Sustainable Resources Management Journal
2022, 7(1) 01 -17
https://10.5281/zenodo.7435503

Good Water Governance: A Review

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ABSTRACT

In this research, a comprehensive analysis of the literature has been conducted to show the value of good water governance. Pressures and challenges for population growth and environmental degradation have been analysed. Characteristics and dimensions of water governance have been examined to adequately address these challenges. Integrated management of water resources has been looked at as a widely accepted method of water governance. The research also covers transboundary waters and aquifers, as well as international water law. The Sustainable Development Goals and human rights to water were discussed as a key strategies for achieving water quality and quantity. Ecological processes and water supply, as well as water-related ecosystems, their benefits, challenges, and solutions, have all been thoroughly discussed.

Keywords: Water governance; International water law; IWRM, SDGs; human right to water.

1. INTRODUCTION

Water is required for life to exist, and everyone should have access to a sufficient, safe, and easily accessible water supply (WHO, 2022). Water governance is more important than ever for sustainable development in a society where scarce resources are increasingly stretched. Ecosystems are under threat, health risks are increasing as a result of declining water quality, and climate change adds to the challenges to the long-term viability of the world's water resources, and thus to the livelihoods of our growing populations. Global economic development has caused massive deforestation, land and marine habitat environmental degradation, biodiversity loss, and significant greenhouse gas emissions that are destabilizing the global climate. It has driven mankind into new ecosystems where people and animals exchange novel viruses, resulting in the emergence of new infectious illnesses like the COVID-19 virus, which is currently affecting communities worldwide (Zhou et al., 2020). As the coronavirus pandemic spreads across the globe in 2020, the importance of access to clean water and sanitation is reinforced (WHO, 2022). The United Nation emphasized “Availability and access to water, sanitation, and hygiene (WASH) services is fundamental to

fighting the virus and preserving the health and well-being of millions. COVID-19 will not be stopped without access to safe water for people living in vulnerability. The World Health Organization (WHO) has recognized the importance of water, sanitation, and hygiene in its interim emergency guidance for COVID- 19. The grim fact, however, is that over 40 percent of the world's population lacks adequate access to basic hand-washing facilities (Panhwar et al., 2022). A variety of variables and drivers place pressure on water resources and influence water management alternatives and requirements. These are mostly socioeconomic reasons, but they also include less controllable ones like climate change. Population growth is a major driver, increasing the demand for more water while also producing more wastewater and pollution. It is estimated that the world's population will grow by about three billion people by 2050, representing a nearly 50 percent increase. The vast majority of this growth will occur in developing countries, bringing with it all of the challenges that entails in terms of investment needs for water supply and wastewater treatment. The problem in urban areas is exacerbated by the predicted continuous migration from rural to urban areas, which raises the current level of difficulty in securing and safeguarding water resources, particularly in urban poor communities. The environmental refugees who occasionally move due to water concerns may also contribute to an unsustainable strain on water resources in order to survive in their new urban or rural locations (Lunstrum, 2022). Although water is free, obstructing water, purifying, bringing it to home or to the industries through pipes requires money and energy. The price that we pay now is typically not covering the cost of production and transport. On the other hand, water is limited. We can't extract too much, or we will destroy the ecosystems. At the same time the demand for energy, food, industry in terms of water is growing everywhere. That is why we need to govern water properly. Water is essential to life on earth, essential for energy production, agriculture, and industry (Jimenez A, 2022).

2. INTEGRATED WATER RESOURCES MANAGEMENT

Managers, whether in government or private sectors, must make tough decisions about allocating water. They have to be constantly allocating declining resources between ever-increasing demands. Drivers such as demographic and climatic changes are also putting a strain on water resources. The previous fragmented strategy is no longer practicable, and a more holistic approach to water management is required. Expectations for water resources management have been transformed over the last century. As engineers our hydraulic mission has been replaced by the mission of Integrated Water Resources Management (IWRM). IWRM sets out to reconcile multiple, competing uses for water, with legitimacy attained through public participation, and with coordination and technical competence assured through specialized entities or agencies. Yet water resource management problems still accumulate more quickly than they are resolved (Smith and Clausen, 2018). This is the reason for the IWRM strategy, which has now been recognized globally as the way forward for effective, equitable and sustainable production and management of the world's limited water resources, and for meeting contradictory demands. IWRM contributes to the protection of the global environment, the promotion of economic growth and sustainable agricultural development, the promotion of democratic involvement in governance, and the improvement of human health. Water policy and management are beginning to reflect the fundamentally interrelated character of hydrological resources around the world, and IWRM is developing as a viable alternative to the sector-by-sector, top-down management method that has previously dominated. The concept of IWRM has gained wide-spread acceptance in the last decades for improving water

