



**We transform
chemistry**

ANNUAL REPORT MAY 2018 – MAY 2019

Shaping the Sustainable Chemistry Agenda

Report on the Second & Third Year of
the International Sustainable Chemistry Collaborative Centre (ISC3)

International Sustainable Chemistry Collaborative Centre (ISC₃)

About the ISC₃

The International Sustainable Chemistry Collaborative Centre (ISC₃) is an independent, globally-acting centre that promotes and fosters innovation, collaboration, education, research, and information on sustainable chemistry, at different levels and worldwide. Through a broad range of activities, supported by its Innovation Hub at DECHEMA e.V. and its Research & Education Hub at Leuphana University, as well as a network of international partners and regional hubs, the ISC₃ fosters the transformation towards sustainability in the chemicals industry and beyond.

As a multi-stakeholder platform, the ISC₃ serves as an interface between the public and the private sector. By connecting the different stakeholders, the Centre supports transformative collaboration and policies in the field of chemicals management, the Sustainable Development Goals (SDGs) and the 2030 Agenda. The Centre reaches out to stakeholders from all sectors to interlink civil society with academia, industry, and politics for the development of a common understanding of sustainable chemistry as a new transformative approach. With its first regional hub at the University of Massachusetts Lowell (UMass Lowell) the ISC₃ partners with Prof. Joel Tickner to reach out to the Americas.

The ISC₃ engages in the dialogue on the contributions of sustainable chemistry to the sound management of chemicals and waste, especially in the SAICM beyond 2020 process. In line with the key findings of the Global Chemicals Outlook II of the UN Environment Programme, the Centre aims to prevent future legacies by promoting sustainable and green chemical solutions.

Acting as an innovation promoter and start-up supporter, the ISC₃ carries out innovation scouting to discover new sustainable chemical solutions and business ideas, especially in developing countries. Through its Global Start-Up Service, the Centre offers start-ups, entrepreneurs, and innovators in the field of sustainable chemistry mentoring, training, and other supporting services to bring innovative products and services to the markets.

Furthermore, the ISC₃ initiates collaborative and foresight projects to explore the opportunities and challenges of sustainable chemistry innovation and discuss transformative pathways towards achieving the Agenda 2030. Through its collaborative projects, the Centre engages with partners from the public and private sector to explore and support new practical approaches, projects, and services.

Through its educational activities, the ISC₃ offers an annual Summer School on Sustainable Chemistry and the first Sustainable Chemistry Master Programme. The ISC₃ sets up sustainable chemistry as a new field in the curricula for chemists, international students, and young professionals. Working towards a new mindset in the chemicals sector, the Centre engages in the international scientific dialogue on sustainable chemistry.

As a knowledge-hub and dialogue forum for sustainable chemistry, the ISC₃ organizes events, conferences, workshops, and exhibitions to engage with stakeholders, gather and exchange knowledge, raise awareness, and disseminate information.



2017: Launch of the new international centre

The International Sustainable Chemistry Collaborative Centre (ISC₃) was launched in May 2017 by the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) and the German Environment Agency (UBA) during the international conference “Mainstreaming Sustainable Chemistry” in Berlin. The conference served to discuss the future role of the new institute, which was defined as follows:

- › an independent international network for Collaboration, Innovation, and Education on sustainable chemistry.
- › a driving force enabling developing countries to achieve the UN Sustainable Development Goals (SDGs);
- › and an active and substantial contributor to national and international chemicals policies;

In order to fulfill its mandate and contribute to the transformation of the chemical sector towards sustainability, the strategic approach of the ISC₃ focused on five fields of activity: Collaboration, Innovation, Education, Research, and Information.

Through its activities, the Centre strives to foster the breakthrough of sustainable chemistry as an important solution-provider for today’s most pressing problems, as well new holistic approach to avoid negative impacts of chemicals and prevent future legacies. As the UNEP report “Analysis of Stakeholder Submissions on Sustainable Chemistry Pursuant to UNEA Resolution 2/7” declares, sustainable chemistry has the potential to contribute to achieving at least 12 out of 17 Sustainable Development Goals (SDGs) of the United Nations. Surveying the ongoing challenges in chemicals

management, the Global Chemicals Outlook II finds that “Consumer demand, as well as green and sustainable chemistry education and innovation (e.g. through start-ups), are among the important drivers of change”. Through the emerging concept of sustainable chemistry as a holistic life-cycle approach, the ISC₃ promotes new sustainable business models and entrepreneurs to transform the chemicals sector, while positively impacting up- and downstream industries.

By promoting sustainable chemistry as a new holistic concept, the ISC₃ reaches out to stakeholders from all sectors to establish a common understanding of sustainable chemistry. Based on a joint understanding, the emerging concept is supposed to serve as a guiding principle for scientists, entrepreneurs, industry, and policy makers to create innovative solutions contributing to the SDGs.

2018 – 2019: Consolidation and further development

Since its launch, the ISC₃ has consolidated its strategy and structures. 2018 was characterised by a series of successful events, a fruitful collaboration with UN Environment (UNEP), and promising first steps in the international debate on sustainable chemistry innovation.

The UNEP and the ISC₃ co-hosted a series of regional expert workshops early in 2018 (Nairobi, March 7-8; Frankfurt, March 26-27; Panama City, April 12-13; Bangkok, April 25-26) to understand trends and identify dangers and chances relevant for sustainable chemistry innovation and the development of the Global Chemicals Outlook II (GCO-II), the leading publication on the sound management of chemicals and waste of

the United Nations. The ISC₃ contributed to the GCO-II through a foundational paper on megatrends and industry sector trends relevant for sustainable chemistry innovation.

The workshop series brought together different stakeholder groups, including innovators, policy makers, and representatives from civil society and academia. The participants identified and examined regional megatrends and industrial trends that may create risks and opportunities for chemicals management and sustainable chemistry innovation.

Another milestone of 2018 was the Centre’s participation in the ACHEMA trade fair in Frankfurt, the world’s leading exhibition and conference on chemical engineering and biotechnology. In partnership with the US-based acceleration platform Think Beyond Plastic, the ISC₃ made a showcase for sustainable chemistry innovation by presenting five inspiring start-ups.

The Green and Sustainable Chemistry Conference in Berlin in May 2018, chaired by Professor Klaus Kümmerer, Director of the ISC₃ Research & Education Hub at the Institute of Sustainable and Environmental Chemistry at Leuphana University (Lüneburg, Germany), constituted a scientific highlight. The conference brought together scientists from all over the world to share the latest developments across all fields of green and sustainable chemistry.

While broadening its range of activities, the ISC₃ also kept growing. During 2019, the ISC₃ headquarters in Bonn welcomed a new Director of Science & Innovation, a Senior Advisor for Project Development, a controller, a second office-manager, and three new members of the communications and policy team.

The ISC₃ has been continuously developing its activities. The Innovation Hub at DECHEMA in Frankfurt, Germany (Gesellschaft für Chemische Technik und Biotechnologie e.V.) started to implement the Global Start-up Service, the Spiderweb Network, and the Lab App, while the Education Hub intensively worked on the development and implementation of new international curricula for sustainable chemistry for students and young professionals from all over the world.

