

UNEP GEMS/Water Capacity Development Centre Newsletter

July 2022 – December 2022

December 2022

Dear friends and partners of the UNEP GEMS/Water CDC,

We are pleased to bring you the latest newsletter of the UNEP GEMS/Water CDC. As usual, we have had a very busy six months. Recent training and education activities include a workshop on biological monitoring in Suva, Fiji, and continued progress with the Capacity Development Consortium of the World Water Quality Alliance. Our current Postgraduate Diploma students continue to progress in their studies, and the MSc class of 2022 have now completed their programme – congratulations to everyone! A new intake of students on our continuous professional development courses have just about completed their 12-week courses, and several PhD graduations have taken place in the last 6 months (congratulations Irene and Obaid!). As usual, there has been a number of new publications, including new training manuals, reports and research papers in the area of ambient water quality. In this edition, we continue to catch up with some of our alumni students, and are delighted to get an update from Megan Cox on her studies and ongoing research on pollution of vital karst aquifers in Barbados.

As always, we hope you are all keeping very well.

Happy holidays,

Tim

CDC Director Dr Tim Sullivan,

on behalf of all the UNEP GEMS/Water Capacity Development Centre Team.

Meet the UNEPGEMS/Water Capacity Development Centre Team



Timothy Sullivan

Centre Director: training and advice in freshwater quality, monitoring and assessment.



Deborah Chapman

UNEP GEMS/Water CDC Ambassador: honorary position and advisory role.



Aoife Nagle

Project Coordinator: administration, project, and Analytical Chemistry support for the GEMS/Water CDC.



Lucía Hermida González

Programme Coordinator: developing and running our training courses, including the on-line CPDs, PG Diploma and MSc in Freshwater Quality Monitoring and Assessment.



Clara Felberbauer

Research Assistant: supporting UNEP GEMS/Water CDC project work.



Carlos Chique

Postdoctoral Researcher: providing advice and support on freshwater monitoring.



Chinelo Nzekwe

PhD candidate: comparative analysis of heavy metal contamination in freshwater bodies in Europe and Africa using Nigeria and Ireland as case studies. *Supervisors:* Timothy Sullivan & Deborah Chapman.



Tadhg Moore

Research Support Officer: designing, developing and publishing online training material for GEMS/Water CDC.

The UNEP GEMS/Water Capacity Development Centre Team is based in the Environmental Research Institute, University College Cork, Ireland and works closely with our colleagues in the UNEP GEMS/Water Data Centre at the Federal Institute of Hydrology, Koblenz, Germany and the UNEP, Global Programme Coordination Unit in Nairobi, Kenya.

New faces: Staff and personnel changes

We are excited to welcome our new members of staff who have joined the CDC team since the summer. Clara Felberbauer, UCC Environmental Science graduate, submitted her MSc thesis and is now supporting UCC GEMS/Water full time as a Research Assistant.

