Europe and North America Research and Action Agenda

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Executive summary

Climate change is increasingly recognised as a threat to mental health, compounding risks for poor mental health outcomes and destabilising the conditions needed for good mental health. While research at the intersection of climate change and mental health has proliferated in recent years, the field remains disconnected, uneven and siloed, slowing urgent progress to address the mental health impacts of climate change.

Connecting Climate Minds (CCM) is a Wellcome-funded initiative which aims to cultivate a collaborative, transdisciplinary climate change and mental health field with a clear and aligned vision. Over the last year, we have convened experts across disciplines, sectors and countries to develop regional and global research and action agendas. These agendas set out 1) research priorities to understand and address the needs of people experiencing the mental health burden of the climate crisis, and 2) priorities to enable this research and translate evidence into action in policy and practice. This report presents the research and action agenda for climate change and mental health in Europe and North America (EU-NA).[i]

EU-NA is facing an increase in the severity and frequency of a range of climate hazards, including droughts, wildfires, floods, landslides, storms and extreme temperatures. These hazards and the broader threat of climate change contribute to a range of mental health challenges, including but not limited to anxiety, depression, post-traumatic stress disorder and climate-related migration stress. Certain vulnerable groups – including Indigenous Peoples, children, women, people of colour and people with pre-existing mental and physical health conditions – are at an even higher risk of climate-related poor mental health outcomes than the general population. It is important to note that some of these factors are linked to social and environmental inequities, and 'vulnerability' is not naturally occurring. This holds for future mentions of 'vulnerability' throughout this report.

Despite a growing amount of research in the climate-mental health space, key evidence gaps exist across EU-NA. First, there is a gap in the current understanding of the extent to which mental health is affected by climate change, and of the impacts on specific disadvantaged populations. Second, there is a lack of understanding of which factors specific to climate change increase mental health risks or create new experiences of mental health challenges. Third, there is a need to understand and quantify when and how climate adaptation and mitigation actions, across sectors, can have win-win benefits for mental health. Finally, there is no clear consensus on the most effective mental health interventions, solutions and actions to support mental health in the context of climate change.

To address these gaps and to better address the needs of people experiencing the mental health burden of the climate crisis, the CCM project has identified 47 priority research themes covering a myriad of areas within the following high-level themes:

- The impact on mental health vulnerabilities amidst compounding climate disasters;
- Links between climate-mental health and Indigenous Peoples and cultural practices;
- Global policy and governance for climate-related mental health;

[i] "North America" includes the United States, US Territories, and Canada.

- Community resilience and the role of social and cultural connectedness in mental health outcomes; and
- Technology and innovation for climate-mental health.

These priority research themes aim to address the complex intersection of climate change and mental health from various perspectives, including cultural, policy, community and technological dimensions.

Key actions to enact this priority research and turn evidence into policy and practice involve:

- Prioritising accessibility, inclusion and collaboration in research;
- Advocating for dedicated funding and blending of mental health and climate initiatives;
- Developing climate-mental health training programmes for healthcare providers and educators;
- Decolonising climate and mental health with community-based interventions and resilience-building;
- Acknowledging the limitations of traditional mental health approaches in diverse communities, especially in historically oppressed groups; and
- Highlighting co-benefits of climate-mental health actions for policymakers.

The CCM community aspires to establish a global support and resilience ecosystem in the climate-mental health field. Our goal is to empower individuals with information and psychological tools to navigate the changing climate. Climate-mental health experts should foster research and action that is proactive, community-driven and accessible; it should not only address the psychological toll of environmental crises but also inspire sustainable action. We envision a world where compassion, education and mental health form the bedrock of climate resilience, fostering a future where our planet and our minds thrive in harmony. This agenda serves as a reference for researchers, funders, policymakers, practitioners, advocates, educators and others to inspire innovative research and spur concrete research and action across EU-NA.

