



International Organization for Chemical Sciences in Development

**Promoting the chemical sciences
for
human development and
economic growth**

**Organization Outline
and
Strategy 2011-2020**

www.iocd.org

IOCD builds on 30 years of achievement in *promoting the chemical sciences for sustainable, equitable human development and economic growth, especially in low- and middle-income countries (LMICs).*

Foundation

IOCD was established¹ in 1981 under the auspices of UNESCO, *as the first international non-governmental organization (NGO) devoted to enhancing the role of the chemical sciences in development work and involving chemists in LMICs* – enabling them to contribute to key science and technology (S&T) areas for development.^{2,3}



Pierre Crabbé
1928- 1987

Chemist, humanitarian
and founder of IOCD⁴

Role of the chemical sciences in development

The chemical sciences provide understanding of the physical and chemical properties of atoms and molecules and practical methods for creating new molecular structures with useful applications.

Chemistry is a 'platform science', contributing to fundamental aspects of a range of other sciences and underpinning the dramatic advances seen in recent decades in such fields as biotechnology, energy, the environment, genetics, materials and medicine.

During the last two centuries, *the chemical sciences have contributed enormously both to broad improvements in human well-being* (including enhancements in life expectancy, health and quality of life) *and to wealth creation* for individuals and nations.⁵

Landmark examples include:

- *Innovations in the generation, storage and use of energy*
- *Creation of new materials*
- *Advances in agriculture, food and nutrition*
- *Better health*
- *Economic growth*

But the benefits from advances in chemistry and other sciences have not been evenly distributed globally. The least industrially and technologically advanced countries have remained the poorest and people in LMICs often have much lower life expectancies than those in high-income countries (HICs).

Economists have concluded⁶ that *much of the decline in mortality in the 20th century had its origin in technical progress* (i.e. a combination of technological advances and their diffusion and uptake in different countries and the capacities of the countries themselves to conduct and apply research). Much of the variation in life expectancies seen between countries is explained by differences in the rate of this technical progress.⁷

Efforts to tackle the large global inequities reflected in the high levels of poverty,⁸ illiteracy, ill health, gender inequality, lack of access to improved water and sanitation and poor environment seen in LMICs led to

agreement by the world's governments in 2000 on the *Millennium Development Goals* (MDGs). However, uneven progress has been made and without a major push many MDG targets for 2015 are likely to be missed in most regions. ***Achieving the goals will require a collective global effort harnessing political will and available resources in all areas, including harnessing science technology, and innovation (ST&I) for development.***

What is poverty?

Poverty is hunger. Poverty is lack of shelter. Poverty is being sick and not being able to see a doctor. Poverty is not having access to school and not knowing how to read. Poverty is not having a job, is fear for the future, living one day at a time. Poverty is losing a child to illness brought about by unclean water. Poverty is powerlessness, lack of representation and freedom.

Word Bank⁸

Recognizing the vital role that ST&I must play in reaching the MDG targets, the Millennium Project established a Task Force on ST&I. Its report⁹ stressed the importance of ST&I policies tailored to the specific circumstances of each country and the need to create international partnerships that allow for mutual learning. Key areas for policy action include:

- focus on platform technologies
- improve infrastructure services as a foundation for technology
- improve higher education in science and engineering and redefine the role of universities

- promote business activities in ST&I
- improve the policy environment
- focus on areas of underfunded research for development.

Why has it been so difficult to pursue chemistry and related sciences in LMICs in the past? By the 1980s, many chemists from LMICs had been, or were being, trained in research in universities in HICs, but found it difficult to engage in productive and rewarding careers in research in the growing number of university chemistry departments in their home countries. Common problems included lack of access to funds, laboratory supplies and equipment and difficulty in staying abreast of the latest advances in their fields. ***IOCD's response was a twin track approach of active research support and capacity building, achieved through the operation of its scientific working groups (WGs) and analytical service centres.***

Impact of IOCD

Overall, the impact of IOCD has been to help highlight the importance of the chemical sciences as contributors to development; to raise the profile of the field and its practitioners; to initiate, promote or sustain a number of technical, managerial, policy and collaborative networks and projects advancing chemical sciences in LMICs; and to contribute to vital resources for teaching, learning and research.

