



Microplastics in freshwater environments

Assessment by UNESCO-IHP International Initiative on Water Quality

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UNESCO

Division of Water Sciences - International Hydrological Programme

Improving water quality to achieve the SDGs



Ensure availability and sustainable management of water and sanitation for all

SDG 6 – Water

Target 6.3

... improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials...



Ensure sustainable consumption and production patterns

SDG 12 – Production & Consumption

Target 12.4

... significantly reduce release of chemicals to air, water and soil in order to minimize their adverse impacts on human health and environment



Ensure healthy lives and promote well-being for all at all ages

SDG 3 - Health

Target 3.3 ... combat water-borne diseases...

Target 3.9 ... reduce deaths and illnesses from hazardous chemicals, air, water and soil pollution



Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss



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Water quality degradation

A global challenge for sustainable development

- Globally over **80% of all wastewater is discharged without treatment** into freshwater and marine water bodies
- **Emerging pollutants represent a new challenge**, with still unknown potential (long-term) impacts on human health and ecosystems
- The **freshwater pollution** is affecting negatively coastal waters and ecosystems. **8 million tons of plastic enter the ocean from land-based sources every year.**
- **Nutrient loads from unmanaged agricultural runoff** and inadequate wastewater treatment cause eutrophication of lakes and spread of dead zones in coastal waters.

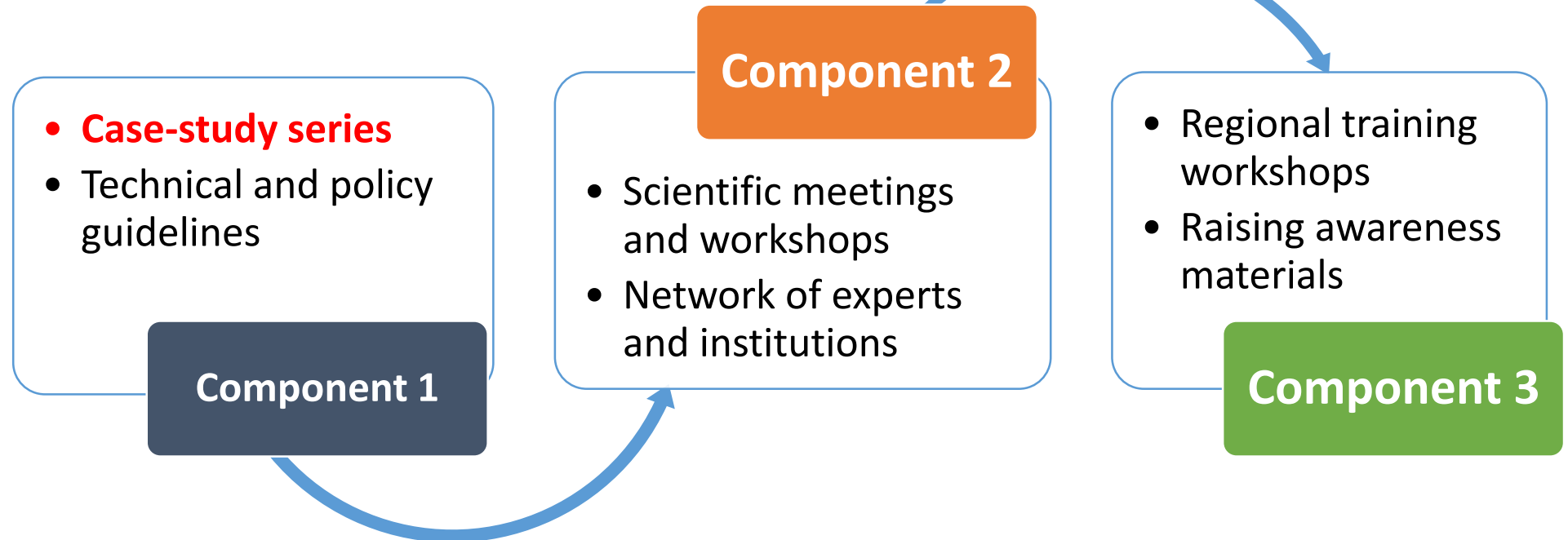


UNESCO-IHP IIWQ Project on Emerging Pollutants

Strengthening knowledge generation, scientific research and policy

Promoting scientific exchange and collaboration

Capacity building and awareness raising



A flagship project under the International Initiative on Water Quality (IIWQ) of UNESCO-IHP
Funded by Sweden

An underwater photograph showing various pieces of plastic waste floating in clear blue water. The waste includes a white plastic bag, a blue plastic bag, a clear plastic bottle, and some green leaves. The scene is illuminated from above, creating ripples on the water's surface.