management. The Global Water Partnership describes IWRM as a process that promotes the coordinated development and management of water, land, and related resources in order to optimize the resulting economic and social welfare in an equitable manner while protecting essential ecosystems (Arora and Mishra, 2022). The concept of IWRM originated at the International Conference on Water and the Environment (ICWE) in Dublin (1992) which led to the formulation of the Dublin Principles. Basic ideas of IWRM are empowerment and participation of water users, transparency of governance and accountability of actors involved in water management, the integration of ecosystem needs and human needs, and the idea of management units based on hydrographic boundaries. The three "E"s, efficiency, equity and ecosystem vitality, are what IWRM strives for. The principles of Dublin describe water as a limited, vulnerable and necessary resource which is to be managed in an integrated way. Development and management of water resources should be based on a participatory approach which involves all relevant stakeholders. Women play a key role in supplying, handling, and securing water. Water has an economic benefit and should be accepted as an economic good in the light of the requirements of affordability and equity. Water has an economic value and should be recognized as an economic good, taking into account affordability and equity criteria (Hellegers and Halsema, 2019). The year 2015 has been a pivotal year of water in development generally, and for IWRM. This started with the launch of the report "Global Risks 2015" at the World Economic Forum that identified "water crises" at the top global risk in terms of impacts. In September the UN General Assembly adopted the 17 Sustainable Development Goals (the SDGs), with 169 specific targets, to guide the world's development agenda through 2030. One of the aims is to ensure the availability and long-term management of water and sanitation for all, and one of the six targets to achieve this is to adopt integrated water resource management at all levels by 2030, including through transboundary collaboration as required. The year 2015 ended with a new global climate agreement at COP 21 in Paris in which the critical role of water for adaptation and resilience building is highlighted. The United Nations defines integrated water resource management as a method of promoting coordinated development and management of water, land, and related resources in order to optimize economic and social welfare in a sustainable manner. Recognizing the importance of water management for achieving SDG 6 and the entire 2030 agenda, the world has agreed on a specific target and water management Target 6.5 is to implement integrated water resources management at all levels, including through transboundary cooperation as appropriate, by 2030 (Kjellen M, 2022). IWRM entails the collaborative development and water management, land, and associated resources. It requires us to understand who influences and who needs water in what way and ensuring that their particular concerns are taken into account. In the same vein, we need integration and cross-sector coordination in relation to water and sanitation services provision, including the set of actors that manage use or influence such services. This target is monitored through two indicators, one on the degree of principle and national level IWRM implementation that is the indicator 6.5.1 and the proportion of trans-boundary basin area within an operational arrangement for water cooperation. This is principally at the international level and monitored by indicator 6.5.2. The ideals of Dublin helped encourage reforms, which were agreed on at government level. Such principles have, over the years, provided a clear, understandable, and very useful guide for water resources management and growth for decision-makers and practitioners alike. Implementing an IWRM process is about getting the 'three foundations' right. The first is a step towards an enabling framework of effective policies, strategies and regulations for the production and management of sustainable water resources.

Secondly, the creation of an institutional structure by which policies, strategies and legislation can be applied, and finally the creation of the management resources needed by these institutions to carry out their duties (Caliskan, A. 2022) .

3. CHALLENGES

Since the 1950s, the world has witnessed a remarkable increase of human activity, with global population, GDP, and urban populations quickly growing. Because to improvements in irrigation and fertilizer use, ecosystems have largely been able to meet growing food demands, and human well-being has risen as a consequence of better water management, flood control, irrigation, hydropower, and pollution control. However, many natural resources have been over-exploited or are on the verge of being over-exploited, and predictions suggest that human demand for water, food, energy, and space will continue to grow in the coming decades. Furthermore, the predicted effects of climate change are likely to have an influence on the availability and demand for water resources, as well as food security (Sherow, B 2022).

According to the World Wildlife Foundation (WWF), freshwater biodiversity has decreased by 76% globally during the last 40 years. During the same time span, a round 70 percent of the world's wetlands have vanished (Addison, et al., 2020). According to Jumani et al. (2022), hydraulic infrastructure has resulted in the modification and fragmentation of the flow regimes of more than half of the world's main rivers. Similarly, it is estimated that 20% of the world's groundwater aquifers are over-exploited. Deltas across the world are becoming increasingly vulnerable to floods and submergence as a result of the combined impacts of sediment entrapment behind dams, sea-level rise owing to climate change, and, in certain cases, over-abstraction of groundwater (Sherow B, 2022). Water supply varies greatly from place to region, ranging from desert extremes to lush woods. Furthermore, supply varies over time as a result of both seasonal and inter-annual fluctuation. The degree of fluctuation, as well as the timing and length of high and low supply periods, are unpredictable, posing significant difficulties to water managers in particular and society as a whole. Most developed countries have, to a large extent, artificially overcome natural variability through supply-side infrastructure to ensure reliable supply and reduce risks, albeit at a high cost and frequently with negative consequences for the environment and, in some cases, human health and livelihoods. Many developing countries are now discovering that supply-side solutions alone are insufficient to meet ever-increasing demands due to demographic, economic, and climatic pressures; waste-water treatment, water recycling, and demand management measures are being implemented to address the challenges of insufficient supply. There are also issues with water quality in addition to water quantity. Pollution of water sources is causing serious challenges for both water consumers and natural ecosystems (Bellezoni et al., 2022). Climate variability and climate change are adversely affecting the availability of water in many countries, both in terms of quantity and quality, with more or less precipitation in different regions and more intense weather events. Demand is increasing as a result of changes in consumption and production patterns brought about by population increase and other demographic changes (particularly urbanization), as well as agricultural and industrial expansion. As a result, certain locations are now perpetually in a state where demand exceeds supply, and in many more regions, this is the case at important periods of the year or during years when water availability is low.

