2. General water policy

This chapter explores how Adherents adjust water policies to local conditions. It provides examples of long-term water management planning, including plans' review and updates as well as stakeholder consultation. It also illustrates how Adherents manage the interlinkages between surface and groundwater. It describes efforts to manage water quantity and quality jointly as well as to address practices, trends and developments that affect water availability, demand and risks. Finally, the chapter covers the development and diffusion of innovation.

The first section of the Recommendation sets out a set of generic and cross-cutting recommendations for Adherents to set up and implement water policies:

2.1. Adjust water policies to local conditions

The first part of the Recommendation asks Adherents to set up and implement water policies that "are adjusted to local conditions". This requires acknowledging the peculiarities of geographical, cultural, political systems at appropriate scales. This can be done in two ways, which are outlined below. The issue is revisited in chapter 6, on water governance.

The first way is to adjust water management to local conditions. In that context, vertical co-ordination between the different scales is key. As regards scale, many countries ensure institutions are set up in line with that focus. For example, **France** established six water basin agencies in 1964 on its mainland, to increase the understanding of local concerns for water management and to ensure administrative boundaries follow a hydrographical logic. In the **European Union**, the Water Framework Directive encouraged the integration and centralisation of all water management activities at the river basin level (European Union, 2000[1]). Other countries consider catchments as the appropriate geographical scale for water management (Austria, Germany). This decentralisation concept was implemented via the requirement to develop cross regional and cross border river basin management plans. Chapter 6 (on governance) provides illustrations on how to achieve vertical co-ordination.

The second way is to adjust policy instruments (e.g. abstraction charges) to local conditions. For instance, abstraction charges are often differentiated by hydrographic zones, so as to send an adequate signal on the value of water and to consider equity. In **Canada,** for instance, the abstraction charges are defined at the provincial level (see further details in chapter 8). Similarly, charges may also have to be differentiated geographically to adequately address different environmental externalities (OECD, 2017[2]). In **Portugal**, the Water Resources Tax in place since 2008 is differentiated by sector and region and is updated regularly. In **Europe**, the Urban Wastewater Treatment Directive set distinctively stringent standards for wastewater treatment in sensitive areas, e.g. where the dilution capacity is low or where water is used for recreational purposes (European Union, 1991[3]).

Local conditions fluctuate over time. In **Australia,** tradable entitlements define access rights to an ongoing share of water within a consumptive pool and water allocation changes according to seasonal water availability in the consumptive pool (allocations) (OECD, 2019[4]) (see chapter 4 for further details).

2.2. Long-term water management planning

The second part of the Recommendation on water policies asks Adherents to set up and implement water policies that "are based on long term water management plans, preferably at river basin, or aquifer level, and, as appropriate, in a transboundary framework. Such plans should foster conjunctive management of surface and groundwater, and be regularly reviewed and updated". The 2019 OECD Implementation Survey shows that almost all 27 respondents have a national water management plan in place. Federal countries are a case in point, as plans may be defined at sub-national level, when water management is not a federal issue.

The **EU** Water Framework Directive, which calls for the long-term protection of available water resources, requires its member states to carry out assessment of long-term changes in natural conditions (European Union, 2000[1]). As reported by the European Commission, the first official draft River Basin Management Plan (RBMP) had to be presented by the end of 2008. To date, all member states have approved their RBMPs and almost all EU member states reported their second RBMPs for the period 2015-2021 to the European Commission under the Water Framework Directive. The information in the RBMPs is available on the common digital repository WISE[1]: the maps include the River Basin Districts and their sub-units, the surface water bodies (water body category, ecological status or potential and chemical status), the groundwater bodies (aquifer type, quantitative status and chemical status) and the monitoring sites.