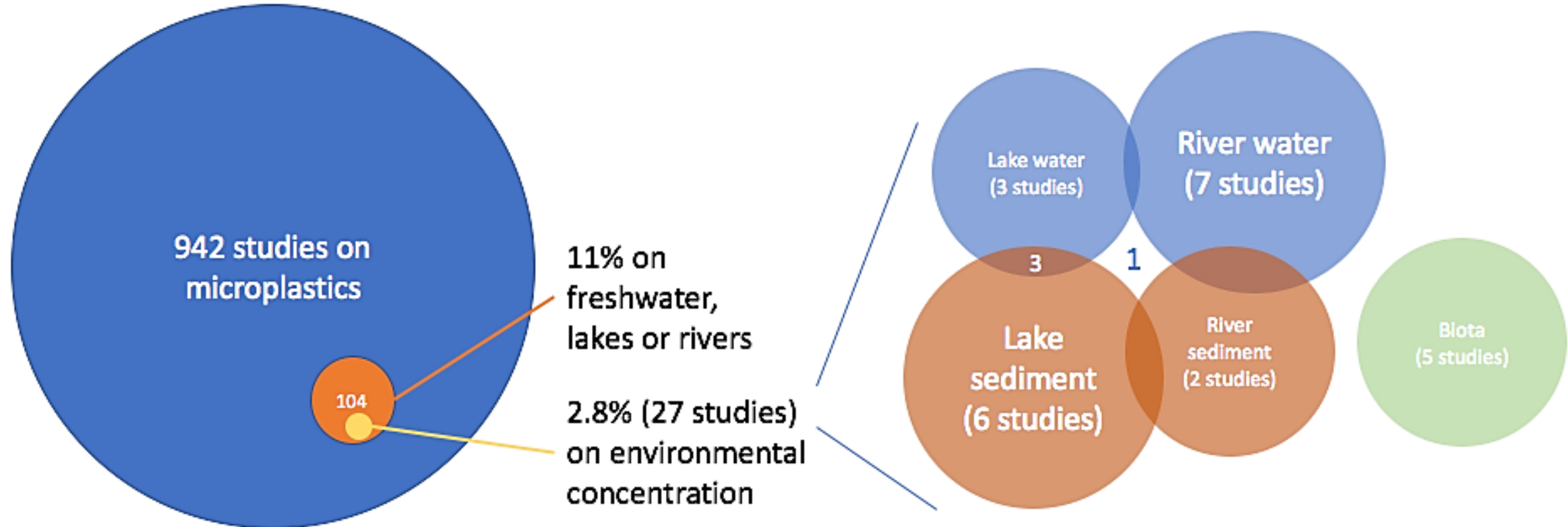
Microplastics in freshwater

What we know so far?