IOCD has a strong record of achievement in its first 30 years:

- As the first international NGO specifically devoted to enhancing

the role of the chemical sciences in development, IOCD helped raise awareness of the importance of the field at national and international levels and the profile of chemists and their contributions to development in LMICs. This was aided by success in attracting prominent chemists to IOCD's cause, including the Presidents (two Nobel laureates), Council (included four additional Nobel laureates) and WG leaders and members.



Glen T. Seaborg
Nobel Laureate in
Chemistry

IOCD President
1981-1995



Jean-Marie Lehn
Nobel Laureate in
Chemistry

IOCD President
Since 1995

- The early work by the Male Fertility Regulation and Tropical Diseases WGs was valued by international partners (including the two WHO Special Programmes for research in fertility regulation and tropical diseases; UNFPA, Walter Reed Army Institute; and CONRAD programme) and helped raise awareness of these neglected areas while providing LMIC

synthesis groups opportunities to undertake medicinal chemistry.

- The later WGs in the areas of medicinal chemistry, natural products, the environment and bioprospecting made important contributions to training, capacity building and networking, attracting support and collaboration from international agencies such as the International Union of Pure and Applied Chemistry (IUPAC) and from the private sector. The work to enhance LMIC capacities and develop national frameworks for sustainable, ethical bioprospecting has impacted on policy making.
- IOCD's analytical services gave essential support to many chemists striving to conduct isolation, structure elucidation and synthesis work in resource-poor settings. Successful localization as NABSA (Network for Analytical and Bioassay Services in Africa) has ensured that national and regional work is being sustained in service provision and in capacity building at individual, institutional and system levels.
- Contributions have been made to strengthening teaching capacities through the creation and dissemination of web-based open and distance learning materials in organic and medicinal chemistry, donations of books and computers and support for micro-scale laboratory kits which enable science to be taught where resources and chemical supplies are very limited.



IOCD's Mission and objectives

IOCD's mission is to promote the pursuit and application of the chemical sciences for sustainable, equitable human development and economic growth, especially in low- and middle-income countries, through:

1. **Raising the profile of the chemical sciences in development** among researchers, funders and policy-makers;
2. **Increasing the capacity to conduct and use the chemical sciences in LMICs to advance their development** by strengthening capacities at the individual, institutional and national/systems levels to apply the chemical sciences to meet current and future challenges;
3. **Strengthening the participation of LMIC researchers in the chemical sciences** in national and global priority areas, including attaining the MDGs and advancing the domains of better health and a better environment.

IOCD's Strategy 2011-2020

IOCD is focusing on *three strategic priorities*.

Strategic priority 1: Chemistry for better health

The nature of health challenges faced in every part of the world is changing, as a result of shifting patterns of disease, the globalization of health threats, changes in the environment and in human behaviour.

Drug discovery and development

LMICs are increasingly concerned to develop their own capacities in areas like drug analysis, discovery, development and production, both to meet their own specific health challenges and to benefit economically from participation in one of the world's largest industries.

African Network for Drugs and Diagnostics Innovation (ANDI)¹⁰

IOCD's strategy is to support:

- capacity building for medicinal chemistry, including drug analysis, discovery and development, in and for the health needs of LMICs. IOCD has worked extensively in this field and its ongoing programme in this priority area will especially help to meet MDG 6 (combating HIV/AIDS, malaria and other diseases).
- chemists working on the isolation, structure elucidation and bioassay of natural products. About a third of all currently used medicines are derived from compounds first extracted from natural sources such as plants, bacteria and fungi. IOCD has a long track record of working in this field. Furthermore, the Biotic Exploration Working Group has helped several countries in Africa, Asia and Latin America to develop policies for ethical, sustainable bioprospecting, helping establish the foundations for new products and processes that will contribute to better health (MDG 6) and economic development (MDG 1).



Strategic priority 2: Chemistry for a better environment

Concern for the environment, including contamination of air, land and water, has become increasingly a matter for global attention since the first Earth Summit in 1992.¹¹ LMICs are now learning how to engage in sustainable development and avoid the historic pathways which have led to pollution, exhaustion of resources and loss of biodiversity.

Environmental Performance Index (EPI)

The EPI covers both environmental public health and ecosystem vitality, provides a gauge of how close countries are to meeting established environmental policy goals.¹² It includes a number of measures that are chemistry-related (e.g. in climate change – emissions of CO₂ and other industrial greenhouse gases; in agriculture – pesticide regulation; in environmental health – indoor and outdoor air pollution and access to good quality water and sanitation; in biodiversity and habitat – biome protection). Monitoring EPI progress and innovation of methods to mitigate threats to the environment therefore *depends on developing adequate local capacities at policy, regulatory and practical levels in areas such as environmental chemical analysis and the sustainable use of biological resources*.