Furthermore, the ISC₃ has broadened its international network by arranging for new partnerships in Egypt, India, and Chile, as well as through a new strategic collaboration with the World Economic Forum and the Elsevier Foundation. Through the new collaborations, the ISC₃ strives to broaden the outreach to the international start-up community, as well as bring forward new approaches to strengthen sustainable chemistry as a new approach for science and industry.

Among the events of the last two years, the 1st ISC₃ Stakeholder Forum in Bonn, bringing together more than 100 stakeholders from all world regions, provided a milestone to strengthen stakeholder engagement and cross-sectoral dialogue. A detailed events list is provided under the section “Information”.



ISC₃ Team at the strategy and team building workshop in February 2019 in Montabaur

Strategy and Activities



The ISC₃ regularly hosts dialogue events to connect various stakeholders around the globe in order to share views and experiences between actors and across sectors. Through the organization of stakeholder events, scientific conferences, and exhibitions, the promotion of new sustainability-driven solutions, cross-sectoral dialogue, and collaboration in the field of sustainable chemistry, the ISC₃ supports the development of a global network of sustainable chemistry actors.



Collaboration – creating sustainable solutions through dialogue and cooperation

An integral part of the ISC₃ mandate is to develop a transformative agenda while strengthening cross-sectoral collaboration. For this purpose, the ISC₃ continued to identify key strategic partnerships with international partners interested in joining program the activities of the Centre. A broad range of institutions, such as the American innovation platform Think Beyond Plastic, the scientific publishing house Elsevier and the Elsevier Foundation, the World Economic Forum (WEF), the European Chemistry Partnering (ECP), and the European Technology Platform for Sustainable Chemistry (SusChem), are among the those that collaborate with the ISC₃ to promote sustainable chemistry and strengthen a common understanding and joint activities.

Stakeholder Engagement and Dialogue

As a globally-acting, independent institution and think tank, the ISC₃ is committed to helping to transform chemistry in cooperation with all stakeholders. Key elements of the ISC₃ stakeholder engagement are the Advisory Board and the Scientific Board, as well as the ISC₃ Stakeholder Forum, three complementary fora allowing the ISC₃ to share experiences and discuss the working programme of the ISC₃. In addition to these three elements of stakeholder engagement, the ISC₃ invites representatives from all sectors to engage on specific topics by participating in the ISC₃ Workstreams.

ISC₃ Advisory and Scientific Board

With the establishment of the Advisory and Scientific Boards in September 2018, the ISC₃ set up a key element of its stakeholder engagement as a part of the Centre's collaborative governance strategy. The boards support the mission of the ISC₃, as well as the international dialogue on the emerging concept of sustainable chemistry by providing advice, know-how, and networking activities. Working in the spirit of international collaboration for sustainable development, the Advisory Board and the Scientific Board are committed to an open, constructive, and transparent dialogue, providing the ISC₃ with inspiration, critical review, and strategic advice.

The members of the Advisory Board and the Scientific Board engage in the dialogue based on their personal and professional experience, providing expert advice on technical, scientific, and communication issues, as well as advice on the mid-term and long-term goals of the ISC₃. The members are duly invited to engage in dialogue and promote the mission of the emerging concept of sustainable chemistry using all appropriate international cooperation platforms and networks.

The first meeting of the Boards took place in September 2018 in Bonn, Germany, and invited the newly appointed members to reflect on the strategic approach of the ISC₃, thus providing valuable guidance for the further activities of the Centre. A second meeting followed in June 2019 in the lead-up to the 1st ISC₃ Stakeholder Forum. During the meeting, the ISC₃ team reported on the progress of the Centre's working programme. Interlinked with the 1st Stakeholder Forum, the meeting invited the members to join the broader dialogue and engage in the cross-sectoral dialogue on sustainable chemistry and the ISC₃ agenda.



International speakers at a panel discussion at the first ISC₃ Stakeholder Forum

ISC₃ Stakeholder Forum

The second key element of the ISC₃ stakeholder engagement is the ISC₃ Stakeholder Forum. This dialogue event is dedicated to involving the ISC₃ stakeholders in the work programme of the Centre and engaging them in a cross-sectoral dialogue on the emerging concept of sustainable chemistry. The ISC₃ Stakeholder Forum provides an open platform to interlink representatives from policy, industry, academia, and civil society, and discuss how sustainable chemistry can contribute to achieving the SDGs and become a solution provider for a circular, climate-resilient society. Furthermore, the event provides a forum to share experiences and activities and engage in the ISC₃'s activity fields on collaboration, innovation, education, research, and information.

The 1st ISC₃ Stakeholder Forum took place in June 2019 in Bonn/Königswinter, Germany. More than 110 experts from Africa, Asia, Europe, and North and South America participated in the new dialogue event. During the two-day conference, participants engaged in an intense interactive programme. The international experts reflected on the ISC₃ working programme,

New partners in Africa, Asia, and Latin America joined the ISC₃ Spiderweb Network

During the conference, three Memoranda of Understanding (MoU) were signed to set up new co-operations with organizations from North Africa, Asia, and South America. The ISC₃ now collaborates with the National Agency for Research and Innovation of Uruguay (ANII), the Green ChemisTree Foundation (India), and the Egyptian social enterprise Youthinkgreen. The organizations agreed to cooperate and support sustainable chemistry innovation by setting up joint activities in the respective regions. All of them joined the global ISC₃ Spiderweb Network of the Global Start-up Service, created by the ISC₃ Innovation Hub, to support entrepreneurs at every point in the innovation chain (see below).



Kick-off for new partnerships with ANII, the ChemisTree Foundation, and Youthinkgreen at the ISC₃ Stakeholder Forum

shared experiences, and offered valuable guidance for the further work of the Centre. With an open forum format, the participants were invited to present their projects and initiatives in order to strengthen the international networks and knowledge management on sustainable chemistry. A key element of the event was the discussion of a common understanding of sustainable chemistry as a transformative concept. The dialogue was based on an ISC₃ thought-starter highlighting key elements and objectives of sustainable chemistry. Participants deliberated on the thought-starter, shared views, and raised a broad range of elements and objectives to be reflected in a common understanding of sustainable chemistry, ranging from the importance of having a holistic approach that encompasses all dimensions of sustainable development and addresses the whole life cycle of a chemical product to the need for better awareness and education on sustainable solutions.



Roundtable discussion at the Stakeholder Forum in Bonn/Königswinter

Stakeholder Dialog Process “Towards a common understanding on Sustainable Chemistry”

The discussion on a common understanding of Sustainable Chemistry highlights the challenges and opportunities associated with the emerging concept, as it clearly shows the divergence in perspectives and expectations among the different stakeholder groups. Developing a common understanding on sustainable chemistry is an essential prerequisite for the full and coherent implementation of the new transformative concept.

With this goal in mind, the ISC₃ initiated a dialogue process to develop a common understanding of sustainable chemistry as a joint endeavour across sectors and actors. A Thought Starter by the ISC₃ “Striving towards a Common Understanding of Sustainable Chemistry” was developed in late 2018, presenting key elements and objectives of sustainable chemistry as a holistic systems approach. Based on the thought-starter, an open dialogue process was initiated, providing a platform to share views, raise concerns, and provide ideas on shaping the concept of sustainable chemistry.