A preliminary assessment by

UNESCO-IHP International Initiative on Water Quality

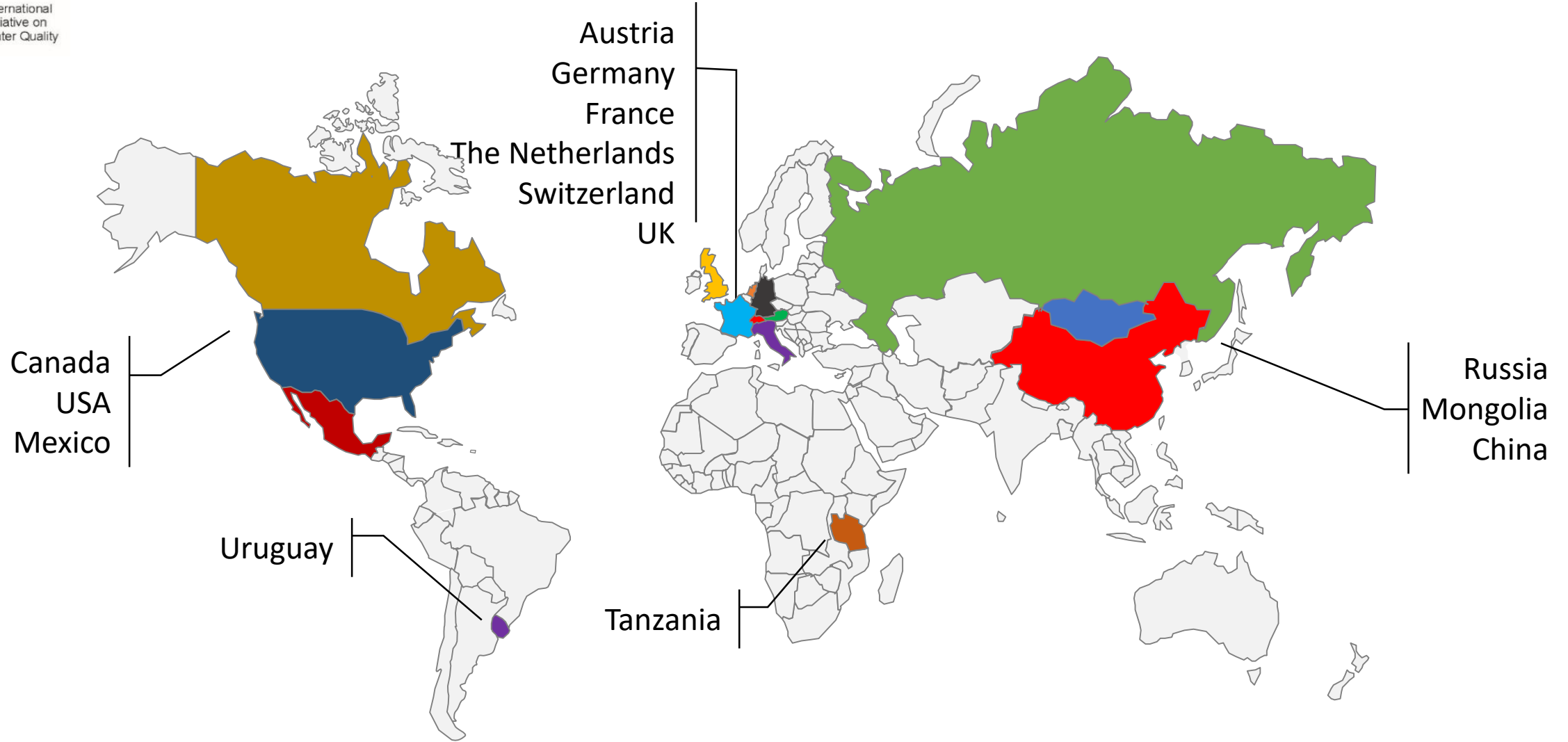
(lack of) Research data on microplastics in freshwater



*Based on findings of UNESCO International Initiative on Water Quality (IIWQ)
Case Study on Microplastics in Freshwater Environments*



Microplastics in freshwater environments



Microplastics in freshwater are reported in 27 research studies in 15 countries in 5 continents

Microplastics in lakes (water and sediment)

- **Great Lakes - Canada/USA**
 - Lake Huron (sediment) – industrial pellets comprised 94% of plastic debris
 - Lake Ontario (water) – mainly industrial pellets; Humber River is one of main pathways
 - Laurentian Great Lakes – mainly microbeads
- **European lakes**
 - Lakes and surface waters of Switzerland (Geneva, Constance, Neuchatel, Maggiore, Zurich and Brienz)
 - Lake Garda in Italy
- **Lake Khuvsgul – Mongolia**
 - Mainly household plastics (lack of solid waste management)
- **Chinese lakes - Lake Taihu & Lake Siling**



