IGU UGI International Geographical Union
Union Géographique Internationale

Commission for Water Sustainability

Annual Report 2019

(Nov. 2018 - Dec. 2019)

Compiler: F. Winde (Chair)
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A. Membership

a. Structure of Steering Committee

Over the reporting period Prof. Olga Scarpati announced her retirement from active academic research. The current composition of the SC is reflected in the following table:

Function	Name	Country, gender	SC since	max. to	Institution	Portfolio
Chair	Prof. Dr. habil. **Frank Winde**	South Africa, male	2012	2024	North-West University, Vaal Triangle Campus, Vanderbijlpark, Geography and Environmental Studies, PO Box 1174, Vanderbiljpark, 1900; Tel. +27 724059561, +49 17696001533, Skype: frank.winde, frank.winde@nwu.ac.za	Management and admin, Membership/ recruitment, website/ public visibility
Vize chair	Prof. Dr. **Natalia Frolova**	Russia, female	2012	2020	Lomonossov State University, Moscow, Department of Hydrology, Faculty of Geography, GSP-1, 119991, Leninskie Gory, MSU. Phone: +7 (495) 939-15-33 frolova_nl@mail.ru	Meetings + archiving
Vice-Chair	Prof. Dr. **Chan-sheng He**	USA, male	2012	2020	Western Michigan University. Wood Hall, Department of Geography, Western Michigan University, 3234 Wood Hall, Kalamazoo, MI 49008-5424. Phone: (269) 387-3425 Fax: (269) 387-3442 chansheng.he@wmich.edu	Publications + reporting
Member	Dr. **Ivan Canjevac**	Croatia, male	2012	2020	University of Zagreb, Faculty of Science, Department of Geography, Marulicev trg 19/II, 10000 Zagreb, Croatia, canjevac@geog.pmf.hr:, Tel. 0038514895424, Fax 0038514895440, Skype name: naumovac canjevac@geog.pmf.hr	Collaboration + outreach
Member	Dr. **Daniel Karthe**	Mongolia, male	2016	2024	German-Mongolian University, Mongolia, daniel.karthe@ufz.de	Membership + recruitment
Member	Prof. Dr. **Liliana Zaharia**	Romania, female	2016	2024	University of Bucharest, Faculty of Geography 1 Nicolae Balcescu Blv., 010041, Bucharest, Romania, Tel: + 40-21-305 38 22, Fax: + 40-21-315 30 74, zaharialil@yahoo.com; zaharialili@hotmail.com	Proposed: Meetings + archiving
Member	Prof. Dr. **Lanhui Zhang**	China, female	2016	2024	Lanzhou University, College of Earth Environmental Sciences, Guanyun Building 0912, TianshuiNan Road 222, Lanzhou City, zip code：730000, Gansu Province，China, Tel/Fax:010 931 8912805 lhzhang@lzu.edu.cn	Proposed: Publications + reporting
Member	Dr **Julia Hall**	Austria, female	2017	2025	Vienna University of Technology, Institute of Hydraulic Engineering and Water Resources Management, Austria, Tel. 4315880122322, 1040 Vienna, Karlsplatz 13/222-2 hall@hydro.tuwien.ac.at	Collaboration + outreach
Member	Prof. emer. **JAA (Tony) Jones**	UK, male	2002	open ended	Institute of Geography and Earth Sciences, University of Wales, Aberystwyth. tonyandjenjones@btinternet.com	honorary SC-member

b. Member statistics

The revamped website contributed to the continued growth of the Commission in 2019 as all five applicants (3 female, 1 male) contacted the chair via the website-linked e-mail service. This brought the total number of members who provided full research profiles to 56 (20 female, 36 male) representing 23 countries. We are welcoming the following colleagues (in chronological order of joining):

- Ms Teresa Graziana, PhD, University of Catania, Geography, Catania, Italy
- Mr Mohammed D Huq, PhD, Bangladesh, currently at Wuhan University, Hubai, China
- Mr Georghe Serban, Assoc. Prof., Babeș-Bolyai University, Cluj-Napoca, Romania
- Ms Harshita Upadhyaya, PhD, Ils University, Jaipur, India

