



© Unsplash/Luca Baggio

Chapter 1: Background

Authors

Ludgarde Coppens, UNEP; Therese El Gemayel, UNEP

Reviewers:

Andrea Hinwood, UNEP; Hally Blanchard, UNEP; Harrison Simotwo, UNEP; Joseph E. Flotemersch, U.S. Environmental Protection Agency; Lorren Haywood, South Africa's Council for Scientific and Industrial Research; Ludgarde Coppens, UNEP; Maria Schade, UN-Water; Riccardo Dallavalle, UNEP/GEMS; Sarantuyaa Zandaryaa, UNESCO; Ting Tang, International Institute for Applied Systems Analysis

1.1 Introduction

1.1.1 A focus on water-related ecosystems

The 2030 Agenda for Sustainable Development and its Sustainable Development Goal (SDG) framework were constructed to interlink economic, environmental and social dimensions. The importance of achieving sustainability relies on understanding the synergies and trade-offs between implemented actions and the actions that may hinder or empower them. The Measuring Progress series explores the relationship between environmental indicators and economic or social indicators. The Measuring Progress: Environment and the SDGs report (2021) mapped those SDG indicators through the standard driver-pressure-state-impact-response (DPSIR) lens and categorized them into state of the environment indicators, state of society indicators and direct drivers indicators, enabling the identification of possible synergies between these SDG indicators by using simple correlation. The simple correlation analysis provided only limited insight into interlinkages which often prove to be complex and ultimately need to be further investigated for impactful policy design. The attempt to establish statistical relationships between some of the key drivers and indicators of the environmental dimension of the SDGs has been inconclusive. The report emphasized the need for data and techniques capable of full multivariate analyses to understand the implications of the full set of the SDG policies and better design new interventions.

In this report, data availability for one thematic area was considered to further explore possible statistical methods for analysing interlinkages. Based on data availability of the 92 environment-related SDG indicators (see Annex A, Table A.1), water indicators, including marine and freshwater, are the most populated of the 92 environment-related SDG indicators. The analysis in this report is carried out for two types of ecosystems: freshwater-related and marine-related. Considering the importance

of disaggregated data and its role in identifying more focused relationships between indicators, analyses are carried out for freshwater-related ecosystems at global, national and basin levels, and for marine-related ecosystems at global and national levels. Going beyond a correlation analysis, the analysis considers additional factors beyond population, GDP and geographical region to improve the understanding of factors that influence interlinkages.

1.1.2 Water-related ecosystems and the SDGs

Water is an essential pillar of sustainable development. Water resources and ecosystems provide food (SDG 2) and energy security (SDG 7), contribute to human and environmental health (SDG 3), and are essential for manufacturing industries (SDG 9). Integrated water resources management can contribute to tackling poverty (SDG 1) and inequality (SDG 10), enhance economic development (SDG 8), develop urban settings (SDG 11) and support the protection of ecosystem services (SDGs 6 for freshwater, 14 for marine and 15 for terrestrial). Yet, the sustainability of water-related ecosystems is threatened by climate change (SDG 13), excessive pollution (SDGs 6 and 14) and overexploitation. Hence the need to reduce deteriorated water quality and water scarcity and avoid water-related conflicts (SDG 16) as well as regulate consumption and production (SDG 12) for future generations. Additionally, given the interlinkages of the water sector with all aspects of national economies, policy coherence is crucial to ensure synergy and avoid trade-offs between and among economical activities.

There is no doubt that the access to and quality of water resources impact people differently (SDG 5). As primary water collectors, women and girls spend ample time finding and collecting water instead of studying (SDG 4) or engaging in employment (SDG 8). Their role also increases their risk of exposure to contaminated water, which carries a direct impact on their health (SDG 3). Raising awareness on the importance of water access and healthy water-



and marine-related ecosystems by citizens can positively impact these ecosystems and encourage partnerships to responsibly manage such resources and respond to the water crisis with improved skills and knowledge (SDG 17).

