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GOVERNANCE

What is groundwater governance?

Groundwater (GW) governance can be defined as the *processes* and the *enabling conditions* for groundwater management, planning, and policy implementation. Though the two terms are closely interrelated and are often used interchangeably, *governance* can be distinguished from groundwater *management* in that it takes aim at the decision-making practices and outcomes at different levels of the administration. GW governance forms part of the broader policy environment of a country, whereas GW management is more action-oriented and focuses on practical implementation activities such as deciding on permits and day-to-day operations of hardware and infrastructure, etc., and hands-on aquifer recharge.

Groundwater governance is about the decision-making processes, law and policy, conditions and enabling environment that determine who gets what water, how, where, and when.

Governance takes place at different, partially overlapping levels. It is concerned with the regulatory framework of formal rules, principles for decision-making, instrumental steering of the relationship between government and line ministries, incentives for cross-sectoral collaboration, the conditions for financing, data collection and sharing, and the link and nexus with other sectoral policies that govern utilisation of GW. At the regional and local level, GW governance comprises specific arrangements that are devised, usually between the different users and local authorities, at the aquifer or basin scale, including social norms and local practices. The different levels are, in turn, influenced by the governance setting and outcomes at other levels (*see also Who is concerned by groundwater governance? and Inclusive groundwater governance*).

The rule of law and other governance principles are, alongside institutional arrangements, the cornerstones that support and create opportunities for steering, action, and transformation.



The multi-stakeholder Groundwater Governance Project (2016) developed four *essential components* for GW governance, as follows:

1. An *institutional* framework characterised by representation and leadership, organisations and capacity, and stakeholder engagement and participation;
2. A comprehensive *legal* framework;
3. *Knowledge* systems and more generalised awareness about (GW-related) issues; and
4. *Policies, incentive* structures and *plans* aligned with effective governance.

Additionally, international *human rights law* provides that access to water for basic, personal needs and to adequate sanitation systems are human rights. Water and interrelated natural resources and systems also need to be protected as part of the human right to a clean, healthy and sustainable environment, which was recently recognised. UN Member States are expected to realise the human rights to safe drinking water and sanitation, among other things through action plans or strategies. Since GW is the source for half of the volume of freshwater withdrawn for domestic use including drinking water and that GW resources are closely interlinked with safe sanitation systems – and given that this resource is also critical for the water cycle as well as for sustaining river flows, wetlands, habitats, and the environment in general – protecting GW is of great importance to realise those human rights and others that underpin SDG achievement.

Notably, the human rights-based approach puts people (as rights-holders) at the centre, pointing to states as the primary duty-bearers with corresponding obligations whilst the private sector has far-reaching responsibilities to respect the human rights. This approach furthermore serves to prioritise the most vulnerable and is key to leave no one behind, which is also a guiding principle of the Global Acceleration Framework. Realisation of human rights is frequently measured through *good governance practices* at state level. The human rights standards include equitable access, accountability, transparency, the rule of law, non-discrimination, and stakeholder participation and inclusion.

Who is concerned by groundwater governance?

Governance being multi-levelled means that it involves a diversity of actors with different degrees of power, influence, and knowledge, from the international, regional and national, down to the most local level. GW is a unique resource in the sense that it is accessed and utilised directly by end-users; some 2.2bn people rely on this resource for their daily consumption.¹ Therefore, GW governance at the *local* scale comprises individual households and farmers with own wells for domestic, irrigation, and other uses; communities in charge of a drinking water supply and/or GW irrigation systems; and private sector companies. These users tend to self-regulate their GW use. Elinor Ostrom's widely accepted and awarded findings on governing the commons through ways of organising activities locally were originally developed for GW resources shared between users, or communities. She found

¹ Murphy et al. (2017). Review: Epidemiological evidence of groundwater contribution to global enteric disease, 1948-2015. *Hydrogeology J* 25: 981-1001. <https://doi.org/10.1007/s10040-017-1543-y>.

that if governed by stable communities, locally evolved institutional arrangements positively impact on the resilience of the environment. Such *de facto* arrangements are of importance as local authorities attempt to issue and implement law and policy that seek to control usage, allocation, and protection of GW.

