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Right to science in the context of toxic substances

Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes, Marcos Orellana

Summary

Pursuant to Human Rights Council resolution 45/17, the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes, Marcos Orellana, presents his annual thematic report dedicated to the human right to science with regard to the risks and harms associated with the life cycle of hazardous substances and wastes, examining the dynamics and interconnections between scientific progress, the diffusion of scientific information and the science-policy interface.

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I. Introduction

1. Science provides the international community with knowledge about the risks and harms posed by hazardous substances on human health and the environment and thus enables the elaboration of evidence-based policies to address those threats. Science-based policies protect the range of human rights that are compromised when individuals and communities are exposed to hazardous substances and waste.

2. The creation of effective channels connecting science with policymaking is indispensable to advancing the contribution of scientific knowledge to human rights protection. In practice, however, science-policy interface platforms, where they exist, are too often undermined by politics, ideology, lack of transparency, vested economic interests and other conflicts of interest.

3. The ability of society to benefit from scientific knowledge is also threatened by the propagation of disinformation about scientific evidence. The manufacturing of doubt about the risks and harms of hazardous substances by producers of deadly products has become a lucrative business. Certain business entities specialize in deliberately spreading ignorance and confusion in society. Tactics of denial, diversion and distortion are intended to keep hazardous products on the market, despite knowledge of their risks and harms, and at the expense of adequate human rights protections. The failure by governments to correct disinformation, or to ensure the avoidance of conflicts of interest in science-policy interface mechanisms, often add to confusion within society.

4. Examples abound of disinformation campaigns developed by companies and industries in order to retain their market share at the expense of the rights of people, including workers, consumers, individuals and communities who are exposed to hazardous substances. In some countries, the asbestos industry has blocked national and even international regulations through campaigns suggesting that asbestos is not toxic or, alternatively, that the controlled use of asbestos can be safe. Corporations that produce highly hazardous pesticides have pressured or misled governments in order to avoid controls or bans. Companies that produce or market dangerous chemicals, such as endocrine disrupting chemicals and “forever chemicals” (per- and polyfluoroalkyl substances), have actively distorted facts or diverted attention to avoid or delay controls and protections. The plastics industry has delayed controls, including by spreading disinformation on the false promises of recycling. For decades, the fossil fuel industry has spread disinformation on climate change, the result of which has been delayed action on the part of governments in the face of a planetary climate emergency that threatens to make the planet uninhabitable for humanity.

5. In addition to attacks on scientific evidence, scientists themselves are often the target of campaigns that malign, harass, discredit, threaten or otherwise undermine them if they question, publish or speak out about the risks and harms of hazardous substances. The result can be to silence disagreement, sow doubt in science and dissuade scientists from engaging in or continuing their work.

6. In its resolution 45/17, the Human Rights Council decided to extend the mandate of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes and requested the Special Rapporteur to continue providing detailed, up-to-date information on the adverse consequences for the full enjoyment of human rights of managing and disposing of hazardous substances and wastes in an unlawful manner.

7. In addition, the Council requested information, inter alia, on the science-policy interface as regards the risks associated with the life cycle of hazardous substances and wastes, including the risks to the right to freedom of expression, which includes the freedom to seek, receive and impart information, and the right to enjoy the benefits of scientific progress.[1]

[1] Consistent with the previous reports of the current mandate holder and those of his predecessors, hazardous substances and wastes are not defined strictly; they include toxic industrial chemicals and

8. The right to enjoy the benefits of scientific progress and its applications, referred to as "the right to science" for the purposes of the present report, is recognized in article 27 of the Universal Declaration of Human Rights and further elaborated upon in the International Covenant on Economic, Social and Cultural Rights. The right to science is also reflected in regional human rights instruments[2] and several national constitutions.[3]

9. In the specific context of toxic substances, the right to science provides humanity with the tools to confront the severe toxification of the planet and its people. The implications for human rights, including the rights to life with dignity, non-discrimination, health, adequate food and housing, clean air and safe water, a healthy environment and safe and healthy work, are immense.

10. The right to science requires that governments adopt measures to prevent exposure to hazardous substances on the basis of the best available scientific evidence. Scientific breakthroughs regarding harmful substances or processes should lead governments to adopt effective and timely measures to provide protection to their populations.[4] Governments should support scientific inquiry that create public benefits, including by producing and disseminating scientific knowledge on non-toxic methods and substances. In this regard, given that resources for scientific inquiry are limited, especially in developing countries, international cooperation is of critical importance.[5]

11. In April 2020, the Committee on Economic, Social and Cultural Rights adopted general comment No. 25 (2020) on science and economic, social and cultural rights. The clarity of interpretation reflected in the general comment provides a strong foundation and timely opportunity to address the implications of the right to science in the context of toxic substances.

12. The Special Rapporteur in the field of cultural rights, in her 2012 report on the right to enjoy the benefits of scientific progress and its applications, noted that certain agreed international standards "are insufficient to determine the hazard(s) of certain chemicals", and "have been criticized by civil society as an inadequate reflection of scientific progress in detecting the hazards of chemicals". She also observed how the reluctance of regulators to use general peer-reviewed and published scientific evidence of chemicals hazard(s) may "impede the application of the benefits of scientific progress by effectively limiting access to relevant information in decision-making processes".[6]

13. The report: (a) focuses attention on the connections between the human right to science and the dangers posed by hazardous substances, particularly as they relate to the

pesticides, pollutants, contaminants, explosive and radioactive substances, certain food additives and various forms of waste. For ease of reference the Special Rapporteur refers to hazardous substances and wastes as "toxics", and thus the term "toxics" (or "toxic substances") as used in the report also includes non-toxic but hazardous substances and wastes.

[2] See Organization of American States (OAS), Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights, 16 November 1999, available at: https://www.refworld.org/docid/3ae6b3b90.html; League of Arab States, Arab Charter on Human Rights, 15 September 1994, available at: https://www.refworld.org/docid/3ae6b38540.html; and Charter of Fundamental Rights of the European Union, 14 December 2007, available at: https://www.refworld.org/docid/50ed4f582.html.

[3] See, for example, Constitution of Madagascar (article 26), Constitution of Lesotho (article 35), Constitution of the Dominican Republic (article 64), Constitution of Ecuador (article 25), Constitution of Guatemala (article 57), Constitution of Mongolia (article 16), Constitution of Indonesia (article 28C), Constitution of Tajikistan (article 40), Constitution of Malta (article 8), Constitution of Spain (article 44), and Constitution of Poland (article 73).

[4] See World Conference on Science, Declaration on Science and the Use of Scientific Knowledge, (1 July 1999), para. 9 (noting "the ever-increasing need for scientific knowledge in public and private decision-making, including notably the influential role to be played by science in the formulation of policy and regulatory decisions"), available at: http://www.unesco.org/science/wcs/eng/declaration_e.htm.

[5] See Declaration on the Use of Scientific and Technological Progress in the Interests of Peace and for the Benefit of Mankind, proclaimed by the General Assembly in its resolution 3384 (XXX) of 10 November 1975.

[6] A/HRC/20/26, para. 55.

science-policy interface; (b) explores the relevant normative content of the right in relationship with other relevant human rights; (c) describes science and scientific evidence; (d) identifies threats against science and scientists; and (e) explores the mechanisms and platforms that are necessary for science to inform toxics policy and regulation.

