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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
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Mapping analysis of the current landscape of existing science-policy interfaces on the sound management of chemicals and waste and on the prevention of pollution

Note by the secretariat

The annex to the present note contains a mapping analysis of the current landscape of existing science-policy interfaces on the sound management of chemicals and waste and on the prevention of pollution. The ad hoc open-ended working group for the science-policy panel to contribute further to the sound management of chemicals and waste and to prevent pollution may wish to consider the information provided. The annex has not been formally edited.

Annex*

Mapping analysis of the current landscape of existing science-policy interfaces on the sound management of chemicals and waste and on the prevention of pollution

I. Introduction

1. At its resumed fifth session, held in Nairobi, Kenya, 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.

2. In addition, the Environment Assembly decided to convene, subject to the availability of resources, an ad hoc open-ended working group that would commence its work in 2022, with the ambition of completing it by the end of 2024.

3. The Environment Assembly also appreciated the work on the promotion of the sound management of chemicals and waste and the prevention of pollution by the relevant multilateral agreements, other international instruments and intergovernmental bodies, including the Inter-Organization Programme for the Sound Management of Chemicals and the International Conference on Chemicals Management, and welcomed the continuation of their scientific work to contribute further to the sound management of chemicals and waste and to prevent pollution."

4. In promoting close cooperation with relevant multilateral environmental agreements and relevant international organizations and bodies, as appropriate, resolution 5/8 also decided that the ad hoc open-ended working group will prepare proposals for the science-policy panel to consider the following issues, among other things:

(a) principal functions of the panel "while respecting the mandates of relevant multilateral agreements and other international instruments and intergovernmental bodies, avoiding overlap and duplication of work, and promoting coordination and cooperation" (paragraph 5(c)) and

(b) "Relationships of the panel with relevant key stakeholders, including governmental and non-governmental organizations, and civil society" (paragraph 5(d)).

5. The Environment Assembly further decided that the ad hoc open-ended working group should take into account the need to ensure that the panel:

(a) Undertakes work that is complementary to and does not duplicate the work of the relevant multilateral agreements, other international instruments and intergovernmental bodies, including those that are members of the Inter-Organization Programme for the Sound Management of Chemicals; (paragraph 6(d))

(b) Coordinates, as appropriate, with other science-policy bodies, such as the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES); (paragraph 6(e)) and

(c) Has the flexibility to respond, to the extent possible, to the needs identified by stakeholders and agreed to by its member Governments (paragraph 6(g)).

6. With the view to achieving these decisions by the Environment Assembly, the present document provides an initial, non-exhaustive mapping analysis of the current science-policy landscape on the sound management of chemicals and waste and the prevention of pollution. It nevertheless begins to convey the myriad initiatives underway that may be generating data and relevant knowledge from a variety of sectors and institutional settings and from across the physical, natural and social sciences. It also points to the breadth of potential stakeholders that may be relevant to the science-policy panel's work. The information provided is intended as a thought-starter for considering means of avoiding overlap and coordinating with relevant entities as well a means of considering possible relationships between the panel and key stakeholders as set out in the resolution. The information is

* The annex has not been formally edited.

provided to support the discussions related to the possible scope and functions of the panel as outlined in documents UNEP/SPP-CWP/OEWG.1/4 and UNEP/SPP-CWP/OEWG.1/5, respectively.

7. Section II of this document introduces the types of stakeholders that may be relevant to the panel's work. Section III presents seven tables that contain an initial mapping of the scope and functions of the science-policy interfaces under consideration. Section IV provides a brief synthesis of the insights gained from this initial mapping exercise.

II. A Complex Institutional and Stakeholder Landscape

8. As alluded to in resolution 5/8 there are many types of relevant stakeholders that may need to engage in the work of the panel, and it is reasonable to expect that the panel's relationship with these stakeholders will vary according to their institutional form.

9. For this mapping analysis, information on each entity is drawn directly from the respective websites or other official documentation with an emphasis on gathering information on their scope and function(s). This analysis also builds on the list of relevant bodies analyzed for the 2020 report *Assessment of Options for Strengthening the Science-Policy Interface at the International Level for the Sound Management of Chemicals and Waste* by the United Nations Environment Programme (UNEP).[1]

10. Furthermore, stakeholders are being considered under two broad categories. The first includes relevant global and regional MEAs, voluntary instruments, IGOs, and other science-policy bodies, as summarized in figure 1. Resolution 5/8 already identifies specific MEAs, IGOs and science-policy bodies with which the panel will need to coordinate their work.

11. Table 1 in Section III provides a mapping of global MEAs, while Table 2 maps some of the relevant regional MEAs. Table 3 provides a mapping of voluntary agreements, while Tables 4 and 5 emphasize science-policy interfaces under IGOs. Finally, Table 6 provides a mapping of other science-policy bodies.

12. The second group includes broad categories of stakeholders that may foreseeably be involved in the panel's work based on their involvement in the current landscape of relevant science-policy interfaces, as summarized in Figure 2. While Figure 1 identifies specific stakeholder organizations and MEAs, Figure 2 presents only generic descriptions of types of stakeholders as place holders for the many non-governmental organizations (NGOs), associations, alliances, partnerships, enterprises, ministries, that might be relevant.

[1] see Appendix 1 of the 2020 report, p.33-34.

Figure 1

Overview of relevant MEAs, voluntary instruments, intergovernmental organizations and science-policy bodies

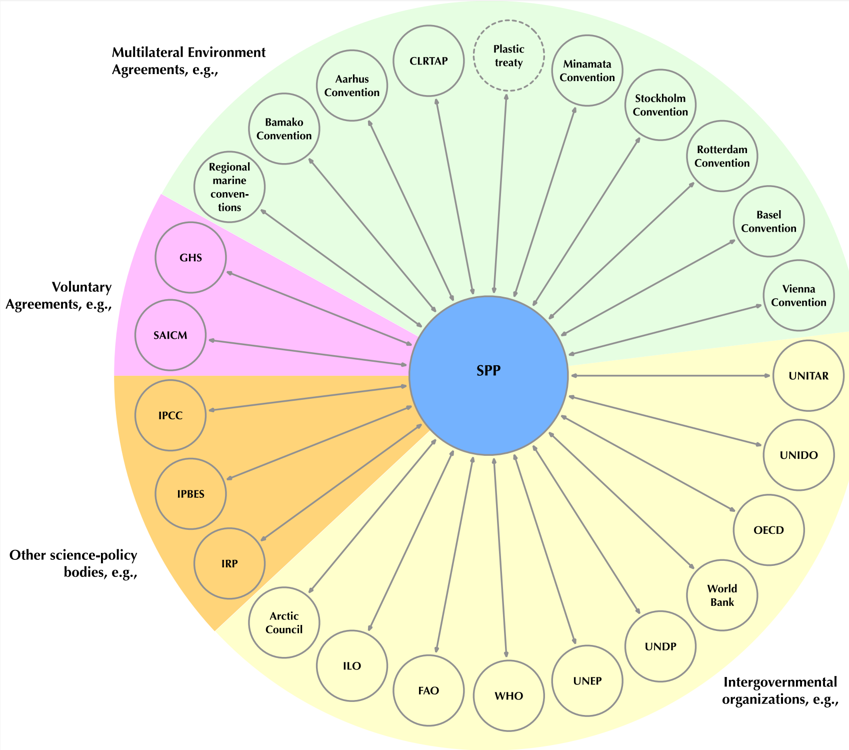
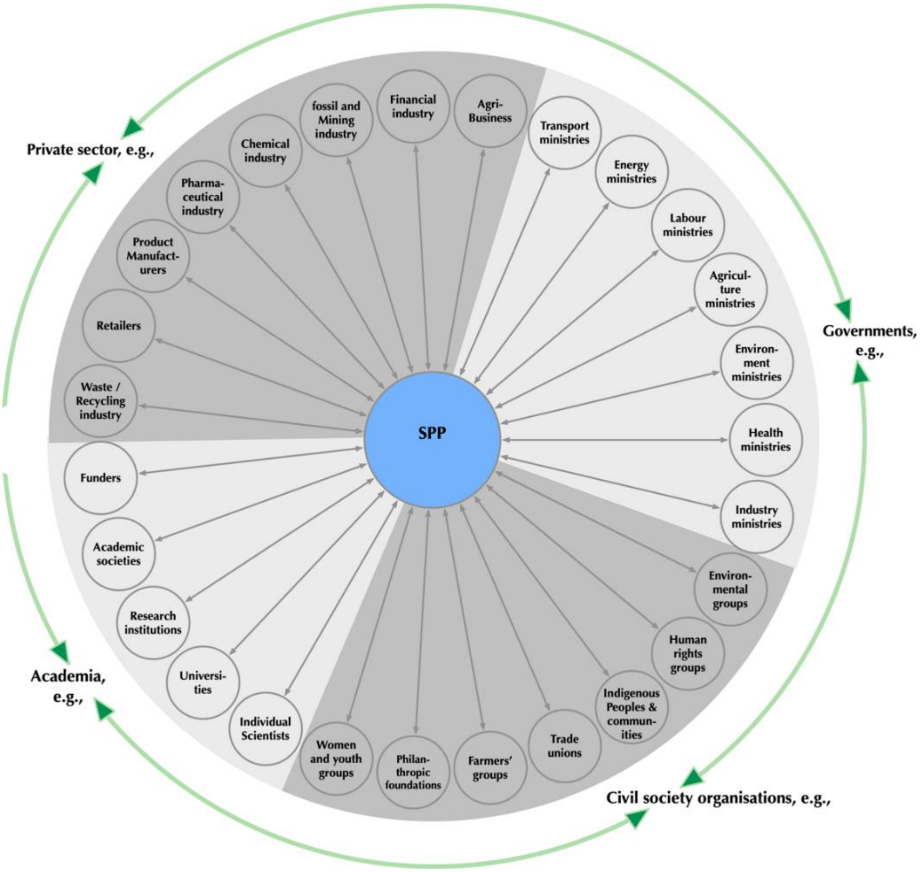


Figure 2

Overview of relevant stakeholders



13. Table 7 in Section III provides an initial snapshot of several interfaces bringing together such stakeholders, distinguishing between civil-society-led, private-sector-led, philanthropy-led, academia-led and government-led initiatives.