At *regional* level, between States, important actors include Regional Economic Communities (RECs); states groupings aiming to facilitate economic integration between members; and River Basin Organisations (RBOs), most of which have secretariats established for basin-wide management of transboundary water resources. At the *international* level, GW is critical to achieve the SDGs and other political commitments as well as realising human rights obligations. Under international law, it is also key for states to meet their general duty of cooperation and assigning of official development assistance, primarily by offering technical assistance. This can comprise contributions towards reviewing a country's regulatory framework and policy landscape, arranging meetings and building partnerships for knowledge exchange and mentorship at institutional level, training on technical skills, supporting fact-finding missions, providing practical advisory services, and strengthening of water diplomacy capacity in transboundary settings.

Inclusive groundwater governance

Inclusivity is a guiding principle of the UN-Water Global Acceleration Framework. Stakeholder participation is also recognised as a principle characterising 'good' governance and is, to a certain degree, legally binding on governments under international law. The discourse and treaty law on inclusion seek to achieve not just any type of inclusion, but 'meaningful' citizen participation in public decision-making. On the often-seen 'ladder of participation', involvement ranges from non-participation and tokenism at the bottom rung, up to citizen empowerment and control as the ultimate indicator of participation. This implicates – and depends on there being – an enabling environment in which, for instance, access to information and other supporting structures are provided for. In practice, participation may translate into sharing of information, providing arenas for dialogue with elected representatives and the public administration, and more direct processes.

For GW, this means involving users and others concerned in planning, policy- and law-making, allocation decisions, the granting of drilling and extraction permits, etc. This is of importance, for instance, ahead of selecting suitable land and aquifers for a well-field, or before designing a managed aquifer recharge (MAR) project. In the case such projects are of a certain scale or may have wider impacts the government would often be obliged under law to arrange for an environmental impact assessment and consult with those concerned. Under certain circumstances, this applies also when the aquifer is transboundary.

The cross-cutting aspects of groundwater governance

As stressed by UN-Water in its Global Acceleration Framework, action on SDG 6 depends on commitments and action in other SDG areas, particularly health, education, agriculture, social development, environment, energy, gender, and climate. 'Governance' matters also to the Financing, Capacity development, and Innovation Accelerators. Alignment and coordinated approaches, unified

strategies and initiatives should apply across sectors and actors. The nexus approach is necessary to maximise synergies and minimise trade-offs.

Cross-sectoral integration and coordination over GW and aquifers (as its subterranean ‘host’ or matrix) is needed to avoid fragmentation. This also requires better recognition of the landscape approach – including interconnections between people and nature – for instance for GW infiltration and aquifer recharge.

In 2016, the Groundwater Governance Project developed a set of *guiding principles* for clearer societal and systemic interlinkages around GW, modified as follows from the World Water Development Report 2022:

- Conjunctive planning for and decision-making on surface water, GW, and aquifers;
- Vertical integration in planning and management between local, district/provincial, and federal-level authorities, as well as international levels, as applicable;
- Horizontal policy coordination of other sectors that affect, or are affected by, GW;
- Consideration of both quantity and quality of GW resources;
- Co-governance of subsurface space and subsurface resources, which comprises the regulation of all activities and functions located in the subsurface space to ensure harmonised use and avoid undesirable and irreversible damage; and
- Cooperation on transboundary aquifers.

The SDGs do not account explicitly for the significant role that GW plays in sustainable development; nevertheless, 53 core targets have a link to the theme of this resource. The exception is target 6.6, which specifically takes aim at the protection and restoration of water-related ecosystems including aquifers. Many more SDG 6 targets have indicators concerned with GW, though (*see below*).