Introduction

Context

Climate change and mental health are two of our greatest global challenges, and awareness of the intersection between mental health and the climate crisis has grown rapidly in recent years.[1] Climate change exacerbates mental health challenges by increasing exposure to extreme heat and the traumas of extreme weather events,[2] destabilising the conditions needed for good mental health and wellbeing (for example, water and food insecurity, forced migration, polluted air, loss of treasured environments),[2] disrupting access to healthcare,[3] and increasing psychological distress through awareness of climate threats and insufficient climate action.[4] People living with mental health challenges are also particularly vulnerable to the stressors of the climate crisis, such as increased risk of physical heat stress and death during heatwaves.[5, 6, 7]

In response to the mounting mental health toll of the climate crisis, research in the climate and mental health field has grown rapidly. Nevertheless, key evidence gaps exist in many regions, including the mental health burden attributable to climate change, the pathways and mechanisms underlying these impacts, the co-benefits of climate action for mental health and the best interventions or solutions to support mental health in a changing climate. Climate change and mental health research remains frustratingly disconnected across disciplines, sectors, and geographies, and is unevenly focused on certain topics and global regions.[8] Moreover, siloed decision making slows the translation of evidence to aligned action across climate and mental health policy and practice.[9, 10] A more inclusive, connected agenda is urgently needed to generate the evidence to truly understand, monitor and respond to the interconnections between climate change and mental health.

Connecting Climate Minds

Connecting Climate Minds (CCM) is a Wellcome-funded project launched in 2023 to develop an inclusive agenda for research and action in climate change and mental health. The project has two key, intertwined aims. The first is to develop an aligned and inclusive agenda for research and action that is grounded in the needs of those with lived experience of mental health challenges in the context of climate change, to guide the field over the coming years. The second is to kickstart the development of connected communities of practice for climate change and mental health in seven global regions (designated by the Sustainable Development Goals), equipped to enact this agenda. We aim to combine the strengths of a global perspective and regional focus, and bring together diverse disciplinary perspectives into a shared vision that can ensure research is effective at addressing priority evidence gaps and informing changes in policy and practice at the intersection of climate change and mental health.

Through bringing together experts across diverse disciplines, sectors and countries, the CCM team has facilitated the development of a lived experience-informed research and action agenda for the climate change and mental health field in Europe and North America (EU-NA).

Objectives of the research and action agenda

The research and action agenda is designed to focus future efforts to help those who are experiencing, or will experience, the compounding mental health challenges of climate change. It aims to support those who are already responding to these challenges – through communities, research, policy and practice – by building a more connected and collaborative climate change and mental health field. It also aims to empower experts across disciplines and sectors to join and make progress in this area by identifying clear priorities and fostering a more inclusive and transdisciplinary field.

1. Identify priorities for research that can inform action to meet the needs of people experiencing and responding to the mental health impacts of climate change in EU-NA.
2. Identify what is needed to appropriately conduct research and translate evidence to action in policy and practice in EU-NA.
3. Build understanding among researchers, practitioners, funders and policy experts across disciplines and sectors of their role in furthering climate change and mental health research and equip them with these clear and actionable priorities.

This regional agenda will be integrated with six other regional agendas to inform a **global research and action agenda** for climate change and mental health. This will ensure that global research efforts and investment in climate change and mental health are grounded in regional priorities. Importantly, the global agenda will also integrate insights from agendas developed with and for some of the most affected groups globally, namely Indigenous Peoples, youth and small farmers and fisher peoples.

Use of the terms climate change and mental health

Climate change, mental health and their intersection are complex and wide-ranging fields. For this agenda, we define the scope of these terms as follows.

By **mental health challenges**, we mean thoughts, feelings, and behaviours that affect a person's ability to function in one or more areas of life and often involve significant levels of psychological distress. This includes, but is not limited to, anxiety, depression, post-traumatic stress, psychosis, suicidal thoughts and substance abuse.