14. Furthermore, while the current landscape of existing relevant science-policy interfaces will inform the ad hoc open-ended working group's work, the details of the relationship between the science-policy panel and the range of other interfaces and stakeholders specified in resolution 5/8 will need to be addressed by the panel once it is established and will also depend on how the entities themselves decide to interact with the science-policy panel.

Brief overview of relevant key stakeholders

15. Figure 1 lays out many relevant key stakeholders that are explicitly addressed in resolution 5/8, including MEAs, IGOs including those members of the IOMC, SAICM and other science-policy bodies such as IPCC and IPBES.

16. In the light of the potential cross-sectoral breadth of the science-policy panel's scope, it can be expected that a broad range of government entities may opt to engage directly with the science-policy panel's process and/or outputs. Such a breadth of engagement within a country can help lead to greater policy coherence but may also present coordination challenges.

17. Recognizing that countries have their own strategies for organizing policy portfolios, ministries addressing the following areas may find the work of the science-policy panel relevant:

(a) Agriculture
(b) Defense
(c) Development
(d) Education
(e) Energy
(f) Environment
(g) Finance/Treasury
(h) Fisheries
(i) Foreign Affairs
(j) Forestry
(k) Health
(l) Housing
(m) Industry
(n) Labour
(o) Science/Technology
(p) Social Services
(q) Transport

18. Furthermore, when considering the scope of a panel, there is a wide array of relevant additional potential stakeholders, notably from the following three broad areas: the private sector, academia, and civil society.

(a) In the context of the sound management of chemicals and waste and the prevention of pollution, **private sector stakeholders** will likely include diverse entities, including multinational corporations and small and medium enterprises. Among others, they include raw material producers, commodity traders, chemical industries, agrochemical producers, brands/product manufacturers, distributors, transport and logistics companies, retailers, the waste and recycling industries, and each of their respective trade associations.[2]

(b) **Academia** will likely include individual scientists and institutions, science associations and professional societies (discipline or region/nation specific), think tanks, funding agencies, and cooperative research programs.

(c) **Civil society** will likely include NGOs, or collectives of NGOs, such as those concerned with human, labor, food and environmental rights as well as the rights of farmers, Indigenous Peoples, youth, women, and workers. In addition, some philanthropic foundations may also be relevant stakeholders, notably those focusing on global health and plastic pollution.

19. There are also many multistakeholder partnerships, associations or alliances that aim to collaboratively engage combinations of these stakeholders. This is further discussed under Section III).

20. Appendix 1 to this document presents two simplified examples that illustrate the breadth of types of stakeholders that contribute knowledge to the current landscape of science-policy interfaces. These examples showcase how leveraging knowledge of different types from across disciplines and institutional settings is essential for understanding ways in which these complex value chains can lead to far-reaching and unforeseen consequences (chemicals-up approach), or conversely ways in which pollution can be traced back to unexpected points in a value chain (impact/pollution-down approach).

[2] Non-exhaustive list based in part on United Nations Environment Programme (2022). *Study on industry involvement in the integrated approach to financing the sound management of chemicals and waste*. Geneva.

III. Mapping analysis of current landscape of science-policy interfaces

21. The following sections present tables with the results of an initial mapping analysis of the scope and functions of relevant science-policy interfaces. Appendix 2 details the methodology used in compiling these tables. They can help to understand the space that the science-policy panel on chemicals, waste and prevention of pollution will interact with, once its scope is determined.

A. Related global and regional multilateral environmental agreements

22. There are several global MEAs and many regional MEAs whose scope and functions may require consideration by the panel as to how best to avoid overlap and duplication of work while also promoting coordination and coordination. Not all of these have established subsidiary science-policy interfaces.

23. In many circumstances, promoting coordination and cooperation with the relevant science-policy bod(ies) associated with a given MEA will require coordination with the MEA's decision-making body first, with the respective secretariats playing a coordination role.

24. Tables 1 and 2, based on a review of publicly available information, provide an overview of the scope (Column I) of each of the relevant global (Table 1) and regional (Table 2) MEAs. Column II provides an overview of the functions of the subsidiary science-policy body(ies) if there are any.

Table 1
Brief overview of the scope and functions of science-policy interfaces under relevant global Multilateral Environmental Agreements. Note that the darker shade employed in the scope column indicates the interface's central scope, and the lighter share indicates a secondary scope.

	Scope			*Main functions*					
Subsidiary or associated science-policy interfaces	*Chemicals*	*Waste*	*Pollution*	*Horizon scanning*	*Assessments*	*Knowledge management, communication and information-sharing, and stakeholder engagement*	*Capacity-building*	*Conducting Research*	*Notes*
1) 1985 Vienna Convention for the Protection of the Ozone Layer and its 1987 Montreal Protocol on Substances that Deplete the Ozone Layer									
Ozone Research Managers (ORM)									Developing recommendations for research and co-operation on ODS, HFCs, ozone layer and so on
Environmental Effects Assessment Panel (EEAP)									Assessing the effects of ozone-layer depletion
Scientific Assessment Panel (SAP)									Assessing the status of the ozone layer and relevant atmospheric science issues; identifying emerging issues
Technology and Economic Assessment Panel (TEAP)									Assessing alternative technologies to ODS and HFCs, and other technical issues (e.g., possible exemptions), per request
2) 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal									
Open-ended Working Group (OEWG)									Developing guidelines, practical manuals and guidance, and international cooperation and coordination; reviewing any applications for amendments to the Basel Convention
Small intersessional working groups (SIWGs)									Developing guidelines of specific hazardous or other wastes; assessing the strategic framework

Regional and Coordinating Centres (BCRCs)									Providing training and technology transfer of the management of hazardous and other wastes
Plastic Waste Partnership (PWP)									Diverse aspects of the prevention, minimization, collection, and management of plastic waste
3) 1998 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade									
Chemical Review Committee (CRC)									Assessing nominated chemicals and pesticide formulations, and severely hazardous pesticide formulations to provide recommendations on possible listing under the Convention
FAO Regional Offices									Providing support to countries to effectively implement the Rotterdam Convention
4) 2001 Stockholm Convention on Persistent Organic Pollutants (POPs)									
POPs Review Committee (POPRC)									Assessing nominated chemicals (including hazardous properties, life cycle, exposure, alternatives and risk control) to provide recommendations on possible listing as POPs
Global Monitoring Plan (GMP)									Collecting and assessing comparable monitoring data on POPs from all regions; capacity-enhancement activities
Expert Meeting on Best Available Techniques (BAT) and Best Environmental Practices (BEP)									Reviewing guidelines and guidance on best available techniques and best environmental practices to facilitate measures on reduce or eliminate releases from unintentional production of POPs
DDT Expert Group									Assessing the global production and use of DDT and its alternatives; assessing progress of transition
Global Alliance for Alternatives to DDT									Developing and deploying products, methods and strategies as alternatives to DDT for disease vector control
PCB Elimination Network (PEN)									Promoting and encouraging the environmentally sound management of PCBs
Regional and subregional centres (SCRCs)									Providing technical assistance and technology transfer to support Parties' implementation, including measures to reduce/eliminate POP releases from wastes (Article 6)
5) 2013 Minamata Convention on Mercury									
Groups of technical experts									Developing guidance, reports and plans on technical aspects related to the Convention
6) ILO Occupational Safety and Health Convention, 1981 (No. 155)[3]									
Currently, no subsidiary or associated science-policy interface identified by the secretariat									
7) ILO Chemicals Convention, 1990 (No. 170)[4]									

[3] Scope of the Convention: Article 4, paragraph 1–Each Member shall, in the light of national conditions and practice, and in consultation with the most representative organisations of employers and workers, formulate, implement and periodically review a coherent national policy on occupational safety, occupational health and the working environment.

[4] Scope of the Convention: Article 4–In the light of national conditions and practice and in consultation with the most representative organisations of employers and workers, each Member shall formulate, implement and periodically review a coherent policy on safety in the use of chemicals at work.

Currently, no subsidiary or associated science-policy interface identified by the secretariat
8) ILO Safety and Health in Mines Convention, 1995 (No. 176)[5]
Currently, no subsidiary or associated science-policy interface identified by the secretariat
9) ILO Safety and Health in Agriculture Convention, 2001 (No. 184)[6]
Currently, no subsidiary or associated science-policy interface identified by the secretariat

Table 2

Brief overview of the scope and functions of science-policy interfaces under selected regional Multilateral Environmental Agreements. Note that the darker shade employed in the scope column indicates the interface's central scope, and the lighter share indicates a secondary scope.

