# Global Heat and Human Health Synthesis Report

1. **Scope and Purpose of the Report**

The GHHIN Global Heat Health Synthesis report will be published every 2 years to synthesize the state of science and practice to monitor impacts, predict hazardous events, and address extreme heat risks to human health.

It will serve to establish and monitor conditions confronting the heat-health community; help track key indicators, progress, learning, and innovations; highlight knowledge, action, and research gaps; and provide an authoritative voice upon which members can advocate more effectively. It will be presented in an accessible format with key figures, focused case studies, and visualization to engage a broad readership.

The GHHIN synthesis will curate the latest evidence and synthesize action. It is not a global assessment and aims to be slightly different from a standard scientific review. It will draw on the scientific literature and align with standing and special reports of IPCC, WMO State of Climate, Lancet Tracking Change, etc. However, its unique nature will highlight local initiatives and learning from the GHHIN Member base, which may not be published in the peer-reviewed literature. In order to do this, the GHHIN synthesis will draw heavily on member inputs to the web portal and what is reported and learned during the bi-annual forums about new research, initiatives, events, outcomes, indicators, and other items. These three activities: inputs, forum, and synthesis report - will need to work in tandem – and it’s for this reason a common framework is desirable to help synchronize information flow.

The report will be structured according to a recognized risk framework covering aspects of the hazard, exposure, vulnerability, impacts, risk management, a focused section on heat health warning systems will be the exception. Each section will include a status update of key indicators, analysis of trends or issues, a presentation of science and information needed for related decision-making; and section describing new innovations and case studies.

The first synthesis report will draw upon a stocktaking exercise completed by the steering committee. In the future the member driven portal and annual forums will serve as a content/data collection opportunities to inform the synthesis report.

Overall goals:

1. To help harmonize discussion and tracking of the characterisation, magnitude and heterogeneity of hazards, exposure, vulnerability, impacts, and global response capacity.
2. To draw out and articulate evidence based key messages, and emerging and pressing issues needing advocacy, investment, and attention.
3. To accelerate global learning about risk reduction, which is not waiting on the scientific literature process – but can provide a credible high profile venue to showcase and draw upon member information – bringing to light success stories, national progress which may otherwise go unnoticed.

1. To identify and document scientific progress - observational and surveillance, process study, biomedical, climate and multidisciplinary research, and information needs to improve decision making for more effective action.

## Proposed Structure – total 50-75 pages online format and limited print

Black text sourced from Literature/writing teams Blue Text / Sourced from Stocktaking, later member inputs

