IGU UGI International Geographical Union
Union Géographique Internationale

Commission for Water Sustainability

Newsletter No. 23[1]

December 2023

Frank Winde

[1] This newsletter was compiled without consulting ChatGPT or any other AI tool ;-)

Contents

1 Introductory remarks

While the Commission did not hold a dedicated annual meeting this year, we were involved in actively preparing for and contributing to the first Water Conference on UN-level in over 40 years as part of the International Science Council. Details are provided in section 2 of this newsletter.

Generally, it appears that interactions among members within the Commission have not yet reached again the levels achieved prior to Corona and the Ukraine crisis, which both adversely affected the scientific exchange. While travel restrictions due to the global pandemic resulted in an upswing of alternative meeting formats such as video-conferencing that partly compensated for the lack of physical meetings, sanctions and inflation following the Ukraine crisis seem to have subsequently hampered the recovery to former strength like low attendance rates of the last IGC in Paris suggest, where very few members of our Commission were present. At the same time, interest in joining our commission is ongoing as a number of newly received requests for membership during the past year illustrate.

As the UN Water Conference finally gave water the prominence on the international science agenda it deserves, we as the only Commission within IGU dedicated to water, now have an opportunity to increase our visibility and draw even more attention to our research. The upcoming 35th IGC in Dublin next year August will be an opportunity to do so, which we should not miss. I therefore call on all members to consider submitting abstracts to one of the sessions of our Commission.

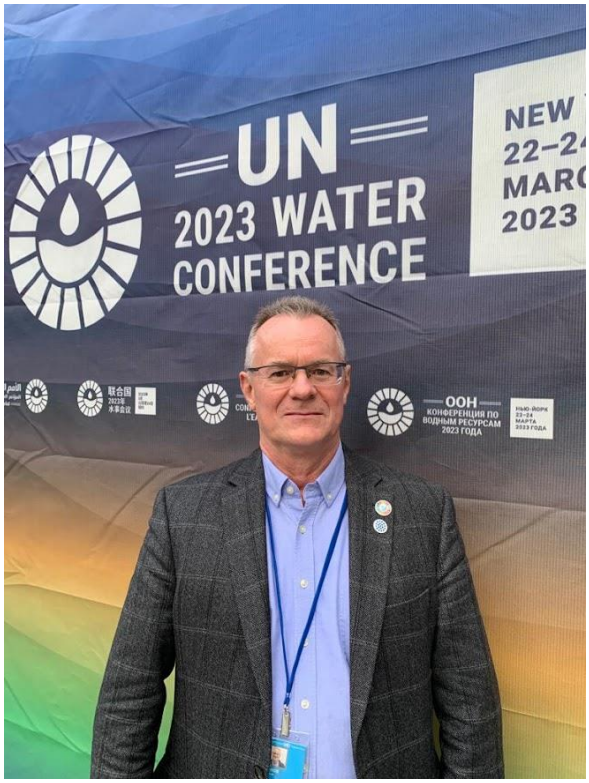
2 Our Commission at the UN 2023 Water Conference

In October 2022 IGU president Mike Meadows and myself were contacted by the International Science Council (ISC) to kindly please assist with preparing the UN Water Conference to be held at the UN-Headquarters in New York in March 2023. In consultation with prof. Meadows, it was agreed that I would represent IGU to assist the IGC with preparations of the upcoming Water Conference. In a first step, this involved to participate in a Stakeholder Consultation meeting and round table discussion taking place on 24 October at the UN HQ for which a short oral statement had to be drafted and delivered. The talking points were drafted by myself and agreed with ISC prior the consultation and are attached to this newsletter. The ISC was represented by Frank Winde (FW) and Mr Anthony Bud Rock (ABR) as appointed ISC-contact at the United Nations, both making contributions to their respective stakeholder groups and round table discussions. While ABR provided input into the Theme 1: Governance, FW spoke during discussions on Theme 2: Capacity Building. All oral statements were recorded and are available online at the streaming channel of the UN television network (Stakeholder consultation: Roundtable on Capacity Development - Preparatory Meeting of the UN 2023 Water Conference | UN Web TV). Owing to the strictly enforced time limit of 2-minutes, the written version had to be shortened on the spot and delivered as free speech by FW while the written statement was submitted to the organisers.

