

responses are short lived and toxicity is high.¹ The role of adjuvant radiotherapy in addition to adjuvant ICI should also be investigated.

PS and AB report consultancy fees from Merck Serono broadly related to treatments for Merkel cell carcinoma but unrelated to the topic of this Comment. PS reports consultancy fees from MSD and BMS outside of the topic of this Comment.

*Philippe Saiag, Astrid Blom
philippe.saiag@uvsq.fr

Department of General and Oncologic Dermatology, Ambroise Paré Hospital, Université de Versailles Saint-Quentin-en-Yvelines, Université Paris-Saclay, 92104 Paris, France

- 1 Gauci ML, Aristei C, Becker JC, et al. Diagnosis and treatment of Merkel cell carcinoma: European consensus-based interdisciplinary guideline—update 2022. *Eur J Cancer* 2022; **171**: 203–31.
- 2 Schadendorf D, Nghiem P, Bhatia S, et al. Immune evasion mechanisms and immune checkpoint inhibition in advanced merkel cell carcinoma. *Oncol Immunology* 2017; **6**: e1338237.
- 3 Nghiem P, Bhatia S, Lipschitz EJ, et al. Three-year survival, correlates and salvage therapies in patients receiving first-line pembrolizumab for advanced Merkel cell carcinoma. *J Immunother Cancer* 2021; **9**: e002478.
- 4 D'Angelo SP, Lebbé C, Mortier L, et al. First-line avelumab in a cohort of 116 patients with metastatic Merkel cell carcinoma (JAVELIN Merkel 200): primary and biomarker analyses of a phase II study. *J Immunother Cancer* 2021; **9**: e002646.
- 5 Weppler AM, Da Meda L, Pires da Silva I, et al. Durability of response to immune checkpoint inhibitors in metastatic Merkel cell carcinoma after treatment cessation. *Eur J Cancer* 2023; **183**: 109–18.
- 6 Kim S, Wuthrick E, Blakaj D, et al. Combined nivolumab and ipilimumab with or without stereotactic body radiation therapy for advanced Merkel cell carcinoma: a randomised, open label, phase 2 trial. *Lancet* 2022; **400**: 1008–19.
- 7 Eggermont AMM, Blank CU, Mandalà M, et al. Adjuvant pembrolizumab versus placebo in resected stage III melanoma (EORTC 1325-MG/KEYNOTE-054): distant metastasis-free survival results from a double-blind, randomised, controlled, phase 3 trial. *Lancet Oncol* 2021; **22**: 643–54.
- 8 Long GV, Luke JJ, Khattak MA, et al. Pembrolizumab versus placebo as adjuvant therapy in resected stage IIB or IIC melanoma (KEYNOTE-716): distant metastasis-free survival results of a multicentre, double-blind, randomised, phase 3 trial. *Lancet Oncol* 2022 **23**: 1378–88.
- 9 Becker JC, Ugurel S, Leiter U, et al. Adjuvant immunotherapy with nivolumab versus observation in completely resected Merkel cell carcinoma (ADMEC-O): disease-free survival results from a randomised, open-label, phase 2 trial. *Lancet* 2023; published online July 11. [https://doi.org/10.1016/S0140-6736\(23\)00769-9](https://doi.org/10.1016/S0140-6736(23)00769-9).

Advancing integrated governance for health through national biodiversity strategies and action plans



In 2022, 196 government parties to the Convention on Biological Diversity (CBD) agreed to update and redesign their national biodiversity strategies and action plans (NBSAPs) by the end of 2024. This process offers an opportunity to influence the implementation of the Kunming-Montréal Global Biodiversity Framework and to shape how countries frame and address biodiversity–health interlinkages for the next decade.¹ Historically, NBSAPs have not drawn on available health expertise in their implementation. This is the time to prioritise fundamental gaps in the knowledge-to-policy interface and to improve policy coordination to advance systems-level, holistic health approaches to implementation. We propose recommendations for aligning NBSAPs to optimise outcomes for biodiversity and health.

