

Three pillars of UNESCO activities on water

UNESCO activities on water are implemented through three main pillars: the **International Hydrological Programme (IHP)**; an extensive network of **UNESCO water centres and chairs**; and the United Nations **World Water Assessment Programme (WWAP)**.

The **International Hydrological Programme (IHP)** of UNESCO is the only intergovernmental programme of the United Nations system devoted to water sciences, aimed at promoting research, knowledge, education and capacity building for sustainable water resources management. Since its inception in 1975, IHP has evolved from an internationally coordinated hydrological research programme into an encompassing, holistic programme to facilitate research, education and capacity building, and enhance water resources management and governance. IHP facilitates an interdisciplinary and integrated approach to watershed and aquifer management, which incorporates the social dimension of water resources, and promotes and develops international research in hydrological and freshwater sciences.

Aligned with IHP's initiative, **UNESCO water centres and chairs** provide a network for scientific knowledge and information sharing and dissemination. UNESCO water centres focus on particular water issues with international or specific regional scopes such as urban drainage, integrated water resources management and water quality. UNESCO water chairs aim to contribute to capacity building on a broad range of water issues, including groundwater management, water ecosystems, and water and gender.

Hosted and led by UNESCO, the **World Water Assessment Programme (WWAP)** coordinates the work of 31 UN-Water members and partners in the World Water Development Report (WWDR).

These three pillars of UNESCO's work on water are strongly interrelated and build on each other to address water science, capacity building and education for sustainable water management at the global, regional and national levels.

International Initiative on Water Quality

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International Initiative on Water Quality

Promoting scientific research, knowledge generation and dissemination, and effective policies to respond to water quality challenges in a holistic and collaborative manner towards ensuring water security for sustainable development





Contents

●	The global water quality challenge: Why water quality issues are important.....	3
●	The global water quality challenge.....	4
●	The need for concerted international efforts to tackle water quality challenges	6
●	Water quality in the 2030 Agenda and Sustainable Development Goals	7
●	How UNESCO is responding to the global water quality challenge.....	9
●	Water quality in the Seventh Phase of IHP (IHP-VII, 2008-2013)	10
●	Water quality in the Eighth Phase of IHP (IHP-VIII, 2014-2021)	12
●	UNESCO-IHP International Initiative on Water Quality (IIWQ)	17
●	Key thematic areas.....	19
●	Objectives	20
●	IIWQ Regional Consultation Meetings and Scientific Workshops on Water Quality	22
●	UNESCO contribution to UN-Water on water quality	23

The global water quality challenge: Why water quality issues are important



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Meeting the **global water quality challenge** is a prerequisite for sustainable development of the present and future generations.

Water quality is intrinsically linked with human health, poverty reduction, gender equality, food security, livelihoods and the preservation of ecosystems, as well as economic growth and social development of our societies. Water quality problems represent a major challenge in both developing and developed countries. Technical, institutional, policy and financial challenges still remain to be addressed despite global efforts and initiatives to improve access to safe water and improve water quality and wastewater management.

Water quality improvement does not only have a significant direct impact on health, food security and ecosystems but it is also strongly relevant to the 2030 Agenda and the attainment of Sustainable Development Goals (SDGs).

The global water quality challenge

Water quality is one of the main challenges that societies will face during the 21st century, threatening human health, limiting food production, reducing ecosystem functions and hindering economic growth. Water quality degradation translates directly into environmental, social and economic problems. The availability of the world's scarce water resources is increasingly limited due to the worsening pollution of freshwater resources caused by the disposal of large quantities of insufficiently treated, or untreated, wastewater into rivers, lakes, aquifers and coastal waters. Furthermore, newly emerging pollutants like personal care products and pharmaceuticals, pesticides, industrial and household chemicals, and changing climate patterns represent a new water quality challenge, with still unknown long-term impacts on human health and ecosystems.

Safe and clean drinking water – a human right

The United Nations General Assembly (RES/64/292) in 2010 recognized **access to safe and clean drinking water and sanitation as a human right** essential for our lives and well-being. Between 1990 and 2015, 2.6 billion people gained access to improved drinking water sources globally. Yet, approximately 663 million people still remain without access to improved sources of drinking water.¹ Each year millions of people die from water-borne diseases such as diarrhoea, from which children under five years old are the most affected, due to poor hygiene, unsafe drinking water and lack of sanitation. As improved sources of water do not always ensure water quality suitable for direct human consumption, more efforts are required to provide access to safe and clean water. In addition to the serious impact on human and ecosystem health, lack of access to safe, clean and affordable drinking water and sanitation is a growing burden on countries' economic and social development. Increased access to safe water and sanitation services leads to disease prevention, enhanced human health, gender and income equality, improved educational outcomes and higher economic productivity.

Water quality facts:

- ▶ One in nine people worldwide uses drinking water from unimproved and unsafe sources.¹
- ▶ 2.4 billion people live without any form of sanitation.¹
- ▶ Lack of sanitation is one of the most significant forms of water pollution.
- ▶ 90% of sewage in developing countries is discharged untreated directly into water bodies.²
- ▶ Every day 2 million tonnes of sewage and other effluents drain into the world's water.³
- ▶ Industry discharges an estimated 300-400 megatonnes of waste into water bodies every year.⁴
- ▶ Non-point source pollution from agriculture and urban areas often greatly increases the total pollutant load together with industrial point source pollution.
- ▶ A reduction of about one-third of the global biodiversity is estimated to be a consequence of the degradation of freshwater ecosystems mainly due to pollution of water resources and aquatic ecosystems.⁵
- ▶ Re-use of wastewater in agriculture is important for livelihoods, but is associated with serious health risks.

Degradation of water quality and aquatic ecosystems

Water pollution, resulting from human activities, disturbs aquatic ecosystems not only in structure but also in function, affecting and modifying the integrity of these systems. Clear evidence is eutrophication, which results from high loads of nutrients (phosphorus and nitrogen) primarily from agricultural runoffs, domestic and industrial wastewater and atmospheric inputs from fossil fuel burning. Acidification is another concerning threat putting more pressure on the complex dynamics of lakes, wetlands and reservoirs. In addition to its health and socio-economic impact, water quality degradation relates directly to biodiversity loss, reduced ecosystem functioning and the unsuitability of water for various uses due to pollution of water resources. Water pollution thus constitutes a serious threat not only to securing enough water of good quality for human needs, but also to meeting the ecosystem needs and maintaining environmental flows.

Inadequate treatment of wastewater

An estimated 90% of all wastewater in developing countries is discharged untreated directly into rivers, lakes or the oceans. The major sources of water pollution are lack or inadequate treatment of domestic sewage and inappropriate management and disposal of industrial and agricultural wastewater. Many developing countries are lacking adequate wastewater infrastructure with only 10% of the wastewater being processed through appropriate treatment² and most sewage not being collected. This problem is even more severe in the rapidly growing cities of Asia and Africa, where investment in sanitation and wastewater infrastructure expansion is much lower than the financial resources required to expand the service both to their current populations and the future population growth and urbanization. Improved wastewater management is required to prevent diseases as well as losses in biodiversity and ecosystem resilience. Hence, there is an urgent global need for sustained investment to improve wastewater management and infrastructure. Furthermore, a shift in world water policies is necessary to emphasize that wastewater is a resource whose effective management is essential for the future of water security.