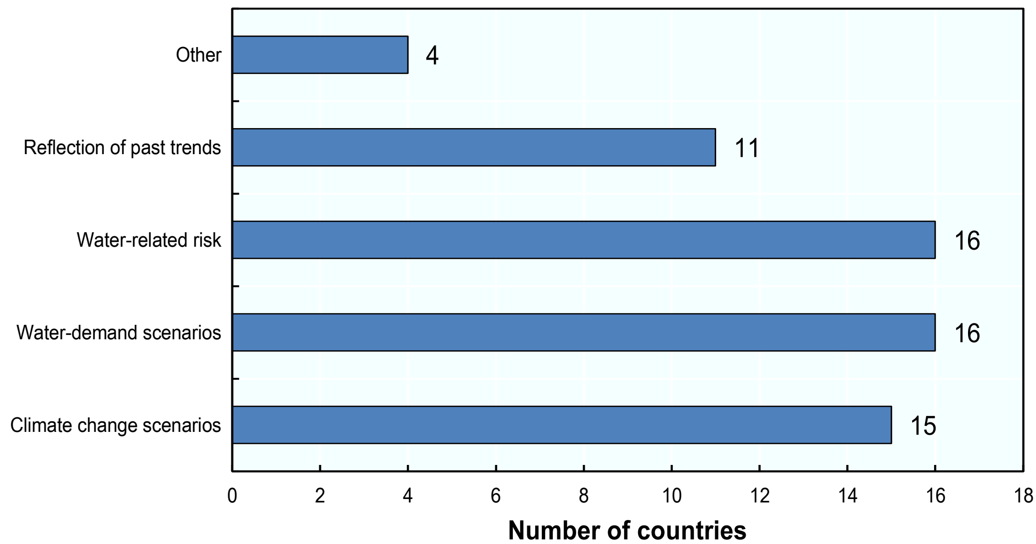
A key characteristic of long-term planning is uncertainty. The 2019 OECD Implementation Survey shows that 22 out of 26 responding Adherents consider uncertainties in planning for future water availability and demand (Figure 2.1).

Figure 2.1. Uncertainties about future water availability and demand in national management plans

Note: Responses to the question "Does the national water management plan consider uncertainties about future water availability and demand?".
Source: 2019 survey on the implementation of the OECD Council Recommendation on Water; 27 responses received, including 26 Adherents.

Of those Adherents that consider uncertainty in their planning, nearly 70% take into account climate as well as water demand scenarios and equally 70% consider water-related risks (Figure 2.2). However, the OECD Survey on water and agriculture policy changes carried out in 2019 showed that of those Adherents that set quantified national planning targets for the use of water resources in the agriculture sector, only 41% account for climate change. More work is needed to assess how countries design and reflect scenarios on climate change and future water availability in planning instruments. Indeed, future local and regional changes in precipitation are uncertain, as different climate models project different directions of change for some regions.

Figure 2.2. Types of uncertainties considered in water management planning



Note: Responses to the question: "How does the national water management plan reflect uncertainties about future water availability and demand?". Multiple responses were possible.
Source: 2019 survey on the implementation of the OECD Council Recommendation on Water; 27 responses received, including 26 Adherents.

Turkey has made efforts to improve its modelling of future climate using scenarios based on expected medium to high global temperatures (RCP4.5 and RCP8.5). It uses three global climate models downscaled to 20 km, which help to identify local changes. Turkey also considers the impact of increasing temperatures and variabilities in precipitation levels, and does so for a horizon until the end of the 21st century (OECD, 2019[5]). River basin agencies in France drafted strategic plans to adapt to climate change, a priority of the on-going programming period. In Chile, some river management plans consider the impacts of climate change, such as those for the rivers Maule and Maipo. Efforts are underway to integrate surface and groundwater modelling in forthcoming river management plans (OECD, 2019[6]). Spain is addressing uncertainties in long-term water conditions by improving its climate models and updating its mapping of water bodies accordingly. Models incorporate a long time series of historical data and make ambitious projections of future water availability[2] (OECD, 2019[6]).

The Delta Programme of the **Netherlands** aims to ensure that present and future generations are safe from water and will have sufficient freshwater in the centuries ahead. The programme takes an "adaptive delta management" approach, taking measures in the short term that will expand capacity to adapt to long-term changes and withstand extreme situations. The programme is supported by a dedicated Delta fund, which secures financial resources for implementation (OECD, 2013[7]).

More work is required to assess whether river basin management plans factor in shifting conditions that affect water availability and use and exposure to water-related risks (see also chapter 3); if plans are aligned with projected plans in other domains (e.g. land use and urban development, agriculture development, energy supply); if they are supported by robust financing strategies; and if they drive decisions related to water management and investment.

2.3. Interlinkages between surface and groundwater management

Alongside long term planning, the Recommendation calls for Adherents to foster "conjunctive management of surface and groundwater".