NBSAPs define how a country values, assesses, protects, and accounts for nature across ecosystems and sectors and also characterise the national policy, regulatory, and investment framework for reducing the risks of biodiversity loss and restoring natural ecosystems. Despite repeated calls since 2000 from governments under the CBD to strengthen the health component of NBSAPs,^{2–5} and a 2016 intergovernmental declaration on mainstreaming biodiversity for

wellbeing,⁶ this element has not been well developed. Greater incorporation of health considerations and involvement of health stakeholders is needed in the implementation of NBSAPs, worldwide.

Advancing health in NBSAPs starts with a more coordinated architecture for systems-thinking and action. A mechanism of engagement must be established between ministries of environment and ministries of health to address broad biodiversity and health interlinkages, with mandates to address these interlinkages. According to the CBD's 2018 review of 159 NBSAPs completed during 2010–18, less than half of countries had a general coordination structure for mainstreaming biodiversity.⁷ Of those, only seven NBSAPs described formal engagement with the health sector in an established committee, ten engaged the health sector through a consultative process, and two identified a role for the health sector in implementation.⁷

Health mandates should also prioritise biodiversity. An integrated research-to-action community of practice needs to develop a comprehensive national list of biodiversity–health priority issues that account for short-term and long-term risks of biodiversity

Published Online
July 24, 2023
[https://doi.org/10.1016/S0140-6736\(23\)01431-9](https://doi.org/10.1016/S0140-6736(23)01431-9)

Panel: Recommended action for managing ecosystem and public health in NBSAPs for Kunming-Montréal Global Biodiversity Framework targets 5, 7, 10, 11, 12, and 14

Target 5 (reducing the risk of pathogen spillovers from the use, harvesting, and trade of wild species) actions:

- Establish a transdisciplinary committee focused on addressing the trade of wild species that pose public health risks, particularly live birds and mammals traded in urban areas
- Require ministries of environment and ministries of health to co-develop and implement early warning, multisectoral, interoperable, surveillance systems to detect and predict disease outbreaks, particularly in high-risk terrestrial and marine areas where climate and environmental conditions are changing and becoming conducive to disease emergence²⁴

Target 7 (reducing pollution risks and negative impacts, especially from plastics, pesticides, and hazardous chemicals) actions:

- Promote and incentivise the use of eco-friendly materials and restrictions on plastic use at all scales
- Align integrated water resource management strategies in ministries of environment to water, sanitation, and hygiene (WASH) planning in ministries of health²⁵
- Align NBSAPs with the World Health Assembly resolution on the Impact of Chemicals, Waste, and Pollution on Human Health,²⁶ particularly for national human biomonitoring and surveillance programmes on cadmium, lead, mercury, highly hazardous pesticides, and endocrine disrupting chemicals, including hazards and harms polluting marine and coastal ecosystems²⁷

Target 10 (sustainably managed agriculture, aquaculture, fisheries, and forestry food systems) actions:

- Establish a transdisciplinary food system committee within national government, requiring collaboration between the ministries of environment, health, and agriculture, among others
- Specify relationships between food security, food safety, and nutritious diets and terrestrial biodiversity conservation, environmental management and restoration,²⁸ and marine conservation and fisheries management objectives and practices²⁹

- Promote sustainable and healthy nationally sourced food dietary guidelines and their integration into public and private procurement policies, with emphasis on food diversity, notably fruits, vegetables, legumes, and nuts, and other plants³⁰

Target 11 (restore, maintain, and enhance “nature’s contributions to people”³¹) actions:

- Frame nature-based solutions and ecosystem-based approaches for health promotion and disease prevention
- Brief ministries of health periodically on the status of air, water, soil, oceans, and pollinators and request that analyses of environmental determinants of health in the health sector include annual trends on the state of ecosystem services