Over-abstraction of groundwater asserts that nearly none of the world's marine environments are currently undisturbed by human influence, and that the most significant impacts are felt in areas subject to both land-based and marine-based human pressures. Excessive nutrient loading in marine and coastal areas is a major pollution concern around the world, and the eutrophication that results is one of the principal causes of marine water deterioration. Changes in the chemistry of the ocean are being influenced by rising carbon dioxide emissions and the global spread of industrial contaminants like mercury and persistent organic pollutants (POPs). Microplastics and other marine litter are becoming increasingly abundant, putting open ocean ecosystems under severe stress (Aljaradin, M., 2020).

Another challenging area is pollution management. This requires regulation, collaboration, and again, responsible behaviors by all water users. If not, pollution may have literally far reaching negative effects. There are upstream-downstream challenges and power imbalances. Pollution upstream can destroy the livelihoods or ecosystems downstream, and this has local, national, regional, and global consequences (Tram et al., 2022). Lack of access to water and sanitation is linked to a number of diseases, principally, diarrhea and cholera.

Diarrhea is still today, the fifth leading cause of this and the third in low-income countries of course in almost seven percent of all that in those regions. By inhibiting normal consumption of foods and absorption of nutrients, diarrheal diseases are also an important course of malnutrition leading to problems in physical growth and cognitive development for children, reduced resistance to infections, and potentially long-term gastrointestinal disorder. Diarrhea is also a substantial economic and social burden leading to loss of work or school attendance, expenditure on medicine, and other problems. Having access to water and sanitation can significantly reduce it from 20-45%. However, simple hygiene improvements such as correct and washing can lead to more than 45% reduction in diarrheal diseases (Meki at al., 2022). Humans have modified the natural landscapes around rivers and wetlands to the point that their biodiversity is put at risk and the freshwater ecosystem goods and services they provide to humans are compromised. These impairments represent pandemic, self-inflicted water security threats that are an apparent by-product of population growth and economic development and poor environmental stewardship (Grambow, 2021).

Numerous ecological factors, including as land degradation, pollution, and exploitation of water resources, limit the quantity and quality of upstream freshwater supplies that support downstream consumers. Human interference has severely damaged about two billion hectares of land globally (roughly twice the size of China), fragmenting watersheds and leading to water scarcity and related food insecurity, mainly in developing countries. Almost the entire world population is serviced by freshwater sources, which have been at least somewhat contaminated by anthropogenic activities, reflecting the existence of water risks to human beings. Industrialized nations, rapidly developing economies, and expanding urban areas represent a clear positive association between rates of economic growth, population and vulnerability to accidents (Lin et al, 2021). The studies show low Human Development Index (HDI) regions demonstrate poor success in implementing water management actions that can reduce the threat to upstream freshwater provisions (King and Palmer, 2022). Many achieve only 20% reduction in threats to water source areas via infrastructure investments. In low HDI countries, better management of upstream freshwater source areas may provide an opportunity to minimize incident risk without the requirement for costly engineering solutions. The results provide a functional tool to assess opportunities for blending nature-based solutions with traditional