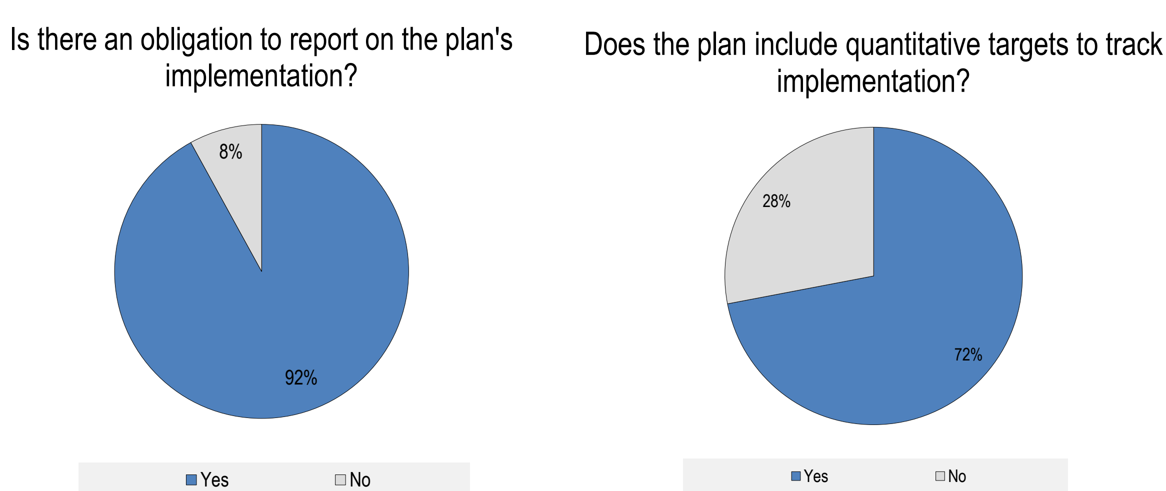
This is an approach followed by **Australia** in its National Water Initiative, which was adopted in the midst a prolonged drought (1996-2010). The National Water Initiative acknowledges the connectivity between surface and groundwater and calls for conjunct management of these systems (OECD, 2018[8]). It also reminds that jurisdictions need to ensure that local environmental flow management and environmental objectives (e.g. on water quality, habitat and pest management) are coherent across complementary waterways (OECD, 2019[4]). Successful implementation of this principle can be seen at the local level. For instance, in the State of California (**United States**), the Arvin Edison Water and Storage District has engaged in conjunctive management, storing groundwater during wet years and pumping back during dry seasons, creating measurable benefits for users (OECD, 2015[9]).

2.4. Reviews and updates

The Council also recommends that Adherents' long-term water management plans are "regularly reviewed and updated". This notion is also reflected in the OECD Water Governance Principles (chapter 6), which call for regular monitoring and evaluation of water policies. The following section presents examples for the national level, which are also relevant for all levels of governance.

The great majority of respondents, namely 92% of those that responded 'yes' to having a national water management plan in the 2019 OECD Implementation Survey, have an obligation to report on the implementation of the plan or equivalent (for countries with plans at sub-national level). Of those respondents that have such an obligation, 72% have quantitative targets to track implementation (Figure 2.3). **EU** member states have formal requirements to undertake monitoring and evaluation of the implementation of their River Basin Management Plans, which are updated every six years. In addition to doing so for its 25 River Basin Management Plans, **Spain** publishes an annual report as part of this reporting exercise. Some countries, including **France**, report on qualitative objectives as well.

Figure 2.3. Reporting on implementation of national water management plans



Note: Responses to the questions: "Is there an obligation to report on the plan's implementation?" and "Does the plan include quantitative targets to track implementation?"
Source: 2019 survey on the implementation of the OECD Council Recommendation on Water; 25 responses received, including 24 Adherents.

2.5. Stakeholder consultation

Finally, with regard to long term water management planning and conjunctive water management, the Recommendation claims that water policies "would benefit from stakeholder consultation". This echoes the principle 10 in section 6 of the Recommendation, which promotes stakeholder engagement in water management at large.

There are an increasing number of examples of legislation, guidelines and standards that formalise stakeholder engagement to encourage information sharing, co-operation, consultation or awareness raising into operational rules and procedures. Indeed, according to Article 14 of the **EU** Water Framework Directive, consultations with the public should be carried out throughout the different steps of development of the river basin management plans. The state of Baden-Württemberg (**Germany**) involved key stakeholders through a series of over 70 different local events to produce a water management plan.