Target 12 (enhance urban green and blue space) actions:

- Develop and invest in urban forests, terrestrial and marine parks, green roofs, tree planting, gardens, rivers, ponds, and lakes as a health necessity (not a luxury), prioritising high-risk areas for heat stress, non-communicable disease prevalence, and environmental injustice³²
- Quantify biodiversity at the municipal level, such as through City Biodiversity Indices³³ and engage the health sector on quantifying the health co-benefits and costs associated to these indicators

Target 14 (biodiversity integration into policies, regulations, planning development, poverty eradication, assessments, and accounting) actions:

- Include diverse health stakeholders in the screening, scoping, review, decision making, and follow-up processes for Strategic Environmental Assessments, Environmental Impact Assessments, national ecosystem assessments, and national reporting under the CBD, and incorporate biodiversity–health linkages into these assessments³³
- Require comprehensive biodiversity–health screening factors in assessments and ensure that they include cumulative impacts, scaled impacts (local, subnational, and regional contributions to global environmental change), and temporal impacts (immediate, slow-onset, and chronic impacts to health)³⁴

declines on physical and mental health and the interconnection of the health of all species. The CBD and WHO,⁸ the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services⁹ (IPBES), and the UN Human Rights Council¹⁰ have collectively recognised 16 biodiversity–health interlinkages. Yet a 2019 independent review of 144 post-2010 NBSAPs did not examine health or involvement of the health sector in its analysis.¹¹ To help overcome barriers to coordination health stakeholders need to facilitate

active transdisciplinary engagement and cross-sectoral consultation, link strategies on communication, education, and awareness-raising, align decision-making spaces, and highlight the health co-benefits of sound environmental management.¹¹

We propose a checklist for policy coordination on biodiversity–health interlinkages to assist governments and institutions to jumpstart collaborative work.

First, national governments should align NBSAPs and national health plans for mental health, nutrition,

non-communicable and communicable disease control, and childhood development. To support this work new financial arrangements must be put in place to coordinate policy making, resource allocation, and a holistic approach. Specifically, a direct funding line must be developed by ministries of finance to enhance engagement between ministries of environment and ministries of health and their mandates. Health budgets must also include line items to address environmental issues so that policies can be enacted. Governments must promote a financial mechanism, private and public investment, and incentives that safeguard a broad spectrum of biodiversity–health interlinkages, especially those affected by the commercial determinants of health.¹²

Second, strategies should be coordinated so that local, subnational, and national governments have integrated agendas, targets, and actions to effectively address climate change, environmental concerns, and health issues at the same time to respond to converging risks and maximise resources. NBSAPs should align with National Disaster Risk Reduction Strategies, National Adaptation Plans, and Health National Adaptation Plans.

Third, NBSAPs should also recognise and align with the Indigenous determinants of health¹³, which are based on interconnection with nature, and the World Health Assembly resolution in 2023 on the Health of Indigenous Peoples.¹⁴ An interministerial committee that engages and learns from Indigenous communities and traditional knowledge holders so that their relational approach to nature and health can be followed would be a valuable start.

Fourth, interdisciplinary evaluation processes need to be established to assess progress to address biodiversity–health interlinkages in NBSAP implementation. Governments must ensure that any environmental assessment, as well as tracking frameworks under the CBD,¹⁵ consider biodiversity decline in the context of intergenerational equity and the health of future generations,¹⁶ specifically, the ability of children to be born, grow, develop, and thrive.