After the preparatory meeting, FW recommended to ISC to appoint of group of water experts from its ranks to jointly prepare an impactful contribution to the Water Conference in March 2023. In this context, Frank sent out an email to all members enquiring about possible activities and interest relating to the UN Water Conference. The ISC subsequently issued a global call to its member organisations for identifying suitable experts (Appendix 1). Subsequently 38 water scientists from some 26 countries were assembled within the ISC Expert Group on Water (ISC-Talent-book_UN-Water-Conference.pdf (council.science)) to discuss what later became the Water Policy Brief of the ISC. Gathering inputs during several web meetings FW finally was tasked to consolidate the input and draft the Water Policy Brief.

The final version of the Policy Brief can be found here: UN 2023 Water Conference: ISC Policy Brief - International Science Council.

The associated statement was submitted to the conference during the Interactive Dialogue 2: Water for Sustainable Development: Valuing Water, Water-Energy-Food Nexus and Sustainable Economic and Urban Development; at Wed. 22 March 2023, 15:00-18:00 in Conference Room 4, UNHQ, New York (Interactive Dialogue - Water for Sustainable Development: Valuing Water, Water-Energy-Food Nexus and Sustainable Economic and Urban Development | Department of Economic and Social Affairs (un.org); https://media.un.org/en/asset/k1r/k1rtlntndp).



Prof. F. Winde at the UN-Water Conference (Photo: James Waddel, ISC)

As the first UN-Water conference open to global stakeholders in nearly 50 years the gathering attracted 6600 on site participants from 150 countries. As biggest scientific umbrella organisation worldwide, the ISC represents more than 230 international scientific unions, national science academies and other scientific bodies of the natural and social sciences. Given the above, the representation of the Commission at this prestigious event advertised geographical water research as a relevant endeavour of global significance. It is hoped that the momentum created will invigorate activities within the Commission and further geographical water research on international scale.

3 Status report and activities of the Commission

The Commission continued to grow in 2023 through unsolicited application for membership that were approved after applicants filled in the template outlining their research profiles. The latter proved to be an important tool for us keeping track of focal areas and key interest of members and detect trends, some of which were outlined in the presentation on 30 years of IGU Water Commission given at the IGC in Paris in 2022 circulated along with the last newsletter. As of 13 December 2023, the Commission has 64 registered members from 26 countries on five continents with the majority coming from Europe (10 countries) followed by Austral-Asia (7x), Africa (4x) and the Americas (4). About a third of our members are female with the overwhelming majority of 85% being academics and 15% practitioners.

The Annual Report 2023 was submitted timely to IGU Exco and circulated among members. The report refers, among others, to activities of the Commission in terms of meetings organised and projects conducted. Unfortunately, already submitted contributions of our commission to a planned IGU-coordinate book project were eventually not considered due to miscommunication.

Owing to limited resources, the updating of the website is lagging behind for quite some time. We are aware of this and try to improve this as soon as possible. A major challenge in this regard is the fact that the entire administrative load associated with running the Commission for some years now is nearly exclusively left to the chair. The sharing of responsibilities among SC-members as indicated in the annual reports on the structure of the SC did, unfortunately, not materialise to date. In fact, even if input is specifically requested to support decision making within the Commission there is little, if any, response from the majority of the current SC-members. This is very different for the two deputy chairs, proffs. Zaharia and Karthe, as well as proffs. Jones and Frolova as honorary members, who provided unfailing and stern support to the chair on many occasions. I also wish to thank Wismut GmbH for allowing me to attend to the duties pertaining to the position of Chair of the Commission.

4 Outlook 2024

The Commission's focus of the coming year clearly is the 35th International Geographical Congress taking place in Dublin (Ireland) from 24 to 30 August for which our Commission submitted the following sessions that were tentatively approved pending sufficiently high numbers of relevant abstracts:

(1) Clean water and sanitation for all – opportunities and challenges to still achieve SDG 6 by 2030

(2) Urban water crises – the new normal?

