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Ad hoc open-ended working group on a science-policy panel to contribute further to the sound management of chemicals and waste and to prevent pollution
First session
Nairobi, 6 October 2022 and Bangkok, 30 January–3 February 2023*
Agenda item 6**

Preparation of proposals for the establishment of a science-policy panel

Scope of the science-policy panel to contribute further to the sound management of chemicals and waste and to prevent pollution: considerations for a way forward

Note by the secretariat

I. Introduction

1. At its resumed fifth session, held in Nairobi from 28 February to 2 March 2022, the United Nations Environment Assembly decided, by resolution 5/8, that a science-policy panel should be established to contribute further to the sound management of chemicals and waste and to prevent pollution, with details to be further specified according to the provisions in paragraphs 4 and 5 of the resolution. The Environment Assembly considered that "the panel should be an independent intergovernmental body with a programme of work approved by its member Governments to deliver policy-relevant scientific evidence without being policy prescriptive".

2. By the same resolution, the Environment Assembly decided to convene, subject to the availability of resources, an ad hoc open-ended working group that would begin work in 2022, with the ambition of completing it by the end of 2024. The Assembly requested the Executive Director of the United Nations Environment Programme (UNEP) to provide a secretariat for the ad hoc open-ended working group and to prepare the analytical and summary reports necessary for its work. In addition, in paragraph 5 of the resolution, the Environment Assembly decided that the ad hoc open-ended working group would prepare proposals for the science-policy panel to consider on a number of issues, including the scope of the panel.

3. The present document is intended to support the ad hoc open-ended working group's discussions on the scope of the panel. It provides a summary of the relevant background information and presents approaches that the ad hoc open-ended working group may wish to consider as a basis for its deliberations. In identifying these approaches, the secretariat drew from the elements laid out in

* The first session of the ad hoc open-ended working group on a science-policy panel to contribute further to the sound management of chemicals and waste and to prevent pollution is being held in two parts. The first part of the session was held in Nairobi on 6 October 2022 while the second part, namely the resumed first session, will be held in person in Bangkok from 30 January to 3 February 2023.

** UNEP/SPP-CWP/OEWG.1(I)/1.

resolution 5/8, as well as a review of relevant existing science-policy interfaces, notably the Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the UNEP International Resource Panel (IRP) and the UNEP Global Environmental Outlook (GEO) process, and of activities of members of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC). It also took into account interventions made at the first part of the first session of the ad hoc open-ended working group, held on 6 October 2022, and information shared during the webinar series[1] convened by the secretariat.

4. Section II of the document describes an integrative approach to chemicals, waste and pollution as a basis for establishing the scope of the panel, which might allow the adoption of perspectives in the context of global value chains – including sectoral and chemicals value chains – in the consideration of issues. Section III sets out concrete steps that the ad hoc open-ended working group may wish to follow in implementing the integrative approach proposed in section II. Finally, section IV sets out a suggested way forward. In addition, to further support the discussion, the secretariat has prepared a thought starter on the interlinkages and differences between chemicals and waste management and the prevention of pollution, which is set out in the annex to the present document.

II. An integrative approach to establishing scope

5. **Taking a non-integrative approach to establishing scope would present challenges.** From the title of Environment Assembly resolution 5/8, "Science-policy panel to contribute further to the sound management of chemicals and waste and to prevent pollution", it might be assumed that the panel should have three distinct scopes:

(a) A scope related to chemicals;

(b) A scope related to waste;

(c) A scope related to pollution.

6. Such an approach could, however, present a logistical challenge and effectively lead to the establishment of up to three parallel subpanels on chemicals, waste and pollution, each with a broad scope, and disparate in focus and intent. In addition, a non-integrative approach does not consider, for example, that in practice the sound management of chemicals is commonly intertwined with the sound management of waste and the prevention of pollution as chemical-containing products from various sectors are manufactured, used and finally managed at the end of their lives.

7. **Taking an integrative approach to establishing scope may prove more effective.** The text of resolution 5/8 seems to point to a more integrative approach[2] to the sound management of chemicals and waste and the prevention of pollution and therefore to promote an integrative approach to establishing scope. Notably, in the preamble of the resolution, the Environment Assembly acknowledged that "improving the availability of scientific information and assessments can address capacity challenges, enable more effective and efficient action to minimize and prevent the adverse impact of the unsound management of chemicals and waste, and prevent pollution to improve human well-being and contribute to the prosperity of all". This text points to an interpretation of scope that, as a starting point, recognizes the interconnections among the three areas.