engineering infrastructure, to secure and safeguard freshwater provisions for downstream populations. This is particularly important for the most economically disadvantaged who stand to benefit the most from more cost-effective and therefore realistic solutions to address their water security threats on freshwater provisions supporting downstream users have stayed under persistent high threat, transitioned to high threat due to limited infrastructure investments, improved from high to low/moderate threat as a result of investments in water infrastructure or maintained relative health under low/moderate threat. If developing nations are encouraged to think about sensible and cost-effective upstream conservation of their natural capital in addition to threat reduction and green/grey infrastructure investments, this will not only benefit them locally but everyone drawing on those water services downstream, regardless of whether they are in high or low HDI. Most importantly, high HDI countries will benefit if they assist their international upstream neighbours, who may lack the capacity to invest in management strategies, to conserve and protect their freshwater natural capital. We don't pay attention to maintaining those networks over a multi-decadal period. Population incursion and incursion of crop land, and incursion of range lands into these otherwise very important protected watersheds, has taken place. As a consequence, pollution levels rise, whether it's for nutrients or pesticides or sediments coming into the system, and about half of the urban water supply systems that have been analysed show relatively high levels of impairment in these supposedly protected watersheds (Aljaradin et al., 2017). Globally, we see that the demand for borders has been increasing over the last decades. Increased our withdrawal rate every year by roughly one percent, and it's likely to continue in the coming decades. We use almost 70% of the water for agriculture, some 19% for industry, including energy production and 12% for domestic water use. This is all likely to increase in the coming years, while the relative percentage of agriculture probably will reduce while the other two are proportionally increasing. This increase in water demand results in an increase in water scarcity (Aljaradin et al., 2020). It is estimated that some 3.6 billion people, that's nearly half the global population, live in areas where potentially water scarcity is so strong that for one month per year, this population's needs cannot be satisfied, and the numbers likely will increase to about 5 billion by 2050. The global face scarcity of surface water and groundwater, hotspots become more pronounced and even warmer. One-third of the world's most important groundwater systems are already in danger. In addition, there are a number of water-related risks, such as floods expose more and more to flooding; floods have accounted for 47% of all weather-related disasters over the last 25 years and have affected a total of 2.3 billion people. And probably, that rate will continue. While over the last few decades the total number of casualties has decreased due to better warning and flood management systems, we see that the economic costs are still escalating.

Also, through urbanization, that's another process that has been accelerating over the last years and we have now more than 50% of the global population living in urban areas and an additional 2.3 billion are expected to live in cities by 2050. The increase in population will definitely increase the demand on the water which in turn will increase the generated wastewater. The 70% that is used for agriculture, almost half of that is discharged back to the environment, often without treatment. In the municipal sector, industry and energy, more than 50% of water withdrawals or water use are discharged back to the environment. If we include also urban runoff, agricultural runoff, municipal industries, and energy industries, over 80% of their wastewater is released back to the environment without proper treatment. That has tremendous implications for ecosystem health. People are also more exposed to pollutants, and this has serious effects on people’s health particularly in low- and middle-income countries.

4. WATER, AS A GLOBAL ISSUE

Water has attracted global attention for a long time, The UN Water Conference held in Marta Plata back in the 1970s was the first big international conference on the subject and declared the first decade of international water supply and sanitation from the 80s to 90s. The Dublin Water Resources Management Principles were issued in 1992, the Millennium Development Goals set a specific target of halving the proportion of people without access to sustainable, safe and drinking water by 2015, and now we have the Sustainable Development Goals, which aim to ensure that everyone has access to sustainable water. However, 3 out of 10 people in the world today do not have access to drinking water, and 6 out of 10 do not have access to good sanitation. Water is inextricably connected with the quality of life and sustainable growth. Due to a combination of population growth, economic development and climate change, the water-related challenges are increasing over the coming decades (UNICEF, 2022). Water cuts across climate change, poverty, health, food safety, energy security, education, gender, etc. Water in one hand is an enabler to achieve all the other goals while progress in the other goals to achieve SDG 6 is also critical.

4.1 The UN Sustainable Development Goals

Water within the UN 2030 Sustainable Development Agenda began in 2015. The 2030 Agenda for Sustainable Development was adopted by 190 Member States. The agenda is broad and universal, and it has 17 Sustainable Development Goals and 169 targets and more than 230 indicators. The agenda is a plan of action for people, the planet and prosperity. The goal of the agenda is ensure availability and sustainable management of water and sanitation for all and to help countries take positive steps and push the world toward a more sustainable path. The agenda also aims to tackle the entire water cycle, including environmental aspects such as pollution reduction, water shortage, social aspects of drinking water and sanitation, but also economic aspects such as integrated water conservation and integrated water management. The main targets of the agenda are about the access to safe drinking water; sanitation; pollution reduction; water quantity; IWRM; ecosystems; international cooperation; and public participation.

4.2 The human right to water

The UN Economic, Social and Cultural Rights Committee adopted general statement No. 15 on the right to water in 2002. The Committee stressed the legal responsibility of the government to fulfil that right, and defined water as a social, cultural, and economic good. It identified a range of normative and cross-cutting requirements that are defined as core values that must be met in order to realize the right to water, such as availability, quality / safety and physical and economic accessibility. The right to water includes not only the right to a service, it also includes participation, justice and information access. The right to water refers primarily to water of reasonable quality and quantity for "personal and household uses. The need for access to water for farming and other productive uses is acknowledged, but although water is needed for a number of different purposes to protect economic development and livelihoods. In 2010, the UN General Assembly adopted water and sanitation as a human right that is essential for the full enjoyment of all human beings. Following this, the UN human rights council, affirm that they are part of the existing international law and confirmed that they are legally binding upon the states that have ratified the international

Covenant of Economic, Social, and Cultural Rights and the Special Rapporteur on human rights obligations related to access to safe drinking, water and sanitation was appointed by the United Nations already in 2008. Human right to sanitation was declared a distinct right already in 2015.

