Health Community Submission on the UAE – Belém work programme

July 2024

This submission has been coordinated by the Global Climate and Health Alliance. It compiles expert inputs by the Wellcome Trust, the Lancet Countdown on Health and Climate Change, United for Global Mental Health, Drugs for Neglected Diseases Initiative (DNDi), Climate Cares Centre (Imperial College London) and The Rockefeller Foundation. On account of the time available, and the volume of content in this submission, this document has not been reviewed in its entirety by each of these organisations, rather, each organisation has directly contributed to the issues related to its own expertise. For more indicators related proposals see the submissions by the World Health Organization (the submission below does not cover the majority of WHO indicators), and by DNDi.

Contents

Background

The objectives of this submission are to

(1) Map existing health-relevant indicators in use at the local, national, regional and global level for measuring progress towards the targets of the UAE Framework for Global Climate Resilience.
(2) Provide information including on associated methodologies and data readiness for such indicators.
(3) Identify gaps and areas where development of new health-relevant indicators may be needed.
(4) Provide perspectives on future phases of the UAE – Belém work programme.

Previous submissions made on the GGA by the health community include a submission by WHO, GCHA, Wellcome Trust, Lancet Countdown, The Rockefeller Foundation, and partners in March 2024; by GCHA drawing on inputs from the wider health community in September 2023; by GCHA with inputs from Health in Harmony and Mahidol Oxford Tropical Medicine Research Unit in May 2023; by WHO, GCHA, Pathfinder Initiative, Health Care Without Harm, Health in Harmony, and the UK Health Alliance on Climate Change in

February 2023; and by the World Health Organization (WHO) and GCHA with input from the Lancet Countdown on Health and Climate Change in October 2022.

Health in the UAE Framework for Global Climate Resilience

Health is the explicit focus of the target defined in paragraph 9c of decision 2/CMA.5, namely:

"Attaining resilience against climate change related health impacts, promoting climate-resilient health services and significantly reducing climate-related morbidity and mortality, particularly in the most vulnerable communities".

In order to provide context for the indicators proposed below, and support common understanding, we define key elements of this paragraph as follows:

Climate change-related health impacts include the following (this is a non-exhaustive list)[1,2,3,4,5,6,7,8,9]*:*

- Heatwaves, especially when combined with drought, cause health impacts including heatstroke, dehydration, kidney disease, increased risk of psychiatric symptoms, suicide, and death. People with existing physical and mental health conditions, pregnant women and unborn children, infants, children and older people are especially vulnerable. Hot and dry conditions can also cause poor air quality due to desert dust and heat-induced increases in air pollutants like ground-level ozone.
- Floods and storms can cause injury and deaths including due to drowning, as well as compromising water and sanitation infrastructure leading to the spread of infectious disease.
- Wildfires present an immediate fatality risk as well as long term health impacts from smoke exposure, thermal injuries, and mental health impacts. Wildfires also affect health through loss of access to healthcare and supporting physical infrastructure.
- Changes in environmental suitability for vectors such as mosquitoes and ticks due to shifts in temperature and precipitation present a risk for transmission of infectious diseases such as malaria, dengue and Lyme disease in new geographies or for longer durations each year.
- Nutrition security is threatened by changes in agricultural yields due to changes in temperature and precipitation. Extreme heat limits labour productivity of agricultural workers, further limiting agricultural yield.
- Climate change undermines sexual and reproductive health and rights, including but not limited to risks of sexual violence against women and girls traveling longer distances or outside of daylight hours to carry water, or without access to clean water for menstrual hygiene, and increases risk of poor birth outcomes.
- Mental health impacts are arising from exposure to extreme weather events, displacement, migration, famine, malnutrition, degradation or destruction of health and social care systems, climate-related economic and social losses, as well as distress due to the prospect of climate change. These events present a risk to mental health by exposing people to potentially traumatic events, anxiety about future events or by worsening the social determinants of good mental health such as housing and employment. Climate change is increasing the number of risk factors for poor mental health among children and adolescents.

Climate-resilient health services

- Climate resilient health systems are defined by the WHO (2022)[10] as systems which are *capable of anticipating, responding to, coping with, recovering from, and adapting to climate related shocks and*

[1] Romanello et al, 2023. The 2023 report of the Lancet Countdown on health and climate change: the imperative for a health-centred response in a world facing irreversible harms. Lancet 402(10419): 2346-2394
[2] Chapman et al, 2021. Kidney physiology and pathophysiology during heat stress and the modification by exercise, dehydration, heat acclimation and aging. Temperature 8(2): 108–159.
[3] WHO, 2024. Sand and dust storms. WHO News Room.
[4] Camey et al, 2020. Gender-based violence and environment linkages. IUCN.
[5] Sagar, 2023. Climate change's devastating toll: Salinity's impact on coastal women's health in Bangladesh. Friedrich-Ebert-Stiftung.
[6] Olson & Metz, 2020. Climate change is a major stressor causing poor pregnancy outcomes and child development. F1000 Research 9: Faculty Rev-1222
[7] Lawrence et al, 2021. The impact of climate change on mental health and emotional wellbeing: current evidence and implications for policy and practice. Imperial College London Grantham Research Institute on Climate Change and the Environment.
[8] IPCC WGII, 2023. Health Climate Change Impacts and Risks. AR6 Fact sheet.
[9] El Omrani & Massazza, 2024. Children's mental health must be prioritised at the first Children's Dialogue at the UN Climate Negotiations. Imperial.
[10] WHO, 2022. Measuring the climate resilience of health systems. World Health Organization.

stresses, so as to bring about sustained improvements in population health, despite an unstable climate.

- Climate resilient health service delivery, which is dependent upon the development of climate-informed health programmes; sustained efforts to manage key determinants of health; and robust emergency preparedness and management systems that can address threats from acute shocks and stresses from extreme weather events and disasters and related public health emergencies (WHO 2022). Service delivery is also dependent on other elements of the wider health system including resilient physical infrastructure, a knowledgeable, trained and psychologically resilient workforce, supply chains, development of climate resilient health technologies and infrastructure.
- The existence and availability of climate services for health, i.e. tailored climate information and services to support the health sector in the face of more extreme weather and poor air quality, shifting infectious disease patterns and food and water insecurity[11] is critical for delivering climate resilient health services. Climate data and information (historic, monitored and forecasted) is central to measuring climate risks and impacts to health at multiple spatial and temporal scales.

Climate related disease morbidity and mortality

- The IPCC notes 69.9% of all deaths in 2019 were due to diseases which are *sensitive* to climate change[12]. While this does not indicate that 69.9% of mortality is *attributable* to climate change, it underscores the need for a comprehensive approach when measuring climate related disease mortality. The IPCC furthermore estimates that an excess of 250,000 deaths annually by 2050 attributable to climate change is projected due to heat, undernutrition, malaria and diarrheal disease, with more than half of this excess mortality projected for Africa (compared to a 1961–1991 baseline period for a mid-range emissions scenario), although this widely acknowledged to be a highly conservative underestimate, including by WHO[13].

The most vulnerable communities

- While impacts are felt in all world regions, populations of developing countries are most vulnerable to the health impacts of climate change despite contributing least to its cause. Furthermore, women, children, people with physical and psychosocial disabilities, the elderly, people with non-heteronormative sexual orientation, gender identity and expression, and sex characteristics (SOGIESC), low-income communities, Indigenous Peoples, migrants, and other marginalized groups are most impacted at subnational level.

Public health is defined by adaptation across sectors, and as such health considerations are also relevant to other thematic and process targets in paragraphs 9 and 10 of 2/CMA.5. Therefore, while we focus on indicators which could be used to measure progress towards target 9c in this submission, we also consider health-related indicators for other targets in paragraph 9 and 10, according to the links below.

- Water: improving access to potable water and climate-resilient sanitation systems, which can reduce the risk of waterborne diseases
- Food: ensuring food systems can support food sovereignty and good nutrition
- Ecosystems and biodiversity: access to natural spaces or green urban infrastructure to protect from heat and promote mental health
- Infrastructure: living and work environments that offer protection against heat and cold-related illnesses
- Poverty eradication: promoting social determinants of physical and mental health
- Cultural heritage: protecting cultural heritage to promote mental health and wellbeing, and social cohesion
- As for all other thematic issues, relevant action can be taken to protect and promote health throughout the adaptation cycle, including impact, vulnerability and risk assessment, planning, implementation, and monitoring.