Subsidiary or associated science-policy interfaces	*Scope*			*Main functions*					*Notes*
	Chemicals	*Waste*	*Pollution*	*Horizon scanning*	*Assessments*	*Knowledge management, communication and information-sharing, and stakeholder engagement*	*Capacity-building*	*Research*	
1) UNECE's 1979 Convention on Long-range Transboundary Air Pollution (LRTAP)									
European Monitoring and Evaluation Programme (EMEP)									Atmospheric monitoring and modelling related to acidification and eutrophication, ground-level ozone, POPs, heavy metals and particulate matter
Working Group on Effects (WGE)									Assessing the degree and geographic extent of the impacts of major air pollutants on human health and the environment
2) UNECE 1998 Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) and Its 2003 Protocol on Pollutant Release and Transfer Registers (PRTR)									
Working group of the Parties to the Protocol on PRTRs									Assessing the guidance document; information exchange on technical issues and good practices; exploring methodologies for information-sharing
International PRTR Coordinating Group									improving coordination between international organisations, Governments and other interested parties; promoting capacity-building for PRTR systems

[5] Scope of the Convention: Article 3–In the light of national conditions and practice and after consultations with the most representative organizations of employers and workers concerned, the Member shall formulate, carry out and periodically review a coherent policy on safety and health in mines, particularly with regard to the measures to give effect to the provisions of the Convention.

[6] Scope of the Convention: Article 4–In the light of national conditions and practice and after consulting the representative organizations of employers and workers concerned, Members shall formulate, carry out and periodically review a coherent national policy on safety and health in agriculture. This policy shall have the aim of preventing accidents and injury to health arising out of, linked with, or occurring in the course of work, by eliminating, minimizing or controlling hazards in the agricultural working environment.

3) 1992 Convention for the Protection of the Marine Environment in the North-East Atlantic – the OSPAR Convention									
Hazardous Substances and Eutrophication Committee (HASEC) and its subsidiary working groups									Identifying substances that are of concern for the marine environment (including establishing the List of Chemicals of Possible Concern); monitoring and assessing the sources, pathways, concentrations and effects of contaminants (including maintaining databases); identifying actions and measures
4) Convention on the Protection of the Marine Environment in the Baltic Sea Area – the Helsinki Convention (HELCOM)									
HELCOM Monitoring and Assessment Strategy									Covering sources and inputs of human pressures and various variables on the marine environment; conducting assessments to evaluate progress
5) 1995 Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention)									
Mediterranean Commission on Sustainable Development									Assisting parties to integrate environmental issues in their socioeconomic programmes; promoting sustainable development policies
Programme for the Assessment and Control of Marine Pollution in the Mediterranean									Assisting parties to implement the three protocols on pollution from land-based sources, from dumping from ships and aircraft, and by hazardous wastes and their disposal, including assessments, information-sharing, and capacity-building
Regional Activities Centres (RACs)									Providing essential expertise for the execution the Convention on individual specific aspects
6) 1991 Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa									
See Notes									Many science-policy functions/activities are mainly undertaken through joint implementation with external bodies (e.g., under the Basel Convention, United Nations Environment Programme)

B. Voluntary Instruments

25. There are a variety of “other international instruments” that bring together a combination of governmental and non-governmental actors in addressing issues related to the sound management of chemicals and waste and the prevention of pollution – here we highlight several voluntary instruments.

26. Table 3, based on a review of publicly available information, provides an overview of the scope and functions of these voluntary instruments.

Table 3
Brief overview of the scope and functions of science-policy interfaces under selected relevant voluntary instruments. Note that the darker shade employed in the scope column indicates the interface's central scope, and the lighter share indicates a secondary scope.

	Scope			*Main functions*					
Subsidiary or associated science-policy interfaces	*Chemicals*	*Waste*	*Pollution*	*Horizon scanning*	*Assessments*	*Knowledge management, communication and information-sharing, and stakeholder engagement*	*Capacity-building*	*Conducting Research*	*Notes*
1) Strategic Approach to International Chemicals Management (SAICM)									
Global Alliance to Eliminate Lead Paint	[dark blue]		[light blue]			[green]	[green]		Promoting the phase-out of paints containing lead
OECD/UNEP Global PFC Group	[dark blue]	[dark blue]	[dark blue]		[green]	[green]			Assessing per- and polyfluoroalkyl substances and alternatives; information exchange (e.g., webinars)
2) Globally Harmonized System of Classification and Labelling of Chemicals (GHS)									
Sub-Committee of Experts on GHS	[dark blue]	[light blue]	[light blue]		[green]		[green]		Updating GHS (including minimum information for safe data sheets that include requirement on disposal considerations); developing guidance on the application of the GHS system; facilitating the coordinated national implementation
3) Global Plastic Action Partnership (GPAP)									
Reuse Portal	[dark blue]	[light blue]	[light blue]			[green]			Providing easy access to practical guidance, tools and networks to take action for reuse solutions
4) Platform for Accelerating the Circular Economy (PACE)									
PACE	[dark blue]	[dark blue]	[light blue]		[green]	[green]			A global collaboration platform for key public and private decision makers to share a vision, best practices, and scale the circular economy together

C. Intergovernmental Institutions (including the IOMC)

27. There are several intergovernmental bodies whose mandates relate, at least in part, to the sound management of chemicals and waste and the prevention of pollution. The most relevant are the nine member organizations of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC):

(a) United Nations Environment Programme (UNEP)

(b) World Health Organization (WHO)

(c) Food and Agriculture Organization of the United Nations (FAO)

(d) International Labour Organization (ILO)

(e) United Nations Development Programme (UNDP)

(f) United Nations Industrial Development Organization (UNIDO)

(g) United Nations Institute for Training and Research (UNITAR)

(h) World Bank

(i) Organisation for Economic Co-operation and Development (OECD).

This section also addresses the Arctic Council as a relevant intergovernmental institution.

28. Tables 4 and 5, based on a review of publicly available information, provide an overview of the scope and functions of some of the relevant subsidiary/associated science-policy interfaces of these intergovernmental organizations (IGOs). Table 4 includes interfaces under one IGO, while Table 5 includes interfaces that are cooperative ventures of two or more IGOs.

Table 4

Brief overview of the scope and functions of science-policy interfaces under a single relevant IGO. Note that the darker shade employed in the scope column indicates the interface's central scope, and the lighter share indicates a secondary scope.

	Scope			*Main functions*					
Subsidiary or associated science-policy interface	*Chemicals*	*Waste*	*Pollution*	*Horizon scanning*	*Assessments*	*Knowledge management, communication and information-sharing, and stakeholder engagement*	*Capacity-building*	*Conducting Research*	*Notes*
1) United Nations Environment Programme (UNEP)									
International Environmental Technology Centre (IETC)		■	▒		■	■	■		Transferring environmentally sound technologies, particularly waste management, to developing and transition countries
Climate and Clean Air Coalition (CCAC)	■	■	■		■	■	■		Conducting initiatives to provide transformative action to reduce methane, black carbon and hydrofluorocarbons (HFCs)
UNEP Life Cycle Initiative (LCI)	■	■	■		■	■	■		Enabling the global use of credible life cycle knowledge by private and public decision makers
UNEP Pollution Action Note			■			■			Displaying the global state of air pollution, major sources, the impact on human health, and national efforts to tackle this critical issue
UNEP Partnership for Clean Fuels and Vehicles (PCFV)	■		■				■		Providing a range of technical, financial and networking support related to cleaner fuels and vehicles for governments and other stakeholders to reduce vehicle emissions
Global Environment Outlook (GEO)	■	■	■		■	■	■		An assessment of the state of the environment, the effectiveness of the policy response, and possible pathways to achieve environmental goals; providing derivative reports for youth, cities and business; developing fellowship and educational materials
Global Chemicals Outlook (GCO) I and II	■	■	■	■	■				Providing assessments to alert policymakers and other stakeholders to the critical role of the sound management of chemicals and waste in sustainable development (including identifying issues where emerging evidence indicates a risk)
Global Waste Management Outlook (GWMO)		■	▒		■				scientific global assessment on the state of waste management and a call for action to the international community

2) World Health Organization (WHO)									
International Agency for Research on Cancer (IARC)									Promoting international collaboration in cancer research
WHO Chemical Risk Assessment Network									Improve chemical risk assessment globally through facilitating sustainable interaction between chemical-risk-assessment-related institutions
WHO Global Chemicals and Health Network									A global forum for discussion about issues related to health and chemicals
INTOX Network of Poisons Centres									Providing a means to tap into the knowledge and experience on the diagnosis and management of poisoning, and on posions centre operations
WHO Drinking-water quality guidelines									International norms on water quality and human health that are used as the basis for regulation and standard setting world-wide
WHO Air quality guidelines (AQG)									Integrating scientific evidence on air pollution's health impacts; monitoring countries air quality progress
Scientific Advisory Group on Air Pollution and Health (SAG)									Providing expert guidance and advising WHO on programmatic issues related to ambient and household air pollution and health
Global Air Pollution and Health–Technical Advisory Group (GAPH-TAG)									Providing technical guidance and inputs to support WHO's work on air pollution and health
3) Food and Agriculture Organization of the United Nations (FAO)									
FAO Programme on the Prevention and Disposal of Obsolete Pesticides									Making developing countries aware of the hazards associated with obsolete pesticides stockpiles and what they can do about them
4) International Labour Organization (ILO)									
International Labour Standards on Occupational Safety and Health									Providing standards as tools for establishing sound prevention, reporting and inspection practices and provide for maximum safety at work
Global database on occupational safety and health legislation (LEGOSH)									Compiling the wealth of legislation in occupational safety and health (OSH)
5) United Nations Institute for Training and Research (UNITAR)									
Sustainable Cycles (SCYCLE) Programme									Developing sustainable production, consumption and disposal patterns for electrical and electronic equipment (EEE), and for other ubiquitous goods
Online courses									Assisting national officers and key stakeholders on chemicals and waste management issues.