5. THE WATER GOVERNANCE

The way water is actually used, created, and handled is influenced by the international, national, and local political, social, cultural, and administrative structures that are in place. Although governance is often associated with a government's actions, water governance is also affected in practice at all institutional levels by the UN system, international aid spending, multilateral banks, civil society, the private sector, NGOs, indigenous communities and other stakeholders.

Water governance is one of the key areas in which water management and services can be established sustainably. How societies choose to govern their water resources and services has profound effects on people's livelihood and on water resource sustainability. To many people, access to water is a question of everyday life, which may help break the vicious cycle of poverty. Water governance refers to the political, social, economic and administrative structures which influence the use of water and the management of resources. Water governance determines fairness and reliability in the allocation and distribution of water resources and services. This combines water use between biodiversity and socio-economic activities. It decides who is receiving what water, when and how, and who is entitled to water and related facilities and benefits (Parisi et al., 2022).

5.1 Why is good Water Governance needed?

Water has multiple uses, for example (drinking water, cooking, irrigation, energy production, etc.). Water has become limited and scarce. Water production is costly. Water demand is growing, too. This is why we should have strong water governance. The basic institutional unit is the water-use network, which is the infrastructure generated on behalf of users for water intake, conveyance, supply and distribution purposes, and for the disposal of effluent. Water-use systems also require significant capital-cost expenditure from the government, and once installed, management is required to supervise operation and maintenance. In response to urban domestic use or rural irrigation, a wide variety of water-use systems were developed. Over the last century, water-use systems have developed rapidly, and natural water sources have gradually been colonized by water-use sources created by man. What constitutes a water-governance system at any point in time is the common patterns that extend through these water-use systems, and the interconnections between them. The global sustainability targets cannot be achieved without better water management or adaptation to climate change. The urgent need for an integrated solution to reduce climate- and water-related risks has been highlighted (Silva JA, 2022).

5.2 Characteristics of the Water Governance

Planning, budgeting for new infrastructure, planning processes, regulation are essential, but these functions can be performed in pursuit of one or more specific goals, such as improving access to water, better management of

the environment, resilience, etc. At the same time, these functions can be performed in a very different way, even if you want the same objective. Many countries may have participatory budgeting, for example, while others may be more centralized. Governance can be described by the attributes it includes, too. The United Nations describes good governance as the decision-making process and its implementations and with a range of characteristics: Participatory, consensus-oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive. The well-being of the society depends on ensuring that all its members feel that they have a stake in it and that they do not feel excluded, and this is especially important for the most disadvantaged segments of society, and that good governance often follows the rule of law, which means that the decisions taken under legislation are taken in a manner compatible with the rules and regulations and that we have fair law. All these characteristics of good governance seem rational, but they may be difficult to enforce in certain situations. The background of each country varies, and this could involve different governance strategies and approaches. In reality, we have many laws, plans and regulations, but many of them are only partly enforced and often not enforced at all. These are the gaps in policy implementation. The reasons for this may include gaps in the policy formulation process, operationalization gaps, or gaps in the behaviour of the various stakeholders, political instability, and lack of high-level political commitment (Benzaken et al., 2022).

5.3 Dimension of water governance

There are four main aspects of water governance to address when examining governance dynamics:

Social: the equal distribution of water resources and services among different social and economic classes and their effect on society. Apart from being unevenly distributed over time and space, water resources and services are also unevenly distributed among different socio-economic groups in both rural and urban areas.

Economic: productivity in the allocation and usage of water and the role of water in overall economic development. Successful poverty reduction and economic development are highly dependent on water and other natural resources. Improving water governance will boost quality and biodiversity, this results in more effective water investment.

Political: Fair access and opportunities for water stakeholders to engage in decision-making processes. More effective involvement of traditionally disadvantaged residents, such as indigenous peoples or slum dwellers, in water-related decision-making will significantly improve outcomes.

Environmental: Sustainable use of water and associated ecosystem services. Adequate water flow of sufficient quality is vital to the preservation of ecosystem functions and services that rely on them (Fenna et al., 2022).

5.4 Human Rights Obligations

The responsibilities of governments at the national level can be divided into three basic tasks: loyalty, security, and respect for the law. By consideration, we recognize that states must refrain from any overt or indirect interference with the enjoyment of the right. Through securing it, third parties must not intervene in any way with the right, and the responsibility to do so ensures that the government must take action to guarantee equal access. The basic water requirements for human consumption, quality, affordability, acceptability, non-discrimination, accountability, and

continuity, must be made available. Human rights set the highest standard of service delivery, price regulation, service quality regulation, competition regulation, consumer protection, and environmental regulation.