Finally, we note that finance and other means of implementation are essential for delivering any level of progress on any of these thematic or dimensional issues. Needs relating to means of implementation and finance should also be tracked under each target.

[11] WMO, 2023. 2023 State of Climate Services for Health. World Meteorological Organization.
[12] IPCC WG II, 2022. Chapter 7: Health, Wellbeing and the Changing Structure of Communities. IPCC AR6, Impacts, Adaptation and Vulnerability.
[13] WHO, 2018. COP24 Special Report Health and Climate Change. World Health Organization.

Principles for the selection of indicators

We propose that indicators to monitor progress towards the thematic targets described in paragraph 9 (in some cases also the process targets in paragraph 10) of 2/CMA.5 should be considered and prioritised according to the criteria below.

1. **Outcome-focussed:** Good physical and mental health are outcomes of adaptation across sectors including and beyond health. Adaptation action in the healthcare sector is key, and should be monitored as part of the GGA, but is insufficient to fully protect public health in isolation. Action in health-determining sectors can be optimised by investing in co-benefit interventions, for example promoting nutrition through agriculture interventions and water security through sanitation interventions. Measuring health *outcomes* will help to track whether adaptation actions are having the intended impact and contribute to the evidence-base for decision-making. In addition to health outcomes, it may be relevant to monitor certain adaptation actions, provided there is a clear link to the outcome being measured and positive health outcomes. Integration between adaptation and mitigation will be important to accelerate progress towards a climate resilient net zero healthy future and minimize maladaptation.
2. **Climate-informed:** Indicators should track an aspect of the relationship between health and climate change that is well evidenced in the literature. Climate data and services are dynamic and evolving, as such it is important that climate-focused indicators take advantage of the most current and timely information the field has available. Climate services for health, and related information sharing efforts, are fundamental in developing a better understanding of how climate change is and will impact health systems. To appropriately manage risk, health indicators must take into account both near term and long term climate risks. Moreover, the indicator should provide annual data for the recent past and to a year as recent as possible. It must be available across an adequate timescale to allow for attribution to climate change, where relevant.
3. **Evidence-based:** Take an evidence-based approach, guided by the best available science (using well-established, internationally accepted, and ideally previously published scientific methods) and the worldviews and values of Indigenous Peoples, in alignment with paragraph 8 of FCCC/PA/CMA/2023/L.18. Transdisciplinary research which draws on knowledge from across disciplines of research and society, and engages affected communities, ensures the relevance of indicators to local settings and across sectors. Indicators identified should reflect priorities identified in national vulnerability assessments.
4. **Promoting health equity and grounded in human rights:** Indicators which address social and environmental determinants of health, reflect and support human rights, and are gender- and age-responsive should be prioritised. Indicators should enable identification of inequalities affecting vulnerable and disproportionately affected populations. This should be achieved through active collaboration and inclusion with representatives of most affected populations and people with lived experience, and tracking disaggregated data, to inform a targeted approach to action. Progress on indicators could be reported for national populations, and also, for example, the 10% lowest income, to include an emphasis on vulnerable and disproportionately affected populations. Such a focus on distribution will be essential, since even scaled adaptation interventions are not guaranteed to address inequalities. We also caution against excessive global aggregation in indicator reporting since this masks needs in individual countries or regions and may distort priorities.
5. **Draw on existing monitoring:** In any cases where new indicators are to be proposed, it is key that these fill a significant gap in existing evidence.
6. **Avoid incentivising potential maladaptation**: Indicators should not inadvertently incentivise maladaptation, for example by encouraging Parties to take actions that lead to short-term gains in climate resilience at the expense of long-term progress in climate adaptation and mitigation. Since health is defined by action across sectors, maladaptation in a health-determining sector can also damage health.
7. **Geographically representative, with relevance at international and national level:** While we do not consider it to be essential that all indicators are monitored by all Parties, as climate-induced threats to health vary between countries and regions, indicators should track issues which are relevant to a substantial number (e.g. >50) countries, to ensure that reporting coverage is sufficient for global trends to be identified and addressed, recognising distinct national circumstances.

Recommended next steps for the UAE – Belém work programme

Ultimately, we propose that the indicators selected should be:

- **Non-exhaustive:** We do not believe it would be constructive to have a list of more than five health indicators, because a high number of total indicators, if Parties do not have the capacity to report on many indicators and select different options, will pose challenges in terms of identifying common trends to be reflected, for example in the next Global Stocktake (GST).
- **Practically feasible, with the potential for strengthening over time:** Tiered options could be presented for each indicator by 2025, with a core suite of indicators based on what is practically feasible for countries to measure in the immediate term, and then with additional supplementary indicators to be measured as methods and capacity improve. Iterative improvements in the indicators could be made following the two year programme, reflecting current adaptation needs, available data, and national capacity. In all cases indicators should be clearly defined, with guidance for effective data collection and reporting. Lessons could be learned from the framework established under the Sustainable Development Goals (SDGs) of tiering, where methodological development and data readiness of each indicator are assessed and updated periodically. This supports implementation and ensures feasibility considerations are reflected in the implementation framework. We have commented below where we understand indicators to be methodologically robust, but where current data systems are not sufficiently advanced in all settings to permit monitoring on a global scale, but which could be monitored in future.

In order to ensure that the optimal indicators are selected for health (and for other targets) we propose the following steps in relation to the selection of experts and after the mapping exercise:

In selecting experts:

- Establish a committee to evaluate nominations based on predefined criteria such as expertise, regional representation, gender, interdisciplinarity, local and indigenous knowledge, etc., according to a transparent process.
- We support the identification of a diverse and interdisciplinary group (transdisciplinary even) of experts to identify indicators under the health target outlined in paragraph 9c of the UAE FGCR and beyond, including epidemiologists, public health professionals, and climate health researchers, climate scientists specializing in climate and health modeling, environmental health, and climate adaptation, data analysts with expertise in health informatics, statistics, and big data analysis. Additional inclusion of social scientists, policymakers, practitioners, NGO representatives, health grassroots community leaders, youth, indigenous traditional health practices and local knowledge holders, and health economists will enhance the local applicability of indicators.

Following completion of the indicator mapping:

- **Identification of additional criteria:** In addition to the indicator criteria / principles agreed by Parties in SB/2024/L.6, we propose that experts identify any additional criteria / principle relevant for the selection of indicators from a technical perspective. This could include some of the principles mentioned above in this submission.
- **Development of indicator shortlists:** Technical experts should review all indicators mapped relating to their own area of technical expertise. Experts should prepare a shortlist for each target (for example, 20 indicators) to be considered by experts and Parties during the hybrid workshop. It would be beneficial for experts to have additional time and space for collaboration to allow technical engagement to support this process. This could include identifying additional criteria and development of shortlists and following up with those who are currently producing indicators to understand methodologies and limitations in greater detail, if needed.
- **Structure of the hybrid workshop:**
    - Day 1: The workshop should be structured with half day initial breakout groups by thematic target in paragraph 9 of 2/CMA.5. Report backs from these breakouts should be provided in plenary for the remaining half day, with ample time for feedback from experts with complementary expertise.
    - Day 2: Indicators under the targets of paragraph 10 of 2/CMA.5 should all be discussed in plenary. Initial overview of the gaps could also be covered in this session.

    - Day 3: Next steps for the work-programme should be discussed including modalities for technical work in Spring 2025 to optimise time at COP29.
    - By the end of the workshop, shortlists should be narrowed (e.g. to no more than 10 indicators per target)
- **Cross-checking of proposed indicators to avoid incentivising maladaptation:** Following the hybrid workshop, experts should contribute to discussions relating to indicators under all targets relevant to their issue of expertise, to avoid incentivising maladaptation (for example a focus on food security alone rather than also incorporating indicators relating to nutrition security under 10a could lead to high food production for export, while communities are left to depend on highly processed or imported foods with low nutritional value. This could be prevented by ensuring discussions on food are open to health experts. This is just one example of the risk of incentivising maladaptation; it should also be considered for other targets and issues).