6) World Bank									
Activities									Providing technical assistance, financing and knowledge products, including on air and water quality, waste management, climate pollutants, cleaner production and pollution prevention
7) United Nations Industrial Development Organization (UNIDO)									
Chemical leasing									Developing different tools (e.g., toolkits, sustainability criteria) to promote the business model; demonstration cases
UNIDO Montreal Protocol Division									Delivering policy advice, technology and financial solutions, and technical training to Member States.
UNIDO Stockholm Convention Division									Supporting developing and transition countries to implement the Convention; promoting BAT and BEP; developing new industries without POPs releases; creating supportive framework conditions
UNIDO Mercury Programme									Facilitating the introduction of clean technologies and policy reform; promoting BAT/BEP through awareness raising, capacity building and technology transfer
Global consultation on circular economy									Facilitating exchanges on best practices, emerging innovations and the promotion and adoption of circular economy principles and practices by industries of Member States
8) United Nations Development Programme (UNDP)									
GEF Project Portfolio									POPs; mercury; other toxic chemicals; hazardous waste; municipal solid waste; ODS and alternatives; secondary alumnium, lead, zinc and lithium sectors; national programme for chemicals and waste management; agrochemical reduction and management
9) Organisation for Economic Co-operation and Development (OECD)									
OECD Test Guidelines Programme									A collection of the most relevant agreed testing methods used by governments, industry and independent laboratory for chemical safety
Assessment of chemicals									Assisting countries in developing and harmonizing methods for assessing risk to human health and the environment, including eChemPortal, QSAR Toolbox, IUCLID, Product Release and Exposure Data Warehouse
Chemical accidents programme									Developing common principles and policy guidance; analysing issues of concern and making recommendations; facilitating the sharing of information and experience
Global Inventory of Pollutant Releases									Bringing publications and data on PRTRs; presenting a tool to explore trends in global releases
BAT to Prevent and Control Industrial Pollution									Assisting governments to implement policies and practices that embody BAT to prevent and control industrial pollution

Biocide Programme									Harmonizing the main data requirements for biocides and the methodologies for the interpretation of these data
Safety of manufactured nanomaterials									Harmonizing the approaches for hazard, exposure and risk assessment for manufactured nanomaterials
10) Arctic Council									
Arctic Monitoring & Assessment Programme (AMAP)									Monitoring and assessing the Arctic region regarding pollution and climate change (including levels and trends, pathways and processes, and effects on ecosystems and humans); proposing actions; producing policy-relevant assessments and public outreach products

Table 5

Brief overview of the scope and functions of science-policy interfaces under two or more relevant IGOs. Note that the darker shade employed in the scope column indicates the interface's central scope, and the lighter share indicates a secondary scope.

	Scope			*Main functions*					
Subsidiary or associated science-policy interfaces	*Chemicals*	*Waste*	*Pollution*	*Horizon scanning*	*Assessments*	*Knowledge management, communication and information-sharing, and stakeholder*	*Capacity-building*	*Conducting Research*	*Notes*
Global Mercury Partnership									Focuses on supporting implementation of the Minamata Convention on Mercury, providing knowledge and science on mercury, and raising awareness towards global action
Green Growth Knowledge Partnership (GGKP)									Offering easy access to the latest research, case studies, guidance and tools on the transition to an inclusive green economy; featuring webinars, courses and academic programmes to facilitate ongoing capacity building
United Nations Partnership for Action on Green Economy (PAGE)									Assisting and leading partner countries towards their transition to an inclusive Green Economy (IGE)
Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)									Conducting global assessments of the marine environment; providing guidance on the design and execution of marine environmental assessments; providing assessments on specific topics relevant to the marine environment; providing an overview of marine environment-related activities of UN agencies; identify emerging marine environmental issues
International Programme on Chemical Safety (IPCS)									Consolidating current, peer-reviewed chemical safety-related publications and database records from international bodies, for public access

WHO/ILO joint estimates of the work-related burden of disease and injury									Quantifying the population exposed to occupational risk factors (including asbestos, arsenic, benzene, beryllium, cademium, chromium, formaldehyde, nickel, sulphuric acid and trichloroethylene) and amount health loss caused by these exposures.
Joint FAO/WHO Meeting on Pesticide Residues (JMPR)									Harmonizing the requirement and the risk assessment on the pesticide residues
Joint FAO/WHO Meeting on Pesticide Specifications (JMPS)									Producing recommendations to FAO and WHO on the specifications and to develop guidance and procedures in establishing pesticide specifications
Codex Alimentarius and Joint FAO/WHO Food Standards Programme									A collection of internationally adopted food standards and related texts presented in a uniform manner
FAO/WHO Panel of Experts on Pesticide Management (JMPM)									Advising on matters pertaining to pesticide regulation, management and use, and alerts to new developments, problems or issues that otherwise merit attention
FAO-WHO International Code of Conduct on Pesticide Management									Framework on pesticide management for all entities related to production, regulation and management of pesticides; tools and guidelines, supported by technical guidelines
ILO-WHO International Chemical Safety Cards (ICSCs)									Providing essential safety and health information on chemicals in a clear and concise way
Scientific and Technical Advisory Panel of the Global Environment Facility (GEF STAP)									Providing objective, strategic scientific and technical advice on GEF policies, operational strategies, programs and on projects and programmatic approaches
UNEP/GEF Towards the Establishment of an International Nitrogen Management System (INMS)									Website of the GEF/UNEP project: 'Targeted Research for improving understanding of the global nitrogen cycle towards the establishment of an International Nitrogen Management System (INMS)', including ongoing preparation of International Nitrogen Assessment.
UNIDO/UNEP National Cleaner Production Centres and Global Network for Resource Efficient and Cleaner Production (RECP*net*)									Training national experts; raising awareness of resource efficient and cleaner production (RECP); demonstrating RECP; helping obtaining financing; providing policy advice; disseminating technical information; innovation and knowledge sharing; institutional capacity building; awareness-raising and advocacy; quality assurance and branding

D. Other Science-Policy Panels

29. As provided for in UNEA resolution 5/8, the ad hoc open-ended working group should take into account the need to ensure that the panel "Coordinates, as appropriate, with other science-policy bodies, such as the Intergovernmental Panel on Climate Change and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services" (paragraph 6 (e)).

30. The following three science-policy panels have been identified as relevant to the science-policy panel on the sound management of chemicals and waste and the prevention of pollution: the Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and the International Resource Panel (IRP). These do not directly address the sound management of chemicals and waste and prevention of pollution in their scope, but each has a scope with potential points of connection with the science-policy panel and the panel, or the ad hoc open-ended working group, may want to elaborate on means of coordination.

31. It is worth noting that, to date, coordination among science-policy panels has been challenging, especially since they each set their own work programmes, often in different time frames/frequencies (this is discussed in more detail in UNEP/SPP-CWP/OEWG.1/4). Nevertheless, there have been punctuated efforts at coordination, including for example a 2021 IPBES-IPCC Co-Sponsored Workshop on Biodiversity and Climate Change. Such initiatives may inform the ad hoc open-ended working group or the panel as they consider means of coordination with these other science-policy panels.

32. For the purpose of this mapping analysis, the scope and functions of each of these three panels are reported below. The ad hoc open-ended working group may also wish to consult the information documents prepared for its resumed first session that provide a more extensive comparative analysis of these panels' institutional arrangements and procedures (UNEP/SPP-CWP/OEWG.1/INF/5 and UNEP/SPP-CWP/OEWG.1/INF/7).

Table 6
Brief overview of the scope and functions of related science-policy panels (IPCC, IPBES and IRP). Note that the darker shade employed in the scope column indicates the interface's central scope, and the lighter share indicates a secondary scope.

	Scope			*Main functions*					
Science-policy panel	*Chemicals*	*Waste*	*Pollution*	*Horizon scanning*	*Assessments*	*Knowledge management, communication and information-sharing, and stakeholder engagement*	*Capacity-building*	*Conducting Research*	*Notes*
Intergovernmental Panel on Climate Change (IPCC)									See UNEP/SPP-CWP/OEWG.1/INF/5
Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)									See UNEP/SPP-CWP/OEWG.1/INF/5
International Resource Panel (IRP)									See UNEP/SPP-CWP/OEWG.1/INF/5

E. Multistakeholder partnerships, associations and alliances

33. As noted in Section II of this document, there are numerous “relevant key stakeholders” with which the panel may need to consider its relationship. For the purpose of this mapping analysis, this document provides a snapshot of just a few of the partnerships, associations and alliances that bring together different combinations of these stakeholders to gather and leverage their diverse knowledge and constituencies.

