Evaluating progress and accountability for achieving COP26 Health Programme international ambitions for sustainable, low-carbon, resilient health-care systems

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A global initiative to develop low-carbon, resilient health systems—the COP26 Health Programme—launched at the UN Framework Convention on Climate Change 26th Conference of the Parties (COP26) in 2021. As of May, 2024, 83 nations have committed to participate in this initiative. This analysis evaluates the effectiveness of existing and proposed indicators towards public monitoring and accountability to these commitments. Our findings reveal substantial gaps in data availability and indicator relevance, with many countries reporting process indicators that do not reflect actual progress towards achieving sustainable health-care systems. We found a dearth of suitable indicators and an urgent need to develop robust ones that are adaptable to different health-care system contexts. These indicators should be designed to capture tangible outcomes, support policy making, and prevent greenwashing. Integration of more robust indicators into independent scientific monitoring can support systematic inclusion of health care in global climate strategies, thereby enhancing the overall effectiveness of the COP26 Health Programme.

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Introduction

At the UN Framework Convention on Climate Change (UNFCCC) 26th Conference of the Parties (COP26) in 2021, the global health community launched the COP26 Health Programme, building on the goal of the 2015 Paris Agreement to limit global temperature rise.[1] The Agreement calls for countries to submit periodic Nationally Determined Contributions (NDCs), outlining their plans and progress towards reducing greenhouse gas (GHG) emissions and adapting to climate change. The COP26 Health Programme emphasises the crucial role of health systems in achieving the Paris Agreement's goals through adaptation and emission reductions.[1] The COP26 Health Programme includes three levels of national commitments to develop sustainable health systems: climate-resilient health systems; sustainable, low-carbon health systems; and net-zero health systems within a designated timeframe (table 1).[2]

To support these commitments, WHO, in partnership with the COP26 and COP27 presidencies, launched the Alliance for Transformative Action on Climate and Health (ATACH) in 2022.[1,2] In November, 2023, WHO updated its Operational Framework for building climate-resilient and low-carbon health systems. For each of the ten framework building blocks (figure), WHO proposed 12 to 20 indicators intended to guide and measure health-care system transformation.[4] Although some efforts are in place for the collection and reporting of indicators by nations, there are currently no independent measurement or accountability structures to ensure adherence to commitments. There is, therefore, a need to develop strategies to evaluate and monitor progress and direct efforts towards areas of greatest need.

In this Review, author members from the *Lancet* Commission on Sustainable Healthcare[11] aim to build on ATACH efforts to achieve sustainable health-care systems (table 1) through a scientific analysis of the COP26 Health Programme commitments by identifying, applying, and evaluating relevant indicators. We review WHO-proposed and existing indicators, evaluate their suitability for independent progress monitoring on the basis of publicly available data, and highlight performance assessment gaps.[4] A crucial challenge in monitoring the COP26 Health Programme commitments is the potential for greenwashing—that countries might report data that give the appearance of progress without actually achieving substantial outcomes. The absence of robust, outcome-oriented indicators (eg, emission reductions or surge capacity and system adaptability) increases the risk of greenwashing, which not only undermines accountability but also misleads stakeholders about the true extent of progress towards achieving sustainable health systems. This Review could serve as a foundation for independent scientific assessment of progress, harnessing the expertise of the scientific community for innovative indicator development to guide actions that can most effectively deliver sustainable health-care systems (defined in table 1).

Methods

First, we created a comprehensive summary of COP26 Health Programme country commitments to May 31, 2024, using publicly available data on the WHO website, categorising the commitments into the three types as defined by the Programme: climate-resilient health systems; sustainable, low-carbon health systems; and net-zero health systems. Next, we systematically assessed country commitments using WHO-proposed and existing indicators. These were then organised into four themes, reflecting UNFCCC processes.

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	Source	Definition
Adaptation	WHO	Adjustment to actual or expected climate and its effects; in human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities; in some natural systems, human intervention may facilitate adjustment to the expected climate and its effects[3]
Climate-resilient health systems	WHO	Those capable of anticipating, responding to, coping with, recovering from, and adapting to climate-related shocks and stress, to bring about sustained improvements in population health, despite an unstable climate[4]
COP26 Health Programme: commitment to climate-resilient health systems	WHO	Commit to conduct climate change and health vulnerability and adaptation assessments at population level, health-care facility level, or both, by a stated target date; commit to develop an HNAP informed by the health vulnerability and adaptation assessment, which forms part of the National Adaptation Plan, to be published by a stated target date; commit to use the vulnerability and adaptation assessments and HNAP to facilitate access to climate change funding for health (eg, project proposals submitted to the Global Environmental Facility, Green Climate Fund, Adaptation Fund, or Green Climate Fund Readiness programme)[2]
COP26 Health Programme: commitment to sustainable, low-carbon health systems	WHO	Commitment to deliver a baseline assessment of greenhouse gas emissions of the health system (including supply chains); commitment to develop an action plan or roadmap by a set date to develop a sustainable low-carbon health system (including supply chains) that also considers human exposure to air pollution and the role the health sector can play in reducing exposure to air pollution through its activities and actions[2]
COP26 Health Programme: commitment to net-zero emissions	WHO	Commitment to set a target date by which to achieve health system net-zero emissions (ideally by 2050)[2]
Environmentally sustainable health systems	WHO	A health system that improves, maintains, or restores health, while minimising negative effects on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and wellbeing of current and future generations[5]
Greenwashing	Nemes et al	Greenwashing is an umbrella term for a variety of misleading communications and practices that, intentionally or not, induce false positive perceptions of an organisation, product, or service's environmental performance[6]
Health National Adaptation Plan (HNAP)	WHO	Plan led by the Ministry of Health as part of the National Adaptation Plan process; the HNAP sets out a range of actions to address the health impacts of climate change and build climate resilient health systems at all levels of planning, contributes to comprehensive health adaptation planning to respond to the health risks of climate change, is based on the best available evidence, and is informed by a comprehensive vulnerability and adaptation assessment[3]
Health systems	WHO	Ensemble of all public and private organisations, institutions, and resources mandated to improve, maintain, or restore health and incorporate disease prevention, health promotion, and efforts to influence other sectors to address health concerns in their policies[7]
Mitigation	United Nations Environment Programme	Any procedure or action undertaken to reduce the adverse impacts that a project or activity might have on the environment[8]
National Adaptation Plan	United Nations Environment Programme	The National Adaptation Plan process seeks to identify medium-term and long-term adaptation needs, informed by the latest climate science; once major vulnerabilities to climate change have been identified, the National Adaptation Plan process develops strategies to address them[9]
Net-zero	Science Based Target initiative	Reducing scope 1, 2, and 3 emissions to zero or a residual level consistent with reaching net-zero emissions at the global or sector level in eligible 1·5°C-aligned pathways, and permanently neutralising any residual emissions at the net-zero target year and any greenhouse gas emissions released into the atmosphere thereafter[10]
Low-carbon health systems	WHO	Those capable of implementing transformative strategies towards reducing greenhouse gas emissions in their operations, reducing short-term and long-term negative effects on the local and global environment[4]
Sustainable health-care systems	*Lancet* Commission on Sustainable Healthcare	Health-care systems that provide universal access to appropriate care that optimises health and wellbeing for today's patients and communities, and for future generations, by delivery of care that is needed, wanted, clinically effective, affordable, equitable, responsible in its use of resources, and functioning within planetary boundaries[11]
Vulnerability and Adaptation Assessment	WHO	A tool that allows countries to evaluate which populations and specific geographies are most vulnerable to different kinds of health effects from climate change, to identify weaknesses in the systems that should protect them, and to specify interventions to respond[3]