Sources

In compiling this submission, we reviewed the following monitoring frameworks:

- Global: The Sendai Framework, the SDGs, 2018 UNEP Adaptation Gap Report, the Global Burden of Disease, the Lancet Countdown on Health and Climate Change
- Regional: The European Environment Agency Climate and Health Obervatory (including indicators from Copernicus)
- National: A UK HSA NIHR scoping review
- In addition, we refer below to INFER and the WHO Global Mental Health Atlas.

Indicator classification

We classify the indicators listed below according to the the following three categories, drawing on work by the UK Health Security Agency[14], UNDRR[15], and Scheelbeek et al[16].

- **Risk profile indicators: Those relating to exposure, hazard or vulnerability.** Situations or activities that identify the potential for exposure to a hazardous condition or climate hazard, such as weather or climate exposure, climate hazards and climate-sensitive environmental hazards. These indicators can be used to assess high-risk areas and populations, but would not enable the impact of an adaptation strategy to be tracked, unless these hazards could be avoided through adaptation (for example, heatwave occurrence cannot be avoided through adaptation, but it is possible to prevent flooding through adaptation).
- **Action: Measures taken to reduce exposure, vulnerability, or to increase adaptive capacity.** Often involving planning and projects, for example national and local strategies and action plans, early warning systems etc. Indicators that relate to population coverage of an action are also classified as actions.
- **Outcome: Experienced impacts on human systems.** For example, mortality, economic loss, and service disruption.

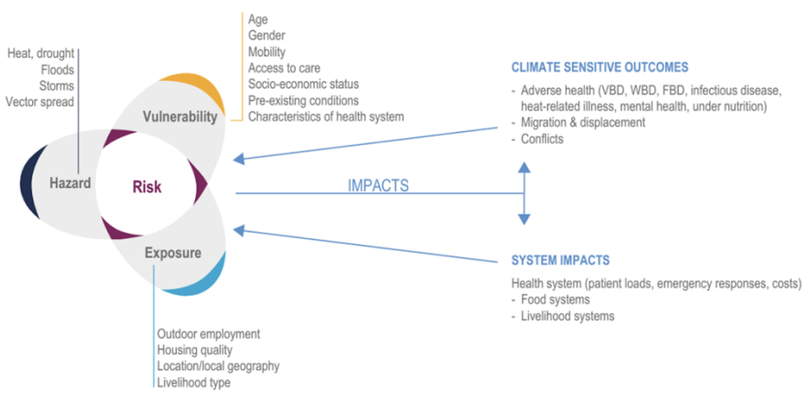

Figure: Interactions between hazard, exposure and vulnerability that generate impacts on health systems and outcomes, with selected examples.[17]
WBD: waterborne disease, VBD: Vector-borne disease, and FBD: Food-borne disease.

[14] Kovats & Leonardi, 2023. Climate change and public health indicators: scoping review. UK Health Security Agency.
[15] UNDRR, 2023. Sendai Framework for Disaster Risk Reduction Goal, Targets and Metrics. UN Office for Disaster Risk Reduction.
[16] Scheelbeek et al, 2021. The effects on public health of climate change adaptation responses: a systematic review of evidence from low- and middle-income countries. Environment Research Letters 16 (7): 073001
[17] IPCC WG II, 2022. Figure 7.4, Chapter 7: Health, Wellbeing and the Changing Structure of Communities. IPCC AR6, Impacts, Adaptation and Vulnerability.

Rationale for inclusion

The principles for selection of indicators outlined above are ideals, and will not be feasible to adhere to for all indicators under the GGA, health related or otherwise. In reviewing the sources above, we did not include risk profile indicators where robust outcome focussed indicators already exist. Where proxies are sometimes used to assess basic healthcare provision, for example measles immunization rates, under 5 mortality rate, these were excluded as they are too far removed from climate change adaptation and thus not relevant for consideration under the UAE FCGR.

Potential health related indicators under the UAE Framework for Global Climate Resilience

Overarching gaps

For each of the groupings of indicators mentioned below (e.g. heat, infectious disease, etc), we have provided comments on gaps in existing indicators. In addition, we note the following crosscutting gaps.

- Climate data is necessary for the delivering successful adaptation policy and the optimising indicators across all of the categories below. There is currently a gap in indicators relating to the accessibility for health decision makers to high quality, timely, relevant and globally standardized climate information services. The existence of robust climate data enables the healthcare sector (and indeed other sectors) to understand risk and thus to anticipate future climate threats and implement actions accordingly is critical. Climate information is vital for optimising adaptation actions to protect and promote health[18].
- The lack of disaggregated data presents a challenge across all indicator groups below and risks masking the challenges faced by the most vulnerable populations. Means of implementation, including finance, technology transfer, and capacity building are necessary to strengthen data infrastructure in countries seeking to address this, to support collection of such granular data.
- For some issues, available indicators mainly track risk profile (hazard, exposure, vulnerability). While they indicate where countries should assess where adaptation capacity should be evaluated, hazard and exposure would not necessarily change due to implementation of adaptation policies. It is also notable that risks may only be considered when they affect groups other than the most marginalised. Outcome-focussed and action-oriented indicators would be preferable.
- Attributing a portion of the health burden of any climate-related event would require advances in data collection and in detection and attribution science.
- Achieving progress on adaptation will depend on sufficient means of implementation - including finance, technology transfer, and means of implementation, especially in developing countries. As such, MoI indicators should be included as part of the UAE FGCR.
- It may be relevant to review Palmeiro-Silva et al[19] for further comments on existing indicators and analyses.

[18] WMO, 2023. 2023 State of Climate Services for Health. World Meteorological Organization.
[19] Palmeiro-Silva et al, 2024. Climate-related health impact indicators for public health surveillance in a changing climate: a systematic review and local suitability analysis. The Lancet Regional Health- Americas 2024;38: 100854

Potential indicators under target 9c

Attaining resilience against climate change related health impacts, promoting climate-resilient health services, and significantly reducing climate-related morbidity and mortality, particularly in the most vulnerable communities;

Heat

Suggested indicator(s)	Annual heat related mortality - UK Health Security Agency scoping review, indicator H3 (France and Italy have something too)	Heat-related mortality - Lancet Countdown 2023 1.1.5 - similar to Morbidity and mortality attributable to non-optimal temperatures (heat and cold) Global Burden of Disease	Costs of heat-related mortality- Lancet Countdown 2023 indicator 4.1.2 (monetised value of heat related mortality, the indicator to the left in this table)	Annual heat illness - UK Health Security Agency scoping review, indicator H4	Change in labor capacity due to heat exposure - Lancet Countdown 2023 1.1.4	Loss of earnings from heat-related reduction in labour capacity Lancet Countdown 2023 4.1.3 (monetised value of change in labour capacity due to heat exposure, the indicator to the left in this table)	Spatial measures for urban cooling - UK Health Security Agency scoping review, indicator H7	Local heatwave plan - UK Health Security Agency scoping review, indicator H8	Proportion of housing stock with overheating risk - UK Health Security Agency scoping review indicator H2
Additional field: indicator type	Outcome	Outcome	Outcome	Outcome	Outcome	Outcome	Action	Action	Risk profile
Specify the relevance to GGA target(s)	9.c - Reducing climate-related mortality and morbidity	9.c - climate impacts on health	9.c. resilience against health impacts These costs further reduce resilience of vulnerable countries, also relevant for 9f	9.c - Reducing climate-related mortality and morbidity	9.c - climate impacts on health	9.c. resilience against health impacts These costs further reduce resilience of vulnerable countries, also relevant for 9f	9.c. resilience against health impacts	9.c. resilience against health impacts	9.c - climate impacts on health
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Informs extent of adaptation measures needed to protect vulnerable populations.	Informs extent of adaptation measures needed.	Could track effectiveness of adaptation policies and impact on economies	Informs extent of adaptation measures needed to protect vulnerable populations.	Informs extent of adaptation measures needed.	Could track effectiveness of adaptation policies and impact on economies	Enhancing adaptive capacity and reducing vulnerability through planning	Enhancing adaptive capacity and reducing vulnerability through planning	Informs extent of adaptation measures needed to protect vulnerable populations.

Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology tested at UK level and available here on p19.	Lancet Countdown Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf) GBD: We analysed individual-level cause of death data for all locations with available information on daily temperature, location, and International Classification of Diseases-coded cause of death. Further information page 25, and 54-58	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology tested at UK level and available here on p20.	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology tested at UK level and available here on p23.	Methodology tested at UK level and available here on p23.	Methodology tested at UK level and available here on p18.
Information on data readiness (if available)	No - needs new processing of existing data	Yes	This indicator is based on results from another indicator. It also uses publicly available data sets.	Data available within the UK, or currently in use within the UK although considered not a good indicator for overall population impact.	Yes	This indicator is based on results from another indicator. It also uses publicly available data sets.	No - needs new processing of existing data although noted the use of Normalised Difference Vegetation Index	No - needs new processing of existing data	No - needs new processing of existing data
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative	Qualitative
Level (local, national, regional and global)	National - local	Global	Global	National - local	Global	Global	National - local	Local	National - local

The ability of the indicators to reflect regional, national and local circumstances	Yes	Regional / National	Regional / National	Yes	Regional / National	Regional	Yes	Yes	Yes
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	No	Yes	Yes	Yes - within UK health system	Yes	Yes	No	Yes	No
The ability of the indicators to be aggregated across levels	No - concerns of imprecision due to low numbers of heat mortality in certain areas	Yes	Yes	Yes	Yes	Yes	Unknown	Unknown	Not yet
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Yes	Not yet at the sub-national level.	Not yet at the sub-national level.	Yes	Not yet at the sub-national level.	Not yet at the sub-national level.	No	No	Not yet
Is based on the best available science?		Yes	Yes		Yes	Yes	Unknown	Unknown	Not yet
Is based on Indigenous Peoples' knowledge and local knowledge systems?		No	No		No	No	No	No	No

Floods

Suggested indicator(s)	Estimated number of people suffering flood related adverse mental health impacts (anxiety, depression, or PTSD) - UK Health Security Agency scoping review, indicator F7	Number of people displaced from home for more than 30 days because of flood damage - UK Health Security Agency scoping review, indicator F8	Fatalities associated with floods - European Environment Agency	Proportion of dwellings with property-level flood resilience - UK Health Security Agency Scoping review, indicator F10

	This indicator may be best suited as part of a tiered approach (ie as an optional or future indicator) – methods and relevance are strong, but data is not widely available.	*This indicator may be best suited as part of a tiered approach (ie as an optional or future indicator) – methods and relevance are strong, but data is not widely available.*		
Additional field: indicator type	Outcome	Outcome	Outcome	Action
Specify the relevance to GGA target(s)	9.c - measuring reduced climate related mortality and morbidity	9.c - measuring resilience against health impacts	9.c - measuring reduced climate related mortality and morbidity	9.c - measuring resilience against health impacts
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Strengthening resilience of populations to extreme weather events	Strengthening resilience of populations to extreme weather events	Strengthening resilience of populations to extreme weather events	Strengthening resilience of populations to extreme weather events
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology tested at UK level and available here on p35.	Methodology tested at UK level and available here on p36.	Methodology	Methodology tested at UK level and available here on p37.
Information on data readiness (if available)	No feasible data available. Improved health surveillance systems required	No feasible data available. Note the potential role of the insurance industry to collect information on this indicator.	Collected for European countries	Needs new processing of existing data
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative
Level (local, national, regional and global)	Local - national	Local - national	National	National
The ability of the indicators to reflect regional, national and local circumstances	Likely	Likely	Unknown	Unknown
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	No	No	Yes, annual (see links above)	No
The ability of the indicators to be aggregated across levels	No	No	Yes	No

The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Not yet	Not yet	Unknown	Not yet
Is based on the best available science?	Unknown	Unknown	Unknown	Unknown
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No	No	No	No

Wildfires

Suggested indicator(s)	Fatalities associated with wildfires - European Environment Agency	Health impacts of wildfires - UK Health Security Agency scoping review, indicator H6	Bushfire adaptation - Lancet Countdown Australia 2024 indicator 2.5	Wildfires - Lancet Countdown 2023 indicator 1.2.1	Fire weather index - Copernicus C3S / European Environment Agency
Additional field: indicator type	Outcome	Outcome	Action	Risk profile	Risk profile
Specify the relevance to GGA target(s)	9.c - measuring reduced climate related mortality and morbidity	9.c - Reducing climate-related mortality and morbidity	9.c 9.d. - restoration, conservation and protection of ecosystems	9.c 9.d - reducing impacts on ecosystems	9.c - measuring reduced climate related mortality and morbidity
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Strengthening resilience of populations to extreme weather events	Informs extent of adaptation measures needed to protect vulnerable populations.	Tracks firefighting capacity as an adaptation measure to bushfires	Strengthening resilience of populations by reducing risks and exposures to extreme weather events.	Informs extent of adaptation measures needed to protect vulnerable populations.
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	Methodology tested at UK level and available here on p22.	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology

Information on data readiness (if available)	Collected for European countries	No feasible data available although noted that use of Fire Danger Ratings could predict danger.	Yes - for Australia	Yes	Collected for European countries
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative
Level (local, national, regional and global)	National	National - local	National	Global, national	Local
The ability of the indicators to reflect regional, national and local circumstances	Unknown		National	Regional, national	Unknown
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes, annual (see links above)	No	Yes	Yes	Was annual, up to 2020 (see links above)
The ability of the indicators to be aggregated across levels	Yes		No	Yes	No
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Unknown	No		Not yet at the sub-national level.	No
Is based on the best available science?	Unknown				Unknown
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No				No

Other / multiple extreme weather events

A gap identified across extreme weather indicators including heat, wildfires and floods in the sections above, is the lack of indicators tracking the relationship between extreme weather and mental health. Exceptions to this are indicator 1.2.3 of the Lancet Countdown 2023, included below, which monitors sentiment using Twitter data during extreme heat and precipitation as a proxy measure[20]; and the UKHSA floods indicator above covering flood related adverse mental health impacts, although deemed by the authority to not yet be feasible. This is despite growing evidence of the negative impacts of heat on mental health from increasing rates of psychiatric hospital admissions during heat waves to increased mortality among people living with pre-existing mental health problems, and links between extreme weather events and poor mental health outcomes such as anxiety, depression, substance misuse, and post-traumatic stress disorder (PTSD)[21,22,23]. Some initiatives are currently exploring feasibility of measuring this association more directly in future (e.g. links between heat and suicides, which was previously reported for Australia by Beggs et al[24]).

Suggested indicator(s)	Global disaster mortality - Sendai Framework for DRR indicators A-2 Similar to Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population SDG indicator 1.13.1 Methodology It may also be possible to develop or strengthen a disaster mortality indicator using EM-DAT	Global disaster injuries - Sendai Framework for DRR indicators B-2	Global disaster missing persons - Sendai Framework for DRR indicators A-3	Extreme weather and sentiment - Lancet Countdown 2023 indicator 1.2.3	Economic losses due to weather-related extreme events - Swiss Re data reported by Lancet Countdown 2023 indicator 4.1.1	Percentage of population exposed to or at risk from disasters protected through pre-emptive evacuation following early warning - Sendai Framework G6
Additional field: indicator type	Outcome	Outcome	Outcome	Outcome	Outcome	Action
Specify the relevance to GGA target(s)	9.c - measuring reduced climate related mortality	9.c - measuring reduced climate related mortality	9.c - measuring reduced climate related mortality	9.c - climate impacts on health	9.c - measuring reduced climate related mortality and morbidity	9.c - resilience against climate change related health impacts and resilient health services and 10.c implementation

[20] Liu et al, 2021. Is there an association between hot weather and poor mental health outcomes? A systematic review and meta-analysis. Environment International 153: 106533
[21] Goldman & Galea, 2014. Mental health consequences of disasters. Annual Reviews Public Health. Annu Rev Public Health 35: 169-83
[22] Thompson et al, 2023. Ambient temperature and mental health: a systematic review and meta-analysis. Lancet Planetary Health 7(7): E580-E589
[23] Meadows et al, 2024. Mental illness and increased vulnerability to negative health effects from extreme heat events: a systematic review. Psychiatry Research 332: 115678
[24] Beggs et al, 2019. The 2019 report of the MJA–Lancet Countdown on health and climate change: a turbulent year with mixed progress. Med J Aust 2019; 211 (11): 490-491.e21.

Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Strengthening resilience of populations by reducing risks and exposures to extreme weather events.	Strengthening resilience of populations by reducing risks and exposures to extreme weather events.	Strengthening resilience of populations by reducing risks and exposures to extreme weather events.	Strengthening resilience of populations to extreme weather events by targeting mental health support.	Informs potential economic benefits from adaptation measures	Yes
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	Methodology	Methodology	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology
Information on data readiness (if available)	Operational under Sendai Framework, some challenges with attribution noted	Operational under Sendai Framework, some challenges with attribution noted	Operational under Sendai Framework, some challenges with attribution noted	Yes	Data is based on several publicly available databases.	
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative
Level (local, national, regional and global)	Global, national	Global, national	Global, national	Global, national	Global	National
The ability of the indicators to reflect regional, national and local circumstances	Yes	Yes	Yes	Regional, national	National	
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes	Yes	Yes	Yes	Yes	Yes
The ability of the indicators to be aggregated across levels	Yes - current global aggregation	Yes - current global aggregation	Yes - current global aggregation	Yes	No	Unknown
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Yes - disaggregation in reporting desirable	Yes - disaggregation in reporting desirable	Yes - disaggregation in reporting desirable	Not yet at the sub-national level.	Not yet at the sub-national level.	Unknown

Is based on the best available science?					Yes	Unknown
Is based on Indigenous Peoples' knowledge and local knowledge systems?					No	Unknown

Infectious disease

The indicators below primarily relate to risk profile for infectious disease, including climate suitability for transmission, and vulnerability. Two of the below indicators are outcome indicators, but neither of these is climate-informed. There is one action-related indicator, which is only known to be considered by the UK. This underpins the need for having indicators which measures progress of action against climate-sensitive infectious diseases. Specific gaps which have been identified include:

- Cholera outbreaks linked to extreme weather events (drought, cyclones etc.)
- Dengue incidence/ frequency of outbreaks.
- Vector climatic suitability (Aedes aegypti, Leish sandflies, Schisto snails)
- Incidence of vector-borne diseases such as Schisto and Leish in new, non-endemic areas
- Incidence and location of zoonotic diseases e.g. hantavirus

A potentially useful model which could be used and rolled out to other diseases is presented within the ISMIP project which calculated the population at risk and length of transmission season of dengue and malaria. In addition, the presence of infectious diseases varies across regions and climatic conditions. Indicators should be developed and tracked which take these national and regional variations into account.

Suggested indicator(s)	Climate suitability for infectious disease transmission (West Nile virus, dengue, Zika virus, chikungunya, malaria, and non-cholera Vibrio pathogens) - Lancet Countdown 2023 indicator 1.3	Seasonal temperature profile compatible with survival of disease vectors – UKHSA Scoping Review V1	*Other indicators relating to climate suitability and season length for infectious disease transmission* (a) Tiger Mosquito Climatic Season Length - Copernicus C3S / European Environment Agency (b) Tiger Mosquito Climatic Suitability - Copernicus C3S /	Vulnerability to mosquito-borne disease - Lancet Countdown 2023 indicator 2.3.1	*Indicators relating to vector activity* (a) Weekly tick activity - UKHSA Scoping Review V2 (b) Fortnightly mosquito activity - UKHSA Scoping Review V3 (c) Tick bite species at veterinary practices - UKHSA Scoping Review V5	Autochthonous cases of vector-borne disease - UKHSA Scoping Review V7	Implementation of monitoring and reporting system for vectors - UKHSA Scoping Review V8	Malaria incidences per 100,000 - SDG 3.3.3

			European Environment Agency (c) Climatic suitability for the presence and seasonal activity of the Aedes albopictus mosquito for Europe derived from climate projections - Copernicus C3S (d) Climate suitability for airborne vectors in the Mediterranean region - Copernicus					
Additional field: indicator type	Risk profile	Risk profile	Risk profile	Risk profile	Risk profile	Outcome	Action	Outcome
Specify the relevance to GGA target(s)	9.c - climate impacts on health	9.c - climate impacts on health	9.c - climate impacts on health	9.c - climate impacts on health	9.c - climate impacts on health	9.c - climate impacts on health	9.c - strengthening resilience of health services	9.c - climate impacts on health
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Reducing vulnerability to disease transmission	Reducing vulnerability to disease transmission		Reducing vulnerability to disease transmission	Reducing vulnerability to disease transmission	Reducing vulnerability to disease transmission - although further assessment of climate attribution and drivers need	Reducing vulnerability to disease transmission	Reducing vulnerability to disease transmission. Further assessment needed on how it is *climate informed* and *climate attributed*
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	Methodology tested at UK level and available here on p43.	(a) Tiger Mosquito Climatic Season Length (b) Tiger Mosquito Climatic Suitability - Copernicus / EEA (c) Climatic suitability for the presence and seasonal activity of the	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	(a) Methodology tested at UK level and available here on p44. (b) Methodology tested at UK level and available here on p44. (c) Methodology tested at UK level and available here on p45.	Methodology tested at UK level and available here on p47.	Methodology tested at UK level and available here on p47.	Methodology

			Aedes albopictus mosquito for Europe (d) Climate suitability for airborne vectors in the Mediterranean region					
Information on data readiness (if available)	Yes	Not yet - research needed to identify the most appropriate climate-based index	Yes, at European level	Yes	(a) Not yet – further surveys need (b) Not yet – investment needed (c) Yes – although limitations at identifying specific species	Yes - feasible but association with climate drivers need to be interpreted with experts	Not yet - This indicator is feasible but requires changes to local reporting systems.	Data readiness considered high
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative		Quantitative	Quantitative	Quantitative	Quantitative	Quantitative
Level (local, national, regional and global)	Global, national	National	National	Global, national	National	National	National – local	Global, national
The ability of the indicators to reflect regional, national and local circumstances	Regional, national	Unknown		Regional, national	Unknown	Unknown	Yes	
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes	No		Yes	No	No	No	Yes
The ability of the indicators to be aggregated across levels	Yes	Unknown		Yes	Unknown	Unknown	Unknown	Yes

The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Not yet at the sub-national level.	No		Not yet at the sub-national level.	No	Yes	No	Yes
Is based on the best available science?	Yes	Unknown	Unknown	Yes	Unknown	Unknown	Unknown	
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No	Unknown	No	No	Unknown	Unknown	Unknown	

Air pollution

Some forms of air pollution have strong links to mitigation of climate change. We focus here on two air pollutants that are strongly influenced by changes in the climate, namely pollen and ozone.

Suggested indicator(s)	Air pollution due to ozone: health impacts and effects of climate change - European Environment Agency	Allergenic tree pollen season start - European Environment Agency , Lancet Countdown in Europe
Additional field: indicator type	Risk profile	Risk profile
Specify the relevance to GGA target(s)	9.c - climate impacts on health	9.c - climate impacts on health
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Informs extent of adaptation measures needed to protect vulnerable populations.	Informs extent of adaptation measures needed to protect vulnerable populations.
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)
Information on data readiness (if available)	Data collected in Europe up until 2012	Data reported on annually in Europe and Australia

Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative
Level (local, national, regional and global)		
The ability of the indicators to reflect regional, national and local circumstances		
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Previously reported on, discontinued	Yes, in Europe
The ability of the indicators to be aggregated across levels	Unknown	Unknown
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate		
Is based on the best available science?	Unknown	Unknown
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No	No

Healthcare systems

Additional indicators for climate-resilient healthcare systems are covered by WHO. There may be particular opportunities to align with the climate adaptation indicator under the 14th General Programme of Work for 2025-2028, GPW14 (see page 56 of 3rd May version, or more recent versions posted at the main GPW14 page), since this will be reported on by WHO Member States once finalised and agreed. When considering disasters under which to report healthcare impacts information, these should be climate informed and attributable to climate change. Indicators relating to general healthcare system capacity have not been included here as these are not directly relevant to climate change, but are bulleted

below. However, these proxy indicators are widely measured and could provide an interim means to track healthcare system resilience until more optimal indicators can be tracked (an indicator on humanitarian response capacity may be appropriate).