The dialogue process took its initial steps with the first meeting of the Advisory and Scientific Board in September 2018. In March 2019, the ISC₃ reached out to the SAICM (Strategic Approach on International Chemicals Management) stakeholders with a background paper on sustainable chemistry submitted to the Open-Ended Working Group (OEWG-III) of the SA-ICM beyond 2020 process. The information document “Reaping the full potential of sustainable chemistry for SAICM, the Sound Management of Chemicals and Waste beyond 2020” brought the dialogue on a common understanding to the international political agenda and served as a contribution to the ongoing discussions the beyond 2020 framework on the sound management of chemicals and waste.

In June 2019, the dialogue on the emerging concept of sustainable chemistry was a key element of the 1st ISC₃ Stakeholder Forum, where more than 100 international experts deliberated on the common understanding.

The first results of the ongoing discussion will be presented to the international chemicals community in a series of workshops throughout 2019 and 2020, including a workshop in the lead-up to the third meeting of the Intersessional Process on SAICM beyond 2020. The revised document on a “Common understanding” will subsequently feed into interrelated processes on the international level, as well as into the work of the ISC₃ in early 2020.

The dialogue process aims to provide guidance and inspiration in a cross-sectoral, collaborative manner, help industry players to rethink their strategy and investments, support policy-makers in shaping regulatory frameworks and instruments, and inspire new research activities and entrepreneurship. As for the ISC₃, the joint development of a common understanding is not only key as transparent guiding document for the Centre’s own activities, it will also provide a framework to assess innovations and new business models in sustainable chemistry.

Transformation towards sustainability in the chemicals sector and beyond calls for a better understanding of the challenges that need to be addressed in the downstream industry sectors, ranging from construction to mobility to renewable energy. To build up knowledge, share experiences, and develop recommendations in a collaborative manner, the ISC₃ will initiate several workstreams addressing topics regarding the SDGs, as well as crosscutting issues, such as: Sustainable Chemistry & Buildings and Living; Sustainable Chemistry & Climate Change; Sustainable Chemistry & Mobility, Circular Economy & Digitalization (Chemistry 4.0), and many more. The collaborative foresight workstreams are dedicated to exploring the benefits and challenges of sustainable chemistry and invite experts to debate how sustainable chemistry might impact our

future. The dialogue-based development of recommendations, as a part of the workstream results, is intended to help the private sector shape sustainable business strategies and investments, provide input to policy makers, and spur further research. The first workstream was initiated in 2018 and addresses the topic of “Sustainable Chemistry & Buildings and Living” and is open for participation.

Collaborative Foresight

Transformation towards sustainability in the chemicals sector and beyond calls for a better understanding of the challenges that need to be addressed in the downstream industry sectors, ranging from construction to mobility to renewable energy. To build up knowledge, share experiences, and develop recommendations in a collaborative manner, the ISC₃ will initiate several workstreams addressing topics regarding the SDGs as well as crosscutting issues such as: Sustainable Chemistry & Buildings and Living; Sustainable Chemistry & Climate Change; Sustainable Chemistry & Mobility as well as Circular Economy & Digitalization (Chemistry 4.0) and many more. The collaborative foresight workstreams are dedicated to exploring the benefits and challenges of sustainable chemistry and invite experts to debate how sustainable chemistry might impact our future. The dialogue-based development of recommendations, as a part of the workstream results, is intended to help the private sector to shape sustainable business strategies and investments, provide input to policy makers, and spur further research.



Collaborative Workstream on “Sustainable Building and Living with a Focus on Plastics”

The workstream on “Sustainable Chemistry & Buildings and Living” focuses on polymer applications in construction highlighting the growing use of plastic materials in buildings. It raises the question of how to drive construction products towards sustainability, as reflected in the SDGs. To prepare the collaborative working process, a preliminary study was conducted exploring the challenges and opportunities in this field. Based on this pre-study, the ISC₃ facilitates a dialogue process with stakeholders from relevant sectors to elaborate necessary considerations for sustainable management throughout the life cycle of plastics in building and living spaces, as well as on potential fields for sustainable chemistry innovations. A series of

workshops and stakeholder dialogues are taking place in 2019. An expert group continuously monitors and supports the dialogue process and ensures high-quality results. Led by the ISC₃, the expert group will incorporate and reflect the different interests and expectations of the stakeholders from the private and public sectors, as well as from academia and civil society. The outcomes will be summarized in a report and presented at the Sustainable Chemistry Summit, as well as at the relevant Sustainable Built Conferences in 2020.

> The goals of the workstream are as follows:

- > to discuss possible transformation paths towards sustainability for chemical products in construction and living;
- > to trigger a multi-stakeholder dialogue bringing together industry, academia, international organizations, and civil society, with the purpose to raise awareness on the topic;
- > to consider current megatrends and regional aspects;
- > to publish a report with guidelines for politics, industry, and consumers;
- > to identify relevant innovative areas and potentials for sustainable chemistry in the field;
- > to provide directions for research and entrepreneurship;
- > to show the potential of sustainable chemistry, in the context of the SDGs and Agenda 2030.

Collaborative Projects

Innovation in the field of sustainable chemistry needs practical support and exploration of new technologies. It also needs capacity building and the engagement of stakeholders in developing and implementing new solutions. To monitor, shape, and support implementation-oriented projects in the field of sustainable chemistry, the ISC₃ initiates and engages in a broad range of projects. With its collaborative projects, the ISC₃ strives to contribute to more sustainable solutions for challenges in developing countries, as well as to build capacity for sustainability-related issues and provide support for entrepreneurs.

The first project ideas are currently in development and aim to explore and provide sustainable chemistry solutions for the plastic waste problem, climate mitigation, and better access to laboratory infrastructure for entrepreneurs.

Sustainable Chemistry Innovation and Plastic Waste – A Project Idea for Nigeria

Plastic waste disposed in the environment is currently one of the largest challenges facing humanity. Plastic waste is polluting the oceans and clogging channels and waterways, being dumped in cities and country sides, and improperly burned. Plastic waste littering is causing adverse health effects in humans and animals, generating GHGs, and compromising ecosystems. The ISC₃ is working with partners from industry, academia,



Joining forces with Elsevier: Friedrich Barth, Managing Director of ISC₃, Ylann Schemm, Director of the Elsevier Foundation, Rob van Daalen, Senior Publisher at Elsevier (from left to right)

government authorities, and non-profit organizations to develop solutions to address the problem of plastic waste. ISC₃ solutions are based on the principles of sustainable chemistry and circular economy and follow a holistic approach that involves a broad number of stakeholders. The solutions will be implemented in the form of a flagship project that will be initiated in Lagos, Nigeria, and will be subsequently deployed to other geographical areas of the world.

Sustainable Chemistry and Climate Mitigation – a project idea to enhance climate mitigation through innovation

The ISC₃ has developed a concept proposal for a “Climate Action Programme Targeting the Chemical Industry” under the framework of the International Climate Initiative (IKI), founded in 2008 by the German Ministry of the Environment (BMU). The project proposal aims to support the transfer of knowledge from Europe to developing and transitional countries through a dedicated training program for capacity building in climate mitigation, sustainable solutions, and chemicals management within the chemical industry. It is designed to be based on a strong partnership between the ISC₃, experts, academia, and civil society.