8. **Taking an integrative approach to establishing scope would be in line with other relevant global initiatives.** It would also be in line with target 12.4 (responsible management of chemicals and waste) of Sustainable Development Goal 12 (ensure sustainable consumption and production patterns) under the 2030 Agenda for Sustainable Development. Specifically, target 12.4 is *"*by 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment".
Target 12.4 also echoes the central goal of the 2002 World Summit on Sustainable Development in Johannesburg, which led to the establishment of the Strategic Approach to International Chemicals Management (SAICM) and is reflected in its overall objective, "the achievement of the sound

[1] https://www.unep.org/events/conference/oewg1-science-policy-panel-contribute-further-sound-management-chemicals-and.

[2] An integrative approach combines relevant aspects of different schools of thought in a synergistic and complementary manner with the view to providing inclusive and interdisciplinary solutions to the issues being addressed.

management of chemicals throughout their life cycle so that by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health".[3]

9. **An integrative scoping approach could facilitate a global value chain approach.** Establishing a scope for the new panel that is integrative in nature would facilitate consideration of all three elements in the title of the resolution and may also allow consideration of the global value chain as a means of further refining the scope. Such a scope would, for instance, enable the panel to address aspects of waste and pollution arising from chemicals used and/or released along the global value chain. (See annex I, figure 2 for a schematic illustration of various issues covered by chemicals management, waste management and pollution prevention, individually and jointly.) According to *Global Chemicals Outlook II: From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development*, "the global value chain concept refers to the broader system of adding value to an article (e.g., through production, marketing, and after-sales service and product stewardship)".[4] The global value chain concept considers a chemical's supply chain as a starting point. That chemical may then be one of several feeding into the supply chain of a particular sector or product. The resulting product's life cycle then extends into the end-of-life phase of the value chain as it is used or consumed, after which the product enters a waste handling stream or, if not well managed, may contribute to pollution issues. It should be noted that, just as there are many inputs into the supply chain of a sector or product, one chemical's supply chain may feed into a multitude of sector or product supply chains. The global value chain is therefore made up of a web of sectoral and chemical value chains that cross and feed into each other in a complex manner. Considering scope through this lens allows consideration of the integrated interactions between the multitude of sectoral and chemical value chains that feed into the manufacture of products and provides an avenue for considering the waste and pollution that results from their production, consumption and disposal. In considering the waste and pollution arising from the global value chain, it is essential to remember that unsound management of chemicals and waste, as well as releases to air, water and soil, can occur throughout their respective value chains, with potentially far-reaching impacts on human health and the environment.[5]

10. **An integrative scoping approach could provide entry points to a range of value chain stages.** Through its agreed functions, the new science-policy panel may be able to aid in identifying key entry points along the value chain for promoting sound chemicals and waste management and pollution prevention, with the view to usefully assessing and managing risks to human health and the environment, especially in developing countries. Furthermore, as the web of sectoral and chemical value chains grows ever more complex and interconnected, there may, for example, be many other stages of integrated interactions along the respective value chains that feed into the manufacture of products that would also be addressed by an integrative approach to scope. For example, raw materials, chemicals, products and waste are commonly extracted, transported, fabricated into products and used across several geographical regions at multiple stages in their respective value chain. This presents challenges to countries, particularly developing countries, that are involved in such processes but do not have the capacity to address the unsound management of the resulting chemicals, waste and pollution.

11. **Some issues may not be covered by an integrative global/sectoral value chain approach.** It should also be noted that establishing scope through the lens of sectoral and chemical value chains may exclude certain aspects of waste and pollution that do not arise in the context of that model. The panel may therefore wish to consider whether areas that are only tangentially connected to the global value chain, such as food waste, human wastewater, biological pollutants, and light and noise pollution, should also be included in its scope.

12. **An integrative approach to scope would also allow socioeconomic and other impacts of chemicals, waste and pollution to be considered.** Establishing the scope of the panel using an integrative approach and through the lens of the global value chain also allows for discussion of the socioeconomic impacts of the sound management of chemicals and waste and preventing pollution. Given that the sectoral and chemical value chains increasingly span the planet, there is also a great deal of variation with respect to the populations and geographic areas most at risk from the unsound

[3] https://www.saicm.org/About/Overview/tabid/5522/language/en-US/Default.aspx. See also UNEP, *Global Chemicals Outlook II: From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development* (2019), notably Introduction, chapter 2, on "Milestones in international chemicals and waste management", and part II, chapter 1, on "International agreements and frameworks on chemicals and waste".

[4] Ibid., figure 4.4.

[5] Ibid., figure 5.1.

management of chemicals, waste and pollution. Risks may include adverse health outcomes, reduced access to meaningful work and ecological impacts.

