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The Guiding Principles of Responsible Chemistry

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During the opening ceremony of IUPAC's World Chemistry Congress in July 2025, the organization launched their Guiding Principles of Responsible Chemistry (GPRC).[1] These were developed by an international team of chemists and built on existing frameworks including the Hague Ethical Guidelines from the Organization for the Prohibition of Chemical Weapons (OPCW),[2] the Twelve Principles of Green Chemistry outlined by Anastas and Warner,[3] and existing guidelines from chemical societies around the world. In the paragraphs below, I will highlight some of the connections between the GPRC and the scope of *RSC Sustainability*.

The GPRC are organised around eight responsibilities and presented in an interactive and engaging visual style on the IUPAC website with the opportunity to download information for discussion within your workplace or classroom. In addition to questions to guide discussion, for each of the eight, an overview is provided, some examples, and suggestions for future direction. There are perhaps three of the guiding principles that are particularly relevant to this journal: *Responsible innovation*, *Equitable access*, and *Safety, security & sustainability*.

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Responsible innovation

Under this principle, IUPAC asks chemists to "employ scientific knowledge and encourage innovations in chemistry to maximize benefits for people and the planet while minimizing and mitigating unintended consequences". This is a call for chemists and chemical companies to find sustainable solutions to achieve pressing global challenges such as access to clean water and sanitation, food, and energy. Focus is placed on consideration of the lifecycles of materials and anticipation of potential harmful consequences. An example provided by IUPAC to highlight unintended harmful consequences is the development of CFCs for use in refrigeration and as propellants, that led to the destruction of the stratospheric ozone layer above the poles in the second half of the 20th century.

Many research articles and reviews have been published in *RSC Sustainability* to date that address this 'Responsible innovation' guidance and target the UN SDGs 9 and 12 (Industry, Innovation and Infrastructure; Responsible Consumption and Production).[4] For example, there are increasing reports of valuable design approaches being incorporated into electrical and electronic equipment manufacture to allow easy recycling and recovery of critical metals.[5] Research and advances towards responsible innovation is not just the purview of academia, and important changes are happening in the chemical industry too, as described by researchers in BASF in a recent perspective article.[6] We, as a global community of chemistry, must be pro-active and anticipate or mitigate the harm that can occur to people and nature when chemical products are developed. We need to prevent problems from happening in the first place rather than just focusing on reducing harm after something problematic happens.

Equitable access

Under this principle, IUPAC asks chemists to "provide equitable access to information, resources, and opportunities to create an open, inclusive, and collegial environment for the chemistry community". They highlight that the chemistry enterprise requires everyone to have opportunities, regardless of socio-economic, cultural background or geographic location. As a gold open access journal, *RSC Sustainability* provides equitable access to research knowledge in sustainable chemistry, and in this regard, we are helping to break down some of the barriers currently in place that led to systemic inequality.

Examples highlighted by IUPAC under this principle include: (a) gender bias in scientific publishing, (b) challenges with disability and (c) global disparities in research, education, and innovation

capacity. In *RSC Sustainability*, some articles that address these disparities have been gathered in our special collection focused on UN Sustainable Development Goal 10: Reduced Inequality.[7] A recent review focused on inequalities globally with respect to contaminants of emerging concern and how there are disparities in available data that could lead to inappropriate strategies for assessment and containment particularly in the Global South, as research efforts to date have largely focused on the Global North.[8] Another review in this collection, with a focus on circularity, asks for the integration of traditional ecological knowledge when developing new materials and products.[9] Furthermore, articles have also been published that highlight the importance of FAIR (Findable, Accessible, Interoperable and Re-useable) data.[10] I hope that authors will continue to contribute to *RSC Sustainability* so readers worldwide can learn about the latest advances in sustainable technologies, innovation and ways that chemists and chemistry can address the UN SDGs in an equitable way.

Safety, security & sustainability

Under this principle, IUPAC asks chemists to "implement a culture of safety, security, sustainability, and responsibility in the practice of chemistry". They emphasize that we should work as chemists to protect the health of people and the planet, and make efforts to prevent illegal, harmful, or destructive uses of chemicals and the misuse of chemical manufacturing facilities and equipment. Examples highlighted by IUPAC include the good, the bad and the ugly: The Responsible Care® Initiative, Chemical Safety Gaps (from large scale incidents, *e.g.* the Bhopal disaster, through to smaller scale laboratory accidents), and the important work of the OPCW.

Many of the procedures described in *RSC Sustainability* are inherently safe as authors are asked to highlight both sustainability aspects of their research (Sustainability Spotlight) and as per our author guidelines "Any unusual hazards about the chemicals, procedures or equipment should be clearly identified". However, we have published a growing number of articles and reviews that focus on safe-and-sustainable-by-design (SSbD) approaches,[11] which are valuable in terms of accelerating the knowledge transfer from research labs to industrial scale and making important decisions regarding safety at an early discovery stage. We have also published articles focused on systems thinking,[12] and material and chemical life cycles (for example, using carbon dioxide from direct air capture for the synthesis of formic acid[13]). Thinking in this way by chemists when approaching their research will lead to improved safety, and advance sustainability by reducing hazards and thereby risks, and help prevent environmental contamination. Closely related to this guiding principle is the 2025 Stockholm Declaration on Chemistry for a Sustainable Future,[14] which was discussed in a previous editorial,[15] which requests that chemists and chemical organizations engage in meaningful change to "transform scientific breakthroughs into positive impact for society and the ecosystems upon which society relies".

I encourage you to read and learn more about the Guiding Principles of Responsible Chemistry,[1] and how we, as chemists and chemical engineers, can contribute to new knowledge, and the practice and application of chemistry safely and sustainably.

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