SAICM Science Sector and IUPAC Activities

by Anna S. Makarova and Colin Humphris

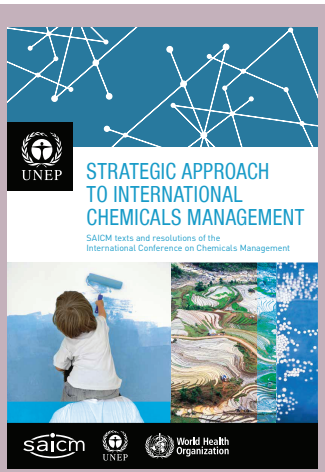
The Strategic Approach to International Chemicals Management (SAICM) is a policy framework designed to foster the sound management of chemicals globally. SAICM is a key United Nations initiative on sustainable development that is being undertaken jointly through the United Nations Environment Programme (UNEP) and the World Health Organisation (WHO). These two agencies have organised the SAICM Secretariat. SAICM builds on the series of World Summits on Sustainable Development that recognised the economic importance of the chemical industry, but also its potential environmental and health costs (see box).

The policy framework is designed to align national and regional regulations, and to address both current pressing issues and emerging issues. At its heart is the concept of cooperation between countries, working together with all the various stakeholders. SAICM is, therefore, a platform for dialogue between stakeholders from different sectors: health, industry, labour, public interest, and importantly, science. The involvement in the SAICM process of all the relevant sectors and stakeholders is seen as key to achieving the objectives of SAICM.

The contribution of the science sector is specifically mentioned in SAICM's Overarching Policy Strategy. Objective scientific information and methodologies are needed for risk assessment and associated decision making related to chemical policy, in particular for emerging issues. The science community has been involved in SAICM implementation since SAICM was established in 2006 and has played an active role at SAICM meetings and in the implementation of projects supported through the SAICM Quick Start Programme Trust Fund. In moving forward to 2020, the science community has new opportunities to contribute to SAICM and build the science-policy interface for chemicals and waste, including:

1. Fostering enhanced coordination, collaboration, and cooperation with respect to SAICM emerging policy issues and other issues of concern;
2. Providing monitoring and assessment information related to impacts of chemicals throughout the life-cycle on health and the environment;
3. Strengthening and accelerating innovation, research, development, training, and education that promote sustainability, as well as technologies and alternatives that are less resource-intensive and less polluting;
4. Building capacity to establish national or regional laboratory facilities that are operated in accordance with international standards and provide the training required to use the facilities;
5. Strengthening mechanisms for reporting and consolidating the information necessary to produce baseline overviews that will help determine policy priorities.

In addition, the fourth session of the International Conference on Chemicals Management (ICCM4), held in September 2015, established a process for considering



Strategic Approach to International Chemicals Management (SAICM)—A short description

The consumption of chemicals by all industries and modern society's reliance on chemicals for virtually all manufacturing processes make chemicals production one of the largest and most globalized sectors of the world economy. Acknowledgement of the essential economic role of chemicals and their contribution to improved living standards needs to be balanced with recognition of potential costs. These include the chemical industry's heavy use of water and energy and the potential adverse impacts of chemicals on the environment and human health. The diversity and potential severity of such impacts makes sound chemicalss management a key, cross-cutting issue for sustainable development.

SAICM is a policy framework to promote chemical safety around the world. SAICM has as its overall objective the achievement of the sound management of chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimize significant adverse impacts on human health and the environment. This "2020 goal" was adopted by the World Summit on Sustainable Development in 2002 as part of the Johannesburg Plan of Implementation.

Source: www.saicm.org

SAICM and the sound management of chemicals and waste beyond 2020. Participation of the scientific community in the intersessional process is encouraged. The first meeting of the intersessional process will take place 7-9 February 2017.