13. **An integrative, value-chain approach may result in overlap with existing bodies and their work.** Using an integrative approach that takes into account the web of sectoral and chemical value chains may result in the inclusion of issue areas that require further consideration in order to avoid overlap and foster collaboration with other relevant bodies. For example, there may be opportunities to coordinate with IPCC when considering whether to address the energy intensity of a product manufacturing process or the emissions arising from transport throughout the value chain. Similarly, there may be opportunities to coordinate with IPBES and IRP when examining the ecosystem impacts of extracting the raw materials that feed into a chemical supply chain or assessing the impact of releases to air, water and soil throughout a value chain.

14. In the light of the above analysis and with a view to facilitating its discussions on scope, the ad hoc open-ended working group may wish to consider reaching a common understanding on the use of an integrative approach to frame the discussion on establishing the scope of the panel and whether to also consider the scope through the lens of sectoral and chemical value chains.

III. Proposed steps for establishing the panel's scope

15. **Four key steps are proposed to establish the panel's scope.** The present section sets out four key steps that the ad hoc open-ended working group may wish to consider that could facilitate an integrative approach to establishing scope as described above. The steps are not mutually exclusive and are best considered as a package. The proposed steps for the ad hoc open-ended working group are:

(a) Agree on the panel's objective that reflects an integrative approach to scope;

(b) Initiate the development of a conceptual framework to guide the panel's work;

(c) Consider whether to explicitly include or exclude certain dimensions;

(d) Identify the multilateral environmental agreements or relevant entities that the panel would support most directly in the light of its scope.

A. Setting the panel's objective

16. **An objective could be used to define the scope.** A common approach to establishing the scope of a science-policy body involves defining its key objective. When discussing the establishment of scope in this manner, specificity and flexibility are two key factors to consider.

17. **An objective-based scope provides specificity.** The advantage of setting a specific objective is that it provides a level of specificity regarding any subsequently agreed-upon features of the body. A specific objective would define the scope, which in turn would provide more clarity regarding the reach and operating space of the new panel.

18. **Specificity, however, can constrain flexibility.** This may be especially relevant in the context of a science-policy panel that is not time-bound and is expected to consider chemicals, waste and pollution resulting from emerging issues that were not envisioned when a scope was agreed. For example, in the thematic area of chemicals, waste and pollution, questions about the sound management of nanomaterials may not have been envisaged a decade ago.

19. **Other bodies have previously considered the balance between specificity and flexibility.** Existing science-policy bodies have balanced the need for both specificity and flexibility by adopting a flexible scope via a broad objective, which is complemented by specificity through the periodic adoption of a multi-year programme of work. Such programmes of work provide a specific framework of subobjectives and focus areas that guide the bodies' activities as agreed upon by their governing bodies while also providing flexibility to periodically re-evaluate and adjust priorities, and allow the timely inclusion of emerging issues as they arise, without requiring the renegotiation of its scope. Striking a balance between specificity and flexibility is one way of ensuring an evolving nature, which is a hallmark of an effective science-policy interface.[6]

20. IPCC, IPBES and IRP are valuable examples. All three bodies have established objectives and/or principles that guide their respective work programmes, taking into account their expected

[6] See S. Sarkki and others, "Adding 'iterativity' to the credibility, relevance, legitimacy: a novel scheme to highlight dynamic aspects of science–policy interfaces", *Environmental Science and Policy*, vol. 54 (Dec. 2015).

functions and the gaps and needs of their respective science-policy environments and work. A detailed comparative analysis of existing assessment structures, including IPCC, IPBES and IRP is provided in document UNEP/SPP-CWP/OEWG.1/INF/5.

21. **IPCC provides for specificity and flexibility through its objective and its governing principles.** It operates with the overall objective of "providing governments at all levels with scientific information that they can use to develop climate policies". This objective is further framed through the principles governing its work,[7] which describe the panel's role as being "to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socioeconomic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation". IPCC organizes its work into assessment cycles. Early in each assessment cycle, the panel decides on topics for special reports to be prepared in addition to the comprehensive global assessment output of each assessment cycle. While the comprehensive global assessment, organized around the panel's three working groups, provides specificity as to what each assessment cycle will yield, the flexibility of special reports allows for more time-sensitive or cross-cutting work to also be carried out.

22. **IPBES offers another example of balance between specificity and flexibility.** The overall objective of IPBES is to "strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development". The first IPBES work programme was time limited (from 2014 to 2018) but in 2019 IPBES adopted a rolling work programme up to 2030 that initially focused on three topics and included six objectives, thus providing a specific framework to guide the platform's ongoing work.[8] The rolling work programme is supplemented by a procedure for receiving and prioritizing requests put to the platform,[9] which sets out a process for Governments and governing bodies of multilateral environmental agreements to submit requests "on scientific and technical matters that require the platform's attention and action" at least six months prior to each session of the Plenary of IPBES (i.e. its governing body). This procedure thus allows the flexibility of bringing issues to the Plenary's attention without having to wait for a window when the work programme is scheduled to be reviewed and adjusted.