- Ms. Olutoyin Adeola Fashae, PhD, University of Ibadan, Nigeria

The research profiles of most members are available on the new website of the Commission (www.igu-water.org). The membership per country is now as follows:

Argentina	2
Armenia	1
Australia	1
Austria	1
Bangladesh	1
China	6
Croatia	3
Germany	4
India	3
Italy	2
Japan	1
Mongolia	1
Nigeria	1
Norway	1
Portugal	1
Romania	6
Russia	6
South Africa	6
Spain	1
Swaziland	1
Turkey	1
USA	4
UK	2
Zimbabwe	2

B. Meetings

a. Meetings held

(i) General

The 2019 Annual Meeting of the Commission was titled: *"Water sustainability in a changing world"* and hosted by the Faculty of Geography of the University of Bucharest. It was jointly supported by the Research Institute of the University of Bucharest (ICUB), the Research Centre "Water resources and water-related risk management (GRARH) and the Institute of Geography of the Romanian Academy (IGAR).

The conference was organised under the leadership of Prof. Liliana Zaharia supported by colleagues and post-graduate student volunteers from the Department of Meteorology – Hydrology of the Faculty of Geography.

The international scientific committee and local organising committee comprised members of the Commission, the Academy of Romania, Romanian universities and research institutes and, importantly, practioners from various organisations such as the National Administration of Romanian Waters and the National Institute of Hydrology and Water Management adding applied aspects to the meeting.

Prof. Zaharia also succeeded in soliciting support by the Vice Rector of the Bucharest

University and the Vice Dean delivering opening addresses. The conference was also honoured by Prof. Fu, President of the Geographical Society of China, addressing the participants in his capacity as liaison-officer of the IGU Executive Committee to our Commission.

The Chair, in his opening address, elaborated on the need for a geographical water commission stressing the need for an integrated approach to complex water issues that employs the specific strengths of Geographers in adopting insights and tools of neighbouring sciences to arrive at new and holistic views rather than further increasing compartmentalisation of water sciences. In doing so the Commission actively encourages membership also of non-Geographers working on water and its sustainable use as well as of practioners as ultimate recipients of scientific solutions.

Opening addresses by Proffs. Fu (upper photo) **and Winde** (Photos: Prof. Frolova)

In addition to the thematic sessions on days one and two an excursion on urban hydrological engineering and a two-day field trip on Carpathian mountain hydrology formed part of the conference programme.

All participants received a comprehensive collection of supporting documents including printed and digital versions of the conference programme, a book of abstracts as well as two most

informative guides on the two field trips indicating thoroughness and attention to detail of the organisers.

Prof. Zaharia also managed to attract local financial support of the conference to supplement accommodation costs, providing additional material for the conference bag and keeping fees at a minimum. The good quality of the catering and the grand location of the gala dinner deserve special recognition in this context.

In summary, the Chair and the members of the SC of the Commission would like to express their sincere gratitude towards all involved in preparing and hosting a scientifically sound and professionally organised meeting that was most enjoyable.

We especially wish to thank Prof. Zaharia, her husband as well as her PhD-student Gabriela Moresanu for providing members with such a memorable event.

(ii) Sessions, presentations and field trip

In five sessions spread over two fully packed days a total of 15 oral presentations (one no show) and 11 posters were presented, with the authors of the latter introducing their work in a 5 to 15 minutes talk. The topics of the thematic sessions in chronological order were:

1. *Keynote addresses*
2. *Water resource variability in a changing environment and hydrological hazards and related risks management*
3. *Human pressure and impacts on hydro-systems and water resources, monitoring and sustainable water management*
4. *Poster session*
5. *Methodology in hydrological research: GIS, modelling, remote sensing*

Topics addressed ranged from analysing hydrological processes in rivers in the context of changing environments with example from Russia, flood risks and predictions for rivers in Romania, human impacts on water quality and flow associated with global mining activities and urbanisation as well as the use of advanced satellite technology to assess water budgets on earth. Cross cutting topics that managed to fuse natural and social research methodologies were also presented with examples from flood risks of Romanian rivers, the reconstruction of historical floods from archives as well as water management practices on ocean cruise ships. The comparative advantages of Geographers over competitors in the field of stream morphology assessments were explored by Prof. Canjevac based on personal experiences in Croatia.

