

Sustainable Development Goals in Chemistry in Switzerland

Abstract: The UN Sustainable Development Goals (SDGs) provide a framework for addressing some of the most pressing global challenges, from rising inequalities to economic growth and environmental impact. Chemistry is relevant to these issues and this Editorial reviews the contributions in the chemistry community in Switzerland.

Keywords: SDG · Sustainable development goals · Sustainable research · Swiss Chemical Society

The Sustainable Development Goals (SDGs) were conceptualised at the United Nations (UN) Conference on Sustainable Development in 2012 to meet the urgent environmental, political and economic challenges.^[1] The UN adopted the SDGs in 2015 as a global framework to address some of the most pressing global issues, with a call for action to end poverty, inequality, and the devastating impact on the environment towards well-being, peace, and justice through 17 interlinked goals (Fig. 1).^[2] Science plays a critical role,^[3] and *chemistry*, often referred to as the ‘central science’,^[4] is instrumental across SDGs.^[5]



Fig. 1. UN Sustainable Development Goals (SDGs).^[2] ©United Nations.

This refers to the efforts contributing to *alleviating poverty (SDG 1)* and *hunger (SDG 2)*, providing *good health and well-being (SDG 3)*, *clean water and sanitation (SDG 6)*, and *affordable and clean energy (SDG 7)*. Moreover, chemical sciences play a pivotal role in *decent work and economic growth (SDG 8)*, *sustainable industry, innovation, and infrastructure (SDG 9)*, *cities and communities (SDG 11)*, as well as *responsible production and consumption (SDG 12)*, driving *climate action (SDG 13)* and influencing *life below water (SDG 14)* and *life on land (SDG 15)*. Finally, the overall impact of chemical sciences is also relevant for *quality education (SDG 4)*, *gender equality (SDG 5)*, and *reducing inequalities (SDG 10)*, contributing to *peace, justice, and strong institutions (SDG 16)*, as well as *global partnerships for the goals (SDG 17)*.^[5]

Switzerland, as one of the UN Member States,^[6] hosting International Geneva^[7] and UN Geneva,^[8] has committed to the implementation of the 2030 Agenda for Sustainable Development,^[9] with a priority focus on three core areas, namely *sustainable consumption and production; climate, energy and biodiversity; and equal opportunities and social cohesion*.^[10] This commitment has been directly translated into action across disciplines of chemical sciences, as well as through (inter)national partnerships.

In particular, the *Swiss Chemical Society (SCS)*,^[11] and their young division, *youngSCS*,^[12] maintain the commitment to sustainable development in the Swiss scientific community across chemistry-related disciplines. **C. Papadimou, G. F. Geraci, and M-D. Schlemper-Scheidt** reflect on this in their discussion on the UN SDGs in Switzerland from the perspective of the youngSCS. The SCS is further involved through the activities of the Sustainable Chemistry (SusChem) division,^[13] part of the European Technology Platform for Sustainable Chemistry.^[14] This platform acknowledges the critical contribution of chemical sciences to SDGs, including **SDGs 2, 3, 6, 7, 9, 11, 12, and 13** (Fig. 2). The SCS also recognises outstanding contributions with a Green & Sustainable Chemistry Award.^[15]



Fig. 2. Selected SDGs (2, 3, 6, 7, 9, 11, 12 and 13) with a critical contribution of chemical sciences according to the European Technology Platform for Sustainable Chemistry and SCS SusChem division.^[14]

In addition, the *Swiss Academies of Arts and Sciences (a+)*^[16] and the *Swiss Academy of Sciences (SCNAT)*,^[17] with the Platform Chemistry, provide an umbrella network for the academic community in Switzerland,^[18] fostering collaboration and dialogue between various stakeholders in academia, industry, and at the interface of science, policy, and society. This has involved a variety of relevant initiatives, with a holistic approach to sustainable development, as discussed by **S. Hofmann and L. Merz** from the perspective

of the SCNAT Platform Chemistry. For instance, the a+ Network for Transdisciplinary Research (td-net) has led the Sustainable Development at the Universities Programme (SDU) and the U Change successor program.^[19] Furthermore, SCNAT Sustainability Research Initiative (SRI) has provided researchers, funding agencies, and policy-makers with synthesis reports on projects, events and news from a+ and related institutions on sustainable development.^[20] One of the latest reports from 2023 recommended establishing dedicated funding programmes referred to as *Lighthouse Programmes in Sustainability Research and Innovation*.^[21] Moreover, Platform Chemistry is involved in collaborations with the chemistry community in Switzerland and internationally, such as with the European Chemical Society (EuChemS)^[22] and the International Union of Pure and Applied Chemistry (IUPAC),^[23] further advancing sustainable development globally.