34. Table 7, based on a review of publicly available information, provides an overview of the scope and functions of only some of the relevant partnerships, associations and alliances that make up the current landscape of science-policy interfaces.

Table 7
Brief overview of the scope and functions of relevant multistakeholder partnerships, associations and alliances. Note that the darker shade employed in the scope column indicates the interface’s central scope, and the lighter share indicates a secondary scope.

	Scope			*Main functions*					
Partnership / Alliance / Association	*Chemicals*	*Waste*	*Pollution*	*Horizon scanning*	*Assessments*	*Knowledge management, communication and information-sharing, and stakeholder engagement*	*Capacity-building*	*Conducting Research*	*Notes*
1) Private-sector-led									
Alliance to End Plastic Waste	□	■	■		■	■	■	■	Collaborate with members and partners to help develop and implement scalable projects around the world. Aim to de-risk these initiatives by providing guidance on their viability, while offering funding and access to a network of like-minded Alliance members to secure collective action.
Better Cotton International	□	■	■			■	■	■	Largest cotton sustainability programme in the world; goal: to train farming communities to produce cotton in ways that improve things for everyone and everything connected with cotton.
Clean Cargo			■			■	■		Collaborative partnership between ocean container carriers, freight forwarders, and cargo owners that is focused on tracking and reducing greenhouse gas emissions from container shipping
Clean Electronics Production Network--- Toward Zero Exposure	■	■	■			■	■		Uniting companies throughout the electronics industry to reduce worker exposure to hazardous chemicals; includes commitments that companies make with their participation, principles that guide the program design and requirements and verification to document how companies implement the commitments.
CropLife Obsolete Stocks Programme	■	■	■			■	■		Engaged in the clean-up of obsolete pesticide stocks and the prevention of new stockpiles for nearly three decades. Contributes to obsolete stocks safeguarding and disposal in collaboration with national and international development agency partners.

Global Battery Alliance (GBA): Critical Minerals Advisory Group									Working with its members across the value chain on ensuring that critical materials are produced, sourced, processed, transported, manufactured and recycled in a responsible and sustainable manner which minimizes environmental harm, respects human rights and creates benefits for stakeholders along the supply chain.
ICCA's Responsible Care									Voluntary initiative to drive continuous improvement in safe chemicals management; supports collaboration among the chemical industry, government and local authorities to help facilitate excellent practices in sound chemicals management and sustainable growth in regions around the globe.
International Solid Waste Association (ISWA) Task Force on Marine Litter									Addressing three key challenges to establishing a sound waste management system, which will prevent plastic waste reaching our oceans: - Develop practices for sound collection and disposal of municipal waste. - Identify and demonstrate realistic best practices that can be adopted by local, regional and national authorities. - Promote sufficient value of secondary plastics as part of a resource efficient circular economy.
Responsible Business Alliance (RBA): Responsible Minerals Initiative									Evolving business practices to support responsible mineral production and sourcing globally, including but not limited to conflict-affected and high-risk areas, providing companies with tools and resources that improve regulatory compliance, align with international standards, and support industry and stakeholder expectations.
Zero Discharge of Hazardous Chemicals (ZDHC)									ZDHC is a multi-stakeholder organisation comprising over 170 contributors from across the industry including Brands, Suppliers, Chemical Suppliers, and Solution Providers. The Roadmap to Zero Programme, by ZDHC, leads the fashion industry to eliminate harmful chemicals from its global supply chain by building the foundation for more sustainable manufacturing to protect workers, consumers and our planet's ecosystems.
2) Civil-society-led									
ChemSec (the International Chemical Secretariat)									Advocates for substitution of toxic chemicals to safer alternatives. Through independent research, cross-border collaboration and practical tools, driving the development of more progressive chemicals legislation and pushing businesses towards the transition to non-toxic alternatives.
Clean Production Action's BizNGO for Safer Chemicals & Sustainable Materials									Collaboration of business and environmental leaders working together to define and implement the leading edge in safer chemicals and sustainable materials. A multi-sectoral informal network, participation is open to downstream users of chemicals, NGOs, governments, and academics who support the BizNGO Principles for Safer Chemicals.

Global Alliance on Health and Pollution (GAHP)									Formulating strategies to address pollution and health at scale. Focuses on improving health as a priority and key metric for combatting pollution. At the forefront of generating arguments (and the data and science behind them) that resonate with decision-makers for investing in solutions to pollution and health problems.
International Pollutants Elimination Network (IPEN)									Global network of public interest NGOs forging a healthier world where people and the environment are no longer harmed by the production, use, and disposal of toxic chemicals. Work to strengthen global and national chemicals and waste policies, contribute to ground-breaking research, and build a global movement for a toxics-free future.
International Union for Conservation of Nature (IUCN)									Membership Union of government and civil society organisations; implements a large and diverse portfolio of conservation projects worldwide.
Pesticide Action Network (PAN) International									Network of over 600 participating nongovernmental organizations, institutions and individuals in over 90 countries working to replace the use of hazardous pesticides with ecologically sound and socially just alternatives.
3) Academia-led									
International Panel on Chemical Pollution (IPCP)									To initiate, prepare and disseminate condensed state-of-the-science documentation on all aspects of environmentally relevant chemicals; to act internationally and in countries with particular needs for improving knowledge regarding chemicals for them to manage issues related to chemicals; to offer the scientific expertise accumulated within IPCP to international organizations, national governments and other parties for discussions and review of all aspects of the scientific basis for regional and/or global management of chemicals.
Systems of Sustainable Consumption and Production (SSCP) Knowledge-Action Network (KAN) of International Science Council's (ISC) Future Earth									Global network of researchers and practitioners interested in ways that sustainable consumption and production systems can be created, nurtured, and contribute to a more sustainable world. SSCP KAN works to advance a more systemic SCP approach, encouraging and enabling an urgent transformation in theory and practice to SCP systems.
University of Capetown's Chemicals Network									To facilitate the sharing of knowledge around sound chemicals and waste management and to establish a platform where stakeholders can meet and discuss key issues around sound chemicals and waste management in the hopes of building the capacity of low- and middle-income countries (LMICs) to improve on sound chemicals and waste management practices.
4) Foundation-led									
Bill & Melinda Gates Foundation: Malaria Eradication Program									With partners, fighting malaria by working to expand access to existing tools, using data to better track and target the disease, advancing research on potentially transformative innovations, and advocating for others to join in the effort to end malaria.

Ellen MacArthur Foundation's Plastics Pact Network									Connects national and regional initiatives around the world to implement solutions towards a circular economy for plastic. Globally aligned response to plastic waste and pollution, which enables vital knowledge sharing and coordinated action.
Ocean Foundation's Plastics Initiative									Working to influence sustainable production and consumption of plastics, to ultimately achieve a truly circular economy for plastics, beginning with prioritizing materials and product design. Goal of protecting human and environmental health, and advance environmental justice priorities, through a holistic policy approach to reduce plastic production and promote plastic redesign.

IV. Summary

35. This mapping analysis illustrates that there are many existing science-policy interfaces addressing at least some dimensions of the sound management of chemicals and waste and the prevention of pollution.

36. As to scope, while a few science-policy interfaces examined in this analysis employ a more integrated approach to scope addressing chemicals, waste and prevention of pollution together, it is not uncommon for interfaces to specialize in chemicals, waste or prevention of pollution. Recognizing that this is not a comprehensive mapping exercise, the tables above do point to a greater frequency of science-policy interfaces which have a primary focus on chemicals (generally on individual specific chemicals or chemicals management-related issues). In addition, the prevention of pollution is more frequently included as a secondary scope area.

37. As to function, the mapping analysis illustrates that the functions that may be most addressed by existing science-policy interfaces are those that relate to assessments, to knowledge management, communication and information-sharing, and stakeholder engagement and to capacity-building, all of which are considered in the document UNEP/SPP-CWP/OEWG.1/5 on functions. It is worth noting that several interfaces also conduct research, a function typically excluded from intergovernmental science-policy bodies such as the IPCC and IPBES. Finally, it appears that horizon scanning and assessments are two functions that are less well represented in the interfaces included in this initial mapping analysis.

38. Together with the documents UNEP/SPP-CWP/OEWG.1/4 and UNEP/SPP-CWP/OEWG.1/5, this mapping analysis may aid in understanding the implications of decisions to be made under the scope and functions of the panel, especially which may be the panel's most relevant stakeholders and bodies to cooperate and coordinate with.

APPENDIX 1

1. As explained in the *Thought-starter on the interlinkages and differences among chemicals, waste and the prevention of pollution* contained in the Annex to UNEP/SPP-CWP/OEWG.1/4, breakthroughs in the sound chemicals management can arise equally from a "chemicals-outward" approach as from a "impact/pollution-inwards approach"

2. These simplified examples illustrate the importance of understanding the current science-policy landscape that falls within the scope of any area of work the science-policy panel may wish to pursue. It also highlights the rich array of relevant key stakeholders that hold different types of knowledge that may be relevant to meeting the panel's objective. It is foreseeable that the science-policy panel would need to engage in targeted stakeholder engagement in order to incorporate knowledge without which the goals set for the panel in resolution 5/8 may not be met.