Geographically, the presented research ranged from the global scale (GRACE and soil water satellites, mining) to regional and local approaches covering study areas in Romania (as host country naturally dominating the conference), Russia, Croatia, Uzbekistan, China, Germany and France as well as the extreme latitudes of the Arctic and Antarctic. Presenting members hailed from Canada, Croatia, China, France, Russia, Slovakia, South Africa, USA and different provinces of Romania including Muntenia/ Wallachia, Transylvania and Moldavia.

Prof. Zaharia and her attentive audience (Photos: F. Winde)

As mentioned above, two field trips were offered a half-day trip on urban hydrological engineering of the Colentia River in Bucharest and a two-day trip on Carpathian mountain hydrology, both supported by dedicated well-illustrated study guides.

Urban hydrology and city excursion

As part of the 2-day field trip that addressed issues pertaining to "Human pressures on hydrosystems: the example of the Arges watershed" (Day 1) we were received by the local agency responsible for raw water provision, flood protection and water monitoring in Pitesti, which not only received us warmly with snacks and gifts but also patiently answered the many questions we had after the introductory presentation. Subsequently we visited the Vidraru Dam near Curtea de Arges (Muntenia province) constructed from 1960 to 1966 whose 166-m-high concrete arch wall dams the Arges River generating 220 MW of hydropower as its primary purpose using 4 Francis turbines located underground in a 42-km-long tunnel system.

Endowed with plentifully water and a mountainous topography Romania has another 14 large hydroelectric power stations. The abundance of water may also account for an exceptionally low price at which raw water is sold by the Arges Water Agency to municipal drinking water

utilities quoted to us as just LEI 60/ Ml (LEI 0.06 per m³; ~ €-cent 1.2 per m³).

At the Arges River water agency in Pitesti (Photo: N. Frolova)

On the 166-m-high dam wall of the Vidraru dam (Photo: L. Zaharia)

After a very interesting and long first day and an excellent stay-over at the Vila Bran Mountain Resort (near 'Dracula's castle') we visited Brasov located in an inner Carpathian depression and then crossed into the neighbouring watershed of the Dambovita River that flows towards Bucharest to where we safely returned in the evening filled with exciting memories. Along the way we also visited Romania's first hydroelectric power plant, built in 1884, using flowing water for powering the nearby residence of the royal family in Sinaia.

2nd day of the field trip: looking onto scenic Brasov (Transylvania)

The historical hydroelectric power plant at Sinaia

2 Business Meeting 2019

On the second day of the conference the annual business meeting of the Commission was held addressing the following agenda points:

(i) Membership development
(ii) Joint publication/ Hydrogeography book project
(iii) Hydrological glossary project
(iv) Session proposals for IGC Istanbul 2020
(v) Miscellaneous

Outcomes:

(i) Membership: In contrast to earlier years where membership grew by simply adding email-addresses of conference participants to the distribution list the Commission now requires specifically developed templates capturing research interests and professional profiles to be submitted before membership is conferred to applicants. In this way active participation is encouraged as only members with interest in the work of the Commission tend to submit the

required information. Furthermore, by displaying member profiles on the website direct collaboration among members working in specific fields is facilitated even attracting interest from non-members visiting the website. Together with the comprehensive overhaul of the website design and content (still in progress) this may explain that the Commission now ongoingly receives unsolicited applications for membership helping to broaden geographical representivity and the member base of the Commission. As of 20 June 2019, the Commission has a total of 57 registered members representing six continents.