Emerging pollutants

Because of the potentially high risks emerging pollutants present for human health and the environment, these contaminants represent a new, complex aspect of the global water quality challenge. Emerging pollutants broadly include pharmaceuticals, personal care products, pesticides, industrial and household chemicals, metals, surfactants, industrial additives and solvents that are not generally monitored and may have a negative impact on human and environmental health. Many of these pollutants are known or suspected to be endocrine disruptors with adverse health and ecological effects. Scientific knowledge and understanding on their effects, fate and accumulation is still limited, as well as efforts on monitoring and regulating emerging pollutants in water resources and wastewater. Due to the complexity of their

- 1 UNICEF and WHO. 2015. *Progress on Sanitation and Drinking Water - 2015 Update and MDG Assessment*. Geneva: WHO.
- 2 WWAP (United Nations World Water Assessment Programme). 2015. *The United Nations World Water Development Report 2015: Water for a Sustainable World*. Paris. UNESCO.
- 3 Corcoran, E., Nellemann, C., Baker, E., Bos, R., Osborn, D. and H. Sevelli (eds). 2010. *Sick Water? The Central Role of Wastewater Management in Sustainable Development. A Rapid Response Assessment*. United Nations Environment Programme, UN-HABITAT, GRID-Arendal. http://www.grida.no/files/publications/sickwater/poster1_SickWater.pdf.
- 4 van der Bliek, J., McCornick, P. and J. Clarke (eds). 2014. *On Target for People and Planet. Setting and Achieving Water-related Sustainable Development Goals*. International Water Management Institute (IWMI): Colombo, Sri Lanka.
- 5 UN-Water. 2015. *Wastewater Management. A UN-Water Analytical Brief*. http://www.unwater.org/fileadmin/user_upload/unwater_new/docs/UN-Water_Analytical_Brief_Wastewater_Management.pdf.

forms, mechanisms of actions, and potential persistence in the environment, there is an urgent need to strengthen and promote scientific knowledge on emerging pollutants and to implement effective approaches to monitor, assess and control them. Emerging pollutants are not only a major challenge facing developing countries, but also a concern in developed countries because conventional water purification and wastewater treatment facilities are not effective in removing most emerging pollutants even if a country has achieved a high rate of wastewater collection and treatment.

Water quality challenges in developing countries

In developing countries, poor water quality and water pollution are the most crucial and serious water problems. A very low level, or inexistent, wastewater collection and treatment coverage is a common challenge in most developing countries, in addition to the lack of access to safe drinking water and sanitation for large portions of their populations. The situation is even more serious in countries where there are no programmes and policies to protect the sources of water supply from diffuse pollution such as agricultural runoff. Furthermore, the lack of proper procedures to ensure the safety of potable water and wastewater reuse is often at the origin of high human morbidity and mortality rates in developing countries associated with water-borne diseases, as well as of ecological degradation and catastrophes.

Water quality problems remain unsolved and serious in developing countries due to poor wastewater management, lack of political will, underinvestment, inefficient allocation of water, land-use changes, population growth and the absence of awareness of policy-makers on critical linkages of water quality with other development aspects such as health, poverty, gender inequality, environmental degradation, and food security. Consequently, there is a crucial need to increase investments, strengthen wastewater management plans, create awareness at the political level, reform water allocation systems, and better plan rural and urban changes affecting water quality issues. Moreover, it is essential to encourage governments to take action to address pressing water quality challenges and to incorporate water quality policies into national development goals. Although water quality problems are prevalent in developing countries, these challenges are a major concern for developed countries too, manifesting in different forms.

The need for concerted international efforts to tackle water quality challenges

The last decades have seen increasing pressure on water resources due to demographic growth, urbanization, a higher consumption level and the effect of climate change. The world of today is similarly facing severe global water pressures. Growing water demand and pollution of freshwater are threatening water quality for food production, ecosystem functions, economic growth and urban water supply. Despite some good examples of polluted systems being restored and biodiversity returning, and innovations in water conservation, reuse, groundwater augmentation and desalination, their potential applications are limited. It is clear that future demands for water cannot be met unless a global commitment on water quality improvement is pursued. In 2030, about 40% of the world's population will be living in water stressed areas, putting hundreds of millions of people at risk of hunger, disease, energy shortage and poverty.² In many regions, changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality.⁶

6 IPCC. 2014. *Climate Change 2014: Synthesis Report. Summary for Policymakers. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. [Pachauri, R. K. and L.A. Meyer (eds)]. IPCC: Geneva.

