



## Quality Infrastructure and Water

Water is the origin and the foundation of life on Earth. It is elementary for all biospheric and climatic processes. Water in the form of humid air is one of the most powerful greenhouse gases and therefore an essential variable for the climate. A total of 72% of the Earth's surface is covered by water, whereas only 2.5% of that is fresh water and, of that, only 0.3% can be used as drinking water. Water permanently circulates in the global cycle in its different forms, while the overall amount remains constant. Water that circulates in a landscape within a

small and confined area attenuates temperature amplitudes and thus decreases the potential for extreme meteorological events in the atmosphere. Nutrient cycles are connected to the water cycle. The smaller the overall scale of the water cycle, the less nutrients are lost. Current land management practices cause irreversible loss of nutrients because it leads to a lowering of the water level over large areas and thus compromises the functionality of the landscape and, ultimately, the foundation of human life.

# Initial Situation and Problem Analysis

Depletion and pollution of natural resources caused by the growing global population, economic growth and the industrialization of major national economies are increasing the global water demand and draining the scarce water resources in many regions of Earth. Ecosystems altered by humans entail higher evaporation rates, lower soil water retention as well as erosion caused by accelerated surface runoff. This causes climatic changes and problems in water management. In many countries, water has become increasingly scarce and neither the supply of clean drinking water nor the disposal of waste water can be sufficiently ensured as part of services for the public, because essential political and technical requirements cannot be met. Water consumption and water distribution are often not recorded at all or only in an inaccurate way. Another challenge is that laboratories for monitoring water quality often do not work according to international standards and are not assessed for quality assurance in an independent manner. Their water sample analysis results are therefore often unreliable.

A majority of all diseases in countries of the Global South originate from polluted drinking water. In 2021, approximately 2.2 billion people did not have regular access to clean drinking water<sup>1</sup> and lived under extreme conditions of heat, drought or heavy rain and flooding. Droughts and water shortages as well as flooding lead to migration. Urbanization aggravates water shortages in rural areas and increases competition for water between cities and the agricultural sector. In many dry regions of the world, rivers are the source of the water supply for the population and the agricultural sector. Neighbouring countries are increasingly coming into conflict over scarce water resources, for example along the Euphrates and Tigris, the Jordan or the Nile. The transformation of natural ecosystems into utilized agricultural areas, deforestation, land drainage as well as the depletion of ground water resources need to be counteracted. Otherwise, more and more regions and areas of life will be affected by shortages of water and other natural resources and, as a result, competition in societies and thus the risk of violent conflicts will increase.

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<sup>1</sup> See UNICEF (2021): Herausforderungen weltweit: Wasserknappheit, Klimawandel, Sanitärversorgung (German); available at: <https://www.unicef.de/informieren/aktuelles/blog/weltwassertag-2021-zehn-fakten-ueber-wasser/172968> (last visited on 14 July 2022); See BMZ (2021): SGD 6 – Sauberes Wasser und Sanitäreinrichtungen (German); available at: <https://www.bmz.de/de/agenda-2030/sdg-6> (last visited on 14 July 2022).

At the United Nations Sustainability Development Summit in New York in September 2015, the 2030 Agenda was adopted with 17 Sustainability Development Goals (SDGs) for a sustainable transformation of society, the economy and the environment. The Agenda's 17 Sustainable Development Goals include improving people's living conditions and protecting the planet. The sixth development goal (SDG 6) deals with water supply and adequate sanitation for humanity, including water availability and sustainable water resource management as well as the entire disposal chain from transport and waste water treatment to reuse. In July 2010, the United Nations have already passed Resolution 64/292, which lists not only the right to water, but also the right to hygienic sanitation as an independent human right. Bolivia, Ecuador, Kenya, Maldives, South Africa, Uganda and Uruguay have stipulated the right to water in their respective constitutions. The human right to clean drinking water and sanitation obligates the countries to create suitable framework conditions for improving the supply situation of their population. In addition, water is a transversal component in other SDGs, such as Zero Hunger (SDG 2), Good Health and Well-Being (SDG 3), Sustainable Consumption and Production (SDG 12), Climate Action (SDG 13), Life Below Water (SDG 14) and Life on Land (SDG 15).

## Our Contribution



On behalf of the Federal Ministry for Economic Cooperation and Development (BMZ), the Physikalisch-Technische Bundesanstalt (PTB) supports its partner institutions in countries of the Global South in their efforts to sustainably manage water resources by strengthening quality infrastructure institutions and their services. By passing on its expertise in the field of quality infrastructure, PTB has contributed to the implementation of the development policy goals of the German Federal Government for more than 60 years. Through PTB, the BMZ supports the establishment and expansion of technical infrastructures so that the prerequisites for sustainable development can be implemented in the partner countries.