COP26=26th Conference of the Parties. HNAP=health National Adaptation Plan.

Table 1: **List of key concept definitions relevant to sustainable health-care systems**

Search strategy and selection criteria

We evaluated each of the 155 proposed indicators from the updated WHO Operational Framework on the basis of quantifiability and public availability of national-level data. To identify other relevant indicators, we further reviewed the University of Exeter's statistical database guide, and extraced all health-related indicators available from key global sources known for their relevance to health care.[13] These sources include the WHO Global Health Observatory, WHO Global Health Expenditure Database, ATACH Baselines, EuroStat, *Lancet* Countdown on Health and Climate Change, Organisation for Economic Co-operation and Development Data Explorer, World Bank Data, UN Data, UN Data Commons, Sustainable Development Goals indicators, International Monetary Fund Data, and Our World in Data.[14–24] The

extraction process involved reviewing each database and cataloguing all health-related indicators. Duplicates were removed, each indicator was reviewed independently by two authors (IMB and XN) for relevance, with disputes resolved by a third author (JDS). Indicators were included if they had clear definitions and measurement methods, measured aspects directly affecting health-care system sustainability, reflected areas where health-care systems could implement changes, and were supported by publicly available national-level data.

Data supporting the identified indicators were extracted and analysed for countries that had made any commitment under the COP26 Health Programme. We identified gaps in public assessment methods to inform the development of robust accounting mechanisms.

Thematic groupings in alignment with UNFCCC

To facilitate a more targeted analysis of sustainable health-care system progress in alignment with the UNFCCC and ATACH, we grouped indicators into four thematic areas. The first two areas—indicators monitoring progress towards resilient health-care systems and those monitoring progress towards sustainable, low-carbon health-care systems—directly reflect the COP26 Health Programme commitment types. However, the types of commitments do not fully reflect the opportunity for more comprehensive integration of health care into the goals of the Paris Agreement. To bridge this gap, we expanded our analysis to include two additional areas: indicators that measure access to financial resources, reflecting the priorities of the ATACH working group on financing, and indicators that evaluate how well health-care considerations are integrated into governance (including NDCs), thereby ensuring consideration of the WHO conceptual framework building blocks of health systems reflecting governance and leadership.[25]

Current status of COP26 Health Programme commitments

Commitments to climate-resilient health systems

As of May, 2024, with one exception (Chile), all countries committed to the COP26 Health Programme have pledged to achieve climate-resilient health systems, defined by WHO as "those capable of anticipating, responding to, coping with, recovering from, and adapting to climate-related shocks and stress, to bring about sustained improvements in population health, despite an unstable climate" (table 1).[4] Low-income and middle-income countries (LMICs) represent 58 of the 82 commitments to resilient health systems (appendix pp 2–8).[26] This commitment requires vulnerability and adaptation assessments to be conducted, either at the population level or health-care facility level, and the development of a Health National Adaptation Plan (HNAP) based on the findings of the vulnerability and adaptation assessments (table 1). This commitment further calls for leveraging these HNAPs to access climate financing to achieve climate-resilient health system goals.[2]