14. The report does not address issues directly related to intellectual property rights, which were discussed in the 2014 report of the Special Rapporteur in the field of cultural rights,[7] nor does it address the ways in which science, whether in the conduct of science or the application of scientific knowledge, may itself violate human rights.

15. The report was informed through a broad consultative process by which the Special Rapporteur invited input from States Members of the United Nations, international organizations, non-governmental organizations, national human rights institutions and other key stakeholders. In addition, he widely disseminated a questionnaire, to which he received a number of valuable submissions from States, academia and civil society organizations.[8] The Special Rapporteur also held two online consultation meetings (on 4 May 2021 and 16 June 2021), with the participation of the Special Rapporteur on the promotion and protection of freedom of opinion and expression, experts representing civil society organizations from around the world and academics.

16. The Special Rapporteur expresses his gratitude to those who shared their expertise, insights and perspectives both in their written submissions and at online meetings. Those valuable insights have been incorporated into the findings in the report.

II. Science and scientific evidence

A. What is science?

17. The Recommendation on Science and Scientific Researchers, adopted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2017, offers a definition of science:

> … the enterprise whereby humankind, acting individually or in small or large groups, makes an organized attempt, by means of the objective study of observed phenomena and its validation through sharing of findings and data and through peer review, to discover and master the chain of causalities, relations or interactions; brings together in a coordinated form subsystems of knowledge by means of systematic reflection and conceptualization; and thereby furnishes itself with the opportunity of using, to its own advantage, understanding of the processes and phenomena occurring in nature and society; ….[9]

18. The 2017 UNESCO definition of science differs from a previous UNESCO definition in its inclusion of peer review as a core element of science.[10] Another core element of science is scientific responsibility, which, like peer review, guides the investigative process and the appraisal of the resulting knowledge.[11] According to the world's largest multidisciplinary scientific membership organization, scientific responsibility is "the duty to conduct and apply

[7] A/HRC/28/57. See also submission to questionnaire by Joshua Sarnoff.

[8] The submissions can be consulted on the webpage of the Special Rapporteur (www.ohchr.org/EN/Issues/Environment/SRToxicsandhumanrights/Pages/right-to-science.aspx).

[9] See http://portal.unesco.org/en/ev.php-URL_ID=49455&URL_DO=DO_TOPIC&URL_SECTION=201.html.

[10] United Nations Educational, Scientific and Cultural Organization (UNESCO) General Conference, Eighteenth Session, Paris, 1974, Recommendation on the Status of Scientific Researchers (C/Res 40).

[11] AAAS [American Association for the Advancement of Science] Science and Human Rights Coalition, "Defining the Right to Enjoy the Benefits of Scientific Progress and Its Applications: American Scientists' Perspectives" (report prepared by Margaret Weigers Vitullo and Jessica Wyndham), October 2013, available at: www.aaas.org/resources/defining-right-enjoy-benefits-scientific-progress-and-its-applications.

science with integrity, in the interest of humanity, in a spirit of stewardship for the environment, and with respect for human rights".[12]

19. At its core, therefore, science is a system of specific and specialized knowledge. Other systems of knowledge and ways of knowing coexist with science, including local, traditional and indigenous knowledge, and have "an important role to play in the global scientific dialogue".[13] In setting policies on toxics, therefore, science must take a central role while recognizing that other systems of knowledge also have a key role to play in the science-policy interface.

B. What is scientific evidence?

20. Scientific evidence, which is derived from the scientific process, can be understood as "a body of specialized knowledge accumulated through an iterative, logical and empirically based process. It will be derived from trustworthy, unbiased and peer-reviewed sources".[14]

21. The iterative character of science relies on the sharing of information about findings, methodologies and data, allowing for replication and scrutiny of scientific studies. It is through this process of constant interrogation and review that errors are identified and corrections are made, gaps are filled, nuances are added to the scientific record and scientific evidence evolves.

22. The iterative character of science embraces divergent views, which, when grounded in scientific and methodological rigor meeting the standards of the relevant scientific community, add to the scientific record rather than detracting from it. The Appellate Body of the World Trade Organization (WTO) has confronted the interplay between scientific evidence and policy in a case concerning contested scientific views on the risks associated with the use of hormones in stimulating beef growth. It explicitly recognized that responsible and representative governments may act in good faith on the basis of what, at a given time, may be a divergent opinion coming from qualified and respected sources.[15]

C. An enabling environment for science to flourish

23. In 2009, UNESCO led a process to give meaning to the right to science, which culminated in the Venice statement on the right to enjoy the benefits of scientific progress and its applications.[16] The Venice statement suggests that the normative content of the right to science be directed, inter alia, towards the creation of an enabling environment for science and technology, without which science cannot flourish.

24. An enabling environment demands respect for fundamental human rights and freedoms. This includes the exercise of academic and scientific freedoms that protect the

[12] See www.aaas.org/programs/scientific-responsibility-human-rights-law/aaas-statement-scientific-freedom.

[13] Committee on Economic, Social and Cultural Rights, general comment No. 25 (2020), para. 39.

[14] Submission to questionnaire from the American Association for the Advancement of Science.

[15] World Trade Organization (WTO), Appellate Body report, EC [European Communities] Measures Concerning Meat and Meat Products (Hormones), WT/DS26/AB/R, WT/DS48/AB/R (16 January1998), para. 194, available at: https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?DataSource=Cat&query=@Symbol=WT/DS26/AB/R&Language=English&Context=ScriptedSearches&languageUIChanged=true. See also, United States – Continued Suspension of Obligations in the EC – Hormones Dispute, WT/DS320/AB/R (16 October 2008), para. 591: "Although the scientific basis need not represent the majority view within the scientific community, it must nevertheless have the necessary scientific and methodological rigour to be considered reputable science. In other words, while the correctness of the views need not have been accepted by the broader scientific community, the views must be considered to be legitimate science according to the standards of the relevant scientific community.", available at: https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=Q:/WT/DS/320ABR.pdf&Open=True.

[16] See https://en.unesco.org/human-rights/science.

ability of scientists to communicate their findings openly with other scientists and with the public.

25. Scientists have the right to pursue research on questions of their choosing, whether in the area of basic science with no immediately evident social purpose, or in applied science that addresses a societal need. In reality, however, the production of science is influenced by multiple factors, including the institutional academic mechanisms of promotion and tenure and the interest of scientific journals in publishing novel science rather than replication studies.

26. An enabling environment guided by the right to science also obligates governments to foster scientific research on issues of particular social need, such as the impacts of, and alternatives to, hazardous substances, the prevention of exposure, the mitigation of harms and remediation.[17] In this regard, sufficient financial support for research and international cooperation are critical to encourage applied research in the field of toxics.[18]

27. For scientists to be able to exercise their freedoms, whistle-blower protections in government, industry and elsewhere are essential. Whistle-blower protections provide a safety mechanism through which scientists can raise concerns about misconduct that may undermine the rigour of the scientific process and the validity of its outputs.