23. **The IRP achieves its goals via guiding principles and a clearly defined overall objective.** Its objective, which is set out in the policies and procedures[10] governing the panel, is "to contribute to a better understanding of sustainable development from a natural resources perspective, providing science-based policy options on how to decouple economic growth from environmental degradation while enhancing human well-being". The statement of the objective further defines how it will be achieved and provides a set of principles that guide the panel's work. Every four years, the IRP secretariat carries out a secretariat-led strategic planning exercise to develop the IRP work programme. The current work programme is for 2022–2025 and identifies four high-impact priority areas, including one on "current trends and future prospects for global resource use and Sustainable Resource Management", which includes a workstream on the Global Resources Outlook 2023. The strategic plan sets specific terms of reference for the confirmed work streams of each high-impact priority area and maps out the launch of approved products over the four-year process.

24. Based on the information provided above, the ad hoc open-ended working group may wish to establish a common understanding of the overall objective for the panel, which may reflect the integrative approach to scope described under section II. As a starting point for discussion, **the ad hoc open-ended working group may wish to consider the following draft overall objective:**

> **The science-policy panel for the sound management of chemicals and waste and the prevention of pollution will provide policy-relevant scientific evidence, through the evaluation of relevant value chains, assessing potential sources of waste and pollution and associated impacts at the global and regional scales.**

B. Initiating the development of a conceptual framework

25. **A conceptual framework could guide the panel's work.** A conceptual framework can be a powerful and effective means of developing, understanding and communicating, in an integrative manner, not only the panel's scope but also its objectives (and connected priorities). Drawing on the positive experiences of several science-policy bodies, the ad hoc open-ended working group may find

[7] https://www.ipcc.ch/documentation/procedures/.

[8] See https://ipbes.net/work-programme for a detailed presentation of the rolling work programme.

[9] https://ipbes.net/document-library-catalogue/procedure-receiving-and-prioritizing-requests-put-platform.

[10] https://www.resourcepanel.org/sites/default/files/documents/document/media/policies_and_procedures_of_the_irp.pdf.

it useful to consider the development of a conceptual framework as a means of guiding the panel's work and providing a more comprehensive representation of its scope, objective(s) and functions. For example, the Plenary of IPBES adopted a conceptual framework at its second session. Similarly, in 2016 the Science-Policy Interface established by the parties to the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa released a conceptual framework for land-degradation neutrality, in line with the focus on the concept in setting the objectives of the convention.[11] It is noteworthy that the conceptual framework was developed through an expert-driven process in both cases (and, in the case of IPBES, was approved by its plenary). Furthermore, it was completed after the establishment of the science-policy body yet helped to guide the production of its assessments and communicate its scope on an ongoing basis.

26. **The ad hoc open-ended working group may wish to request the secretariat to develop a draft conceptual framework and a set of priority-setting criteria,** with a view to allowing for flexibility and specificity in the panel's work programme, for consideration by the ad hoc open-ended working group at its second session. Once the panel is established, the draft conceptual framework could be presented to the panel's governing body for approval.

C. Explicitly addressing dimensions to be included or excluded

27. **Consideration should be given to an inclusive or exclusive scoping approach.** As outlined under section II of the present document, establishing scope through the lens of the global value chain may exclude certain aspects of waste and pollution that do not arise directly from relevant sectoral and chemical value chains. The ad hoc open-ended working group may therefore wish to discuss whether to develop open or closed lists that specify topics to be explicitly included or excluded from the panel's scope. There are advantages and disadvantages to each approach. Under an open-list approach,[12] scope is broadly specified, but excluded areas are explicitly listed; thus, if an issue is not explicitly listed as being excluded, it is considered to be within the scope of the instrument/institution being developed. In contrast, under a closed-list approach,[13] scope is delineated by explicitly listing each item or category that is understood to fall within it; thus, if an issue is not explicitly listed, it does not fall within the scope of the instrument/institution being developed.

28. **Closed- and open-list approaches both come with trade-offs.** In the context of a science-policy interface, relying on a closed-list approach may make it particularly difficult to address emerging issues or novel conceptions that may not have been understood to exist, or to be pertinent, when the closed list was drawn up. For a flexible science-policy interface, an open-list approach may hence be more appropriate. The ad hoc open-ended working group may wish to reach a common understanding on the topics that can be considered central to the panel's objectives and to identify topics that could be specifically excluded from the panel's scope. It may also wish to consider requesting the secretariat to initiate the compilation of a glossary of terms to facilitate future discussion.