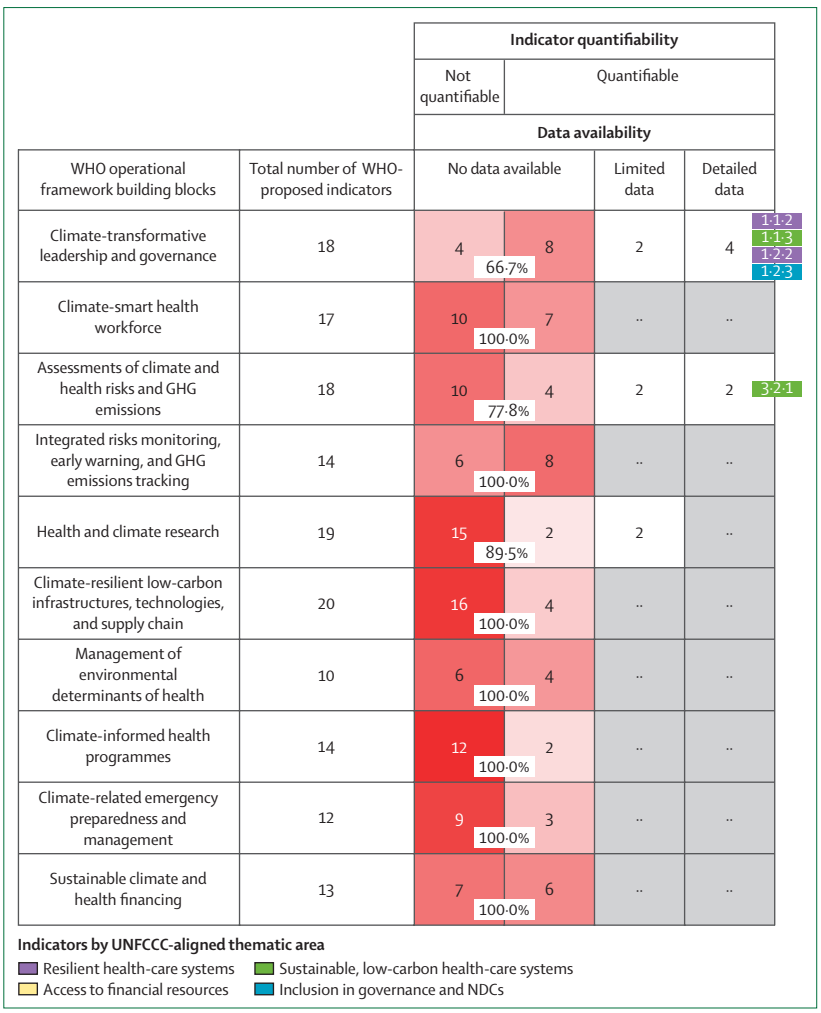

Figure: **Summary analysis of the 155 WHO-proposed indicators across the ten building blocks of the WHO Operational Framework for climate-resilient and low-carbon health systems**
Limited data availability is defined as only one case study identified. Detailed data availability is defined as the existence of a corresponding international database. Indicators lacking data are visualised via heatmap in red and identified in grey by proportion of total indicators per WHO-derived building block. Numbers of quantifiable indicators for which detailed data are available for at least a quarter of committed countries are denoted by numerical classifiers referenced in the WHO Operational Framework,[4] and categorised by colour per our identified key themes (with the exception of Access to financial resources, as no WHO-proposed indicators reflected this). GHG=greenhouse gas. NDCs=Nationally Determined Contributions. UNFCCC=UN Framework Convention on Climate Change.

Commitments to sustainable, low-carbon health systems

Of the 83 COP26 Health Programme signatory countries, 76 have committed to developing sustainable, low-carbon health systems, defined by WHO as "those capable of implementing transformative strategies towards reducing GHG emissions in their operations, reducing short- and long-term negative impacts on the local and global environment". LMICs account for 54 of these 76 countries (appendix pp 2–8).[4] The primary intent of low-carbon

See Online for appendix

commitments is to reduce the estimated 4·6% of global GHG emissions attributable to health-care systems, and their negative effects on health.[17] According to the COP26 Health Programme, all committed countries must calculate their baseline national health system emissions and devise an action plan to reduce both GHG emissions and health sector air pollution.[2]

Commitments to net-zero health systems

38 (46%) of 83 COP26 Health Programme signatory countries have committed to the more ambitious target of achieving net-zero health-care emissions between 2030 and 2060, of which 24 are LMICs (appendix pp 2–8). We were unable to find an official WHO definition of a net-zero health system, and it is therefore unclear if this commitment entails reducing all health-care system GHG emissions across scope 1 (health-care operations), scope 2 (energy), and scope 3 (supply chain) to near-zero, and counterbalancing remaining emissions with removals from the atmosphere.

Review of WHO-proposed and existing indicators

In our review of WHO-proposed indicators, difficulties in identifying specific metrics arose for 61% (95/155). These difficulties stemmed from lack of specificity of what indicators were trying to measure, or their inherent complexity suggesting multifaceted data points would be required. Of the 60 indicators deemed readily quantifiable—meaning they could be measured directly or through single-source data—seven are supported by publicly available, international databases (figure 1; appendix pp 9–16). One of these seven indicators was the "Proportion of population with primary reliance on clean fuels and technology", which we excluded as it pertains to household instead of health-care system fuel; thus, six proposed indicators were analysed.

In addition to WHO-proposed indicators, a total of 6257 indicators were retrieved from the 12 international databases. After screening, 12 relevant indicators were identified, for a total of 18 indicators that support our four identified themes (table 2).

The results are organised around four key thematic areas: resilient health-care systems, low-emission or net-zero health-care systems, financial resources towards resilient and low-emission health-care systems, and the inclusion of health-care systems in governance and NDCs. For each theme, we first describe the relevant indicators identified and then present analysis of the progress made by the countries committed to the COP26 Health Programme.

National-level data-driven indicators by key theme

Indicators of progress towards resilient health-care systems

Vulnerability and adaptation assessments are intended to help identify health-care system vulnerabilities to climate-related hazards and to inform adaptation strategies. Committed countries report to ATACH on whether they have conducted or updated these vulnerability and adaptation assessments, using binary (yes or no) data.[15]

National Adaptation Plans are not mentioned by the COP26 Health Programme, however the WHO Operational Framework includes a proposed indicator with integration of health adaptation planning into the National Adaptation Plan process. Under the UNFCCC, National Adaptation Plans are formulated to guide countries in identifying and addressing their medium-term and long-term adaptation needs. WHO evaluated health integration within National Adaptation Plans in 2020 and 2023. The 2020 evaluation included country-specific, binary data,[27,28] providing insight into countries' adaptation plans including their health-care systems.

HNAPs are not specified in the WHO Operational Framework or recognised in UNFCCC processes, however standalone HNAPs provide detailed health-specific adaptation plans. Committed countries report to ATACH on whether they have completed or updated HNAPs since 2020.[15]

Health surveillance systems enhance the capacity of health systems to adapt to climate-sensitive disease risks. Through the WHO Global Health Observatory's 2021 Health and Climate Change Global Survey, countries reported on whether they have a health surveillance system in place, including those measuring effects on health-care systems, and whether they include meteorological information.[14]

Indicators of progress towards low-emission or net-zero health-care systems

Committed countries report to ATACH whether they have assessed their health system's GHG emissions. It is unclear whether these assessments include emissions across all three GHG protocol scopes.[15]

Through ATACH, countries also report with binary data on whether they have developed an action plan since 2020 for creating a sustainable, low-carbon health-care system.[15]

The *Lancet* Countdown on Health and Climate Change reports annually on country-level health sector GHG emissions using national health expenditures (as reported to WHO) combined with environmentally extended multiregion input–output models to facilitate tracking of emissions associated with economic activities in health sectors of countries studied. The models also incorporate emissions from domestic sources and global health-care supply chains, accounting for international trade. This approach yields total and per capita health-care GHG emissions, with the most recent results based on 2020 health-care expenditure data.[17]

Reported by the *Lancet* Countdown on Health and Climate Change, national health expenditures (as reported to WHO) and environmentally extended multiregion input–output models are also used to estimate the health effects of air pollution ($PM_{2·5}$ and ozone pollution) from