Challenges for achievement of SDG 6 relating to groundwater

GW governance – and day-to-day GW management – is challenging due to several interlinked and somewhat overlapping factors. It is partially because of the open access-nature and direct use of most underground resources, where private property rights and/or social norms contribute to dictating entitlements. Globally, institutional and regulatory frameworks generally build on GW being public property. However, in some of the world’s largest GW users – foremost India, Pakistan, and parts of the USA – GW rights are tied to land ownership in ways that limit the state’s ability to restrict pumping and usage through a modern permit system or other policy instruments. Top-down governance of GW becomes inherently difficult in such settings.

GW governance is also challenging because GW’s hidden character leads both to that it is technically difficult and complex to comprehend in terms of availability and quality matters. Moreover, GW and aquifers remain unappreciated from financial, socio-economic, and cultural perspectives. Here, it is worth noting that GW as well as aquifer /systems/ are resources with multiple values, and that ecosystems and geosystems provide services such as soil layers for filtration and ‘green infrastructure’ storage acting as buffers to drought. Additionally, insufficient data and information, also about the

diversity of stakeholders and their interests, form stumbling blocks. This is partially because billions of people in rural as well as in /peri-/urban areas self-supply from GW in response to being inadequately served, and for food security; the size of the pressure on GW and aquifers is hence difficult to assess. These end-users may understand 'their well' but lack knowledge about GW and aquifers as parts of a larger system, impacted by other users as well as by climate change variability. Moreover, the prevalence of self-supply and other dependence on GW is far from properly recognised by planners and decision-makers.

To this comes that industrial usage of GW flies under the radar in countries where landowners have no obligation to apply for extraction permits, or do not properly report their extractions.

GW resources are under unprecedented pressure from a wide range of factors, all of which can potentially deteriorate the quality of the water and sometimes cause land subsidence and the collapse of aquifers. Ensuring ecological flows and maintenance of GW-dependent ecosystems is particularly challenging in a context where impacts of GW pumping are not direct, or not perceived in the long run.

According to the Water Policy Group's 2021 report,² based on the experiences and perspectives of national water leaders from 88 countries of all regions, "[t]he greatest challenges many face are with integration and prioritisation of water issues within governments. Administrative problems of fragmented water institutions are of as much, if not greater, concern than factors such as public resistance to reforms [...] For most, the [SDG] 6 targets are 'challenging' or 'impossible', with governance problems and lack of financing the main reasons for this [...] *While groundwater is considered by many national water leaders to be essential to their country's future water supply, far fewer consider their groundwater is being used sustainably*" (p. 7, emphasis added).

Institutional frameworks and regulation as well as the enabling environment often come as an afterthought to GW development. Governing bodies tend to act in silos. At aggregate and disaggregate level, risks connected to over-abstraction and pollution of GW resources, in particular such used as sources of drinking water and for agricultural use, have to be governed without full knowledge about the resource or the collective of users. The saying goes "you cannot manage what you do not measure." Yet somehow, governance processes for SDG implementation must muddle through at all levels, and implementation gaps be overcome.

Groundwater governance and SDG 6 progress

GW availability and quality are intimately related to, and impacted by as well as impacting on, access to *drinking water* (target 1) and *sanitation and hygiene* services (target 2), respectively. In turn, governance concerning the resource up- and downstream of access points is interlinked with decision-making around safely managed services necessary to achieve those targets. Yet, a strong separation persists between, on the one hand, water for and wastewater from domestic needs (WASH) and, on the other hand, water resources management, which answers for water for all other

² Water Policy Group (2021). Global Water Policy Report 2021: Listening to National Water Leaders. <http://waterpolicygroup.com/wp-content/uploads/2022/02/2021-Global-Water-Policy-Report-4-Feb-2022.pdf>.

human and environmental needs. Accordingly, institutions for each field tend to exist at different administrative levels, with relatively narrow but often overlapping mandates.³ This has a negative impact on progress towards reaching SDG 6.1–2 in a long-term, sustainable manner. Additionally, the practice of households providing themselves with drinking water from GW is not recognised as contributing to achieving SDG 6 targets 1 and 2.