By **experiences of the effects of climate change**, we mean: 1) experiencing direct impacts of climate hazards, such as more frequent and intense heatwaves, wildfires, drought, floods or storms (e.g., typhoons, hurricanes, cyclones), and 2) experiencing disruption to the social and environmental determinants of good mental health, such as being forced to move home, not being able to access food or water, losing livelihood or homelands, or disruption to cultural practices because of climate change.

Mental health challenges in the context of climate change include:

- How climate change may lead to worsening pre-existing mental health challenges.
- How climate change may contribute to the prevalence or impact of existing mental health challenges.

- How climate change may impact treatment access or effectiveness for those with mental health challenges.
- How climate change may lead to new mental health challenges.

Background to Connecting Climate Minds

Regional Community of Practice

In EU-NA, CCM is led by a Regional Community Team (RCT), responsible for convening diverse expertise across the region and building regional capacity to create and enact the research and action agenda. The structure of the RCT is outlined below.

Regional Community Convenor (RCC)

Purpose: Responsible for developing and delivering project activities in the region, including convening and supporting a regional community of diverse expertise.

Members: Planetary Health Alliance, USA

Tulsi Modi, MPH

Samuel Myers, MD

Marie Studer, PhD

Co-convenors

Purpose: Bringing additional breadth of expertise across disciplines and countries (i.e. organisations spanning climate expertise, stress neuroscience and mental health expertise, in different sectors), providing technical advice and review, and supporting project delivery.

Members: Britt Wray, PhD (Stanford University, USA)

Sean Kidd, PhD, C.Psych (Centre for Addiction and Mental Health, Canada)

Donald K. Warne, MD, MPH (Center for Indigenous Health at JHU, USA)

Lise Van Susteren, MD (Climate Protection and Restoration Initiative, USA)

Lived experience advisory group (LEAG)

Purpose: Advisory board of experts with lived experience of mental health challenges in the context of climate change and/or belonging to vulnerable population groups and living with climate hazards. Drawing on their unique expertise and wisdom, LEAGs provide vital community-centred perspectives and guidance that inform the overarching approach and outputs of the project.

Members: Allison Kelliher, MD (Johns Hopkins University, USA)

Kyle Hill, PhD, MPH (University of North Dakota, USA)

Michele Lapini (Michele Lapini Photography, Italy)

Youth ambassador (YAs)

Purpose: Youth advisors (aged 18-29) with lived experience of mental health challenges in the context of climate change and/or belonging to vulnerable population groups and living with climate hazards. YAs bring unique youth-centred perspectives to the development and implementation of project activities.

Members: Amiteshwar Singh (University of East Anglia, UK)

Bonolo Madibe, MSc (Youth and Environment Europe, UK)

Iris Blom, PhD candidate (London School of Hygiene and Tropical Medicine, UK)

Leeya Pressburger, MA candidate (Johns Hopkins University, USA)

Philippa Clery, MD (Camden and Islington NHS Foundation Trust, UK)

Methodology

We produced this research and action agenda through a robust and inclusive methodology to capture, combine and refine a rich diversity of perspectives while fostering connection across a growing community of practice.

The CCM core team developed this methodology in consultation with RCTs, a Global Advisory Board and Wellcome. Methods and materials were adapted regionally to ensure a balance of global standardisation with regional appropriateness and flexibility. Continuous sharing between regions of processes, learnings and challenges facilitated the iterative development of the methodology. The process for developing the regional research and action agendas is shown below (Figure 1).

Figure 1: Research and action agenda development methodology

Pre-dialogue scoping

Global scoping and framing

- The Climate Cares team and EU-NA RCCs each performed a global-level scoping review of current reviews, key papers, and policy reports relating to climate change and mental health.
- We undertook a mapping of the research categories covered by and used to structure reviews in this field.
- We conducted a second mapping of the recommendations for action on climate change and mental health in reports written to inform policy and practice.
- We used these results to frame the dialogues and research agenda to align with current literature while responding to key gaps.