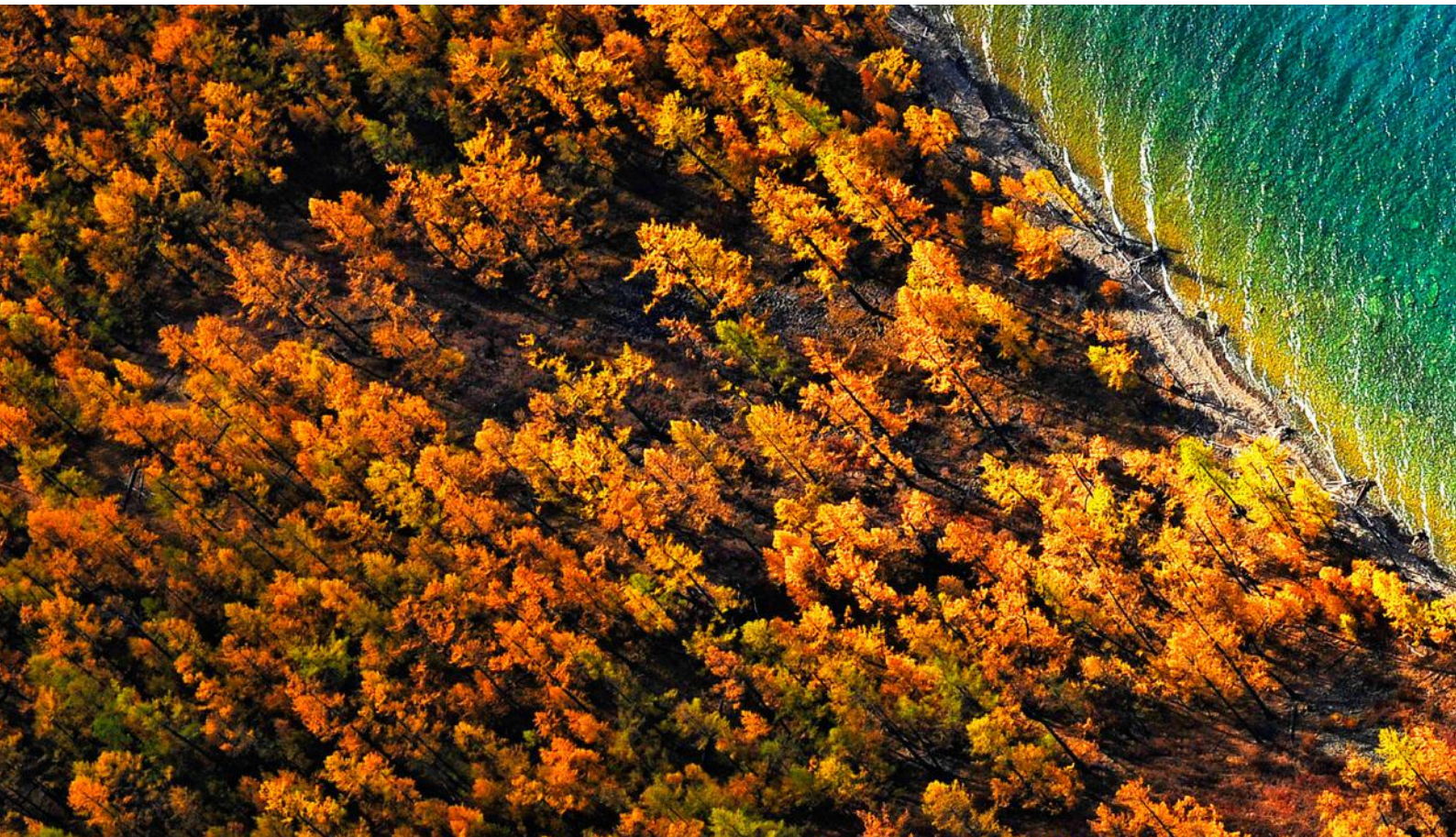
More effort needs to be dedicated to promoting scientific research, knowledge dissemination and the sharing of effective solutions, technologies, policy approaches and best practices to respond to the water quality challenges faced globally. Ultimately, these efforts will help ensure water security for sustainable development in the 2030 Agenda and the attainment of the Sustainable Development Goals (SDGs).

Water quality in the 2030 Agenda and Sustainable Development Goals

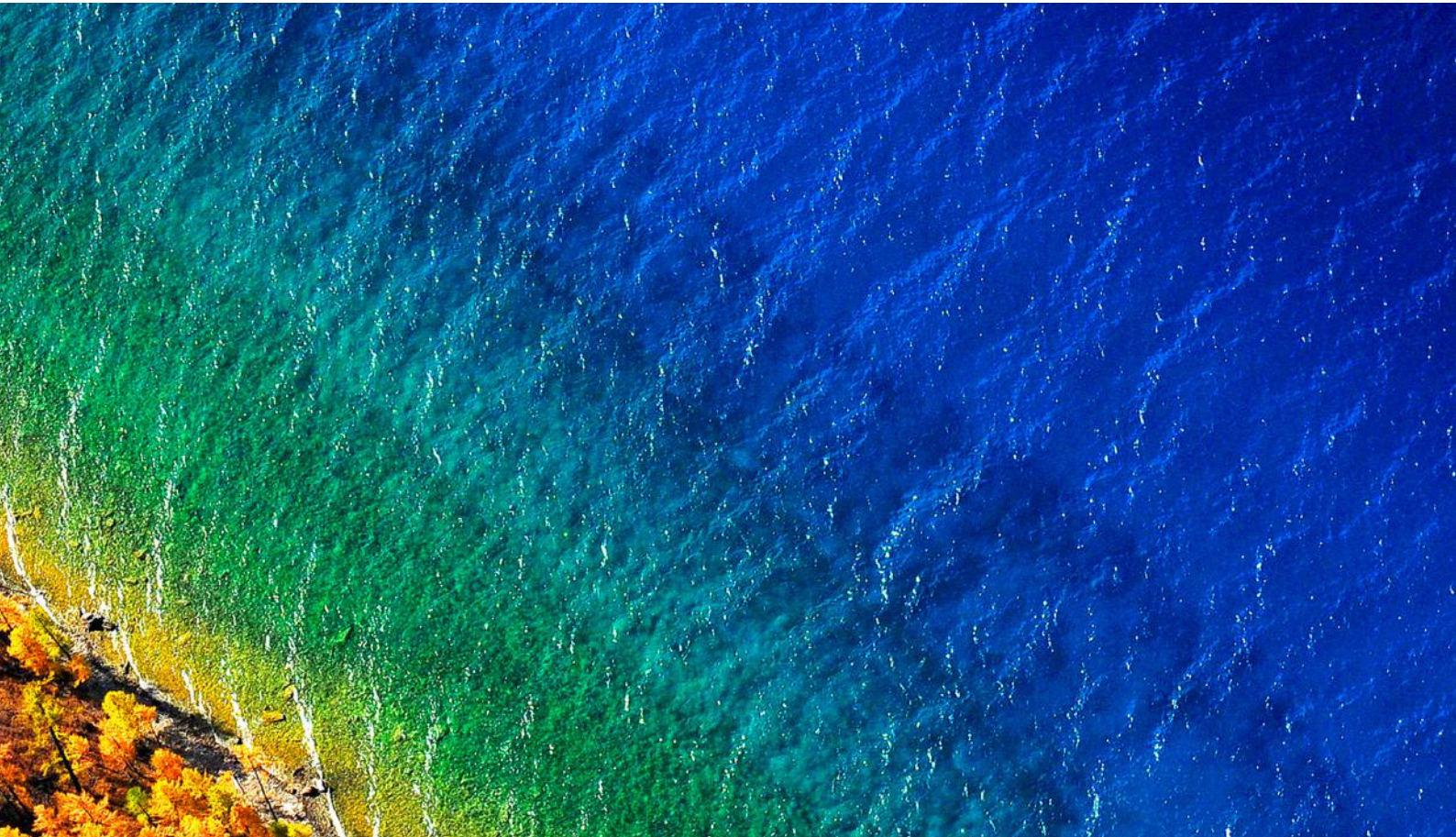
The 2030 Agenda⁷ and SDGs bring water quality issues to the forefront of international action by setting Goal 6 which specifically aims *to ensure availability and sustainable management of water and sanitation for all* to respond to the pressing challenges posed by water quality issues. Water quality is addressed also under other SDGs such as the goals on health, poverty reduction, ecosystems and sustainable consumption and production, recognizing the links between water quality and the key environmental, socioeconomic and development issues. The clear focus on water quality in the SDGs demonstrates growing attention on the urgent need to improve water quality worldwide.

