A Chronological and Systematic Assessment of Sustainable Development Considerations within The United Nations' World Water Development Reports

Major Research Paper

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Abstract

As a result of economic development, increasing population, and shifting consumption patterns, the demands on the planet's water systems are at their peak; there is thus an urgent need to address the growing global water crisis. Significantly, international organizations, like the United Nations, play a significant role in maintaining international unity and stability. Subsequently, international mobilization around water security is of great importance. This paper offers a systematic review of the thirteen World Water Development Reports published by the United Nations to investigate and develop best practices and critical recommendations. This paper will provide insight into the need for a comprehensive and coordinated approach to water and increased attention and investment in water-related services. The findings emphasize the importance of transformative and just governance to combat the water crisis through sustainable development. The recommendations offered must be achieved in conjunction with each other and are crucial to realizing truly equitable and comprehensive sustainable development.

Table Of Contents

1. Introduction

1.1. Contextual Background: the Global Water Crisis

Fresh water has emerged as an increasingly scarce resource. With continuously growing demands for water resources, increased instances of pollution and severe water stress have followed all around the world (Sustainable Development Knowledge Platform, 2022). The global community, led by intergovernmental organizations such as the United Nations (UN), has identified access to clean water as a human right. International human rights law obliges nations to work towards achieving universal access to water and sanitation for all, without discrimination, while prioritizing those most in need (UNDESA, 2014). Fulfilling human rights to water and sanitation requires that the services be physically accessible, equitably affordable, safe, and culturally acceptable. Access to water is a basic human need, needed for consumption and to support sanitation and hygiene, sustaining life and health; access to both water and sanitation are human rights (UNDESA, 2014). However, following through with the fulfillment of this right has been challenging.

The international demand for water resources is a multifaceted situation with many complex factors that have resulted in many actors, from civil society to national governments, proposing potential solutions. One such source for a resolution comes from the United Nations World Water Development Reports (WWDR), the United Nations' leading report on water and sanitation issues. While not always proposing specific water policies, the reports provide insights on main trends concerning the state, use and management of freshwater and sanitation. This information provides decision-makers with the knowledge and tools needed to formulate and implement sustainable water policies and offer best practices and analyses to inspire actions for better water stewardship (UN-Water, 2022a).

An essential and guiding principle of the United Nations today is sustainable development. Sustainable development aims to ensure a nexus of environmental, social and economic needs being treated equally to ensure that all basic needs are met in an equitable society (Liu et al., 2018). Furthermore, it ensures that development meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987). Water resources, naturally, are at the core of sustainable development as their safe and reliable access is imperative to poverty reduction, economic growth and environmental sustainability (United Nations Division for Sustainable Development, 2002). However, as the United Nations' conceptualization and adoption of sustainable development have changed over time, it is vital to understand how this has underpinned past and existing approaches to water policies and knowledge. Thus, it is crucial to recognize how conceptualizations and perceptions of water security/scarcity and sustainable water governance have developed over time to understand better how to best transform the way the world manages its water resources for the future.

1.2. Research Question

This paper seeks to answer the following research questions:

1. What are some of the main trends concerning the state, use and management of freshwater globally?
2. How have approaches to sustainable development been considered within the UN World Water Development Reports over time?
3. What lessons can be drawn to develop and advance sustainable water policies?

1.3. Rationale

Water Scarcity within the Anthropocene

The United Nations defines water scarcity as either a scarcity in "availability due to a physical shortage, or scarcity in access due to the failure of institutions to ensure a regular supply or due to a lack of adequate infrastructure" (UN-Water, 2022b). Globally, water scarcity has been increasing at more than twice the rate of population increase in the last century. An increasing number of regions are reaching the limit at which water services can be sustainably delivered, especially in arid areas (UN-Water, 2022b).

The planetary boundary of freshwater consumption and the global hydrological cycle dictates that we are currently in the Anthropocene, where human pressure is now the dominant driving force determining the operation and distribution of natural resources, including global freshwater systems (Lewis & Maslin, 2015). The dominant feature of the Anthropocene is that the economic activity of humans continues to grow at a rapid rate, including increased population growth (predominantly in the Global South) and consumption (predominantly in the Global North) (Steffen et al., 2015). Beyond the mid-20th century, there is clear evidence for fundamental shifts in the Earth System's state driven by human activities, with ramifications including increased water use and water withdrawals (Steffan et al., 2015). The consequences of the human modification of water bodies, at both local and global levels, result in shifts in the hydrological system that can be unexpected and irreversible (Bogardi et al., 2013).

Water scarcity leads to instances of water stress, which are the symptoms of water scarcity, such as growing conflict between users, increased competition for water, declining standards of reliability and service, and food insecurity (Steduto et al., 2012). Existing data suggest that presently, two-thirds of the global population (4.0 billion people) live under

conditions of severe water scarcity for at least one month of the year. In comparison, half a billion people worldwide face severe water scarcity all year round (Mekonnen & Hoekstra, 2016). Moreover, these numbers are expected to continue rising. The OECD projects that by 2050, over 40% of the world's population will be living in water-stressed areas, thus increasing the pressure to intervene in water systems (OECD, 2015).

Water Governance

Governance has often been used as an umbrella concept, and no agreed definition exists. It is a complex process that considers multi-level participation beyond the state, where decision-making includes public institutions and the private sector, civil society, and society (Tortajada, 2010). Water governance, then, refers to the political, social, economic and administrative systems that influence water's use and management (Water Governance Facility, 2022). It is concerned with how institutions operate and how regulations affect political actions and societal concerns through formal and informal instruments (Tortajada, 2010). Given the size and nature of water challenges, tackling them requires a coordinated effort among policymakers and stakeholders: those who play a role in and those affected by actions and outcomes in the water sector (OECD, 2015).

Moreover, the water sector is often highly decentralized and fragmented, with multiple, interdependent players at different levels (OECD, 2015). Presenting complex information in a streamlined and accessible format, thus, is imperative to helping various actors and stakeholders across the globe take meaningful actions towards sustainable water use, management, and access. "Good governance", then, according to the United Nations, involves adhering to principles of human rights, including effectiveness, responsiveness and accountability; openness

and transparency; participation in the performance of crucial functions relating to policy and institutional arrangements; planning and coordination; and regulation and licensing (UNESCO & World Water Assessment Programme, 2006).

Sustainable Development and the UN World Development Reports

The first modern idea of sustainable development was framed in the 1987 report "Our Common Future", stating that: "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 16). While humanity appears to be succeeding with overall increasing human life expectancy and decreasing infant mortality, there remain several global issues, including a widening wealth gap and more people with no access to potable water and food (Nadin, 2019). The former *modus operandi* has paved the path for substantial inequality due to uneven and non-sustainable development.

To address this growing inequality, the United Nations published the Millennium Development Goals (2000), which, upon their completion and after years of fragmentation in their application, were expanded upon with the 2030 Agenda for Sustainable Development Goals (2015). Yet, one significant aspect that separates the SDGs from the MDGs is that the SDGs focus not only on eliminating poverty but doing so in the context of environmental, economic and social aspects. In promoting sustainable development, the SDGs thus focus on building resilient systems by recognizing and establishing a globalized, interconnected world system and have clearly outlined goals that the world can agree are fundamental and attainable.

The United Nations' World Water Development Report is an annual and thematic report that focuses on different strategic water issues each year and aims to provide decision-makers with the tools to implement sustainable use of our water resources (UN-iLibrary, 2022). Since its first iteration in 2003, the United Nations' World Water Development Report has undergone revisions in terms of its scope and format to better meet the needs of all stakeholders and readers. Sustainable development ensures a nexus of environmental, social and economic conditions being treated equally to ensure that all basic needs are met in an equitable society. It is thus vital to understand how conceptualizations of water scarcity and water governance within the context of sustainable development have developed over time.