“AirBnB for Labs” – a project for better access to lab space for entrepreneurs

Taking a science innovation from the lab to the market is an expensive undertaking. Starting with a promising idea or prototype, scientists and founders face a series of hurdles related to space, equipment, and personnel. At the same time, institutions that own resources and lab spaces evidence high rates of underutilization. On average, 40% of the individual equipment’s capacity is not utilised in universities and science parks. In regions where the facilities are available, entrepreneurs often cannot access them due to lack of reliable, comprehensive information on available infrastructure.

To unlock barriers to innovation in the emerging markets, the ISC₃, Merck KGaA, and Clustermarket have joined forces to develop a new integrated solution for better access to lab and prototyping facilities. Envisioning an “AirBnB for Labs”, the project partners seek to introduce a neutral, digital marketplace solution allowing start-ups, scientists, engineers, and other technology pioneers to get easy and affordable access to lab spaces, equipment, and services.

The ISC₃ Network: Collaboration with international partners

Working towards the global breakthrough of sustainable chemistry requires a global network of partners. As a collaborative centre, the ISC₃ actively reaches out to actors from all sectors to engage with them on the ISC₃ agenda and bring in different perspectives and experiences. Conversely, the ISC₃ engages in like-minded projects and initiatives in the field of green and sustainable chemistry. Thus, the collaborations of the Centre range from the partnerships with UN Environment on the stakeholder dialogue for the Global Chemicals Outlook II to a strategic joint working programme with the World Economic Forum on mainstreaming sustainable chemistry innovation.



Driving Transformative Innovation through Sustainable Chemistry - Discussion Panel at the UN Science-Policy-Business Forum, March 2019, Nairobi, Kenya

During 2018 and 2019, the ISC₃ network has grown rapidly, leading to joint activities and MoUs with the following institutions:

UN Environment – Partnership on the stakeholder dialogue for the Global Chemicals Outlook II (GCO II)

Since early 2018, the ISC₃ has engaged in collaboration with UN Environment to reach out to different world regions as a part of the stakeholder dialogue on the GCO II. With jointly hosted workshops, the ISC₃ supported the dialogue and gathered information for a foundational paper as a contribution to the GCO II. By hosting the international multi-stakeholder workshop on the draft of the GCO II in June 2018 in Bonn, Germany, the ISC₃ further supported the important work on this leading publication.

Elsevier and Elsevier Foundation – Partnership on Green and Sustainable Chemistry Science

Based on the joint efforts of the ISC₃ and the scientific publishing house Elsevier to promote green and sustainable chemistry science, a partnership in this field was established. The joint activities focus on bringing entrepreneurship to the scientific community at the annual Green and Sustainable Chemistry Conference hosted by Elsevier and chaired by Klaus Kümmerer, Director of the ISC₃ Research & Education Hub. The joint programme encompasses the Award for “Entrepreneurial Spirit in Green and Sustainable Chemistry Science”, as well as an Entrepreneurship Workshop for scientists.

Think Beyond and the European Chemistry Partnering – Partnership on Sustainable Chemistry Entrepreneurship

Through the partnership with the US accelerator and innovation platform Think Beyond Plastic and the European Chemistry Partnering, the ISC₃ reaches out to the start-up community to join forces on promoting sustainable chemistry entrepreneurship and raising awareness for the major role and responsibility chemical innovators have in the joint endeavour to achieve the SDGs. The networking activities feed directly into the Global Start-up Service of the ISC₃ and have already proven to be very helpful in speeding up the process of reaching out entrepreneurs globally.



New cooperation with SusChem: Markus Steilemann, Chairman of the SusChem board, and Friedrich Barth, Managing Director of ISC₃.

SusChem – Partnership on Research and Technologies for Sustainable Chemistry

SusChem and the ISC₃ engage in a continuous exchange on research activities for sustainable chemistry. SusChem will address the impact of sustainable chemistry on global challenges and the SDGs. The ISC₃ provides input on all relevant technology priorities and the potential impact of such innovation activities. The ISC₃ will also provide recommendations on education capacity building activities that need further fostering.



The World Economic Forum (WEF) – Partnership on Mainstreaming Sustainable Chemistry Innovation

The partnership with the WEF is driven by the joint endeavor to build up a global ecosystem for sustainable chemistry innovation. Under the joint Platform on Mainstreaming Sustainable Chemistry Innovation, the ISC₃ and the WEF reach out to the industry to raise awareness and initiate action and investments to develop the different elements that are needed to shape a “Silicon Valley” for sustainable chemistry innovation.

The ISC₃ also engaged in funding activities in 2019. In this field, the ISC₃ also supports the European Circular Bioeconomy Fund (ECBF) as part of a consortium that manages a fund for bio-based start-ups and the blue economy. The fund will help enable the transformation from linear to circular value chains through new technologies and products and will create greater opportunities for innovative companies.



Innovation – promoting sustainable products and business models

Scouting and promoting innovative and sustainable solutions that can concretely impact the chemicals sector across countries and along value chains, in order to implement the transformation of the chemicals sector towards sustainability, is at the core of the **ISC₃ Innovation Hub's** activities.

The ISC₃ Innovation Hub's vision is to become a global player in innovation and entrepreneurship promotion for sustainable chemistry. An essential milestone to reach this goal is the development and establishment of the ISC₃ Global Start-up Service (GSS).

The ISC₃ GSS seeks to contribute to the global breakthrough of sustainable chemistry by supporting innovators along the entire innovation chain. The Service primarily addresses innovators with a background in sustainable chemistry-related fields at the global, regional, and local levels. As such, the GSS targets students, researchers, and professional staff in research institutions (ideators), as well as innovators across the whole innovation chain (early-stage innovators, mature start-ups, etc.). While the programme is to be implemented globally, special focus will be put on the needs of entrepreneurs at the early development stage in developing and emerging economies.



The GSS provides a coherent service system based on four inter-related aspects: sustainability, chemistry, global reach, and tailored support.

Key Elements and activities of the Global Start-Up Service

Global Network: Engaging and Increasing support on a global basis

Chemistry-related entrepreneurs struggle with less visibility than innovators in other economy sectors and need more international advocacy for adequate support. Thus, a network of innovators' supporters in green and sustainable chemistry is highly needed. The Innovation Hub created the concept of a "Spiderweb Network" of multipliers. The Spiderweb represents the vision of a growing network of organisations and individuals with a shared vision on the role of sustainable chemistry for the achievement of the UN Sustainable Development Agenda 2030. Its actors foster the support of innovators in their regions, mobilise resources and knowledge towards sustainable chemistry, and empower other players, particularly start-ups, to join the community. The Innovation Hub has quantified the need for global support, seeking to gain around 20 new partners with a strong regional presence and an eclectic mixture of themes, and to subsequently sign MoUs with them until the end of 2020.

For this purpose, fact-finding missions were conducted in India and Egypt and Tunisia. In addition, the ISC₃ was active in numerous international events and fairs that were used as a platform to identify further partners and assess needs or possibilities for cooperation. As a result of these global activities, the Innovation Hub has developed an active network of around 40 organizations and individuals. New and promising agreements were already signed with partners from Africa, Asia, and Latin America, who officially joined the ISC₃ Spiderweb Network during the Stakeholder Forum in Bonn in June 2019. The ISC₃ now collaborates with the National Agency for Research and Innovation of Uruguay (ANII), the Green ChemisTree Foundation (India), and the Egyptian social enterprise, Youththinkgreen.