(ii) Joint publication: Following the Quebec meeting 2018 different options for a joint Commission publication were explored including special issues of established journals as well as a book on Hydrogeography as proposed by Prof. Karthe. After a brief discussion the meeting agreed with a proposal by Prof. Natalia Frolova to publish a special issue in the Scopus-indexed journal: *Geography, Environment, Sustainability* (https://ges.rgo.ru/jour) based on a selection of papers presented in Quebec (2018) and Bucharest (2019). As preliminary working title directing the type of submission the following is proposed: *"Water sustainability: geographic perspectives based on international case studies".* The intention of the special issue is briefly described below (first draft):

> *As a follow-up of recent conferences of the IGU Commission for Water Sustainability in Quebec (2018) and Bucharest (2019) we propose the compilation of a special issue dedicated to studies of water-related challenges in different geographical environments ranging from climate-induced hydrological extreme events in the arctic circle to man-made impacts on water quality and availability through urbanization, irrigation, mining and deforestation in arid and semiarid areas of Africa, Europe and Asia addressing the water-energy-food nexus to the development of hydrological methods and tools encompassing latest remote sensing technology, GIS and numerical modelling. Based on case studies from Russia, China, South Africa, Central and Eastern Europe and Antarctica and other areas the issue aims to promote integrated transdisciplinary approaches to water sustainability from different water-related disciplines including Physical and Human Geography, Civil Engineering, Biology, Sedimentology and others. By transcending disciplinary boundaries and limitations the special issue aims at arriving at an improved understanding of how the complex interplay between natural and anthropogenic factors impacts on the sustainable use of water as a renewable yet increasingly scarce resource.*

We encourage members to offer suggestions for thematic focal points and the title of the special issue via email (frank.winde@nwu.ac.za; frolova_nl@mail.ru).

Once details on the actual topics and format requirements are agreed upon with the publisher members will be asked to submit manuscripts.

(iii) ***Hydrological online glossary****:* Recognising that there are at least two online multilingual hydrology glossaries already in existence it was proposed that any further work should focus on a wiki-platform type of format that allows expanding and updating of entries. However, this will require a longer-term commitment which needs to be assured before the Commission can embark on the project.

b. Meetings planned

- ***IGU Congress 2020, Istanbul (Turkey)***

After having received feedback from members on the proposed sessions listed above the chair will inform the organisers accordingly.
We also consider contacting local members of the Commission (we have 2 members from Turkey)

to please consider the preparation of a water-related field trip as part of the event continuing with the well-established and much-valued tradition of the Commission. It was agreed that themes similar to those of the Bucharest sessions be adopted for Istanbul 2020 possibly complemented by water topics that are of particular relevance to Turkey in order to attract and accommodate widespread participation of local Geographers. In addition, a dedicated session on socio-economic water aspect is added to attract human Geographers and foster an integrated research approach
The following sessions are proposed for Commission sessions in Istanbul and are open for modifications/ suggestions:

(1) Water resource variability, monitoring, hydrological hazards and risk management

- hydrological processes: hydrograph analyses, run-off formation, climatic drivers, land use impacts etc.
- floods (long-term trends in magnitude and frequency, dynamics, risks and risk perception, prediction, reconstructing historical events etc.)
- droughts (natural and man-made causes, trends in magnitude and frequency, susceptibility, resilience, coping strategies etc.)
- water monitoring: observation networks, data availability, quality and accessibility
- mitigation strategies for extreme events
- hydrological processes in lakes, rivers, estuaries, groundwater, karst and soil
- integrated water resource management

(2) Human pressures on water: causes and consequences

- human impacts on water availability: groundwater mining, dewatering of aquifers, irrigation, mining, industry, urbanisation, aquaculture, deforestation, urban agriculture, land use changes etc.
- surface water and ground water pollution, sediment pollution
- exposure pathways and associated risk analysis, pollution sources, mitigation strategies
- mobilisation and immobilisation of waterborne contaminants
- impacts on human health, ecosystems and habitats
- conventional and emerging contaminants (micro plastics etc.), geochemical mobility and environmental fate of waterborne contaminants, toxicity and bioavailability
- waste-water prevention and treatment
- waterborne diseases, sanitation issues, epidemiological/ medical geology studies

(3) Sustainable water use in the context of the water-energy-food nexus

- causes and geographical patterns of water scarcity
- SDGs on water, energy and food: relations and interdependencies
- water overuse, water use efficiency, water consumption, water losses
- water use in energy generation and storage (cooling water, steam production, thermal pollution, emerging technologies …), water implications of renewable energy expansion and e-mobility
- energy use for water provision (desalination, pumping, conventional potabilization, recycling, waste-water treatment, sludge disposal …)
- water and energy for food: irrigation, horticulture, meat vs. crops
- embedded water, bottled water trade, virtual water trade