1.4. Research Significance

The urgent need to address the growing global water crisis cannot be understated. International water use has increased by a factor of six over the past 100 years. It grows steadily at about 1% per year due to economic development, increasing population, and shifting consumption patterns (United Nations, 2019). Combined with a more erratic and uncertain supply, climate change will aggravate existing water-stressed regions and generate water stress in areas where water resources are still abundant today (United Nations, 2020). Physical water scarcity is often a seasonal phenomenon rather than a chronic one; climate change is likely to cause shifts in seasonal water availability throughout the year in several places (United Nations, 2020). Human use of water, water pollution and the degradation of aquatic ecosystems continue to accelerate because of population growth, economic growth, the climate emergency, land-use change, extractivism, inefficient use of water, and weak planning, regulation and enforcement (United Nations, 2020).

A growing need for cohesion in water policy is increasingly recognized within water policy and governance scholarship, but the main trends and how they have fit within sustainable development, over time, remain unclear (Neuman, 2010; Seppälä, 2002; von der Porten & de Loë, 2013). A systematic review of the 13 WWDRs to investigate and develop best practices and key recommendations will be imperative to propose a typology of water policy recommendations to combat the growing water crisis. Indeed, international organizations, like the United Nations, play a significant role in maintaining international unity and stability (Baumann, 2016; Nadin, 2019). Subsequently, global mobilization around water security is of great importance. The need for a comprehensive and coordinated approach to water and increased attention and investment in water-related services is of the highest significance to combat the growing crisis and ensure that all clean and safe water goals are achieved. The WWDRs aim to provide recommendations offered by the United Nations in a seamless, efficient, and transparent format to highlight all needed actions.

This paper is organized as follows. Section 2 covers the research design of the paper and outlines the methodology used. Section 3 presents a rigorous, integrative, and systematic literature review using qualitative techniques on the 13 WWDRs. In Section 4, I overview and discuss previous and ongoing discussions on sustainable development and water governance scholarships. Section 5 outlines critical recommendations based on the aggregated information offered from the 13 WWDRs and discourses in sustainable development. Lastly, in Section 6, I conclude the paper by discussing lessons learned and an outlook for future considerations.

2. Research Design and Methodology

To explore the proposed research questions, I conducted a thorough and systematic review of all 13 published WWDRs. To complete this research, I conducted an argumentative discourse analysis. Discourse analysis within the social sciences describes various discourses' practices, patterns, structures, and functions (van Rees, 2007). Discourse analysis can interpret policies and recommendations made by academics and institutions, as it delivers evidence of the intentions and meanings within the language used in policymaking processes (Yanow, 2014). Discourse analysis is thus a methodological framework that involves the interpretation of the language used in texts, including the language used in policy documents (Epstein et al., 2014; Fløttum & Gjerstad, 2017; Nerlich et al., 2010). Argumentative discourse serves two essential functions: 1) To persuade others to accept an argument, and 2) To deliberate arguments posed by others (Felton et al., 2015; Mercier & Sperber, 2011). Thus, an argumentative discourse analysis was applied to analyze the dominant discourses, counter-discourses and marginalized discourses that directly influence sustainable water policies' decision-making processes and policymaking and determine what power relations and knowledge structures these discourses align with (if any).

Especially in the evolution of water policies and knowledge-sharing, reports and knowledge from larger institutional bodies, such as the United Nations, can be perceived as constructing specific discourses about international governance and sustainability, which requires further analysis in addressing the contextualization of water from various powerful actors. My analysis of the United Nations' World Water Development Reports focuses on how water knowledge, information-sharing, and policy recommendations within sustainable development

have evolved and changed over time and what this means for sustainable development and water scarcity moving forward.

This paper utilized a mixed methodology approach through qualitative analyses from a combination of policy documents, peer-reviewed/scholarly literature, and grey literature. Regarding the inclusion and exclusion criteria, the review only included studies that provide information on sustainable development and water governance scholarships. This included studies from all disciplines, all of them written in English. This study used a limited number of exclusion criteria and therefore does not include publications on issues unrelated to sustainable development or water governance. The research design commenced with a comprehensive literature review of the 13 published WWDRs, including an annotated bibliography. All reports post-2010 offer regional case studies, but these were not analyzed within the parameters of this study due to time and length constraints. NVivo was used across this study phase to manage the overall research effort and identify trends.

3. A Systematic Review of the United Nations World Water Development Reports

Report 1 - Water for People, Water for Life (2003)

From the first report published near the beginning of the twenty-first century, the water crisis is clearly and unquestionably deemed a problem of water governance. According to research, case studies, and individual accounts, the water crisis will only continue to worsen unless corrective action is taken. Threats from climate change and anthropogenic influence have resulted in significant and unprecedented variations in available water, the consequence of which is that water for all uses is becoming scarce and deepening the water crisis. Within the Anthropocene, humankind's control and manipulation of water systems are global; humans are

the most significant players in the hydrological cycle. Consequently, there is a heavy emphasis on the role of humans and how our actions can largely dictate the future of this crisis.

Thus, to prevent further worsening of the water crisis, stakeholders, including those connected directly to the water sector (and most emphasized, those responsible for managing water), must focus on how they mismanage water and rectify this. Key elements to consider to combat the water crisis include the geography of water, concerns regarding the capacity to provide water supply, investments in water infrastructure, and levels of health services and environmental protection. Thus, emphasis must be placed on the further development and application of indicators and continued monitoring of progress towards realizing targets. Further, this report heavily emphasizes that, as with many other international issues, the poor are most and worst affected by the water crisis. The report calls for an expanded emphasis on building national abilities to report developments at national and local levels effectively. Therefore, it is action at the local level which will make the most effective and significant impact and a clear recognition of the significance of bottom-up policies in water policy, with the stipulation of these directions being monitored and guided at the national level (UNESCO, 2003).

Report 2 - Water, a Shared Responsibility (2006)

In the second report that comes three years after the inaugural report, the following ideas are paramount to all recommendations for incorporating sustainable development and combating the water crisis: a) sustainable and equitable water management using an integrated approach, b) assessment of the resource as the basis for rational decision-making, and c) national capacities undertaking assessments must be further supported and expanded from the local level through to international levels.

The report offers best practices and theoretical and analytic analyses to promote ideas and actions for better stewardship in the water sector. This report expands on the previous report's findings on the significance of governance; there is enough water for everyone, and the major challenge in combating the water crisis is one of governance. Thus, it is crucial to recognize a path towards equitably sharing water while ensuring the sustainability of natural ecosystems. In line with emphasizing governance issues, the report highlights the increasing recognition that an Integrated Water Resources Management (IWRM) course is needed to evaluate all water issues simultaneously to ensure the equitable and sustainable management of freshwater. IWRM searches for more effective and fair management of water through expanded collaboration. Calling for new regulative arrangements worldwide, raising public cooperation, and exploring alternative solutions for settling disputes, are all part of the process.

Subsequently, decisions on water management are a top priority, and the challenges of this management are diverse globally; this is mainly because global water resources are limited and unevenly distributed. These resource issues complicate water management, particularly for decision-makers who are faced with the challenge of managing and sustainably developing water resources in the face of economic growth, significant population increases, and climate change. Especially within the context of the Millenium Development Goals, a very significant factor in meeting these goals is industrial growth for countries adopting poverty-reduction policies, as it is necessary to diversify economies, create jobs, and add value to the products and raw materials being produced.