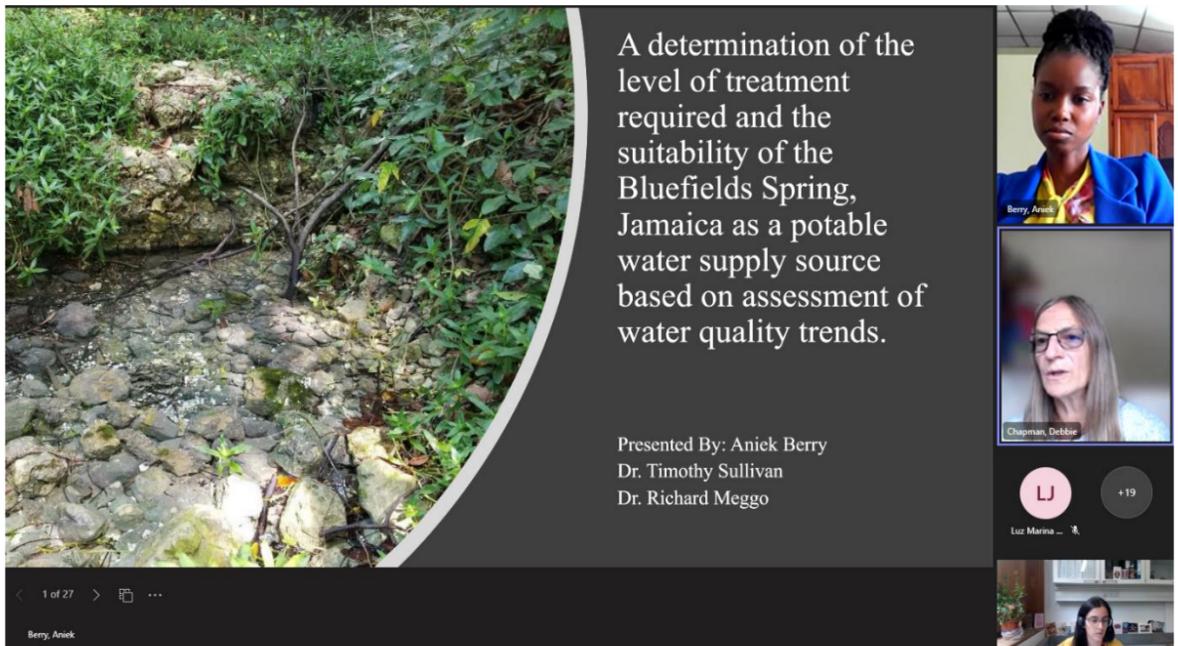
Student and Course Updates

PGDip and MSc in Freshwater Quality Monitoring and Assessment

The Postgraduate Diploma (PGDip) and Master of Science (MSc) students in Freshwater Quality Monitoring and Assessment who progressed to Year 2 have recently finished their first semester. Our third-year MSc students completed the module EV6010 (*Dissertation in Freshwater Quality Monitoring and Assessment*) and presented their MSc dissertations in August. A wide range of topics and study areas were covered in the research projects:

- **CAITLAN O'KEEFFE.** *A comparison of water quality trends in septic system-dominated watersheds in Gwinnett County, Georgia, USA.*
- **NKEM OKAFOR.** *Assessment of the impacts of artisanal and small scale gold mining on freshwater quality in Ushafa (Nigeria).*
- **DAENA PLOWRIGHT.** *Possible impacts of septic tank effluent on Roaring River, Westmoreland (Jamaica).*
- **DISAN WABWIRE.** *Assessing the contribution of flooding events to the variation of water quality in the Inner Murchison Bay (Uganda).*
- **WENDY HARRISON-SMITH.** *A preliminary Assessment of the Water Quality of Two Major Water Storage Facilities in Jamaica.*
- **CORAZON ACHIENG.** *Comparative assessment of selected water quality parameters of Ondiri Swamp, Kikuyu I and Kikuyu II, Kenya.*
- **GEORGE WILLIAM.** *Use of integrated approach in determining the ecological integrity of River Nyarwodho (Uganda).*
- **SHER SINGH.** *Assessment of water quality status of Vaturu Dam, Fiji Islands, impacted by anthropogenic activities.*
- **KAYSHA MCFARLANE.** *A 25-year analysis of water quality within the Martha Brae River, Jamaica.*
- **AGNES IMALINGAT.** *Assessing the impact of natural wetland in treating surface water: a case of Mpologoma Wetland (Uganda).*
- **SASHA-GAYE RAMSAY.** *An integrated water quality report on the monitoring and assessment of the Rio Cobre River system in Jamaica.*
- **ANIEK BERRY.** *A determination of the level of treatment required and the suitability of the Bluefields Spring (Jamaica) as a potable water supply source based on assessment of water quality trends.*
- **ISHMAIL KAMARA.** *Identifying pressures on the water quality in the Rokel River Basin to inform a River Basin Management Plan (Sierra Leone).*
- **KUBUYA MUKOKOMANI.** *Mambo Wastewater Treatment Plant (WWTP) effluent and its possible impact on downstream users along the Tati River, Botswana.*

These students received their final results at the end of November and will have their conferring in Spring 2023. Below are impressions from the online presentations of dissertations.



Members of GEMS and UCC teaching team listening to dissertation presentations.

PREPARATION OF STANDARDS



SAMPLE PREPARATION BEFORE ANALYSIS





10 of 21

Otiemo, Corazon Achieng

CK BH

O Keefe, C... Haram, Brng...