	Indicator source	Data source	Type	Most recent data (year)
Resilient health-care systems				
Country commitment to a resilient health-care system	(P) WHO Operational Framework: component 1, objective 1, indicator 2 (1.1.2)	WHO Alliance for action on climate change and health	Binary (yes or no) process indicator	2024
Vulnerability and adaptation assessments	Partial relevance to WHO Operational Framework (3.1.1)	WHO Alliance for action on climate change and health	Binary (yes or no) process indicator	2024
National Adaptation Plan health-care integration	(P) WHO Operational Framework (1.2.2)	WHO review	Binary (yes or no) process indicator	2020
Health National Adaptation Plan	WHO Alliance for action on climate change and health	WHO Alliance for action on climate change and health	Binary (yes or no) process indicator	2024
Health surveillance system with or without considering meteorological information	Partial relevance to WHO Operational Framework (4.1)	WHO Health and climate change global survey	Binary (yes or no) process indicator	2021
Sustainable, low-carbon health-care systems				
Country commitment to a sustainable, low-carbon health-care system	(P) WHO Operational Framework (1.1.3)	WHO Alliance for action on climate change and health	Binary (yes or no) process indicator	2024
Country commitment to a net-zero health-care system	(P) WHO Operational Framework (1.1.3)	WHO Alliance for action on climate change and health	Binary (yes or no) process indicator	2024
Greenhouse gas emissions assessed	(P) WHO Operational Framework (3.2.1)	WHO Alliance for action on climate change and health	Binary (yes or no) process indicator	2024
National health sector greenhouse gas emissions	Partial relevance to WHO Operational Framework (3.2.1)	*Lancet* Countdown on Health and Climate Change	Quantitative outcome indicator	2020
Low-carbon, sustainable health-care system action plan for health system developed	WHO Alliance for action on climate change and health	WHO Alliance for action on climate change and health	Binary (yes or no) process indicator	2024
Disability-adjusted-life-years from $PM_{2.5}$ and ozone pollution associated with health-care delivery and supply chains	*Lancet* Countdown on Health and Climate Change	*Lancet* Countdown on Health and Climate Change	Quantitative outcome indicator	2020
Access to financial resources				
Health expenditure including domestic, private, or external sources	WHO Global health expenditure database	WHO Global health expenditure database	Quantitative process indicator	2020
Universal Health Coverage Service Coverage Index (SDG 3.8.1)	WHO Global health observatory	WHO Global health observatory	Quantitative process indicator	2021
Inclusion in governance and Nationally Determined Contributions				
The Global Climate and Health Alliance Nationally Determined Contributions Scorecard	(P) WHO Operational Framework (1.2.3)	Global Climate and Health Alliance	Quantitative process indicator	2023 and 2021*
Climate Change and Health Agreements Ministry of Health	Partial relevance to WHO Operational Framework (1.3.1)	WHO Health and climate change global survey	Binary (yes or no) process indicator	2021
Designation of a key person responsible for health and climate change within the Ministry of Health	Partial relevance to WHO Operational Framework (1.1.1)	WHO Health and climate change global survey	Binary (yes or no) process indicator	2021
Existence of a multi-stakeholder mechanism on health and climate change	Partial relevance to WHO Operational Framework (1.3.2)	WHO Health and climate change global survey	Binary (yes or no) process indicator	2021
National health and climate change plan or strategy developed	Partial relevance to WHO Operational Framework (1.2.1)	WHO Health and climate change global survey	Binary (yes or no) process indicator	2021

Overview of national-level data-driven indicators, categorised by key themes. Where a partial relevance is indicated, the WHO Operational Framework describes details that are not fully reflected in the existing indicator. P=proposed. SDG=Sustainable Development Goal. *Two evaluations have been conducted on updated Nationally Determined Contributions, and the most recent analysis has been included for each evaluated country.

***Table 2*: Overview of existing national-level data-driven indicators by key theme**

health-care delivery and supply chains, expressed as disability-adjusted-life years (DALYs), combining years of life lost and years lived with disability.[17]

Indicators of financial resources towards resilient and low-emission health-care systems

The WHO Global Health Expenditure Database aggregates data from national reports, Ministries of Finance, central banks, and international bodies to provide an overview of health expenditures (domestic, private, or external) and their sources across countries. These data elucidate the relative responsibilities of financial stakeholders in implementing solutions necessary to meet the COP26 Health Programme commitments.[29]

Scored on a scale of 0 to 100 by the WHO Global Health Observatory, the Universal Health Coverage Service

	Climate resilient health systems (n=82)		Sustainable, low-carbon health systems (n=76)		Net-zero commitment (n=38)	
	n	%	n	%	n	%
Vulnerability and adaptation assessment as per the Alliance for Transformative Action on Climate and Health (2024)						
Completed or updated since 2020 (self-reported)	25	30	24	32	13	34
National Adaptation Plans as per the Review of Health in National Adaptation Plans (2020)						
Health sector recognised as a vulnerable sector	9	11	10	13	3	8
Health National Adaptation Plan as per the Alliance for Transformative Action on Climate and Health (2024)						
Completed or updated since 2020 (self-reported)	21	26	21	28	11	29
Health Surveillance System as per the Global Health Observatory (2021, self-reported)						
Surveilling impacts on health-care facilities	13	16	10	13	4	11
Surveilling impacts on health-care facilities including meteorological information	4	5	3	4	0	0
Surveilling impact on mortality and morbidity	8	10	6	8	4	11
Surveilling impact on mortality and morbidity including meteorological information	0	0	0	0	0	0
Disability-adjusted-life-years from $PM_{2·5}$ and ozone pollution associated with health-care delivery and supply chains (2020)						
>1000	50	63	48	66	25	69
Greenhouse gas emissions assessment and strategy as per the Global Health Observatory (2021, self-reported)						
Greenhouse gas emissions assessed for health system since 2020	9	11	9	12	6	16
Low-carbon, sustainable health-care system action plan for health system developed since 2020	6	7	6	8	0	0
Total greenhouse emissions per capita (total CO_2 equivalent/capita) (2019)						
≥400 kg CO_2e/cap	13	16	12	16	8	22
<400 kg CO_2e/cap	66	84	61	84	28	78
Income status as per the World Bank (2022)						
High income	24	29	22	29	14	37
Upper-middle income	17	21	16	21	4	11
Lower-middle income	26	32	24	32	12	32
Low income	15	18	14	18	8	21
Global health expenditure database (2020)						
Domestic general government ≥50%	45	57	41	56	19	53
Domestic general government <50%	34	43	32	44	17	47
Domestic private ≥25 %	55	70	51	70	22	61
Domestic private <25%	24	30	22	30	14	39
External sources ≥25 %	13	16	12	16	7	19
External sources <25%	59	82	54	82	25	78
Universal health coverage index as per the Global Health Observatory (2021)						
>80 out of 100	18	22	19	25	19	50
Integration of health categories as per the National Determined Contributions Scorecard (2021 or 2023, maximum score)						
Integrated governance	0	0	0	0	0	0
Health impacts	12	29	12	32	8	42
Health sector action	13	50	12	57	5	56
Health co-benefits	16	38	15	39	7	37
Economics and finance	0	0	0	0	0	0
Monitoring and implementation	5	19	5	24	2	22

