

Report to Science Board and Council January 2025
Chemical Research Applied to World Needs (CHEMRAWN) Committee
Francesca Kerton Chair
8 January 2025

I. Executive Summary and Highlights:

This committee brings chemistry into action in civil society in a way that benefits people and their quality of life. The topics that CHEMRAWN focuses on relate to the UN Sustainable Development Goals and so the committee serves IUPAC's vision as part of 'an indispensable worldwide resource for chemistry'. Activities in 2023-present include webinars, a special issue of *Chemistry Teacher International*, conference symposia, and contributions to a special issue of *Pure and Applied Chemistry* as part of the Global Conversation on Sustainability. All committee activities were aimed at fulfilling IUPAC's mission and strategic plan through pursuit of the application of chemistry in the service of humankind and the world. Moving forward, we plan to achieve our goals, not only in our one-of-a-kind multidisciplinary conferences and the work of the related future outcomes committees, but with outreach, workshop and symposia to raise the profile of IUPAC with stakeholders. Unfortunately, our efforts to hold a conference on the topic of safe and secure water access in the Middle East are on hold because of the current situation there. We continue to make progress in building collaborations with other committees and divisions (especially CCE, COCI, Division II and Division VI) and look forward to further developing these. We have developed a strong relationship externally with the educational foundation *Beyond Benign*.

CHEMRAWN priorities include:

- Continuing to develop relationships to work collaboratively with committees/groups/divisions both inside and outside of IUPAC.
- Raising awareness, social responsibility, and understanding of how chemistry and related disciplines can be used to address unmet world needs in areas including sustainable development, health and equality.
- Developing resource pages on chemistry-related topics that are critical for everyone to understand. The goal is to make the IUPAC website the preferred place to search for reliable information about chemical issues making headlines and the Union's importance when societal challenges involving chemistry come on the agenda.
- Continue to reinvigorate our committee through virtual meetings, improved engagement/involvement of current committee members, and recruitment of additional National Representatives.
- Discussions with new committee members regarding future CHEMRAWN conferences and opportunities to develop symposia at well-established conferences/conference series worldwide.

We have continued to work with IYCN (International Younger Chemists Network) and IUPAC representatives in project 2021-034-2-041 "Global Conversation on Sustainability" [GCS-Day] This was first held on Sept. 25, 2022 and took place for the 3rd time on Sept. 25, 2024 as it is an annual event. We organized a webinar in October 2024 on Sustainable Lab Practices, as a tie-in event. GCS-Day is an excellent opportunity to build relationships with scientists around the world, and we encourage all NAOs to get involved.

II. Plans and priorities for 2024-25 biennium, and beyond:

Our planned activities are fundamentally aligned with the IUPAC's objectives and include:

- Highlighting and addressing global needs that could benefit from matured concepts arising from applied chemistry research and associated chemical technologies.
- Promoting communication among chemists, organizations and stakeholders in civil society with special emphasis on bringing them together to achieve practical solutions for world needs, which from a global perspective are often issues for developing countries. As part of this conversation, other disciplines are involved in these discussions with a view to promoting a better understanding and to work toward realistic solutions. This may involve a citizen science project in addition to our education and outreach efforts through webinars (incl. the ongoing Promoting Chemistry Applied to World Needs Webinar Series - project, 2024-010-2-021, Jan 2025-present), short videos/'cartoons' and contributions to special issues and symposia that are already underway.
- Leveraging IUPAC's resources platform through improved interdivisional interaction and collaboration. This includes existing projects (e.g. Global Conversation on Sustainability with IYCN, entrepreneurship with COCI, promoting chemistry applied to world needs). As the committee has received project funding in the 2022/23 and 2024/5 biennia for the first time (historically CHEMRAWN did not receive a project budget), this has allowed us to be more engaged via the project system (of planning, doing and recording our initiatives) and we look forward to continued activity in 2025 and beyond. For example, a project proposal for a new IUPAC resource page focused on plastic pollution and potential solutions will be submitted soon.
- Supporting multidisciplinary initiatives/projects that can evolve towards addressing critical global issues and the development of related conferences. We are interested in pursuing three future CHEMRAWN conferences on the following topics: (a) 'Safe and Secure Water Access', (b) 'Elements at Risk' and possibly collaborating with Div. II, and (c) 'Carbon-neutrality'. Due to volunteer hours and external fundraising needed to host such events, we will also explore the opportunities to contribute symposia and workshops under the 'IUPAC CHEMRAWN' name within other established conference series worldwide. Where appropriate, in addition to conferences, we will carry on the conversation by making use of virtual technologies, social media platforms and other newer/emerging means.
- Increasing the diversity and a broader member base for our committee and IUPAC as a whole. Working with IYCN will help us to achieve this.
- Promoting entrepreneurship and innovation via chemistry for socio-economic development. We are currently engaged with COCI in this area. Beyond entrepreneurship, we are also interested in developing a project focused on capacity building in emerging economic regions of the world perhaps in collaboration with outside organizations such as *Seeding Labs* and the *International Organization for Chemical Sciences in Development* (IOCD).