According to progress reported on the proportion of bodies of water with good ambient *water quality* (6.3.2), overall, 60% are in good condition. However, of the 89 countries reporting towards this target, only 52 had information about GW, which is monitored based on the three parameters: electrical conductivity; nitrogen/nitrate; and pH (UNEP, 2021). This is problematic because inadequate understanding of GW quality and the trend in pollution prevents efficient governance in terms of issuing of law and policy instruments, enforcement of GW protection regulation, and restoration measures. It also affects access to information and possibilities to hold decision-makers accountable, as well as investments in capacity and in raising awareness around the challenges connected with remedying polluted GW.

GW forms part of environmental flows (EF), monitored for the ‘environmental’ *water stress* indicator (6.4.2), which is complementary to the ‘economic’ *water use efficiency* indicator (6.4.1) and has important GW synergies with SDG 2.4.1 on sustainable agriculture, SDG 12 on responsible production, and 15.3 on land degradation.

For reporting on 6.4.2, disaggregation into different levels, dimensions, and by water source (surface water/GW) is fundamental. Hence, the ‘total renewable freshwater resources’ measurement includes GW recharge, ‘non-renewable resources’ include fossil and confined GW, and the EF calculation accounts for discharge from GW (base flow) and its interaction with rivers and streams. According to the progress report, 10% of the global population lives in countries with high or critical water stress – but the figures hide large regional, national and subnational variations. Critically, as GW usage is characterised by its local and often private nature, the totality of global abstractions is not monitored and the actual level of water stress – and potential or actual overuse – hence not known.

The world is not on track to achieve *integrated water resources management* (IWRM) (6.5). Indicator 6.5.1 measures the degree of IWRM through four main components as aspects of the policy framework, including enabling environment, institutional arrangements, and management instruments. Coordinated policy and regulatory frameworks, management arrangements and financing are critical also from a GW governance perspective. Notably, though, the IWRM approach often takes its departure in river basin boundaries, which do not always coincide with those of ‘invisible’ aquifers /aquifer systems/.

The *operational arrangements for transboundary basins* target (6.5.2) monitors existence of a joint body; regular, formal communication between riparian countries; joint or coordinated management plans or objectives; and regular exchange of data and information. All those components are essential

³ UNDP, SIWI & UNICEF (forthcoming 2023). Cooperation Opportunities for Improved Integration Across SDG6. United Nations Development Programme (UNDP), Stockholm International Water Institute (SIWI) and United Nations Children’s Fund (UNICEF) on behalf of UN-Water, New York and Stockholm.

for cooperation over transboundary aquifers and important features of GW governance, and for this target there are also several UN bodies – including UNECE, UNESCO, and IGRAC – as well as organisations and scholars engaging in furthering the cause (*see separate overview on the state of the matter*).

With respect to *protecting and restoring water-dependent ecosystems* (6.6.1), UNEP notes that global data on aquifer ecosystems are not available beyond modelling or ground-based measurements. As is the case for water quality (6.3.2), this lack of data, and generally insufficient knowledge and understanding of GW-dependent ecosystems, is a hinderance to governance at all levels of decision-making. Considering that this is the only SDG target explicitly referring to aquifers, it is unfortunate that absence of data undermines the methodology's aim to monitor the change in ecosystems depending on aquifers. Governance of GW is already impeded by being an 'invisible' resource.

The *water- and sanitation-related official development assistance* (ODA) is measured based on government-coordinated spending (SDG 6.a and 17.2). In terms of progress reported, disbursements for the water sector remained stable from 2015 to 2019 (before the COVID-19 pandemic), with disbursements for WASH – to which most water sector ODA goes – increasing by 13%.