(Table 3 continues on next page)

Coverage Index reflects access to essential health services among the general population and the most disadvantaged populations, thereby monitoring national progress towards universal health coverage.[14]

Indicators of inclusion of health-care systems in governance and NDCs

NDCs are a key policy instrument for mobilising state actors in GHG mitigation and climate adaptation. The Global Climate and Health Alliance evaluated the representation of health care within countries' NDCs in 2021 and 2023. NDCs were then assigned a score out of 18 across six health categories: integrated governance, health effects, health sector action (including national planning of mitigation and adaptation), health co-benefits (including identifying health benefits of actions in other sectors), economics and finance, and monitoring and implementation. This scorecard is a potential aid for evaluating the COP26 Health Programme by examining progress on country-level implementation.[30,31]

Extracted from the WHO Health and Climate Change Global Survey, binary data indicate the presence of cross-sectoral collaboration through tracking of formal agreements between Ministries of Health and other sectors, such as agriculture and energy.

The WHO Health and Climate Change Global Survey collects self-reported data on whether countries have: a designated key person responsible for health and climate change within the Ministry of Health, an operational multistakeholder mechanism on health and climate change, and a national health and climate change plan. These three indicators on policies and engagement highlight the organisational and strategic mechanisms supporting efforts towards achieving sustainable health care.

Analysis of COP26 Health Programme progress using identified indicators

The COP26 country commitments are presented in the appendix (pp 2–8) alongside the 18 identified indicators across the four themes described previously, and are summarised in table 3. Each of the indicators and their significance in monitoring COP26 Health Programme progress in alignment with the UNFCCC process are discussed in the following sections.

Resilient health-care systems

According to ATACH data, only 25 (30%) of 82 countries committed to the COP26 Health Programme have conducted a vulnerability and adaptation assessment.

The 2020 WHO assessment of National Adaptation Plans identified that only 9 (11%) of 82 countries committed to achieving resilient health systems under the COP26 Programme had identified health as a vulnerable sector in a total of 19 published National Adaptation Plans.[27] Although a 2023 assessment found that 63% of all NDCs had identified health adaptation as a priority,

this assessment did not provide country-specific data, nor was it specific to health care.[28]

Only 21 (25%) of 82 countries committed to achieving resilient health systems report having completed or updated their HNAPs since 2020.

Data on health surveillance systems from the Global Health Observatory (2021) revealed varied levels of implementation among countries committed to the COP26 Health Programme. Specifically, only 13 (16%) of 82 countries committed to resilient health-care systems reported having surveillance systems in place to monitor the effects of climate change on health-care facilities. Notably, only 4 (5%) of 82 countries (Bahrain, Brunei, Cabo Verde, and the Dominican Republic) had surveillance systems that included meteorological information.

Low-emission or net-zero health-care systems

Only 9 (12%) of 76 countries committed to sustainable, low-carbon health systems, and 6 (16%) of 38 countries committed to net-zero health systems have assessed their health system's GHG emissions following their commitment. These nine countries are France, Germany, Guinea, Madagascar, Nepal, the Netherlands, New Zealand, Norway, and the UK.

Only 6 (8%) of 76 countries committed to sustainable, low-carbon health-care systems—and none of the countries committed to net-zero health-care systems—have developed sustainable, low-carbon health-care system action plans following their commitment. These six countries are France, Mauritania, Morocco, the Netherlands, New Zealand, and the UK; of these, only France, the Netherlands, New Zealand, and the UK have performed baseline GHG assessments essential for evidence-based action plans.

Health-care systems from all committed high-income countries (HICs) emitted on average 8-fold more GHGs per capita (n=25, M=619 kg CO_2 equivalent [CO_2e], SD=438) compared with health-care systems from committed LMICs (n=55, M=74 kg CO_2e, SD=74), with Israel having the highest per capita health-care emissions at 1910 kg CO_2e in 2020 (appendix pp 2–8).[32] Several HICs such as Russia and South Korea, and high-emitting LMICs such as China and India, are conspicuously absent from the commitments.[32] Notably, the 51 LMICs committed to sustainable, low-carbon health systems for which data are available contributed only 7·5% (171 Mt CO_2e) of total global health-care emissions in 2020, whereas the 22 committed HICs contributed 38% (861 Mt CO_2e).

Although the USA is a COP26 Health Programme signatory, and responsible for 21% of total global health-care emissions and 45% of committed country emissions (474·1 Mt CO_2e), its commitment represents a small fraction of its national health sector emissions. The USA low-carbon commitment falls under Presidential Executive Order (EO 14057), and thus applies only to federal health systems, including the Military Health System, Veterans Health Administration, and Indian Health Service, which represent approximately 4% of total USA health-care GHG emissions, meaning that most USA health-care emissions fall outside its commitment.[33] Altogether, assuming all other countries' commitments comprehensively cover their entire national health sectors, only around 26% (587 Mt CO_2e) of emissions from global health care are presently represented in the COP26 Health Programme commitments. 12% (287 Mt CO_2e) of global health-care emissions are accounted for by countries that have committed to net-zero health systems.

Across COP26 committed countries, the USA contributes the highest burden of air pollution ($PM_{2·5}$ and ozone, associated with health-care delivery and supply chains), with an annual loss of 470 000 DALYs. Japan follows with 140 000 DALYs. In Europe, the health-care systems in Germany (71 000 DALYs), France (29 000 DALYs), and the UK (46 000 DALYs) contribute a notable burden.