5.5 Accountability

The water and sanitation service delivery system actors need to play their part in ensuring the right to clean water and sanitation and cooperate with one another. State, district and local decision makers are accountable to the communities for access to services. It is their primary duty to ensure that the services are provided to the community. On the other hand, groups may communicate their concerns to policy makers and demand that their civil rights be upheld. Service providers are also responsible to the policy makers. They have to transfer responsibility into a contract stipulating what the service providers should do and how they should pay for it. On the other hand, the service providers are liable to the government for providing up to standard and affordable service. Regulators need to lay down the rules to make sure roles and duties are transparent. The service provider is accountable for the consistent and fair provision of the quality service, while the people are responsible for paying for the services and making good use of the water and sanitation facilities. They will voice concerns to the operator and are active in monitoring the service's efficiency. For these accountability relations we need to work on the following dimensions: the responsibility dimension which clarifies roles, duties, and teamwork. The dimension of responsibility: access for dialogue and interactions to stakeholder information, engagement of stakeholders and stakeholder participation. Finally, the enforceability level: constraints may be enforced if the players do not carry out the tasks as well. Working to improve these three-dimensional obligations and recognizing the value of water as a human right and all that it entails, would provide us with valuable guidance on how to enhance water conservation and sanitation.

5.6 Water Resource Governance from Source to Sea

The source to the sea system is about the land, the freshwater systems, the estuaries and deltas, the coastline and nearshore, the adjoining seas, and the open oceans. As we think about water governance of water resources from source to sea, we're looking at different types of flows. These flows include water itself, the biota that moves across that source to the sea system, the sediment that comes from the land into the freshwater and down into the deltas and the ocean. The pollutants that we put into the source to sea system. These flows combined to imply what the ecosystem services are going to be in the source to sea system. Currently, the governance of water resources is based on some priorities that we have had in the past. Water governance decisions have often excluded important stakeholders, like women and indigenous people and subsistence users. And frequently in the decision making around the governance of water resources, there's been no one speaking for the environment. These dire conditions of water resources around the planet are concrete evidence of a failure in the way we govern and manage water resources. Relationships between water flows and quality, the connectivity, the variability are difficult to know completely, those relationships with ecosystem services, biota, our human health, and so one of the principles that we want to bring into the governance of water resources is called the precautionary principle. We need that process to be inclusive; all the stakeholders that could be affected by these decisions are included in the decision making, and we need the results and including the process to be transparent. Making these water-sharing agreements, how we can involve the people that are most

directly going to be affected by the agreements so that they're reflective of the local context and built up from the people and the environments within which those water-sharing agreements are going to be implemented.

To achieve the 2030 Agenda, water resources need to meet environmental, social and economic sustainability. Coordination across source-to-sea segments will result in governance that balances uses and users and addresses trade-offs. Companies can become good water stewards by ensuring a sustainable water balance, good water quality, healthy important water-related areas, and good water governance.

5.7 Transboundary water management

Transboundary water management is a social, economic, and politically complex process that involves many different stakeholders and interests, usually influenced by power relations that go beyond the water sector itself, and which is often informed by the foreign and security policies of the countries that share the same water resource. In nature, water always flows to the lowest point in the landscape, to a lake, to a river, to the ocean, or simply recharging the groundwater. Water doesn't naturally keep within administrative boundaries; it transcends borders when it flows between regions within a country and when it flows between countries. Tigris as example river that overlaps with regions characterized by substantial interstate and intrastate tensions, and often with a history of armed conflicts.

In essence, a substantial part of the global available fresh water which humanity and the environment is in such great need of, is part of a political context where water and security is intricately linked. In addition to this, the geographical dimension of transboundary waters, it is very important to note that almost half of the world's population live in regions where the water resources are shared by two or more countries. In this context, «Fierce competition for freshwater may well become a source of conflict and wars in the future. » Said by Kofi Annan, March 2001. Several explanations of these absences of water wars exist; one such explanation is that market forces manage to even out the deficiencies in water-scarce and arid countries, simply through the import of water-intense food products, that if produced locally they would draw on scarce water resources. Such hidden flows of water in food and other commodities that are traded from one place to another is often referred to as «virtual water;» however, what we can see is that violent disputes over water have been more common within countries, for example between local communities dependent on the same river or stream, or between sub regions within a country where the upstream located region has through, for example, industrial production which has caused water quality problems downstream. What we can conclude from historical records is that governments have been more eager to find a solution to the joint management of shared waters than to enter into war over the same resource.