In conclusion, the report sets out the following key recommendations: a) to appreciate the context within which water issues must be approached; b) to recognize that the various issues of water are interrelated - and with growing demand and decreasing supply, competition is

increasing, requiring greater insight in the distribution of water; c) to appreciate the variety of circumstance - solutions have to be tailored to the situation; d) to understand that water moves within natural limits - but that these do not usually correspond to the administrative units within which societies organize themselves; e) to improve primary data through research, as more excellent knowledge and understanding are prerequisites for better management of all the systems involved; f) to focus on governance; g) to anticipate and adapt to changing circumstances; h) and for all to assume responsibility for action. This report, like its predecessor, recognizes a need for responsible action and involvement at all levels of society. Individuals at the community level should be encouraged and given the means to take responsibility for their problems. Likewise, governments must take their share of responsibility at local and national levels. Finally, at international levels, responsibility must be taken to set goals and targets and share knowledge (UNESCO & World Water Assessment Programme, 2006).

Report 3 - Water in a Changing World (2009)

This report offers a holistic approach to links between water and climate change, food, energy, health and human security. Human security, broadly conceived, includes basic needs for food, water, health, livelihoods and a place to live. The report (like previous reports but with more urgency and drawing on more data) highlights that poor people are likely to suffer most from climate change. However, compared to previous reports, fuller treatment is given to such topics as climate change, business and trade, financing, the role of the private sector, water transport and innovations and new technologies.

Very significantly, this report marks a transition from the first two reports (a change that continues in all further reports): a transition from being a report primarily for water managers to

being a report for leaders at all levels of government, the private sector and civil society, whose decisions depend on the availability of water resources and make demands on water management. A central theme of this report, intuitively then, is that decisions affecting water management are constructed beyond the water sector and are driven by external, vastly unpredictable forces (including climate change, technological innovation, demography, the global economy, financial markets, changing societal values and norms, laws and customs). These external drivers are dynamic and quickly changing, where developments outside the water sector influence water management strategies and policies. This report emphasizes that decisions in other sectors and those related to development, growth and livelihoods should incorporate water as an integral component, including responses to climate change, food and energy challenges and disaster management. This idea is the first indication of clear recognition that water challenges are not solely the result of the "water sector" but are shaped by actions in other sectors.

Further, the report's analysis of the state of the world's water resources is embedded in a more broad context of what can be accomplished through water management. The analysis leads to a set of responses and recommendations for action that differ from those previously developed from more thoughtful analyses of the water sector because they fully recognize and incorporate the contribution of water to sustainable development. It is recommended that actions include increased investment in water infrastructure and capacity development. Leaders in the water domain can inform the processes outside their domain and manage water resources to achieve agreed socio-economic objectives (MDGs) and environmental integrity. Government leaders, the private sector, and civil society will determine the direction that actions take (UNESCO, 2009).

Report 4 - Managing Water Under Uncertainty and Risk (2012)

The fourth report seeks to provide a new way of looking at the existing water reality through the perspective of risk and uncertainty. One of the key messages of this report is the idea that water underpins all aspects of development. Water is the only medium that links sectors and through which significant crises can be jointly addressed. Further, a united approach to governing and designating water across competing sectors to meet various objectives likewise guarantees that headway made in one sector is not counterbalanced by decreases in others.

More prominent recognition is required of the idea that water is not exclusively a local, regional, or national issue that can be managed at any of those levels alone. An essential component for water management is acknowledging that water is not a standalone sector but also a crucial element that provides benefits for all sectors, thus requiring active consultation with, coordination among, and trade-offs between the other sectors and communities that depend upon it. International interdependencies will progressively be interlinked through water; sectors and regions without enough water to address their demands will need to depend more intensely on others' water resources to meet them. Thus, powerful institutions and political will must foster dialogue and decisions between sectors and support balancing risks. Regulatory frameworks and institutional arrangements must also have the flexibility to adapt to changing circumstances affecting water management. Globally, with rising uncertainty and risk, concerted action must be taken by government leaders, business, water managers, and civil society at local, national and global levels. Like the third report, the outlined stakeholders are clear, but the most important calls to action are directed at national governments. The report encourages national governments to accept leadership and prioritize water in all key policy areas within their own countries and global policy paths, including the MDGs.

Thus, members of the water community are responsible for providing direction to regulatory authorities on decision-making and how to use and manage water sustainably, optimizing and sharing its many benefits and minimizing conflicts. Despite increased recognition of water's role in many other sectors, specific recommendations remain directed to those solely in the water sector. Rising acknowledgement of the water–food–energy–health– environment nexus conception raises awareness among managers responsible for planning in different water-dependent sectors of the more broad implications of their actions, including their water use, on water and other users. This nexus remains a crucial component of sustainable development found in all future reports. Decision-makers need planning tools that reflect the broader impacts of their decisions over the long term. A key recommendation is reducing the uncertainties and risks involved in decisions regarding ecosystem services directly affected or potentially influenced by various management options.

Sustainable development under inherent uncertainty requires deliberate efforts to build robustness and resilience into management structures. These fundamental changes are likely to occur in the nonstructural elements of water management measures. Government leaders, the private sector and civil society, make many significant decisions impacting water. Therefore, it is necessary to devise new methods to deliver technical information to decision-makers in government and those affected by the decisions they make. The report recommends a formal structuring of relationships between technical specialists, government decision-makers, and society. The financial, food, fuel and climate crises are, even individually, serious problems, but in combination, their effects could be catastrophic for global sustainability. Political leaders, business leaders, water managers, water users and everyday citizens have an exceptional

opportunity to see past direct challenges and risks and to affect long-term change towards sustainable prosperity for all through water (UNESCO, 2012).

Report 5 - Water and Energy (2014)

This report is rooted in the idea that freshwater and energy are crucial for human well-being and sustainable socio-economic development. This report is the first in the series, in a trend that will continue in future reports, to be focused on a specific theme. Major regional and global crises of climate, poverty, hunger, health, and finance threaten livelihoods and are interconnected through water and energy. The decisions that determine how water resources are used stem from broader policy circles concerned primarily with economic and industrial development, investment and financing, public health, food security and, most relevant to this report, energy security. As also identified in previous reports, the challenge for governance is to adopt the multiple elements, functions, and benefits of water and set water at the core of decision-making in all water-dependent sectors, including energy.

Policies that aid one field can translate to advanced risks and harmful impacts in another, but they can also yield co-benefits. The need to address trade-offs and maximize co-benefits across numerous sectors is now an urgent and critical issue. A significant existing barrier is that there is often little or no incentive to create and seek coordination or integration of policies across sectoral institutions. Planners, practitioners, and policymakers in water and energy need to take steps to specify and overcome the obstacles that exist in their fields.

Recommendations for a coherent policy, which must include adequate public response to the interconnectedness of the water, energy and related domains, require the following recommendations: a) developing coherent national policies affecting the different domains; b)

creating legal and institutional frameworks to promote this coherence' c) ensuring reliable data and statistics to make and monitor decisions; d) encouraging awareness through education, training and public information media; e) supporting innovation and research into technological development; f) ensuring availability of finance; g) and allowing markets and businesses to develop. In addition, the international community can bring actors together and catalyze support for national, subnational and local governments and utility providers, who have a significant role at the national and local levels (UNESCO, 2014).

Report 6 - Water for a Sustainable World (2015)

Written in the final year that closes out the MDGs, this report's focus on sustainability falls in line with the hypervigilant focus on sustainable development that is to come in future reports. This report fully realizes the idea that water is at the core of sustainable development. Water is inseparably linked to agriculture, health, gender, climate change, food security, equality, and education; there is an international agreement that water and sanitation are essential to achieving many sustainable development goals. This sixth iteration of the report provides a thorough understanding of water and sanitation challenges and how to transform them into opportunities.