Scoping research

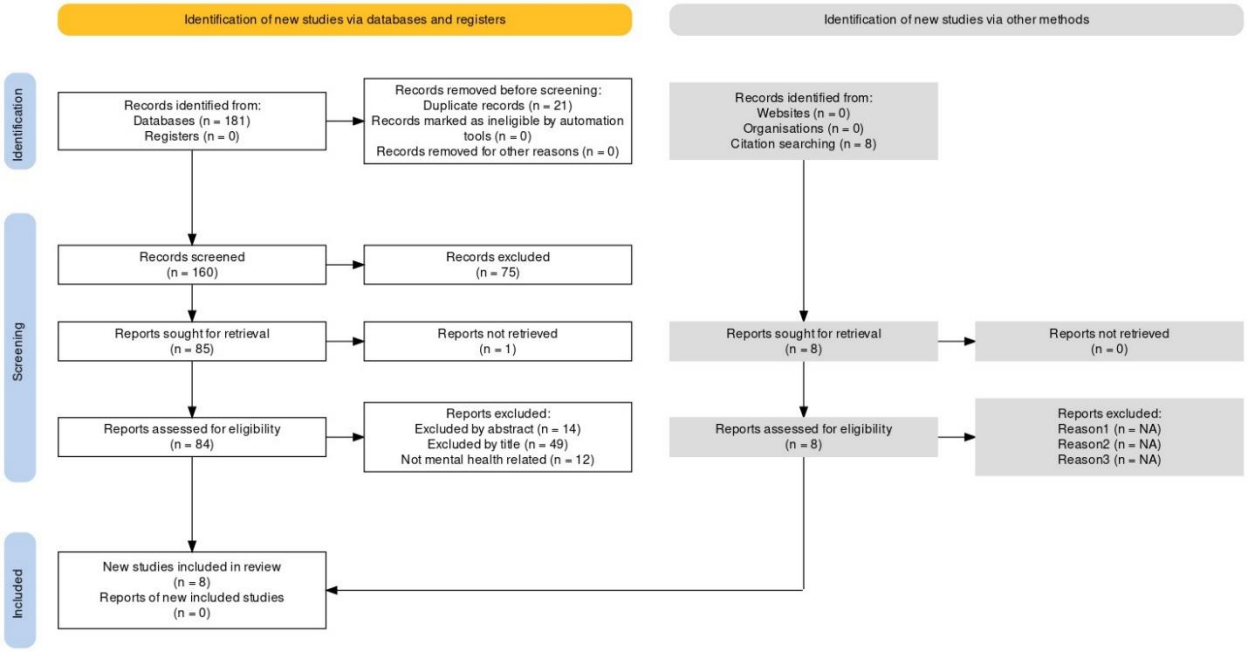
- We engaged with lived experience experts through key informant interviews to ensure that the production of the research agenda was appropriately grounded in an understanding of the key lived experience needs of the region.

Literature review

Before the first dialogue, we undertook a thorough literature review to understand the current research on climate-mental health in the region. Our search in Web of Science and PubMed yielded 181 articles from 2017 to 2023; please reference Appendix 1 for the full search query and Figure 2 below for a PRISMA flow diagram.[11] Web of Science returned 90 articles and PubMed returned 91. After removing one closed-source paper, 21 duplicate articles and 75 due to irrelevance, a total of 84 articles remained. Eight additional papers were found by citation search from the original list, bringing the total number of articles included in our review to 92.

Most papers were written in English; three articles were written in German and were analysed by a native speaker.

Figure 1: Process for identifying articles for the literature review



Based on the literature review's identification of key groups particularly likely to be affected by climate-mental health challenges, we reached out to six key individuals from diverse backgrounds – such as those with pre-existing physical and mental health conditions, low-income families, immigrant families and Indigenous individuals – to gather stories and perspectives that informed regional and thematic dialogues; this ensured that lived experience knowledge was included alongside academic and practice-based knowledge (see Appendix 2 for more details on the lived experience stories).