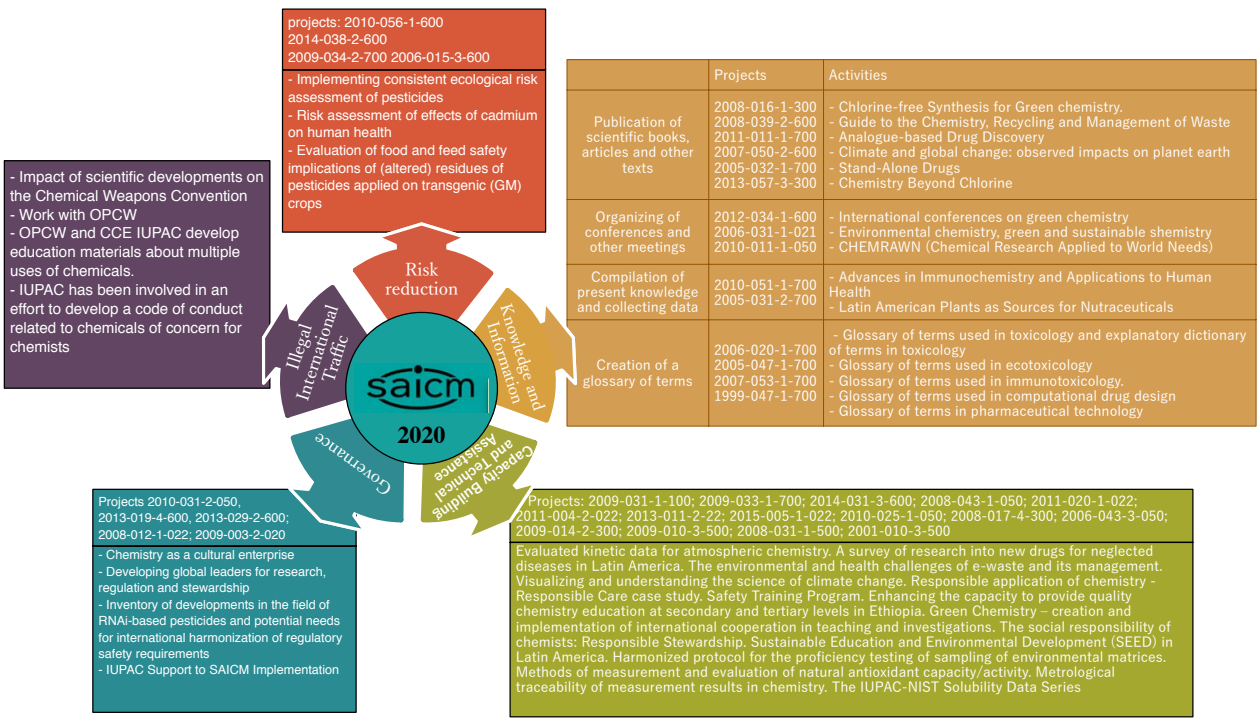
IUPAC's interest in SAICM is clear, given that this is an international activity, part of the UN Sustainable Development agenda, and one that is directly related to applied chemistry. The mission of IUPAC is to provide objective scientific expertise and to develop essential tools for the application and communication of chemical knowledge for the benefit of humankind and the world. [1] In 2010, IUPAC undertook a preliminary scoping project to assess a potential science contribution to SAICM, [2] concluding that this has a number of components:

- ensuring a firm scientific basis for policy development;
- reinforcing education and capacity building in relation to chemistry and its safe and responsible application;
- identifying and mitigating emerging issues of concern to health and the environment as early as possible;
- providing a balanced scientific perspective when considering new or emerging issues.

In addition, today we can see that SAICM provides an important context for the proposed new IUPAC Interdivisional Subcommittee on Green and Sustainable Chemistry.

Throughout this article, specific relevant IUPAC activities are identified by their project numbers to help the reader find more detailed information on the IUPAC website.