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Microplastics in rivers

- **European rivers**

- Rhine, Jade, Mosel, Necker, Main – Germany (high inputs of industrial pellets)
- Danube – Austria
- Seine – France (mainly fibers; also high levels of fibers in wastewater)
- Thames – UK (all types)
- Po – Italy
- Dalalven - Sweden

- **Rivers in US**

- Chicago, Illinois, two rivers in Southern California (microbeads / multicoloured spheres – from cosmetic products)

- **Yangtse River – China**

- High densities of microplastics (fibers, granules and films)
- Accumulation of microplastics behind the Three Gorges Dam

Microplastics in wastewater

- **The Netherlands**

- Micro plastics found in effluents from a wastewater treatment plant (treated wastewater) with concentrations of 9 to 91 particles per litre
- Mainly from consumer products (fibres, spheres and fragments)

- **Russia**

- 1-day sampling in the influent and effluent of the wastewater treatment plant in Saint Petersburg
- Microplastics are significantly removed (fibres captures in the sludge)

- **France**

- Fibres found in wastewater

Microplastics in freshwater biota

- **Mollusks**

- Microplastics found in the tissue of commercial bivalves from a Chinese fishery industry
- Highest concentrations in the ark shell *Scapharca subcrenata*



- **Freshwater fish**

- Microplastics (polymer fibres and pellets) found in the digestive tract of 12% of *Gudgeon* collected from 11 streams in France
- Microplastics in 20% of *Nile Perch* and *Nile Tilapia* in Lake Victoria (Tanzania)
- Microplastics in the digestive tract of 8 species of fish in outer Rio de Plata (Uruguay)



- **Marine biota – Gulf of Mexico**

- Microplastics found in 8% of freshwater fishes (5% in non-urbanized streams and 29% in urbanized streams)
- Microplastics found in 10% of marine fishes



Microplastics in freshwater

What needs to be done?

More research and data on:

- Occurrence and concentrations in freshwater environments
- Pathways, transport and accumulation in the environment
- Potential ecological and health risks & effects on biota

Scientific cooperation

- Research in developing regions – Africa, Asia and Latin America
- Sharing of scientific knowledge and information
- Enhancing the capacity researchers and research institutions

Awareness raising

- Raising awareness of the public (responsible consumption)
- Engaging industries for stewardship and voluntary action (responsible production)
- Informing policy-makers