Dialogue methodology

- We held two virtual dialogues (three hours each) with experts across disciplines, sectors, and countries in EU-NA (see Appendix 3 for agendas).
- Dialogue discussions were designed by the global team, amended to be locally relevant and contextual, and facilitated by members of the RCT, who are themselves research, policy, and lived experience experts.
- Many facilitators actively contributed to the discussions and therefore played a role in both data collection and production.
- The first dialogue identified regional needs and generated research priorities.
- The second dialogue gathered feedback on draft research priorities, identified how to enact research in the region and translate evidence to action in policy and practice, and

explored the diversity of regional perspectives and understandings of key relevant concepts.
- Data generated from the dialogues included notes written by participants in Google Jamboard[ii] and Zoom[iii] chats, notes made by dedicated notetakers and transcripts of discussions, including plenary sessions and breakout room sessions.

Dialogue agendas can be found in Appendix 3.

Survey methodology

- We distributed a **pre-dialogue online survey** before Dialogue 1 to inform dialogue design and to solicit perceptions on regional climate impacts, climate-related mental health impacts, and research priorities.
- We distributed a **post-dialogue online survey** after Dialogue 2 to obtain a second round of feedback on research priorities and to identify relevant methods, metrics, and datasets to address these priorities.

Analysis methodology

- **Research categories:** The Climate Cares Centre conducted a global landscaping exercise of relevant existing climate change and mental health reviews and identified four broad research categories as areas of critical need to further this work globally. This framework was used as the basis for structuring discussions within dialogues to generate research priorities and forming the global coding framework for analysis.
- **Generating priority research themes**: Participants in Dialogue 1 (see Appendix 3 for agenda) were led through a structured discussion to express their views on the emerging and likely mental health consequences of current and future regionally relevant climate hazards, who was particularly affected, and opportunities for mental health benefits of action across both climate and mental health. Participants then generated draft research themes based on identifying where evidence would usefully inform responses in policy and practice.
- **Analysis**: Dialogue data (transcripts of breakout rooms and notes) was analysed using the Framework Method[12] – a matrix-based approach that allows qualitative researchers to undertake deep analysis of transcripts and written notes (see Appendix 4 for the coding framework). The analyst team populated a matrix based on the global coding framework by creating nuanced summaries with key quotes drawing from the notes and transcripts of the break-out discussions.
- **Draft priority research themes:** This matrix was used to draft a list of priority research themes, refined through consultation with the RCoP and triangulation across breakout notes, transcripts, the pre-dialogue scoping outcomes, and expert consultations. The selection of priority research themes adhered to a globally developed structure and

[ii] Jamboard is a collaborative and interactive digital whiteboard platform.
[iii] Zoom is a video communications platform.

selection criteria (e.g., potential to answer greatest regional emerging needs and evidence gaps, potential to inform decision-making in policy and practice and research feasibility; for full detail refer to Appendix 5).

- **Refinement of priority research themes:** Research themes were shared with Dialogue 2 participants who gave feedback in response to the following prompts:
    - Is this a valuable question? Would you change or add anything?
    - What would you want to know first?
    - What would be most helpful to know about this topic to understand and respond to it?
    - Share any ideas on datasets, metrics, or methods that could be applied to help address this.
    - Research themes were refined in response to this feedback and shared with dialogue participants and a wider sample of experts in the post-dialogue survey. Participants gave free text responses to the question "*Is there anything you would like to change, remove, or add to this research theme?*" and were given the option to suggest additional research themes.
- **Finalisation of priority research themes:** A final list of priority research themes was generated based on the incorporation of survey feedback and consultation with the RCoP and regional experts, CCM core team, Global Advisory Board, and Wellcome.

Participants

Dialogue participants were a diverse group across geographical spread, gender, sector, and discipline. All participants were invited to both dialogues; however in some cases participants were unable to attend both dialogues and only attended the first or the second dialogue.