In the BMZ 2030 reform strategy, water is part of the core subject *Sicherung unserer natürlichen Lebensgrundlagen* (safeguarding our natural foundations of life). Moreover, the BMZ water strategy sets the goals for implementing the 2030 Agenda and the Paris Agreement. It is a mandatory basis for measures of development cooperation between states and defines contributions to solutions for these goals. The strategy contains clear requirements for projects in the field of water for implementing the human right to having access to a safe water supply and sustainable sanitation. This strategy is

## Quality infrastructure

<b>Metrology</b>
Calibration of water meters for water balances and consumption, pressure measurements, measurements of chemical parameters
<b>Testing</b>
Water analyses, materials testing
<b>Standardization</b>
Stipulation of quality criteria, measurement and testing procedures, minimum requirements for infrastructure and material
<b>Certification</b>
Certification of management systems, products and staff
<b>Accreditation</b>
Skills assessment of laboratories, testing, inspection and certification bodies

### Caption

-  Volume measurement
-  Quality measurement

## Water circuit



linked to other water-related topics such as the reduction of climate change and adaption to it as well as the topics of peace and migration.

The main project partners of PTB are the national quality infrastructure institutions such as metrology institutes, testing and calibration laboratories, standardization institutes and certification and accreditation bodies that provide important services to national institutions, e.g., the ministries and their subordinate authorities, as well as for private sector and civil society stakeholders. With their services, they jointly provide reliable information required for managing water supplies and waste water disposal. Metrology services (calibration and verification) in the water sector include reliable recording of water consumption and distribution using water meters that are regularly checked. Adequate water prices can thus be invoiced in a transparent way and in accordance with the actual consumption. The payments of the consumers are required for operation, maintenance and also for expanding the drinking water supply systems. If the flow rate and water consumption can be precisely measured, losses can be promptly detected and the water supply can be made more efficient. Standardization in the water sector serves to stipu-

late minimum requirements for infrastructures, define water quality criteria and describe measurement and testing procedures. It is also, for example, the basis for uniform sampling of drinking water and waste water. The chemical/biological properties of water can be determined using analyses in testing laboratories. Quality assurance systems in laboratories (quality management) contribute to making measurement and analysis results comparable and, as a result, reliable. Accreditation allows independent examination of the work of testing and calibration laboratories and asserts the competence of certification and inspection bodies.

PTB's work at the national and international level in the form of consulting, knowledge exchange, basic and advanced training as well as with the support of South-South collaborations contributes to improving the technical competence of the quality infrastructure. Given the importance of water as a natural resource, such competence is essential for the efficient and proper handling of water.

# The Impact of our Work

Together with its partners, PTB has established an internationally recognized quality infrastructure in numerous countries and is expanding it continuously. The quality infrastructure services increase the reliability of measurements and analyses and make data comparable. International and national rules, norms and standards lay down limit values in many fields, for example compliance with specific pollutant limits, which can only be checked with reliable measurement results. Standards and technical provisions describe testing and analysis procedures as well as monitoring and control mechanisms which are indispensable for a sustainable use of water resources. In this way, the quality infrastructure creates a basis for the consumer and environmental protection policies of a state.

Projects in the water sector implemented by PTB have laid significant foundations for the availability of clean drinking water and have therefore made a positive contribution to human health. Apart from quality, quantity is another relevant factor in water resources management. PTB has supported partner countries in introducing reliable techniques to measure the consumption of drinking water, which is required for economic and efficient drinking water management. The positive effects of projects on the subject of industrial and domestic waste water also include qualifying partner organizations to provide reliable data as a basis for decisions in the field of waste water management. The determination of physico-chemical parameters of industrial waste water allows the effectiveness of waste water treatment processes to be monitored. By analyzing the quality of waste water treatment of private households, well-founded decisions can be taken as to whether the water should be reused for landscape irrigation or whether it should be discharged into natural waters. PTB's international cooperation projects have a positive effect on the determination and compliance control of limit values that are also being introduced in national environmental regulations and laws. These data make it possible to take transparent and plausible decisions for sustainable water resources management. They are used as basic information for environmental monitoring in order to describe and assess the current state of waters and, if necessary, to take suitable measures for improving the water quality. Applying internationally recognized quality infrastructure procedures and services creates a data basis for actions of the state for the sustainable handling of water as a resource.

Through its worldwide network of partners and its long-standing relations with national, regional and international metrology, standardization and accreditation organizations, PTB is able to support the responsible handling of water as a resource in political, institutional and technical respects.

The functionality of ecosystems as an economic base can be restored via water and nutrient cycles. Sustainable management of natural resources in this sense has to be the top priority goal of politics at all levels in order to safeguard our natural foundations of life on Earth in the long term.