III. An overall report of Division/Committee activities and since 2023 Council meeting organized in context of IUPAC strategy and by priorities proposed by science board.

Priorities proposed by the Science Board are used as four sub-headings in the section below and our corresponding activities written in blue text:

(a) Global scientific cooperation and collaboration that creates a common language of chemistry, including data or technical standards, nomenclature, terminology, and symbols.

Not applicable to CHEMRAWN Standing Committee

(b) Interaction with chemistry organisations, professional societies, industry and other relevant bodies to facilitate best practice in chemistry and chemistry education, or which support educational initiatives in data standards and management

We have developed a strong relationship with the international educational foundation *Beyond Benign*. This has allowed us to provide webinars (Sustainable Lab Practices, a tie-in event to GCS Day, October 2024; Promoting Chemistry Applied to World Needs Webinar Series, project, 2024-010-2-021, January 2025 onwards). We first hosted a webinar with Beyond Benign in October 2023 based on submissions to our special issue of *Chemistry Teacher International* (IUPAC Project 2022-016-1-021). As most submissions were from Brazil, we held the majority of the webinar in Portuguese and also involved high school students in the discussion.

(c) Connections with cognate disciplines and educational communities, including outreach or engagement initiatives and those that contribute to sustainable development

We are working with *Beyond Benign* on a webinar series “Promoting Chemistry Applied to World Needs”, Jan 2025 onwards, and they will also help us distribute educational material/videos associated with the topics covered (IUPAC Top 10 emerging technologies and UN SDGs) to a broad audience, IUPAC project 2024-010-02-021. Dr. Silvia Borsacchi (CHEMRAWN Secretary) and Elisa Carignani (CHEMRAWN Young Observer) are part of IUPAC project 2023-017-2-600 with the Chemistry and the Environment Division and are co-organizing a symposium on the potential of solid-state NMR in the fields of environmental protection and sustainable chemistry. Building on E-Waste Africa (IUPAC Project 2020-021-1) and CHEMRAWN XXII, we have completed IUPAC Project 2022-016-1-021 and published a special issue of *Chemistry Teacher International* on effective teaching tools and methods to learn about e-waste during 2024.

(d) Promotion of diversity and inclusiveness in the profession of chemistry, or of values and ethics in science through responsible practice.

We have been working to improve diversity and inclusiveness especially in terms of language and geography. For example, we hosted a GCS Day webinar (Oct 2023) based on submissions to our special issue of *Chemistry Teacher International*. As most submissions were from Brazil, we held the majority of the webinar in Portuguese and also involved high school students in the discussion. We are hopeful that activities such as this can help IUPAC increase involvement of LatinX chemists worldwide. Also, Italian members of our committee were involved in the recent

translation of the official IUPAC Periodic Table into Italian. Members of our committee are also very involved with annual GWB events.