1.1.3 The importance of water-related ecosystems to the natural environment

Freshwater plays a fundamental role in support of the environment, society and the economy. Ecosystems such as wetlands, rivers, aquifers and lakes are indispensable for life on Earth. Freshwater-related ecosystems are also vital for directly ensuring a range of benefits and services such as drinking water and recreation, agriculture and energy, habitats for aquatic life forms and natural solutions for water purification and climate resilience. Freshwater-related ecosystems can be defined as “a dynamic complex of plant, animal, and microorganism communities and the non-living environment dominated by the presence of flowing or still water, interacting as a functional unit.” (Dickens and McCartney 2019; MEA 2005). SDG target 6.6 aims for the protection and restoration of water-related ecosystems and includes indicator 6.6.1 which is framed around the monitoring of different types of freshwater-related ecosystems including lakes, rivers, wetlands, groundwater and artificial waterbodies such as reservoirs. In the indicator methodology, reservoirs are also included as part of freshwater-related ecosystems. Although reservoirs are not traditional ecosystems requiring protection and restoration, they contain significant freshwater in many countries and were therefore included (United Nations Statistics Division [UNSD] 2022a).

Freshwater and marine-related ecosystems are linked through the Earth’s hydrologic cycle. Marine-related ecosystems are aquatic environments that contain high levels of dissolved salt and range from coastal shores to dark seabeds. Open ocean and coastal marine-related ecosystems are characterized by different physical and biological attributes (National Geographic 2022).

From the deep sea to coastal reefs, from mudflats to seagrass meadows, ocean and marine systems provide essential services to humans, including carbon capture for climate mitigation, climate regulation, oxygen provision, renewable energy, protection from storm surges and serving as a significant economic and dietary source for people worldwide. As the dedicated goal for marine-related indicators, SDG 14 includes target 14.1 on preventing and significantly reducing marine pollution, target 14.3 on minimizing and addressing the impacts of ocean acidification and target 14.4 on halting overfishing, illegal, unreported and unregulated fishing and destructive fishing practices. These three targets comprise the indicators on the state of marine-related ecosystems.

1.2 Threats to water-related ecosystems

Water sustainability reflects the need to make water available for current and future generations for consumption, agriculture and other economic activities, while preserving the health of ecosystems. Water faces major threats to its quality, availability and sustainability. Some threats may be more impactful than others, but all threats jeopardize the sustainability of water resources.

The impact of climate change and variability on water resources is becoming more visible. Changes in precipitation, ambient and water temperatures (Woolway et al. 2020), extreme weather events causing floods, droughts and storms (Crook et al. 2015) as well as changes in water quality through increased acidification of the oceans resulting from increased carbon dioxide absorption (United Nations Environment Programme [UNEP] 2017) are all exacerbated by climate change. Sea level rise is causing groundwater deterioration through saline intrusion in coastal areas (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2020), which is further impacted by the change in land use causing surface run-offs to the sea and altering the natural

replenishment of groundwater resources (United Nations [UN] 2022a). Additionally, the introduction of invasive species in new water environments is having devastating consequences on native biota, both in marine and riverine habitats (Crook et al. 2015).

The most significant threat originating from socioeconomic and political factors is pollution. The UNEP has designated pollution as one of the three planetary crises due to its extent and impact on the environment and human health and well-being. Its impact on aquatic ecosystems is tremendous, resulting from the disposal of untreated wastewater and industrial effluents in water streams and the masses of plastic pollution in water streams and oceans, chemicals and waste disposal. In addition to urbanization, agricultural practices and deforestation, pollution is pushing ecosystems to their thresholds, where they can no longer restore and regulate themselves, thus expediting the degradation of water quality and availability (WWAP 2015). Human overexploitation of aquatic resources is accelerating the decline in their availability and quality. This is exacerbated by the increase in worldwide water stress¹ (1.6 per cent increase between 2015 and 2019, with 72 per cent attributed to the agricultural sector (UNSD 2022b)) and overfishing in oceans, seas, lakes and rivers (decline in the proportion of fish stocks within a biologically sustainable level from 73 per cent in 2000 to 65 per cent in 2019 (Food and Agriculture Organisation [FAO] 2022a)).

