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Practitioner´s Section

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The chemical industry as a key player for climate protection: Learning experiences from cooperation with developing countries and emerging economies

This paper is directed to stakeholders from the private sector, public institutions, civil society, and academia that have to do with the production and use of chemicals or climate change, be it in a direct form or indirectly in advisory institutions, research, or government and regulatory bodies. It is meant as a contribution to the discussion on the nexus between chemistry and climate change, presenting the chemical industry as a key sector for building pathways towards climate neutrality. The findings presented in this paper are based on the learning experience of an international cooperation project with developing countries and emerging economies, named Climate Action Programme for the Chemical Industry (CAPCI) (ISC3, 2023). It seeks to inform and inspire the reader on potentials of the chemical industry for implementing GHG mitigation strategies and contributing to achieve climate targets. Furthermore, it shows possibilities for the transfer of knowledge and experiences between industrialized countries and developing or emerging countries as well as south-south collaboration. As chemicals production and use are characterized by international value chains with a growing share of developing countries and emerging economies, international cooperation and knowledge sharing are crucial drivers for enhancing their successful transformation.

1 Introduction

Chemicals are omnipresent in our modern economies as well as in our daily lives. Over 350,000 chemicals or substance mixtures are currently registered for commercial use – and this number continues to rise. They are essential for manufacturing nearly all industrial products, from automobiles and electronics to household goods and textiles, as well as materials needed for developing renewable energy and sustainable mobility solutions. At the same time, however, the chemical and petrochemical industry is highly energy and carbon-intensive, accounting for around 10 percent of the world's final energy demand (World Business Council for Sustainable Development, 2018) and 7.4 percent of the global greenhouse gas (GHG) emissions when considering emissions directly controlled by the companies (scope 1) as well as those associated with purchased electricity, heat or steam (scope 2) (Intergovernmental Panel

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on Climate Change, 2022). While chemical production is one of the top-three industrial sectors in terms of GHG emissions, along with cement and steel, it is also a major source of innovative solutions and materials for decarbonizing other sectors such as energy and transport. Tapping the entire potential of the chemical industry to advance mitigation and low-emission technologies is crucial for effectively tackling climate change (World Economy Forum, 2021).

On the other hand, the chemical industry is in a unique position to develop technologies and products that can mitigate climate change, enhance circularity and advance sustainability. Innovations in chemistry have the potential to transform entire value chains and reduce GHG footprints, for instance via energy-saving and emissions-reducing technology and materials. Some of the relevant economic sectors and actors include building and construction, energy, transportation, consumer goods, and individual consumers (International Council of Chemical Associations, 2019). The transformation to a low-carbon chemical industry requires action through several pathways, including technological and political solutions as well as smart organizational structures (European Commission, 2023). It also requires agreement and commitment on the part of governments, as well as industry and other stakeholders, guided by the conviction that a climate-neutral chemical industry can be achieved (VCI, 2019; VCI, 2022). A position paper of the International Council of Chemical Associations representing the global chemical industry (International Council of Chemical Associations, 2021) provides some promising starting points. It sets out a vision that the chemical industry can indeed become climate-neutral if certain conditions are met.

The German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) has established the Climate Action Programme for the Chemical Industry (CAPCI) in the framework of the International Climate Initiative (IKI) to help address these challenges in the cooperation with developing countries and emerging economies. CAPCI is executed by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and operates in collaboration with global partners such as ICCA and the Paris Committee on Capacity Building (PCCB) of the UN Climate Secretariat. With a focus on raising awareness and building capacity, CAPCI helps identify and unlock the potential held by the chemical industry in mitigating climate change and driving innovation.

While most multinational chemical companies do have their organizational units dealing with environmental and climate issues or sustainability questions in general, smaller companies, especially in developing countries and emerging economies very often lack knowledge about climate aspects associated with chemicals production and use. Nevertheless, many of these countries have recently raised the ambitions of their climate objectives as defined in their Nationally Determined Contributions (NDCs) (United Nations Environment Programme, 2021), and some of them, including CAPCI partner countries such as Thailand and Vietnam, have even committed to achieving climate neutrality by the middle of the century. As a result, they are revising their national climate policies and developing specific mitigation strategies that need to address all relevant emission sectors – including the chemical industry.