28. An enabling environment also requires that scientists be free from undue pressure to act in any way contrary to their scientific responsibility. Such pressure may take the form of smear campaigns and personal or professional threats. Undue pressure may also result from attacks against scientific projects by labelling them as "pseudoscience", including "science denial and other anti-science perspectives".[19]

29. Scientific freedom and scientific responsibility are "inextricably linked".[20] Failure of scientists to act responsibly can have as significant a deleterious effect on the outcomes of science, and public trust in science, as can unjustifiable limitations on scientific freedom or corporate disinformation campaigns. Scientific responsibility demands scientific independence, which is vital for ensuring the integrity and validity of scientific research and findings.

30. Conflicts of interest, however, undermine scientific freedom and responsibility. Conflicts of interest often arise in cases when business interests exert undue influence on the design of research and/or the reporting of results.[21] When regulatory agencies inadequately monitor, disclose or manage conflicts of interest, such conflicts can pervade the regulatory process and impair an enabling environment for science.

III. Right to science in international human rights instruments

31. Article 27 (1) of the Universal Declaration of Human Rights recognizes the right of everyone to "share in scientific advancement and its benefits". The International Covenant on Economic, Social and Cultural Rights expands upon this right, in article 15, which recognizes the right of everyone to "enjoy the benefits of scientific progress and its applications", and the obligation of States to take the steps "necessary for the conservation, the development and the diffusion of science", to "undertake to respect the freedom indispensable for scientific research" and to "recognize the benefits to be derived from the encouragement and development of international contacts and cooperation in the scientific and cultural fields".

[17] Leslie London, "The right to enjoy the benefits of scientific progress for small farmers facing pesticides hazards" pp. 65–80, in Environmental Health Risks (Friedo Zölzer and Gaston Meskens, eds., Routledge, 2019).

[18] Besson, Samantha, "Science without Borders and the Boundaries of Human Rights: Who Owes the Human Right to Science", *European Journal of Human Rights*, 2012, No. 4, pp. 462–485.

[19] Submission to questionnaire from Andrea Boggio.

[20] See https://www.aaas.org/programs/scientific-responsibility-human-rights-law/aaas-statement-scientific-freedom.

[21] Submission to questionnaire from the Endocrine Society.

32. The inter-American system provides the most robust and comprehensive protection of the right to science among the regional human rights systems. The American Declaration of the Rights and Duties of Man (1948), in article XIII, recognizes the right to science in language similar to that of the Universal Declaration. The Charter of the Organization of American States, in article 38, calls for the sharing of the "benefits of science and technology" among its member States. The Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights (Protocol of San Salvador) (1988), in article 14, further elaborates upon the right to science.

33. The Arab Charter on Human Rights (2004) uses similar, though not quite as comprehensive, language to recognize the right to science.

34. In Europe, the Convention on Human Rights and Biomedicine (1997) reflects the principle of benefit sharing. Article 13 of the Charter of Fundamental Rights of the European Union (declared in 2000, came into force in 2009) states that the arts and scientific research shall be free of constraint and that academic freedom shall be respected.[22] While the European Convention on Human Rights is silent on the right to science, the European Court of Human Rights has referred to scientific evidence in its jurisprudence on article 6 on the right to a fair trial (addressing statutes of limitation in a case of latency periods for toxics exposure) and on articles 2 and 8 on the right to life and the right to respect for private and family life, respectively (addressing environmental risks).[23]

35. The African Commission on Human and Peoples' Rights has interpreted the right to a healthy environment under article 24 of the African Charter on Human and Peoples' Rights as requiring independent scientific monitoring of threatened environments and providing information and meaningful opportunities for participation to communities exposed to hazardous materials and activities.[24]

36. In April 2020, the Committee on Economic, Social and Cultural Rights adopted general comment No. 25 (2020), which addressed the entirety of article 15 of the International Covenant as it relates to science, clarifying the meaning of the right and exploring the connections between the right and other economic, social and cultural rights. The general comment offers the most comprehensive conceptualization of the right to science to date.

37. General comment No. 25 (2020) explicitly recognizes "scientific knowledge and information" as a benefit of scientific progress. It suggests that this benefit is realized "through the development and dissemination of the [scientific] knowledge itself".[25] The general comment further explains that a "clear benefit of scientific progress is that scientific knowledge is used in decision-making and policies".[26]

38. In addition, general comment No. 25 (2020) describes the core content of the right to science as requiring governments to align their policies with the "best available, generally accepted scientific evidence".[27] It also identifies the duty of governments to remove any limitations on access to scientific information and to promote accurate scientific information, refrain from disinformation and adopt mechanisms to provide protection against the harmful consequences of false and misleading information.

39. The obligation to align government policies with the best available scientific evidence demands that independent science and independent scientists be engaged in informing policy

[22] Explanations of the Charter note that this right is deduced primarily from the right to freedom of thought and expression and may be subject to the limitations authorized under article 10 of the European Convention on Human Rights, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32007X1214%2801%29.

[23] See, e.g., Manual on Human Rights and the Environment, available at: www.echr.coe.int/LibraryDocs/DH_DEV_Manual_Environment_Eng.pdf.

[24] African Commission on Human and Peoples' Rights, Social and Economic Rights Action Center and the Center for Economic and Social Rights v. Nigeria, communication No. 155/96, para. 53 (2001), available at: www.escr-net.org/caselaw/2006/social-and-economic-rights-action-center-center-economic-and-social-rights-v-nigeria.

[25] Committee on Economic, Social and Cultural Rights, general comment No. 25 (2020), para. 8.

[26] Ibid., para. 54.

[27] Ibid.

decisions and those processes be established for the review of outdated policy decisions, taking into account the evolving, non-static nature of scientific information.[28]

40. The right to science also includes the right to have access to technical scientific methodologies and findings, including findings on the risks and harms of exposure to hazardous substances. Recognizing that technical literature is often inaccessible to a general public, given the complexity of the terms and concepts used, the right to science also involves the duty of governments to disseminate scientific findings in language understandable to the general public.[29]

41. As the Special Rapporteur in the field of cultural rights noted in her 2012 report: "The right to have access to scientific knowledge is pivotal for the realization of the right to science. At the juncture of the right to education and the right to information, it implies a right to science education."[30] Scientific information communicated transparently and in plain language to broad audiences, according to their level of scientific literacy, is vital to the realization of the potential of the right to science and to counteracting ignorance and confusion about toxic substances. Such information is also a vital tool that equips the public to question reporting that purports to be scientific in nature but is, in reality, disinformation, created to manipulate public understanding and discourse. Both formal education institutions and informal education spaces, including libraries, museums and media outlets, have a role in contributing to furthering general science literacy.

42. Accessibility to scientific information about toxics, in a form that is understandable and actionable, strengthens the agency of individuals, communities and civil society to exercise the right to take part in the conduct of public affairs, as recognized in article 25 of the International Covenant on Civil and Political Rights (1966). Engagement of the public in decision-making related to hazardous substances engenders public trust in the decision-making process and its outcomes.

43. On the other hand, failure to enable public scrutiny and participation in decision-making related to hazardous substances, and failure to align government policies with the best available scientific evidence, are incompatible with the right to science. When the right to science is compromised, individuals and communities may be exposed to hazardous substances.

