Academia's Role for Sound Chemicals Management: Stockholm Convention and International Panel on Chemical Pollution

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1 Problems at the interface between science and politics

The Stockholm Convention on Persistent Organic Pollutants is an important international framework for addressing the issue of large-scale environmental contamination by Persistent Organic Pollutants (POPs). Such a framework is, by its very nature, an interface between science and politics. At first sight, the function of such an interface may seem to be straightforward: at the interface, relevant scientific findings are passed on to policy makers in national governments and international institutions such as UNEP or, more specifically, the secretariat of the Stockholm Convention. However, there are several potential problems that may impede this straightforward transfer of knowledge:

- the information required by users may not be available because the needs of users in governments and international institutions do not correspond to a topic that is interesting or relevant to scientists in academia;
- even if the needs of users would lead to an interesting scientific question, academic scientists may not be aware that these needs exist;
- users require the scientific information in a format different from what scientists normally deliver (mainly journal publications) or users do not have the capacity to search for the relevant information in a large number of sources;
- scientists do not have the capacity to present their results in a format suitable for the needs of users.

Therefore, scientific information obtained by users often remains incomplete or is used without the necessary context being provided. An example is the information about phthalate softeners contained in the Risk Assessment Reports by the European Union (Wormuth et al. 2007). However, these difficulties in the development of the relevant knowledge by science and/or the transfer of the knowledge from science to politics do not represent a failure on either of the two sides of the interface. On the contrary, they are a logical implication of the fundamentally different objectives and ways of operating of science and politics. But as a consequence of these fundamental differences, one has to conclude that the simple "transfer model" assuming that the relevant scientific information "trickles down" from science to its application contexts needs to be revised.

What are typical goals and drivers on the academic science side of the interface? Scientific research aims to find answers to relatively well-defined questions that are relevant to scientists because they represent the cutting-edge of the scientific understanding of a topic. The point where this cutting-edge is located is, in general, the result of a long process in which scientists have explored solutions to an initial problem, encountered new questions, developed new methods, found solutions to some of the new questions but also discovered additional new questions. It is important to see that this historical process of exploring problems, developing and refining methods, finding partial solutions but also encountering new problems, etc. defines to a large extent the focus of scientific research at a given time. Often, the scientifically relevant questions are centered around certain methods such as techniques for trace level analysis. In addition, there is a trend that new scientific questions often address increasingly specific aspects of a problem so that the science becomes more and more specialized. This trend makes it possible for scientists to develop novel and original ideas, which is an important driver in the scientific system. At a practical level, an important product or deliverable of scientific work is a journal publication.

On the other hand, most scientific research is not primarily driven by an interest in the “big picture” that involves more than the questions and problems relevant to a certain discipline or branch of science. In review articles, scientists do synthesize the available knowledge to a certain extent but real-world problems or “issues” still go beyond such a synthesis of the scientific knowledge that mainly addresses other scientists as readers, but not policy makers or the public. Accordingly, real-world problems are not generally of paramount importance to the scientific perspective in academia.

Another aspect that is not primarily in the focus of scientific research is questions and implications of uncertainty and lack of knowledge. Of course, uncertainty analysis and a discussion of open questions is an essential part of today’s scientific work. For scientists, uncertainties and lack of knowledge mainly define possible directions or their future work. In the context of real-world problems, however, decisions have to be made “here and now” and it is not possible to wait for the scientific results of tomorrow. Accordingly, the implications of uncertainty and lack of knowledge are more severe for policy makers than for scientists. For the decision-making process, it is essential to overcome the obstacles caused by scientific uncertainties and, therefore, these uncertainties are often disregarded.

Politics, in contrast to science, typically needs a broad overview of a certain topic and a focused selection of the knowledge (and the related open questions) that is most relevant to the decisions to be made. Policy makers normally do not have the capacity to search for all relevant scientific information and evaluate the many different pieces of information available. In today’s world where many political processes deal with highly complex problems and, therefore, have to rely on scientific knowledge, the mismatch between science and politics as outlined above is a problem.

To improve the situation, it is important to recognize that for scientists it is an additional effort to work towards the needs on the politics side of the interface. Therefore, instead of asking individual scientists to provide such an additional effort, it is useful to establish an institutional framework for the science-policy interaction. Advantages of such a framework are that it helps to assemble many different aspects of a chemical pollution problem in a comprehensive picture and that the outcome of such a process will have a higher impact than the statement of a single scientist. An institutional framework will also make it easier to create incentives for scientists to participate in the work at the interface (productive interaction with other scientists and with partners from various institutions; visibility and reputation). Two examples of such institutional frameworks are the OECD Expert Group for Multimedia Modeling and the International Panel on Chemical Pollution, IPCP. The OECD expert group involves only a relatively small number of scientists and focuses on a single question. The IPCP is a long-term initiative, involving many scientists and dealing with a broader range of topics.