Moore, Tad... Chapman, ...

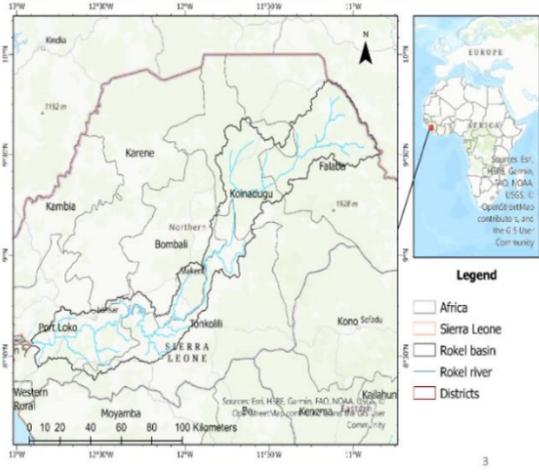
AB +17

Berry, Aniek

LG

Introduction

- The Rokel River basin is the second largest in Sierra Leone
- The basin has an area 8,236 km² and a length of 386 km.
- A microcosm of water resources issues affecting Sierra Leone.
- Serves as a source for water supply, irrigation, mining, and provides livelihood for people
- It also provides ecosystem services





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OW

Olum Geor... Jansen, Mar...

Sullivan, T... Agnes (Gu...)

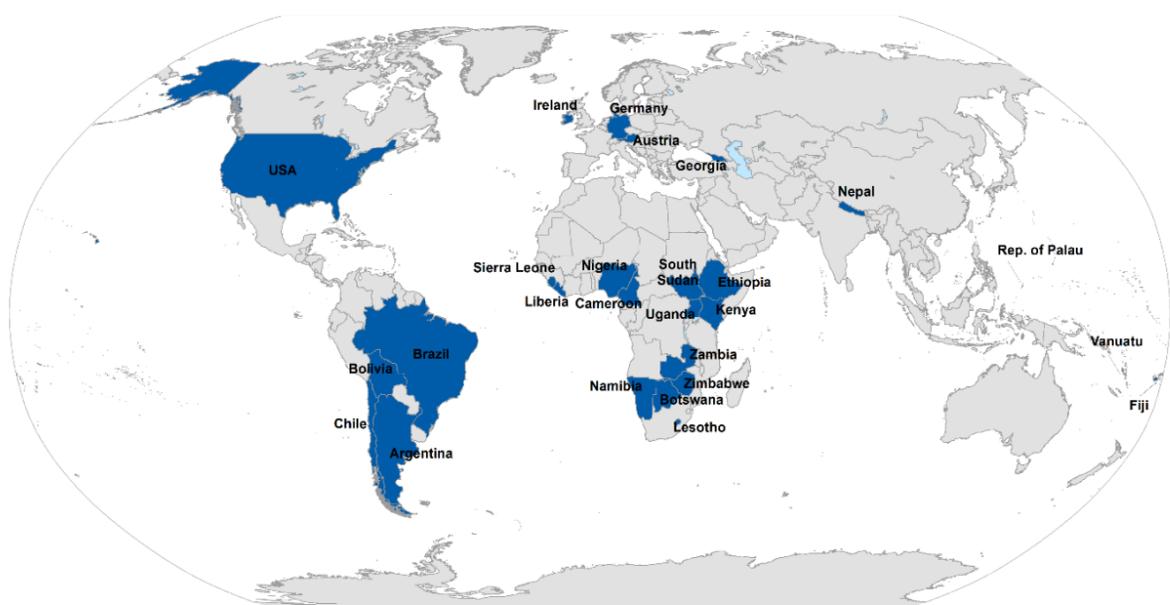
Moore, Tad... +10

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Some MSc Freshwater Quality Monitoring and Assessment dissertation presentations 2022.

Continuous Professional Development (CPD) courses

The students registered in our September 2022 intake recently finished the 12-week CPD courses. This year, for the first time, we had students from Georgia, Lesotho and the Republic of Palau participating in our courses. With the current intake we have reached over 100 students in these short courses since their beginning in January 2019, accounting for a total of 26 countries worldwide (see map below).