44. Accessibility of scientific information used to create policies on toxics is frequently addressed in legislation and often includes the creation of a repository or some other mechanism for facilitating access.[31] Open data, including the necessary privacy protections, can facilitate public understanding of the scientific basis for policy and support external assessments of whether policies are aligned with scientific evidence. The aim of the Kyiv Protocol on Pollutant Release and Transfer Registers (2009), for example, is to "enhance public access to information" on pollution from industrial sites and other sources.[32]

45. Dissemination of scientific information upon which governments rely in their decision-making is essential for transparency and facilitating public participation in science. Participation, as a core element of the right to science, is recognized in general comment No. 25 (2020).[33] This principle is echoed in other relevant normative statements, including principle 10 of the 1992 Rio Declaration on Environment and Development, the 1998 Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention) and the 2018 Regional Agreement on Access to Information, Public Partnership and Justice in Environmental Matters in Latin America and the Caribbean (Escazú Agreement).

46. The right to science includes participation in the conduct of science. Increasingly, "citizen science" projects are creating opportunities for participation in data collection,

[28] Submission to questionnaire from Frederick S. vom Saal.

[29] J. M. Wyndham and M.W. Vitullo, "The Right to Science—Whose Right? To What?", *European Journal of Human Rights*, 2015, No. 4, pp. 431–461.

[30] A/HRC/20/26, para. 27.

[31] Response to questionnaire from the Government of Argentina.

[32] Protocol on Pollutant Release and Transfer Registers (Kyiv Protocol), 2003.

[33] Committee on Economic, Social and Cultural Rights, general comment No. 25 (2020), paras. 53–55.

contributing to data analysis and interpretation and partnering in the dissemination of scientific information. For citizen engagement in research to be scientific in nature, the research must follow scientific methodologies and protocols.[34]

47. The citizen science model of engagement, which ties scientific inquiry to the needs of communities, can contribute to the relevance and impact of the scientific research, ensuring that the benefits of science reach the very people who need their application. Examples include the Pesticide Action Network Asia Pacific, one of five regional centres of the Pesticide Action Network, which supports the monitoring and recording of the impacts of pesticide use by impacted communities. This knowledge empowers the communities to exercise agency on their own behalf.[35] Such initiatives may be community-driven, facilitated by civil society organizations or encouraged by governmental authorities.[36]

48. General comment No. 25 (2020) also recognizes the core obligation to "foster the development of international contacts and cooperation".[37] The coronavirus disease (COVID-19) pandemic and several other recent epidemics of zoonotic origin underscore the importance of global cooperation and solidarity. International cooperation is particularly important in the toxic's context, where grave environmental injustices arise from insufficient institutional capacities, the differing levels of available resources across countries, opacity in access to relevant information and odious double standards revealed by the export of pesticides prohibited in their country of origin. In this regard, international agreements that reflect a rights-based approach and effect a science-policy interface are indispensable to reversing the severe toxification of the planet.

IV. Use of science to inform toxics policy

49. One of the primary benefits of scientific activity is the production of scientific knowledge and information.[38] One vital way in which that knowledge benefits society is in the alignment of policies on toxics with the "best available scientific evidence".[39]

50. An effective science-policy interface ensures that the policy and regulatory framework addressing toxics is grounded in the best available evidence. It also ensures that where science is unable to offer sufficient evidence, such as in the face of scientific uncertainties, toxics policy is developed in accordance with the precautionary principle. Furthermore, an effective science-policy interface mechanism engages all relevant stakeholders, securing opportunities for informed participation of the public. All three elements of an effective science-policy interface are vital to a human rights-based approach to toxics, as informed by the right to science.[40]

A. Best available science

51. Scientific evidence is required to ascertain hazards, risks and harm from toxics and response measures. The best available evidence consists of reproducible data and analyses derived from trustworthy and unbiased sources, adhering to accepted principles of scientific integrity and responsible conduct of research, published in scientific literature following a process of peer-review.[41] The best available science can be identified because it is broadly

[34] Response to questionnaire by Andrea Boggio.
[35] Response to questionnaire from the Pesticide Action Network Asia Pacific.
[36] Response to questionnaire from the Government of Malta.
[37] Committee on Economic, Social and Cultural Rights, general comment 25 (2020), para. 52.
[38] Ibid., para. 8.
[39] Ibid., para. 54. See also UNESCO recommendation, para. 5 (g), available at: https://unesdoc.unesco.org/ark:/48223/pf0000260889.page=116.
[40] Committee on Economic, Social and Cultural Rights, general comment No. 25 (2020), paras. 52, 54 and 82.
[41] Submission to questionnaire from the American Association for the Advancement of Science.

accepted by the scientific community or, at minimum, subject to minimal epistemic contestation.[42]

52. Studies on toxics do not meet the criteria for the best available science when they are tainted by the financial interests of research sponsors. That is the case, for example, when companies that have a financial stake in the substance in question, such as producers and sellers of toxics, or defendants in toxic torts cases, influence the design or findings of the studies they sponsor. For this reason, it is deeply concerning when toxics policy relies on seller-sponsored studies and ignores relevant literature published in peer-reviewed scientific journals.[43]

53. One important tool for creating transparency in toxics policy is making its scientific basis openly available. In practice, this may involve making the data that underpin a completed body of scientific research publicly accessible. When such data are accessible, they can be used to gain an understanding of the basis for policy decisions and the findings can be subjected to a process of scientific peer review. Moreover, any discrepancies between the scientific findings and the policies upon which they are based can be scrutinized.

54. Freedom of information mechanisms provide an important tool for ensuring access to government data. They have proven helpful for journalists and civil society in uncovering inadequate scientific underpinnings or inappropriate linkages between toxics policies and industry influences.

55. However, a blanket requirement for open data in order to establish policies related to toxics is not in the interests of transparency and the promotion of human rights. Privacy protections need to be in place when personally identifiable information is collected as part of, for example, epidemiological studies. To exclude studies that include such privacy protections from the science-policy interface would remove potentially relevant scientific studies from possible consideration by policymakers and regulators.

56. There are multiple tactics employed by industry, and sometimes also by governments, to create confusion about what constitutes the best available scientific evidence. In fact, a whole new industry has emerged to defend harmful products by obfuscating the science underlying public health or environmental regulation. The tactics employed by this product-defence industry include the manipulation or reanalysis of open data to cast doubt on or to distort scientific findings and the employment of individuals who appear neutral to defend the reanalysis in public forums.[44]

57. Transparency and open access to scientific information enables science to evolve. This includes questioning assumptions and methods that are no longer capable of explaining certain causal interactions involving toxics. Such stale assumptions include, for example, that males and females respond in the same way if exposed to an endocrine disrupting chemical, or that there is a “safe” or “threshold” level of exposure for such chemicals. Adherence to outdated assumptions and procedures in regulatory approaches fail to take proper account of the evolving nature of science.

58. The evolving nature of science also means that scientific understandings may be subject to change. While science leads to the creation of reliable knowledge, scientific literature can also recognize gaps in knowledge and uncertainties. This, however, does not justify a relativist substitute for science. Rather, such gaps in knowledge and uncertainties demand that the methodological foundations of claims to scientific evidence be scrutinized.

59. The role of “divergent and minority [scientific] opinions” in the regulation of risk have been recognized by WTO.[45] Minority scientific opinions do not exist in all

[42] Submission to questionnaire from Andrea Boggio.

[43] Submission to questionnaire from the Centre for Health Science and Law.

[44] D. Michaels, Doubt is Their Product: How Industry’s Assault on Science Threatens Your Health, Oxford University Press (2008); and D. Michaels, The Triumph of Doubt: Dark Money and the Science of Deception, Oxford University Press (2020).