Goal 6 Water and sanitation	Target 6.1	Achieve universal and equitable access to safe and affordable drinking water for all
	Target 6.2	Achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
	Target 6.3	Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
	Target 6.6	Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
Goal 1 Poverty	Target 1.4	Ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
Goal 3 Health	Target 3.3	End the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases
	Target 3.9	Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
Goal 12 Sustainable consumption and production	Target 12.4	Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment
Goal 15 Ecosystems and biodiversity	Target 15.1	Ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

⁷ United Nations. 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development*. A/RES/70/1. sustainabledevelopment.un.org



How UNESCO is responding to the global water quality challenge



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UNESCO's International Hydrological Programme (IHP) is the only intergovernmental scientific programme on water sciences within the United Nations system, aimed at promoting research, knowledge, education and capacity building for sustainable water resources management.

UNESCO, through its **International Initiative on Water Quality (IIWQ)** under IHP, supports Member States in responding to water quality challenges by promoting scientific research, mobilizing and disseminating knowledge, facilitating the sharing and exchange of technological and policy approaches, fostering capacity building, and raising awareness on water quality.

IHP implements a wide spectrum of activities to protect the world's freshwater resources and enhance water quality in an interdisciplinary and integrated manner.

Aligned with the 2030 Agenda and SDGs, IHP activities on water quality aim to mitigate the effect of human activities on the quality of water resources, prevent and reduce pollution, and protect water quality for sustainable development of the present and future generations.

Water quality in the Seventh Phase of IHP (IHP-VII, 2008-2013)

Water quality was addressed in the Seventh Phase of IHP, with a renewed focus through the dedication for the first time of a specific thematic area - **Focal Area 4.1 Protecting water quality for sustainable livelihoods and poverty reduction** under **Theme 4 Water and Life-Support Systems**.

Focal Area 4.1: Protecting water quality for sustainable livelihoods and poverty reduction

This focal area aimed to strengthen and develop the scientific knowledge base on the quality of surface and groundwaters to attenuate contamination of water sources and to protect the quality of current and future water supplies for all their uses. It also contributed to the attainment of the Millennium Development Goals by facilitating the sharing and exchange of effective solutions and best practices on access to safe drinking water and sanitation.

Major achievements on water quality under IHP-VII

UNESCO implemented numerous activities to accomplish IHP-VII's objectives on **Protecting water quality for sustainable livelihoods and poverty alleviation**.

Major achievements include: strengthening and dissemination of scientific knowledge on water quality; promotion of sustainable solutions and approaches to reduce pollution, improve wastewater management and mitigate water quality degradation; facilitating the sharing and exchange of best practices; and creating awareness on critical water quality issues.

Key activities contributing to these achievements include, but are not limited to, the following:

UNESCO Multi-stakeholder International Workshop on Gender Mainstreaming in Drought Management (Niger, 2013), a major event on the linkages between gender equality and access to water and sanitation, highlighting the importance of clean water for better health, education and well-being of women and girls

Promotion of 30 best practices as solutions to protect water quality, identified and selected by UNESCO and disseminated as the 6th World Water Forum Solutions for Target 3.1.3 Reducing Nutrient Inputs and Pollution of Programme Action 3.1 Improve the Quality of Water Resources and Ecosystems (Marseille, 2012)

UNESCO Seminar Towards Resource-Effective Water and Nutrient Reuse in the Urban Environment at the 2011 Stockholm World Water Week

UNESCO Seminar on Regulatory and Social Contexts for Institutional Performance – Water in an Urbanizing World at the 2011 Stockholm World Water Week

UNESCO-IAHS Symposium on Water Quality: Current Trends and Expected Climate Change Impacts (Australia, 2011)

UNESCO Workshop on Integrated Approaches to Sanitation at the 2nd IWA Development Congress (Malaysia, 2011)

UNESCO Regional Workshop on Addressing Water Quality Challenges in Africa (Kenya, 2011), a keystone event for the establishment of the UNESCO-IHP International Initiative on Water Quality (IIWQ)

UNESCO Seminar on Emerging Pollutants in Water Resources – A New Challenge to Water Quality at the 2010 Stockholm World Water Week

UNESCO Workshop on Origins, Pathways and Accumulation of Pollutants – An Urban Perspective at the 2010 Stockholm World Water Week

UNESCO High-level Roundtable on *Qualité de l'eau, Qualité de Vie* (Water Quality, Life Quality) on World Water Day 2010 Clean Water for a Healthy World (Paris, 2010) and **'Water Splash' - water quality testing campaign** for school children as a UNESCO contribution to the UN-Water Official Event on World Water Day 2010 (Kenya, 2010)

UNESCO Seminar on Access to Water and Sanitation: Good Water Quality in Developing Countries (Mexico, 2009)

UNESCO Seminar on Safe Reuse of Wastewater at the 2009 Stockholm World Water Week

Extrabudgetary projects and activities on water quality during IHP-VII

During IHP-VII, UNESCO's work on water quality was complemented by extrabudgetary projects and activities.

As the international executing partner for Output 1.4 (pollution hotspot assessment) on the GEF project on **Integrated Natural Resource Management in the Baikal Basin Transboundary Ecosystem** (Mongolia and Russia, 2011-2014), UNESCO carried out two basin-level water quality assessments: **Water Quality of the Kharaa River Basin: Pollution Threats and Hotspots Assessment** (Mongolia) and **Water and Sanitation in Municipalities in the Selenge River Basin** (Mongolia).

UNESCO, with the support of the Korean Ministry of Environment, fostered awareness raising on water quality through the production and dissemination of the UNESCO short film ***Protecting Water Quality for Healthy People and Environment***. This film was launched at the 6th World Water Forum.

Innovative solutions to improve water quality

Innovative solutions for water and wastewater management rely to a great extent on technologies for pollution prevention and control and advanced water and wastewater treatment. In particular, the potential of nanotechnologies in water purification and wastewater treatment offers promising solutions to address water problems in developing and developed countries. UNESCO's efforts to identify and promote nanotechnologies for improved water quality and wastewater management include:

UNESCO technical meeting on Energy and Resource-Efficient Water Treatment: What Future for Nanotechnologies? at the 2014 Stockholm World Water Week

UNESCO Experts Group Meeting on Nanotechnology Applications for Clean Water: Meeting Water Challenges in Developing Countries (UNESCO Headquarters, Paris, 2013)

UNESCO-UNIDO Session on Nanotechnology Applications in Water Purification and Wastewater Treatment at the UNESCO-COMEST Conference on **Emerging Ethical Issues in Science and Technology on Nanotechnology** (Slovakia, 2013)

Water quality in the Eighth Phase of IHP (IHP-VIII, 2014-2021)

The significant achievements and effective implementation of a wide range of activities on water quality during IHP-VII have led to a high prioritization on water quality in the IHP-VIII phase, bringing water quality to the forefront of IHP priorities. Under the overarching theme **Water security: Reponses to local, regional, and global challenges**, the IHP-VIII Strategic Plan emphasizes water quality issues as one of the main themes for UNESCO's work on water during this 8-year period, designating IHP-VIII Theme 3 particularly as **Addressing water scarcity and quality**. This Theme contributes further to the 2030 Agenda and SDG Target 6.3 to *improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally*,⁸ as well as to other SDG targets related to water quality and wastewater.

