

An IYCN/IUPAC Joint Effort to Creating a Sustainable Future Worldwide

by Juliana L. Vidal and João Borges

Since 25 September 2022, the International Younger Chemists Network (IYCN) and the International Union of Pure and Applied Chemistry (IUPAC) are jointly organizing the Global Conversation on Sustainability (GCS, <https://www.gcs-day.org>) in an annual fashion. This day has been chosen because it marks the anniversary of the United Nations Sustainable Development Goals (UN SDGs) [1].

The IYCN/IUPAC joint GCS project, which is supported by the IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD), aims to coordinate a yearly one-day event worldwide focusing on sustainability towards a common good by providing guidelines on different possible formats to organize and register events by the community, as disclosed on the GCS website. Moreover, the GCS project is sponsored by Merck KGaA, Darmstadt, Germany, and is supported by several organizations, including the International Year of Basic Sciences for Sustainable Development (IYBSSD2022), Beyond Benign, the International Sustainable Chemistry Collaborative Centre (ISC3), the Global Young Academy (GYA), and the Chemicals and Waste Platform of the Major Group for Children and Youth of the United Nations Environment Programme (UNEP-MGCY).

In the first year of the GCS project, which coincided with the beginning of the IYBSSD2022 aiming to celebrate the key role of basic sciences for sustainable development, more than 30 events were organized around the world, both in-person and online (<https://www.gcs-day.org/events>). We have reached out to some of the event organizers and asked them to share their individual experiences, why they have decided to jump in and become involved in the organization of a GCS event, and how the event has impacted their lives, as highlighted below. We hope such feedback and diversity of opinions and thoughts would encourage and actively engage colleagues from around the world to get involved with the GCS, come up with their own events in the next edition (25 September 2023) and join us in this global effort in accelerating the pace



Figure 1. Social media promotion of the GCS Day 2022 coordinated by the IYCN and IUPAC. The #Sustain4All was used to track and promote the communication and engagement between the community and organizers of the GCS events happening worldwide.

towards a sustainable future for the benefit of Society and our Planet.

Goals, Coordination, and Implementation

The objectives of the GCS project (iupac.org/project/2021-034-2-041/) are aligned with the goals of both the IYCN and IUPAC to tackle the UN SDGs of the UN 2030 Agenda for Sustainable Development by raising awareness and encouraging conversations among diverse stakeholders, including university scientists, governmental and non-governmental organizations, business entities, and the whole scientific community on implementing sustainable solutions globally. The project seeds upon previous collaborative projects and activities by the IYCN and IUPAC targeting the UN SDGs [2]. Such ambitious goal is expected to be accomplished globally, on a yearly and sustainable basis, through (i) the *implementation* of sustainable actions, practices, and mindset among the chemistry community across the world, (ii) the *communication* of local activities that could be applied at national and international levels, (iii) *connecting and engaging* young and established scientists, as well as the general public in taking effective actions for the achievement of a sustainable future, and keeping track of their progress, and (iv) *launching synergies and collaborations* across different countries, cultures, and continents to further

implement the practices discussed (Figure 2).

The GCS project is chaired by João Borges (Immediate Past Chair and Advisor of the IYCN for 2022-2023) and Javier García Martínez (President of IUPAC for the biennium 2022-2023) and encompasses 13 Task Group members. The diversity is showcased in terms of gender and geographical location, being the team represented across 11 different countries, namely Portugal, Spain, Brazil, The Netherlands, Germany, Canada, Egypt, USA, Malaysia, Australia and Jordan (Figure 3).

GCS Day 2022 Across the World

In-person events for a sustainable future

Francesca Kerton (Memorial University of Newfoundland, Canada) is a member of the GCS Task Group and has been thoroughly involved in the creation and promotion of the project, and its further implementation at Memorial University. *Entitled Scientists and Sustainability*, the in-person event held at the Core Science Facility was able to promote sustainability in science and build confidence in young chemists through flash presentations followed by discussions regarding the need for collaborative work to achieve the UN SDGs.

According to Kerton, “both graduate and

undergraduate students volunteered to give short ‘elevator pitch’ style presentations on their research or a topic related to sustainability. I was very grateful for their participation and energy on the day. A big thank you in particular to Kavi Heerah (Ph.D. student, Reader lab) (Figure 4), as he was the first to step forward and encouraged others to take part. We had a small audience on the day (around 20 people) including some local high school chemistry teachers and we hope they took some of our passion for sustainability back to their classrooms. I was able to secure some funding from the Canadian Society for Chemistry local section for this event and this allowed me to buy refreshments (hot and cold drinks, cookies and cakes). After presentations were complete, we chatted informally with a cup of coffee in hand to reflect on the UN SDGs and other sustainability issues.”