Financial resources towards resilient and low-emission health-care systems

According to the WHO Global Health Expenditure Database, in 43% (34/83) of countries committed to the COP26 Health Programme, less than 50% of 2020 health

	Climate resilient health systems (n=82)		Sustainable, low-carbon health systems (n=76)		Net-zero commitment (n=38)	
	n	%	n	%	n	%
(Continued from previous page)						
Climate change and health agreements as per Ministry of Health (2021, self-reported)						
Environment	21	26	17	22	7	18
Transportation	8	10	6	8	4	11
Agriculture	10	12	7	9	5	13
Education	7	9	5	7	4	11
Energy	11	13	9	12	5	13
National meteorological and hydrological services	15	18	13	17	7	18
Social services	2	2	1	1	2	5
Urban development and housing	7	9	5	7	5	13
Water, sanitation, and hygiene	18	22	15	20	6	16
Policies and engagement as per the Global Health Observatory (2021, self-reported)						
Designation of a key person responsible for health and climate change within the Ministry of Health	42	51	38	50	15	39
Existence of a multistakeholder mechanism on health and climate change	25	30	23	30	9	24
National health and climate change plan or strategy developed	25	30	23	30	23	61

n is the number of countries in the WHO COP26 Health Programme Commitments. Detailed overview per country is in the appendix (pp 2–8). Percentages shown as total of measured committed countries unless otherwise indicated. Year given for each indicator indicates the most recent data. CO_2e/cap= CO_2 equivalent per capita. COP26=26th Conference of the Parties.

Table 3: **Summary of extracted data relevant to the COP26 Health Programme, by indicator with description**

expenditures originated from the domestic central government.[29] In 55 countries, more than 25% of health expenditures came from domestic private health care, and in 13 countries, more than 25% came from external sources such as international governmental and non-governmental charities.[29]

Among countries committed to the COP26 Health Programme, 18 (22%) achieved a Universal Health Coverage Service Coverage Index score above 80, indicating a high level of service coverage. High scorers included Canada (91), Germany (88), Norway (87), Australia (87), and the UK (88). However, several countries received substantially lower scores, such as the Central African Republic (32), Somalia (27), and Ethiopia (35), highlighting disparities in health-care service coverage across different regions.

Inclusion of health-care systems in governance and NDCs

Of 26 countries committed to the COP26 Health Programme for which an updated NDC (which, as detailed in the Paris Agreement, should take place every 5 years) was available, 13 achieved the maximum Global Climate and Health Alliance NDC score for health sector action across process indicators, meaning they included a combination of key measures such as vulnerability and adaptation assessments, resilience and preparedness actions, or mitigation strategies in the health sector, or they outlined an HNAP (table 1).[30,31]

Ministries of Health from committed countries reported agreements with other Ministries, including environment (26%), transportation (10%), agriculture (12%), education (9%), energy (13%), national meteorological and hydrological services (18%), social services (2%), urban development and housing (9%), and water, sanitation, and hygiene (22%).

With regard to the three indicators on policies and engagement, a total of 42 (51%) of 83 committed countries reported having designated a key person responsible for health and climate change within the Ministry of Health. Only 25 (30%) of 83 committed countries indicated the existence of a multistakeholder mechanism on health and climate change, such as a task force or committee. Similarly, only 25 (30%) of 83 committed countries had developed a national health and climate change plan or strategy.

Discussion

The COP26 Health Programme and ATACH are landmarks in coordinating global efforts towards sustainable, resilient health systems. The UNFCCC COP28 in December, 2023, further reinforced these global efforts with a Declaration on Climate and Health, signed by 150 countries, which included a commitment to reduce health sector emissions and waste.[34] These collective efforts underscore the crucial intersection of climate, health, and care, and suggest promising actions towards health-care system transformation.

The WHO Operational Framework aims to guide countries in systematically addressing climate-related health risks while reducing the health sector's carbon footprint. This Review concludes that, to strengthen this effort with independent scientific monitoring, there is a need for broader consideration of existing indicators and overall indicator refinement.

Our analysis found that WHO-proposed indicators and other existing indicators for which data are publicly available did not effectively capture the extent and ambition of different COP26 Health Programme commitment types, nor were they sufficiently comprehensive to capture health-care mitigation and adaptation progress. The supporting public data for 13 of 18 indicators are limited to binary (yes/no) process measures, which provide no insight into health-care quality or outcomes.

The paucity of completed national vulnerability and adaptation assessments (30%), infrequent inclusion of health in National Adaptation Plans or completed HNAPs (26%), and unknown quality of these assessments and plans highlight gaps in the building of health-care system resilience. Analysis of health surveillance systems highlights further gaps, with only 16% of countries committed to resilient health systems under the COP26 Health Programme reporting surveillance systems for effects on health-care facilities, and even fewer (5%) incorporating meteorological information essential for prospective health-care system planning in a rapidly changing climate.

Traditionally, Ministries of Environment, which might not always prioritise health-care system vulnerabilities due to a disconnect with Ministries of Health, have spearheaded the development of National Adaptation Plans.[35] To deliver COP26 Health Programme commitments, countries must embed health-care system resilience within their national climate strategies. To this end, incorporating HNAPs into National Adaptation Plans could improve collaboration between Ministries of Environment and Health.

Furthermore, a detailed understanding of the vulnerability and adaptation content, which is crucial to inform these adaptation plans, is lacking. There is an urgent need for more health-care-specific metrics within existing vulnerability and adaptation frameworks to drive evidence-based planning, guide investments, and enable monitoring of progress and accountability to build capacity sustainably. Previously published WHO quality criteria could be considered in the development of indicators.[36] A recent systematic analysis highlights seven crucial areas for strengthening health-care system resilience to climate effects that should be considered when refining indicators: workforce, tools and frameworks, infrastructure and urban planning, communication, surge capacity and increased system burden, service interruption, and financial costs.[37] Employing the RESILIENT framework, as detailed in a recent review on health-care facility resilience, to report facility-level interventions could help

standardise the way assessments, risks, population impacts, facility capabilities, and climate solutions are documented.[38]

One major finding of this analysis is the lack of substantial commitment from high-emitting countries. Despite commitments from 83 countries, 74% of global health-care emissions (~1667 Mt CO_2e) are not currently encompassed by the COP26 Health Programme. According to fair share principles, which advocate for an equitable distribution of the remaining carbon budget and health benefits, it would be anticipated that the bulk of low-carbon or net-zero commitments would come from the countries that are contributing the highest per capita emissions, leveraging HICs' relatively greater resources for comprehensive emissions tracking and innovation, including making accounting and reporting systems less onerous. Instead, LMICs have embraced a disproportionate role, comprising a distinct majority in all commitment categories.[39]