SAICM is managed through major implementation conferences held at three yearly intervals (The International Conference on Chemicals Management, ICCM). Dr. Anna Makarova attended the fourth conference representing IUPAC on behalf of the Committee on Chemistry and Industry (COCI). She presented the strategy and primary activities of IUPAC, speaking to the submission paper available on the SAICM website (SAICM/ICCM.4/INF/35). [3] As part of this presentation, she shared an analysis of IUPAC projects and their relation to the SAICM core objectives. The review is summarized in Figure 1 and serves to illustrate the relevance and diversity of IUPAC projects, thereby hinting at the potential contribution should IUPAC become more fully engaged



	Projects	Activities
Publication of scientific books, articles and other texts	2008-016-1-300 2008-039-2-600 2011-011-1-700 2007-050-2-600 2005-032-1-700 2013-057-3-300	- Chlorine-free Synthesis for Green chemistry. - Guide to the Chemistry, Recycling and Management of Waste - Analogue-based Drug Discovery - Climate and global change: observed impacts on planet earth - Stand-Alone Drugs - Chemistry Beyond Chlorine
Organizing of conferences and other meetings	2012-034-1-600 2006-031-1-021 2010-011-1-050	- International conferences on green chemistry - Environmental chemistry, green and sustainable shemistry - CHEMRAWN (Chemical Research Applied to World Needs)
Compilation of present knowledge and collecting data	2010-051-1-700 2005-031-2-700	- Advances in Immunochemistry and Applications to Human Health - Latin American Plants as Sources for Nutraceuticals
Creation of a glossary of terms	2006-020-1-700 2005-047-1-700 2007-053-1-700 1999-047-1-700	- Glossary of terms used in toxicology and explanatory dictionary of terms in toxicology - Glossary of terms used in ecotoxicology - Glossary of terms used in immunotoxicology. - Glossary of terms used in computational drug design - Glossary of terms in pharmaceutical technology

Figure 1. IUPAC activities related to chemical management; projects are identified by their IUPAC project number that can be used to find more detailed information under the "Projects" tab on the IUPAC website, [1] or directly at www.iupac.org/project/ NUMBER, e.g., *iupac.org/project/2008-016-1-300*

Before (top) and After (bottom) inventory. The clean-up project was under the direction of Dr. Ahmed Fahmy A. Youssef of Cairo University, a Fellow of the IUPAC Safety Training Program. He has also participated in Responsible Care Workshops for the Egyptian Chemical Industry.

in cooperative work with the other stakeholders.

To achieve its goal of ensuring that chemicals are produced and used in ways that minimize their adverse effects on human health and the environment by 2020, SAICM objectives are grouped under five themes, all relevant to IUPAC:

1. **Risk Reduction:** IUPAC has carried out numerous projects on ecological risk assessment.
2. **Knowledge and Information:** the whole ethos of the organisation is the provision of objective, unambiguous, accredited chemistry information, standards, and nomenclature.
3. **Capacity Building and Technical Cooperation:** this is the core of much of the work of the Committee on Chemistry Education (CCE) and COCI. COCI is currently working to help the global chemical industry deliver adoption of its "Responsible Care©" initiative throughout Africa (project 2011-020-1-022) and through promotion of the IUPAC 'Safety Training Programme" (project 2015-005-1-022).
4. **Governance:** projects such as the Inventory of developments in the field of RNAi-based pesticides and potential needs for international harmonization of regulatory safety requirements. Also the adoption of the Organisation for the Prevention of Chemical Weapons (OPCW) Ethical Guidelines for chemists, based on the original project on codes of conduct for chemists (project 2007-022-2-020).
5. **Illegal International Traffic:** IUPAC continues to work with OPCW providing a state-of-the-science input to convention meetings, as well as in the provision of educational materials (project 2013-020-1-050), and a new interest in promoting chemicals security.