D. Identifying relevant multilateral environmental agreements and entities that the panel would most directly support in the light of its scope

29. **Collaboration with existing bodies will be key to success.** In line with the integrative approach to scope described in section II, the ad hoc open-ended working group may wish to specify the entities with which the science-policy panel will collaborate and coordinate, as well as the multilateral environmental agreements that it will support and whose respective scientific bodies it will complement, as appropriate. Furthermore, it may wish to request the respective governing bodies of the following multilateral environmental agreements and entities to cooperate with it, and with the panel, once it is established:

(a) The Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on Substances that Deplete the Ozone Layer: the Montreal Protocol has three subsidiary scientific panels: the Scientific Assessment Panel, the Environmental Effects Assessment Panel and the Technology and Economic Assessment Panel;

[11] "Land in Balance", the 2016 science-policy brief presenting this conceptual framework, is available in English, French and Spanish at https://www.unccd.int/resources/brief/land-balance. The brief includes a detailed "logic model" that aids in visualizing and understanding all that is encompassed by the framework.

[12] In some settings, the open-list approach is called a negative list approach or exclusive framing.

[13] In some settings, the closed-list approach is called a positive list approach or inclusive framing.

(b) The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal: the Open-ended Working Group of the Basel Convention has a mandate to, inter alia, "consider and advise the Conference of the Parties on issues relating to … technical, scientific … aspects of the implementation of the Convention";

(c) The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade: the Rotterdam Convention has the subsidiary Chemical Review Committee, which considers chemicals and makes recommendations regarding listing them in the convention's annexes to make them subject to the prior informed consent procedure;

(d) The Stockholm Convention on Persistent Organic Pollutants: the Stockholm Convention has the subsidiary Persistent Organic Pollutants Review Committee, which considers chemicals proposed for listing in the convention's annexes to ensure their elimination or restriction or to avoid unintentional production;

(e) The 2013 Minamata Convention on Mercury, whose objective is "to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds";

(f) SAICM, whose stakeholders are currently working on developing the beyond-2020 framework for the sound management of chemicals and waste;

(g) The World Health Organization, which leads global efforts to expand universal health coverage and direct and coordinate the world's response to health emergencies; it should also be noted that the Environment Assembly, in resolution 5/8, requested the Executive Director of UNEP to invite the World Health Organization to play a role, as appropriate, in the establishment of the panel;

(h) The International Labour Organization, whose main aims are to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue on work-related issues;

(i) The planned treaty on plastic pollution;

(j) Entities conducting work on antimicrobial resistance at the global level (the Quadripartite Alliance), endocrine-disrupting chemicals under the World Health Organization and air pollution at the regional level.

30. The list of potential collaborating bodies will likely grow over time. Document UNEP/SPP-CWP/OEWG.1/INF/4 provides a mapping analysis of the current landscape of existing science-policy interfaces on the sound management of chemicals and waste and the prevention of pollution. The ad hoc open-ended working group may therefore wish to consider a flexible approach to including new bodies linked to the work of the new panel as they come into being.

31. The ad hoc open-ended working group may also wish to consider the information provided in document UNEP/SPP-CWP/OEWG.1/INF/6, which presents a summary of the results of the stakeholder engagement survey that was undertaken to gather views on the possible governance, functions, principles and scope of the panel.

IV. Suggested way forward

32. The open-ended working group may wish to agree on a process for the development of a proposal on the scope of the panel, as requested in resolution 5/8. In doing so, it may wish to use the present document as a basis for its deliberations and, specifically:

(a) To consider whether the proposal for an integrated approach as laid out in section II is a suitable way forward for establishing the scope of the panel and whether any additional elements should be taken into account;

(b) To consider the steps proposed in section III for the establishment of the scope, and whether any additional elements require consideration;

(c) To recommend any further activities to be undertaken during the intersessional period to support the provision of additional information for consideration by the ad hoc open-ended working group at its second session, including the development of a draft conceptual framework.

Annex

Thought starter on the interlinkages and differences among chemicals, waste and the prevention of pollution

The sound management of chemicals and waste and prevention of pollution can be considered in isolation or as part of closely interconnected and interrelated issues. For example, the anthropogenic and naturally occurring chemicals that make up the global value chains can cause waste and emissions throughout the chemical, mineral, materials or product life cycle, contributing to pollution in air, water, soil and humans. Pollution, including that caused by the mismanagement of chemicals and waste, can in turn lead to a range of environmental and human-health impacts, which are often experienced differently across geographic and economic contexts.