In total 46 participants attended Dialogue 1 and 43 participants attended Dialogue 2. The tables below provide an overview of participant characteristics.

Table 1: Geographical spread

	Dialogue 1		Dialogue 2	
Country	Number	Percentage	Number	Percentage
Belgium	0	0%	3	8%
Canada	5	11%	3	8%
Finland	1	2%	1	3%
France	1	2%	1	3%
Germany	2	5%	1	3%

Italy	3	7%	6	15%
Malta	1	2%	1	3%
Netherlands	3	7%	1	3%
Serbia	0	0%	1	3%
Spain	1	2%	1	3%
Switzerland	2	5%	2	5%
United Arab Emirates	1	2%	1	3%
United Kingdom of Great Britain and Northern Ireland	11	25%	8	21%
United States of America	13	30%	9	23%

Table 2: Expertise

	Dialogue 1		Dialogue 2	
Expertise	Number	Percentage	Number	Percentage
Climate Change	25	28%	20	28%
Mental Health	27	30%	21	30%
Health	25	28%	22	31%
Other	13	14%	8	11%
I do not know / Prefer not to say	0	0%	0	0%

Table 3 : Discipline

	Dialogue 1		Dialogue 2	
Discipline	Number	Percentage	Number	Percentage

Activism	12	10%	9	8%
Community	11	9%	13	12%
Education	18	15%	14	13%
Expert through my own lived experience	11	9%	6	5%
Funding	1	1%	1	1%
Healthcare	9	7%	11	10%
Non-governmental Organisation	11	9%	13	12%
Policy	12	10%	11	10%
Research	31	25%	27	24%
Other	7	6%	6	5%

Table 4: Gender

	Dialogue 1		Dialogue 2	
Expertise	Number	Percentage	Number	Percentage
Men	12	27%	10	26%
Women	32	73%	29	74%
Non-Binary	0	0%	0	0%
I do not know / Prefer not to say	0	0%	0	0%

Survey participants:[iv]

Pre-dialogue survey: 66

Post-dialogue survey: 45

[iv] Please note numbers are approximate and do not account for duplicate or incomplete responses.

Ethics, data collection and storage

This study has been given ethical approval by the Imperial College Research Ethics Committee (Study title: "Global Dialogues to set an actionable research agenda and build a community of practice in climate change and mental health," study ID number: 6522690).

Details on data collection and storage can be found in Appendix 6.

Current state and emerging needs for climate change and mental health in Europe and North America

As the climate crisis escalates, more people globally are experiencing related mental health consequences. However, the current evidence base doesn't fully capture these experiences. To develop research themes that ultimately meet the needs of those experiencing and responding to the interconnections between climate change and mental health, it is vital to know: 1) what do people from different backgrounds, contexts and sectors – particularly those with lived experiences of mental health challenges in the context of the climate crisis – report as their experiences, needs and resiliencies, and 2) what evidence do people making decisions and taking actions on the ground need to adequately respond?

This section sets out the context of the research agenda, presenting a synthesis of what we heard through the dialogues, surveys, expert consultations and literature review as key emerging needs for mental health in the context of climate change.

Current research on climate change and mental health in Europe and North America

Europe and North America face several major climate threats, including but not limited to extreme weather events (including extreme temperatures), floods, wildfires, heat and drought. These events can lead to mental health challenges such as acute stress, anxiety, depression, PTSD and increased risk of suicide.[13, 14, 2] Wildfires in the Canadian Northwest Territories are increasing human isolation and time spent indoors, worsening mental health outcomes overall.[15] Residents of Florida who have experienced multiple successive hurricanes are facing cumulative mental health impacts, like post-traumatic stress syndrome (PTSS), from recurring disasters.[16] Additionally, populations exposed to flooding in the UK face a heightened prevalence of PTSD and anxiety compared to the general public.[17] Climate change also impairs mental health in the region by forcing migration and displacement after extreme events, leading to increased stress, trauma, isolation and feelings of loss and grief,[18, 19] and can cause economic hardships for rural or agriculture-based communities, worsening depression and anxiety.[20] There is also emerging research on the relationship between climate awareness and climate distress; eco-anxiety may disproportionately affect youth populations or those working in the climate change field.[21]