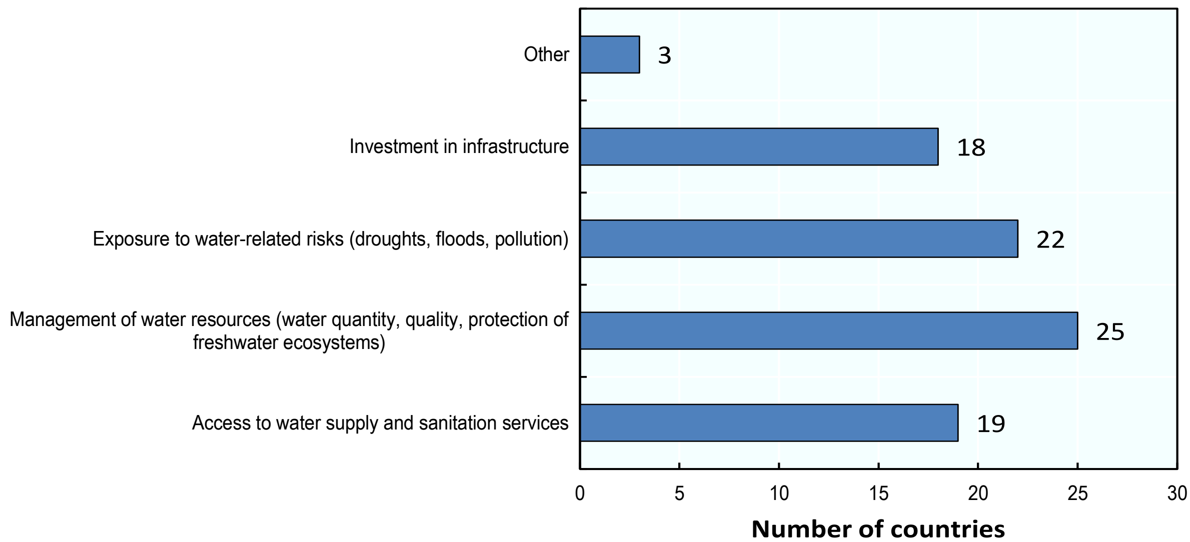
However, barriers remain in practice such as "consultation fatigue", often due to a lack of clarity on how to use stakeholder inputs in decision making and implementation. Among other shortcomings that have been identified are insufficient time, staff and funding, weak supportive legal frameworks, consultation "capture" from over-represented categories, weak capacity, the lack of public concern and awareness, information asymmetry, fragmented institutional settings, and the complexity of the issues (OECD, 2015[10]).

2.6. Joint management of water quantity and quality

The Council recommends that Adherents set up and implement water policies that "encourage the joint management of water quantity and quality, and pay attention to the hydro morphological characteristics and temporal variability of water bodies, as these affect water quantity, quality, disasters, and water-related ecosystems".

The 2019 OECD Implementation Survey shows that countries have adopted national water management plans covering a range of issues, to ensure coordination across water-related policies (Figure 2.4). These areas usually cover water quantity and quality, exposure to water-related risks, access to water and sanitation services as well as investment in infrastructure.

Figure 2.4. Issues covered in national water management plans



Note: Responses to the question: "Which of the following topics are covered in your country's national water management plan?", "Other" includes: irrigation, water finance, R&D, water industry, international cooperation; drinking water; analysis of pressures and impact on water resources by different users. Multiple responses were possible.
Source: 2019 survey on the implementation of the OECD Council Recommendation on Water; 25 responses received, including 24 Adherents.

In the **EU** Water Framework Directive, joint management of water quantity and quality is promoted through the RBMPs. The plans are a detailed account of how the objectives set for the river basin (ecological status, quantitative status, chemical status and protected area objectives) are going to be met. Ecological status is based on biological quality elements and supporting physico-chemical and hydro morphological quality elements (European Union, 2000[1]). In **Israel**, water quality and quantity are intrinsically related in the management of water resources, as the country uses desalinated seawater as a key source of water supply and treated wastewater as a major source of water for irrigation, to reduce the need for and use of freshwater extraction from aquifers and surface water bodies. Co-ordination is ensured under the Water Authority Council, set up in 2007, and responsible for all decision making and policy setting by the Israeli Water authority.

The use of nature-based solutions (NbS) is a promising approach to deliver on both water quantity and quality objectives. For example, the "Upstream Thinking" catchment management scheme in the **United Kingdom** has successfully restored over 2000 hectares of sensitive upstream land on Exmoor in 2010-15 to improve peatland and biodiversity, and reduce sediment loads and flood risk downstream. The work is targeted to benefit 15 water treatment facilities supplying 72% of the total daily water to customers in the region (OECD, 2017[11]). The use of NbS have been promoted in Europe, with EU Horizon 2020 framework programme for research and innovation allocating approximately EUR 185 million to research and pilot projects between 2014 and 2020 (European Parliament, 2017[12]).