Ineffective or absent water governance is one of the most significant management threats to aquatic resources. Governance arrangements sit at the heart of integrated water resources management, more specifically the effective coordination of development objectives focusing on policy and regulatory frameworks, institutional responsibilities, and financing and management (UNEP 2021a). Principle 3 of the Organisation for Economic Co-operation and Development's (OECD's) Principles on

Water Governance promotes policy coherence through effective cross-sectoral coordination, focusing on policies between water and the environment, health, energy, agriculture, industry, spatial planning and land use. The overall principles intend to contribute to tangible and outcome-oriented public policies, which are based on three mutually reinforcing and complementary dimensions of water governance: effectiveness, efficiency, and trust and engagement (Organisation for Economic Co-operation and Development [OECD] 2015). Water resources are being significantly pressured by governance failures and unsustainable development pathways (WWAP 2015). The lack of a full representation of the values of water is a primary reason for limited successes in attaining integrated water resources management and failures in water governance (UN 2021a). Part of the failure of efficient water governance lies in the ageing water infrastructure as well as the inadequate funding for its operation and maintenance (UNESCO and UN-Water 2020). For instance, it was estimated that US\$ 1.7 trillion is required by 2030 to achieve the Water, Sanitation and Hygiene for All (WASH) component of SDG 6, including capital investment, operating and maintenance costs (UNESCO and UN-Water 2020).

Several reasons explain why these threats – whether environmental, socioeconomic or management-related – have not been addressed yet. Although the freshwater sector is the environmental sector with the most data available to date, targeted and detailed information still lacks. For instance, the average United Nations Member State publishes data on about two thirds of the SDG 6 indicators, while 24 Member States publish less than half (UN-Water 2021). There is significant gap in disaggregated data, whether subnational, gender or basin levels, which hinders decision-making and the development of targeted policies. Although closing the data gap is essential, a persistent lack of monitoring infrastructure and data management systems



hamper closing the data gap (UN-Water 2021). In a similar vein, there is a lack of data, information and knowledge to develop a comprehensive understanding of the oceans, their components and their interactions (United Nations Educational, Scientific and Cultural Organization - Intergovernmental Oceanographic Commission [UNESCO-IOC] 2021).

Developing targeted policies to adequately manage water resources is complex and requires cross-institutional cooperation to account for all stakeholders across all levels. For instance, the role of groundwater resources is not often fully recognized due to the complexity and diversity of hydrogeological processes, which hinders its full incorporation in policymaking (UN 2022a). In addition, another layer of complexity relates to climate change adaptation and mitigation actions, where complex interactions between energy, land, water and biodiversity need to be considered to improve the management of water resources (UNESCO and UN-Water 2020).

Poverty, social inequality and water resources are connected in a vicious cycle. Poverty and social inequality exacerbate poor water quality through the release of wastewater effluents due to unavailability of wastewater collection networks, the disposal of waste in open dumps next to water streams, which pollutes surrounding water resources, and through using basic techniques to extract groundwater, which renders it unclean and unsafe for

human use. The unsafe and unclean sources of water available for use and the unaffordable prices of water from private or informal vendors also add to this cycle. This drives people to use unclean water sources or save on daily water use, which in both scenarios impacts their health, in turn causing educational or employment opportunities losses (WWAP 2015).

1.3 Presentation of report sections and what is covered under each section

The report is divided into seven chapters. The first introduces water-related ecosystems, their link to the SDG framework and the main issues threatening their sustainability. Chapter 2 provides the analysis of progress on global and regional² levels of the 92 environment-related indicators. The end of chapter 2 provides the link to the statistical methodology by introducing the categories of socioeconomic and environmental factors, while chapter 3 presents the methodological summary of the statistical analysis. The results of the statistical analysis are interpreted in chapter 4 with a focus on freshwater-related ecosystems, and chapter 5 concentrates on marine-related ecosystems. Despite suboptimal data availability, chapter 6 identifies data sources, current and potential usage to report on SDG indicators. Chapter 7 presents the main conclusions and recommendations, including policy, data and indicators recommendations.

2 The regional analysis is based on the SDG regional groupings, except for Northern America and Europe, which have been separated. A full description of the SDG regions, including their respective countries, is included in Annex B.