A. Example 1: Tyres and the life cycle of synthetic rubber

3. In 2008, the World Business Council for Sustainable Development (WBCSD)'s report on end-of-life tyres (ELTs) estimated that "1 billion ELTs are generated each year," and "an estimated 4 billion ELTs are currently in landfills and stockpiles worldwide."[7] Throughout their lifecycle, these tyres present a complex story from production to disposal and possible recycling. As the WBCSD report further details: "A typical passenger tire contains 30 types of synthetic rubber, eight types of natural rubber, eight types of carbon black, steel cord, polyester, nylon, steel bead wire, silica and 40 different kinds of chemicals, waxes, oils and pigments. They typically contain 85% hydrocarbon, 10-15% iron (in the bead wire and steel belts) and a variety of chemical components."

4. Figure 3 presents a simplified schematic of the life-cycle of synthetic rubber tyres. The upper part of the figure emphasizes two key components of tyres: natural rubber and carbon black and other chemical additives. The figure also highlights three pathways to possible pollution once tyres are designed and produced:

(a) their release of microplastic into the environment through their every-day-use;[8]

(b) the shredding of ELTs to produce crumb rubber that is used in synthetic turf;[9] and

(c) the stockpiling of ELTs which can lead to fires that are almost impossible to extinguish.[4]

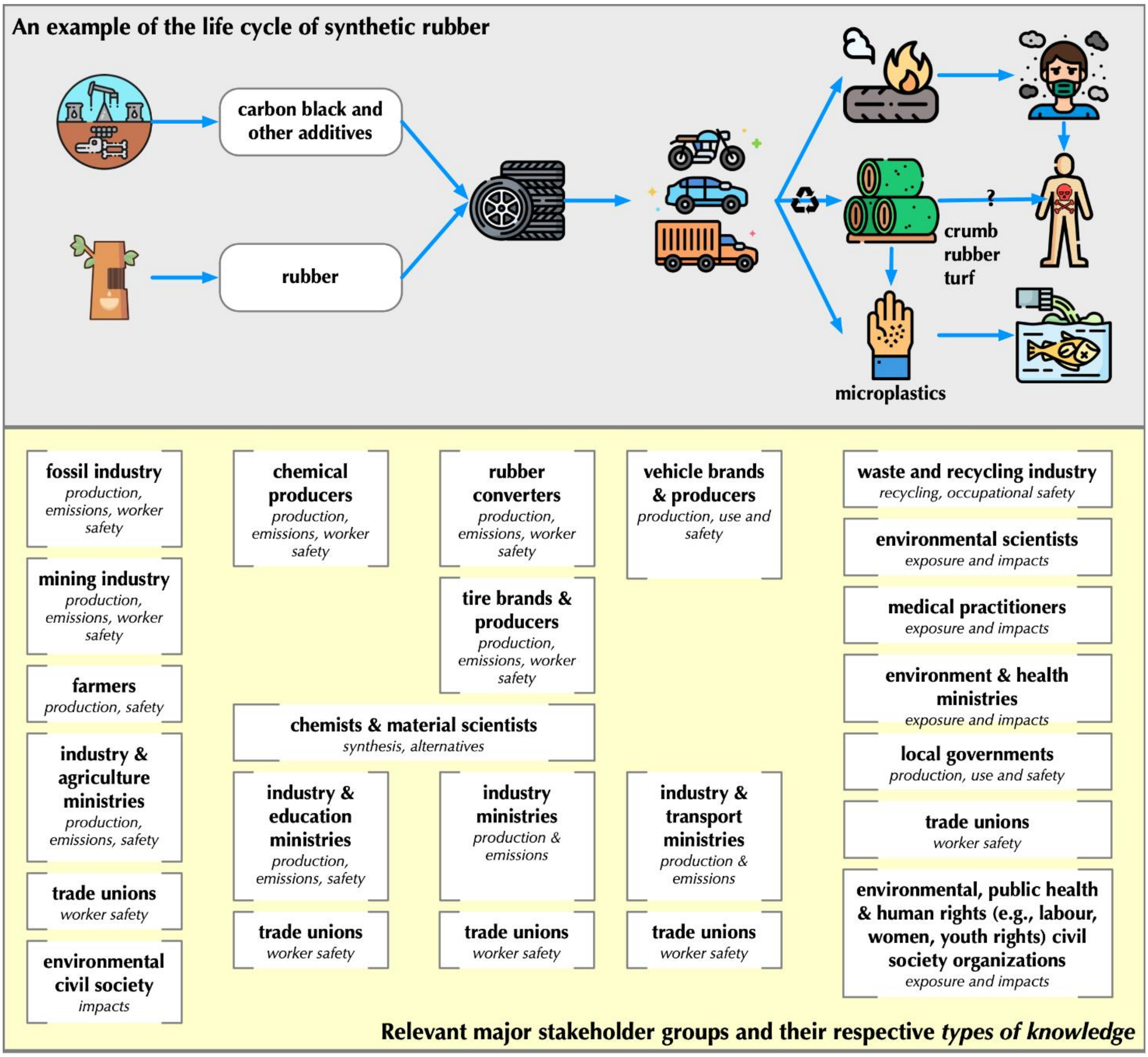
5. The lower section of Figure 3 lists some of the relevant stakeholders, and the type of knowledge they may hold, at different stages of this simplified life cycle. The next paragraphs draw from existing cases and policy responses to consider how varied stakeholders may come together and leverage their knowledge to identify and address the potential impacts on human health and the environment presented to the upper right part of the graphic.

[7] World Business Council for Sustainable Development. 2008. Managing End-of-Life Tires. Tire Industry Project. Geneva.

[8] See: Kole, P.J., Löhr, A.J., Van Belleghem, F.G. and Ragas, A.M. (2017). Wear and tear of tyres: a stealthy source of microplastics in the environment. *International journal of environmental research and public health*, *14*(10), p.1265. and Wik, A. and Dave, G. (2009). Occurrence and effects of tire wear particles in the environment–A critical review and an initial risk assessment. *Environmental pollution*, *157*(1), pp.1-11.

[9] Valentini, F. and Pegoretti, A. (2022). End-of-life options of tyres. A review. *Advanced Industrial and Engineering Polymer Research*. 5 (2022): 203-213.

Figure 3
A simplified schematic of the life cycle of synthetic rubber



6. Stockpiling of ELTs: fires of tyre stockpiles often yield impressive, and widely shared, videos and photographs. In addition to the disruptions that these long-burning fires can cause, such fires can lead to air, water and soil pollution with negative effects on human health and the environment.[10] Many types of knowledge can be deployed to minimize the risks of, and from, such fires, for example:

(a) Tire producers may be able to identify changes to tire manufacturing that may make combustion less likely and less toxic;

(b) Auto manufacturers, tyre producers/recyclers and government agencies responsible for road construction and road safety may be able to identify and implement safe retreading technologies or changes to road technology that extend the life of tires;

(c) Fire-fighting experts and local authorities may be able to implement safer storage conditions for when storage is necessary; and,

(d) Governments may be able to implement extended producer responsibility schemes that divert ELTs to safe end-of-life treatment.

[10] See: https://environment.govt.nz/publications/end-of-life-tyre-management-storage-options/6-potential-environmental-impact-of-uncontrolled-tyre-fires/.

7. Shredding for crumb rubber turf: shredding of ELTs for use as crumb rubber, especially in artificial turf and on playgrounds, has been one of the key pathways for tyre recycling. However, concerns have been raised regarding the safety of this application for users of this artificial turf. Risks cited include exposure to hazardous chemicals in tyres through abrasion and inhalation, but also concerns over greater rate of sports injuries arising on such fields. These concerns have led several jurisdictions to consider the safety and desirability of this use of ELTs. Concerns have also been raised about such artificial turfs becoming a source of microplastic releases into the environment.[11] Many types of knowledge can be deployed to inform examinations on the potential risks from crumb rubber in artificial turf, for example:

(a) Professional athletes and sports medicine experts may speak to the rate and type of injuries sustained on a crumb rubber field rather than on a natural grass field;[12]

(b) Groups concerned with youth health may be able to inform risk assessments with information on the difference in the likely exposure time of recreational youth users versus elite youth athletes;

(c) Local jurisdictions and government ministries can consider the risks of using artificial turf in the context of risks incurred from maintaining natural grass fields in their local conditions;

(d) Recyclers and turf producers may be able to identify means of minimizing infill (crumb rubber) loss;

(e) Regulators, perhaps via existing science-policy interfaces, may be repositories of credible risk assessments for individual substances encountered in crumb rubber; and,

(f) Environmental scientists may be able to monitor pollution in the field and waterways, as well as identify associated environmental impacts.

8. Microplastic emissions throughout the tyre life cycle: As noted in the two prior paragraphs, end-of-life mismanagement that leads to tyre stockpile fires, as well as recycling into artificial turf, can lead to air and water pollution, notably by microplastics. In the case of tyres, regular wear and tear has also been identified as a major source of microplastic pollution to air and water, but the effects of such pollution on human health and the environment are still being researched.[13] Many types of knowledge can be deployed to minimize the risks of, and from, such fires, for example:

(a) Environmental protection agencies can partner with communities living in proximity of busy roadways to monitor the amount and type of tyre wear particles emitted, whether at peak times or over sustained periods;

(b) Auto manufacturers, tyre producers/recyclers and government agencies responsible for road safety and road construction/maintenance may be able to identify and implement solutions that minimize microplastic emissions from tyres;

(c) Scientists and engineers may be able to assess the economical, environmental and technical feasibility of solutions such as devices that capture tyre wear particles while a vehicle is in use, or new road surfacing options;[14] and

(d) Urban planners and transportation ministries may be able to develop strategies to reduce vehicle use.