(3) Emerging water issues – anticipating research and new solutions

(4) Advances in hydrological methodology and water management

(5) Wetlands: Changing landforms under changing environmental and climatic conditions

In addition to the above, there are also sessions the LOC decided to allocate to our commission even though they were submitted by non-Commission members, which resulted in some degree of overlap with the themes proposed by us. This refers to the following sessions:

(6) PFAS in the freshwater environment: occurrence, pathways and monitoring

(7) Geographies of rivers and floodplains

(8) Water resources management and planning

I am looking forward to meeting many of you in Dublin next year and wish you and your families a merry festive season and a good start into a hopefully more peaceful and prosperous New Year.

With best regards,

Frank Winde

Chemnitz, December 2023

Appendix 1:

Statement for roundtable discussion of the UN 2023 Water Conference preparatory meeting on capacity building, UN-HQ, New York, 24 Oct. 2022

Stakeholder Consultation on UN 2023 Water Conference
Roundtable discussion, **24 Oct. 2022**
UN-Headquarters, New York City, in-person meeting

Talking points F. Winde (ISC representative, Chair: IGU Commission for Water Sustainability)**,** 3-minute statement (drafted: 20.10.2022)

Key messages:

(1) **Societal water issues** are inherently **complex** often involving a multitude of role players with diverting or even competing interests that span across physio-chemical, social, economic, psychological, medical, religious, cultural and legal aspects of water

(2) With its proven competence in handling complexity **science** is **best suited** to disentangle complex water issues and provide unbiased, evidence-based advice to **improve the fact base and credibility of political decision making.**

(3) In doing so, a more **holistic approach** is still required that better integrates the different angles of water-related disciplines from **natural as well as social sciences** to improve responses to societal needs

(4) Comprising over 200 natural and social science bodies from around the world the International Science Council (**ISC**) is uniquely positioned to coordinate and **facilitate water science** across disciplinary boundaries on a global level building on its longstanding experiences as a scientific advisory body to the UN..

(5) In line with the credo of UN-2023 Water Conference the scientific focus needs to be on action-oriented **innovative and game-changing solutions** to practical problems on the ground, especially in areas where cause-effect relations are already well understood like e. g. the link between water quality, health and sanitation. But even here, impacts of gradually rising water temperatures on the proliferation of bacteria and viruses and related waterborne diseases may need more attention in future.

(6) While water sciences made significant progress over the past decades including introducing new paradigms like the nexus approach, the water footprint, ecohydrology and the virtual water concept, **the field still needs conceptual advances and theoretical innovation** to address emerging challenges.

(7) These include, inter alia, the **growing severity of hydrological extremes** such as floods and droughts as some of the most direct and drastic expressions of climate change necessitating a stronger focus on mitigation, adaptation, resilience as well as water education and capacity building.

(8) In addition, emerging global trends such as the green energy transition, e-mobility and large-scale digitalization and the associated **drastic rise in demand for mined metals and minerals** significantly impact – directly and indirectly - on already scarce water resources especially in the global South where most minerals come from. The current nexus concept of water may thus need to be expanded from energy and food to also include mineral resources.

(9) Additional research needs such as applying natural capital accounting to water may be identified by a dedicated **gap analysis** coordinated by the ISC drawing on the vast expertise of its members.

Appendix 2:

ISC Call for Experts UN Water Conference (source: website of Royal Academy of New Zealand), Dec. 2022

UN Water Conference - Call for experts (royalsociety.org.nz)

News
Published 1 December 2022

UN Water Conference - Call for experts

The United Nations Water Conference will take place from 22-24 March 2023.
The conference will be organised around plenaries and interactive dialogues on 5 themes:

1. *Water for Health*: Access to WASH, including the Human Rights to Safe Drinking Water and Sanitation.
2. *Water for Sustainable Development*: Valuing Water, Water-Energy-Food Nexus and Sustainable Economic and Urban Development.
3. *Water for Climate*, Resilience and Environment: Source to Sea, Biodiversity, Climate, Resilience and Disaster Risk Reduction.
4. *Water for Cooperation*: Transboundary and International Water Cooperation, Cross Sectoral Cooperation, including Scientific Cooperation, and Water Across the 2030 Agenda.
5. *Water Action Decade*: Accelerating the Implementation of the Objectives of the Decade, Including through the UN Secretary-General's Action Plan.