2 Conceptual approach and main activities

The conceptual approach of CAPCI responds to the great need for knowledge and capacities. The activities pursued by CAPCI follow a two-pronged approach and include both, country-specific and more general topic-specific knowledge-sharing measures at the global level. First, the programme provides stakeholders and decision-makers with information, applied knowledge, and best practices regarding GHG mitigation opportunities in the production and use of chemicals, through international webinars and side events, the establishment of an online knowledge base with best practices for mitigation in the chemical sector, publications, and training concepts. Second, it supports activities in selected developing and emerging countries aimed at better understanding the connection between the chemical industry and climate change as well as implementing measures for reducing related GHG emissions.

As the structure of the chemical industry differs from country to country and companies also show different levels of progress in terms of low-carbon practices, CAPCI does not promote a defined technological blueprint but considers the entire menu of mitigation technologies. They range from low-cost options such as measures for increasing energy and resource efficiency, while reducing losses, to more complex solutions such as shifts to renewable energy sources or the application of Power-to-X solutions or carbon capture

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and use (CCU) etc. One best practice from Germany that generated much interest among the partner countries was the use of chemical parks as so-called Verbundstandorte (Weber, 2022), in which inter-linkages between different plants and companies at these parks lead to impressive synergies and optimisation in energy and resource flows. The parks contribute to a local circular economy and thereby significantly reduce GHG intensity.

2.1 Cooperation with partner countries

CAPCI supports selected partner countries, particularly with knowledge, information, training and action-oriented capacity building regarding climate protection in the production and use of chemicals. To identify the initial pilot countries, CAPCI reviewed the chemical industry landscapes, chemical industry GHG emissions, energy mixes, NDCs and collaborative UNFCCC initiatives across numerous GIZ partner countries (International Sustainable Chemistry Collaborative Centre ISC3 et al.). Based on these criteria as well as the formal expression of partner interest and a favourable cooperation landscape, the countries ultimately identified were Argentina, Ghana, Peru, Thailand and Vietnam. CAPCI's main partner organisations in these countries are the ministries of environment and industry as well as the associations of the chemical industry.

2.2 Stock-taking, information-sharing, and stakeholder dialogue

In each country, CAPCI supported activities of stock-taking, information, awareness creation and discussion on the nexus chemistry – climate change. The first step in these efforts involved baseline studies that shed light on the landscape of the chemical industry of each country for mapping the structures and challenges of the chemical industry, in order to provide guidance for tailored measures aimed at GHG reduction to be developed.

CAPCI then organised national stakeholder dialogues in collaboration with national partners from government and private sector as well as academia and civil society to generate further insights into the national chemical industry while also identifying needs and gaps for capacity building for each country. At the national stakeholder dialogues, the participants recognised that the chemical sector is an important factor in relation to climate change as well as broader national sustainable development agendas.

The stakeholder dialogues together with the baseline studies helped to identify challenges, priorities, needs and gaps for capacity building among stakeholders from the private, governmental, and academic sectors related to the chemical industry and climate protection. Their results also serve as a guidance for follow-up activities with a focus on building capacities for climate change mitigation in the chemical industry which represents a crucial pre-condition for identifying and leveraging successful pathways toward greenhouse gas mitigation in the partner countries.

2.3 Developing capacity and training trainers

CAPCI's capacity building programme started with an online training-of-trainers course (ToT), designed and elaborated together with the consulting company HEAT GmbH. It is accompanied by extensive training materials and addresses the different political, economic, methodological, and technical aspects of the nexus "chemistry – climate change" in a broad manner while particularly catering for the needs and gaps, identified in the baseline studies and national stakeholder dialogues in each of the partner countries. In the ToT, that extended over a period of seven weeks, a diverse group of 30 participants from the five pilot countries acquired knowledge about the nexus between the chemical industry and climate change. An online platform called "atingi" (atingi CAPCI) was used for the course which included a number of exercises, quizzes, and a final exam.

The target audience for the training course included representatives from government institutions and the private sector, particularly professionals from the chemical industry with prior knowledge regarding climate policies as a prerequisite. One of the expected outcomes of the course was for participants to be enabled to serve as trainers of subsequent capacity-building activities in partner countries with support from CAPCI. Through this approach, the course turned participants into knowledge multipliers and agents of change for the topic of climate change mitigation and sustainable chemical industry.

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2.4 Study visit

Aiming to further deepen knowledge, CAPCI organised in 2022 a study tour in Germany for a group of experts from the partner countries and particularly for participants from the training-of-trainers course. This study programme included a visit to ACHEMA the big trade fair for the chemical sector. The participants also visited two chemical parks to gain insights into the advantages of chemical parks as "Verbund sites" that leverage energy and resource efficiency along with circular business models. These site visits gave experts from the pilot countries the opportunity to learn on-site about options for creating synergies between chemical processes and plants while enhancing circular economy and GHG mitigation.