One ‘inclusive’ practice that CHEMRAWN has been part of for many years is the CHEMRAWN VII prize for early-mid career scientists in emerging regions of the world studying atmospheric or green chemistry. CHEMRAWN wants to investigate methods of support and alternative fundraising strategies to help sponsor the next generation of scientists to attend IUPAC meetings, especially as funding for the CHEMRAWN VII prize (which was endowed from profit in historic CHEMRAWN conferences) is restricted currently. Another idea moving forward is for successful CHEMRAWN conferences to be replicated in different regions around the world, and we encourage NAOs to reach out to our committee in this regard. We were planning (2022-23 biennium) a CHEMRAWN conference on ‘Water’ in the Middle-East (to be held in the current 2024-25 biennium) but this is on hold due to instability in the region. We have worked with the Italian NAO on a hybrid symposium and round-table discussion on the past and the future of electrochemistry (October 2022) and look forward to working with others on similar projects in the future on topics of relevance to CHEMRAWN. Hybrid or virtual events can complement in-person activities and are more inclusive as they do not require travel expenses.

Activities in in context of current IUPAC strategy

The CHEMRAWN committee meet at least twice a year (e.g. February 2024, October 2024, February 2025, July 2025) and communicate via e-mail or one-on-one zoom calls between meetings. The CHEMRAWN website continues to be updated by a committee E. Carignani (Young Observer and representative of Italian NAO) and L. Sydnes (NR). This team approach to improving our communication is working well and we will continue to use this model in the next biennium.

We have been and will be addressing IUPAC’s Goals in a number of ways and especially:

- (i) *Provide scientific expertise to address critical world needs.* Our committee, as its name states, targets the use of chemical research to meet unmet world needs. Building on the CHEMRAWN XXII conference “E-waste Africa” (2021), we led a collaborative project and edited a special issue of *Chemistry Teacher International*, and a new resource website (prepared by Sydnes and Kaucic with assistance from F. Meyers). We are now producing a webinar series (Jan 2025 onwards) and some teaching materials/videos on chemistry related to IUPAC Top Ten Emerging Technologies and UN SDGs.
- (ii) *Improve the vitality, effectiveness and efficiency of our Union.* We are working with chemists in emerging economic regions that are typically under-represented in the Union. Engaging with chemists truly representing the whole world in which we live will improve the vitality of the Union. For example, we received most submissions for our e-waste special issue of *Chemistry Teacher International* from Brazil and so we hosted a GCS Day webinar in Oct. 2023 in Portuguese including conversations with high school students who had performed experiments during their classes. Furthermore, we are interested in newer avenues of communication and outreach (e.g. webinars, social media) to increase efficiency within our committee and our interactions with others, including new external collaborations such as our work over the past two years with *Beyond Benign*. We look forward to continuing to work with IYCN, other divisions/committees and project task group members in this regard.

We have been addressing IUPAC's current Objectives in a number of ways:

“*Brand IUPAC in the minds of stakeholders*” – We have worked with IYCN and *Beyond Benign* to emphasize the important role chemists and IUPAC play in sustainable development and energy research. *Beyond Benign*'s higher education program have direct contact with 210+ institutions and 4,600 faculty members worldwide to provide green chemistry skills and knowledge to 1.2 million students a year annually. These connections will introduce young scientists across the globe to IUPAC via our *Beyond Benign X CHEMRAWN* initiatives such as webinars and teaching materials.

“*Improve quality and frequency of communication with stakeholders*” – Dr. Fran Kerton (current chair) and members of the task group for project 2024-010-021 are organizing webinars in collaboration with *Beyond Benign*, and promoting these events across social media platforms. Dr. Leiv Sydnes and Dr. Venčeslav (Slavko) Kaučič, with Dr. Fabienne Meyers, have prepared a resource page on e-waste (as an important outcome from CHEMRAWN XXII in 2021), iupac.org/e-waste. Dr. Sydnes is drafting a proposal for a similar resource page on plastic pollution.

“*Expand and retain Member and volunteer base with an emphasis on diversity and inclusion*” – through our CHEMRAWN ambassador's program, talks on IUPAC have been given at events for the Global Women's Breakfast and elsewhere. Kerton has been working on the 'Global Conversation on Sustainability' project, which will be impactful here because it is led by IYCN. Our current collaborations with *Beyond Benign* are also expanding our reach to a broad audience.