(4) Socio-economic aspects of water sustainability

- socio-economic drivers of water consumption, access to water,
- privatisation of water, water pricing, metered water
- leakage-related water loss, non-revenue water, mitigation strategies
- centralised vs. decentralised water supply and waste treatments
- national and international water conflicts and water collaboration
- cross boundary catchment management
- water access as a human right, SDG 6

(5) Methods in hydrological research

- Hydro-GIS, Virtual geographical environment,
- numerical modelling: groundwater, surface water, scale-dependent processes,
- remote sensing (satellites, drones etc.)
- crowd sourcing of hydrological data,
- big data, data transparency, raw data storage and sharing

(6) Water issues where Europe meets Asia: challenges and success stories in Turkey

- focus is on real-world local water issues from a natural science or human sciences point of view preferably combining both views
- possible topics include drinking water quality and management in Turkey, water use and availability now and in future, dams and other large water projects, cross-boundary catchment management issues etc.

- **4th Conference on World's Large Rivers, Moscow 2020**

Prof. Frolova invited members to the upcoming event in Moscow taking place from 3-7 August 2020 and is supported by UNESCO, IAHR, IAHS and the IAG to name but a few. Topics include the following:

- Hydrology, Hydraulics & Water Quality
- Sediment Transport & River Morphology
- Ecology & Restoration
- Integrated River Management,
- Climate Change and its impact in general and specifically related to Russian and Arctic Rivers.

For more details please refer to the following website: http://worldslargerivers.boku.ac.at/wlr/

C. Networking

a. Internal collaboration of Commission members

1) Hydrological glossary

Refer to relevant paragraph in section on Business meeting in Bucharest above

(2) Joint book project

Refer to relevant paragraph in section on Business meeting in Bucharest above

b. International collaboration of Commission members

Continuation of a joint project with the WHO-IARC on uranium exposure of residenzs in South African gold mining areas (see joint publications below).

Prof. Ewald Schnug, a member of the Commission and chair of the Scientific Centre for Fertilizers (CIEC) organized an international conference at which the Chair presented a keynote paper representing the Commission:

Winde F (2019): Behaviour of fertilizer-derived heavy metals in agrosystems. 26th International Symposium of the Scientific Centre for Fertilizers (CIEC); Impact of anticipating research in the past on research in the future. 5-7 September 2019, Julius-Kühn Institute, Braunschweig, https://www.youtube.com/watch?v=7g2rZGRSVT0.

D. Publications

a. Newsletter and reports

Newsletter no. 19 has been circulated in June 2017 and can also be found at the Commission's website (www.igu-water.org).

The Annual Report 2018 has been submitted to IGU Executive Committee

b. Joint papers

Winde F, Geipel G, Espina C, Schüz J (2019): Human exposure to uranium in South African gold mining areas using barber-based hair sampling. *PloS ONE*, https://doi.org/10.1371/journal.pone.0219059 , IF (2019): 2.766; https://journals.plos.org/plosone/article/related?id=10.1371/journal.pone.0219059

Winde F, Hoffmann E, Espina C, Schüz J (2019): Mapping and modelling human exposure to uraniferous mine waste using GIS-supported virtual geographical environments. *Geochemical Exploration*, 204, 167-180, https://doi.org/10.1016/j.gexplo.2019.05.007, IF (2019): 2.858

Danjou AM, Patel M, Espina C, Pentz A, Joffe M, Winde F, Schüz J (**2019**): **Pro**spective case-series analysis of haematological malignancies in gold mining areas in South Africa. *S Afr Med J, 109 (5), 340-346,* DOI:10.7196/SAMJ.2019.v109i5.13538, http://www.samj.org.za/index.php/samj/article/view/12600/8865

d. Website

The website is in the process of being updated by adding research profiles of newly adopted members as well as conference-related documentation, the 2019 Newsletter and this report (www.igu-water-org).

E. Archival contributions

A section on the Commission's website is dedicated to archive news. Progress was also made in retrieving information regarding past conferences as a means to record and track the historical development of the Commission.