Home countries of all our past and current students in the CPDs.

See below for complete information of the courses available:

- *Freshwater Monitoring Programme Design:*
<https://www.ucc.ie/en/cpd/options/science/ev6012/>
- *Quality Assurance for Freshwater Quality Monitoring:*
<https://www.ucc.ie/en/cpd/options/science/ev6013/>
- *Data Handling, Assessment & Presentation for Freshwater Quality Monitoring:*
<https://www.ucc.ie/en/cpd/options/science/ev6014/>
- *Water Quality Monitoring and Assessment in rivers/lakes/reservoirs:*
<https://www.ucc.ie/en/cpd/options/science/ev6015/>
- *Water Quality Monitoring and Assessment of Groundwater:*
<https://www.ucc.ie/en/cpd/options/science/ev6016/>
- *Freshwater Quality Monitoring with Biota and Particulate Matter:*
<https://www.ucc.ie/en/cpd/options/science/ev6017/>

A short brochure listing all CPD courses is available here:

<https://www.ucc.ie/en/media/research/watercapacitydevelopmentcentre/CPDShortCourses.pdf>

Application forms and more information of the courses are available at:

<https://www.ucc.ie/en/gemscdc/onlinecourses/>

New free freshwater quality monitoring course on UNEP E-learning platform

UNEP and GEMS/Water have launched another new Open Access course through the UNEP eLearning platform (<https://elearning.unep.org>). The new course *Freshwater Quality Monitoring with Biota and Particulate Matter* brings the educational offer of the GEMS/Water CDC to a total of five courses. These courses cover the basic principles of freshwater monitoring. By being free to access, we are aiming to make this knowledge accessible to anyone interested.

The courses are fully online and self-paced, with lessons distributed over 8 weeks. As a student in these courses, you are able to self-evaluate progress through a series of Multiple-Choice Questions (MCQs). A certificate of completion will be issued for achieving an overall score of at least 80%.



[Freshwater Quality Monitoring Programme Design](#)



[Quality Assurance for Freshwater Quality Monitoring](#)



[Water Quality Monitoring and Assessment of Groundwater](#)



[Water Quality Monitoring in Rivers and Lakes](#)

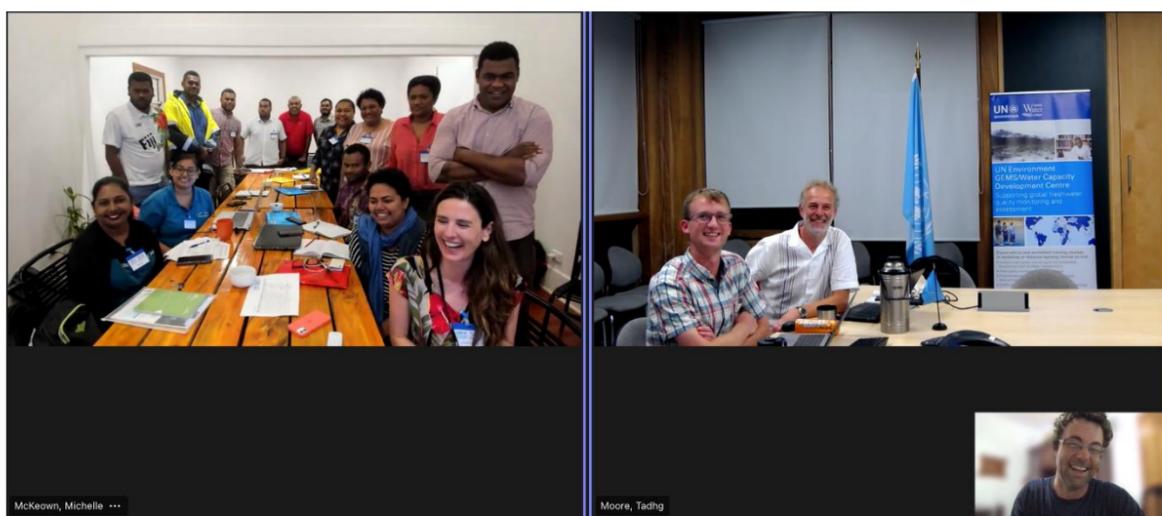


[Freshwater Quality Monitoring with Biota and Particulate Matter](#)