The second in the series' transition to annually released theme-oriented reports, this report also demonstrates how water is critical to sustainable development. Indeed, water is the fundamental natural resource upon which most social and economic activities and ecosystem processes depend. Sustainable development requires proper management of freshwater resources and equitably sharing its benefits. The linkages between sustainable development and water are considerable, complex and nuanced. Beyond describing the relationship between water and its

environmental, economic, and social dimensions, this report further examines water's role in managing several of the most critical developmental challenges, from energy security to climate change.

This report primarily targets national-level decision-makers and water resources managers like its predecessors. The report describes a future world in which water resources and water-related services are managed so that the benefits derived from water are maximized and shared equitably throughout the world. This vision is not proposed as a fictional outlook; it is a future that authors believe is entirely achievable, where water is recognized and managed as an essential resource that sustains all facets of sustainable development. This vision represents a unique and creative approach to the WWDR that can be identified in all future reports.

Although the notion of sustainable development may be specific, different stakeholders tend to see the challenges and possible resolutions from their respective and often varying perspectives. Accordingly, this report seeks to present a fact-based, balanced and neutral account of the state of knowledge, covering recent water and sustainable development outcomes. In a shift towards a new sustainable development paradigm, this report serves as a practical, illuminating and credible tool that will strengthen and support visionary discussions on "our common future" and ultimately support identifying and adopting appropriate responses.

This report significantly underscores equity, non-discrimination, participation and accountability as fundamental principles in water governance. Further, national laws should support the mainstreaming of the human rights-based approach to water, which helps correct potential imbalances and avoid social exclusion. Finally, all stakeholders, including policymakers, politicians, regulators, the judiciary, educators, allocators of resources, academics and members of civil society organizations, must work together within their areas of expertise to

advance shared norms, protocols and understanding of water as a resource and how best to consume and protect it (UNESCO, 2015).

Report 7 - Water and Jobs (2016)

This report is the first in the series to be published after the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development were adopted by world leaders in September 2015. However, curiously, the report remains primarily focused on the economic elements of sustainable development. Indeed, water is a critical part of national and local economies and is required to develop and sustain jobs across all sectors. Therefore, managing the water-jobs nexus, notably through harmonized policies and investments, is required for sustainable development worldwide.

Water jobs (and other ancillary jobs) provide the enabling environment and critical support to numerous industries, institutions, organizations, and systems and the jobs they produce. Therefore, governments can identify the investment and employment policies that will advance and enhance jobs across the economy by assessing the possible employment subsidized by investments in water conservation, treatment, and delivery. The analyses made in this report estimate that more than 1.4 billion jobs (42% of the world's total active workforce) are predominantly water-dependent. It is further estimated that 1.2 billion jobs (36% of the world's total active workforce) are moderately water-dependent. Essentially, 78% of jobs constituting the global workforce are dependent on water.

This report identifies that water scarcity is likely to restrict prospects for creating decent jobs and economic growth in the upcoming years. Furthermore, water availability might vary significantly without sufficient infrastructure to manage and store the water, leaving countries

"water-scarce" for extended periods. Therefore, to promote economic growth, poverty reduction and environmental sustainability, consideration must be given to methods that mitigate job loss or displacement and maximize job creation that may result from applying an integrated approach to water management. Adopting an ecosystem-based approach to watershed management, including the economic valuation of ecosystem services, is one way of quantifying their benefits for livelihoods and employment.

Failure to invest in water management represents missed opportunities and impedes economic growth and job creation. The political will to set and implement water-related policy objectives that mutually support sustainable development and job creation is essential. However, there is frequently a low level of appreciation of the high risks and severe impacts to which neglect of water issues can lead, often with catastrophic and highly costly results. Improving knowledge and understanding, especially among politicians and policymakers, of the pervasive role of water resources, infrastructure and services in the economy and employment creation would enhance benefits in the generation of decent jobs and serve the broader objectives of sustainable development.

The allocation and provision of water resources and services to different economic sectors will largely dictate the growth potential for high-quality jobs at the country and local levels. Therefore, focusing on the economic sectors that are most relevant for environmental sustainability and job creation will prove to be the ultimate key to success. Reaching these targets involves coherence and a shared vision to ensure that incentives are aligned for the benefit of all stakeholders (UNESCO, 2016).

Report 8 - Wastewater: the untapped resource (2017)

Human activities that use water tend to produce wastewater, so this report's focus on a largely unused aspect of water is influential. As the overall water demand grows, the quantity of wastewater produced and its overall pollution load continuously increase worldwide. Moreover, in all but the most highly developed countries, most wastewater is discharged straight into the environment without satisfactory treatment, with destructive impacts on economic productivity, ecosystems, and human health. If these trends persist, water quality will continue to degrade, especially in dry, water-poor countries, further jeopardizing ecosystems and human health, contributing to water scarcity and restraining sustainable economic development.

After it has been used, water is often seen as a burden or a nuisance. The immediate effects, including the degradation of aquatic ecosystems and waterborne disease from polluted freshwater, have far-reaching impacts on the well-being of peoples' and communities' livelihoods. This emphasis on human health has been found in previous reports, but this report especially highlights its linkages directly to the environment. Continued failure to address wastewater as a significant social and environmental problem would compromise other efforts toward achieving the 2030 Agenda for Sustainable Development. In ever-growing demand, wastewater is increasingly recognized as a reliable alternative water source. Wastewater can no longer be seen as a problem in need of a solution but instead is part of the solution to water challenges that societies are facing today. Wastewater can also be a cost-efficient and sustainable source of energy, nutrients and other valuable by-products. The potential benefits of extracting such resources from wastewater go well beyond human and environmental health, with implications for climate change mitigation and food and energy security.

A critical path forward includes involving citizens in decision-making at all levels to promote engagement and ownership. This path includes decisions about what types of sanitation facilities are desirable and acceptable and how they can be securely funded and maintained over the long term. Improved wastewater treatment, the recovery of valuable by-products, and increased water reuse sustain the transition to a circular economy by enabling reduced water withdrawals and the loss of resources (UNESCO, 2017).

Report 9 - Nature-based solutions for water (2018)

Nature-based solutions (NBS) are inspired and sustained by nature and use or simulate natural processes to improve water management. An NBS can involve conserving or rehabilitating natural ecosystems and enhancing or creating natural processes in modified or artificial ecosystems. Attention to NBS has significantly increased, as evidenced through the mainstreaming of NBS into an expansive range of policy advancements, including in food security, agriculture, water resources, biodiversity, environment, disaster risk reduction, and climate change. This trend illustrates a growing convergence of interests around recognizing the need for common objectives and identifying mutually supporting actions, as illustrated in the 2030 Agenda for Sustainable Development by acknowledging the interdependency of its various goals and targets.

Despite a long history of and growing experience with the application of NBS, there are still many cases where water resources policy and management ignore NBS options, even where they are apparent and proven to be efficient. Challenges to upscaling NBS to reach its full potential are generic across the sectors at global, region-specific or place-based scales. In addition, there remains historical inertia against NBS due to the continuing overwhelming

dominance of grey (built) infrastructure solutions in the current instruments of the Member States, from public policy to building codes and regulations. This dominance can also exist in civil engineering, market-based economic instruments, the expertise of service providers, and consequently, in the minds of policymakers and the general public. These factors collectively result in NBS often perceived as less efficient or riskier than grey systems.

NBS often requires cooperation among multiple institutions and stakeholders, which can be challenging to achieve. Current institutional arrangements did not evolve with cooperation on NBS in mind. As a result, there is a lack of awareness, communication and knowledge at all levels, from communities to regional planners and national policymakers, of what NBS can genuinely offer. The challenge can be compounded by a lack of experience integrating green and grey infrastructure at scale and an overall lack of capacity to implement NBS. NBS can require much greater cross-sectoral and institutional collaboration than grey-infrastructure approaches. However, this can also open opportunities to bring those groups together under a common approach or agenda.