When considering the interrelationships between value chains, waste and pollution and their impacts, it is possible to examine the issue from both viewpoints. One may wish to perform a theoretical analysis of the possible types of waste produced along material/chemical/product/sector value chains, assess the potential for pollution from each type of waste, and predict the possible future impacts on both environment and human health (as highlighted by existing foresight and horizon scanning processes). This can result in an assessment of the social, economic, political and technological systems needed to provide policy-relevant (but not policy-prescriptive) recommendations to prevent pollution and ensure sound management of that class of chemicals.

As is shown in figure 1, example 1 (see p. 9), the assessment may start with the life cycle and releases of biocides such as triclosan and antibiotics, followed by their presence in the aquatic environment, and (potential) resulting impacts on antimicrobial resistance. The Persistent Organic Pollutants Review Committee established under the Stockholm Convention takes this approach in its review of potential persistent organic pollutants, starting with the screening of hazardous properties against pre-defined criteria (Annex D to the convention) and moving through understanding the life cycle of the candidate chemical(s) and the scale and likely impacts of associated pollution (Annex E) to assessing the social and economic considerations (Annex F) and finally formulating recommendations to the Conferences of the Parties to the Stockholm Convention.

Similarly, in 1974, Mario Molina and Sherwood Rowland raised alarm about the proliferation of chlorofluorocarbons (CFCs) and their potential impact on the ozone layer in their widely noted *Nature* article (see figure 1, example 2). This then informed later findings of Antarctic ozone layer depletion and the discovery of the ozone "hole". These scientific breakthroughs are widely credited with spurring the Montreal Protocol and its ensuing success.

An alternative starting point could be the observation of environmental and human-health impacts, prompting investigation of the related causes, including pollution, followed by investigation and understanding of the relevant sectors that contribute to the observed pollution and identification of the activities and waste that have caused the pollution, and subsequently to identification of the chemicals that can be confirmed to have caused the observed pollution and impacts. A result similar to that of the chemical-up approach outlined above can be achieved by again considering the social, economic, political and technological systems needed to provide policy-relevant (but not policy-prescriptive) recommendations to prevent pollution and ensure sound management of relevant chemicals.

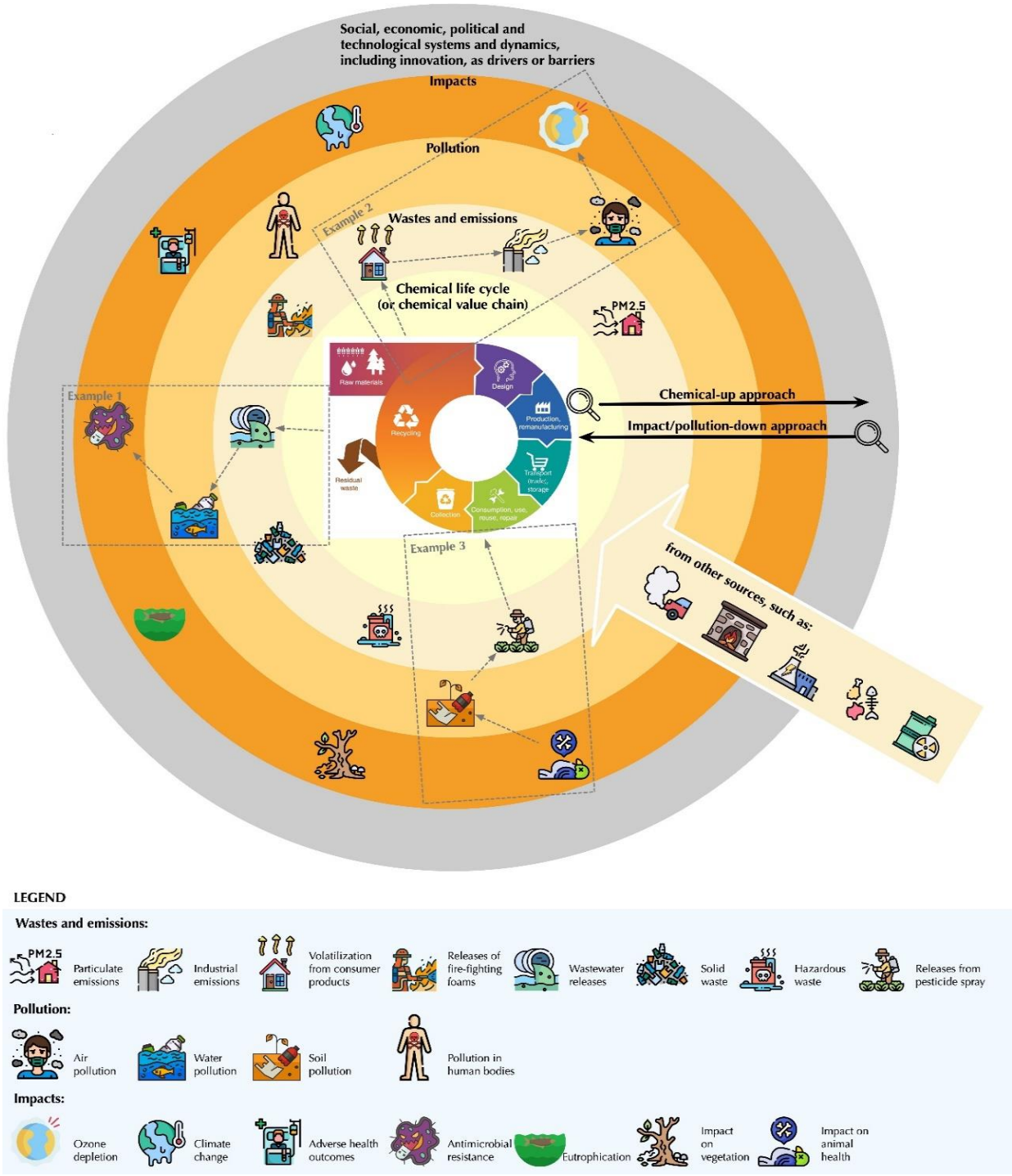
A well-known example of this impact-down scenario is provided by Rachel Carlson's work published in *Silent Spring* (see figure 1, example 3). An impact was first observed on bird populations, with thinning eggshells resulting in a falloff in the number of new hatchlings. This observation triggered work to better understand the pollution and value chains that were causing the release of harmful chemicals into the environment. In this instance, the impact was traced back to the overapplication of organochlorine pesticides, with no regard for unintended consequences on non-target organisms.