Similarly, (inter)national collaborations for sustainable development, more broadly relevant to global partnerships for the goals (**SDG 17**, Fig. 3), are strengthened by research networks. This involves the *National Centers of Competence in Research (NCCRs)* supported by the Swiss National Science Foundation (SNSF).^[24] For instance NCCR Catalysis focuses on the ‘Sustainable chemical processes through catalyst design’,^[25] bringing together researchers across disciplines of chemistry toward carbon neutrality, which is relevant to **SDGs 8, 9, 12, and 13**. The program of NCCR Catalysis is outlined by **M. F. Lagadec, S. Mitchell, J. Waser, and J. Pérez-Ramírez**, who share insights into the alignment of the activities with sustainable development and the opportunities for involvement.



Fig. 3. SDGs reflecting a broader societal impact of chemical sciences to quality education (4), gender equality (5), decent work and economic growth (8), reducing inequalities (10), and contributing to life below water (14), life on land (15), and peace, justice, and strong institutions (16), as well as global partnerships for the goals (17).

The networks and partnerships strengthened by the support of SCS, SCNAT, and NCCR, among others, include stakeholders across academia and industry. In this context, the Swiss chemical industry significantly contributes to the SDGs, including **SDGs 1, 8, and 9**, among others. For instance, *Syngenta*, as one of the leading agriculture companies, has been committed to **SDGs 1, 3, 6, 12, 13, 14 and 15**, and **SDG 2** in particular,^[26] as discussed by **C. Screpanti**, who considers the role of chemical innovation in soil and agrifood systems. Similarly, the Swiss pharmaceutical industry, with some of the leading companies and businesses, actively contributes to SDGs, as **SDG 3**,^[27] whereas institutes, such as *Eawag*, leading the aquatic research, contribute to other SDGs, such as **6**, and **2, 3, 7, 11, 12, 13, 14, and 15**.^[28]

While research and industry networks beneficially contribute to research, innovation, and society, they increasingly involve the use of materials with a potentially detrimental impact on health and the environment. This stimulates the ongoing efforts to adopt a more holistic approach to the sustainability of materials that considers various contributing factors, in accordance with the *Safe and Sustainable by Design (SSbD)* framework proposed by the European Commission and other agencies.^[29] This applies to nanomaterials and related processes, as discussed by **S. Keshavan, A. Petri-Fink and B. Rothen-Rutishauser**, who call for a multifaceted approach to sustainability and the use of nanomaterials throughout their life cycle, integrating science, ethics, and risk assessment, relevant to **SDG 3** and **12**.^[30]

The holistic approach to sustainability also applies to *renewable energy conversion and storage*, which stimulates intensive research in Switzerland that is closely related to **SDGs 7, 11, and 13**. This includes energy storage in battery materials and technologies, as discussed by **K. V. Kravchyk, C. Battaglia, V. Siller, B. Lelotte, M. El Kazzi, J. Morzy, M. Futscher, Y. Romanyuk, M. Stalder, A. Fuerst, and M. V. Kovalenko**, providing a perspective on the solid-state battery technologies in Switzerland and the associated challenges and opportunities for innovation in this area. This is complemented by a perspective on the mitigation of the environmental impact of these and other energy technologies through carbon capture, as discussed by **T. Ashirov and A. Coskun**, who outline the progress and challenges that stimulate further innovation in these emerging technologies for sustainable development.

Such progress towards sustainable development requires raising a new generation of young scientists involved in the implementation of SDGs. To this end, *quality education* (**SDG 4**) plays a critical role, along with enthusiasm and joy for science, as argued by **W. Rickhaus and M. Rickhaus** advocating for collaborative learning environments. Making these learning environments equitable is also relevant to reducing inequalities (**SDG 10**), as addressed further by **E. Komarczuk, L. Galazzo, S. Kuzin, J. Fischer and M. Teucher**, invested in equitable education through the company *EquipSent* which facilitates equipment sharing and transfer for sustainable education.^[31] To this end, the strive toward gender equality (**SDG 5**) is another especially critical element for sustainable development. This is further emphasised by **V. Gasser, A. Singh-Morgan, M. Lederbauer, M. Azizbaig Mohajer, and E. Komarczuk** who outline the efforts by the *Society of Women in Natural Sciences of ETH Zurich (WiNS)*,^[32] contributing to supporting women scientists while advocating for systemic changes toward sustainable equality in Switzerland.

The action to realise the UN Agenda 2030 has faced setbacks over the last few years due to the COVID-19 pandemic and climate emergency.^[33] However, there is an ongoing effort to address the SDGs in Switzerland as well as globally. Toward this goal, the activities and networks in chemical sciences are

contributing across the areas of research, education, and innovation as well as through science for policy and diplomacy,^[34-35] and partnerships. This special issue of CHIMIA highlights some of these activities to raise awareness, harness their potential, and stimulate more innovation and cooperation to achieve sustainable development.



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