“*Enhance interdivisional interaction and collaboration*” – We have participated in IYCN events such as GCS day and these are important for the future of chemistry worldwide and IUPAC. We have been able to start projects with NAOs and other divisions and standing committees of IUPAC including CCE, COCI, Div II and Div VI. We encourage divisions and NAO to get in touch if they are interested in working with us.

“*Emphasize multidisciplinary projects addressing critical global issues*” – Building on our collaborations with Division VI during past biennia, we have developed projects with other committees and divisions during the past 4 years including a special issue of *Chemistry Teacher International* on e-waste and related issues with CCE, Div II, Div VI and COCI.

“*Support chemistry education, particularly in developing countries*” – An important outcome of our CHEMRAWN XXII E-waste Africa conference was the development of teaching materials and specifically to communicate with the public regarding remediation of E-waste and pollution that can occur if electronic devices are not disposed of appropriately. This has led to an education themed project (special issue of *Chemistry Teacher International*, published in 2024) focused on developing University-level and high school level teaching materials on chemical aspects of e-waste and [a webpage of resources, iupac.org/e-waste](http://iupac.org/e-waste).

IV. Tabular material.

Forthcoming events, January 2025 onwards:

- Silvia Borsacchi (CHEMRAWN secretary) and Elisa Carignani (CHEMRAWN Young Observer) are co-organizing a symposium at IUPAC 2025 World Chemistry Congress related to IUPAC project 2023-017-2-600, July 2025

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- Dr. Junji Nanamura (CHEMRAWN AM) will be giving a webinar: ‘What is carbon neutrality and how to achieve it?’, part of our Promoting Chemistry Applied to World Needs project, 2024-010-2-021, February 6/7, 2025. Registration for all webinars in this series is possible here:
https://mailchi.mp/ae959a1fc960/chemistry_webinar_series?mc_cid=9ad0a9d68e&mc_eid=0bb67908b9
- Dr. Amy Cannon with Dr. F. Kerton. “Not-for-profit and Social Entrepreneurship”, Part of the Chemistry Entrepreneurship project led by COCI, 2023-012-2-022,
<https://iupac.org/event/not-for-profit-and-social-entrepreneurship/>, February 5, 2025
- Dr. Ashlee Howarth, ‘Adventures in the Synthesis of Metal-Organic Frameworks’, Facilitators: Dr. J. Vidal and Dr. F. Kerton, part of our Promoting Chemistry Applied to World Needs project, 2024-010-2-021, <https://iupac.org/event/adventures-in-the-synthesis-of-metal-organic-frameworks/>, January 24, 2025

Conferences, symposia and outreach activities for 2023 onwards:

- The Relevance of Sustainable Laboratory Practices and Green Labs, Webinar with Beyond Benign (due to requests to CHEMRAWN by the chemistry community), October 8, 2024, Presenter: T. Freese, University of Groningen, Facilitators: F. Kerton and J. Vidal, Recording is available on YouTube: <https://youtu.be/AF9rOdyg0l4?si=5pJoPMomn2WgClz3>
- Members of the committee are actively involved with GWB events worldwide. For example, GWB 2024 organized by NAO-CNR incl. Silvia Borsacchi (“women and peace” a discussion with Dr. Syeda Sultana Razia, recipient of the 2023 OPCW The Hague Award)
- E-waste Management in Brazil: Diverse Approaches for a Sustainable Future, Webinar with Beyond Benign (part of IUPAC project 2022-016-1-021), October 19, 2023, Presenters: Contributing authors from E-waste special issue of *Chemistry Teacher International*, Facilitators: F. Kerton and J. Vidal, Recording available here: <https://www.beyondbenign.org/webinar/e-waste-management-in-brazil-diverse-approaches-for-a-sustainable-future/>

Resources

A resources page on e-waste has been recently compiled; see <https://iupac.org/e-waste/>
The editors of the e-waste site are Dr. Venčeslav (Slavko) Kaučič and Dr. Leiv K. Sydnes, and additions can be made by e-mailing them. Thank you also to Dr. Fabienne Meyers for help with this.