Professional service: Providing specialized functions

Innovation, entrepreneurship, and start-up support are now the focus of broader political and corporate trends. Compared to other economic sectors, the support infrastructure for chemistry-related start-ups, and most specifically for sustainable chemistry innovation, is still lacking. To enable professional work, the Innovation Hub designed a new concept for its staff focused on a specialization of functions, aimed towards reaching the ambitions and defined value proposition of the Service. The new division of roles covers the following areas: international relations, start-up relations, development of GSS entrepreneurship services, and scientific start-up evaluation.



Outreach and Onboarding: Creating a pool of start-ups with clear and transparent on-boarding processes

The Innovation Hub team has designed a standardized and transparent procedure to "on-board" relevant innovators into the GSS and offer them specific, predefined support.

The criteria for start-ups eligible for the initial, general support provided within the Global Start-Up Service ask for the following:

- > **The start-up operates in the chemistry sphere.**
- > **The start-up strives for chemistry-related innovative solutions.**
- > **The start-up is interested in learning more about sustainable chemistry and the relationship between its innovation and sustainability.**

As the service is active on a global basis and identifies relevant start-ups upon recommendation or through joint scouting activities with international partners, the ISC₃ has chosen a collaborative approach to advance a definition of sustainable chemistry, and the profile of the pool might change according to the developments in the discussion around the common understanding.

To ensure transparent processes in start-up on-boarding and the selection of GSS services, the Innovation Hub designed an online "On-boarding Questionnaire". The form allows the team to conduct a preliminary quick check of the eligibility of the innovator for general support within the GSS.

Customized Support: Evaluation processes for the subsequent levels of support

General Support Plus and Customized Support are now being finalized and tested. Additional questions and interviews with pre-selected start-ups and innovators will be conducted, seeking to assess their eligibility to enter higher support levels. The evaluation processes will correspond with the evolving discussions about metrics for sustainability and sustainable chemistry occurring in scientific and technical expert communities.

Currently, the GSS is focused on the official on-boarding of start-ups who have already been supported by the team or have an interest in receiving support. Setting up a monitoring system that documents the level of start-up support received, as well as the level of satisfaction and effectiveness of the support offered, is planned for the second half of 2020.

Continuous Improvement: Understanding the needs of support and developing further services

The Innovation Hub acts as an innovation promoter. Through partnerships and collaboration, it positions itself as a neutral player and single-entry point for engaging relevant ecosystem supporters to boost innovation in worldwide sustainable chemistry. The goal is to shape the transformation of the chemical sector and all other sectors where chemicals are utilized towards greater sustainability. Jointly with its Spiderweb Network of the GSS, the Hub catalyses innovation from its starting point to the market and between regions and countries, with the ambition to support entrepreneurs in becoming "Sustainable Chemistry Changemakers" on a global basis.



Education – promoting knowledge on sustainable chemistry worldwide

ISC₃ Innovation Challenge

In order to accelerate the search for solutions, the ISC₃ launched the first Innovation Challenge, a global contest designed for start-ups that aims at engaging, awarding, and promoting sustainable chemistry innovators from around the world.

The ISC₃ Innovation Challenge is organized annually and focuses on a specific topic that follows the respective workstream of the ISC₃. The ISC₃ Innovation Challenge 2019/20 calls for innovations in the field of Sustainable Building and Living. Topics addressed by innovation proposals may include, e.g.: innovative construction chemicals and materials, green chemistry solution for buildings, enhanced resource and energy efficiency, circular materials, improved recyclability, elimination of toxic ingredients (e.g., lead in paint), and contributions to affordable housing and resilience engineering, as well as to modular construction and indoor air quality.

Five finalists will receive tailored support, access to Global Start-Up Service Customised Support services, as well as the promotion of their innovation via ISC₃ communication channels and participation at the ISC₃ Investor Forum 2020, including pitch training in preparation to their Pitching Session at the Sustainable Chemistry Summit. Finally, the winner receives a cash prize of 25,000 EUR. At the end of 2019, an international jury panel will select five finalists for tailored support by the ISC₃ Global Start-up Service. The Innovation Challenge will be organized annually and will focus on a different specific topic every year.

The key features of all activities at the **ISC₃ Research & Education Hub** are interdisciplinarity and openness. As such, the Hub focuses on developing and advancing a better understanding of the opportunities and possible pitfalls of sustainable chemistry. Focus is put on emerging concepts and trending research topics in green and sustainable chemistry by conducting own research, collecting and assessing good examples of green and sustainable chemistry, and publishing related studies. As sustainable chemistry needs to be able to rely on the sound knowledge of executives, researchers, and practitioners, the hub screens, assesses, develops, and implements international study programs on sustainable chemistry.

International school and capacity development

Sustainable chemistry begins in the minds of decision makers, researchers, and practitioners at large. The transformation of the chemical sector and other related sectors through sustainable chemistry can only be achieved through targeted and more effective education. The mission of the ISC₃ Research & Education Hub is to develop and implement international curricula for sustainable chemistry.

With the development of the two master courses, with the support of the Leuphana Professional School, the ISC₃ Research & Education Hub takes a first step on the path to making sustainable chemistry an integral part of scientific and executive education.

First Master Program in Sustainable Chemistry launched at Leuphana University, Lüneburg

As a part of the ISC₃ educational activities, the ISC₃ Research & Education Hub has developed a first of its kind Master of Science in Sustainable Chemistry (M.Sc. SC) for international professionals. Starting in March 2020 at Leuphana University Professional School, the professional Masters programme M.Sc. Sustainable Chemistry will provide expert, interdisciplinary training in sustainable chemistry. The unique curriculum teaches students how to understand and apply chemistry in the context of sustainability.

The innovative programme, M.Sc. Sustainable Chemistry, teaches professionals with a background in chemistry to understand the relevance and opportunities of chemistry in the context of sustainability. This groundbreaking, interdisciplinary programme conveys a broad understanding of sustainable chemistry, ranging from the molecular level of chemical products, global material and product flows, alternative business models, tools for assessing sustainability, international regulations, and strategies for initiating and leading change towards sustainability. Extending far beyond the lens of green chemistry, the curriculum delivers novel perspectives on how chemistry can and must contribute to sustainable development and the Sustainable Development Goals of the Agenda 2030.

The programme addresses highly motivated professionals with a degree (B.Sc. or M.Sc.) in chemistry, chemical/biological/environmental engineering, pharmacology, biochemistry, or related fields, and at least one year of relevant work experience, who wish to integrate expertise in sustainability into their professional portfolio. Successful completion of the Masters programme entitles graduates to the pursuit of a PhD.

The M.Sc. in Sustainable Chemistry is designed as a “blended modular learning program”. It combines e-learning with clustered classroom sessions, including

lectures, seminars, group work, and laboratory exercises. The M.Sc. Sustainable Chemistry at Leuphana Professional School is an important milestone for the integration of sustainable chemistry into higher education.