WWDRs have consistently argued for transformational change in managing water, as this theme is emphasized in all reports to date. The inadequate recognition of ecosystems' roles in water management reinforces the need for transformational change, and increased uptake of NBS provides a means to achieve it. This transformational change needs to rapidly accelerate and translate into fully operationalized policy with improved action. The objective needs to be to minimize costs and risks and maximize system returns and robustness while providing optimal 'fit-for-use' performance. The role of policy should be to enable the right decisions. Adopting NBS is necessary for improving water management outcomes and achieving water security and

critical for ensuring the delivery of co-benefits essential to all aspects of sustainable development (UNESCO, 2018).

Report 10 - Leaving no one Behind (2019)

Advancements in water resources management and access to sanitation services and water supply are critical to managing diverse social and economic inequities so that "no one is left behind" when experiencing water's multiple benefits and opportunities. There are multiple prohibitive grounds for discrimination regarding who is left behind, but poverty usually features prominently. Women and girls systematically experience prejudice and discrimination in accessing their human rights to safe water in many parts of the world. Ethnic and other minorities, including indigenous peoples, migrants and refugees, and people of particular ancestries (e.g. castes), often experience discrimination, as religious and linguistic minorities do. The potential responses to address the lack of drinking water supply and sanitation services to groups in disadvantaged situations can vary significantly from one place to another.

Insufficient funding and a lack of effective financing mechanisms have created barriers to achieving the WASH (Water, Sanitation, and Hygiene) targets for disadvantaged and marginalized groups. A specific portion of the investment gap could be overcome through improved system efficiency, which effectively uses available finances and significantly decreases general costs. However, equitable tariff structures and targeted subsidies for vulnerable groups will remain a crucial source of funding and cost recovery. In addition, official development assistance (ODA) is beneficial in mobilizing investments from other sources, such as commercial and blended finance, including from the private sector. However, it will be incumbent upon

national governments to dramatically increase the public funding made available to expand WASH services.

Unless exclusion and inequality are explicitly and responsively addressed in both policy and practice, water interventions will continue to fail to reach those most in need and likely to benefit most. Improving water resources management and providing access to safe and affordable drinking water and sanitation for all is critical to eradicating poverty, building peaceful and prosperous societies, and ensuring that "no one is left behind" as the world advances towards achieving sustainable development (United Nations, 2019).

Report 11 - Water and Climate Change (2020)

Climate change will affect water quality, quantity, and availability for basic human needs, endangering human rights to water and sanitation for people worldwide. Furthermore, the hydrological changes generated by climate change will add challenges to the sustainable management of water, which is already under extreme pressure in many world regions. In addition, food security, human health, urban and rural settlements, energy production, industrial development, economic growth, and ecosystems are water-dependent and thus vulnerable to climate change. Therefore, climate change adaptation and mitigation through water management is critical to sustainable development and essential to achieving the 2030 Agenda for Sustainable Development.

Adaptation and mitigation efforts in one sector can directly influence its water demand, expanding or decreasing local water availability and quality for other sectors. In cases of decreased water demand, these actions can lead to numerous benefits across boundaries and sectors, whereas increased water demand can result in the need for trade-offs over the

distribution of limited supplies. More significant public participation in managing climate risk is recommended as a way to build adaptive capabilities at multiple levels, bypass institutional traps and prioritize risk reduction for socially vulnerable communities. Further, data and scientific information need to be made available at the local level and included as knowledge in local multi-stakeholder decision processes.

Both water and climate management need mechanisms for coordination and oversight. However, sectoral fragmentation and bureaucratic competition may present severe challenges for integration across scales. This challenge calls: for a) greater public participation to discuss and manage climate risk, b) building adaptive capacities at multiple levels, and c) prioritizing risk reduction for socially vulnerable groups. Given the cross-cutting nature of water and climate through different economic sectors and across society, trade-offs and conflicting interests need to be addressed at all levels to negotiate integrated and coordinated solutions. This requires an equitable, participatory, multi-stakeholder approach to water governance in the context of climate change. There are increasing opportunities to integrate adaptation and mitigation planning into water investments more genuinely and systematically, rendering these investments and associated activities more appealing to climate financiers.

Combining climate change adaptation and mitigation through water is a win-win-win proposal. First, it benefits water resources management and improves the provision of water supply and sanitation services. Second, it directly contributes to combating climate change's causes and impacts, including disaster risk reduction. Third, it contributes, directly and indirectly, to meet several of the Sustainable Development Goals (hunger, poverty, health, energy, industry, and climate action). This report proposes a series of practical responses to

support collective objectives regarding policy, financing, and action on the ground (United Nations, 2020).

Report 12 - Valuing Water (2021)

This report highlights that the current status of water resources highlights the need for improved water resources management. This report emphasizes that recognizing, measuring and expressing water's worth, and incorporating it into decision-making, are fundamental to achieving sustainable and equitable water resources management and the SDGs of the United Nations' 2030 Agenda for Sustainable Development. Those who control how water is valued control how it is used. Values are a central aspect of power and equity in water resources governance. The failure to fully value water in all its different uses is considered a root cause, or a symptom, of the political neglect of water and its mismanagement. All too often, the value of water, or its full suite of multiple values, is not prominent in decision-making.

This report groups methodologies and approaches to the valuation of water into five complementary philosophies: "valuing water sources, in situ water resources and ecosystems; valuing water infrastructure for water storage, use, reuse or supply augmentation; valuing water services, mainly drinking water, sanitation and related human health aspects; valuing water as an input to production and socio-economic activity, such as food and agriculture, energy and industry, business and employment; and other socio-cultural values of water, including recreational, cultural and spiritual attributes" (2021). Prospects support these to harmonize multiple water values via more holistic and integrated approaches to financing, governance, and methods to address research, knowledge, and capacity needs.

There are multiple perspectives on what "value" means explicitly to various user groups and stakeholders. Differences in the way water resources are valued occur between stakeholder groups and are widespread within them. Conflicting viewpoints on water value, the best ways to consider it, and possessing limited knowledge of water all present a challenging landscape for rapid improvements in valuing water. Diverse water values need to be harmonized, and the trade-offs between them are settled and contained in inclusive and systematic planning and decision-making processes. Therefore, the way forward will be to develop other common approaches to valuation where feasible, prioritize enhanced approaches to compare, contrast and merge different values, and incorporate fair and equitable conclusions into improved policy and planning. It is incredibly challenging to determine water's "true" value. Accordingly, the overall importance of water is not appropriately reflected in political attention and financial investment in many parts of the world. This lack of acknowledgement leads to inequalities in access to water resources and water-related services and unsustainable and inefficient use and degradation of water supplies, affecting the fulfillment of nearly all the SDGs and fundamental human rights.

Compiling and fully understanding the different approaches and methods for valuing water across multiple dimensions and perspectives will likely remain challenging. Varying approaches can lead to different valuations even within a specific water use sector. Trying to reconcile valuations across sectors would generally increase the overall difficulty level, as would taking into account some of the more intangible values attributed to water in different socio-cultural contexts. While there may be the capacity to lower complexities and formalize measurements in some circumstances, the reality is the need for better means to identify, support and accommodate different values (United Nations, 2021).

Report 13 - Groundwater: Making the Invisible Visible (2022)

This report shines a spotlight on groundwater, emphasizing the specific roles, challenges, and opportunities in groundwater resources development, management, and governance worldwide. In addition, the report aims to provide an explicit understanding of the role that groundwater plays in everyday life, its interactions with people, and the possibilities for optimizing its use to ensure the long-term sustainability of water.