UN-Water and WHO's Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) estimates that 2/3 of WASH sector financing comes from household contributions towards their own self-supply. This makes households the biggest source of investment, more than ODA, government funding, philanthropy and international cooperation combined.⁴ Critical parts of the international cooperation on GW resources and hydrogeology consist of providing technical assistance, as noted above; to this should be counted the international community's support to country progress under the Global Acceleration Framework.

Participation and inclusion being essential aspects of GW governance, the proportion of local administrative units with established and operational *policies and procedures for participation* of local communities in water and sanitation management is monitored (6.b). Such procedures are increasingly recognised in national policies and laws but fewer than half of the reporting countries have laws or policies that specifically mention women's participation for rural sanitation or water resources management. Moreover, implementation of these procedures still lags behind and the levels of actual participation have only seen moderate improvement.

Governance to accelerate SDG 6 achievement

UN-Water has provided examples of what purpose-driven coordinated action and application of the Global Acceleration Framework would mean in terms of governance. In addition, and for GW, this translates into the following recommendations:

⁴ Danert, K. & G. Hutton (2020). Shining the spotlight on household investments for water, sanitation and hygiene (WASH): let us talk about HI and the three 'T's. *J Water, Sanitation and Hygiene for Development* 10: 1-4
<https://doi.org/10.2166/washdev.2020.139>.

For SDG 6.1–2 achievement:

- Govern, conjunctively, GW and surface water quality and quantity: Ensure that policy, planning, legal frameworks and other conditions and processes are in place, well aligned and comprehensive, so to enable universal and equitable access to safe, adequate, and affordable drinking water, sanitation and hygiene systems. Establish interaction between concerned government bodies, civil society and citizens, underpinned by systemic thinking around all water as interconnected.
- Given the large number of people who self-supply around the world, as well as the prevalence of private actors in the WASH services supply, recognise that the ‘who gets water’-aspect of GW governance should also be understood in terms of *who sources* (ground) water, why, how, where, when, and for whom. For such practices to contribute to the achievement of SDG 6.1–2, provide support complementing households’ contributions and investments, through practical trainings, recommendations and advice, subsidies, and implementation of the WHO’s *Guidelines for drinking water quality: Risk-based regulation, management and surveillance of small water supplies*.
- Ensure alignment with the international human rights framework and prioritise the right to safe drinking water over other uses. Take steps to realise in full the rights to water and sanitation,⁵ and bridge the gap between these rights and the WASH sector, on the one hand, and the right to a healthy environment and broader water resources management up- and downstream of the service delivery point, on the other hand.

For SDG 6.3–4 achievement:

- The agricultural sector plays a major role in protecting GW quality and quantity. Couple strengthened implementation of ‘best management practices’ – reducing the use of fertilisers and pesticides, and how they are applied – with reformed law and policy incentivising nature-based solutions, payment for ecosystem services, water funds, the landscape approach, etc., for the greatest sustainability returns. License and monitor GW abstractions, recognising that adherence is a matter of multi-level governance as well as every-day, operational management decisions by farmers on the ground. Offer exemptions from the permitting system for small (*de minimis*) uses.
- Recognise that water stress linked to GW overextraction has multiple causes, ranging from climate variability to demography to anthropogenic land use and pumping. Today’s situation demonstrates the importance of more effective demand-management policies to counter water stress – strengthened regulation and conditions that, i.a., encourage reuse of wastewater, and awareness campaigns to reduce the use of water at household level, including through sustainable diets. However, UN-Water notes that extremely low water stress values may indicate the inability of a country to properly use its water resources for the

⁵ Lessons are provided in the UN Special Rapporteur’s report (2020) *Progressive realization of the human rights to water and sanitation* <https://daccess-ods.un.org/tmp/5280228.85322571.html>.

benefit of the population. This suggests that controlled *increase* of GW resources development may be advisable, to be accompanied by capacity building, advice, incentives, and other policy instruments.