Master of Business Administration Sustainable Chemistry in development for spring 2022

In addition to the M.Sc. Sustainable Chemistry, the ISC₃ Research & Education Hub is also developing a Master of Business Administration (MBA) Sustainable Chemistry. Different from the M.Sc. Sustainable Chemistry, this programme is directed at decision makers from policy and management that do not have a background in chemistry, as they constitute a target group often involved in decision making relevant to the implementation of a sustainable chemistry. The online MBA degree will be launched in spring 2022 at Leuphana Professional School.

Summer School Sustainable Chemistry for Sustainable Development and Green and Sustainable Chemistry Conference

In addition to the activities regarding the ISSC, the ISC₃-Research & Education Hub holds an annual “Summer School on Sustainable Chemistry for Sustainable Development”, which addresses not only academic themes, but also aims to connect young academics with professionals from governmental institutions, industry, and non-governmental organizations. The summer school is designed as an educational complement to the annual scientific “Green and Sustainable Chemistry Conference”. Contacts with the International Union of Pure and Applied Chemistry (IUPAC), the European Chemical Society (EUChemS), and the German Gesellschaft Deutscher Chemiker e. V. (GDCh) have been established in order to exchange input, receive feedback, and establish collaborative initiatives at different levels.





Research – monitoring science and driving research

The **ISC₃ Research & Education Hub** brings cutting-edge scientific expertise to the Innovation Hub and to the activities of the Headquarters, allowing the ISC₃ to fully embrace its role as an international think-tank.

The hub started with seminal research that serves as a basis for the international and dialogue-based development of a common understanding of sustainable chemistry (see above). This common understanding will, in turn, result in hands-on sustainability assessment tools over time that will provide help and guidance for decision makers.

In addition, research topics are currently being screened. They are intended to be cross-sectoral by nature and to include topics, such as “the potentials and limits of the circular economy for chemical products”. The hub is also screening new upcoming academic research ideas, materials, and processes linked to these topics to analyze their potential and pitfalls. Investigations in the following areas provide some examples: which material and energetic bottlenecks could be expected if a technology would be successfully implemented, the competitive use of resources such as energy, digitization, Industry 4.0, electromobility, electrosynthesis, and the possible contributions of science to the sound management of chemicals and the Sustainable Development Goals. Currently, the sustainable use of metals is a focus topic in this context, as to better understand what entropy change could offer as a measure for sustainability. For this purpose, a cooperation with the Ministry of Environment and Tourism of Austria has been established. The hub also contributes to the workstream “Sustainable Building and Living”, as well as to activities of the Innovation Hub. The research is addressed in discussion and collaboration with international academic institutions and institutions from developing countries.

Not only does the hub publish and promote its own reports, but also third-party findings. It primarily serves the ISC₃ platforms, but also contributes to other relevant websites and scientific publications, as to spur the discussion among subject matter experts. Based on this work, the Hub contributes to enlarge the international visibility and reputation of the ISC₃ by organizing scientific conferences.

So far, four main research streams are being screened at the Research and Education Hub:

- > **Electrochemical synthesis of chemicals:**
CO₂ can be applied as a carbon source in place of mineral oils and other fossil fuels. In this alternative fuel production process, CO₂ as a greenhouse gas can be taken out of the atmosphere. This approach is based on renewable energy, electrolysis of water, and utilisation of CO₂. However, there are also limitations for the use of these technologies that have to be understood in order to avoid rebound effects in the future.
- > **Metals as non-renewable, critical resources:**
To reach the goals of the Paris agreement, much hope is placed in low carbon technologies. Decarbonizing electricity, mobility, and industry can prevent further climate change; however, it results in a highly increased metals demand (“low carbon-high metal”). The sound management and effective recycling are therefore a focus area for the research activities.
- > **Entropy change as a measure for chemical sustainability:**
Sustainability assessment tools are desired by numerous stakeholders. Commonly applied approaches, such as “Life cycle Assessment” and “Material Flow Accounting”, do not include thermodynamic aspects beyond energy, e.g. products complexity, dissipation of resources, and limits of recycling. Thermodynamic-based approaches can significantly contribute to sustainability assessment frameworks by providing information missing in other approaches.
- > **Chemo-informatics as a versatile tool in Green and Sustainable Chemistry-Study on the biotic and abiotic degradation of ionic liquids as an example:**
In the field of chemo-informatics, computational methods, such as quantitative-structure-activity-relationship models (QSAR), were developed to elucidate the dependence between a chemical’s activity or property and its structure. Using QSAR models, the design of benign chemicals can be supported concerning ready biodegradability and less toxicity and ecotoxicity, contributing to the implementation of sustainable chemistry.



Information – knowledge management

Over the last two years, the ISC₃ has been developing a new communication strategy based on three pillars: knowledge management, information dissemination, and awareness-raising on sustainable chemistry.

Start-up and partnering events, exhibitions, political activities embedded in the SAICM context, scientific conferences, investor fora, lectures, and awareness raising workshops are all important pillars of spreading the word, reaching out to stakeholder groups, sharing insights in sustainable chemistry around the world. A detailed events list held in 2018 and 2019 is provided below.

To facilitate easier access for stakeholders to information on sustainable chemistry and its activities, the ISC₃ is working on a new webpage designed as an interactive platform. The platform will include an “Atlas of Sustainable Chemistry” that maps knowledge and sustainable chemistry activities in all world regions and aims to connect science, entrepreneurs, and industry with the public sector and civil society. The platform will highlight innovation and best practices in sustainable chemistry, demonstrate contributions to sustainable development, and raise awareness for the discipline and its potential to create new economic possibilities for all countries.

Furthermore, to build up a community and increase visibility, the ISC₃ will implement a social media strategy based on social media channels like LinkedIn, Facebook, and Twitter, as well as the use of videoclips to guarantee better access to information for experts and the public at large.

Panel discussion at the ISC₃ anniversary: (f.l.t.r.): Moderator Paul Hohnen; Prof. Klaus Kümmerer (ISC₃ Research & Education Hub, Leuphana University); Dr. Pierre Barthélemy (cefic); Sascha Gabizon (WECF); Dr. Thomas Jakl (Ministry of Sustainability and Tourism, Austria)



First anniversary of the ISC₃



The German Minister for the Environment, Svenja Schulze at the ISC₃ anniversary

In September 2018, the ISC₃ celebrated its first anniversary. On this special occasion, the German Federal Minister for the Environment, Nature Conservation, and Nuclear Safety (BMU), Ms. Svenja Schulze, visited the ISC₃ Headquarters in Bonn. In her greetings, the minister highlighted the role of sustainable chemistry as a new way to address the manifold challenges arising from the increasing use of chemicals in our daily life. In representing the founding organisations of the ISC₃, the minister was joined by Ms. Jutta Klasen, Head of the Chemicals Management Department at the German Environment Agency (UBA). Ms. Klasen underpinned the need for sustainable innovation in many areas that are crucial for achieving the SDGs. Furthermore, Ms. Tanja Gönner, Chair of the Management Board of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), joined the distinguished speakers. Ms. Gönner drew attention to the role of the GIZ in supporting the successful implementation of the ISC₃ as a new international organisation. The relevance of sustainable chemistry as a new transformative concept was highlighted in a panel discussion, which brought together the different perspectives from science, industry, civil society, and politics on the emerging concept. In conclusion, the panelists called for an active role of the ISC₃ in connecting stakeholders worldwide, highlighting important trends in the interconnected fields of sustainability and chemistry, as well as fostering the role of start-ups and SMEs in bringing new, sustainable products and services to the market.