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| **Sections** | **Content Description** |
| **Executive Summary** | **Key Messages and Emerging Issues**   1. Drawn from summation of contents below (hazard, exposure, vulnerability, responses). Showcasing headline figures, key successes and remaining gaps. 2. Heat Health Tracker: 10 indicators/10 gaps key figures draw on contents from other chapters and are easy to update and display as a sort of dashboard upfront. 3. Statement on mitigating climate change vs. managing risks |
| **Introduction to GHHIN and the Report** | What is GHHIN  Why is it needed  How it works  Synthesis report scope/purpose |
| **Chapter 1 –**  **Heat: a human health hazard**  (review needed by Met expert Team) | 1. **Status:** ***What is the magnitude and dimensions of the problem?*** Global overview of observed status and latest projections of global heat hazards. 2. **Analysis: *How are dangerous heat conditions changing?*** Describe relevant trends, climate drivers such as ENSO, or notable regional and country dimensions (e.g. where air quality magnifies the health hazard) 3. ***What do we need to know?* Science-Information- Decision-making:** Availability and skill to forecast and predict Extreme Heat Events (EHEs). 4. **Innovations and Experience:** Reporting scientific innovations in understanding or monitoring the hazard,feature case study of member experience predicting hazardous conditions/creating warnings (source: members) |
| **Chapter 2 –**  **Heat Exposure**  (review needed by mixed team) | 1. **Status: Who is exposed to increasing temperatures and EHE*?***  * Framing: relative nature of dangerous exposure, exposure-response * Provide key indicators, figures and maps of regions, populations at risk, urban heat islands, occupational contexts * **Status update:** (future reports) summary of changes detected in key indicators and new knowledge about global exposure.  1. **Analysis: Trends and tracking change:** Highlights new findings regarding understanding and monitoring changing human exposures to heat. (source: new publications and findings of previous 2yr). 2. ***What do we need to know?* Science-Information- Decision-making:** Availability, access, and use of knowledge about exposure. (source: members) 3. ***Innovations and Experience:*** Reporting scientific innovations in understanding or monitoring exposure; Feature case Study of member experience characterizing local exposure. (source: members) |
| **Chapter 3 - Human vulnerability**  (review needed by public health expert Team) | 1. **Status *Who is vulnerable to heat, where, when?***  Baseline understanding of global vulnerability to negative health impacts.  * **Status update:** (future reports) summary of changing vulnerability indicators over the past 2 year reporting period. (source: new publications). * **Analysis**: Discuss how vulnerability is changing? Maps of how are drivers of vulnerability changing (e.g. Urbanization. Aging. Migration. Energy Access). * **(option) Feature:** Reports may want to rotate featured vulnerable populations with more in-depth coverage of workers, elderly etc. Ask key questions? E.g. What we can expect from acclimatization. Where are the limits?  1. ***What do we need to know?* Science-Information- Decision-making:** Availability, access, and use of knowledge about vulnerability   - highlight what indicators of vulnerability are/could be available at national, sub-national levels?   1. **Innovations and Experience:** Reporting scientific innovations in understanding; monitoring, or forecasting vulnerability; Feature case Study of member experience characterizing/studying vulnerability |
| **Chapter 4 –Human Impacts**  (review needed by public health expert Team) | 1. **Status:** ***How is heat affecting people?***   Summarizes global literature as baseline. Describes types of direct impacts, but reference to indirect impacts   1. Provide key impact figures: *key indicators and sources to track, morbidity, mortality, productivity, etc.* 2. (future reports) **Status update:** summary of changing impact indicators over the past 2 year reporting period. (source: new publications). 3. **Analysis:** Are impact trends changing? What can be said of future impacts? 4. ***What do we need to know?* Science-Information- Decision-making:** Availability, access, and use of knowledge about impacts   - highlight what indicators of impacts are/could be available at national, sub-national levels   1. **Innovations and Experience:**: Reporting scientific innovations in understanding or monitoring exposure; Case Study snapshot characterizing or forecasting impacts, health surveillance.(source: members) |
| **Chapter 5 – Heat Health Warning Systems (HHWSs)**  (review needed by mixed team) | 1. **Status:** ***What is being done to predict and classify extreme heat events (EHEs)?***   Baseline understanding of what is being done predict and classify EHEs, derived from national/regional/global HHWSs   1. Provide key mechanisms of HHWSs: *key metrics and definitions of EHEs* 2. (future reports) **Status update:** summary of new and updated HHWSs (source: new publications). 3. **Analysis:** Are HHWS being designed? Are they being used?How effective are HHWSs once they’re being implemented? *Skill, advance timing, trigger threshold methodology,* 4. ***What do we need to know?* Science-Information- Decision-making:** Availability, access, and use of knowledge about HHWSs  * *provide framework for detailing what a HHWS consists of*  1. **Innovations and Experience:** Reporting scientific innovations in HHWS;  Feature case Study snapshot characterizing effective/new HHWS (source: members) |
| **Chapter 6 –**  **Risk Management**  (review needed by public health expert Team) | 1. **Status:** ***What is being done to reduce risk of increasing and extreme heat?***   Baseline understanding of what is being done to reduce risks at different timescales annual planning cycles, EHE preparedness/response cycle, long term vulnerability reduction. Broken into different categories such as time scale and stakeholder level. (source: stocktaking)  (future reports) **Status update:** will track changing implementation and investments (source: new publications + member inputs to database over the past 2 year reporting period)   1. ***(Gap Analysis) Risk : Response Equation – based on the data base relative to known risks where is action needed, and what kind of action.*** 2. ***What do we need to know?* Science-Information- Decision-making:** Availability, access, costs, and use of knowledge about interventions - highlight what indicators of effectiveness are/could be available at national, sub-national levels. Pointing to knowledge gaps. 3. **Innovations and Experience:**  Case Study snapshot characterizing local action (source: members) Commentary on what is being reported as effective (or what is not) Advances in science and application. Showcase new approaches (source: new publications + member inputs to database/forum) |
| **Chapter 7 –**  **Recommendations** | focus on calling out needs for knowledge/information/capacity to make better decisions, and take practical and political action.   * **Monitoring Impacts and Action:** Track over time key indicators, report back * **Information:** critical data and observations used and needed * **Research** * **Capacity**: * **Local action** * **Advocacy and communication;** |
| **References** | Glossary of Key Terms – see <https://link.springer.com/article/10.1007/s00484-013-0729-9> |