Theme 3: Addressing water scarcity and quality

The planet's freshwater resources, if managed sustainably and effectively, can meet the demands of the world's growing population with good quality water. However, water quality degradation presents major challenges in securing enough water of good quality to meet human, environmental, social and economic needs to support the sustainable development of countries. Widespread water quality degradation across the world is the most serious problem, threatening human health and ecosystem integrity, but also representing a major concern for water resource sustainability. New water quality challenges such as emerging pollutants and safe wastewater reuse bring even greater concerns, needing urgent attention.

⁸ United Nations. 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development*. A/RES/70/1. sustainabledevelopment.un.org

This Theme focuses on the protection of the world's freshwater resources to reduce the impact on human well-being and the natural environment, protect water resources, prevent and reduce pollution, and enhance and restore water quality.

The objectives of the Theme include: strengthening the knowledge base on the quality of the world's water resources; improving the understanding and management of water quality; integrating quality-quantity management and science-based decision-making; enhancing legal, policy and institutional frameworks for improved water quality management; and promoting new innovative tools for water quality management and pollution control. Activities under this Theme also focus on the promotion of innovative and interdisciplinary approaches to protect the quality of water resources and address specific water quality issues, such as the improvement of scientific knowledge on emerging pollutants, promotion of scientific innovation and advanced technologies – for instance, nanotechnologies for water quality, and improved wastewater management and safe reuse.

These objectives are achieved through a wide range of activities implemented under two focal areas:

Focal Area 3.4 Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional and human capacity

Focal Area 3.5 Promoting innovative tools for safety of water supplies and controlling pollution

Focal Area 3.4: Addressing water quality and pollution issues within an IWRM framework – improving legal, policy, institutional and human capacity

This Focal Area aims at improving the understanding, knowledge and institutional and regulatory frameworks on water quality for the sustainable use of water resources. Effective water quality management in the context of Integrated Water Resources Management (IWRM) requires an enabling environment in the form of policy, legal and institutional frameworks such as instituting water pollution licensing and enforcement systems for sustainability in order to address water quality and pollution issues. The Focal Area also prioritizes strengthening human and institutional capacities to improve water quality management and pollution control.

In particular, the Focal Area aims to:

- ▶ Improve the understanding and knowledge base on the quality of water resources for human well-being and ecosystems.
- ▶ Promote state-of-the-art scientific, technological and policy solutions to support science-based decision-making and establish management priorities for improving water quality and preventing, reducing and controlling water pollution.
- ▶ Promote integrated water quality-quantity management through approaches such as safe wastewater reuse and 'fit-for-purpose' water quality management.
- ▶ Enhance legal, policy and institutional frameworks for water quality management by improving water pollution licensing and enforcement systems for sustainability, including water quality regulations, guidelines and standards, and promoting their implementation, enforcement and compliance.
- ▶ Build institutional and human capacities in water quality management and water pollution control through strengthening scientific and technical cooperation among countries.

Activities on water quality under IHP-VIII

Within the framework of the implementation of IHP-VIII Focal Area 3.4, IHP organized expert meetings and scientific conferences to strengthen the knowledge base and promote collaboration on water quality issues:

UNESCO International Symposium on Scientific, Technological and Policy Innovations for Improved Water Quality Monitoring in the Post-2015 SDGs Framework (Kyoto, 2015)

This major UNESCO event, in cooperation with Kyoto University and Lake Biwa Environmental Research Institute (LBERI) of Japan, mobilized experts and facilitated the sharing and dissemination of the state-of-the-art scientific knowledge, technologies, policy approaches and best practices to address water quality challenges at the national and global levels. It also aimed to support the implementation of the 2030 Agenda and SDG targets related to water quality. Building on the success of this event, the UNESCO International Symposium on Water Quality will be organized annually.

Seven Thematic Sessions on Enough Safe Water for All (Theme 1.1) and six Science and Technology Sessions on Resource Recovery from Water and Wastewater Management (Main Focus 2) at the 7th World Water Forum (Korea, 2015)

UNESCO promoted innovative scientific, technological and policy approaches to improve the quality of water resources, wastewater management and safe water reuse.

UNESCO Technical Sessions on Wastewater Management and Water Quality at the Fifth Africa Water Week (Senegal, 2014)

With special focus on Africa, these UNESCO-led sessions served as a multi-stakeholder platform to support African countries to address water quality and wastewater management challenges and priorities by sharing best practices and experience on monitoring, technological, economic, financing and policy responses, as well as promoting the science-policy interface for better policy-making.

Focal Area 3.5: Promoting innovative tools for safety of water supplies and controlling pollution

This Focal Area aims to develop and promote new innovative tools for water quality management and pollution control for sustainable livelihoods as well as promoting joint research on particular water quality issues and challenges through an integrated water pollution management framework. It also aims to facilitate the sharing and exchange of scientific information on water quality challenges. Meeting water quality challenges in a holistic way requires an integrated water pollution control framework to respond to complex issues, including pollution prevention at source, lack of authority to enforce and difficulty of monitoring.

Hence, this Focal Area aims to:

- ▶ Develop and promote innovative tools for water quality management and pollution control.
- ▶ Promote scientific cooperation and joint research on specific water quality issues and challenges such as improved understanding and scientific knowledge on new and emerging pollutants, water quality monitoring, risk assessment and regulations, and pollution control and attenuation.

- ▶ Promote integrated water pollution management through prevention, reduction and restoration of polluted water, improved wastewater management and effective management of impacts of land-use changes.
- ▶ Disseminate scientific knowledge and share research findings, facilitate the exchange of best practices and successful experiences in reducing pollution and restoring water quality.

UNESCO-Sida Project on Emerging Pollutants in Wastewater Reuse in Developing Countries (2014-2017)

Building on the success of IHP activities on emerging pollutants, UNESCO-IHP International Initiative on Water Quality (IIWQ) developed a project aimed at supporting UNESCO Member States to strengthen their scientific, technical and policy capacities to manage human health and environmental risks caused by emerging pollutants in water and wastewater. Consequently, the project helps countries to improve water quality and wastewater management, promote safe reuse of wastewater, and ultimately to enhance water and food security.

Activities under three main components contribute to the achievement of the project's main objective.

Component 1 – Strengthening scientific research and policy (2015-2016): At an initial stage, the project aims to strengthen scientific research and policy on emerging pollutants through the development of case studies on each geographical region together with technical and policy guidelines supported by case studies for science-based policy-making in Member States.

Component 2 – Promoting scientific exchange and collaboration (2015-2016): Furthermore, it focuses on the promotion of scientific exchange and collaboration on emerging pollutants and wastewater reuse through scientific meetings and workshops, and the establishment of a network of experts and leading institutions.

Component 3 – Capacity building and awareness raising on emerging pollutants (2016-2017): Lastly, the project aims to build capacities and raise awareness on emerging pollutants through training and the dissemination of educational and outreach materials on emerging pollutants.