Fifth, NBSAPs should explicitly recognise the human right to a clean, healthy, sustainable environment¹⁷ and its connection with the right to health¹⁸ and promote the uptake of biodiversity–health core competencies from primary school through professional education curricula.¹⁹

Finally, NBSAPs should call on the health sector to recognise its own contribution to ecosystem and

biodiversity loss,²⁰ and mobilise to identify, quantify, and tackle its adverse impacts²¹ as part of its overall environmental footprint.²²

The Kunming-Montréal Global Biodiversity Framework outlines four goals and 23 targets that structure updates to NBSAPs and guide their implementation for the next decade.²³ To maximise health outcomes within their NBSAP, countries should consider going beyond the Kunming-Montréal Global Biodiversity Framework targets to establish a stand-alone national target specifically on biodiversity–health interlinkages. For instance, a national target on planetary health would support the achievement of multiple Kunming-Montréal Global Biodiversity Framework targets; such a target could encompass broad health and biodiversity issues nationally alongside efforts to respond to the increasing and converging risks of exceeding planetary boundaries.

Kunming-Montréal Global Biodiversity Framework targets 5, 7, 10, 11, 12, and 14 directly link to health outcomes and should be implemented jointly with the health sector at the national level. The panel identifies actions that must be included in NBSAPs to achieve these targets and advance integrated governance. These actions are a starting point for considering biodiversity loss in different local contexts, cultures, and ecosystems.

Updated NBSAPs will determine the national perspective, investment, and global scope of work related to nature for the next decade. Well-designed NBSAPs can contribute to minimising health risks and strengthening human health, to safeguarding the development and wellbeing of future generations, and to improving health equity. The health sector must catalyse and reinforce the implementation of global biodiversity governance and participate in the ongoing NBSAP update process. Research and data that show the health interlinkages of the Kunming-Montréal Global Biodiversity Framework and scenarios for transformative decision making are needed in all countries.

NMV receives honorarium for lectures, presentations, speaker's bureaus, manuscript writing, or educational events from Icahn School of Medicine at Mount Sinai and the American Academy of Neurology; has received support for attending meetings/travel from the American Academy of Neurology and Aspen Ideas Festival; and he is on the board of Health in Harmony (unpaid) a non-profit organisation. All the other authors declare no competing interests. OH is from the Mohawk/ Kanienkehaka community of Akwesasne (Haudenosaunee Confederacy). The opinions expressed in this Comment are those of the authors. They do not purport to reflect the opinions or views of the Inter-American Institute for Global Change Research (IAI) or its Parties. The designations employed in this comment and the presentation of material therein do not imply the expression of any

opinion whatsoever on the part of the IAI concerning the legal status of any country, area, or territory or of its authorities, or concerning the delimitation of its frontiers.

**Liz Willetts, Carly Siege, Anna M Stewart-Ibarra, Ojstoh Horn, Benjamas Chotthong, Tanirat Tanawat, Phyllis Omido, Manushi Sharma, Lujain Alqodmani, Nathan J Bennett, Christopher D Golden, Cilia Wangari Githaiga, Neil M Vora ewillets@hsph.harvard.edu*

Harvard T H Chan School of Public Health, Boston, MA 02115, USA (LW, CDG); Conservation International, New York, NY, USA (CS, NMV); Inter-American Institute for Global Change Research, Montevideo, Uruguay (AMS-I); Canadian Association of Physicians for the Environment, Akwesasne Medical Clinic, QC, Canada (OH); Thailand Environment Institute, Bangkok, Thailand (BC, TT); Centre for Justice, Governance and Environmental Action, Mombasa, Kenya (PO); The George Institute for Global Health, New Delhi, India (MS); Collaborating for Resilience, Washington, DC, USA (MS); EAT, World Medical Association, Oslo, Norway (LA); World Wildlife Fund, Washington DC, USA (NJB); People and the Ocean Specialist Group, Commission on Environmental, Economic and Social Policy, International Union for the Conservation of Nature, Gland, Switzerland (NJB); Institute for the Oceans and Fisheries, University of British Columbia, Vancouver, BC, Canada (NJB); Wangari Githaiga & Co Advocates, Centre for Advanced Studies in Environmental Law and Policy, University of Nairobi, Nairobi, Kenya (CWG)