The United Nations Water Conference 2023 is set to gather momentum to achieve the internationally agreed water-related goals and targets and will review progress on the implementation of the objectives of the International Decade for Action "Water for Sustainable Development" (2018–2028).
The ISC is seeking your nominations of experts to form a group of around 10 individuals to support the development of an ISC white paper addressing the conference themes. In addition, experts may also be invited to make contributions to the preparatory process of the conference upon request by the United Nations.

Please nominate relevant experts by 16 December.
More information https://council.science/members/membership-notice-board/call-experts-un-2023-water-conference/
To be considered for nomination please complete the this **nomination form**[DOCX 24.26 kb]. Nominations must be submitted to International.Unions@royalsociety.org.nz by 5:00pm **Monday 12 December**.
The Society's Academy Executive Committee will ratify the Nominations, ahead of nominations being endorsed by Royal Society Te Apārangi and submitted to ISC by the deadline.
Please note: Nominations **must** be endorsed and submitted by Royal Society Te Apārangi as the ISC member.
Source: Royal Society Te Apārangi

Appendix 3:

ISC Statement Interactive Dialogue 2, UN Water Conference, UN-HQ, New York, 22 Mar 2023

INTERNATIONAL SCIENCE COUNCIL

Interactive Dialogue 2: Water for Sustainable Development: Valuing Water, Water-Energy-Food Nexus and Sustainable Economic and Urban Development Wed. 22 March 2023, 15:00-18:00, Conference Room 4, UNHQ, New York

Presenter: Dr. habil. **Frank Winde**

Spoken version may vary from written version

1. As Chair of the IGU Commission for Water Sustainability I am presenting the following statement on behalf of the International Science Council (ISC):

2. As a global umbrella organization with a broad-based membership of over 230 National Science Academies and international unions of the natural and social sciences, the ISC offers evidence-based scientific guidance to address obstacles still hindering progress on crucial water issues.

3. Given the increasing competition for water and the urgency to meet water goals, we need to avoid partial solutions to complex problems. To do that, science that is independent, open and transparent has a key role to play to provide a robust basis for collaboration and joint action.

4. To prioritize scientific input and achieve tangible improvements on the ground the ISC grouped the large number of water challenges into four categories ranging from applying known solutions to long-standing problems like the lack of access to safe water, to the need for new responses to address rapid changes and emerging water issues.

5. For this interactive dialogue, the ISC stresses the need to reconcile the usage of limited water resources with economic and social development to achieve a truly sustainable water use. Related focal areas include inter alia:

- rapid and uncontrolled urbanization leaving millions of vulnerable dwellers exposed to flood, drought and pollution while burdening health systems and harming economies
- redesign the trade of embedded water to stop exacerbating water-stress in exporting regions
- address potentially perilous shifts within the Water-Energy-Food nexus associated with the global green energy transition: as electric cars, wind- and solar parks require significant more metals and minerals per output than their technological predecessors and most high-grade mineral deposits already being depleted, the transformation towards low-carbon economies will require a significant expansion of an increasingly water- and energy intensive extraction of minerals that is likely to exacerbate the fierce competition for natural resources in water-stressed areas of the global South where most of the global mining takes place

6. The ISC is committed to provide comprehensive, holistic and geographically diverse expertise to support the UN and countries to achieve all water-related SDGs.