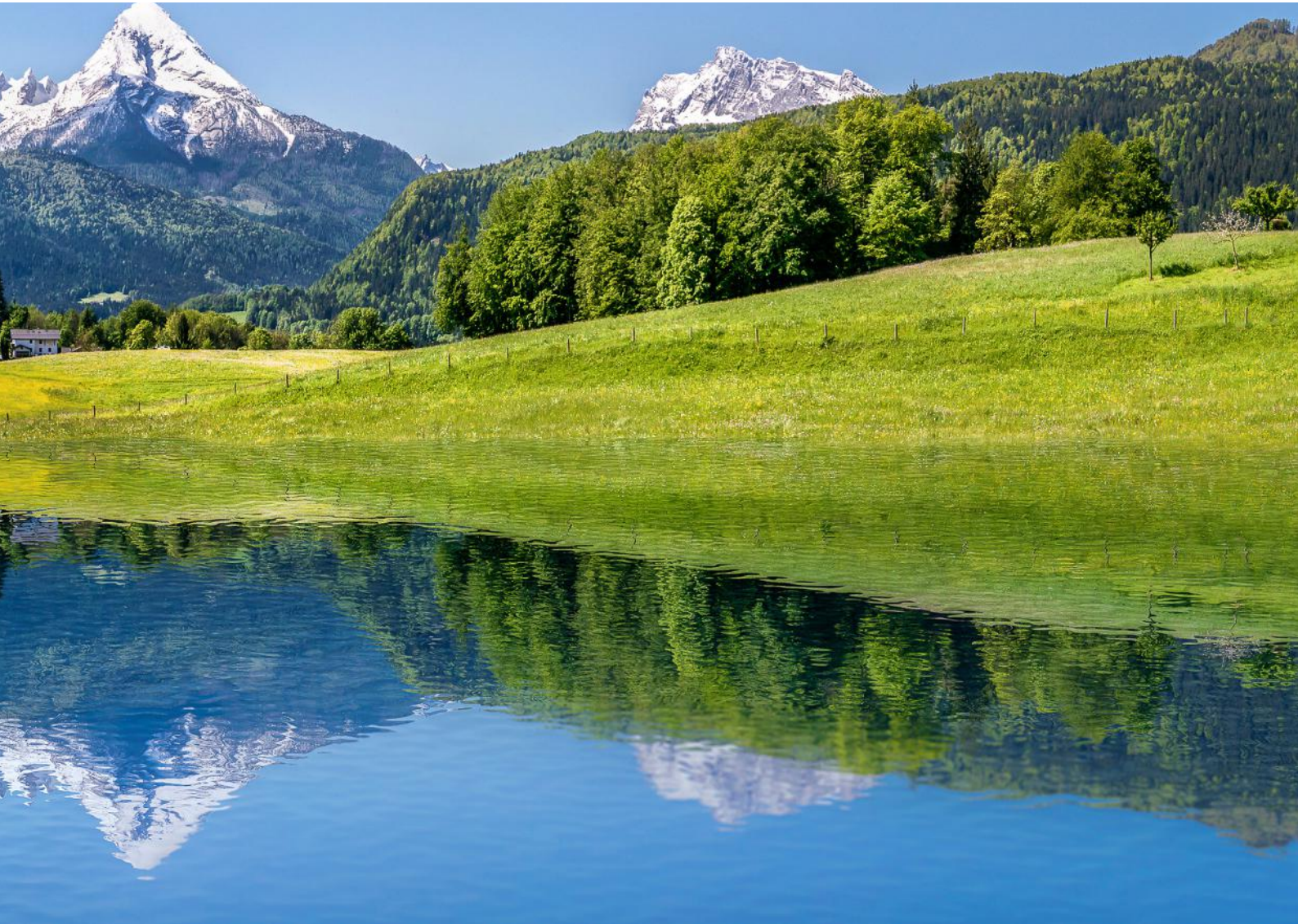
As a final point, a **Concluding International Conference** will report on the results of these activities, developing further the scientific network of experts and opportunities for development on future collaborations and partnerships.

Care studies on emerging pollutants

IIWQ has launched a series of 16 case studies on emerging pollutants, addressing issues such as hydrological modelling of the fate of emerging pollutants, potential ecological and human health risks, monitoring and regulatory frameworks, removal technologies and pollution control approaches, and related socio-economic issues. The case studies cover about 20 countries from all regions of the world, namely: Australia, Brazil, Canada, China, Ethiopia, India, Kenya, Kuwait, Mexico, Mongolia, Nigeria, Norway, Rwanda, Saint Lucia, Tanzania, Thailand, Tunisia, Ukraine and Vietnam. Some case studies have a global or international focus covering one or more regions, including the Africa, Asia, the Baltic Sea region, Caribbean islands, Europe, Latin America and North America.



UNESCO-IHP International Initiative on Water Quality (IIWQ)