Biological and Chemical Monitoring of Freshwater Resources - Regional engagement in the Southwest Pacific - UNEP GEMS/Water CDC Summer School in Suva, Fiji

The GEMS/Water 2022 Summer School workshop *'Biological and chemical monitoring of freshwater resources; Regional engagement in the Southwest Pacific'* was organized in partnership with the GEMS/Water Capacity Development Centre in Ireland, the Water Authority of Fiji, the Global Programme Coordination Unit of the United Nations Environmental Programme (UNEP), and the local United Nations Development Programme (UNDP) teams. A very special thanks to our colleague in BEES, Dr Michelle McKeown, who made the in-person training possible and led the workshop and fieldtrips in Fiji!

The training featured a series of remote and local lectures delivered by water quality experts, roundtable discussions, as well as local field trips covering water quality, biological monitoring techniques and citizen science engagement.



Attendees of the UNEP GEMS/Water Summer School in Suva, Fiji with Michelle McKeown, joined from Cork, Ireland by Tadhg Moore, Simon Harrison and Tim Sullivan. Photo credit: Tim Sullivan

Field exercises included the physical and chemical monitoring of streams, in tandem with collecting, identifying, and recording macroinvertebrates for the biological assessment of water quality. Because live organisms integrate variable exposure to pollution over time and space, they reflect the health of freshwater systems and can function as indicators of contamination, pollution, and climate change. Biological sampling can also provide opportunities for social engagement by including local citizens in water quality monitoring of their local area.

Feedback on the workshop was positive throughout; attendees praised the field exercises and approaches introduced such as the CSSI (Citizen Science Stream Index). These workshops do not only help individuals, but also promote the building of local collaborative networks. You can read more about the workshop [here](#).



Workshop participants at the field site in Colo-i-suva collecting macroinvertebrate samples. Photo credit: Michelle McKeown.

Alumni Stories

For this edition of our newsletter, we are delighted to feature the work of MSc Freshwater Quality graduate Megan Cox and her studies and ongoing research on the pollution of vital karst aquifers in Barbados. Barbados is one of the highest-ranking nations globally regarding water scarcity. Due to the geology of the island, many streams in Barbados only carry water occasionally and the population is almost totally dependent on groundwater from limestone aquifers. As part of her MSc project, Megan planned to take groundwater samples via boreholes to help improve the national water quality monitoring program. Read more about Megan’s field work and the difficulties she has been working to overcome [here](#).



PhD Updates

Irene O’Callaghan, under the supervision of Drs Timothy Sullivan and Dara Fitzpatrick, successfully completed her PhD on biological monitoring of nanomaterials using macroinvertebrates in freshwater environments. Irene’s thesis “A novel macroinvertebrate biomonitor for metals in the freshwater environment” can be accessed [here](#). Huge congratulations, Dr O’ Callaghan!



Dr Obaid Alharbi, supervised by Dr Debbie Chapman, successfully defended his thesis on “Emissions and Transport of Pharmaceutical Residues from three Wastewater Treatment Plants in Saudi Arabia and the Associated Risk for the Aquatic Environment”. Hearty congratulations to Obaid from all of us at the CDC! The thesis abstract is available [here](#).

UNEP GEMS/Water CDC @GemsWaterCDC · Sep 8
 Congratulations to Obaid Alharbi on submitting his PhD thesis “Emissions and transport of pharmaceutical residues from three wastewater treatment plants in Saudi Arabia and the associated risk for the aquatic environment”. Supervised by @debchapman54 🙌🇸🇦



UNEP GEMS/Water CDC participation in the World Water Quality Alliance

The World Water Quality Alliance (WWQA), convened by the United Nations Environment Programme, is a global Expert, Practitioners and Policy network that advocates for the central role of freshwater quality in achieving prosperity and sustainability. Within its various work streams, it aims to explore and communicate water quality risks in global regional, national and local contexts. It points towards solutions for maintaining and restoring ecosystem and human health and well-being looking to serve countries throughout the lifetime of the 2030 Agenda for Sustainable Development and beyond. An overview of the work of the WWQA and its workstreams can be found on the [website](#).