Appendix 4:

Abstracts of sessions of the Commission at the IGC Dublin 2024

'Clean water and sanitation for all' – Opportunities and challenges to still achieve SDG 6 by 2030

Chairs: Frank Winde (Wismut GmbH, Germany; North-West University, Potchefstroom, South Africa), Daniel Karthe (UN University, Dresden, Germany)

Abstract: This session mainly relates to water issues of Categories I and II of the ISC Water Policy Brief and addresses long known and persistent problems such as lack of access to safe water and adequate sanitation facilities still prevalent in many parts of the world. However, the underlying causes often differ significantly. While arid regions suffer from a natural shortage of available water (termed 'physical water scarcity'), scarcity of water also occurs in water-rich countries in tropical high-rainfall regions. I.e., differentiated approaches are needed to address the lack of safe water depending on the underlying causes.
This session explores causes, consequences, challenges and solutions around the following themes:

1. Physical water scarcity under changing climatic conditions: who wins, who loses?
    - regional net-effects of global warming on the climatic water balance
    - frequency, timing, intensity of precipitation
2. Tapping into new resources: high-tech vs. low-tech approaches
    - desalinating sea water
    - towing of icebergs
    - harvesting atmospheric water vapour, new technologies, fog-harvesting
    - enhanced groundwater exploration
    - runoff storage through artificial recharge; rainwater harvesting, grey water use, underground water storage
3. Other coping strategies
    - reduce/ manage demand
    - water saving and conservation
    - increase water use efficiency
    - curb water losses from reticulation systems
    - optimised virtual water trade etc.
4. Economic water scarcity – causes and solutions
    - political inequality
    - asymmetric power relations
    - lack of funding, water pricing and privatisation
    - PPP - pros and cons
    - water as common good vs. commodification
    - fragmented governance
    - externalised costs
    - lack of human capacity and affordable technology
    - innovative funding mechanisms
    - use of indigenous and ancient knowledge
    - low-cost solution
    - natural capital accounting

Urban water crises – the new normal?

Chairs: Dr Frank Winde1,2; Prof. Liliana Zaharia3; 1Wismut GmbH, Chemnitz, Germany. 2North-West University, Potchefstroom, South Africa; 3University of Bucharest, Bucharest, Romania

Abstract: This session relates to category III of the ISC water policy brief listing water issues

caused by rapidly changing condition such as an unprecedented rate of urbanisation and shifts in local climates. More than half of the world's population is now living in cities while rural-urban migration continues unabated mainly in many developing countries. The uncontrolled growth of megacities regularly overstretches existing infrastructure and leaves many migrants without adequate water and sanitation facilities. Since water consumption rises as rural dwellers move into cities, urbanisation exacerbates existing water stress. Acute water scarcity like recently experienced with an approaching Day Zero in Cape Town is now threatening many cities around the world. However, there are also unresolved issues affecting affluent cities. This includes overflowing sewage systems after heavy rainfall, massive water losses from pressured reticulation systems, increased vulnerability to floods and droughts etc. With rainfall intensities predicted to rise and longer dry spells reducing the dilution capacity of receiving streams this poses future threats to aquatic and human health.
Proposed discussion threads are:

- Urban water management: new solutions for old problems
    - Sponge City Concept
    - reducing sewage overflows
    - reducing leaks and non-revenue water
    - extracting resources from urban waste water (incl. energy)

2. Future-proofing cities: building resilience to hydrological extremes
    - flood- and drought-proofing of cities
    - early warning systems
    - fore- and now-casting

3. Curbing urban water use and pollution
    - pricing strategies
    - smart water meters
    - solutions for emerging contaminants (EDC, micro plastics, fungicides etc.)

4. Groundwater in urban areas
    - Anthropogenic groundwater warming
    - artificial recharge through leakages
    - over-abstraction, ground subsidence and saltwater intrusions
    - pollution
    - reduced natural recharge

Emerging water issues – anticipating research and new solutions

Chairs: Dr Frank Winde1, Dr. Natalia Frolova2; 1Wismut GmbH, Chemnitz, Germany. 2Moscow State University, Moscow, Russian Federation