- 1 Willetts L, Comeau L, Vora NM, et al. Health in global biodiversity governance: what is next? *Lancet* 2023; **401**: 533–36.
- 2 Convention on Biological Diversity. Fifth Conference of the Parties to the Convention on Biological Diversity. Decision V/18 Impact assessment, liability, and redress. 2000. <https://www.cbd.int/decisions/cop/> (accessed July 12, 2023).
- 3 Convention on Biological Diversity. Tenth Conference of the Parties. Decision X/32 Sustainable use of biodiversity. 2010. <https://www.cbd.int/decisions/cop/> (accessed July 12, 2023).
- 4 Convention on Biological Diversity. Fourteenth Conference of the Parties. Decision 14/4 Health and biodiversity. 2018. <https://www.cbd.int/decisions/cop/> (accessed July 12, 2023).
- 5 Convention on Biological Diversity. Fifteenth Conference of the Parties. Decision 15/29 Biodiversity and health. 2022. <https://www.cbd.int/decisions/cop/> (accessed July 12, 2023).
- 6 Convention on Biological Diversity. Thirteenth Conference of the Parties. Cancun Declaration on Mainstreaming the Conservation and Sustainable Use of Biodiversity for Well-being. 2016. <https://www.cbd.int/cop/cop-13/hls/cancun%20declaration-en.pdf> (accessed July 12, 2023).
- 7 Convention on Biological Diversity. Fourteenth Conference of the Parties. Note by the Executive Secretary: update on progress on revising/ updating and implementing national biodiversity strategies and action plans, including national targets. 2018. <https://www.cbd.int/doc/c/3d50/c310/2e8a0f5f3b44fd8c0df5f7f3/cop-14-05-add1-en.pdf> (accessed July 12, 2023).
- 8 Convention on Biological Diversity, WHO. Connecting priorities: biodiversity and human health: a state of knowledge review. 2015. <https://www.who.int/publications/i/item/9789241508537> (accessed July 12, 2023).
- 9 Brauman KA, Garibaldi LA, Polasky S, et al. Chapter 2.3. Status and trends—nature’s contributions to people (NCP). In: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Brondizio ES, Settele J, Diaz S, et al, eds. Global assessment report on biodiversity and ecosystem services. Bonn: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019.
- 10 UN Human Rights Council. Human rights depend on a healthy biosphere. A/75/161—Executive summary. <https://www.ohchr.org/sites/default/files/2022-02/BiosphereSummary.pdf> (accessed July 12, 2023).
- 11 Whitehorn PR, Navarro LM, Schröter M, et al. Mainstreaming biodiversity: a review of national strategies. *Biological Conservation* 2019; **235**: 157–63.
- 12 Gilmore AB, Fabbri A, Baum F, et al. Defining and conceptualising the commercial determinants of health. *Lancet* 2023; **401**: 1194–213.
- 13 UN Permanent Forum on Indigenous Issues. 22nd Session, Note by the Secretariat: Indigenous determinants of health in the 2030 Agenda for Sustainable Development. Document E/C.19/2023/5. Jan 23, 2023. <https://undocs.org/Home/Mobile?FinalSymbol=E%2FC.19%2F2023%2F5&Language=e&DeviceType=Desktop&LangRequested=False> (accessed July 12, 2023).