[45] WTO, Appellate Body report, European Communities – Measures Concerning Meat and Meat Products (Hormones), WT/DS26/AB/R, WT/DS48/AB/R (16 January 1998), para. 194. See also,

circumstances and may not be relevant in all contexts, but when divergent scientific views either shed light on gaps in the existing majority scientific view or offer alternative conclusions or explanations, that science can be used by responsible governments in the development of regulations or laws concerning hazardous substances.

60. The standards required of minority scientific opinions are the same for majority science. Governments may act on the basis of minority science when expressed coherently, coming from qualified and objective sources following a process of methodological rigour required by science and considered legitimate by the standards of the relevant scientific community.

B. Precautionary principle

61. Given that science does not, in respect of all substances, in all situations and at all times identify conclusive causal connections between toxics and their impacts, and given that science is a process of continual knowledge development, knowledge gaps and uncertainties are unavoidable. It is the existence of such uncertainties that makes the adoption of the precautionary principle so important.[46]

62. General comment No. 25 (2020) explicitly recognizes the "important role" of the precautionary principle in contexts in which there is no full scientific certainty.[47] The precautionary principle requires that, in the absence of scientific consensus, States should act cautiously and diligently, and should avoid steps that may cause harm to human health or the environment.[48] For example, the precautionary principle would apply where scientific evidence used to determine whether pesticides should be approved for use was incomplete or ambiguous. If it could not be scientifically determined that a pesticide would not cause disease or disability, or affect fertility, then its use should not be approved.

63. Referencing the UNESCO World Commission on the Ethics of Scientific Knowledge and Technology (2005), general comment No. 25 (2020) describes harms in the context of which the precautionary principle should particularly apply as harms: "(a) threatening to human life or health; (b) serious and effectively irreversible; (c) inequitable to present or future generations; or (d) imposed without adequate consideration of the human rights of those affected".[49]

64. In international forums and normative documents, particularly those related to environmental protection, the precautionary principle is widely recognized and applied, in varying formulations.[50] In at least three countries the precautionary principle is constitutionally recognized.[51] Legislation and judicial decisions exist in many jurisdictions and international tribunals have begun to apply the precautionary principle.[52] At the same

United States – Continued Suspension of Obligations in the EC-Hormones Dispute, WT/DS320/AB/R (16 October 2008), p. 591.

[46] European Union, Communication from the Commission on the precautionary principle (COM(2000) 1 final of 2 February 2000), available at: https://op.europa.eu/en/publication-detail/-/publication/21676661-a79f-4153-b984-aeb28f07c80a/language-en.

[47] Committee on Economic, Social and Cultural Rights, general comment No. 25 (2020), para. 56. See also, Venice statement on the right to enjoy the benefits of scientific progress and its applications.

[48] Inter-American Court of Human Rights, Advisory Opinion OC-23/17, 15 November 2017, para. 180. The precautionary principle, at times referred as an approach, figures prominently in a number of international instruments, including: the landmark Rio Declaration on Environment and Development (1992) (principle 15), the United Nations Framework Convention on Climate Change (1992) (article 3 (3)), and the Stockholm Convention on Persistent Organic Pollutants (2001).

[49] World Commission on the Ethics of Scientific Knowledge and Technology, "The precautionary principle" (Paris, UNESCO, 2005), p. 14.

[50] See Hubert, Anna-Maria, "The Human Right to Science and Its Relationship to International Environmental Law", *European Journal of International Law*, vol. 31, Issue 2, pp. 625–656.

[51] Côte d'Ivoire, Ecuador and France.

[52] European Court of Human Rights, Chamber Judgment, *Tătar v. Romania*, Application No. 67021/01, paras. 109 and 120; International Tribunal for the Law of the Sea, Advisory Opinion of 1 February 2011, Responsibilities and Obligations of States sponsoring persons and entities with respect to

time, across and within domestic jurisdictions, application of the precautionary principle is not universal.

65. The precautionary principle calls on governments to regulate hazardous substances with a view to ensuring protection for the rights to life, health and a healthy environment. For example, the precautionary principle demands that governments require private industries to reveal all they know about the toxic effects of their products. Information on the risks and harms caused by hazardous substances should not be considered confidential. Nevertheless, unwarranted claims of confidential business information are often used by industries to avoid disclosure of information regarding hazardous substances.

66. Decision-making about policies and the regulation of toxics demands a participatory approach that engages all relevant stakeholders in a transparent process of assessment, decision-making and implementation. This is particularly the case in the absence of scientific certainty, when the public and local communities often bear disproportionate risks of exposure to hazardous substances. In addition to scientists, local, traditional and indigenous knowledge can strengthen decision-making on toxics.[53] To that end, the engagement of potentially affected individuals and communities is vital, and States should provide the resources – financial and informational – to facilitate such engagement.

C. Effective science-policy interface platforms

67. The right to science requires that States align policies on toxics with the best available scientific evidence. There are multiple ways to recognize and enable input of scientific information in decision-making processes about toxics at the national and international levels.

68. At the national level, a common science-policy interface mechanism is the appointment of a chief scientist, or equivalent, who serves as primary adviser to the executive branch, sometimes even serving in the executive cabinet. Increasingly, governmental scientific agencies have been created with the mandate to inform government decision-making, and there is increasing reliance on scientific and technical advisory committees to advise legislators or regulators. Such committees can bring a broad range of technical expertise and opinions, and should be selected from recognized, credible experts in their field who are independent and without conflict of interest.

69. At the international level, science-policy interface platforms synthesize and critically evaluate existing scientific knowledge for the benefit of the international community. For example, the science-policy interface is at the core of the functioning of the United Nations Environment Assembly.[54] The scientific assessments of the Intergovernmental Panel on Climate Change and the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services contribute critical knowledge to policymakers.

70. In the multilateral toxics realm, specifically, science-policy interface platforms are more fragmented. Some platforms such as the Global Chemicals Outlook process have been steered by the United Nations Environment Programme, while others have been established under treaty structures. The Montreal Protocol, the Basel Convention, the Rotterdam Convention, the Stockholm Convention and the Minamata Convention all include some form

activities on the Area, paras. 131 and 135; International Court of Justice, Judgment of 20 April 2010, Case concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay), para. 164; see also Foster C., Science and the Precautionary Principle in International Courts and Tribunals, Cambridge University Press, 2011.

[53] Morgera, Elisa, "Fair and Equitable Benefit-Sharing at the Cross-Roads of the Human Right to Science and International Biodiversity Law", *Laws*, 2015, vol. 4 (4), pp. 803–831.

[54] General Assembly resolution 66/288, para. 88 (d). See also General Assembly resolution 2997 (XXVII) and United Nations Environment Assembly resolution 4/23 (UNEP/EA.4/Res.23).

of science-policy interface platform that focuses on the objectives of the respective multilateral environmental agreement.[55]

71. Some of these science-policy interface mechanisms, however, have not proven wholly effective. The Conference of the Parties to the Rotterdam Convention, for example, has repeatedly failed to act on the recommendations of its Chemical Review Committee. As a result, the controls necessary to prevent harm to human health and the environment from several hazardous substances, including paraquat dichloride, a highly hazardous pesticide, and chrysotile asbestos, a highly toxic mineral used in construction, are not in place.

