agreed , interpretation debated (see Box 4.3)
Human right to water and sanitation	Water explicitly mentioned: 1979 Convention on the Elimination of All Forms of Discrimination Against Women 1989 Convention on the Rights of the Child 2002 ECOSOC General Comment 15 2010 UN HRC Resolution on Human rights and access to safe drinking water and sanitation 2010 UNGA Resolution on the Human right to water and sanitation Water implicit/derivative: 1948 Universal Declaration of Human Rights 1950 European Convention on Human Rights 1966 International Bill of Rights	Agreed in hard and soft law , see Box 4.4
Intergenerational equity	1992 Rio Declaration: Principle 3	Emerging
Poverty eradication	1992 Rio Declaration: Principles 5 & 6	Emerging
Prior informed consent	1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1991 Bamako Convention 2010 Nagoya Protocol to the 1992 Biodiversity Convention	Agreed
Priority of use	1977 Mar del Plata Declaration 2004 ILA Berlin Rules 2008 ILC Draft Articles	Agreed in hard and soft law
Public participation	1992 Rio Declaration: Principle 10 1992 Dublin Principles: Principle 2 2004 ILA Berlin Rules	Agreed
Public access to information	1992 Rio Declaration: Principle 10 1992 OSPAR Convention 1993 Lugano Civil Liability Convention 1998 Aarhus Convention 2003 Protocol on Pollutant Release and Transfer Registers	Agreed^b
Public awareness and education	1992 Rio Declaration: Principle 10 1992 Agenda 21: Section 36 1987 Montreal Protocol on Substances that Deplete the Ozone Layer 1989 Convention on the Rights of the Child 2000 Cartagena Protocol on Biosafety	Agreed
Role and rights of women, youth and indigenous peoples	1948 Universal Bill of Rights 1992 Rio Declaration: Principles 20, 21, & 22 1992 Dublin Principles: Principle 3 1989 UN Convention on the Rights of the Child 1989 ILO Indigenous Peoples Convention 2004 ILA Berlin Rules	Agreed, esp. in human rights law

^a Customary status refers to “the collection of international behavioral regularities that nations over time come to view as binding on them as a matter of law” (Goldsmith & Posner 1998: 1116).

^b See Partan 1988; Pallemarts 1991; Smets, 1991; Pallemarts 2011

4.6 ECONOMIC PRINCIPLES

The principle of maintaining an **open international economic system** has the objective of facilitating economic growth. It ensures that environmental trade policies are neither discriminatory nor constitute a “disguised restriction on international trade” (Rio Declaration 1992: Principle 12). This principle also operates *de facto* in trade regimes, thereby increasing demand for water-intensive products (Vörösmarty et al.

2015). Since many internationally traded products are made using groundwater in their production processes, this principle holds great relevance for sustainable development of groundwater resources. On the one hand, restricting groundwater use in the production of goods may shift supply or pricing in such a way that it could negatively impact the trade of those products and reduce economic growth. On the other hand, excluding the values of groundwater from prices of groundwater-intensive products across the world could shift financial burdens of groundwater use/depletion onto countries and reduce incentives for ecosystems protection.

The Rio Declaration frames the **polluter pays** principle as requiring internalization of the costs of externalities into the operational costs of those who pollute and thus aims to discourage pollution and allocate responsibility for activities that harm the environment. The polluter pays principle is important for groundwater governance in that it helps states to protect the quality of their groundwater resources by requiring those who pollute to pay for the costs of cleaning up their own pollution.