Regarding the future of the GCS, Francesca is looking forward to further dissemination and application of the project. In this context, she already has plans for the event at the Memorial University in 2023: “I am excited for GCS Day becoming an annual event and I hope more people will take part in activities around the world this year. As Chair of the IUPAC Chemical Research Applied to World Needs (CHEMRAWN)

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Figure 2. A summary of the goals, objectives, and expected outcomes of the GCS. The project is based on the implementation, communication, promotion, and collaboration between individuals and organizations in contributing to achieve the UN SDGs and promoting sustainable development globally.

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Figure 3. Task group members of the IYCN/IUPAC joint GCS project encompassing members of the IYCN, IUPAC and other entities, and their countries of origin.

Committee, we are planning a webinar featuring chemical education focused on the topic of e-waste for GCS Day in 2023 and I will be busy encouraging other Canadian Universities to host in-person events. Closer to home, one of my own Ph.D. students, Sachel Christian-Robinson, will be leading the organization of a local event at Memorial University of Newfoundland this September."

Local discussions during the GCS Day 2022 were also performed at McGill University (Montréal, Canada) and at the British University in Egypt. The motivation behind the planning of 'McGill's GCS' came from the necessity of promoting a sustainable change. Julio Terra and Jasmine Hong are both graduate students at McGill University and highlighted that "there is a need for more sustainable conversations in our department." According to Terra and Hong, panelists from different backgrounds (*e.g.*, academia, government, research, industry, and education) participated in an engaged discussion during the event to promote sustainable actions: "We even started the discussion of implementing a nitrile glove recycling program in the department." At the British University in Egypt, Hassan Nageh was behind the organization of a round-table discussion on

sustainability held at the Nanotechnology Research Centre, in which "external researchers and staff members were invited to discuss the role of science and nanotechnology in the implementation of the UN SDGs towards a greater impact on our world."

In South America, one of the GCS in-person events was organized by Cintia Milagre (State University of São Paulo, UNESP, Brazil). Milagre and the Institute of Chemistry (IQ) at UNESP celebrated not only the GCS Day 2022, but the whole week during the *#GlobalGoalsWeek: Contributions of Synthetic Organic Chemistry to Drug Development and Production Innovations for Sustainable Development*. About 50 attendees of the event at UNESP had the chance to participate in an important discussion with a Merck representative and hear from industry, as well as academia the importance of "implementing Green Chemistry actions from the beginning of the experimental work and not as an optimization strategy."

Cintia became involved with the GCS Day 2022 because she believes that "forming the next generation is essential if we seek fundamental changes. The GCS Day was a fantastic opportunity to spread Green and Sustainable Chemistry among undergraduate and

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graduate students.” According to Cintia, the event “was fuel to continue going on. Being surrounded by young chemists, the future of Chemistry—thirsty for knowledge about Green and Sustainable Chemistry and how to use chemistry to reach the UN SDGs —see the spark in their eyes and use the opportunity to share experiences with them and the experts from the university and industry is priceless.” Milagre also made a call for action as a participant or organizer of the GCS Day to “everyone interested in sustainability and sharing experiences about what actions are within our reach. As an organizer, I would say that investing our precious time in such an activity is quite rewarding, personally and professionally, especially when you have all the necessary institutional support and encouragement.”

Virtual events for a sustainable future

Besides in-person discussions about sustainability, the GCS Day 2022 also took place online in live or even via pre-recorded formats. One example of the latter consists in the video *Research for Sustainability* (<https://youtu.be/sRclYbfhyKE>) created by the Italian IUPAC Young Observers (Figure 5). Using their own GCS format, the group discussed, in an informative video, the main challenges involving the achievement of a sustainable future and potential solutions developed by chemists worldwide. Elisa Carignani, postdoctoral researcher at the National Research Council of Italy

and member of the Italian IUPAC Young Observers group, said that the creation of a pre-recorded video for the GCS Day 2022 was “an opportunity to develop communication skills for a non-specialized audience and get some experience in video-making.” According to Carignani, the leadership skills acquired during group planning and coordination of the GCS event was “another important part of the work,” and she believes that those will be very useful in her career. Carignani also suggests others “invest time in participating/organizing a GCS event. It is an occasion to gain a broader perspective, and a source of inspiration to find renewed enthusiasm to bring in your professional life.”

The Brazilian Chemical Society (SBQ) has also joined the GCS Day 2022 through the webinar *Education and Scientific Dissemination for the SDGs of the 2030 Agenda*, which was recorded and can be found online (<https://www.youtube.com/live/ziCqR-9peblk>). During this GCS event, attendees were able to understand the importance and relevance of taking actions aimed at promoting the 2030 Agenda within the context of education for sustainable development. According to Romeu C. Rocha-Filho from the Federal University of São Carlos (UFSCar, Brazil), the motivation for this event came from the fact “that SBQ has an ongoing action focused on sustainability” that promotes the discussion of ways that chemistry can contribute to Brazil’s achievement of a sustainable future.