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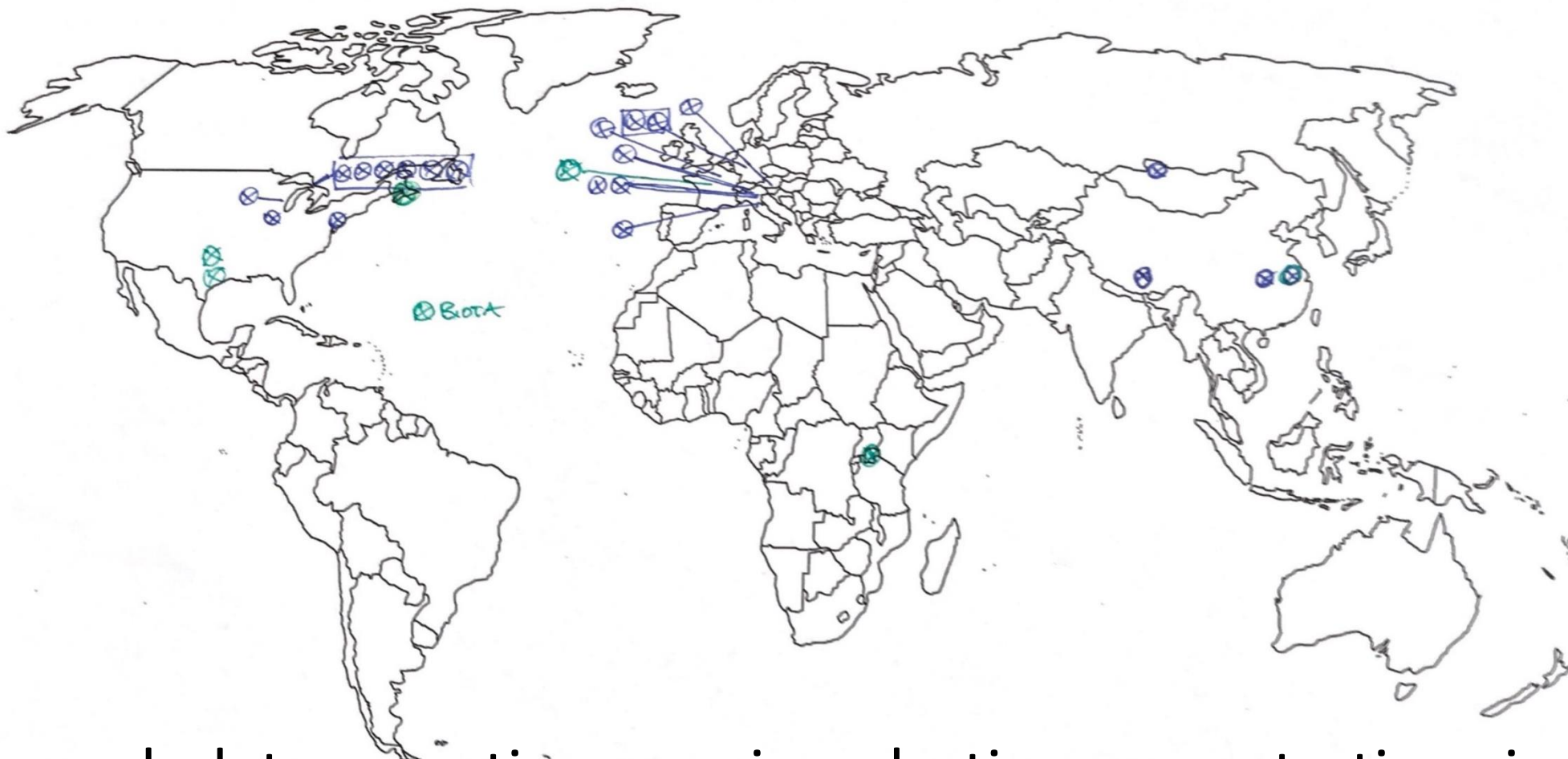
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Microplastics in freshwater

Availability of research and data

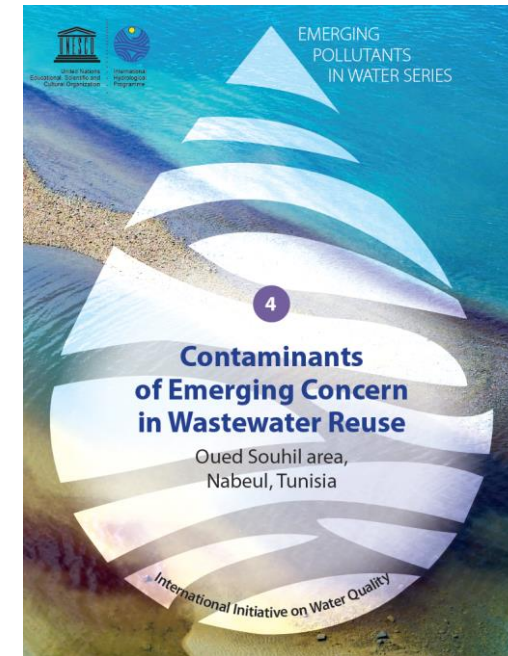


Research data reporting on microplastics concentrations in North America and Europe represent 82% of all studies



UNESCO Emerging Pollutants in Water Series

Microplastics in freshwater environments



and others

<http://en.unesco.org/emergingpollutants/strengthening-scientific-research-and-policy/case-studies>



UNESCO

International Initiative on Water Quality - IIWQ



International Initiative on Water Quality - IIWQ

Unique international initiative aims to address water quality issues in a holistic manner towards ensuring water security for sustainable development:

- Promoting research and scientific cooperation
- Facilitating knowledge generation and dissemination
- Promoting effective technological solutions, science-based policy-making, innovative approaches and best practices

IIWQ implements activities and projects of interdisciplinary and trans-sectoral scopes, focusing on specific water quality and wastewater issues

- in a participatory and cooperative manner, engaging researchers, water professionals, and policy-makers, as well as other stakeholders (NGOs, the private sector, the general public)
- in both developing and developed countries

IIWQ was established by the endorsement of the UNESCO IHP Intergovernmental Council in its 20th session in 2012.