72. Unlike the situation with regard to climate change and biodiversity, no global intergovernmental science-policy body exists in the context of managing hazardous substances and waste. Such a platform could raise global awareness of the serious toxification of the planet, identify emerging issues of concern and produce authoritative scientific assessments to prevent exposure to harmful chemicals and waste.[56] Such a global body could also overcome the shortcomings of the fragmented character of current science-policy mechanisms in the field of toxics and waste.

73. As emphasized by the United Nations Environment Assembly in its resolution 4/8, there is an "urgent need to strengthen the science-policy interface at all levels to support and promote science-based local, national, regional and global action on the sound management of chemicals and waste beyond 2020; use of science in monitoring progress thereon; and priority setting and policymaking throughout the life cycle of chemicals and waste, taking into account the gaps and scientific information in developing countries". At its next session, the United Nations Environment Assembly is expected to assess options for strengthening the science-policy interface for the sound management of chemicals and waste.[57]

V. Threats to the right to science in the toxics context

74. Effective science-policy interface platforms are critical to support the realization of the right to science and to enable societies to properly address the risks and harms of hazardous substances. The operation of such platforms is often hindered, however, by a number of threats, including tactics to divert attention and distort findings, conflicts of interest, attacks against scientists and disinformation campaigns by irresponsible business entities.

A. Tactics to divert attention and distort findings

75. Greenwashing is a tactic frequently employed by industry and sometimes by governments in addressing responses to known harms caused by hazardous substances. Greenwashing involves making an appearance of responding to the risks and harms associated with hazardous substances, for example, by holding hearings about the known health impacts of toxics and issuing health advisories, all without creating enforceable standards or meaningful change. The result is that while these measures give the appearance that governments or industries are taking action, in reality, they have no, or little, practical implications for the individuals and communities harmed by the substances in question.

[55] Montreal Protocol on Substances that Deplete the Ozone Layer, 1987 (Montreal Protocol), Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1989 (Basel Convention); Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998 (Rotterdam Convention); Stockholm Convention on Persistent Organic Pollutants, 2001 (Stockholm Convention); and Minamata Convention on Mercury, 2013 (Minamata Convention).

[56] Wang, Zhanyun et al., "We need a global science-policy body on chemicals and waste", Science, 19 February 2021, vol. 371, Issue 6531, pp. 774–776.

[57] See United Nations Environment Programme (UNEP), Assessment of options for strengthening the science-policy interface at the international level for the sound management of chemicals and waste, 2020.

76. The same can be said of legislative proposals that, on their face, appear to support the integration of the best scientific evidence into policy processes, but which in reality are aimed at stymying the role of science in decision-making. One example is the push by chemical companies for a "transparency rule". Such a rule would demand that greater weight be given to scientific studies that reveal the underlying raw epidemiological data on which they are based. Irresponsible firms covet access to such data to manipulate methodological parameters of studies and to dispute scientific findings. Moreover, given the private and confidential nature of much of such data, "transparency" rules would exclude potentially relevant scientific findings.

B. Conflicts of interest

77. Conflicts of interest pose a direct threat to the right to science, particularly in the toxics context. They can undermine scientific integrity, cause confusion and erosion of public trust in science and harm health and the environment.[58]

78. Conflicts of interest arise when scientists are employed or promised employment, whether funded or contracted, or otherwise derive benefit from a business entity or industry about which they are doing research and communicating findings.[59] Rather than following the rigorous process of independent scientific inquiry, these conflicted scientists may produce and communicate misinformation and may suppress data and findings that run contrary to the interests of their sponsors. Oftentimes the motivation of business entities that offer financial reward for scientific pretence is to intentionally delay or kill regulatory actions that would change the status quo and reduce their market share, despite any possible risk or harm to human health and the environment.

79. Conflicts of interest can arise at each stage of the research process, including when formulating a hypothesis, conducting a literature review, designing a study and recruiting participants, analysing data, sharing research data and communicating findings. Conflicts may be identified at multiple stages along this continuum, from the time that reviewers determine the eligibility of a study for external funding through to the process by which academic journals determine whether a paper is to be published. Conflicts can also be addressed by policymakers who rely on scientific studies to inform their decisions.

80. In order for the right to science to be realized, policymaking processes informed by science must be free of conflicts of interest. Conflicts can be avoided if governments ensure adequate funding for investigator-initiated research that is not associated with private industries. In practice, however, industries invest immense resources in research, including through industry/academic partnerships.[60] In such cases, conflicts may be avoided through the independent design and peer review of scientifically rigorous methodologies aimed at preserving the independence of the scientific process.

81. When conflicts cannot be avoided, conflict management through disclosure is the standard approach. The disclosure of any conflicts of interest is standard practice in peer review panels for funding and in the review of publications by scientific journals, but it is not standard practice in the submission of scientific evidence in regulatory processes. Disclosure has proven to be an unreliable approach in many instances, given the voluntary character of self-reporting and inadequate enforcement mechanisms and penalties.

82. In order for the science that forms the basis of policy to be trusted, conflicts should be avoided rather than simply managed through disclosure processes. Complete avoidance of conflicts of interest requires that researchers, regulators, policymakers, journal editors and others not be allowed to accept roles and responsibilities that compromise their scientific independence.

[58] Submission for the questionnaire of the Irerê Network for the Protection of Science.

[59] See Resnik, David B., "Conflicts of Interest in Science", *Perspectives on Science*, vol. 6, No. 4 (1998), pp. 381–408.

[60] Response to questionnaire of the Endocrine Society.

83. Complete avoidance of conflict is the approach taken, for example, by the World Health Organization (WHO) Framework Convention on Tobacco Control with regard to individuals associated with the tobacco industry. The WHO approach taken in the context of nutrition programmes, specifically, was to avoid both potential conflicts of interest and also a reasonable perception of a conflict of interest.[61] Avoidance of conflict is also the approach taken by the Intergovernmental Panel on Climate Change (IPCC) conflict of interest policy, which aims not only at avoiding conflicts of interest but also at avoiding the perception of a potential conflict of interest.[62] As described in the IPCC policy, the primary motivation behind the approach is to "protect the legitimacy, integrity, trust, and credibility" of the body.[63]

C. Attacks against and harassment of scientists

84. Scientists who expose the negative impacts of toxics can also be seen as human rights defenders and are often subject to attacks, threats, smear campaigns, intimidation and harassment by entities with a vested financial interest in the marketing of hazardous substances. Such actions include legal action, accusations of misconduct, withdrawal of funding, censorship, thwarting career progression, loss of employment, loss or denial of tenure and intimidation of family members.

85. Such actions directly threaten the "freedom indispensable for scientific research" recognized in article 15 (3) of the International Covenant on Economic, Social and Cultural Rights and also contravene the principles of protection for human rights defenders.[64] The right to freedom of expression, read together with the right to science, safeguards the space for scientists to communicate their scientific findings freely and openly without threat of harassment or other retaliation.[65]

D. Disinformation

86. Conflicts of interest in scientific studies and attempts to silence scientists are ways of manipulating the information on hazardous substances and waste in the public domain and resulting policy decisions. Another pervasive and nefarious practice is the fabrication and dissemination of disinformation. Disinformation as a tactic is not new, but it has become all the more threatening through the use of the Internet, social media and machine learning, which make widespread and targeted messaging possible.