This report emphasizes that the vast potential of groundwater and the need to manage it sustainably need to be of significant priority. Groundwater, accounting for approximately 99% of all liquid fresh water on Earth, has the potential to provide tremendous environmental, economic, and social opportunities and benefits. Groundwater presently provides half of the water withdrawn for domestic use worldwide, including drinking water for the vast majority of the global rural population who do not have their water delivered via private or public supply systems. Nevertheless, groundwater is often poorly understood, undervalued, mismanaged and abused.

This report highlights that groundwater is paramount to the fight against water security, food, poverty, the production of decent jobs, socio-economic development, and the resilience of societies and economies to climate change. Moreover, reliance on groundwater will increase mainly due to growing water demand by all sectors combined with increasing variation in rainfall patterns. Therefore, countries must develop an adequate and practical framework for groundwater governance. This requires that governments take leadership and accept responsibility to establish and sustain a fully operational governance structure, including the institutional capacity; laws, regulations and enforcement; knowledge base; policy and planning; financing and stakeholder participation. It is also incumbent for countries to ensure that their

policies and plans are fully enforced through groundwater management). Finally, governments must assume their role as resource custodians; given the common-good aspects of groundwater, governments have the responsibility to ensure that access to and profit from groundwater is delivered equitably and sustainably (United Nations, 2022).

4. Contextualizing Sustainable Development

4.1. Defining Sustainability: From the Millenium Development Goals to the Sustainable Development Goals

The first modern idea of sustainable development was framed in the 1987 report "Our Common Future," stating that: "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 16). Since then, several other definitions have been proposed and debated, and countless papers, articles and books have been published, each seeking to broaden understanding of the concept and the types of actions sustainable development implies. To be combatted within sustainable development, the water crisis needs to fit into an overall scenario of problem-solving and conflict resolution.

In September 2000, to acknowledge growing inequality and achieve poverty eradication, the United Nations Millennium Summit was held at the United Nations Headquarters in New York. The representatives of 189 countries adopted the "United Nations Millennium Declaration," which identified the Millennium Development Goals (MDGs) with the development and elimination of extreme poverty as the focus, including eight key areas and 21 operational targets (United Nations, 2008). These goals became an internationally recognized framework for guiding national development and cooperation over the next 15 years and guided

the development of humanity in the new century (Shi et al., 2019; United Nations, 2008). In recognizing the need to speed up poverty alleviation and socio-economic development, eight MDGs with specific and quantifiable targets were set by the United Nations (UN) General Assembly Millennium Meeting in 2000 to be achieved by 2015 from a 1990 baseline (United Nations, 2008). Additional goals related to sanitation and the inclusion of IWRM in national plans were established during the World Summit on Sustainable Development in 2002 in Johannesburg (United Nations, 2008). As pointed out by the Commission for Sustainable Development (CSD) in 2002: "Poverty eradication, changing unsustainable patterns of production and consumption and protecting and managing the natural resource base of economic and social development are overarching objectives of, and essential requirements for, sustainable development" (United Nations Division for Sustainable Development, 2002, p. 1).

By setting these goals, the UN system committed to taking a leading role in finding ways to share the world's resources more equitably while offering more protection from natural hazards. Setting targets establishes concrete, quantifiable objectives while focusing attention on the issues at hand and providing incentives to take action and mobilize the resources necessary for reaching the goals (UNESCO, 2009). In September 2015, more than 150 heads of state and government participated in the United Nations Sustainable Development Summit at the United Nations headquarters in New York. The summit assessed the implementation of MDGs and adopted "Transforming our World — the 2030 Agenda for Sustainable Development". The agenda set out the Sustainable Development Goals (SDGs), covering 17 focus areas and 169 specific targets. Building on the experience of the MDGs, the 2030 Agenda for Sustainable Development has a more comprehensive goal for water, going beyond the issues of water supply and sanitation. Most notable to water issues, Goal 6 aims to ensure the availability and

sustainable management of water and sanitation for all and Goal 8 addresses the promotion of sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Water- and labour-related concerns are also significant to several other SDG targets, notably Goal 1 on poverty and Goal 3 on health. Besides solely pursuing economic growth, the SDGs put forward the concept of inclusive growth and sustainable development featuring coordinated economic, social, and environmental development (Shi et al., 2019).

4.2. Sustainable Development as a Conceptual Framework

The concept of development has been associated with various definitions, interpretations and theories from diverse scholars over time. One of the earlier modern conceptualizations of development defines it as "an evolutionary process in which the human capacity increases in initiating new structures, coping with problems, adapting to continuous change, and striving purposefully and creatively to attain new goals" (Peet & Hartwick, 1999). According to Reyes, development is a social condition within a nation where the needs of its population are fulfilled by the reasonable and sustainable use of natural resources (2001). Todaro and Smith also define development as a multi-dimensional process that involves significant changes in social structures, attitudes, institutions, and economic growth, reduction of inequality, and eradication of absolute poverty (2006).

In its most literal definition, sustainability means a capacity to maintain some entity, outcome or process over time (Basiago, 1999). However, in development literature, many academics and practitioners apply the concept of sustainability to represent enhancing and upholding a beneficial and healthy social, economic, and ecological system for human development (Gray & Milne, 2013; Thomas, 2015; Tjarve & Zemīte, 2016). Further, Stoddart

(2011) defines sustainability as the efficient and equitable distribution of resources intra-generationally and inter-generationally with socio-economic activities within a finite ecosystem. Contrastly, some scholars view sustainability as dynamic in its interactions between the population and the carrying capacity; the population evolves to its full potential without producing irreversible adverse effects on the environment's carrying capacity (Ben-Eli, 2015). From this perspective, the idea that sustainability focuses on human activities and their ability to satisfy human needs and wants without depleting or exhausting the productive resources at their disposal emerges (Thomas, 2015). Accordingly, this evokes ideas on how people should conduct their social and economic lives drawing on the available ecological resources for human development.

Structurally, sustainable development can be seen as a phrase consisting of "sustainable" and "development." Subsequently, sustainable development is based on the concept of development, the concept of needs, and the concept of future generations (Klarin, 2018). Modern conceptualizations of sustainable development are derived from the "triple bottom line" approach, as coined by Elkington, which implies the balance between three pillars of sustainability: a) environmental sustainability, which is focused on maintaining the quality of the environment and is necessary for conducting the economic activities and quality of life of people; b) social sustainability which seeks to ensure human rights and equality, preservation of cultural identity, respect for cultural diversity, race and religion; c) and economic sustainability, necessary to maintain the natural, social and human capital required for income and living standards (Elkington, 1998; Goel, 2010; Miller, 2020). Therefore, this paper maintains that complete sustainable development is achieved by balancing the three pillars of the triple bottom line.

5. Analysis and Recommendations

A growing need for consensus in water policy and its recommendations is increasingly recognized within water policy and governance scholarship. However, the types of recommendations and changes being considered or undertaken and the conditions that enable or hinder those changes undergo constant transformations. Understanding how to change policies, what information is being advised to change these policies, and the subsequent effect on practice and implementation is an important field of inquiry as governments, civil society, and industry address growing water quantity and quality concerns. Based on the investigation of the consolidated, qualitative information presented, an analysis of the systematic review of the thirteen WWDRs water policy reform literature within the context of sustainable development is offered to define and offer recommendations for policymakers.

5.1. A State of Uncertainty: The Future of Water

The distribution of freshwater supplies can be erratic, with different countries and regions receiving different quantities of water over any given year as precipitation delivers water unevenly over the planet from one year to the next. Therefore, understanding water's spatial and temporal distribution and movement are crucial for efficient water resources management, which must take this variability into account. In addition, the hydrological cycle is driven by a complex, interrelated ensemble of dynamic natural processes, which scientists refer to as 'climate forcings' (UNESCO, 2009). The Earth's tilt and rotation around the Sun are the primary drivers of seasonal precipitation and water availability variations. However, atmospheric and oceanic circulation patterns and interactions are equally important drivers of weather, climate and the hydrological cycle (UNESCO, 2009).