5.8 International water law

International water law is a new area of international law which focuses on Transboundary Rivers, shared lakes, and transboundary aquifers. Today's world has some issues such as water scarcity, competing water uses, impact of climate change, and the rising tensions between the riparian states that all underline the need to understand international water laws. A summary of how this field of international law has evolved, we have several theories: absolute territorial sovereignty, absolute territorial integrity, and these two theories have been examined in two

conflicts. Absolute territorial serenity can be demonstrated by the conflict between the United States and Mexico over the Rio Grande. And the second theory on absolute territorial sovereignty in the Lake Land dispute between Spain and France. But these ideas were based on the premise that the upstream or downstream state might exert complete control over this mutual water resource. It was a necessary negotiation of three decades to have some common rules and principles, to govern the uses of international watercourses (Devlaeminck, 2022). The process of water diplomacy should be viewed as a long-term continuous process involving actors who are influenced by and who have the power to influence the governance systems have shared waters. The most common way to manage different aspects of collective water governance is to establish a river basin organization, also referred to as RBOs. 120 RBOs are established around the world. These organizations provide riparian countries with an institutional platform for water cooperation, including mechanisms for data sharing, negotiation, decision making, and dispute resolution. Geographically, RBOs are particularly prevalent in Europe where more than 30 organizations cover most of the region's transboundary rivers, and in Africa, more than 35 RBOs covers the majority of the continent's waterways. That is why we hope that the findings from this report will spark discussion not just among a technical audience, but also among a range of regional actors and policymakers, including representatives from governments, the private sector, civil society, and utilities. Climate change poses another set of pressures on this rapidly evolving context. The negative impacts of climate change on water availability call for urgent action to allocate and use water more wisely. Climate change is also bringing more frequent and severe extreme climatic events. This will in turn increase drought and flood risks, which will harm the poor disproportionately.

5.9 How do we usually make long-term water decisions?

For the past 20 years we have witnessed an increase of economic, political and climate instability in many places. Our confidence in being able to predict the future in many ways has become much less confident and secure. There's been a transition towards what we call a non-optimized or post-optimized, decision making. A range of choices that we might be able to choose from to address the uncertainties that we face in the future. Then we can test the suitability of the solutions against what we know and don't know about future climate. Decision-makers then can choose maybe a single solution, a single approach, but they may try to order them into a kind of portfolio of flexibility so that we can navigate through climate uncertainty into the future (World Bank, 2018).

6. ECOLOGICAL PROCESSES AND WATER

throughout all land that covers forests, grasslands, wetlands, agricultural land and urban areas. If we look at the water cycle, the rainfall, when it hits the ground, if the rainfall is further infiltrating into the soil and percolating down to the ground water, or if the water runs off laterally to the next river, to the next wetland. We can see that ecological processes are influencing the water cycle dynamics throughout. If we look at a large river basin, for instance, at the transboundary river basin with a mountainous area in the upstream and the lowland area in the downstream part of the river basin, the rainfall in the upstream part of the river basin, depends on the amount of rain in that area.

For instance, in the Nile River basin in East Africa, about two thirds or even more of the total discharge that goes down to Egypt comes from the Ethiopian highlands. That means in parts of the Congo, in parts of the Sahel area, central Africa as well, Uganda, South Sudan, etc, whatever land use modification is happening there, defines the evaporation to the atmosphere, defines the rainfall in the Ethiopian highlands and defines also to a large extent the discharge to Egypt into the Mediterranean Sea. Everything is connected within the river basin, as well, the whole continent through these inter linkages.

Ecosystems and their inhabitants, including humans, are water users. Water-related ecosystems include wetlands, rivers, aquifers and lakes, and sustain a high level of biodiversity and life. They are vital for providing benefits and services such as drinking water, water for food and energy, humidity, habitats for aquatic life, and natural solutions for water purification and climate resilience. They contribute to addressing competing demands, mitigating risks and promoting stability and trust-building measures, if they are managed well. They regulate flows and extreme conditions, and of course, they purify water and replenish groundwaters.

Water-related ecosystems can continue to provide benefits to society through halting their degradation and their destruction and helping to recover those that are already degraded. Water-related ecosystems underpin and depend on other Sustainable Development Goals, in particular, those relating to food security, to energy production, to biodiversity, and terrestrial and ocean ecosystems. Progress is therefore needed on all related Sustainable Development Goals to ensure that water-related ecosystems are protected and restored successfully.

Despite the values and benefits of water-related ecosystems, they face considerable pressures to meet short-term socio-economic development demands. It is alarming to note that most of the world's water-related ecosystems are already degraded and polluted. To measure the extent of change, one needs to know if the spatial extent of water-related ecosystems is changing. Additionally, whether the quantity of water and the quality of water is also changing. This is no easy task and requires substantial amounts of data over a period of time, ideally, measuring a change in extent in an ecosystem from a natural state. Environmental Targets such as Target 6.6 is new in the context of the Sustainable Development Goals and measuring environmental data is new for many countries and most of them simply do not have all of the data that is needed to measure the change in their water-related ecosystems.