It is important to highlight that marginalised and disadvantaged groups face risk amplifiers to

these climate impacts, such as socioeconomic status, age, race and pre-existing health conditions. Indigenous peoples and those experiencing housing insecurity also experience heightened vulnerability. Often, these vulnerability factors intersect or overlap, further worsening mental health and wellbeing outcomes. It is important to note that some of these factors are linked to social and environmental inequities and 'vulnerability' is not naturally occurring. As an example, Alaska Native communities report increased stress, depression, suicide rates and social disruption as well as rising rates of drug and alcohol use due to imposed rapid socioeconomic and cultural change (such as assimilationist educational policies) in the last 75 years. Suicide rates spiked after periods of 'active colonialism' when government-sponsored economic programs altered traditional ways of living. These socioeconomic factors laid the groundwork for mental health outcomes that will likely be exacerbated by climate impacts, further threatening lives, livelihoods and culture.[22]

Climate change and biodiversity loss present a particular challenge for farmers and agricultural workers, as extreme ecological stress and constraints to agriculture threaten their livelihoods. Studies have shown that farmers have high rates of chronic stress that can lead to anxiety and depression.[23, 24]

Finally, during the 2021 Canadian heat dome event in British Columbia, 8% of the people who died had schizophrenia, but people with schizophrenia make up approximately 1% of British Columbia's population.[25] Considering these cases, climate-mental health is presenting as a clear and urgent problem across the entire region.

Framing of key concepts

The overall scope and focus of Connecting Climate Minds have been guided by the framing of climate change and mental health outlined in the introduction. 'Climate change,' 'mental health,' and their intersections and related terms, along with other relevant key concepts, are also understood and defined in diverse ways in EU-NA. The research underscores the critical challenge in the climate-mental health field of diverse terminology that is used across research studies and disciplines which can be confusing and even culturally insensitive. Identifying, acknowledging, and honouring the ways these terms are understood and used in different settings is critical to help foster connections, awareness, and recognition across disciplines, cultures, and communities.

The convening work of CCM presents a key opportunity to build our understanding of diverse perspectives, framings, and terminologies in Europe and North America, which we have sought to reflect within this research and action agenda. This section highlights regionally relevant understandings, as generated through a mapping activity in Dialogue 2 (see Appendix 7), designed to reveal the diversity of perspectives around key concepts and other discussions throughout the project. The three terms that were used most often and with the most variety in their definitions in Dialogue 1 were pulled to be addressed in the spectrum mapping exercise in Dialogue 2. Terms selected for discussion included 'social connectedness,' 'climate resilience,' and 'climate-mental health governance.' Regional definitions can be found below.

Social connectedness

Social connectedness can be regionally defined as a feeling of belonging to a place or a group of people or a feeling of empathy and support for others that can inspire action. Social

connectedness can serve as a strong basis for community action, as trust and inclusion may bring people together in a robust, supportive way. Social capital, understood as the ability of members of a community to cooperate and achieve shared goals, has been found to protect mental health and support adaptation in the wake of disasters.[26] Studies that are of regional interest include 1), the relationship between social capital and social connectedness, 2), if social connectedness can then be fostered through social capital-based climate mitigation and adaptation projects, and 3), the consequences for mental health risk and protective factors.

Climate resilience

Regional definitions of climate resilience include a mix of preparing for, recovering from and adapting to climate impacts as forms of adaptation and mitigation actions. Resilience is not just about 'bouncing back' after a disaster, but rather empowering individuals and communities to respond smoothly with a forward-thinking approach to take climate action and adapt in healthy ways, safeguarding mental health and wellbeing. It is important to note that thinking of resilience at the individual level can be insensitive and place an unnecessary onus on one person. Climate resilience is better understood at the individual and community level together, to adapt and move forward with mitigation efforts as a united group.