The two approaches are complementary and should not be considered mutually exclusive. The "impact/pollution-down" approach has been more common. It provides the advantage of having certainty on the impacts, which can be important for spurring public momentum and political commitment. It also entails certain challenges, such as identifying the culprit chemicals.[1] The

[1] For instance, in the Pacific Northwest region of the United States of America, the regular acute death of wild salmon was observed after heavy rain events. It took more than 10 years of research to determine that the chemicals causing the acute mortality events were linked to a breakdown product from an additive to tires, indicating that the cause of the impact was not necessarily limited to the chemicals originally added to a product.

Figure 1

A schematic illustration of the linkages between chemicals, waste and emissions, pollution and impacts within the social, economic, political and technological systems. The icons within each circle are examples and not exhaustive



Source: The chemical life cycle/value chain is reproduced from European Parliament, "Circular economy: the importance of re-using products and materials", 3 July 2015, and the icons are made by Amethyst prime, Bzzrincantation, Dreamicons, Eucalyp, Freepik and Photo3idea_studio (see www.flaticon.com and binogi.com).

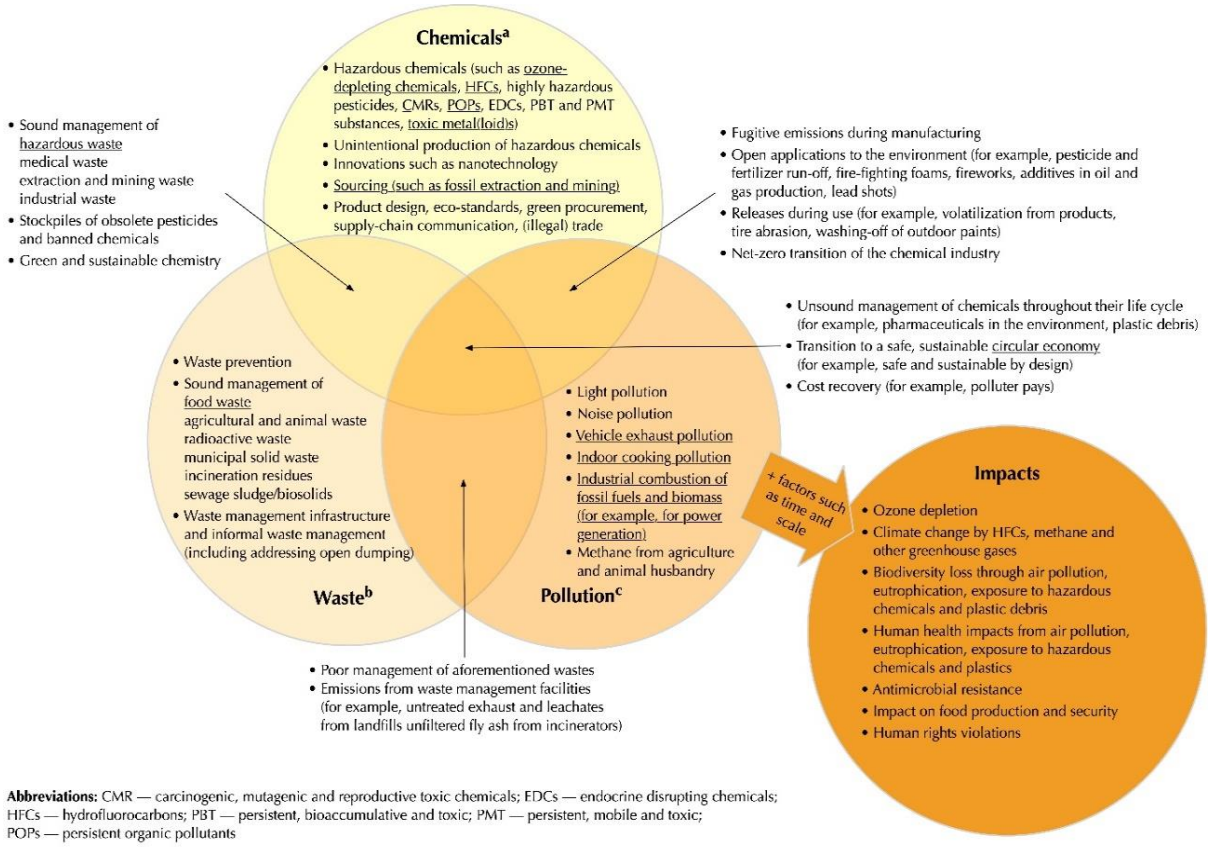
impact/pollution-down approach is reactive, however, and the timescale needed for the impact of harmful releases into the environment to manifest can be significant. It may also take decades before action results in any form of mitigation or restoration. The "chemical-up" approach has the advantage of being more proactive and precautionary in nature, identifying potential impacts early on, including for emerging technologies, and thus can often be more effective. All potential impacts may not be foreseen, however, nor is it always certain that an impact will occur. This uncertainty in turn creates issues that can have significant social and economic impacts on sectors critical to a country's growth.

It also needs to be highlighted that waste and pollution can also be generated outside the context of chemical value chains, and including or not including such processes or sectors within the scope of the science-policy panel has implications for the panel's operation and associated budget. For example, assessments on food waste will require different expertise from those on plastic waste. Meanwhile, it should be noted that, owing to the current lack of separate waste collection, waste for subsequent waste management measures is generally mixed. Thus, identifying evidence--based options for plastic waste, for instance, would require an understanding of the complex municipal solid waste streams, even those that do not appear to be related to chemicals.