IOCD's strategy is:

- to enhance capacities for environmental chemical analysis and sustainable use of biological resources, addressing the need to ensure a sustainable environment encapsulated in MDG 7. IOCD's

Environmental Chemical Analysis WG, formed in partnership with IUPAC, has supported workshops and training in laboratory management and in practical analytical techniques, including for the analysis of pesticide residues and water quality.

- to support capacity building for the exploration and sustainable, ethical exploitation of natural resources in and for the benefit of LMICs. IOCD's interventions will help LMICs to advance towards several of the MDGs through contributions by the chemical sciences to economic development (MDG 1), a sustainable environment (MDG 7) and developing effective partnerships (MDG 8).

Strategic priority 3: Capacity building in chemical education

As well as acquiring specific technologies, it is clear that there is a need for LMICs to put in place a broad array of capacities and enabling factors so they can use the chemical sciences in responding to changing conditions and new challenges over time and to become self-reliant in their abilities to determine their own futures.

Requirements to benefit from ST&I

The **scientific capacities** necessary include broad capacities in both analytical and synthetic chemistry. The **enabling environment** necessary includes a range of institutions, policies, systems and resources to ensure that there is an adequate supply of well-trained chemical scientists and suitable institutions and conditions in which they can work.



IOCD's strategy is to assist in enhancing capacities for chemical education, including:

- **Web-based resources:** IOCD groups have developed:
 - on-line tutorials in organic chemistry, available in Spanish.¹³
 - training in practical medicinal chemistry, available on-line and as a CD, to help up-grade the skills of chemists in the field of drug design and development.
- **Books and equipment for international development:** An IOCD group collects university textbooks across all disciplines, including the chemical sciences, as well as laboratory equipment and computers, and in collaboration with UNESCO makes a number of shipments each year to universities in Africa, Asia and Latin America.
- **Microscale science kits:** In many LMICs, there is little or no opportunity for chemistry students to gain practical experience, especially at the advanced school level. Together with UNESCO, IUPAC and the International Foundation for Science Education, IOCD supports the Global Microscience Project – portable micro-scale kits enabling chemical reactions to be conducted with very small quantities of chemicals. The kits and materials are designed to be easily adaptable to different national curricula, and different language versions are in preparation.

Communications

IOCD's communications work aims to:

- Highlight the key role of the chemical sciences in development
- Inform about IOCD's role as a proponent of the chemical sciences in development
- Provide informational resources that facilitate and enhance capacities to conduct and use the chemical sciences in LMICs to advance their development
- Promote the stronger participation of LMIC researchers in the chemical sciences in national and global priority areas.

Governance, management, structure, funding and accountability

Overall responsibility for governance and strategic direction rests with a small board, the **Executive Committee (EC)**, led by the President, who is currently a Nobel laureate in chemistry. The EC is supported by a **Scientific and Technical Advisory Committee (STAC)**, which includes the leadership of the IOCD Working Groups and Projects and additional members appointed by the EC. The annual work programme approved by the EC is managed and overseen by an **Executive Director** and implemented by IOCD's Working Groups and Projects. The EC also appoints members of a **Senior Advisory Council**, who are eminent persons willing to assist IOCD to attain its mission.



Senior Advisory Council 2010-2015

Prof. Berhanu Abegaz: Executive Director, African Acad. Sciences

Prof. Vadim Ivanov: Director, Shemyakin Institute of Bioorganic Chemistry, Russian Acad. Sciences

Prof. G. Mehta: School of Chemistry, University of Hyderabad

Prof. Koji Nakanishi: Department of Chemistry, Columbia University, New York

Prof. C. N. R. Rao: Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore

IOCD has received **funding** from a wide range of public and private sector sources, including UN agencies, governments, national and international agencies and industry-funded foundations. IOCD is registered in Belgium; its USA affiliate, the Organization for Chemical Sciences in Development, Inc. (OCDI), is a 501(c)(3) tax-exempt organization.

Monitoring and evaluation is undertaken annually by the Executive Committee, to which the Secretariat and all IOCD programmes report.

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For further information and details of IOCD's programmes

Visit IOCD's Website:

www.iocd.org

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