**Heat Health Tracker – Dashboard Key Facts/Indicators Corresponding to Chapters**

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| Should reference key standing scientific reports and processes. | **Monitoring Key indicators**  **Need Ideas/Agreement on Specific Indicators to be used** | **Monitoring Key Knowledge or Action Gaps**  **Need Ideas/Agreement on Specific Indicators to be used** | **Regional Factsheets** |
| **Heat Hazards** | **Key figures and 2 indicators**   * key global thresholds and related indicators for extreme heat * annual mean temperature change (positioning extremes in the trend) * heatwave incidence (proposed: >95% T-Avg relative to 1981-2010 for 2+ days) * heat index relevant for labour productivity |  | **Would be Ideal to work toward regionalized data of each indicator set** |
| **Heat Exposure** | **Key figures and 2 indicators**  *See: Future population exposure to US heat extremes, Jones et al.*   * Person-days of exposure to high temperature * Projected population change * % population in urban areas * Demographic make-up * Socioeconomic factors |  |  |
| **Heat Vulnerability** | **Key figures and 2 indicators**  Proposed Key Indicators for consideration:   * % Population Less Than 5 Years Old * % Population 65 Years Old or Old * % Population Living in Urban areas * % Adult Population with little formal education * % People Living Alone * % with no access to shelter/homeless * % with access to air conditioning and secure energy supply. * % Adult Population with No access to health care * % land area covered with Impervious Surfaces * % Covered by Forest Canopy * Proportion of adults employed as outdoor workers * % Adults with heat exacerbated illnesses – Diabetes, Asthma, Hypertension, Obesity, |  |  |
| **Human Impacts** | **Key figures and 2 indicators**   * Morbidity, (requires case definitions, defined measures). * Mortality, Productivity, Infrastructure * Heat-Related ED Visits (per 100,000 people per year) * Excess deaths during extreme heat events (per 100,000 persons per year)   (identify key sources to build on e.g. emdat.be)  https://ahs-vt.maps.arcgis.com/apps/MapSeries/index.html?appid=5bfd71bdeff242d4a8f0d2780369807a |  |  |
| **Heat Warning Systems** | **Key figures and 2 indicators** |  |  |
| **Risk Management** | **Key figures and 2 indicators**   * No of cities with heat health action plans * No of city/region/countries undertaking risk assessments. * Legislation/policies/strategies specific to population protection from heat |  |  |

1. **Bi-annual Production Process**

The production of any major assessment report requires significant dedicated effort, with enough ongoing investment in monitoring and reporting of updates to the web portal, during the forum, and at other community meetings. For this reason the common framework is very desirable, and this section outlines such a framework for production.

The initial GHHIN Synthesis Report will require the largest level of effort because it is accomplishing something hitherto undone – the collection, synthesis, and publication of the actions of and progress made by the international heat health community toward addressing the current and future threat posed to society by extreme heat. The initial report will not only be much larger than subsequent reports in order to document global progress in addressing heat health, but will also be primed by two stocktaking papers that will perform a one-time collection and synthesis of detailed information on global heat risk.