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Thank you to the NL Section of the CIC for
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Figure 4. Kavi Heerah’s presentation at the GCS Day 2022 at Memorial University of Newfoundland and flyer used both in social media and internally for the promotion of the ‘Scientists and Sustainability’ event.



Figure 5. Snapshots of the *Research for Sustainability* video created by the Italian IUPAC Young Observers, highlighting the different scientific approaches used by researchers in the group for addressing the UN SDGs.

“Learning, spreading, and applying Green Chemistry” was the motivation behind the joint organization of the *Let's Talk Sustainability: A Global Conversation* event by the Asociación de Licenciados en Ciencias Químicas del Paraguay (ALQUIMPY), Asociación de Biotecnólogos del Paraguay and Colegio de Biólogos del Paraguay at the Faculty of Exact and Natural Sciences of the National University of Asunción (FACEN-UNA). With over 40 participants, the online event consisted of a set of diverse lectures with the aim to increase sustainability in chemistry, include more Green Chemistry topics in the academic curriculum, and further promote a culture of sustainability. In addition, a new network was born, and the Green Chemistry Paraguayan Network was created through the organization of this GCS event (Figure 6).

Lourdes Gisella Duarte Pereira was behind the organization of the GCS Day 2022 at FACEN-UNA and highlights the importance of the network created as a support for the communication and implementation of sustainable actions: “As a result of GCS 2022, an important network of professionals was obtained who are interested in working in the line of sustainability, be it in social, academic, and research work. We have managed to raise awareness about our environment and how important it is to have a sustainable culture to

improve our quality of life in the present and future. The GCS is a great opportunity to make networks and work to change our vision of what sustainability is, exchange ideas, and have the help of people who are working in that.”

Another online event was organized by the Task Group of the IYCN/IUPAC Joint GCS Project. During the *Sustainability for a Bright Future: A Global Conversation for Achieving the SDGs*, participants from all over the world had the chance to hear from, address questions, and be inspired by Javier García Martínez (President of IUPAC), Amy Cannon (Co-Founder and Executive Director at Beyond Benign), Anna Becker (Specialist Policy and Communications at the International Sustainable Chemistry Collaborative Centre — ISC3), and Jeffrey Whitford (Head of Sustainability, Social Business Innovation and Life Science Branding at MilliporeSigma) on initiatives, activities and actions towards pursuing sustainable solutions for a sustainable future globally.

The speakers not only discussed the urgent need for addressing the UN SDGs by 2030, but also highlighted the fundamental importance of education, taking effective actions, and thinking sustainably at the molecular level for a systemic change. In this context, the role of Green Chemistry was thoroughly discussed

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Figure 6. Promotional material and screenshots of the GCS Day 2022 at the Faculty of Exact and Natural Sciences of University of Asuncion (FACEN-UNA) in Paraguay. One of the main outcomes of the *Let's Talk Sustainability: A Global Conversation* event was the creation of the Green Chemistry Paraguayan Network.

as a fundamental piece towards the path of sustainable development. Javier García Martínez showed the work of IUPAC in targeting and tackling the UN SDGs, as well as different opportunities for young scientists to be connected and engaged. Amy Cannon talked about Beyond Benign, which works in preparing our future workforce to think sustainably through the insertion of Green Chemistry in the chemistry curriculum. Anna Becker talked about the different initiatives by ISC3 in enabling the transformation towards sustainable chemistry, including the 2nd Global Sustainable Chemistry Week, happening in 2023. Jeffrey Whitford displayed the initiatives of Merck KGaA, Darmstadt, Germany and, in particular MilliporeSigma (the life science business of Merck KGaA, Darmstadt, Germany, operating in the US and Canada) on sustainability, including the DOZN 2.0, a tool for measuring how “greener” a process actually is. These metrics are essential in the field of Green Chemistry and in the development of more sustainable processes and products. The talks were followed by a panel discussion, in which Green Chemistry resources were shared, and the role of young researchers for addressing the UN SDGs was amplified (<https://youtu.be/ByGDCiBY9aQ>).