ISC₃ Activities and Highlights

At a glance: Activities and highlights in 2018

3rd Green and Sustainable Chemistry Conference in Berlin, Germany

Mai 13 – 16 2018

The 3rd Green and Sustainable Chemistry Conference was held in Berlin, hosted by Elsevier and chaired by Prof. Klaus Kümmeler, Director of the ISC₃ Research and Education Hub. Scientists, NGOs, companies, innovators, and authorities explored the latest developments in green and sustainable chemistry, and the event was a source for new research projects ideas. During the conference, the ISC₃ Innovation Hub hosted the workshop “Start-ups and Sustainable Chemistry”, where start-ups had the opportunity to present their ideas, articulate their needs, meet international representatives of the chemical industry, and learn more about support opportunities provided by the ISC₃.

ACHEMA exhibition and fair trade in Frankfurt, Germany

June 11 – 15, 2018

The triannual exhibition is the world’s largest forum for chemical engineering and the process industry, offering a panorama of current technology trends and platforms. The exhibition offered an exciting opportunity to highlight the game-changing concept of sustainable chemistry. The ISC₃ hosted a booth in cooperation with the US-based initiative Think Beyond Plastic, an accelerator and think-tank advancing the commercialization of research and innovation with focus on circular materials and design and innovative packaging. At the Innovation & Research Exhibition Hall, the ISC₃ showcased sustainable chemistry innovation by presenting five inspiring start-ups. The entrepreneurs also had the opportunity to take part in a pitch presentation at the ACHEMA Dialogue Corner.

Global Chemical Outlook-II (GCO-II) workshop in Bonn, Germany

June 18 – 20, 2018

The ISC₃ hosted the multi-stakeholder workshop on the draft of the Global Chemicals Outlook II by UN Environment. During the workshop, contributions to the publication, including the foundational paper by the ISC₃, were reviewed in a cross-sectoral dialogue, allowing the participants to offer advice on the draft and further development of the GCO II. The workshop brought together about 100 international experts and representatives from different sectors, including the lead authors and other contributing authors for the publication. The workshop was a key element of the collaborative approach in developing the second edition of the leading publication on chemicals management.

1st Anniversary Event of the ISC₃ – Bonn, Germany

September 2018

In September 2018, the ISC₃ celebrated its first anniversary. On this special occasion, the German Federal Minister for the Environment, Nature Conservation, and Nuclear Safety (BMU), Ms. Svenja Schulze, visited the ISC₃ Headquarters in Bonn. In representing the founding organisations of the ISC₃, the minister was joined by Ms. Jutta Klasen, Head of the Chemicals Management Department at the German Environment Agency (UBA). For the hosting organization, Ms. Tanja Gönner, Chair of the Management Board of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), joined the distinguished speakers. The relevance of sustainable chemistry as a new transformative concept was highlighted in the discussions, which brought together the different perspectives from science, industry, civil society, and politics on the emerging concept. The event underpinned the role of the ISC₃ in connecting stakeholders worldwide, working on important trends in the interconnected fields of sustainability and chemistry and shed a light on the successful first year of the new international centre.



Members of the Scientific Board: (f.l.t.r.): Prof. Alexei Lapkin, Dr. Avatar Matharu, Xin Hui, Dr. Mahjoub Borhane, Prof. Vania Zuin, Prof. Klaus Kümmeler, Friedrich Barth

1st Advisory and Scientific Board Meeting of ISC₃ – Bonn, Germany

September 18, 2018

The first meeting of the Advisory and the Scientific Board Meeting was held back to back with ISC₃ Anniversary Event and provided an important opportunity for the ISC₃ to share thoughts with international experts and stakeholders. The boards are a key element of the ISC₃ stakeholder engagement and provide guidance on the strategic approach and the activities of the ISC₃.

4th Summer School on Sustainable Chemistry for Sustainable Development, Lüneburg, Germany

September 24 – 28, 2018

With a focus on experience exchange and knowledge transfer among participants from different world regions, the 4th Summer School dealt with the topic “chemicals in the construction industry”, as well as the various effects of different chemical components in products and in construction materials used for residential buildings. The participants discussed the opportunities, benefits, and limitations of sustainable chemistry in this field. The Summer School is an integral part of the ISC₃ education programme.

4th Global Chemical Leasing Award Ceremony at the Green Chemistry Conference – Vienna, Austria

November 6th, 2018

To act as a global supporter of innovation, ISC₃ Managing Director Friedrich Barth served as a member of the jury of the 4th Global Chemical Leasing Award Ceremony, which took place in November in Vienna, Austria. The Award Ceremony was part of the Green Chemistry Conference 2018 within the trio Presidency of the Council of the European Union (EU) programme, “Smart and sustainable Europe”, held during Austria’s EU Presidency.



Members of the Advisory Board: (f.l.t.r.): Berthold Welling, Sascha Gabizon, Johannes Wagner and Rebecca Freitag, Stefan Haver, Bob Diderich, Achim Halpaap, Dr. Pierre Barthélemy, Dr. Stefanie Deuser, Friedrich Barth

New Plastics Economy Investor Forum – Frankfurt, Germany

December 7, 2018

The Investor Forum was organized by the Ellen MacArthur Foundation, Think Beyond Plastic, and the ISC₃ Innovation Hub. The forum brought together investors and leaders from the plastics industry and innovators along the plastics value chain, who presented the latest disruptive innovations in the field of plastics. Throughout the day, experts discussed critical topics on advancing and scaling new sustainable chemistry business models, designs, and technologies that keep plastics in the economy and prevent them from becoming waste.

Side Event at the UN Climate Change Conference COP24 – Katowice, Poland

December 13, 2018

With a side event, hosted jointly with the International Council of Chemical Associations (ICCA), the ISC₃ raised awareness for climate smart solutions based on sustainable chemistry innovation and highlighted the need to create an enabling environment for entrepreneurs. The ISC₃ presented two case studies for sustainable chemistry innovation from start-ups and showcased the contributions of sustainable chemistry innovation towards a greenhouse gas-neutral society.

At a glance: Activities and highlights in 2019

3rd European Chemistry Partnering in Frankfurt, Germany

February 26, 2019

European Chemistry Partnering event is a milestone for the European industry. The conference – designed as an interdisciplinary networking event – enables founders and start-ups to interlink with a wide range of investors and the largest corporations in the chemicals sector. The event helps to leverage innovative ideas in chemistry, industrial biotechnology, digitization, and nanotechnology. This year's ECP brought together more than 800 participants from 40 nations, intending to explore new business ideas in the chemicals sector. Due to the high demand for pitches and partnering opportunities, European Chemistry Partnering was organized in modules that took place simultaneously. As a sponsor and promoter of sustainable innovation, the ISC₃ introduced the participants to its Global Start-up Service, a unique service programme which provides customized international support for start-ups working in the field of sustainable chemistry.