- Immunization, measles (% of children ages 12-23 months) - UNEP Adaptation Gap Health Report, 2018
- Mortality rate, under-5 (per 1,000 live births) - UNEP Adaptation Gap Health Report, 2018
- Prevalence of stunting, height for age (% of children < five years old) - UNEP Adaptation Gap Health Report, 2018
- Under 5 mortality rate, neonatal mortality rate - SDGS 3.2.1, 3.2.2
- Maternal mortality ratio - SDGs 3.1.1
- Proportion of Births attended by skilled health personnel - SDGs 3.1.2
- Coverage of essential health services - SDG 3.8.1

Suggested indicator(s)	Destroyed or damaged health facilities attributed to disasters - Sendai Framework for DRR D-2	Other health facility incidents (a) Hospitals overheating incidents - UKHSA Scoping Review, HS1 (b) Health services flooded - UKHSA Scoping Review, HS2 (c) Care home overheating incidents - UKHSA Scoping Review, SC1	Global multilateral funding for health adaptation programs - Lancet Countdown indicator 2.2.4	Detection, preparedness, and response to health emergencies - Lancet Countdown indicator 2.2.5 (implementation status for health emergency management)	Health care facilities adapted to be climate proof - UKHSA Scoping Review, HS4
Additional field: indicator type	Outcome	Outcome	Action	Risk profile	Action
Specify the relevance to GGA target(s)	9.c and 9.e - strengthening resilience of health services	9.c measuring climate impacts on health	9.c and 9.e	9.c strengthening resilience of health services	9.c - strengthening resilience of health services
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Strengthening resilience of populations to extreme weather events and enhancing adaptive capacity	Informs extent of adaptation measures needed to protect vulnerable populations.	Financing for adaptation - relevant particularly for LMICs	Strengthening resilience of health systems	Enhancing adaptive capacity and reducing vulnerability through planning
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	(a) Methodology tested at UK level and available on p70 (b) Methodology tested at UK level and available on p71 (c) Methodology tested at UK level and available on p75	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology tested at UK level and available here on p73

Information on data readiness (if available)	Yes	(a) Yes – data already being collected within UK by health providers (b) Not yet – technically feasible but reporting system needs updating (c) No - not yet collected or available	Yes	Yes	No – no methods on how this could be conducted developed yet
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative
Level (local, national, regional and global)	Global	Local	Global	Global, national	Local
The ability of the indicators to reflect regional, national and local circumstances		Yes	No	Regional, national	Yes
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)		Yes	Yes	Yes	No
The ability of the indicators to be aggregated across levels		Unknown	Yes	Yes	Unknown
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate		No	Not yet at the sub-national level.	Not yet at the sub-national level.	No
Is based on the best available science?		Unknown	Yes	Yes	
Is based on Indigenous Peoples' knowledge and local knowledge systems?		No	No	No	

Potential health-relevant indicators under other targets of paragraph 9

Target 9a: Water, including potable water

Significantly reducing climate-induced water scarcity and enhancing climate resilience to water-related hazards towards a climate-resilient water supply, climate-resilient sanitation and towards access to safe and affordable potable water for all;

Suggested indicator(s)	Population affected by supply disruption - UK Health Security Agency scoping review, indicator W1 *This indicator may be best suited as part of a tiered approach (ie as an optional or future indicator) – methods and relevance are strong, but data is not widely available.*	Proportion of population using safely managed drinking water services - SDG indicator 6.1.1	*Water quality indicators in the UK* (a) Drinking water quality - UK Health Security Agency scoping review, indicator W3 (b) Bathing water quality- UK Health Security Agency scoping review, indicator W4 *These indicators may be best suited as part of a ed approach (ie as an optional or future indicator) – methods and relevance are strong, but data is not widely available.*	Population supplied by private wells - UK Health Security Agency scoping review, indicator W2
Additional field: indicator type	Outcome	Risk profile	Risk profile	Risk profile
Specify the relevance to GGA target(s)	9.a, 9.c - climate impacts on health, reducing climate induced water scarcity	9.a, 9.c - enhancing climate resilience to water-related hazards towards a climate-resilient water supply, climate-resilient sanitation	9.a, 9.c - climate impacts on health, climate resilient water supply and access to safe and affordable potable water.	9.a, 9.c - climate impacts on health, reducing climate induced water scarcity
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Enhancing adaptive capacity. Consideration needed on how it can be *climate informed*	Informs extent of adaptation measures needed to protect vulnerable populations	Enhancing adaptive capacity, strengthening resilience. Consideration needed on how it can be *climate informed*	Enhancing adaptive capacity
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology tested at UK level and available here on p66	Methodology	(a) Methodology tested at UK level and available here on p68 (b) Methodology tested at UK level and available here on p69	Methodology tested at UK level and available here on p67

Information on data readiness (if available)	Not currently feasible	Data readiness considered high	(a) Yes in the UK, though, the cause of contamination and the role of weather is not routinely reported. The quality of drinking water is regulated by the Drinking Water Inspectorate (DWI) and monitored by the individual water companies or by local authorities for PWS (b) Yes in the UK	Not currently feasible
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Qualitative	Quantitative
Level (local, national, regional and global)	Local	National	Yes	Yes
The ability of the indicators to reflect regional, national and local circumstances	Yes		Yes	Yes
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	No		Yes	No
The ability of the indicators to be aggregated across levels	Unknown		Unknown	Unknown
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Unknown		Unknown	Unknown
Is based on the best available science?	Unknown	Unknown	Unknown	Unknown

Is based on Indigenous Peoples' knowledge and local knowledge systems?	No	No	No	No

Target 9b: Food

Attaining climate-resilient food and agricultural production and supply and distribution of food, as well as increasing sustainable and regenerative production and equitable access to adequate food and nutrition for all;
Attribution

While a wide range of food related indicators are tracked, these are not always linked to climate- further consideration should be given to ensure the existing indicators on food are adequately *climate informed.* Attention is needed to ensure risks relating to maladaptation inform food indicators due to potential trade-offs associated between low-emissions/sustainable food systems with food systems resilience, which can have different implications for dietary patterns and food and nutrition security, which may not be the same in different contexts and populations.

Suggested indicator(s)	INFER Risk Index INFER calculates an overall food system risk score for each country as an equally weighted product of the three risk dimensions whereby: Risk = Hazard & Exposure (HE)1/3 × Vulnerability (VU)1/3 × Lack of adaptive capacity (LAC)1/3	*Indicators relating to food insecurity and undernutrition* (a) Food security and undernutrition - Lancet Countdown 2023 indicator 1.4 (b) Depth of the food deficit (kilocalories per person per day) - UNEP Adaptation Gap Health Report, 2018 (table 3.1) , also SDG Indicator 2.1.2 (c) Proportion of households that are food insecure - UKHSA Scoping Review FS7	*Indicators relating to food price variation* (a) Food price volatility - Food systems countdown initiative (b) Frequency and length of disruptions in supply by food group - UKHSA Scoping Review FS6	*Indicators relating to food supply variation* (a) Food supply volatility - Food systems countdown initiative (b)) Food price change by food group - UKHSA Scoping Review FS10	*Indicators relating to foodborne disease* (a) Incidence of foodborne diseases - UKHSA Scoping Review FS11 Foodborne diarrhoeal disease incidence estimated per 100 000 population (secondary indicator - help explore narrative and topic))	*Indicators relating to integrated climate - food policymaking* (a) Development of dietary guidelines that embed climate change adaptation - UKHSA Scoping Review FS13 *This indicator may be best suited as part of a tiered approach (ie as an optional or future indicator) – methods and relevance are strong, but data is not widely available.* (b) Presence of a food system transformation pathway (from the	Dietary sourcing flexibility index - Food systems countdown initiative	Percentage of high-risk populations who need to rely on extreme strategies to cope with food insecurity - Food systems countdown initiative