Abstract: This session relates to category IV of the ISC water policy brief and focuses on anticipative research addressing emerging future water risks. This includes impacts of the global transition towards a low carbon economy via shifting the water-food-energy nexus. With solar panels, wind turbines and electrical cars requiring significantly more mineral resources than their technological predecessors, the consumption of water and energy required to produce these metals are set to rise exponentially. This is in addition to metals required for digitalization. As over 80% of the current mineral extraction takes place in water-scarce areas, mostly in developing countries, the future expansion of mining is likely to exacerbate existing water conflicts. As mining output doubled in the last 20 years, this hazard grew larger ever since. Given such magnitude, related impacts on water resources need to be better understood and managed to avoid water causing even more domestic and international conflicts.
The following themes are suggested:

1. The water-energy-food-nexus: current challenges and future shifts

- Drought-proving current energy supply systems – lessons from the recent cooling water crisis in Europe
- Energy and water requirements of minerals extraction and processing
- Do wind/solar farms affect precipitation and the soil water balance?
- Water implication of hydrogen-based economies

2. Improving water use efficiency in food production
    - Smart irrigation, genetically modified crops
    - Water footprint, changing product portfolios
3. Water pollution and health
    - Emerging contaminants
    - Pathogen survival in warming waters – associated health risks (incl. malaria)
    - Water pollution related to agriculture and mining

Advances in hydrological methodology and water management

Chairs: Frank Winde (Wismut GmbH, Germany; North-West University, Potchefstroom, South Africa);
Daniel Karthe (UN University, Dresden, Germany)

Abstract: Aspects covered in this session relate to methods employed in hydrological research. This includes established methods like numerical modelling, GIS, remote sensing to new IT-based approaches using artificial intelligence (AI), big data and cloud computing as well drone-based surveys, and free-of-charge satellite data and analytical tools, cheap mass sensors etc. The session also covers topics relating to the wide spectrum of water management approaches.

Themes to be discussed include:

1. Hydrological methods:
    - AI, big data, and cloud computing – applications in hydrological research
    - Hydro GIS, hydrological modelling, remote sensing, satellite data and sensors, UAVs, open source spatial and analytical tools
    - Real time measurements, in-situ sensors, mass sensors
    - Alternative data sources: citizen science and crowd sourcing
2. Water management:
    - IWRM, integrated catchment management
    - Water risks assessment,
    - Integrated water reporting,
    - Innovative water accounting (full-cost- and natural capital accounting, water footprint)
    - Water efficiency benchmarking

Wetlands: Changing landforms under changing environmental and climatic conditions

Prof Heinz Beckedahl; University of Eswatini, Matsapha, Swaziland; University of Pretoria, Pretoria, South Africa

Wetlands, including peatlands, have historically been seen as at best a resource to be used and at worst, an unpleasant, wet, insect-infested area of little value, to be drained and used for more economic pursuits. This attitude has resulted in an estimated 70% of the world's wetlands either having been destroyed or, at best, being severely degraded. This despite ecologists having proven that wetlands are more effective carbon sinks than natural forests. The RAMSAR Convention contributed significantly to a paradigm shift; yet countries such as Eswatini, together

with many other developing countries have only recently adopted Wetland Policy Papers, and no wetland inventories exist for in parts of Africa, Asia, Central and South and America. Rapidly expanding urban sprawl, land degradation and climate change are posing significant threats to many of the remaining wetlands, world-wide. The theme 'Celebrating a World of Difference' is thus an apt description of the wetland context – both in a positive, constructive as well as a negative sense. The Session is proposed against this background, where wetland change, be it human-induced or the consequence of natural environmental change, is the focus of the presentations. It is envisaged that the session would consist of two 90-minute slots, accommodating some nine offered papers and one invited paper, with some discussion time at the end.