The state of water resources is constantly changing, resulting from the natural variability of the Earth's climate system and the anthropogenic alteration of that system and the land surface through which the hydrological cycle is modulated. Specific changes to water resources and the hydrological cycle include modifying runoff through storage and inter-basin transfers, increased flood potential due to climate change, increased water losses due to temperature increase, changes in the seasonality of flows, changes in flows from glaciers due to their retreat, decreasing snow and permafrost, and groundwater depletion. The state of water resources is also influenced by withdrawals to meet socio-economic demands and control measures undertaken to protect human settlements in flood plains and drought-prone regions. These changes and interactions create a new level of uncertainty associated with the use and availability of water resources and existing uncertainties related to the Earth's climate system and hydrological cycle (United Nations, 2020).

This trend is emphasized in many of the reports (reports 4 and onwards). However, what has also been emphasized is that although there is no certainty for what is to come in the planet's hydrologic future, this does not mean that finite action should not be prioritized in the water sector. Therefore, while it is no longer possible to assume that the future hydrological record will follow the course of the historical record, policymakers and stakeholders have the responsibility to take immediate, meaningful action to combat the water crisis.

5.2. Water for All: Equity and Inclusivity through Empowerment

As emphasized in all reports, the poor are the worst affected by the impacts of the water crisis; they live in marginal areas, those afflicted by floods, pollution and scarce water supplies, and the loss of valuable natural sources of food. The extremely poor, the elderly, women and

children are the worst impacted. As more people live on limited available land, there is an increasingly substantial risk of flooding or drought (United Nations, 2019). Therefore, a top priority that has been identified is ensuring adaptable management structures with an equitable allocation of benefits and a comprehensive and context-specific conflict resolution instrument.

Equity and inclusion can best be realized through empowerment. Empowering all actors can elevate sustainability and secure equity and inclusiveness. Unfortunately, current policies and actions for water can often privilege elite actors and their value systems, which further impedes their effectiveness and legitimacy. Empowerment strategies that civil society groups and governments can implement include a redistribution of power and rights so that all can assume responsibility and control over their lives and futures (United Nations, 2019, 2021, 2022). Further, existing approaches such as co-management and community-based natural resource management can equalize the costs and benefits of conservation and reconcile different interests and values (provided that they recognize and address trade-offs and uneven power relations). Inclusivity in practices and decisions surrounding water, thus, can promote informed decisions, facilitate more vital interaction between communities and conservation activities, and foster equity among water users.

5.3. The Price of Water: Opportunities for Financing and Economic Growth

Projections support that water scarcity, as it worsens, is likely to limit further prospects for creating jobs and economic growth. Unless there is adequate infrastructure to store and manage water, as in many developed countries, water availability may continue to vary significantly, leaving countries ‘water scarce’ for vast periods. Further, water availability is highly dependent on water quality. The cost of the necessary treatment for poor water quality

may be a challenging and prohibitive factor for accessing water resources, hence contributing to the burden of economic water scarcity. Industrial and economic growth is highly desirable for countries adopting poverty-reduction policies. Thus, the WWDRs emphasize that economic growth is necessary to diversify economies, create jobs, and add value to industrial products and raw materials (UNESCO, 2003, 2016, 2017). Therefore, to promote economic growth, poverty reduction, and environmental sustainability, consideration must be given to methods that mitigate job loss or displacement and maximize job creation that may result from the implementation of an integrated approach to water management.

The reports highlight that water investments are necessary for economic growth, jobs, and reducing inequalities. Conversely, failure to invest in water management represents missed opportunities and may also impede economic growth and job creation. Wise investments in the financing, operations, and maintenance of infrastructure facilitate the structural changes necessary to foster advances in many productive areas of the economy. In addition, better investments often mean more income opportunities to enhance expenditure on health and education, reinforcing a self-sustained dynamic of economic development.

However, economic growth is not a guarantee for more comprehensive social progress. There is a widening gap between rich and poor in most countries and between those who can and cannot exploit new opportunities (Reardon & Bischoff, 2011). Subsequently, while “Our Common Future” adeptly defines what sustainable development is, it failed to analyze which principles of the market-based economy needed to be changed, and as a result, few countries had explicitly adopted it as part of the requirements for their economic growth plans. Therefore, to translate sustainable development into a “doable” development initiative within the current international development context, it must first be established that our global system, at an

economic, social, and environmental level, is interconnected, with policies reflecting this. Thus, considerations for economic growth must prioritize equity and inclusion in tandem.

Further, recognizing the centrality of water for sustainable development is crucial in developing a green economy. In a green economy, the role of water in maintaining ecosystem services and water supply would be acknowledged, appreciated and financed (UNESCO, 2016). Managing water sustainably supports the overall objectives of a green economy or a green growth pathway and meets critical social imperatives of poverty alleviation, food and energy security, and health and dignity (UNESCO, 2016). Direct benefits to society can be gained by increasing investment in water supply and sanitation, including investment in wastewater treatment, watershed protection and the conservation of ecosystems critical for water. New approaches, such as planning for adaptation to uncertain futures, adopting green technologies, improving the efficiency of water provision, and developing alternative water sources and forms of management, will play an essential role in enabling a cross-sectoral transition to a green economy. The green economy agenda has severe implications for investments in water infrastructure. It increases pressure for more efficient use of resources and reduces waste and greenhouse gas emissions, shifting investment and consumption patterns towards alternatives that deplete less natural resources (UNESCO, 2016, 2018).

Decision-makers have a range of options and tools for improving the sustainability of economic and financial systems. Achieving a sustainable economy involves fundamental reforms to economic and financial systems and tackling poverty and inequality as vital parts of sustainability. Governments could reform subsidies and taxes to support nature and its contributions to people, removing perverse incentives, and instead promoting diverse instruments such as payments linked to social and environmental metrics, as appropriate (United Nations

2010). Trade agreements and derivatives markets could be reformed to promote equity and prevent deterioration of nature, although there are uncertainties associated with implementation. To address overconsumption, voluntary measures can be more effective when combined with additional incentives and regulations, including the promotion of circular economies and sustainable production models (UNESCO, 2017). Although market-based policy instruments such as payments for ecosystem services, voluntary certification and biodiversity offsetting have increased in use, their effectiveness is mixed and often contested; thus, they should be designed and applied carefully to avoid perverse effects in context. Alternative models and measures of economic welfare (such as inclusive wealth accounting, natural capital accounting and degrowth models) are increasingly considered possible approaches to balancing economic growth and conservation of nature and its contributions and recognizing trade-offs, value pluralism and long-term goals (UNESCO 2017, 2018).

5.4. Collaborative Management In and Outside the Water Sector

The WWDR reports highlight that water increasingly acts as the catalyst for cooperation and, thus, not only divides but also unites peoples and societies. Consequently, making progress requires returning to the original actors in the decision-making process for responses that take these limitations into account. Decision-making is improved by consulting with stakeholders and ensuring accountability in planning, implementation and management, building trust within the water and related sectors and resisting mismanagement and corruption (UNESCO 2006, 2009). In addition, strengthening organization structures and improving water supply utilities' operating efficiency will help improve service.