- 14 WHO. World Health Assembly. Seventy-sixth Session Resolution 76/16: the health of Indigenous Peoples. 2023. https://apps.who.int/gb/ebwha/pdf_files/WHA76/A76_R16-en.pdf (accessed July 12, 2023).
- 15 Convention on Biological Diversity. Fifteenth Conference of the Parties. Decision 15/6: Mechanisms for planning, monitoring, reporting and review. 2022. <https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-06-en.pdf> (accessed July 12, 2023).
- 16 UN. Convention on Biological Diversity. 1992. <https://www.cbd.int/doc/legal/cbd-en.pdf> (accessed July 12, 2023).
- 17 UN General Assembly. Resolution 76/300, the human right to a clean, healthy and sustainable environment. 2022. <https://www.un.org/en/ga/76/resolutions.shtml> (accessed July 12, 2023).
- 18 WHO. Constitution of the WHO. 1946. <https://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf> (accessed July 12, 2023).
- 19 Guzmán CAF, Aguirre AA, Astle B, et al. A framework to guide planetary health education. *Lancet Planet Health* 2021; **5**: e253–55.
- 20 Convention on Biological Diversity. Thirteenth Conference of the Parties. Decision XIII/6 Biodiversity and human health. 2016. <https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-06-en.pdf> (accessed July 12, 2023).
- 21 Willetts L. Integrating policy: water, endocrine disruptors, and pharmaceuticals. International Institute for Sustainable Development. 2023. <https://sdg.iisd.org/commentary/policy-briefs/integrating-policy-water-endocrine-disruptors-and-pharmaceuticals/> (accessed July 12, 2023).
- 22 Lenzen M, Malik A, Li M, et al. The environmental footprint of health care: a global assessment. *Lancet Planet Health* 2020; **4**: e271–79.
- 23 Convention on Biological Diversity. Fifteenth Conference of the Parties. Decision 15/4: Kunming-Montréal Global Biodiversity Framework. 2022. <https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf> (accessed July 12, 2023).
- 24 Ryan S, Lippi C, Caplan T, et al. The current landscape of software tools for the climate-sensitive infectious disease modelling community. *Lancet Planet Health* 2023; **7**: e527–36.
- 25 Fuller R, Landrigan PJ, Balakrishnan K, et al. Pollution and health: a progress update. *Lancet Planet Health* 2022; **6**: e535–47.
- 26 World Health Assembly. Seventy-sixth Session. Resolution 76/17: the impact of chemicals, waste and pollution on human health. 2023. https://apps.who.int/gb/ebwha/pdf_files/WHA76/A76_R17-en.pdf (accessed July 12, 2023).
- 27 Bennett NJ, Alava JJ, Ferguson CE, et al. Environmental (in)justice in the Anthropocene ocean. *Marine Policy* 2023; **147**: 105383.
- 28 Convention on Biological Diversity. Eight Conference of the Parties. Decision VIII/23: agricultural biodiversity. 2006. <https://www.cbd.int/doc/decisions/cop-08/cop-08-dec-23-en.pdf> (accessed July 12, 2023).
- 29 Farmery AK, Allison EH, Andrew NL, et al. Blind spots in visions of a “blue economy” could undermine the ocean’s contribution to eliminating hunger and malnutrition. *One Earth* 2021; **4**: 28–38.
- 30 Willett W, Rockström J, Loken B, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet* 2019; **393**: 447–92.
- 31 Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services. Brondizio ES, Settele J, Diaz S, et al, eds. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Bonn: Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services, 2019.
- 32 Wilson SJ, Juno E, Pool JR, et al. Better forests, better cities. World Resources Institute. 2022. <https://www.wri.org/research/better-forests-better-cities#:~:text=Better%20Forests%2C%20Better%20Cities%20is,suite%20of%20benefits%20to%20cities.> (accessed July 12, 2023).
- 33 Chan L, Hillel O, Werner P, et al. Handbook on the Singapore Index on Cities’ Biodiversity (also known as the City Biodiversity Index). Convention on Biological Diversity and Singapore National Parks Board. 2021. <https://www.cbd.int/doc/publications/cbd-ts-98-en.pdf> (accessed July 12, 2023).
- 34 UN Economic and Social Commission for Asia and the Pacific, International Institute for Sustainable Development. Operationalizing the environment-health nexus in Asia and the Pacific: a policy guide on opportunities for enhancing health, biodiversity, food system and climate action. 2022. <https://www.unescap.org/kp/2022/operationalizing-environment-health-nexus-asia-and-pacific-policy-guide-opportunities> (accessed July 12, 2023).