80% of the world's wastewater is discharged untreated. 30% is a decline of biodiversity, and health issues have been observed since the 1970s. More than 40% of freshwater fish species in the United States and Europe were

in imminent danger of extinction. Wastewater is expected to be doubling by 2050. The sewerage connections are increasing, but the wastewater treatment doesn't really keep pace, particularly not in the demographic change in urbanization. There's another nexus with fish. What it needs in terms of guaranteeing the services is we need to rely on adequate water quality. In the industrial revolution of the late 19th century, we saw a rise of river systems involving organic contaminants, industrial pollutants, nutrients, home waste, and hydrogeomorphological systems. We see these balancing off in the early changes in Europe and around the world. Industrial pollution is at height, as is farm pollution and the loading of nutrients, and new threats such as micro-pollutants, plastics and neo-biotas are present (Aljaradin, 2020).

It's the first-of-a-kind global agenda that looks into the global hydrological cycle in its entirety. We are looking to enhance data collection and sharing, assist countries in developing national standards for water quality for which a system has been established by UN Climate, empowering countries in monitoring water quality and building capacity. Dealing with people is important. Measurement is in situ. We must speak to see what is accessible and what can be given by the technicians, the stats agencies. Then look at new data sources Earth observation, citizen science since we work internationally in a very data scarce region, but this is enabled by the global environmental surveillance framework. The benthic, which is the sea bottom fauna, deteriorated due to massive influence and input of nutrients from the Danube River mostly. The water became turbid, light penetration went down, actually, species that did not belong to the system entered the system and ended up with 40,000 square kilometre hypoxia zone. Suddenly there was a social-political change. A massive effect due to the change in the eastern countries has been observed, which had a massive effect on nutrient flexes. As of the 1990s, it happened that the nitrogen emissions went down by 20% and phosphorus by over 50%. The social-political change was one driver, the other was investments. Nutrient loads decline. Indeed, we need to have the right structure in place, the Water Policy Directive or the Main Strategy Framework Guideline, to ensure that we are able to resolve this problem in the long term and to ensure that the environmental quality of river and sea water continues to be protected. It is not just about investment, it is not just about measuring, it is about engaging people. In this phase, people have to participate. We're not in here yet.

7. CONCLUSION

To date, water resource governance has primarily been a static concept. The laws, the policies, the regulations, the procedures have been set. The allocation of water resources is often based on a historical baseline, but those are no longer viable and a more holistic approach to water management is essential. A way to make it adaptive and flexible should be found. It must be provided enough security, enough certainty, so that users, the economy, households, municipalities, can plan for the future and can have some security in the future, but at the same time, need to be responsive to these changes that are coming upon us. The governance must be based on water resources on the natural conditions of quantity, variability, conductivity, and quality. Environmental, social, and economic sustainability through our governance system is crucial. This needs to be developed in an equitable, transparent, and inclusive way. Water governance needs to be coordinated with the governance of land, coastal areas, and marine environments along the source to sea continuum. Governance of surface and groundwater needs to be done in a coherent and integrated way. A global community should change the way that govern water resources, so that can reverse the trends of

increasing water insecurity and it can help to achieve environmentally, socially, and economically sustainable water use. It is imperative that governments across the world ensure equitable access to safe drinking water and hygiene facilities to minimize all kinds of infectious diseases among poor and vulnerable communities. Communication across borders becomes imperative. Transnational and regional cooperation have benefits such as, decreasing risk of conflict, reducing poverty levels, providing regional development opportunities and increasing resilience to climate variability. Because of climate changes, we need to be adaptive and responsive with our laws, our policies, our regulations and procedures to have resilient and sustainable development. As individuals, we need to consume only our fair share of humanity's water footprint which is the volume of freshwater used to produce well and services and be an advocate for improved water stewardship and water governance. This can give us some idea about the global nature of water resources and that through the globalization of our economy, we have extended our water footprint, whether as an individual, as a company, or a government to lands in many places in the world. If we are to have sustainable production and consumption, we need to address our water footprint- wherever it lands-and join with local stakeholders to ensure that water resources everywhere are being used in an environmentally, socially, and economically sustainable way. The SDGs within scope of the UN 2030 agenda have made a great impact on water resources management and there are many good samples which involve nature-based solutions or combination of green-grey solutions that can make us more hopeful about the future. Regarding water politics, as Dr. Therese Sjömander Magnusson from Stockholm International Water Institute (SIWI) emphasized “Water politics is still politics. Thus, like all politics, it's a matter of who gets what when and how. Disagreements over these questions can generate tensions and conflict, but transparent, accountable, adaptable, and integrated governance approaches and bodied in cooperative institutions can provide the means to manage these challenges peacefully and productively in order to truly ensure global water security in the 21st century.”

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