		(d) Prevalence of undernourishment SDG Indicator 2.1.1				UNFSS) - Food systems countdown initiative		
Additional field: indicator type	Risk profile	Outcome	Outcome	Outcome	Outcome	Action	Risk profile	Risk profile
Specify the relevance to GGA target(s)	9.b. Attaining climate-resilient food and agricultural production and supply and distribution of food	9.b. Equitable access to adequate food and nutrition for all	9.b. Attaining climate-resilient food and agricultural production and supply and distribution of food	9.b. Attaining climate-resilient food and agricultural production and supply and distribution of food	9.b. Equitable access to adequate food and nutrition for all	9.b. Attaining climate-resilient food and agricultural production and supply and distribution of food	9.b. Equitable access to adequate food and nutrition for all	9.b. Equitable access to adequate food and nutrition for all
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change		Informs extent of adaptation measures needed to protect vulnerable populations	Informs extent of adaptation measures needed to protect vulnerable populations.	Informs extent of adaptation measures needed to protect vulnerable populations.	Informs extent of adaptation measures needed to protect vulnerable populations. Further assessment of climate attribution and drivers need	Enhancing adaptive capacity and reducing vulnerability through planning. Additional note on (b) Consideration needed on how to prevent maladaptation given trade-offs potential trade-offs between low-emission diets, nutrition security and adaptation considerations	Informs extent of adaptation measures needed to protect vulnerable populations.	Informs extent of adaptation measures needed to protect vulnerable populations.
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	(a) Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf) (b) Methodology	(a) Methodology (b) Methodology tested at UK level and available here on p57	(a) Methodology (b) Methodology tested at UK level and available here on p61	(a) Methodology tested at UK level and available here on p62 (b) Etimates informed by the Foodborne Disease Burden Epidemiology Reference Group (FERG) Methdology	(a) Methodology tested at UK level and available here on p47. (b) Methodology	Methodology	Methodology

		(c) Methodology tested at UK level and available here on p59 (d) Methodology						
Information on data readiness (if available)	Available for Asia Pacific	(a) Yes (b) Yes (c) Not yet – data available within national statistics which could be used (d) Data readiness considered high	(a) Unknown (b) Not yet - no data available to monitor supply chain disruptions	(a) Unknown (b) Not yet – technically feasible within UK but not being monitored	(a) Yes – although limitations at identifying specific species	Unknown	Unknown	Unknown
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative	Qualitative
Level (local, national, regional and global)		(a) Global (b) (c) Local – national	National	National	(a) Local – national	(a) National – local (b) National	National	National
The ability of the indicators to reflect regional, national and local circumstances		(a) Regional (b) (c) Unknown (d) Data readiness considered high	Unknown	Unknown	(a) Unknown	(a) Yes (b) Unknown	Unknown	Unknown
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes, see link above	(a) Yes (b)	(a) Yes - see here (b) No	(a) Yes - see here (b)	(a) No	(a) No (b) Yes - see here	Yes - see here	Yes - see here

		(c) Yes						
The ability of the indicators to be aggregated across levels		(a) Yes (b) (c) Unknown	Unknown	Unknown	(a) Unknown	Unknown	Unknown	Unknown
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate		(a) Not yet at the sub-national level. (b) (c) No	(a) Unknown (b) No	(a) Unknown (b) No	(a) Yes	(a) No (b) Unknown	Unknown	Unknown
Is based on the best available science?	Unknown	(a) Yes (b) (c) Unknown	Unknown	Unknown	(a) Unknown	Unknown	Unknown	Unknown
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No	(a) No (b) (c) Unknown	Unknown	Unknown	(a) Unknown	Unknown	Unknown	Unknown

Target 9d: Ecosystems and biodiversity

Reducing climate impacts on ecosystems and biodiversity, and accelerating the use of ecosystem-based adaptation and nature-based solutions, including through their management, enhancement, restoration and conservation and the protection of terrestrial, inland water, mountain, marine and coastal ecosystems

Emerging evidence also suggests that "species richness" is relevant for mental health[25,26.]

Suggested indicator(s)	Urban Green Space - Lancet Countdown 2023 Indicator 2.2.3, using normalised difference vegetation index (NDVI)
Additional field: indicator type	Risk profile
Specify the relevance to GGA target(s)	9.d. - restoration, conservation and protection of ecosystems
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Tracks implementation of adaptation measures needed to protect populations from extreme heat through increasing green spaces
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)
Information on data readiness (if available)	Yes
Whether quantitative and/or qualitative information applies to the indicators	Quantitative
Level (local, national, regional and global)	Global

[25] Methorst et al, 2021. Species richness is positively related to mental health – A study for Germany. Landscape and Urban Planning 211: 104084
[26] Hammoud et al, 2024. Smartphone-based ecological momentary assessment reveals an incremental association between natural diversity and mental wellbeing. Nature Scientific Reports 4: 7051.

The ability of the indicators to reflect regional, national and local circumstances	Regional, national, local
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes
The ability of the indicators to be aggregated across levels	Yes
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Not applicable.
Is based on the best available science?	Yes
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No

Target 9e: Infrastructure

Increasing the resilience of infrastructure and human settlements to climate change impacts to ensure basic and continuous essential services for all, and minimizing climate-related impacts on infrastructure and human settlements

Suggested indicator(s)	Damaged dwellings - Sendai Framework for DRR indicators B3	Destroyed dwellings - Sendai Framework for DRR indicators B4	Destroyed or damaged critical infrastructure units and facilities attributed to disasters - Sendai Framework for DRR D4	Disruptions to basic services attributed to disasters - Sendai Framework for DRR D5	Coastal risk management plan - UKHSA Scoping Review E2	Population living in areas where elevation is below 5 metres (in millions) - UNEP Adaptation Gap Health Report, 2018 (table 3.1)	Population at risk of inhabitability within 20 years because of coastal erosion - UKHSA Scoping Review E2	Population at risk of coastal flooding or erosion without insurance or compensation scheme – UKHSA Scoping Review E3

Additional field: indicator type	Outcome	Outcome	Outcome	Outcome	Action	Risk profile	Risk profile	Risk profile
Specify the relevance to GGA target(s)	9.e Measuring resilience of human settlements	9.e Measuring resilience of human settlements	9.e Measuring resilience of human settlements	9.e Measuring resilience of human settlements	9.e Measuring resilience of human settlements	9.e Measuring resilience of human settlements	9.e Measuring resilience of human settlements	9.e Measuring resilience of human settlements
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Strengthening resilience of populations to extreme weather events although consideration of attribution of disasters to climate change needed.	Strengthening resilience of populations to extreme weather events although consideration of attribution of disasters to climate change needed.	Strengthening resilience of populations to extreme weather events although consideration of attribution of disasters to climate change needed.	Strengthening resilience of populations to extreme weather events although consideration of attribution of disasters to climate change needed.	Strengthening resilience of populations to extreme weather events by reducing risks and exposures		Strengthening resilience of populations to extreme weather events by reducing risks and exposures	Strengthening resilience of populations to extreme weather events by reducing risks and exposures
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	Methodology	Methodology	Methodology	Methodology tested at UK level and available here on p41.		Methodology tested at UK level and available here on p40.	Methodology tested at UK level and available here on p40.
Information on data readiness (if available)					Yes – although criteria needed for the evaluation of local plans.		Yes – data available within the UK to support this indicator	No – Further advances in modelling and mapping required.
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative		Quantitative	Quantitative
Level (local, national, regional and global)	Yes	Yes	Yes	Yes	Local		National – local	National – local
The ability of the indicators to reflect regional, national and local circumstances	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes	Yes	Yes	Yes	No		No	No

The ability of the indicators to be aggregated across levels	Yes	Yes	Yes	Yes	Unknown		Unknown	Unknown
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Yes	Yes	Yes	Yes	Unknown		Unknown	Unknown
Is based on the best available science?					Unknown		Unknown	Unknown
Is based on Indigenous Peoples' knowledge and local knowledge systems?					Unknown		Unknown	Unknown

Target 9f: Poverty eradication

Substantially reducing the adverse effects of climate change on poverty eradication and livelihoods, in particular by promoting the use of adaptive social protection measures for all;

Suggested indicator(s)	Livelihood disruption or destroyed - Sendai Framework for DRR indicators B5	Proportion of population covered by social protection floors/systems SDG indicator 1.3.1
Additional field: indicator type	Outcome	Action
Specify the relevance to GGA target(s)	9f - reducing the adverse effects of climate change on poverty eradication and livelihoods and 9.c climate change resilience against health impacts.	9f
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Yes although consideration of attribution of disasters to climate change needed.	

Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	Methodology
Information on data readiness (if available)		
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	
Level (local, national, regional and global)	Global, national	
The ability of the indicators to reflect regional, national and local circumstances	Yes	
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes	
The ability of the indicators to be aggregated across levels	Yes	
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Yes	Indicator is suggested to be disaggregated by sex, distinguishing children, unemployed persons, older persons, persons with disabilities, pregnant women, newborns, work-injury victims and the poor and the vulnerable
Is based on the best available science?		
Is based on Indigenous Peoples' knowledge and local knowledge systems?		