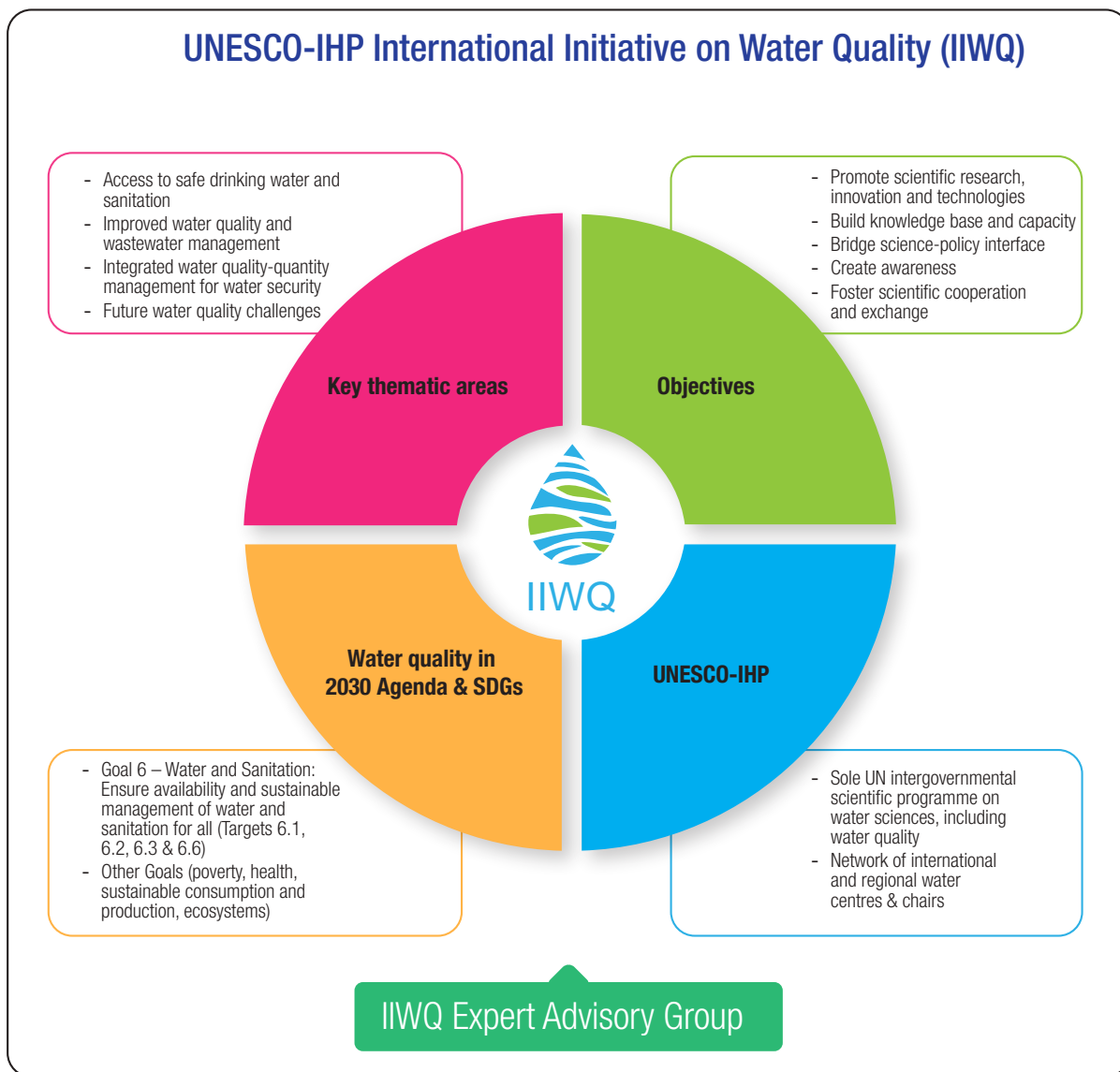


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The UNESCO-IHP **International Initiative on Water Quality (IIWQ)** supports Member States in protecting and sustainably managing the quality of freshwater resources in making progress towards the attainment of the Sustainable Development Goals by mobilizing scientific and policy-relevant expertise and knowledge sharing to address water quality challenges.

IIWQ is a programme aimed at promoting scientific collaboration to address water quality issues in a holistic manner through joint research activities, knowledge generation and dissemination, and sharing of effective solutions, technologies, policy approaches and best practices among researchers, practitioners and policy-makers as well as among other stakeholders in both developing and developed countries.

The UNESCO-IHP **International Initiative on Water Quality (IIWQ)** was established in response to the urgent need for global action to improve the quality of the world's freshwater resources and to mitigate the continuing degradation of water quality, which is posing serious threats to human health and ecosystems. It is imperative to respond to the impact of water pollution, especially in Africa and Asia, which are jeopardizing the sustainability of water resources at an alarming rate. The crucial importance of providing clean drinking water and adequate sanitation in pursuing sustainable development is increasingly evident.



The IIWQ was officially endorsed by the IHP Intergovernmental Council of UNESCO at its 20th session in 2012 (Resolution XX-4), reflecting the recommendation of the UNESCO Workshop on **Addressing Water Quality Challenges in Africa**, held in Nairobi, Kenya, in March 2011, and the UNESCO-IHP consultation meetings on water quality in other regions such as Asia and the Pacific, the Middle East, the Americas and Europe.

The Initiative is implemented in a participatory and cooperative way, characterized by activities and projects of interdisciplinary and transsectoral scopes, which focus on specific water quality issues under key thematic areas.

Key thematic areas

The IIWQ serves as an umbrella programme for UNESCO activities on water quality, addressing three key thematic areas aligned with IHP strategies and priorities.

Water quality issues are addressed with an overall aim to develop efficient and effective approaches to safeguard water quality for human well-being, environmental integrity and sustainable socio-economic development, focusing on:

- Safe drinking water and sanitation
- Water quality management
- Wastewater management and reuse

These key thematic areas contribute to global efforts on:

Ensuring access to safe drinking water and sanitation as a human right

Access to safe drinking water and sanitation is a prerequisite for poverty eradication, education, gender equality, reduction of child mortality, improved maternal health, combating against water-borne diseases and achieving environmental sustainability. These issues are inherently intertwined with water quality, as this crucial resource can also be a vehicle for diseases and its lack of access increases socio-economic inequalities. Consequently, the recognition of the human right to water and sanitation and access to safe drinking water and sanitation are essential to the realization of all human rights.

Protecting water quality for human well-being and ecosystem integrity

Water quality degradation translates directly into environmental, social and economic problems. Water pollution has an impact on biological diversity of aquatic ecosystems, on which depend the livelihoods of millions of people and a wide range of sectors from urban development to food production and the fishery industry. Improving water quality is, therefore, a prerequisite not only for the improvement of human health and well-being, but also for reducing poverty, ensuring food security and maintaining ecosystems in structure and in function.

Integrating quality-quantity management of water resources towards water security

Water pollution reduces water availability for human and ecosystem uses. This close but complex interdependence between these two aspects of water resources management – water quality and quantity – constitutes a serious threat to water security. Today, water resources pollution poses major problems, putting more pressure on available water resources to meet human uses and maintain natural ecosystems. On the contrary, reduced water quantity results in immediate changes in the state, functions and integrity of water resources and aquatic ecosystems, affecting water quality as well as economic, social and cultural activities. Hence, integrated management of quality and quantity of water resources needs to be addressed for economic and social welfare in an equitable manner without compromising the sustainability of the vital ecosystems. For instance, water pollution should be prevented by controlling the discharge of nutrients and chemicals from agricultural diffuse sources, or should be reduced by improving wastewater collection and treatment in urban and industrial areas. Furthermore, safe wastewater reuse should be promoted in order to prevent public health and environmental risks, while providing alternative water resources for productive uses such as agricultural irrigation.

Responding to future water quality challenges

In the coming years and decades, the most serious water challenges threatening the quality of the world's water resources will strongly relate to new and emerging pollutants, fast developing urban societies, expanding economies, changing climate patterns, and linkages of the water-energy-food nexus. More coordinated and comprehensive action and efforts are therefore required to help secure safe and sufficient water supplies for people and ecosystems, which are at a risk of being potentially overdrawn or tainted with increasing pollution in the near future.

Objectives

For the achievement of its main goal, IIWQ activities are entrenched within several specific objectives. These objectives focus on promoting scientific research, knowledge and effective policies, building capacities and enhancing the knowledge base on water quality, bringing together science and policy-relevant expertise, creating awareness and facilitating the sharing of best practices.

Specifically, IIWQ aims at:

Promoting scientific research, innovation and technologies

Scientific research, innovative solutions and technologies are needed to fully safeguard the quality of limited water resources against global threats and potential risks in order to secure adequate levels of supply of good quality water for human use, while preserving the hydrological, biological and chemical functions of ecosystems, as well as maintaining ecosystems and their goods and services. Advanced water treatment technologies and innovation can help respond to water quality challenges to ensure access to safe and clean water for all, restore and protect water quality, and ensure the sustainability of water resources. However, more investment is needed to improve water quality monitoring and data collection, to develop and adopt non-polluting technologies, and to foster innovation for effective water purification and wastewater treatment solutions.