World Water Quality Alliance 2022 Conference in Konstanz

Dr Tim Sullivan, Dr Tadgh Moore and Clara Felberbauer of the CDC were pleased to be able to participate in World Water Quality Alliance Conference 2022 in collaboration with Konstanz University of Applied Sciences (HTWG), which was organised by the Social Engagement Workstream and the Youth Action for World Water Quality Workstream of the WWQA. This event took place both online and in person at the Konstanz University of Applied Sciences from the 28th– 30 November 2022. The aim of the event was to promote local dialogue, engagement, and exchange; and highlighted how data generated by the World Water Quality Assessment could be transformed into practical local action and how, as a result, local society could maintain a permanent dialogue with decision-makers at a supranational level.

Development aid experts, chief scientists and water experts as well as engaged citizens were all among the participants, ready to observe, learn and engage with the Local Water Forums and the Youth Organisations who work with the WWQA. Key outcomes included a much greater appreciation of the critical role of social engagement in issues around water quality at the global scale, the crucial role of youth and social engagement in working towards solutions to water quality issues, and a commitment to much greater collaboration between different workstreams of the Alliance in these areas, with a range of presentations, debates, discussions in these areas over the three-day event.



Lake Konstanz in Konstanz, Germany.

Erasmus+ WATER Project Completion



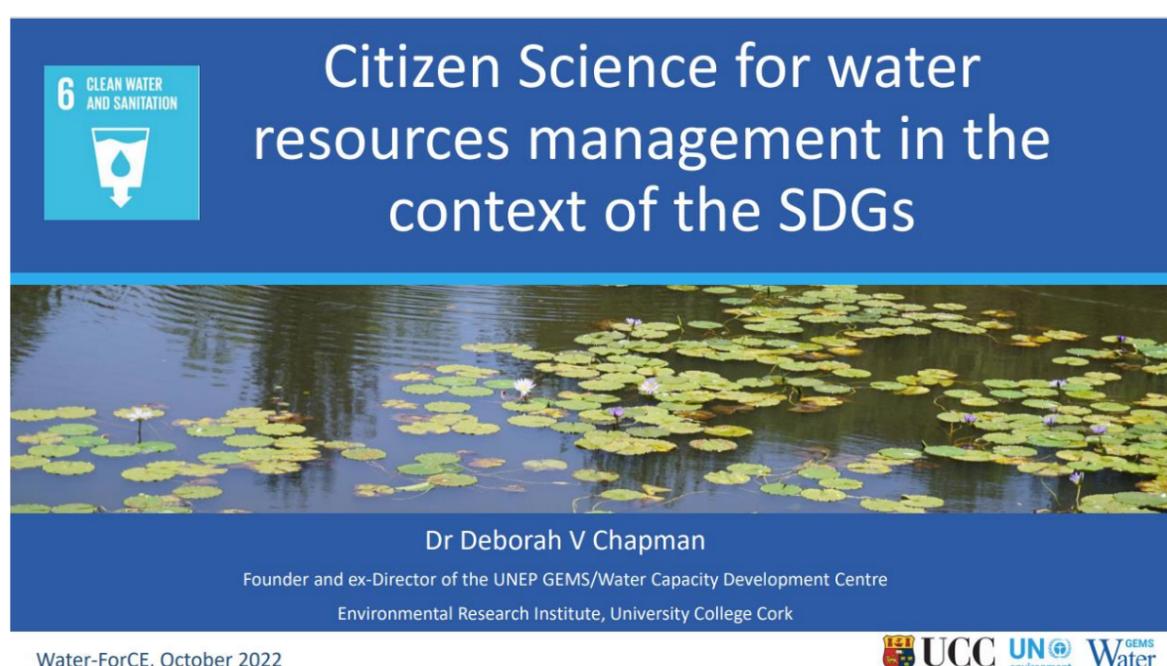
The partnership of the UNEP GEMS/Water CDC with the Erasmus+ WATER ('Work based Learning Paths in Water Management Project') came to an end at the beginning of summer. This project was an exchange of best practices in water management with the goal of updating the professional development profiles of teachers, trainers, mentors in schools, secondary and post-secondary education, as well as work-based sectors with state-of-the-art, innovative insights. The partnership was composed by educational institutes and public companies from Italy, Canada, Ireland, Albania and Spain, and allowed for stakeholders in the labour market, academia and society to meet and cooperate at an international level. Meetings of the Erasmus+ funded Water Projects were organized as 3-day training visits which took place in Bari, Italy in 2019, in Valencia, Spain in 2021 and in Montréal, Canada in 2022.