Potential indicators under the targets referred to under targets in paragraph 10

Target 10a: Impact, vulnerability and risk assessment

Impact, vulnerability and risk assessment: by 2030 all Parties have conducted up-to-date assessments of climate hazards, climate change impacts and exposure to risks and vulnerabilities and have used the outcomes of these assessments to inform their formulation of national adaptation plans, policy instruments, and planning processes and/or strategies, and by 2027 all Parties have established multi-hazard early warning systems, climate information services for risk reduction and systematic observation to support improved climate-related data, information and services;

See WHO standalone submission for more information on indicators for health vulnerability and adaptation assessments. Number of countries receiving WHO technical support in this regard could offer a relevant MoI indicator. The indicator gap that exists is tracking how many countries have active Health Surveillance Systems that are informed by climate.

Suggested indicator(s)	National assessments of climate change impacts, vulnerability and adaptation for health - WHO indicator, reported by Lancet Countdown 2023 indicator 2.1.1	Climate Information for Health - WHO indicator, reported by Lancet Countdown 2023 indicator 2.2.1	City-level climate change risk assessments - CDP indicator, reported by Lancet Countdown 2023 indicator 2.1.3	Early warning services for health risks - WHO indicator, reported through Lancet Countdown China 2023 indicator 2.3	Countries that have multi-hazard early warning system - Sendai Framework G1	Countries that have multi-hazard monitoring and forecasting systems - Sendai Framework G2	People per 100,000 that are covered by early warning information through local governments or through national dissemination mechanism - Sendai Framework G3	Countries that have accessible, understandable, usable and relevant disaster risk information and assessment available to the people at the national and local levels - Sendai Framework G5
Additional field: indicator type	Action	Action	Action	Action	Action	Action	Action	Action
Specify the relevance to GGA target(s)	10 a, 9 c	10 a, 9 c	10 a, 9 c	10 a, 9 c	10a, 9c - strengthening resilience of health services and vulnerable populations to climate change related health impacts	10a, 9c - strengthening resilience of health services and vulnerable populations to climate change related health impacts	10 a, 9 c - strengthening resilience of health services and vulnerable populations to climate change related health impacts	10 a, 9 c - strengthening resilience of health services and vulnerable populations to climate change related health impacts

Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Assesses vulnerabilities and resilience to climate change	Assesses vulnerabilities and resilience to climate change	Assesses vulnerabilities and resilience to climate change	Assesses vulnerabilities and resilience to climate change	Strengthening resilience of populations to extreme weather events by reducing risks and exposures	Strengthening resilience of populations to extreme weather events by reducing risks and exposures	Strengthening resilience of populations to extreme weather events by reducing risks and exposures	Strengthening resilience of populations to extreme weather events by reducing risks and exposures
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Tracks cooperation between meteorological and health services and support for health services to be able to access, understand, and act upon climate information Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)	Methodology	Methodology	Methodology	Methodology
Information on data readiness (if available)	Yes	Yes	Yes	Available in China				
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative
Level (local, national, regional and global)	National	National	Local	National	National	National	Local	National
The ability of the indicators to reflect regional, national and local circumstances	No	No	No	Yes - national and local.				
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The ability of the indicators to be aggregated across levels	Yes	Yes	Yes	No.				
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Not yet at the sub-national level.	Not yet at the sub-national level.	Not yet.	Not yet.	Unknown	Unknown	Unknown	Unknown
Is based on the best available science?	Yes	Yes	Yes	Yes	Unknown	Unknown	Unknown	Unknown
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No	No	No	No.	Unknown	Unknown	Unknown	Unknown

Target 10b: Planning

Planning: by 2030 all Parties have in place country-driven, gender-responsive, participatory and fully transparent national adaptation plans, policy instruments, and planning processes and/or strategies, covering, as appropriate, ecosystems, sectors, people and vulnerable communities, and have mainstreamed adaptation in all relevant strategies and plans;

See WHO standalone submission for more information on indicators for health in NAPs, and health national adaptation plans (HNAPs). Number of countries receiving WHO technical support in this regard could offer a relevant MoI indicator. Indicators under 10b could consider whether individuals and representatives of government ministries spanning health and climate determining sectors, together with those responsible for finance, are engaged in planning and implementation processes.

Suggested indicator(s)	Countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030 - Sendai Framework E1	Local governments that adopt and implement local disaster risk reduction strategies in line with national strategies - Sendai Framework E2	Percentage of local governments having a plan to act on early warnings - Sendai Framework G4	Number of countries integrating mental health and psychosocial considerations as components of their disaster preparedness/ risk reduction plans - WHO Mental Health Atlas	National adaptation plans for health - WHO indicator, reported through Lancet Countdown 2023 indicator 2.1.2
Additional field: indicator type	Action	Action	Action	Action	Action

Specify the relevance to GGA target(s)	10.b - Planning Relevant to all thematic targets	10.b - Planning Relevant to all thematic targets	10b Strengthening resilience of services and vulnerable populations to climate change including related health impacts	10. b Planning 9.c Health	10b, 9c
Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Supports enhance adaptive capacity and strengthen resilience	Supports enhance adaptive capacity and strengthen resilience	Strengthening resilience of populations to extreme weather events by reducing risks and exposures	Building resilience to climate change	Assesses vulnerabilities and resilience to climate change
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology	Methodology	Methodology		Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)
Information on data readiness (if available)				Data not collected annually	Yes
Whether quantitative and/or qualitative information applies to the indicators	Quantitative	Quantitative	Quantitative		Quantitative
Level (local, national, regional and global)	Global, national	Global to local	Local	National	National
The ability of the indicators to reflect regional, national and local circumstances	Yes	Yes			No
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes	Yes	Yes	Yes, via Atlas linked above	Yes
The ability of the indicators to be aggregated across levels	Yes	Yes		Yes	Yes

The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Not relevant	Not relevant	Unknown	No	Not yet at the sub-national level.
Is based on the best available science?			Unknown	Unknown	Yes
Is based on Indigenous Peoples' knowledge and local knowledge systems?			Unknown	No	

Target 10c: Implementation

Implementation: by 2030 all Parties have progressed in implementing their national adaptation plans, policies and strategies and, as a result, have reduced the social and economic impacts of the key climate hazards identified in the assessments referred to in paragraph 10(a);

WHO indicators, covered in WHO's own submission, could support tracking of implementing adaptation measures for health, as well as the extent to which finance is a barrier – a high proportion of countries previously cited insufficient finance/budget, followed by insufficient human resource capacity[27]. When considering finance for implementation, it is necessary to not only consider climate finance for health (as measured partly by the Lancet Countdown indicator below) but also health finance for climate adaptation. A much wider assessment of public and private finance flows is needed. Indicators under 10c could consider whether individuals and representatives of government ministries spanning health and climate determining sectors, together with those responsible for finance, are engaged in implementation processes.

Suggested indicator(s)	Global multilateral funding for health adaptation programs (based on the GCF) - Lancet Countdown 2023 indicator 2.2.4
Additional field: indicator type	Action
Specify the relevance to GGA target(s)	10.b - Planning 9.c. - Health

[27] WHO, 2021. 2021 WHO health and climate change global survey report. World Health Organization.

Relevance to adaptation, including enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change	Financing for adaptation - relevant particularly for LMICs
Information on associated methodologies (if available) including clarity of methodologies associated with the indicator	Methodology (create a free account, select supplementary material from the left hand menu, and download the pdf)
Information on data readiness (if available)	Yes
Whether quantitative and/or qualitative information applies to the indicators	Quantitative
Level (local, national, regional and global)	Global
The ability of the indicators to reflect regional, national and local circumstances	No
Information on whether the indicator is already being reported on and how (and if so, can this info be accessed)	Yes
The ability of the indicators to be aggregated across levels	Yes
The ability of the indicators to be disaggregated by demographic and socioeconomic characteristics, such as vulnerability, gender, age, disability, race, socioeconomic status, and status as Indigenous Peoples, as appropriate	Not yet at the sub-national level.

Is based on the best available science?	Yes
Is based on Indigenous Peoples' knowledge and local knowledge systems?	No