Inter-institutional committees can facilitate the management of various water-related issues and ensure policy coherence across national authorities responsible for water and other policies. In **Ireland**, the Water Policy Advisory Committee co-ordinates the overlap between the EU Water Framework Directive, and other directives including the Floods Directive and Marine Framework Directive. In **Costa Rica**, there are committees on hydrology and meteorology, groundwater, surface water and wastewater. Some countries have merged the responsibilities for water and environment such as some states in **Brazil**. In **Korea**, the Government Organisation Act, June 2018, merges the vast majority of responsibilities for water quantity and quality management under the Ministry of Environment (OECD, 2018[13]) (Box 2.1). See chapter 6 for further arrangements that support policy coherence in water management.

Box 2.1. A national reform to address institutional and financial inefficiency of national water management in Korea

Korea's efforts to address institutional and financial inefficiency of national water management policies have translated into the policy reform for integrated water management. In 2018, the Government Organisation Act was amended to transfer the authority over water resources conservation, use, and development from the Ministry of Land, Infrastructure, and Transport (MOLIT) to the Ministry of Environment (MOE). With this, 188 government officials from the MOLIT with a water quantity management budget of over 500 million USD and 5 878 staff members from K-water (asset value of about 9 billion USD) to the MOE. In addition, authorities overseeing groundwater quantity and quality as well as multi-regional and local waterworks management, were integrated into the MOE.

Moreover, the Framework Act on Water Management was introduced for the first time in the history of the Korean government in 2018, laying legal foundation for the integrated water management encompassing water quality and quantity management. The Framework Act on Water Management, remaining in force since June 2019, covers 12 basic principles on water management including publicness of water, sound water cycle, management by basin, integrated water management, management of water demand, addressing climate change, and multi-stakeholder participation, along with the National Master Plan for Water Management and the Comprehensive Basin Water Management Plans.

Following the introduction of the Framework Act on Water Management, the Presidential Water Commission and four Basin Water Commissions were established. Overseen by the Office of the President, the Presidential Water Commission is chaired by the Prime Minister, and a civic expert appointed by the President. A majority of the total number of members of the Commission must be comprised of civic members other than ex-officio members with appropriate gender ratio.

The National Master Plan for Water Management for the next decade, the first ever inter-governmental plan for water management strategies, and the Comprehensive Basin Water Management Plans are expected to be completed by June 2021 and June 2022 respectively. These plans must be adjusted based on the results of validity assessment which will be conducted on a 5-year basis and are subject to annual implementation reviews. The Presidential and Basin Water Commissions will discuss, review and co-ordinate several laws and plans set by Korean ministries and local governments in order to ensure policy coherence and efficiency.

Source: (Republic of Korea, 2019[14]) (Republic of Korea, 2020[15])

2.7. Address practices, trends and developments for water availability, demand and risks

Further to the joint management of water quantity and quality, the Council recommends Adherents to "address practices, trends and developments that affect water availability, water demand, and exposure and vulnerability to water risks; reflect their wider economics, social and environmental consequences, at different scales". See further details on the management of water quantity in chapter 3, and on water risks in chapter 5, and on pricing instruments in chapter 8.

2.8. Facilitate the development and diffusion of innovation

The Council recommends that Adherents set up and implement water policies that "facilitate the development and diffusion of innovative and more efficient ways to manage water, based on technical and non-technical innovations".

Technical innovations exist in different domains related to water, notably pollution abatement (e.g. wastewater treatment), demand-side management (e.g. indoor or irrigation water conservation such as drip irrigation or leak prevention technologies) and supply-side management (e.g. rain water collection, desalination of sea and brackish water) (Haščič and Migotto, 2015[16]). There are also technical innovations in information and communications technology (ICT) such as smart meters that are beneficial to the water sector (Box 2.2).

Patent data for water-related technologies, used to explore the development of inventions, show that several Adherent countries are leading water innovation, namely the **United States**, accounting for more than 30% of global water-related technologies patenting in the period 1990-2015, followed by **Korea**, **Germany** and **Japan** (Table 2.1). **Korea** experienced rapid growth in the share of patenting, for water-related and all technologies, from less than 1% of the world's water-related patents in 1990 to more than a quarter since 2009. It is also notable that **Israel** has the highest share of demand-side water patents and a relatively larger share of high-value inventions that are transferable to other countries (Leflaive, Krieble and Smythe, 2020[17]).