UNESCO-IHP International Initiative on Water Quality (IIWQ)

Key thematic areas:

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

- Access to safe drinking water and sanitation
- Improved water quality and wastewater management
- Integrated water quality-quantity management for water security
- Future water quality challenges

Key thematic areas

- Promote scientific research, innovation and technologies
- Build knowledge base and capacity
- Bridge science-policy interface
- Create awareness
- Foster scientific cooperation and exchange

Objectives

Water quality in 2030 Agenda & SDGs

- Goal 6 – Water and Sanitation: Ensure availability and sustainable management of water and sanitation for all (Targets 6.1, 6.2, 6.3 & 6.6)
- Other Goals (poverty, health, sustainable consumption and production, ecosystems)

UNESCO-IHP

- Sole UN intergovernmental scientific programme on water sciences, including water quality
- Network of international and regional water centres & chairs

IIWQ Expert Advisory Group

Objectives:

- Promoting scientific research, innovation and technologies
- Building the knowledge base and capacity
- Bridging the science-policy interface
- Creating awareness
- Fostering scientific cooperation and exchange

IIWQ Expert Advisory Group

A network of experts and specialists on water quality and in other areas related water quality, representing governmental and non-governmental organizations, research institutions and the academia from different regions.

The IIWQ Expert Advisory Group aims to:

- Provide **state-of-the-art technical and expert advice** on water quality challenges, priorities, and emerging issues, as well as on future directions of IIWQ
- Facilitate **scientific exchange and promote collaboration** to support IIWQ activities

International Initiative on Water Quality

Partners

- **A large network of experts** in fields related to water quality, wastewater and other specialized areas with strong links to water quality
- **An expanding network of collaborative research institutions and governmental organizations** in both developing and developed countries
- **Strategic collaboration with UN, intergovernmental and international organizations**
 - **OECD, UNEP, HELCOM etc.**
- **Active in all regions:** Africa, Asia, Arab States, Europe, Latin America and the Caribbean, North America.

For more information:

<http://en.unesco.org/waterquality-IIWQ>

<http://en.unesco.org/emergingpollutants>

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International Initiative on Water Quality (IIWQ)

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.

UNESCO resource scientific

The Inter scientific knowledge and best both dev

Managing the quality of freshwater development Goals by mobilizing er quality challenges.

Programme aimed at promoting ough joint research activities, echnologies, policy approaches ill as among other stakeholders in

IIWQ UNESCO

The global water quality challenge & SDGs

What is IIWQ?

IIWQ Activities and Projects

IIWQ Regional Consultations and Symposium Series

Partners

International Initiative on Water Quality

PROMOTING SCIENTIFIC RESEARCH, KNOWLEDGE SHARING, EFFECTIVE TECHNOLOGY AND POLICY APPROACHES TO IMPROVE WATER QUALITY FOR SUSTAINABLE DEVELOPMENT

UNESCO Project

Emerging Pollutants in Wastewater Reuse in Developing Countries

Implemented under UNESCO-IHP International Initiative on Water Quality (IIWQ)

Funded by the Swedish International Development Cooperation Agency (Sida)

2014-2017

Division of Water Sciences International Hydrological Programme

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Emerging Pollutants in Water and Wastewater

Emerging pollutants present a new global water quality challenge with potentially-serious threats to and ecosystems. Good quality water is essential to sustain human well-being, livelihoods and environment for the post-2015 sustainable development.

plemented under **UNESCO-IHP International Initiative on Water Quality (IIWQ)**, aims to ent need and support UNESCO Member States to strengthen their scientific, technical and s to manage human health and environmental risks caused by emerging pollutants in water . Consequently, the strengthening of these capacities of Member States will help improve d wastewater management, including safe reuse of wastewater, and enhance water and

Emerging Pollutants in Water and Wastewater

Strengthening Scientific Research and Policy (2015-2016)

Thank you !



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International Initiative on Water Quality (IIWQ)

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