There is a dearth of baseline data to inform evidence-based decarbonisation, as only 11% of all countries have committed to low-carbon health systems and none of the countries with net-zero commitments reported to have assessed their health-care emissions. Furthermore, the absence of clear definition tied to the net-zero health system commitment is concerning, as it could lead to a narrow focus on scope 1 and 2 emissions, neglecting the more substantial scope 3 emissions, which are estimated to account for 70–80% of total health sector emissions.[17] However, some countries, such as Egypt, Iran, Morocco, and the UK, have started to measure scope 3 emissions, indicating progress towards comprehensive emissions reporting.[15,40] Published in June, 2024, WHO's checklist for setting sustainable, low-carbon health system targets does include scope 3 emissions.[41] This checklist provides a structure for further indicator development, and a WHO net-zero health system definition is required to match this. Sectors such as energy and manufacturing have developed comprehensive approaches to tracking and reporting emissions, offering valuable lessons for the health-care sector.[42,43] Engaging relevant actors such as the private sector, non-profit entities, and municipalities via environmental, social, and governance (ESG) reporting could be particularly effective in advancing health-care sustainability.[44] For example, National Health Service England mandates ESG reporting for its supply chain vendors.[45] The EU's Corporate Sustainability Due Diligence Directive further supports this trend, with potential implications for expanding these practices across Europe.[46]

The *Lancet* Countdown on Health and Climate Change reports health-care emissions against measures of health-care access and quality to track health system performance and ensure that care standards are not compromised in the pursuit of GHG reduction. Results show that emissions tend to rise with health-care quality to an inflection point of 400 kg CO_2e per person.[47] The observation that emissions increase with health-care quality up to a certain efficiency threshold suggests that achieving high-quality care does not inherently necessitate high emissions. Given that health-care access and quality are expected to expand in LMICs to address unmet needs, investment in sustainable solutions is crucial to ensure development of low-carbon health services rather than replication of carbon-intensive models of care currently in widespread use in HICs.[3,5] HICs must reduce excessive material and energy consumption in the delivery of health-care services.[32] Considering the indicator's limitations of reliance on reported economic activities, improving accuracy through bottom-up data collection by countries and supply chain vendors can help refine reporting and drive evidence-based strategic management.

The loss of DALYs from $PM_{2.5}$ and ozone pollution associated with health-care delivery and supply chains highlights substantial health effects across countries committed to the COP26 Health Programme. A broader understanding is warranted following this first assessment, including use of fossil fuels by health-care facilities, which can disproportionately affect populations susceptible to pollution-related health effects in surrounding communities. The WHO Operational Framework emphasises the importance of mitigating environmental health risks, including air pollution, to protect public health and reduce the health-care sector's carbon footprint,[4] which underscores the need for comprehensive pollution mitigation strategies that include scope 3 emissions.

Although GHG emissions and DALYs from air pollution serve as crucial indicators of environmental and health effects of health-care delivery, the sector's contribution to other environmental emissions, water consumption, material extraction, land use, and waste generation is also of concern. Although beyond the remit of the COP26 Health Programme, ensuring a holistic approach to sustainable health care requires expanding the current indicator set to capture the broader health-care system environmental footprint in tandem with health-care access and quality.[48,54] Research is needed to quantify and compare the environmental effects of alternative health-care interventions and strategies.

Within COP26 Health Programme countries there is a broad spectrum of public and private financing models. Country commitments could be more readily actionable within publicly funded health systems, owing to inherently stricter regulatory oversight and stewardship of common resources. The UK's National Health Service exemplifies the rapid progress possible within a publicly funded system, facilitated by strong national leadership and legal decarbonisation mandates through the UK Climate Change Act of 2008, which subsequently led to embedding implementation support into the Health and Care Act 2022.[7] In France in 2020, through the Ségur de la Santé, a cadre of advisors was established to improve

health-care facility energy management and emission reductions.[8] The intricacies of maintaining commitments and implementing similar actions across varying health-care system funding models remain largely unexplored.

Reliance on the WHO Global Health Expenditure Database for financial insights poses a risk of oversimplification. Although this database consolidates data from various sources, it might not capture the full dynamics and disparities of health-care financing within and across countries. This gap underscores the need for a more detailed assessment of health-care financing mechanisms and their implications for transitioning to sustainable health-care delivery.

Countries with higher Universal Health Coverage Service Coverage Index scores might have better infrastructure and resources to implement sustainable and low-emission health-care practices or, conversely, those with lower coverage might use sustainability solutions while expanding coverage. Understanding the correlation between universal health coverage and the ability to meet COP26 Programme commitments might help tailor strategies that address both health-care access and sustainability, ensuring that no country is left behind in the global effort to transform health-care systems.

Self-reported climate change and health agreements by Ministries of Health indicate varying levels of cross-sectoral collaboration, which are essential for integrating health into climate policy, as reflected in the WHO Operational Framework's emphasis on comprehensive, multisectoral approaches to building sustainable health systems.[4] Only half of countries committed to the COP26 Health Programme have a designated key person for health and climate change within their Ministry of Health, and just 30% had national health and climate change plans. The absence of multistakeholder mechanisms in 70% of countries indicates insufficient cross-sectoral collaboration. Furthermore, it is unclear to what extent these indicators specifically consider health-care delivery.

Although the Global Climate and Health Alliance NDC scorecard shows progress in integrating health into NDCs, particularly with respect to health effects and health co-benefits, it also exposes ongoing deficiencies in parameters crucial for the practical implementation of sustainable health-care delivery. These deficiencies are reflected in low scores in integrated governance and finance, potentially translating into practical challenges in cross-sectoral coordination and financing. A more in-depth evaluation of NDCs could provide more understanding of the integration of health-care systems into global climate negotiations.

Low scores for implementation and monitoring highlight the disparity between COP26 Health Programme commitments and actual reported actions. A grey literature review of international policy and practice in 2022 found substantial gaps in the integration of health-care within any type of national climate strategy. Of 60 country commitments to the Programme at that time, only 13% (8/60) referenced health-care decarbonisation, and 32% (19/60) mentioned adaptation or resilience in NDCs.[9] These gaps underscore the need for meaningful consideration of health care in national strategies and NDCs to ensure effective climate action and progress towards achieving sustainable health-care systems at the national level.[30,31] The use of NDCs for gauging countries' health–climate integration has inherent limitations. The voluntary nature of plans outlined in NDCs and insufficient data standards could result in selective reporting, with countries emphasising their strengths while downplaying areas needing improvement.