Table 2.1. Top Water-Related Inventor Countries, 1990-2015

Country	United States	Korea	Germany	Japan	United Kingdom	France	Canada	Switzerland
Share of global water-related technologies (total patents)	30.90%	14.50%	12.00%	6.90%	4.60%	4.00%	2.50%	1.90%
Relative Technological Advantage (RTA)	1.14	0.97	1.22	0.48	1.85	1.55	1.45	2.05

Note: Water-related patented inventions include water pollution abatement or demand- or supply-side technologies.
Source: (Leflaive, Krieble and Smythe, 2020[17]).

When considering relative technological advantage (RTA), which measures a country's specialisation in a particular technological domain, **Switzerland** has a RTA of 2.05, indicating it is relatively specialised in water security technologies compared to other domains. Conversely, **Japan** with a RTA of 0.48 is 'underweight' in water related patenting relative to other areas of invention. Some Adherent countries, such as **Chile**, **or Australia**, are highly specialised in water-related technologies, which represent a high share of their domestic patenting. They are both top inventors and potential markets for the technology patented (Leflaive, Krieble and Smythe, 2020[17]). Different dynamics across countries, and relative specialisation of selected countries indicate that Adherents differ in the strategies developed and implemented to support and accelerate the development of water-related innovation.

Countries have also used different mechanisms to facilitate the diffusion of water related innovation. This encompassed the formation of groups in charge of transferring and knowledge and publicly available data. For instance, **New Zealand** established a Science and Technical Advisory Group to oversee the scientific evidence for freshwater policy development, and developed the Land Air Water Aotearoa (LAWA) – publicly sharing environmental data and information to help communities balance using natural resources while maintaining water quality and availability. The **EU** Commission set up a knowledge hub on agriculture and water management, aiming at providing links to available information from research in this area.[3]

The development and deployment of smart water systems has been encouraged by a number of Adherents such as **Australia, France, Israel, Korea** and the **Netherlands** as well as states (Arizona, California in the **United States** and Ontario in **Canada**). They have been deployed in combination with water tariff reforms and implementation of measures to encourage efficiency. In Arizona, water utilities adopted smart water meters to inform customers about their water usage. New smart water companies have emerged in **Ontario** and **Israel**. In **France**, incentives to reduce leakage in water supply and sanitation networks have driven the diffusion of smart meters and investment in data monitoring to detect and locate anomalies in real time (OECD, 2017[2]).

Non-technical innovations can help change behaviours to use water more efficiently (see section Promoting water use efficiency).

Box 2.2. The use of citizen science and public engagement to enhance water-related information

Citizen science, which is the involvement of citizens in scientific research and/or knowledge production, is an emerging example of a non-conventional data source that can play an important role in the process of monitoring water resources. The development of new technologies, such as smartphone apps and social networks, has broadened the scope of citizen contributions, enabling scientists to process far higher volumes of data than would previously have been possible. There are now many examples of citizen science projects around the world covering a diversity of domains including the water sector. For example, SciStarter.org is a search engine for citizen-science projects; and an inventory of citizen-science activities in Europe that address environmental policies was recently published.

Several mobile applications have been developed to facilitate the engagement of citizens in documenting and sharing information for the purpose of water resources monitoring. Examples include Citclops's EyeOnWater and Earthwatch's FreshWater Watch, which enable volunteers to contribute data on the colour of coastal waters, serving as a simple and accessible indicator for eutrophication that can be used together with remote-sensing data. NASA is exploring a potential of citizen science within general aviation to contribute aerial photos to assess eutrophication. A comparison of citizen science data and agency monitoring of water quality in the UK shows that FreshWater Watch data complements environmental agency monitoring efforts by filling in gaps in the spatial and temporal coverage, as well as water body types.

While not all citizen science programmes are designed or fit to inform policy, it is essential to understand and maximize the conditions for the uptake of citizen science by decision-makers to contribute to the locally-relevant and globally-scaled evidence base needed to solve upcoming water challenges.

Source: (OECD, 2019[6]); (OECD, FAO, IIASA, 2020[18])

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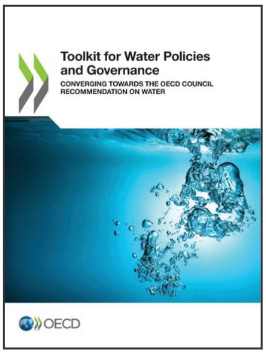

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