2.5 Developing roadmaps towards climate-friendly chemical production

Based on the national baseline studies, the stakeholder dialogues, and the capacity building measures CAPCI aims to support practical measures for efficient greenhouse gas mitigation in the chemical industry. One more general element is the development of roadmap studies, specific to the chemical sector, that show different scenarios and options for mitigating greenhouse gas emissions and ultimately proceeding on the pathway towards climate neutrality, in accordance with the NDCs. It is important to note that each country and industrial sector has to identify and define its own pathway or long-term strategy that responds to the specific structures, conditions, and challenges, though existing roadmaps and strategies can provide valuable inspiration and orientation (World Business Council for Sustainable Development, 2018; ICCA ,2019; VCI, 2019; World Economic Forum, 2021).

2.6 Side events and international webinars

A set of international activities of CAPCI are carried out in parallel with cooperation measures with partner countries. In addition to a web-based knowledge base of best practices, factsheets, and other information materials, CAPCI organized together with the ICCA and the PCCB of the UN Climate Secretariat international webinar series for information and discussion on the important relations between chemicals production and use and climate change. CAPCI engaged representatives from chemical companies and associations as well as from science and research, focusing on sharing knowledge, networking and raising awareness. The topics addressed range from policies over innovation to best practices from the industry.

CAPCI also organised side events at international conferences, such as the conferences of parties of the UN framework convention on climate change (CoP 27) in November 2022 in Sharm El Sheik, Egypt, or the "Triple CoP´s" of the Basel, Rotterdam and Stockholm Conventions in Geneva in June 2022. Special emphasis was given to the important issue of how to enhance synergies and avoid trade-offs between international efforts for tackling climate change and those for ensuring the safe management of chemicals and waste.

3 Main results and learning experiences

The above-described activities have created a good basis for further cooperation, including information and training materials, best practices, and networks of interested partners as well as multiplicators and trainers. In collaboration with national associations and government partners, CAPCI supports diverse country-specific capacity-building measures executed with help from trainers that have taken part in CAPCI's ToT course on Sustainable Chemistry and Climate Change. This includes designing different training modules for consultants, chemical company staff, and political leaders to help them identify mitigation options as well as specific strategies and roadmaps for their country.

The programme partners in Argentina have already started to define a roadmap for their chemical industry, with CAPCI providing support for carrying out a technical study and organizing dialogues with all relevant stakeholders about effective and realistic pathways toward mitigation in the chemical sector. Thailand as well as Ghana also prepare studies for the development of roadmaps for their respective chemical industry.

Among the most striking learning experiences, it can be noted that partners from the chemical industry as well as from government institutions joined CAPCI cooperation activities with great interest and gave to understand it

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as coming at the right moment. As one representative of a chemical association put it: "CAPCI is very welcome, because we have become aware that we need to do more in the area of climate change". On the other hand, the support of the ICCA was very important for CAPCI because it opened doors to focal points in the national chemical associations. These are not only crucial partners; they also generally have long-standing experiences with the Responsible Care programme; and there are signs that climate-related training and awareness-building could at least partially build on the established structures and mechanisms, thereby linking climate protection with chemicals management.

Furthermore, all countries are requested to regularly raise the ambitions of their NDCs; especially when mitigation objectives are risen or even a climate-neutrality commitment is made, this causes a dynamic to include all relevant sectors in respective GHG abatement efforts. Interestingly, the chemical industry was often not in the focus of national mitigation strategies, though they belong to the three most GHG-intense industrial subsectors, accounting for 7.4 % of global GHG emissions (scope 1 and 2). The potential of the chemical industry to contribute to tackling climate change is in many countries not well known and is often under-estimated. One reason for the under-estimation of the sector's climate relevance may be the fact that the methodology for establishing national emission inventories usually attributes most of the chemical industry's GHG emissions, particularly those generated by fossil fuel burning, to the emission sector energy.

The implementation of CAPCI so far has shown that the chemical industry has an important role to play in tackling climate change, not only in mitigation of its own significant GHG emissions and implementing innovative solutions in areas such as circular economy, renewable energy, and green hydrogen. It is also an important provider of solutions for decarbonization or "defossilization" of other sectors. Information, awareness creation, knowledge sharing, and capacity building remain important tasks.

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