87. Disinformation, as described by the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, is "false information that is disseminated intentionally to cause serious social harm".[66] In accordance with the right to science, States have an obligation to guard against the dissemination of false or misleading scientific information.[67]

88. Disinformation campaigns are ubiquitous in the toxics context; they reflect tactics of industry aimed at spreading doubt and confusion in society. The tobacco industry in the 1950s developed tactics that have been followed by numerous industries. These well-known tactics include: diverting attention and fabricating doubt by funding research on a wide array of alternative explanations; claiming lack of scientific proof and demanding ever more scientific research; setting up and/or funding front groups with a scientific appearance to propagate

[61] World Health Organization (WHO), "Safeguarding against possible conflicts of interest in nutrition programmes", EB142/23, 4 December 2017.

[62] See Intergovernmental Panel on Climate Change (IPCC), IPCC conflict of interest policy, available at: www.ipcc.ch/site/assets/uploads/2018/09/ipcc-conflict-of-interest-2016.pdf.

[63] Ibid.

[64] See www.ohchr.org/en/issues/srhrdefenders/pages/translation.aspx.

[65] Committee on Economic, Social and Cultural Rights, general comment No. 25 (2020), para. 50.

[66] A/HRC/47/25, para. 15. Misinformation is defined as "the dissemination of false information unknowingly. The terms are not used interchangeably".

[67] Ibid., para. 43.

industry propaganda and to lobby governmental bodies; and attacking or distorting scientific findings contrary to industry interests.[68]

89. In the toxics context, examples of disinformation tactics abound, including on the part of the fossil fuel industry and agroindustry,[69] for example: (a) "ghost-writing" studies to support an industry position is a tactic aimed at obfuscating the connections between authors and the industry in question; (b) manipulation of the findings of research studies in patent applications; (c) deliberate misinterpretation or cherry-picking of data; (d) hiding or suppressing information; and (e) posing as a defender of health or truth.

90. The hunger for profit of companies spur disinformation, and the thirst for profit of social media companies drive the online disinformation machinery. Politicians with conflicting interests also have financial and other incentives to spread disinformation. As a result, contrary to the right to science, accurate information concerning the risks and harms of hazardous substances is not accessible to all, and the ability of governments to adopt policies based on the best available scientific evidence is significantly undermined.

91. The right to science requires that governments correct scientific disinformation. Some governments have taken steps to correct the public record or issue clarifications when scientific information is misrepresented in publications or in the press.[70] Such actions, however, are not commonplace. Governmental silence in the face of industry attempts to manufacture ignorance for profit carries with it substantive harm to people's human rights.

92. The right to science, including evidence-based decision-making in the public interest, is a pillar of participatory decision-making under the 2030 Agenda for Sustainable Development. At the same time, efforts to curb disinformation must be pursued consistent with the right to freedom of expression, which can only be restricted in order to protect the rights of others, to protect the reputations of others or to preserve public health, public order and national security.[71] The international community and national governments face the challenge of how to address the problem of disinformation while protecting freedom of expression.

93. Valuable tools in the fight against disinformation can be found in measures to secure the right of access to information. Scientific information is made accessible by, inter alia, ensuring the freedom of expression of scientists, providing robust whistle-blower protections for scientists in the public and private sectors, establishing adequate penalties for withholding scientific studies from regulators, putting an end to secrecy under the guise of confidential business information and requiring that data underlying scientific publications be made accessible. Ensuring a free and independent media, empowered to report on scientific advances in a robust and open manner, is also vital.

94. The Special Rapporteur in the field of cultural rights has recognized science as a public good.[72] UNESCO, in its 2017 revised Recommendation on Science and Scientific Researchers, also recognized science as a common good. Accordingly, structures need to be in place to provide everyone with the opportunity to continuously engage with scientific knowledge and to interrogate, investigate and contribute to that knowledge. When science is appreciated as a public good, the challenges of disinformation can no longer be understood as primarily or solely a concern of the State, or a State and business concern, but one that must engage multiple actors in society.

95. The Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework also have a role to play in safeguarding

[68] Oreskes N., "The fact of uncertainty, the uncertainty of facts and the cultural resonance of doubt", Philosophical Transaction of the Royal Society, November 2015, vol. 373, Issue 2055, p. 373; see also, Oreskes, N and Conway, E.M., Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Climate Change, Bloomsbury Press, 2010.

[69] Goldberg, Rebecca F. and Vandenberg, Laura N., "Distract, delay, disrupt: examples of manufactured doubt from five industries", *Reviews on Environmental Health*, vol. 34, No. 4, 2019, pp. 349–363, available at: https://doi.org/10.1515/reveh-2019-0004.

[70] Submission to questionnaire from the Government of Malta.

[71] International Covenant on Civil and Political Rights, article 19.

[72] See A/HRC/20/26.

against disinformation by business entities. Due diligence is a process for identifying human rights risks and preventing abuses, including those resulting from exposure to hazardous substances. Due diligence by businesses should produce "information that is sufficient to evaluate the adequacy of an enterprise's response to the particular human rights impact".[73] Businesses should also take the necessary measures to avoid negative impacts, including ensuring accurate communication of any hazards, risks or harms identified through the due diligence process.[74]

96. In his 2019 thematic report to the Human Rights Council, the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes put forward a number of principles aimed at protecting workers from exposure to toxics substances. Principle 6 calls on States to "prevent third parties from distorting scientific evidence or manipulating processes to perpetuate exposure". This includes "the deliberate tampering with, obfuscation or distortion of scientific evidence or the manipulation of processes by business enterprises and other third parties to the detriment of workers' health and safety".[75]

VI. Conclusions

97. **The right to science requires that government policy be aligned with the best available scientific evidence and that policymaking processes be participatory. Science-policy interface platforms provide a mechanism for integrating the best available scientific evidence into deliberations and the formulation of policies and practices concerning hazardous substances at the national, regional and international levels. Policy mechanisms that integrate scientific evidence and engage the public in the deliberative process can help engender public trust and improve protections against exposure to hazardous substances.**

98. **Science is a system of knowledge derived from rigorous methodologies, leading to replicable findings that are subject to peer review. Science produces knowledge on the existence, extent and impacts of toxic hazards and helps to identify risks and harms and to develop responses. Scientific knowledge enables safeguarding an array of human rights in the toxics context, including the right to life with dignity, the right to the highest attainable standard of health and the right to a healthy environment.**

99. **Because scientific research produces an evolving body of knowledge, some areas of current scientific understanding are contested and gaps in knowledge exist. Science-policy interface platforms are a forum for addressing what is known and what is unknown about hazardous substances and for developing policies accordingly. In this context, the precautionary principle, a critical tool for dealing with uncertainty, has proved particularly influential in court decisions.**

100. **Domestically, there are models of science-policy interface platforms that, for example, inform legislative development, contribute to the development and implementation of executive-branch science policy and guide the formulation of regulation.**

101. **At the multilateral level, science-policy interface platforms exist in several multilateral environmental agreements. In the field of chemicals and waste, however, such platforms are fragmented and their effectiveness limited. The Conference of the Parties to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade has yet to fully heed the advice of its own scientific committee regarding the necessary controls of hazardous substances under its scope.**

102. **One of the greatest threats to effective science-policy interface platforms are conflicts of interest. These arise from inappropriate financial relationships that**

[73] A/HRC/17/31, annex, guiding principle 21 (b).
[74] See A/HRC/42/41.
[75] Ibid., para. 48.

scientists, scientific advisers or policymakers and regulators may have with industries, front groups or specific companies that have vested interests in policies under consideration. When such conflicts lead to suppression of scientific evidence or the manipulation of scientific findings, the integrity and effectiveness of the science-policy interface platform is undermined and human rights and environmental health are threatened.