The goal is to make the IUPAC website the preferred place to search for reliable information about chemical issues making headlines and being of importance when societal challenges involving chemistry come on the agenda.

Publications

- E. Carignani, A. M. Paci, S. Borsacchi, M. Peruzzini, “Outreach in coordinated individual events: the GCS format of CNR Italy”, *Chemistry International*, vol. 47., no. 1, 2025, pp. 10-16.
- F. M. Kerton, “Learning about e-waste”, *Chemistry International*, vol. 46, no. 3, 2024, pp. 36
- Y. S. L. Choo, F. M. Fung, J. L. Vidal, “The PARTY Approach: How Friendship Transcended Borders for Science”, *Chemistry International*, vol. 46, no. 3, 2024, pp. 6-11

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- F. M. Kerton, Editorial, “Effective teaching tools and methods to learn about e-waste”, *Chemistry Teacher International*, vol. 6, no. 2, 2024, pp. 105-106
 - Special issue of CTI, vol. 6, no. 2, 2024.
- J. L. Vidal, J. Borges, Preface for the special issue ‘Activities and Actions Towards a Sustainable Future’ – a joint project by the International Union of Pure and Applied Chemistry (IUPAC) and the International Younger Chemists Network (IYCN), *Pure and Applied Chemistry*, vol. 96, no. 9, 2024, pp. 1245-1246, <https://doi.org/10.1515/pac-2024-2007>
- E. Carignani, A. M. Paci, S. Borsacchi, M. Peruzzini, “Outreach in coordinated individual events: the GCS format of CNR Italy”, *Pure and Applied Chemistry*, vol. 96, no. 9, 2024, pp. 1291-1297, <https://doi.org/10.1515/pac-2024-0238>
- S. Christian-Robinson, F. M. Kerton, “One story as part of the Global Conversation on Sustainability: dye adsorption studies using a novel bio-derived calcite material”, *Pure and Applied Chemistry*, vol. 96, no. 9, 2024, pp. 1247-1255, <https://doi.org/10.1515/pac-2024-0209>
- Interview included in: J. L. Vidal, J. Borges, “The Global Conversation on Sustainability: An IYCN/IUPAC Joint Effort to Creating a Sustainable Future Worldwide”, *Chemistry International*, vol. 45, no. 2, 2023, pp. 10-16
- S. Borsacchi, M. Guidotti, A. Sanson, A. Minguzzi, A. Pozzi, A. M. Paci, F. Kerton, M. Peruzzini, “Alessandro Volta: Still Fully Charged After 200 Year” *Chemistry International*, vol. 45, no. 2, 2023, pp. 17-20
- Y. Shevah, L. Hogue, C. O’Brien, Z. Lerman, “Malta Conferences Foundation, 10th Anniversary Conference: “Knowledge and Society” - MALTA X focus” *Chemistry International*, vol. 45, no. 2, 2023, pp. 44-48
- F. M. Kerton, “Effective teaching tools and methods to learn about e-waste” *Chemistry International*, vol. 45, no. 1, 2023, pp. 24

Projects led by CHEMRAWN:

2024-010-2-021 “Promoting Chemistry Applied to World Needs”

Projects led by other Committees/Divisions involving CHEMRAWN members:

2023-017-2-600 “Develop Solid State NMR potential for environment protection and sustainability” Led by Chemistry and the Environment Division

2023-012-2-022 “Chemistry entrepreneurship” Led by COCI

2021-027-2-600 “The global scenario and challenges of radioactive waste in the marine environment” Led by Chemistry and the Environment Division

2021-034-2-041 “Global Conversation on Sustainability” Led by IYCN and ICGCSD

2020-011-2-041 “Assessment of the Contribution of IUPAC Projects to the Achievement of the United Nations Sustainable Development Goals” Led by ICGCSD