In particular, members of the water community can help by informing and guiding decision-making through to regulatory authorities on how to use and manage the resource sustainably to optimize and share its many benefits and minimize conflicts. An equitable sharing of the benefits is particularly challenging in transboundary river basins. The movement toward integrated water resources management (IWRM), which promotes the coordinated development and management of water, land and related resources to maximize the results in an equitable and sustainable method, has significantly helped (UNESCO, 2009, 2015). Therefore, water management institutions are most effective when based on collaborative governance. Water management that builds on a joint effort of government, society and technical institutions ensures that measures will be both practical and sustainable. Achieving this will require building trust and social capital to ensure that a problem-solving process occurs.

Policies that benefit one domain can translate to increased risks and detrimental effects in another, generating co-benefits. Managing trade-offs and maximizing co-benefits across multiple sectors has become an urgent and critical issue. Unfortunately, there is often little or no incentive to initiate and pursue coordination or integration of policies across sectoral institutions (UNESCO, 2012, 2017; United Nations, 2022). Policymakers, planners, and practitioners in water and other adjacent and overlapping sectors must identify and overcome the barriers between their domains. The international community can play a vital role here, bringing actors together and catalyzing support for national, subnational and local governments.

Coordinating, harmonizing and sharing data represents the first step in cooperation between neighbouring countries. In addition, scientific cooperation initiatives exist worldwide in technical projects on transboundary aquifers. Such initiatives can have various scopes, some of them aiming at joint scientific assessment, while some others tackle the management of specific

issues. In these cases, regional and international organizations and donors can be critical, mainly when the countries concerned are not on a par regarding capacity, knowledge and information or when confidence is lacking (UNESCO, 2012, 2015).

5.5. Elevating Knowledge

Knowledge is empowering and forms the basis for making informed and progressive decisions, and information communicated in a precise and targeted way can enable people to better understand and reach conclusions about the risk involved. This imparts responsibility and encourages action, which is essential for change. Unfortunately, though, local knowledge often goes unrecorded or even unrecognized. The reports emphasize recognizing the knowledge, innovations and practices, institutions and values of Indigenous and local communities; their inclusion and participation in environmental governance often enhance their quality of life and nature conservation, restoration, and sustainable use (United Nations, 2022).

Policies, strategies and plans should be tailored to the local context, based on the priorities and aspirations of the local population, and informed by sound scientific evidence. Then, based on dialogue and inclusive technical support, plans can be prepared as a cooperative effort between national ministries, provincial and local agencies, and other relevant stakeholders to enable co-ownership of the process and the outcome.

This is especially significant in sharing and developing technologies to understand water information better. Data on water quantity and quality are essential for policymakers, researchers, practitioners and public institutions to develop national and local action plans for environmental protection and wastewater's safe and productive use. However, there is a pervasive lack of data relating to virtually all water quality and management aspects, particularly

in developing countries. As a core component of knowledge-building and sharing, water-related data and information are central to understanding and valuing the resource. Water-related data and information can also be generated by other sources such as earth observations, sensor networks and citizen data, including social media. However, data and information relating to social, economic and environmental demands and uses for water are also needed. Further efforts and investments are required to sustain the supply chain of data and information from its collection, analysis, sharing and application across sectors and scales.

5.6. Alternative Pathways: Nature-Based Solutions

Nature-based Solutions (NBS) are defined as "actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" (UNESCO, 2018). NBS support a circular economy that is regenerative and restorative and promotes greater resource productivity to reduce waste and avoid pollution. NBS also supports the concepts of green growth or the green economy, which promote sustainable natural resource use and harnesses natural processes to underpin economies. The application of NBS for water can generate economic, environmental and social co-benefits, including decent jobs, improved human health and livelihoods, sustainable economic growth, and ecosystem rehabilitation and maintenance.

NBS are presented as the part of the most effective path forward, primarily because they have the potential to be cost-effective for meeting the SDGs, which are crucial for global sustainability. NBS includes safeguarding or retrofitting infrastructures, such as green spaces, water, vegetation, and tree cover in existing urban areas and new settlements. NBS can

contribute to flooding protection, temperature regulation, urban food production, recreation, cleaning of air and water, treating wastewater, providing energy, locally sourced food, and the health benefits of interacting with nature. NBS allow for the identification of win-win outcomes across sectors (UNESCO, 2018).

5.7. Ensuring Accountability and Political Will

As evidenced in all of the reports, attitude and behaviour problems lie at the heart of the water crisis. With numerous ongoing data and research available to better understand the water issue, it is primarily understood what and where many of the problems are faced. Furthermore, as the recommendations mentioned above and all of the reports highlight, decision-makers and policymakers have the knowledge and expertise to begin to tackle them. However, it is inertia at the leadership level and a world population not fully aware of the scale of the problem that has failed to take the needed timely corrective actions and put the concepts, like sustainable development, to work.

Thus, accountability is the key to practical development goals. While the SDGs are respected for their inclusion of goal-specific means of execution, they fail to specify who is supposed to do what to get it accomplished. Therefore, to bolster accountability, various decision-making stakeholders (from governments to the larger international communities) must take more accountability for the problem, clearly specifying their responsibilities. The political will to set and implement water-related policy objectives that mutually support sustainable development and job creation is essential. However, there is frequently a low level of appreciation of the high risks and severe impacts to which neglect of water issues can lead, often with catastrophic and highly costly results. Improving knowledge and understanding, especially

among politicians and policymakers, of the pervasive role of water resources, infrastructure and services in the economy and employment creation would enhance benefits and serve the broader sustainable development objectives.

6. Conclusion and Future Considerations

In 2010, the United Nations General Assembly and the Human Rights Council confirmed that access to safe water and sanitation is a human right (UNDESA, 2014). Therefore, Member States must ensure the progressive implementation of the right to water and sanitation for everybody in their jurisdiction (UNDESA, 2014). In an SDG context, the term sustainable development has become a universal development model and is used and accepted widely from development practitioners to academia to large aid institutions (Di Vaio et al., 2021). Returning to the original definition of sustainable development by the Brundtland Commission, to "ensure that [sustainable development] meets the needs of the present without compromising the ability of future generations to meet their own needs", it is evident from this research that immediate and structural, transformative change must be immediately realized (WCED, 1987).

When the gains from accelerated economic growth promise immediate rewards and environmental mitigation appears primarily to benefit the richer, more developed world, severe consideration and prioritization must be given to ensuring the planet's sustainability (United Nations, 2021). Advocacy for change in the water sector (and beyond) must include transformative and just governance. As highlighted throughout the United Nations World Water Development Reports, transformative change is a societal change in technological, economic, and social structures. It includes both personal and social transformation and includes shifts in values, beliefs, and patterns of social behaviour.

In a post-MDG and sustainable development-focused world, transformative change has emerged in the policy discourse and is increasingly seen as necessary and inevitable for biodiversity-related issues and sustainable development more broadly. This attention is based upon the increasing understanding of the persistence of the complex sustainability challenges we face: despite high ambitions, policy commitments, large-scale investments in innovation and voluntary actions, our economies are still developing along unsustainable pathways pushing ecological boundaries (United Nations 2019, 2020, 2022). To escape this path-dependency, it is increasingly evident that structural, systemic change is necessary, and continuing along current trajectories increases the likelihood of disruptions, shocks and undesired systemic change. (United Nations 2017, 2018). Future research and activity must focus on continuing to realize transformative governance internationally.

This paper has demonstrated that, as seen in the WWDRs, all stakeholders, both in and outside the water sector, are responsible for elevating and bringing attention to the water crisis to make informed decisions on policy and actions. Water has remained too low on the list of political priorities, a situation that cannot be allowed to continue. Lives and livelihoods depend on water for development. After decades of inaction, the problems are immense. Moreover, these problems will worsen if left unattended. While many discourses remain surrounding what needs to be done to achieve actual sustainable development, it is more evident than ever that transformative, equitable, and inclusive governance is required.

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