Building the knowledge base and capacity

Building technical and policy capacities at the international, national and local levels are a key aspect of efficient and effective water quality management frameworks. Effective water quality management approaches specifically require proper education and capacity building to strengthen human and institutional capacities in both developing and developed countries through training of water experts, professionals, policy-makers and key stakeholders, as well as ensuring equal gender and minority groups' participation. In addition, improving the knowledge base on water quality is highly important, especially in developing countries, for its economic, social and ecological benefits. The strengthening of the knowledge base can be reached by improving academic programmes and professional career structures, and the sharing of appropriate knowledge and technologies in the field of water quality management.

Bridging the science-policy interface for science-based policies and strategies

Sustainable policies are needed to develop and implement effective solutions to meet water quality challenges. Solutions can be sustainable only if based on scientific foundations and science-based policy-making. Sound science-based policy-making can be achieved by providing policy-makers with profound knowledge and awareness on water quality problems, as well as possible responses to address these problems. In addition, intergovernmental organizations and international scientific

programmes have a special role to play in bringing different stakeholders together and bridging the science and policy gap.

Creating awareness

Public awareness and education of civil society is also fundamental to addressing water quality challenges in a holistic way. Water quality improvements largely rely on proper education of the general public and the understanding of the importance of access to safe water, improved sanitation and wastewater services, and effective water quality management. Furthermore, lifestyle and individual action can make a significant difference in protecting water quality and the ecosystems. Some significant examples include: avoiding the use of hazardous household products, pesticides and hazardous substances in gardens; refraining from using polluting household and recreational tools such as power boats; and leaking oil, gasoline and solvents into water resources, among others. Creating and raising awareness at all levels needs global and local action to promote such programmes, with particular emphasis on public participatory techniques, including the enhancement of the role of women, youth, indigenous people and local communities. For this purpose, technical and non-technical skills in water management must be developed not only by water authorities and professionals, but also by governmental and non-governmental organizations, private institutions, and other actors in sectors not related to water.

Fostering scientific cooperation and exchange

Water quality problems need solutions at different levels, systems and areas. Yet, widespread water quality degradation needs solutions on a global scale through international and regional scientific collaboration based on knowledge exchange, scientific dissemination and sharing of technology and innovation. Notably, knowledge exchange and scientific cooperation must suit the demands of developing countries to provide them with appropriate solutions, technologies and policy responses to address critical water quality issues.

IIWQ Expert Advisory Group

The IIWQ Expert Advisory Group was established with the aim of providing state-of-the-art technical and expert advice on water quality challenges and priorities, as well as on future directions of IIWQ, and to facilitate scientific exchange and promote collaboration in this area to support IIWQ activities. In addition, it also aims to support countries in the implementation of the 2030 Agenda SDG targets on water quality and wastewater.

The Expert Advisory Group brings together water quality specialists from a variety of governmental and non-governmental organizations, research institutions and academia from different global regions. The first meeting of the IIWQ Expert Advisory Group was held in Kyoto in July 2015, which brought together over 20 water quality experts and specialists from all regions of the world.

IIWQ Regional Consultation Meetings and Scientific Workshops on Water Quality

Under IIWQ, UNESCO organized regional consultation meetings on water quality in all regions of the world. These meetings and workshops served as a milestone to assess key priorities and challenges on water quality under the framework of the 2030 Agenda and SDGs.

UNESCO Regional Consultation Meeting on Water Quality in Europe: Challenges and Best Practices (Koblenz, Germany, 2015)

The meeting focused on water quality issues in Europe, including western, central and eastern European regions, from a strategic perspective to identify key issues and challenges and to exchange and promote best practices on solving water quality problems through the sharing of state-of-the-art technological solutions, policy approaches and successful case studies.

UNESCO Regional Workshop on Water Quality in the Americas (Irvine, United States, 2015)

This workshop was dedicated to the most important water quality issues in the Americas, such as the growing water quality degradation, natural contamination of water resources and water pollution from mining, proposing important water quality management solutions to improve the present state of water resources in the region.

UNESCO International Workshop on Water Pollution Prevention and Control Strategies towards Sustainable Water Resources Management in the Middle East (Tehran, Islamic Republic of Iran, 2011)

This international workshop focused on water quality and water pollution concerns in the Middle Eastern and Central Asian countries. The workshop aimed to evaluate water quality trends in major surface water and groundwater resources, identifying relationships between water quality, water pollution and environmental, health and socio-economic issues. It also contributed to the sharing of experiences and success stories as well as lessons learned on water quality management and pollution control.

UNESCO International Symposium on Addressing Water Quality Challenges in Asia-Pacific (Daejeon, Republic of Korea, 2011)

This symposium brought together high-level government officials, water experts and researchers from the Asia and Pacific region to discuss scientific, technological and policy solutions to the region's critical problems of water quality degradation and its impact on human health, the environment and economic development. It also discussed water quality issues in different socio-economic contexts of the Asia and Pacific nations and their specific problems and differences in economic development levels.

UNESCO Workshop on Addressing Water Quality Challenges in Africa (Nairobi, Kenya, 2011)

This workshop – the first of the UNESCO regional consultation meetings on water quality – was a milestone event, which served as the foundation for the establishment of IIWQ as a major UNESCO programme on water quality. It focused on the urgent need to address water quality challenges in Africa for effective water resources management and sustainable development of the region. Issues addressed included the current situation of water quality, water pollution problems and their root causes, and the impacts of global changes such as urbanization, population growth and climate change on the quality of surface water and groundwater resources of Africa. Moreover, it concluded with a set of recommendations for approaches, policies and strategies for integrated water quality management towards ensuring the sustainability of Africa's water resources and human well-being.

UNESCO contribution to UN-Water on water quality

UNESCO, through its **International Initiative on Water Quality**, actively contributes to global and United Nations efforts on water quality, by playing a leading role in the mobilization and strengthening of scientific knowledge and expertise.

UNESCO is an active member of the following UN-Water work in the area of water quality:

UN-Water Thematic Priority Area on Water Quality

UN-Water Taskforce on Wastewater Management

UN-Water Thematic Priority Area on Water Supply and Basic Sanitation

UNESCO's work on water quality remains strongly relevant to the United Nations system-wide priorities, through synergies and joint efforts with other United Nations agencies and programmes.

Furthermore, IIWQ activities directly contribute to global efforts on water quality by supporting Member States in their endeavours towards attaining the global time-bound goals, targets and action, agreed by the international community, particularly those contained in the 2030 Agenda and Sustainable Development Goals, through the facilitation of scientific cooperation, knowledge dissemination, and the promotion of sustainable solutions, technologies and policy approaches to improve water quality management.