3 The OECD expert group on multimedia modeling for overall persistence and long-range transport potential

After the OECD/UNEP workshop on *The Use of Multimedia Models for Estimating Overall Environmental Persistence and Long-Range Transport in the Context of PBTs/POPs Assessment*, held in Ottawa, Canada, in 2001 (OECD 2002), an expert group was formed and given the mandate to address the recommendations from the workshop:

- to provide guidance for users on model applicability and fitness for purposes;
- to conduct model comparison studies;
- to ensure that a core set of multimedia models be made available and accessible at no cost to the public.

The expert group extensively comperared nine environmental fate models that can be used to calculate the overall persistence (Pov) and long-range transport potential (LRTP) of chemicals in the environment (Fenner et al. 2005). In addition, the group investigated in which way known POPs can be used as reference chemicals in the identification of new POPs (Klasmeier et al. 2006). The members of the group realized that the collaborative process in the group was highly productive and that, as a group, they could provide a more effective input for the process of chemicals assessment at the national and international level than as individuals. This is an example of the advantage of an institutional framework as mentioned above. On this basis, the group made another step that was not initially defined as an objective: all group members endorsed the development of a consensus model for calculating Pov and LRTP. This model, called the OECD Pov and LRTP Screening Tool, was developed in 2005 and is now freely available from the OECD website (OECD 2008). The OECD Tool provides a well-defined reference for Pov and LRTP assessments at a screening level. The availability of a single model makes Pov and LRTP assessments more consistent than a set of many different models from which users would have to choose one. The design and functionality of the OECD Tool along with some example applications have been described by Wegmann et al. (2008). An important field of application of the OECD Tool is the identification of new POPs under the Stockholm Convention; the OECD Tool has been used to characterize the current POP candidate chemicals in terms of Pov and LRTP (Scheringer et al. 2006, Wegmann et al. 2007). In the lecture, the OECD Tool and its recent applications will be presented.

4 The International Panel on Chemical Pollution

The initiative to establish an International Panel on Chemical Pollution, IPCP, was started in 2006 (Scheringer et al. 2006). Currently, the initiative is supported by about 100 scientists from 35 countries all over the world, see www.ipcp.ch. Main objectives of the IPCP are (i) to create an interface that links science and politics in the field of chemical pollution problems; (ii) to address chemical pollution problems that need international collaboration, and (iii) to support the implementation of international agreements such as the Stockholm Convention. A key task of the IPCP is to go beyond the normal endpoint of scientific research, namely publications in scientific journals. To this end, the IPCP selects priority topics, for example single chemicals of high importance, such as DDT or polyfluorinated chemicals, or important broader subjects such as the assessment of human exposure to chemicals. To address these topics, IPCP Working Groups are established; the purpose of such a

Working Group is: to review the available knowledge about a topic, to identify the consensus and the disagreement present in the available knowledge; to discuss and evaluate uncertainties; to identify most important gaps of knowledge and needs for future research; and to make this review and interpretation of the state of the science available to national governments, international institutions, and the public. In this process it will be important that the working group members also learn about the decisions to be made by the users of the scientific knowledge. In other words, the work of IPCP Working Groups will not be a one-way process that just delivers a summary of scientific knowledge to users of this knowledge, but it will involve the selection and interpretation of scientific knowledge (and lack of knowledge) in the light of practical problems to be handled by policy makers. In the lecture, recent activities of the IPCP and steps planned for future work of the IPCP will be presented.

5 Conclusions

International agreements on the mitigation of chemical hazards and risks such as the Stockholm Convention define objectives that do not necessarily correspond to scientifically relevant problems. Accordingly, scientists need to identify, ideally in collaboration with policy makers, suitable scientific questions that will lead to results that are useful for the initial objectives of the international agreement (such results include, for example, concentration measurements of adequate temporal and spatial resolution and taken in the appropriate matrices; new methods for obtaining such measurement data; new concepts for modeling the environmental fate of POP). In other words, there is an important step that has to be made before the actual scientific research starts, namely the definition of the most appropriate tasks to be addressed by science, and this step needs a well-defined interface between science and politics. Because of this additional and non-trivial step, the interaction of science and politics in the context of the Stockholm Convention does not follow the model of applied science, where science can address the needs of users in a more straightforward way.

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