The training visits laid the basis for an international reflection on key competencies and skills for efficient and sustainable water resource management in partner countries. A common profile for technicians of integrated water resources was shaped, with the aim of updating existing profiles and training programmes, as well as a plan to provide updated and market-oriented training programmes useful for youth employability. A particular focus was laid on emerging skills needed for challenges regarding digitalization and process greening, as well as involvement of stakeholders and policy makers. The multi-stakeholder approach was essential to understanding the needs of the water sector to increase capacity development, to meet demands and to offer collaboration to achieve better sustainable solutions for water management.

The UNEP GEMS/Water CDC greatly benefited from the training visits that took place over the duration of the project. Study visits and interactions with project partners provided first-hand experience around Integrated Water Management and helped identify what professional skills and knowledge water quality managers needed. New tools such as different software and case studies helped close the gap between third level education, research and industry by transferring this specific knowledge and skills to the courses offered by the UCC Centre.

Water-ForCE (Water Scenarios for Copernicus Exploitation) Workshop on Citizen Science for validation of water related satellite products

Water-ForCE is an EU Horizon 2020 project aiming to analyse advantages and shortcomings of the current water-related services in the Copernicus Earth Observation (EO) programme. To improve current Copernicus EO services, inputs from experts and the wider community will be used to build a roadmap by the end of 2023. A group of experts discussed the potential of citizen science for ground truth water data validation of satellite products in an on-line workshop entitled “Citizen Science for the CAL/VAL of satellite aquatic products” held on October 11th. As part of the workshop, Dr Deborah Chapman of the GEMS Water CDC gave a presentation on Citizen Science for water resources management in the context of the SDGs.



According to Dr Chapman, some of the main challenges in developing a global methodology for freshwater quality monitoring is that it must be feasible for all nations worldwide and add minimal monitoring burden for countries while resulting in meaningful and comparable data.

Issues with this approach include large variations in the temporal and spatial coverage used to calculate the indicator in different countries, lack of resources to support the additional burden of SDG monitoring in low-income countries as well as the major additional burden of indicator calculation for high-income countries that have thousands of monitoring stations.

In this context, it can be beneficial to involve citizen scientists:

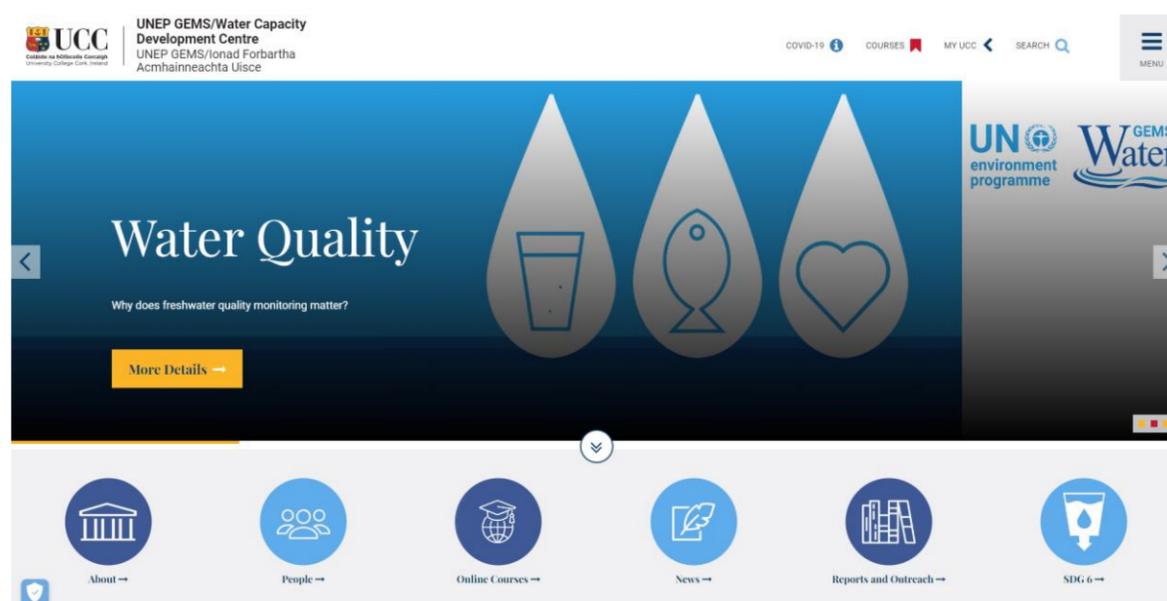
- Increase spatial and temporal monitoring capacity at relatively low cost
- Community driven activities to manage and improve water quality
- Community driven pressure on policy makers to monitor and manage freshwater resources, e.g. Kenya
- Increase education and awareness of the need for protection and management of freshwater resources