ISC₃ Team at the 3rd ECP

Session at the UN Science-Policy-Business Forum in Nairobi, Kenya

March 8 – 10, 2019

The second Global Session of the UN Science Policy Business Forum on Environment was held in Nairobi in the lead-up to UNEA IV. During the forum, the ISC₃ hosted a session dedicated to sustainable chemistry innovation as a driver of transformative ideas for environmental challenges and sustainable consumption and production, with special focus on green technology start-ups.



Panelists of the Global Session of the UN Science Policy Business Forum on Environment in Nairobi, Kenya

Open-Ended Working Group of the SAICM beyond 2020 process in OEWG-III, Montevideo, Uruguay

April 2 – 4, 2019

The ISC₃ engaged in the third Meeting of the Open-ended Working Group (OEWG-III) on the SAICM beyond 2020 process by taking part in the negotiations in Montevideo and submitting an information document on the potential contributions of sustainable chemistry to a future framework on the sound management of chemicals and waste. The document included a thought starter by the ISC₃ on a common understanding of sustainable chemistry and invited the SAICM stakeholders to share views, concerns, and ideas on the emerging concept.

4th Green and Sustainable Chemistry Conference and Award for "Entrepreneurial Spirit", Dresden, Germany

May 5 – 8, 2019

Organized by Elsevier and chaired by Prof. Klaus Kümmeler, Director of the ISC₃ Research & Education Hub, the annual high-level conference brought together international participants from academia and the private and public sectors, with the focus on sharing the latest developments in the fields of green and sustainable chemistry in a transparent and interdisciplinary way. Sponsored by the Elsevier Foundation, the conference provides the winners of the Green and Sustainable Chemistry Challenge with a podium to present their innovative ideas. As a new element of the Challenge, the first Award for "Entrepreneurial Spirit in Green and Sustainable Chemistry Science" was awarded jointly by the ISC₃ and the Elsevier Foundation.



Mario Salgado (r), Winner of the first Entrepreneurial Spirit in Green and Sustainable Chemistry Award and Friedrich Barth



Engaged in the dialogue on the emerging concept of sustainable chemistry: Participants at the first ISC₃ Stakeholder Forum in Bonn

Start-Up Presentation at the AchemAsia in Shanghai, PR of China

May 21 – 23, 2019

Co-organized by DECHEMA since 1989, AchemAsia is the innovation forum for sustainable chemical production in the Asian market. The international exhibition takes place every three years and provides an excellent opportunity for manufacturing suppliers to explore the opportunities that China's market offers. With its booming chemicals market and unsolved environmental problems due to the improper use of chemicals, China is a particularly important area for the ISC₃ and its mission of leveraging sustainable chemistry solutions.

At the exhibition, the ISC₃ hosted a booth showcasing Asian innovators that develop sustainable chemistry solutions and led a congress session on "Building Sustainable Chemistry Ecosystem for Innovators in Asia", targeted at entrepreneurs and potential Asian partners. The ISC₃ promoted its Global Start-up Service and organised an expert's workshop on Resilience & Urbanisation within the workstream "Plastics in Sustainable Building & Living". It also launched the first ISC₃ Innovation Challenge, which calls for solutions in the field of Sustainable Building and Living and awards its finalists lucrative prizes and extensive start-up support within the ISC₃ Global Start-up Service.



ISC₃ both at the AchemAsia Fair in Shanghai

1st Stakeholder Forum and 2nd Advisory and Scientific Board Meeting, Bonn, Germany

June 20 – 21, 2019

The Stakeholder Forum is a crucial milestone amongst the ISC₃'s schedule of activities. It represents the major ISC₃ platform for dialogue, consultation, and feedback by stakeholders and board members regarding policy, technical, and strategic questions. In June, the ISC₃ successfully organised its first Stakeholder Forum, during which it introduced its work programme and activity fields to the participants. They were then encouraged to take an active role in the dialogue on the emerging concept of sustainable chemistry. By discussing how sustainable chemistry can contribute to achieving the SDGs and be a solution provider for a benign, circular society, the event turned into a forum to foster sustainable chemistry solutions worldwide through collaboration, innovation, education, research, and information.

Workshop "Entropy change - a suitable measure for (chemical) sustainability?", Vienna, Austria

June 25 – 26, 2019

The workshop explored the appropriateness of entropy change as a measure of sustainability. As an interactive scientific format, the workshop brought together leading experts from the fields of material flow management, resource and waste management, statistical entropy analysis, and sustainability, amongst others. The multidisciplinary approach provided an opportunity to look at entropy change from different perspectives and investigate its links to sustainability. The workshop was jointly organized by the ISC₃ Research and Education Hub, the Austrian Federal Ministry for Sustainability and Tourism, and the Institute of Sustainable and Environmental Chemistry at the Leuphana University of Lüneburg, Germany.

Planned activities and events in 2019

Foresight Workshop Series

June – October 2019

ISC₃ plans a series of international experts' workshops within the context of the workstream "Sustainable Building and Living with the focus on Plastics". The participants will discuss how to drive the construction sector towards sustainability. In this process, they will explore issues related to urbanisation and the most relevant sustainable innovations in the construction field, with a focus on building climate resilience.

The workshops:

- > Resilience & Urbanization at AchemAsia, Shanghai, PR China, 21 May 2019
- > Resilient Cities 2019, interactive stand at the ICLEI (Local Governments for Sustainability) conference Bonn, Germany, 26 - 28 June 2019
- > Affordable Housing & Urbanisation at Nairobi Innovation Week, Nairobi, Kenya, 12 June 2019
- > Protection of Health and the Environment at SBE 2019, Graz, Austria, 13 September 2019
- > Energy & Resources in Building Lifecycle at Green Build 2019, Atlanta, USA, 22 November 2019

5th Summer School on Sustainable Chemistry for Sustainable Development, – Lüneburg, Germany

September 16 – 20, 2019

Under the motto "The Myths of Renewables", the 5th edition of the Summer School on Sustainable Chemistry for Sustainable Development will open its doors again in September for international students interested in sustainable chemistry. The 5th edition of the Summer School will not only deliver to the participants some knowledge basis for sustainable chemistry and chemicals management, but also discuss the opportunities and limitations of renewables from the perspective of sustainable chemistry. The Summer School is an integral part of the ISC₃ education programme.

Workshop in the lead-up to the Third Meeting of Intersessional Process III of the SAICM beyond 2020 process in Bangkok, Thailand

October 1 – 4, 2019

The third meeting of the Intersessional Process to SAICM will be held in the beginning of October at the United Nations Conference Centre in Bangkok. The ISC₃ will participate in the negotiations and will further strive to anchor sustainable chemistry in the discussions and push forward the new concept. Furthermore, ISC₃ will hold a workshop in cooperation with UNEP (back-to-back), in which the key findings of the dialogue process started with the submission of the paper "Towards a common Understanding on Sustainable Chemistry" at the OEWG-III will be presented to the SAICM community.

Workshop at the International Green Chemistry World in Mumbai, India

October 18, 2019

In collaboration with the ChemisTree Foundation, the Innovation Hub will host a workshop "Building Sustainable Chemistry Ecosystem for Innovators in India" as part of the Industrial Green Chemistry World 2019. The target audience includes students and ideators from technical universities. The workshop aims at motivating and inspiring students to become entrepreneurs and will host interactive sessions, a discussion panel, and presentations and pitches.

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