At ICCM4 actions were agreed to on five emerging policy issues that need objective science input. These are:

1. **Lead in paint:** Lead poisoning is entirely preventable, but lead paint is still available in the Developing World. This would seems to be an issue for appropriate technology transfer, legislation, and education, but what should the chemistry community be doing to address this?
2. **Chemicals in products:** This is essentially about the properties of chemical mixtures and whether the effects are additive, or positively or negatively synergistic. This is a difficult area for policy makers.
3. **Hazardous substances within the life cycle of electrical and electronic products:** The current IUPAC project of the Chemistry and the Environment Division, "The environmental and health challenges of e-waste and its management: an emerging 21st century global concern" (project 2014-031-3-600) is directly relevant.
4. **Nanotechnologies and Manufactured Nanomaterials:** The IUPAC project "The chemical speciation of anthropogenic nanoparticles" (project 2014-026-3-600) is directly relevant.
5. **Endocrine Disrupting Chemicals:** This is an enduring concern. The State of the Science review undertaken by UNEP and WHO in 2012 includes the conclusion that "despite substantial advances in our understanding of EDCs, uncertainties and knowledge gaps still exist that are too important to ignore. These knowledge gaps hamper progress towards better protection of the public and wildlife. An integrated, coordinated international effort is needed to define the role of EDCs in current

declines in human and wildlife health and in wildlife populations." [4]

In the framework of Sustainable Development, the SAICM Secretariat developed guidelines for achieving the 2020 goal of the sound management of chemicals, which were endorsed by all stakeholders in 2015. [5]

As part of this, industry is encouraged to enhance Green Chemistry in the design, production, and use of products, and to work collaboratively with others to achieve this. Green Chemistry and its 12 principles have been defined by IUPAC, [6] however, within the SAICM framework, a need still remains for a common and consistent understanding of what this means, what represents best practice, and how it can be more effectively implemented globally. As a first step in this direction, IUPAC might bring together specialists in environmental protection, risk assessment for human health, industry, and chemistry to define the scientific criteria for green chemistry that correspond with the Sustainable Development Goals, [7] adopted at the UN General Assembly in September (2015).

During ICCM4, discussions were held with representatives of the chemical industry, represented by the International Council of Chemical Associations (ICCA), with regard to possible cooperation between IUPAC and ICCA. ICCA is keen to encourage public-private partnerships, the development of new products, and solutions that improve people's lives through its initiatives such as Responsible Care® and the Global Product Strategy.

As part of possible cooperation with IUPAC, ICCA is interested in the development of training programmes and in involvement in Africa to promote the Responsible Care® programme. The focus of this would be training using Case Studies. COCI produced a book, "Responsible Care, a Case Study", edited by Peter Topalovic and Gail Krantzberg and published by De Gruyter (ISBN 978-3-11-034316-8 (2013)). In addition, the Safety Training Program (project 2015-005-1-022) provides scientists from developing countries with a 2-3 week training course provided by a chemical company with a strong environmental, health, and safety culture. This programme can be combined with a programme of training 'The best practices to develop Responsible Care© programmes for the chemical industry' which have been developed by specialists from D. Mendeleev University of Chemical Technology of Russia for the representatives of chemical enterprises in developing countries of Russian-speaking regions (Central and Eastern Europe and Central Asia), preferably working in a field related to environmental protection, safety, and security. Such a project might be of interest to ICCA and other intergovernmental organizations, such as OPCW.

In conclusion, SAICM is central to the UN initiatives on sustainable development and safe, responsible, applied chemistry. It is a global activity and that the chemistry community is well placed to engage in through IUPAC. Indeed, many IUPAC projects are already highly relevant to SAICM priorities and objectives, even though they developed separately from the SAICM process. SAICM now provides an opportunity for chemists to cooperate with Intergovernmental Organisations (UNEP, WHO, OPCW), governments, civil society, trade unions, and industry to leverage the impact of IUPAC's work, especially through the proposed Interdivisional Subcommittee on Green and Sustainable Chemistry.

IUPAC is currently engaged in SAICM through COCI. COCI is working to establish the optimum ways of working with and through SACIM. Those interested in further information should contact the authors.

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