The principle of **water as an economic good** underlies the other economic principles since it supports valuation of (ground)water and the benefits it provides in terms of a market economy. It presupposes that (ground)water has an economic value and thus should be considered an economic good. It also assumes that understanding the economic value of water will change user behavior. It is closely linked to the user pays principle, which requires all water users to pay for water services. The 2000 EU Water Framework Directive (WFD); international organizations such as the UN (1997) and FAO (2003); and the IWRM discourse generally consider this an important principle of (ground)water governance (Rogers et al. 1998; Savenije and van der Zaag 2002; Solanes et al. 1999). Further, this principle has underlain the privatization of water and sanitation services, particularly in developing countries. In practical terms, it has resulted in the proliferation of water pricing and cost recovery mechanisms as a condition of water and sanitation infrastructure project funding through development agencies and banks. The World Bank's Private Participation Infrastructure Database indicates that since 1990, 64 countries engaged the private sector for water and/or sanitation services with a total investment of over USD 83 billion since that time (World Bank Group 2016). However, considering water as an economic good is also debated on two fronts: (1) regarding the equity issues surrounding cost recovery from poor and marginalized groups (Bakker 2010; Jaglin 2002; Marson and Savin 2015), and (2) the potentially conflicting relationship between cost recovery and the human right to water (Bakker 2007; Obani and Gupta 2015).

Table 4.4 Status of Economic Principles

	ORIGINS	STATUS IN INTERNATIONAL LAW [Customary ^a , Agree, Emerging]
Open international economic system	1992 Rio Declaration: Principle 12 WTO and NAFTA generally	Agreed in soft and hard law
Polluter pays	1992 Rio Declaration: Principles 13 and 16 1972 European Program of Action on the Environment) 1972 OECD Council Recommendation on Guiding Principles Concerning the International Economic Aspects of Environmental Policies 1992 UNECE Water Convention	Agreed in soft and hard law The principle is highly debated with regard to its legal status in international law by several states and the PCA (Sands and Peel 2012). However, it is considered applicable in domestic law.
Water as an economic good	1992 Dublin Principles: Principle 4 2000 EU WFD	Emerging 'Commodification' of water heavily debated in academic literature (see Bakker generally).

^a Customary status refers to "the collection of international behavioral regularities that nations over time come to view as binding on them as a matter of law" (Goldsmith & Posner 1998: 1116).

4.7 INFERENCES

This chapter provided a comprehensive overview of the principles of groundwater governance. It shows that the creation and selection of governance principles are critical to laying a solid foundation for governance from an institutional perspective. This chapter further presented a range of principles for groundwater governance that are discussed in the literature as well as included in legal and policy documents. The analysis results in three conclusions.

First, 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. Most principles applicable to groundwater were developed for the environment broadly or for surface water. Consequently, the principles originating from environmental law are well-accepted with the exception of a few included in the 1992 Rio Declaration that are not considered part of binding international law. Water law principles vary in acceptance but are generally designed for sharing water equitably and environmental protection. The principles are not evenly distributed across the dimensions of sustainable and inclusive development. For example, there are far fewer economic principles than the other types, although one could argue that economic principles are implicitly dominant in a neo-liberal world. Groundwater specific principles are only emerging and may or may not be sufficiently developed or comprehensive.

Second, there are ongoing debates regarding the principles that potentially conflict or undermine each other, without clear guidance to actors regarding how to reconcile them. Given the principles' different origins, the differing extents to which they are agreed upon, and how the relationship between them can result in tradeoffs, the potential for pluralism is already an indicator. The principles have three conflicting implications. (1) All people have a right to water, regardless of economic or social standing, yet the costs of water services should be borne, at least in part, by the user. (2) Economic growth is a by-product of trade and should not be subject to restrictions based on environmental concerns, but ecosystems should remain protected for present and future generations. (3) States have the right to conduct their affairs according to their wishes, yet cannot pursue activities that constitute inequitable use of water resources or result in transboundary harm. These challenges seem *prima facie* irreconcilable, yet it is up to state actors to establish priorities in accordance with these principles. The debated relationships between principles reflect a broader tug-of-war occurring between the momentum of the neo-liberal paradigm, which underlies the development and growth discourses, and the push for human rights and inclusiveness, which is gaining prominence in these same fora.

Third, the differing origins and distributions of the principles may have consequences for achieving sustainable and inclusive development, if a lack of principles results in drivers of groundwater problems being unaddressed in governance frameworks. Several social principles lack authority in international law and the economic principles are underdeveloped, indicating that they may vary in the degree to which they deal with groundwater specific issues and contemporary challenges facing sustainable and inclusive development.