The reliance on publicly available data—with a majority being binary and lacking quality assessments—limited the scope and depth of analysis in this Review, potentially affecting the robustness of our findings and the ability to capture nuanced progress. Additionally, our systematic search of 12 key global databases, although comprehensive, was not exhaustive and might have excluded less widely recognised sources. An in-depth survey of national policies for countries committed to the COP26 Health Programme would complement the current analysis, but was outside the scope of this Review. A more detailed examination of national policies, including stratification by income status and further qualitative analysis, can offer additional understanding of the challenges faced by countries at different income levels. Despite these limitations, this Review provides a valuable, comprehensive assessment of the current landscape of indicators and identifies crucial gaps. The systematic approach used in selecting and analysing indicators ensures that the findings are relevant and aligned with global priorities, thereby contributing to ongoing efforts towards monitoring progress under the COP26 Health Programme.

Conclusion

Our analysis of the COP26 Health Programme highlights the need for transparent, standardised reporting of data to understand progress, guide policy making, and better ensure accountability. Developing robust indicators through targeted research is essential to capture these crucial aspects and prevent greenwashing. Greenwashing not only poses a technical challenge but also raises ethical concerns, as current commitments could allow countries to report progress without delivering meaningful outcomes, potentially obscuring the true state of global efforts towards achieving resilient health-care systems within planetary boundaries.

To effectively address these challenges, it is important to adopt a comprehensive approach that not only focuses on resilience and environmental sustainability, but also considers the social foundations in the broader context of economic development and governance as presented in this Review. By grounding efforts more broadly in the context of the Paris Agreement, better monitoring can be

achieved to track and guide the transition to sustainable health-care systems that are equipped to meet both current and future challenges.

Immediate steps towards these grounding efforts include the establishment of governance structures and implementation of standardised metrics to set baselines and track progress, fostering transparency and aligning actions with science-based targets. Indicators should include tangible health-care outcomes to ensure that quality and access are maintained or improved.[54] Standardisation will simplify data management and enhance comparability, contributing to an evidence base that will allow identification of best practices and guide systemic transformation. The *Lancet* Commission on Sustainable Healthcare aims to support global efforts by developing and refining data-driven indicators to enhance transparency and effectiveness in achieving COP26 Health Programme goals and beyond.

Contributors

IMB, JDS, AJM, FNR, and MR conceptualised the Review. IMB and MJE curated the data. IMB conducted formal analysis of the data with support from MJE, JDS, and XN. IMB was responsible for data collection. All authors developed the methodology. IMB was responsible for project administration, with support from JCY. JDS and AJM provided supervision for the Review. IMB, JDS, and AJM undertook validation of results. JCY, supported by IMB, prepared the figure. IMB wrote the original manuscript draft, and all authors contributed to further review and editing. All authors had final responsibility for the decision to submit for publication.

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IMB received grants from the Prince Bernhard Culture Fund, Stichting VSBFonds, and Dr Hendrik Mullerfonds, and travel grants from the London School of Hygiene & Tropical Medicine. ME received US National Science Foundation award 1454414; has received consulting fees from AstraZeneca and the WorldBank; and declares honoraria from the Institute for Healthcare Improvement and Colombia University. MH has received honoraria from the University of Bayreuth, Novartis South Africa, and Netzwerk Plurale Ökonomik; travel support from the Preventing Overdiagnosis Conference and the *Lancet* Commission on Sustainable Healthcare; and holds advisory roles (paid) with the South Australian Health Performance Council and Glenview Community Services. AM has received grant funding from the Wellcome Trust; has been employed by the UK National Health Service, and is currently employed by the Australian Government Department of Health and Aged Care; has been paid for consultancy services to WHO; and has received travel support from the Public Health Association of Australia. AJM has received funding from the University of British Columbia and the Canadian Medical Association, and honoraria from both for speaking. XN received partial support from the Yale Center on Climate Change and Health. PP provides consultation services (paid) for the World Bank India Office and Health Care Without Harm (Ikea Foundation), and holds advisory roles (unpaid) with CAFÉ, Connecting Climate Minds, and the Climate and Health Hub for G-20 countries. FNR has received consulting payments from Aga Khan Health Services, travel support from WISH Foundation, and is a member of the Geneva Sustainability Centre Steering Committee. MR is funded by Wellcome and Horizon Europe programmes via IDAlert and CATALYSE (payments to institution). RGR declares a research grant from the Adaptation Research Alliance, which is funded by the UK Foreign, Commonwealth and Development Office; consulting fees from Wellcome; honorarium for lectures from USAID; is a member of the International Advisory Board for *The Lancet Planetary Health*, chair of the Thematic Working Group on Climate-Resilient and Sustainable Health Systems of Health Systems Global, member of the WHO Technical Advisory Group on Embedding Ethics in Health and Climate Change Policy, and member of the National Panel of Technical Experts of the Climate Change Commission of the Philippines. HS has received grants from the Agency for Healthcare Research and Quality, the US Department of Veteran's Affairs Health Services Research & Development and the VA National Center for Patient Safety; and declares honoraria from the Institute for Healthcare Improvement. JDS received partial grant support (paid to institution) from the Canadian Institutes of Health Research, Commonwealth Fund, Institute for Health Research, and National Science Foundation; declares honoraria for lecture and travel from various organisations; and holds leadership roles with the American Society of Anesthesiologists and the World Federation of Societies of Anesthesiologists. DvA provides consultation services (paid) for the Pan American Health Organization (unrelated to this work). JCY is supported by the University of British Columbia. CZ-C declares salary support through contracts between Cayetano Heredia University with the University of Leeds and WHO; has provided consultation services (paid) for the University of Alberta; declares an advisory role (unpaid) with the Global Environment Outlook of the UN Environment Programme and the Indigenous Peoples Food and Agriculture Organization. All other authors declare no competing interests. All authors declare no other support from any organisation for the submitted work, no other financial relationships with any organisations that might have an interest in the submitted work in the previous 36 months, and no other relationships or activities that could appear to have influenced the submitted work.

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