- Strengthen institutions to deliver through clear mandates coupled with incentives to boost motivation and political will – and cross-sectoral coordination mechanisms – for SDG 6 delivery, providing for that all 50+ GW-related SDG targets are met with due consideration to invisible subsurface resources. Coordinate multi-level governance at domestic level, and in turn regionally and globally, to ensure that resource usage is efficiently planned and regulated. This requires data collection and analyses, including through participatory monitoring, with tailored support from UN SDG custodian agencies, the scientific community, and civil society.

For SDG 6.5 achievement:

- Integrate management of all water as one, dynamically interconnected resource. Ensure adequate GW considerations in surface-water plans to offset the hydro-geographic and socio-cultural disconnect between governance of river basins and surface water bodies and invisible recharge and discharge zones and aquifer boundaries, respectively. Adjust the IWRM scope to also account for GW and aquifer users whose recharge zones may lie in another river basin.
- Undertake detailed assessments and draw up ‘aquifer contracts’ signed by relevant stakeholder groups.

For SDG 6.6 achievement:

- Preserve GW-dependent ecosystems to ensure the integrity of the resource, for humans and nature, by implementing nature-based solutions for blue-green infrastructure.
- Calculate and attach monetary and other values to GW aquifers as critical parts of wetlands, landscapes and forests, rivers and lakes from an ecosystems services perspective. Develop water funds to engage users and beneficiaries downstream with actors and conditions upstream.

For SDG 6.b achievement:

- Embrace how today’s multi-level governance landscape necessitates effective and equitable GW governance, based on inclusive, multi-stakeholder approaches, involving a diversity of actors across administrative lines, with different degrees of influence and expertise.
- Recognise how GW is characterised by its ‘local nature.’ Trainings, guidelines, and information sharing – through traditional means as well as digitisation and other cutting-edge technology – are key to involve users and authorities alike in decision-making processes. At the same time, governments need to fully assume their role as resource custodians in view of the common-good aspects of GW, to counteract that it stays out of sight of political prioritisation.

- Support improved transparency and accountability using information and communication technology (ICT), citizen involvement and oversight, and local ownership in interventions.
- Ensure stakeholder participation with gender equality and representation of local and vulnerable groups as well as youth.
- Recognise that self-regulation, community awareness building, and participatory monitoring are complementary to governmental administration, institutions, and rules.

Key messages on actors and mandates

SDG 6 achievement goes much beyond provision of water and sanitation services and beyond the WASH community. Agents of change must be found in all sectors and at all levels of society. Improved cross-sectoral consideration of GW resources requires urgent action to better value GW and aquifers also by governance actors involved in food security and jobs, disaster risk reduction, stability and peace, and biodiversity and ecosystem protection. Therefore, key recommendations on actors and their mandates include the following:

- Coordinate governance arrangements to reduce the impact of fragmented roles and responsibilities as well as gaps in institutional and human capacity, at all levels. Align the work carried out by appointed SDG 6 custodian agencies to prevent a siloed approach to GW resources in SDG 6 achievement, by ensuring that UN Country Teams' support to Member States complements the leading role of UN-Water in organising cross-sectoral integration;
- Foster better alignment between formal governance arrangements and informal elements that influence how actors, networks, and systems function on the ground to consider how socio-economic and cultural rules and norms are factors that impact on, and are formed by, a very large and heterogenic group of GW stakeholders at local level;
- Regulate GW resources usage with consideration to the common pool character of GW and tragedy of open access that presently leads to a race to the bottom and inequitable battle of the deepest pump. Ensure that wide consultations are conducted to counter competition, political will and power dynamics at and between line ministries and other decision-making bodies of the administration, as well as on the ground, as part of reform processes;
- Recognise that GW resources are mostly managed on a day-to-day bases at the well- or borehole-scale, often based on individual users' limited understanding of GW and aquifers;
- Engage the private sector by aligning better with the UN Guiding Principles on Business and Human Rights, beyond SDG 6.1–2 and beyond the rights to water and sanitation.