**Initial Report Preparation**

The GHHIN Core Team support by two interns, with support from the Steering Committee is structuring the initial report, and leading the development of contents by producing a stocktaking paper with background content. Expected inputs to the initial report include: Stocktaking and Published Literature. Future reports will draw from the Heat Hub, Forum, and Published Literature

**Sources of Inputs to Synthesis**

Details on the Stocktaking papers, the Global Forum, and other Reports can be found in other GHHIN documentation. The GHHIN Heat Hub, will include Member Profiles, Country Profiles and Wiki function that will soon be elaborated in a supporting document. The Country profiles will contain basic information on the operational status of heat health actions in the country, including subnational/city levels, as well as basic information on the heat hazard, exposure, and vulnerability of its citizens. In principle, if sufficient these indicators could be aggregated and tracked on the GHHIN portal. A dashboard of key indicators will be created.

The profiles will be featured and updated during Global Forums and through special requests to members. It is expected members will take the responsibility of updating the profile of their own country, and content tagged for a location will be featured on the country page. Regular reviews (every 6 months) will also be made by the GHHIN Core Team to refresh content.

**Target Publication Date**: September 2018 and every two years thereafter (2020, 2022, etc…) in sync with Global Forum meetings.

* **Dec-Feb**: collection and synthesis of data for the preceding period (calendar years 2016 & 2017). This long lead time is because we may draw on many sources that do their own compilation and need a few months after the close of the previous year to publish their data.
* **Feb-March**: preparation of the report
* **April-May**: review and revision
* **June – September** : publication production

Publication Target to Align with other Policy and Reporting Processes: Notably, Lancet Tracking Climate and Health (annual Oct/Nov), WMO State of the Climate (Impacts section)(annual Oct/Nov release pre-COP), IPCC AR6. Outreach to research funding agencies and institutions, to the earth observation community, and to key international organizations (IPCC, WMO, WHO)

Subsequent reports will be an assessment of progress made since the previous report, and will thus be much more abbreviated. The stocktaking report will provide a one-time input to establish the current state of affairs, in the absence of other data collection opportunities. Other input sources, (e.g. Forum, Hub, Literature) for the subsequent GHHIN Synthesis Reports.

1. **Report Production and Management**

Decision Point: Do we attempt to do this in-house with volunteer author teams and manage the production process with a dedicated GHHIN task committee. Do we outsource elements of the production process to a third party? How much funding is needed for production? Authors need to be identified

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| **Production Team** |  |
| **Coordinating Manager** |  |
| **Chapter 1 –**  **Heat: a human health hazard**  (review needed by Met expert Team) | **Chapter Lead:**  **Chapter Contributors:**  **Chapter Reviewers:**  Glenn M.  Jon Gottschalck  Robert Kopp  KMA person  Sarah Perkins-Kirkpatrick |
| **Chapter 2 –**  **Heat Exposure**  (review needed by mixed team) | **Chapter Lead:**  **Chapter Contributors:**  **Chapter Reviewers:**  Census/population trends expert  Sociologist (Eric Klinenberg)  Economist  Climate Expert  Gregg Garfin |
| **Chapter 3 - Human vulnerability**  (review needed by public health expert Team) | **Chapter Lead:**  **Chapter Contributors:**  **Chapter Reviewers:**  Sharon Jeffers  Robert D. Bullard |
| **Chapter 4 –Human Health Impacts**  (review needed by public health expert Team) | **Chapter Lead:**  **Chapter Contributors:**  **Chapter Reviewers:**  Shubhayu Saha  Pat Kinney |
| **Chapter 5 – Heat Health Warning Systems (HHWSs)**  (review needed by mixed team) | **Chapter Lead:**  **Chapter Contributors:**  **Chapter Reviewers:**  Rachel Lowe  Joan Ballester |
| **Chapter 6 –**  **Risk Management**  (review needed by public health expert Team) | **Chapter Lead:**  **Chapter Contributors:**  **Chapter Reviewers:** |
| **Chapter 7**  **Recommendations** |  |