[11] One 2018 European report estimates that 18,000 to 72,000 tonnes of microplastics are generated from artificial turf each year.

[12] One of the elements of the 2019 discrimination lawsuit the US Women's National Soccer Team filed against U.S. Soccer related to the Women's National Team playing on artificial turf while the Men's National Team played on grass.

[13] See for example Tamis, J.E., Koelmans, A.A., Dröge, R., Kaag, N.H., Keur, M.C., Tromp, P.C. and Jongbloed, R.H., (2021). Environmental risks of car tire microplastic particles and other road runoff pollutants. *Microplastics and Nanoplastics*, *1*(1), pp.1-17 and Evangeliou, N., Grythe, H., Klimont, Z., Heyes, C., Eckhardt, S., Lopez-Aparicio, S. and Stohl, A., (2020). Atmospheric transport is a major pathway of microplastics to remote regions. *Nature communications*, *11*(1), pp.1-11.

[14] One may expect such an analysis to have to consider potential trade-offs such as for example between reduced microplastic emissions and increased fuel consumption or accelerated road wear.

9. This simplified example highlights the rich array of relevant key stakeholders that hold different types of knowledge that may be relevant to meeting the panel's objective. It is foreseeable that the science-policy panel would need to engage a wide range of relevant stakeholders in order to incorporate knowledge in the way that is interdisciplinary, ensuring contributions from experts with a broad range of disciplinary expertise as set out in paragraph 6(b) of the UNEA resolution 5/8.

B. Example 2: Synthetic nitrogen fertilizers and disruptions to the nitrogen cycle

10. The breakthrough of synthetic nitrogen fertilizers is widely recognized as one of the keys to increases in food production that have helped to provide food security to the Earth's growing population. Indeed, "approximately 40 percent of the world's population is fed by crops sustained by human-induced formation of reactive nitrogen".[15] Since the invention of technology that allows mass production of biologically available nitrogen from air has "revolutionized farming, doubling the number of people that one acre of land could feed".[16]

11. And yet this production process is very energy intensive, and has been estimated to contribute "between 1 and 2% of worldwide carbon dioxide emissions".[17] Furthermore, over-application of synthetic nitrogen fertilizers can lead to unintended flows of nitrogen throughout ecosystems, so that "reactive nitrogen is implicated in the high concentration of ozone in the lower atmosphere, the eutrophication of coastal ecosystems, the acidification of forests, soils, and freshwater streams and lakes, and losses of biodiversity. In the form of nitrous oxide, a greenhouse gas, nitrogen contributes to global warming and stratospheric ozone depletion".[18] By one estimate, 80 per cent of nitrogen is wasted and lost to the environment.[19] Indeed, sustainable nitrogen management is the focus of UNEA resolution 5/2.[20]

12. Figure 4 presents a simplified[21] schematic of the life cycle of synthetic nitrogen fertilizers from raw material to use in agriculture, emphasizing some of the environmental and societal impacts of their use (and over-use):

(a) Increased yields in food production, and potential gains in global food security;

(b) Runoff into water bodies, leading to eutrophication and ecosystem disruption; and,

(c) Emissions to air that contribution to climate change.

[15] According to International Nitrogen Management System (INMS).

[16] Erisman, Jan Willem, et al. "How a Century of Ammonia Synthesis Changed the World." Nature Geoscience, vol. 1, no. 10, Oct. 2008, pp. 636–39, doi:10.1038/ngeo325, cited at MIT's Climate Portal explainer on Fertilizer and Climate Change (2021).

[17] MIT's Climate Portal explainer on Fertilizer and Climate Change (2021).

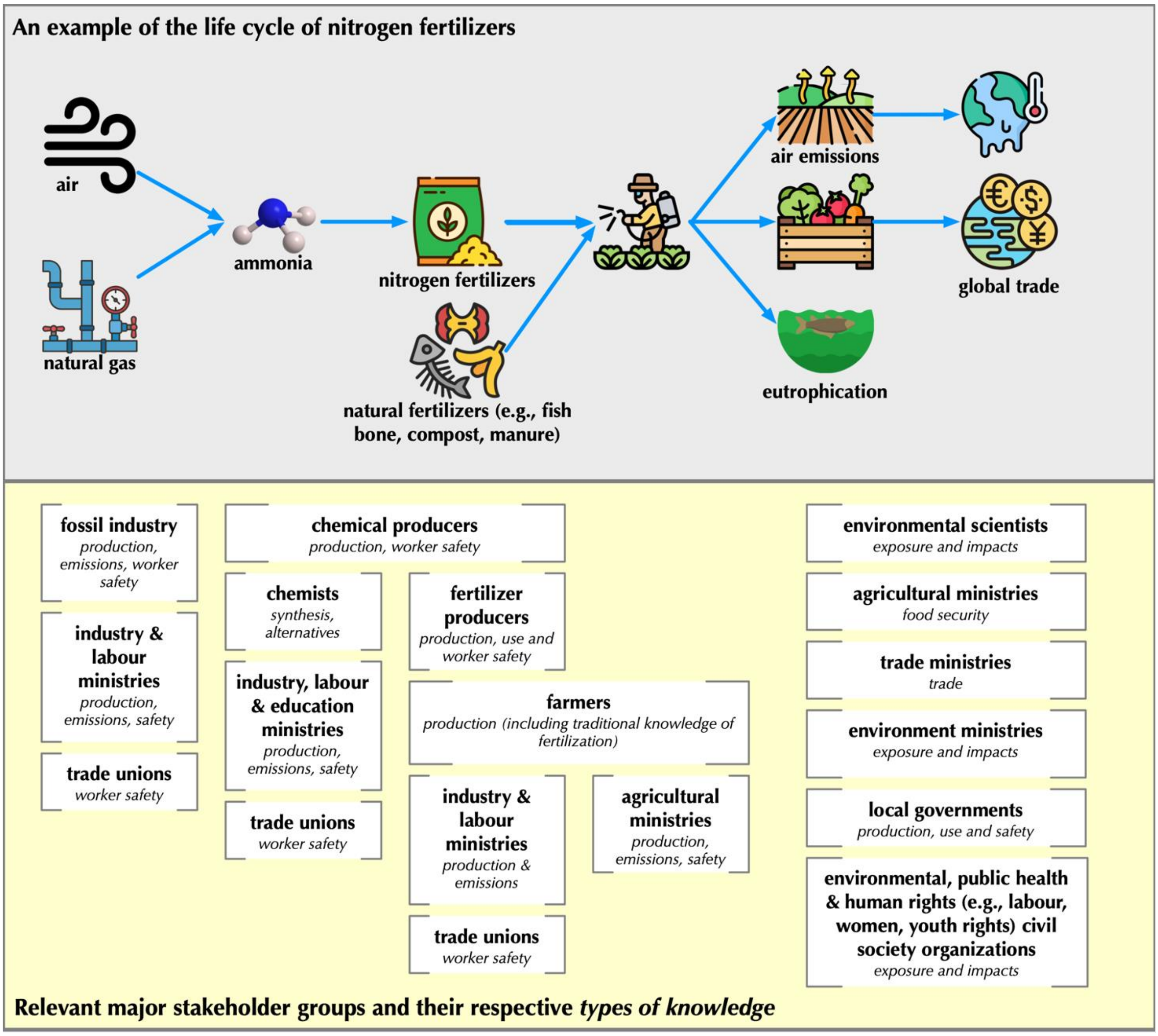
[18] International Nitrogen Management System (INMS), "Why care about nitrogen"

[19] UNEP (2020) Fertilizers: challenges and solutions.

[20] UNEA resolution 5/2 (2022) Sustainable Nitrogen Management encourages UN Member States to accelerate their action in the significant reduction of nitrogen waste by 2030, with national action plans supported by UNEP.

[21] Note that input into the environment stemming from unsound management can occur throughout this life cycle.

Figure 4
A simplified schematic of the life cycle of nitrogen fertilizers



13. The lower section of Figure 4 lists some of the relevant stakeholders, and the type of knowledge they may hold, at different stages of this simplified life cycle. The next paragraphs draw from existing cases and policy responses to consider how varied stakeholders may come together and leverage their knowledge to identify and address the potential impacts of synthetic nitrogen fertilizer use on human health and the environment (presented to the upper right of the graphic).

14. Increased yields in food production: According to Carbon Brief, "[t]oday, the world applies more than 100m tonnes of synthetic nitrogen fertiliser to its crops every year, according to data from the UN Food and Agriculture Organization (FAO). Around half of this is used to boost the production of cereals – predominantly maize, wheat and rice".[22] While the gains in food production stemming from the use of nitrogen fertilizer are not in question, recent market disruptions have highlighted ways in which reliance on synthetic nitrogen fertilizer can in turn threaten food security.[23] Many types of knowledge can be deployed to ensure gains in food production are maintained while improving resilience to market disruptions, for example:

[22] Carbon Brief (2022) What does the world's reliance on fertilisers mean for climate change? July 11, 2022.
[23] SwissInfo (2022) How the war in Ukraine is fuelling the next global food crisis. May 17, 2022.