In conclusion, integrating Citizen Science at a global scale requires regular community engagement and support, a standardized approach, collection and aggregation of data as well as dissemination among the community and globally. Successful case studies and examples exist but are limited until now. To foster and promote the generation and use of citizen science in policy making, a dedicated workstream was set up within the newly formed World Water Quality Alliance (WWQA).

The full presentation by Dr Deborah Chapman is available [here](#).

Updated GEMS/Water CDC website

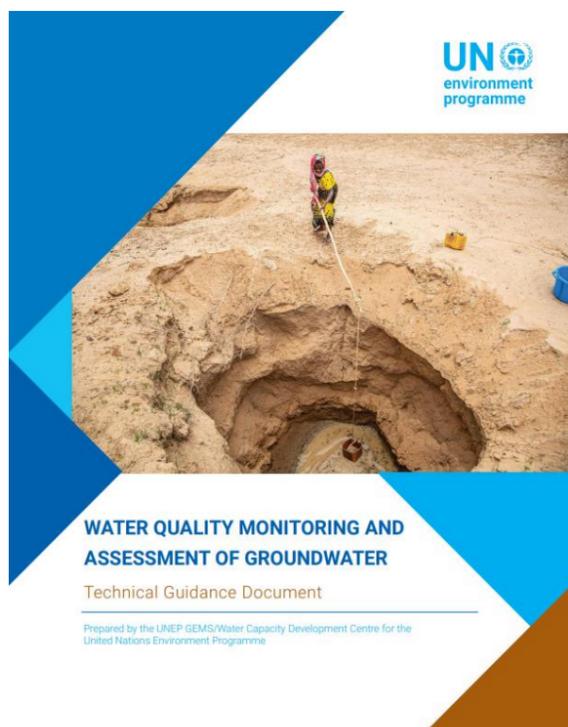
Our GEMS/Water CDC website received an update – visit us at <https://www.ucc.ie/en/gemscdc/>.



Publications

The CDC is actively involved in the latest research in water quality monitoring and assessment, and actively publishes in a wide variety of formats each year. Below is a selection of publications for the current period.

The first of six technical handbooks titled [Water Quality Monitoring and Assessment of Groundwater – Technical Guidance Document](#) has been published and is now available online. Five more books accompanying the course materials offered by the CDC are in progress.



Deborah V Chapman and Tim Sullivan, 2022. The role of water quality monitoring in the sustainable use of ambient waters. *One Earth*, 5(2), pp.132-137. <https://doi.org/10.1016/j.oneear.2022.01.008>

Kenneth Irvine, Stuart Warner and **Deborah V Chapman**, 2022. Section introduction: Human Pressures and Management of Inland Waters. In Thomas Mehner and Klement Tockner [Eds] *Encyclopaedia of Inland Waters. Second Edition*, Elsevier, 4, 1-8. <https://www.sciencedirect.com/science/article/pii/B9780128191668002140>

With this we come to the end of our December 2022 newsletter. We would like to send warm regards to you and your families, and wish you health and happiness throughout the coming year. We at GEMS/Water are looking forward to working with you in 2023. Keep an eye on our [Twitter feed](#) and [website](#) for the latest updates and further information.

The GEMS/Water CDC team



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