Figure 2 (on p. 11) presents a schematic illustration of the various issues associated with chemicals, waste and pollution, individually and jointly. The ad hoc open-ended working group may wish to consider which of the zones shown in figure 2 the new panel should focus on. The intersection of chemicals, waste and pollution provides a narrow scope. Consideration of other zones of the diagram will widen the scope and have associated increased complexity and costs. Widening the scope beyond the intersection of the three sectors will also broaden the possible areas of overlap with the work of existing bodies. An alternative approach would be to consider everything in all sectors as potentially included, and then have a work programme for each period decided through the governance structure that specifies the elements that will be the subject of an assessment process. The figure provides a visualization of the process of applying the inclusion and exclusion principles highlighted in this document.

Figure 2

Schematic illustration of various issues covered by chemicals management, waste management and pollution prevention, individually and jointly[a]



Abbreviations: CMR — carcinogenic, mutagenic and reproductive toxic chemicals; EDCs — endocrine disrupting chemicals; HFCs — hydrofluorocarbons; PBT — persistent, bioaccumulative and toxic; PMT — persistent, mobile and toxic; POPs — persistent organic pollutants

The figure is not a complete representation of all related issues, and new issues may emerge within each thematic area.

[a] Examples of chemicals issues (partially) covered by existing international science-policy bodies are carcinogens, covered by the International Agency for Research on Cancer; ozone-depleting substances and hydrofluorocarbons, covered by bodies under the Montreal Protocol; persistent organic pollutants, covered by the Persistent Organic Pollutants Review Committee of the Stockholm Convention; and sourcing and metal material flows, covered by the International Resource Panel. These are underlined in the graphic.

[b] Examples of waste issues (partially) covered by existing international science-policy bodies are food waste and the transition to a circular economy, covered by the International Resource Panel, and hazardous waste, covered by the Open-ended Working Group of the Basel Convention. These are underlined in the graphic.

[c] Examples of pollution issues (partially) covered by existing international science-policy bodies are vehicle exhaust, indoor cooking and industrial combustion of fossil fuels and biomass, covered by the World Health Organization, the Intergovernmental Panel on Climate Change and the Climate and Clean Air Coalition. These are underlined in the graphic.