103. **Scientists, whose expert views are invited to inform policy and regulation, have an ethical responsibility to conduct their work with integrity and a social responsibility to contribute to the social good and to respect human rights. Scientists, however, are often subject to immense pressure, threats, harassment, intimidation and persecution if they voice or publish opinions that are contrary to the interests of business enterprises or political appointees. Whistle-blower protections and existing national and international tools for protecting human rights defenders can be used to support and protect scientists who speak out against bad practices in the private or public sector, sound the alarm on the risks and harms of hazardous substances or raise awareness about existing or potential human rights violations.**

104. **Disinformation is a direct violation of the right to science. Disinformation, which involves the deliberate spread of false information, has become a powerful tool for manipulating public understanding and debate, generating confusion and doubt about the risks of toxics and cultivating mistrust in science.**

105. **Businesses that produce and sell harmful substances engage in multiple tactics to manufacture doubt about the harmfulness of their products. Numerous examples exist of companies denying or distorting facts and realities, diverting attention to spread confusion, demanding ever more research to avoid or delay controls or attacking or harassing scientists who speak out. Some companies fund front groups and/or mercenary scientists to pose as independent think tanks or experts to push company propaganda. These business tactics are a direct attack on the right to science and are incompatible with the human rights responsibilities of business.**

106. **The right to science implies the availability and accessibility of accurate scientific information to the general public and specific stakeholders. The right to science also requires that governments correct scientific disinformation. In addition, the right to science implies an enabling environment where scientific freedoms may be realized and where governments foster needed scientific research on toxic substances that endanger human health and the environment.**

107. **The right to science requires that States foster the development of international contacts and cooperation in science. International cooperation is critical to unified efforts to face the increasing toxification of the planet, and particularly relevant to low and middle income countries that lack the resources to carry out adequate scientific inquiry into the risks and harms of hazardous substances. Both bilateral assistance and science-policy interface platforms at the global level have the potential to enhance the capacity of the international community in translating science into policy. The international community has recognized the urgent need to strengthen the science-policy interface specifically in the toxics context, as reflected in resolution 4/8 adopted by the United Nations Environment Assembly.**

VII. Recommendations

108. **The Special Rapporteur recommends that States:**

(a) **Design policy interventions to address the risks and harms of hazardous substances on the basis of the best available scientific evidence;**

(b) **Create structures and procedures that engage independent scientific bodies and independent scientists to inform policy decisions, legislative developments and regulation concerning hazardous substances;**

(c) **Ensure the proper evaluation of chemicals and the disclosure of scientific information to the public, prior to products being authorized for release on the market;**

(d) **Respond to scientific breakthroughs by updating and revising protection measures regarding toxics in a timely manner;**

(e) **Apply the precautionary principle in all policymaking and regulatory contexts in which the relevant scientific evidence concerning hazardous substances is inconclusive;**

(f) **Create processes for meaningful public participation, including impacted communities, in policymaking processes concerning hazardous substances;**

(g) **Make scientific evidence that is relied upon as the basis for policymaking, legislation and regulation, including underlying data, publicly available;**

(h) **Put an end to the practice of withholding scientific information from disclosure under the pretence that it is confidential business information;**

(i) **Ensure the availability and accessibility, in understandable and actionable terms, of scientific information on hazardous substances of relevance to all stakeholders;**

(j) **Support the inclusion in primary and secondary education of age-appropriate materials concerning hazardous substances, paying attention to the specific needs of impacted communities;**

(k) **Support scientific inquiry on toxics and wastes that creates public benefits, including through the direct funding of investigator-initiated research into the human health and environmental risks and harms of hazardous substances;**

(l) **Create an enabling environment that protects scientists (and, in case of need, their families and colleagues) from undue pressure to act contrary to their scientific responsibilities and from any possible intimidation or retaliation and that provides a safe and effective mechanism for scientists to raise concerns about issues they encounter, whether in the private or public sector, that may jeopardize human rights;**

(m) **Ensure that courts of law do not allow secrecy agreements in the settlement of cases involving toxics that seal from public view scientific evidence on the health, safety and environmental risks and harms of chemicals and waste;**

(n) **Establish mechanisms to use industry funding for scientific studies while preserving the independence of the researchers and ensuring the communication of their findings;**

(o) **Establish scientific integrity policies to guide the funding, conduct and reliance on scientific research by government agencies, including requiring that scientific evidence that is reviewed in the policymaking process be evaluated according to criteria accepted by the independent scientific community not the industry being evaluated;**

(p) **Create and implement safeguards to identify and avoid conflicts of interest, with particular attention to funding structures for science: the review of potential conflicts of interest should be ongoing throughout engagements and due processes should be followed to remove conflicted scientists;**

(q) **Adopt measures to correct scientific disinformation that has the potential to cause harm to individuals, communities or the environment;**

(r) **Establish appropriate civil and criminal penalties for business entities and their executive officers that withhold scientific studies and evidence from regulators.**

109. **The Special Rapporteur recommends that business enterprises:**

(a) **Conduct human rights due diligence processes to identify and address any negative human rights impacts of their businesses, including with regard to workers and impacted communities;**

(b) **Communicate to all relevant stakeholders any hazards, risks and harms identified through the due diligence process;**

(c) **Elaborate a plan for the sound management and disposal of hazardous substances, on the basis of best available scientific evidence, to be communicated to workers, regulators and the public;**

(d) **Develop and implement robust and effective whistle-blower and human rights defender protections that include a prohibition on retaliation, a commitment to anonymity and confidentiality, as appropriate, and a regular evaluation of their effectiveness;**

(e) **Refrain from practices that create or could create conflicts of interest in science-policy interface platforms;**

(f) **Commit to and refrain from spreading disinformation and manipulating or distorting the impartiality and independence of the scientific process;**

(g) **Commit to transparency in the communication of any scientific findings or advice by any individual employed by or otherwise associated with a related business enterprise.**

110. **The Special Rapporteur recommends that international bodies and mechanisms in the field of management of chemicals and wastes:**

(a) **Join efforts in strengthening the science-policy interface at the international level for the sound management of chemicals and waste, as recommended by the United Nations Environment Assembly in its resolution 4/8, and establish a global science-policy interface on the sound management of chemicals and waste that is free of conflict of interests and that:**

(i) **Assesses the body of scientific evidence concerning chemicals and wastes;**

(ii) **Raises early warnings on chemicals and waste issues of special concern;**

(iii) **Builds on the Global Chemicals Outlook and Global Waste Management Outlook processes of the United Nations Environment Programme;**

(b) **Ensure the effective operation of science-policy interface platforms that exist in dedicated multilateral environmental agreements;**

(c) **Enhance the science-based assessment and control of classes of chemicals through existing science-policy interface and regulatory mechanisms;**

(d) **Consider building on the model for avoiding conflicts of interest put in place by the Intergovernmental Panel on Climate Change.**