Geographies of rivers and floodplains

Chairs: Emily Rick1,2, Dr. Jonathan Turner1, Kate De Smeth1
1University College Dublin, School of Geography, Dublin, Ireland. 2Teagasc Research Centre, Wexford, Ireland

Abstract: Management of riverine landscapes is fundamentally multi-disciplinary, bridging the divide between the human and physical by connecting the people that live there with environmental issues, such as the biodiversity crisis or risk of extreme events (floods and droughts). "River corridors" across the world, comprising river channels, riparian zones, and floodplains, are under increasing pressure from rapid climate and land use change. Over the last century, the science of river management has evolved from an engineering discipline that sought to control river corridors, into a discipline that advocates a more holistic approach in service of both healthy communities and the natural world. Increasingly environmental managers are being challenged to deliver solutions that "give space to the river" without adversely affecting communities and competing land uses. The questions that emerge are: how can we achieve this? and how can the discipline of Geography help?
This session will critically examine the relationship between people and river corridors, both in terms of our historic impacts and the contemporary challenges of river management. Speakers are invited to showcase challenges and successes they have experienced in this field, and importantly to reflect on the value of Human and Physical Geography in achieving mutually beneficial solutions. Themes explored may include river catchment management, green infrastructure in urban river landscapes, human impacts on river ecosystems, river restoration, planning, sustainable approaches to flood risk management, and environmental policy.

PFAS in the freshwater environment: occurrence, pathways and monitoring

Chairs: Dr Susan Hegarty1, Prof Fiona Regan1, Prof Jennifer Tank2,
1DCU, Dublin, Ireland. 2University of Notre Dame, South Bend, USA

Abstract: PFAS are a group of synthetic chemicals which have been commonly used in consumer products, such as non-stick cookware, for over 70 years. Once they get into the environment, they are persistent, and are now ubiquitous in the environment and organisms globally, having been detected in air, soil, plants and living organisms. Legacy PFAS, such as PFOS and PFOA, are submitted to regulation: PFOS and derivatives have been restricted in Europe for more than 10 years, while PFOA has been banned under the POPs Regulation since 2020. Both PFOA and PFHxS are already included or are being considered to be included in the Stockholm Convention on Persistent Organic Pollutants. Moreover, several countries have proposed to ban the use of PFAS, except for essential uses. Global manufacturers are now producing new chemicals in order to substitute long-chain PFAS. However, some of these new chemicals have resulted to be equally environmentally persistent and even more mobile in the environment and more difficult to remove from drinking water than their long-chain counterparts, and some have resulted to be toxic as well. Nonetheless, the pathways for these 'forever-chemicals' are only now being investigated.

This session, which aims to bring together researchers from diverse disciplines and jurisdictions working on this issue, will examine current research on pathways of PFAS into the freshwater environment from land use, and will explore methods of monitoring PFAS concentrations in areas across the globe.

Water resources management and planning

Chairs: Dr. Seema Rani; Dept of Geography, Institute of Science, Banaras Hindu University, Varanasi, India

Abstract: Recent reports and studies are showing concern on water resources scarcity and its drivers at the global and regional levels. Both surface and groundwater resources are depleting and deteriorating at a faster rate. It would affect the billions of people in developed and developing worlds. Though several strategies have been adopted to overcome the issue of water resources, this problem is still growing with time. There is a need to improve our understanding of ongoing issues of water resources and their management around the world. To strengthen water security there is a need to build capacity, adaptability, and resilience. Considering these facts, interest in searching and developing innovative and low-cost management strategies is growing among researchers in recent years. Such case studies are crucial for decision-makers and planners at global and local levels for better management of water resources. The session aims to cover:

- Access to safe and quality drinking water
- Advanced tools/techniques in water quality assessment
- Wastewater management techniques (recycling storm water and wastewater)
- Discharge monitoring network reliability (downscaling of global hydro-climatic datasets, observation networks, data availability, and its quality)
- Availability/application of advanced GIS tools (ground and surface water resources modelling such as SWAT, HEC-RAS, flood, river discharge, etc.)
- Case studies on mitigation and management strategies (integrated water resources management)
- Reducing the risk of water-related disasters
- Complex and interlinked water challenges within and among the countries
- Water resources information systems, Public-private collaboration
- Hydro-meteorological forecast and warning
- Water governance and initiatives (policy/plan/program and their implementation issues)

Appendix 5:

ISC Group of Water Experts (Talent book)

(ISC-Talent-book_UN-Water-Conference.pdf (council.science))

Appendix 6:

ISC Water Policy Brief UN 2023 Water Conference

(ISC-Water-Policy-Brief.pdf (council.science))