The Zimbabwe Chemical Society was also present in the GCS Day 2022 and Kudakwashe Chingono, a

postgraduate researcher at the University of Leeds, helped in the coordination of the *Early Conversations for Sustainable Action in Zimbabwe*. The hybrid event took place online and in Harare, Gweru and consisted of a series of lectures and panel discussions with the goals to initiate the dialogue, open room for collaboration and mentorship, and promote sustainable actions in Zimbabwe. Kudakwashe believes that, as a young researcher, “the exposure to sustainable research through practice and experiences of other researchers at different career stages is important.” He highlights how the involvement in the GCS helped him to learn from others and share information: “Prior to the GCS, I had never encountered organizations such as Beyond Benign which have a uniquely useful approach to sustainable science. I enjoyed learning about their tools, and the opportunities available. In a developing country context, where I’m from, this means we can do research differently, educate about sustainability from the grassroots. I envision being part of and nurturing a generation of science that is conscious about the future.”

What the Future Holds

According to the feedback obtained by the event organizers from across the world during the GCS

Day 2022, the first year of the GCS project was able to support an initial dialogue and even provide local outcomes regarding the implementation of sustainable actions for a sustainable future. As the need for global conversations contemplating and correlating sustainable development, transforming science education, tackling societal, economic and environmental challenges, societal inequities, Green and Sustainable Chemistry research, and public policies continues to increase, we hope that the number of events organized by individuals, institutions, and organizations from all over the world in the upcoming GCS Day (September 25th, 2023) follows the same trend for the benefit of everyone. The very first year of the GCS project was only the beginning of a universal call for action and engagement of everyone upon addressing the UN SDGs at different levels and, therefore, we expect to see many other GCS events, in as many countries as possible, and in several formats in the years to come in jointly contributing to this global effort of achieving a sustainable future globally. Regardless of the magnitude of consequences achieved, “every sustainable action begins with a conversation” and the GCS Task Group is proud to promote both the implementation of a culture of sustainable practices in the community and effective actions, as well as the active communication and collaboration of our society to achieve a sustainable future. To learn more about the GCS project, find out the events that happened last year, and be inspired to plan and organize your own event for the year ahead, have a look into the guidelines at the GCS website (<https://www.gcs-day.org/guidelines>) and follow the **#Sustain4All** on Twitter (https://twitter.com/GCS_Day) and LinkedIn (<https://www.linkedin.com/company/gcs-day/>). If you want to ask questions, engage with or support the GCS project, please do not hesitate to contact us at contact@gcs-day.org.

We very much look forward to seeing your event for the GCS Day 2023 registered at the GCS website and joining us in this global conversation towards a sustainable future worldwide! We count on all of you!

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Council – CNR – ICCOM-CNR, Italy), Romeu C. Rocha-Filho (Federal University of São Carlos, Brazil), Lourdes Gisella Duarte Pereira (Faculty of Exact and Natural Sciences of the National University of Asunción, Paraguay), and Kudakwashe Chingono (University of Leeds, United Kingdom), for their kind feedback as per the organization of an event during the GCS Day 2022. We thank the International Year of Basic Sciences for Sustainable Development (IYBSSD2022), Beyond Benign, the International Sustainable Chemistry Collaborative Centre (ISCC), the Global Young Academy (GYA), and the Chemicals and Waste Platform of the Major Group for Children and Youth of the United Nations Environment Programme (UNEP-MGCY) for their support, as well as Merck KGaA, Darmstadt, Germany for its financial support to the IYCN/IUPAC joint GCS project. We also thank all Task Group members of the IYCN/IUPAC joint GCS project for their invaluable efforts, support, and contributions in the planning of the GCS project and GCS Day, and for making them a reality. 🙏

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3. Juliana Vidal (juliana_vidal@beyondbenign.org) is a Higher Education Program Manager at Beyond Benign. She received her Ph.D. from Memorial University of Newfoundland in 2021 and completed her postdoctoral research at McGill University in 2022 working with Green Chemistry. Juliana was selected a CAS Future Leader in 2020 and is currently a member of the Task Group of the IYCN/IUPAC Joint Project Global Conversation on Sustainability and a member of the Chemicals and Waste Platform of the Major Group for Children and Youth of the United Nations Environment Programme (UNEP-MGCY). <https://orcid.org/0000-0001-8755-7220>

João Borges (joaoborges@ua.pt) is a Senior Researcher at the Department of Chemistry and CICECO – Aveiro Institute of Materials at the University of Aveiro, Portugal, focusing on the molecular design, synthesis and development of soft supramolecular multicomponent biomaterials to interface with living systems. João is currently the Immediate Past Chair and Advisor of the International Younger Chemists Network (IYCN) for 2022-2023, Task Group Chair of the IYCN/IUPAC Joint Project Global Conversation on Sustainability, and Affiliate Member of IUPAC. Previously, João served as the Chair of the IYCN in 2021-2022, Vice-Chair in 2021, and Conference Presence Committee Leader between 2019-2021. <https://orcid.org/0000-0003-0126-8482>