(a) Fertilizer producers may develop greener processes for ammonia production, while avoiding the exacerbation of other environmental problems;[24]

(b) Farmers may implement agroecology initiatives. As explained in FAO's *Scaling Up Agroecology* Initiative, "Agroecological systems are diverse, maximising the synergies between different components (e.g. soil, water, crops, livestock, trees, aquatic plants and animals, human processes) to deliver greater resource-use efficiency and resilience. Managing these interactions depends on locally adapted knowledge";[25]

(c) Researchers in agricultural ministries and in academia may identify means of assisting farmers to calibrate their fertilizer application to more precisely meet their crops' nitrogen needs, and to develop natural fertilizers from local resources[26]; and,

(d) Civil society groups, including those focused on food sovereignty and food security, may advocate for strategies that will shore up a local population's food system resilience to market disruptions.

15. Climate impact from the production and use: Substantial greenhouse gases are emitted along the life cycle of synthetic nitrogen fertilizer. The production of synthetic nitrogen fertilizer is energy-intensive and involves the use of natural gas at high temperature (approximately 60% of the natural gas is used as raw material, with the reminder employed to power the synthesis process).[27] When nitrogen fertilizer is applied to the soil, a large portion is used by soil microorganisms, which produce N_2O with 265 times more global warming potential than CO_2 over a 100 years period as a by-product. Latest estimates suggest that the life cycle of synthetic nitrogen fertilizer contributes to about 2% of global greenhouse gas emissions (ca. 38.8% from the production, 58.6% from the field emissions during and after the application, and 2.6% from the transportation).[28] Many types of knowledge can be deployed to ensure gains in food production are maintained while improving resilience to market disruptions, for example:

(a) Fertilizer producers may develop greener processes for ammonia production;

(b) Farmers may implement agroecology initiatives to reduce the overall use of synthetic nitrogen fertilizers;

(c) Government ministries may identify policies and regulations that encourage farmers to reduce the application of fertilizers more than they need.[29]

(d) Researchers in agricultural ministries and in academia may identify means of assisting farmers to calibrate their fertilizer application to more precisely meet their crops' nitrogen needs, and to develop natural fertilizers from local resources;

(e) Civil society groups may leverage networks to inform farmers about agroecology initiatives and share best practices.

16. Runoff into water bodies: Inefficient use of nitrogen fertilizer is widespread, so that non-point source run off from agricultural fields can contribute to some bodies of water incurring eutrophication. In such conditions, the excess nutrients being washed into the water body contribute to algal blooms that can, in worst cases, lead to such depletion of oxygen in the water that large areas can become what are commonly called "dead zones" as most organisms cannot survive in those conditions. Many types of knowledge can be deployed to ensure greater efficiency of nitrogen use and minimize nitrogen runoff, for example:

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[24] The Royal Society (2020) Ammonia: zero-carbon fertiliser, fuel and energy store. Policy Briefing. and D'Angelo, S.C., Cobo, S., Tulus, V., Nabera, A., Martín, A.J., Pérez-Ramírez, J. and Guillén-Gosálbez, G. (2021). Planetary boundaries analysis of low-carbon ammonia production routes. *ACS Sustainable Chemistry & Engineering*, *9*(29), pp.9740-9749.

[25] FAO (2018) Scaling Up Agroecology Initiative: Transforming Food and Agricultural Systems in Support of the SDGs. A proposal prepared for the International Symposium on Agroecology (3-5 April 2018).

[26] https://www.elsevier.com/connect/guava-leaves-as-preservatives-fish-bones-as-fertilizer-creative-ideas-for-a-sustainable-future.

[27] https://www.fertilizerseurope.com/fertilizers-in-europe/how-fertilizers-are-made/.

[28] Menegat, S., Ledo, A. and Tirado, R. Greenhouse gas emissions from global production and use of nitrogen synthetic ferilisers in agriculture. *Scientific Reports*, 12, 14490.

[29] European Commission, n.d. *Farm to Fork Strategy*. https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en.

(a) Researchers in agricultural ministries and in academia may identify means of assisting farmers to calibrate their fertilizer application to more precisely meet their crops' nitrogen needs;

(b) National or local agencies or authorities may develop guidelines or rules as to when and how farmers should apply nitrogen fertilizers so as to maximize efficiency;

(c) Farmers may implement agroecology initiatives, including those aimed at improving soil health, to reduce the use of fertilizers in general; and,

(d) Civil society groups may leverage networks of citizen scientists to monitor water quality and overall health of aquatic ecosystems.

APPENDIX 2

Methodology Employed for the Mapping Analysis

1. This Appendix provides additional details on the methodology employed in populating the tables contained in the document. This work was undertaken in two broad steps:

I. Identifying relevant science-policy interfaces

2. A first step of this analysis involved identifying existing science-policy interfaces in the realm of the sound management of chemicals and waste and the prevention of pollution at the global, inter-regional and regional levels, particularly by mapping those subsidiary or associated interfaces under multilateral environmental agreements and under other international instruments and intergovernmental organizations (IGOs).

3. The analysis is not meant to be exhaustive. Because of the breadth and complexity of the institutional landscape in the field of chemicals management, waste management, and prevention of pollution, and due to the restricted time and resources available, not all existing science-policy interfaces were included in the analysis, particularly the many interfaces that exist at the regional, national and local levels.

4. Those interfaces that have global to inter-regional coverage were emphasized, while some examples of regional interfaces are also provided. It should also be noted that member states may also conduct science-policy activities related to their participation in MEAs, other international instruments and intergovernmental organizations. For example, under the Stockholm Convention, member states may conduct their own horizon scanning to make nominations of chemicals for listing under the Convention, triggering the subsequent official assessments by the Persistent Organic Pollutants Review Committee. Such member state-driven science-policy initiatives are not part of this mapping analysis.

II. Categorizing scope and functions of identified science-policy interfaces

5. This second step entailed reviewing available information on these interfaces in order to characterize their scope and main functions in tabular format. Information about each body was collected through a review of publicly accessible online information and relevant reports or documents published by the interfaces themselves. The quality and completeness of the data sets considered depend on the availability and (online) accessibility of data. In some cases, a complete analysis for all the interfaces considered could not be completed due to data gaps.

A. Scope

6. The identified scope (Column I) of science-policy interfaces considered were categorized into one or more of the following groups: chemicals, waste and pollution. For the purpose of this analysis, considerations were made as follows.

(a) The "Chemicals" category refers to a mandate related to managing "chemical life cycle" or "chemical value chain" in the technosphere, including addressing the inherent properties of chemicals. The waste generated from the life cycle or value chain of chemicals would be considered in the "waste" category below, whereas the pollution generated from the life cycle or value chain of chemicals in the environment or biota would be considered in the "pollution" category below.

(b) The "Waste" category refers to a mandate related to managing waste, regardless of which types of waste or waste mixtures.

(c) The "Pollution" category refers to a mandate related to addressing pollution in air, water, soil and resulting health effects, including the presence of chemicals in the environment or biota, and associated adverse impacts.

7. As noted in the Annex to the working document on scope (UNEP/SPP-CWP/OEWG.1/4), the sound management of chemicals and waste and prevention of pollution can be considered as part of closely interconnected and interrelated issues. For example, the chemicals that make up the global value chains can cause waste and emissions throughout their life cycle, contributing to pollution in air, water, soil and humans. Thus, addressing chemicals or waste will inevitably contribute to addressing

pollution. Therefore, two shades of blue were used to indicate scope: the darker shade indicates the body's central scope, whereas the lighter shade is used to identify secondary scope, including as a result of co-benefits arising from the body's work.

B. Functions

8. To categorize functions, we relied on the four principal functions discussed in working document UNEP/SPP-CWP/OEWG.1/5. Furthermore, a fifth category, conducting research, was also mapped since it was deemed necessary to convey an accurate picture of the landscape of science-policy interfaces. And so, the categories used in populating the table included:

(a) Horizon scanning: any systematic review of available data and information to detect, collect and interpret signals of possibly early changes in a specific field. This is typically carried out as part of a comprehensive foresight process to identify potential medium- and long-term opportunities and risks.

(b) Assessments: sharing of authoritative information on topics related to the interface's scope of work. Assessments are typically extensive documents that build on existing peer-reviewed literature and other diverse sources of data that are publicly available, such as grey literature and indigenous and local knowledge. The function of various science-policy interfaces may generate different types of assessments, including comprehensive (global), regional, thematic and methodological assessments.

(c) Knowledge management, communication and information-sharing, and stakeholder engagement: such activities include providing up-to-date and relevant information, identifying key gaps in scientific research, encouraging and supporting communication between scientists and policymakers, explaining and disseminating findings for different audiences, raising public awareness and facilitating information-sharing with countries, in particular developing countries seeking relevant scientific information.

(d) Capacity building: refers to "the process whereby people, organizations and society as a whole unleash, strengthen, create, adapt, and maintain capacity over time,"[30] including developing guidance documents, webinars, e-learning courses, training workshops, and other educational programmes.

(e) Conducting Research: conducting new research, including data generation and analysis.

[30] United Nations Development Group, "Capacity development: UNDAF companion guidance."