Climate-mental health governance

There were many comments around climate change and government inaction that led to short- and long-term effects on mental health. The term 'climate-mental health governance' was mentioned by a few participants but used in a way that piqued interest and warranted further exploration. While difficult to define, regional climate-mental health governance supports the implementation of climate-mental health policies through multi-level governance, cross-boundary leadership and targeted action to integrate mental health and climate change within policy action.

Regional needs for mental health in a changing climate

While the climate crisis affects every part of the world, current and future hazards are unevenly distributed geographically. In addition to geographical inequalities, disadvantaged communities face additional inequalities related to economic stability, racial injustice, healthcare access, and more. Different parts of the same country or region may face different levels of threat to droughts, wildfires, floods, or extreme heat. For example, to illustrate the richness and breadth of experiences, coastal communities may face increasing rises in sea level, coastal erosion, and storm surges, which can disrupt livelihoods and community cohesion while Inuit communities face melting sea ice, which can lead to loss of valued cultural and ancestral traditions as well as aspects of community identity. Understanding the projected climate hazards and their timescales for different communities and regions is vital to appropriately target support for mental health.

This section outlines the key climate exposures facing EU-NA projected to approximately 2030 as compared to historical baseline (generally 1986-2005), as modelled by climate experts at the Red Cross Red Crescent Climate Centre. We also present findings from the dialogues, surveys and consultations with lived experience experts to explore perceptions of 1) mental health risks associated with these climate exposures, 2) whose mental health may be most at risk, 3) the pathways through which climate exposures might produce or exacerbate existing mental health

problems, 4) climate adaptation and mitigation actions that may benefit mental health, and 5) mental health actions/solutions that can help respond to these mental health impacts.

Climate hazards[v]

EU-NA is vulnerable to climate change. This region has experienced droughts, wildfires, floods, landslides, storms, and extreme temperatures in recent years according to the international disaster database EM-DAT. The region is facing an increase in the frequency and severity of a range of climate hazards, including the following, modelled to approximately 2030 as compared to historical baseline (generally 1986-2005):[27,28]

- **Extreme temperatures**, with 30 additional days above 35°C per year in the central region of North America (covering Mexico and the southern half of the United States) and 20 additional days above 35°C in southern Europe (high confidence); [vi]
- **Droughts** in the Mediterranean region (high confidence) and southern US (low to medium confidence) though there is a projected decrease in droughts in northern Europe (medium confidence);
- **Wildfires**, particularly in the Mediterranean (high confidence), western Russian Federation (medium confidence) and central Canada (medium confidence);
- **Heavy precipitation events and flooding** across many areas of North America (medium to high confidence), Europe (high confidence) and the Russian Federation (high confidence);
- **Sea level rise** in all European areas except countries on the Baltic Sea (high confidence) and along most coasts of Central and North America (high confidence), leading to increased coastal flooding and erosion, though regions with strong coastal land uplift along the south coast of Alaska and Hudson Bay are exceptions (high confidence); and
- **Tropical storms**, with category 4-5 tropical hurricanes with higher precipitation expected to become more extreme in the United States Gulf Coast and the East Coasts of Northern and Southern Central America (medium confidence).

What mental health outcomes appear to be impacted?

Dialogue participants identified the following notable mental health and wellbeing impacts from climate change. For additional context of and research on these effects, please reference Appendix 9.

- Mental health challenges, such as depression, anxiety, suicide and substance abuse.
- Mental health-related experiences and symptoms, such as stress or sleep disruptions.
- Mental wellbeing impacts specifically related to climate change, such as ecological grief, eco-anxiety, social isolation, pre-traumatic stress disorder and climate distress.

[v] Information based on Red Cross Red Crescent Climate Centre mapping exercise and projections (methods detailed in Appendix 8). Future projections are based on the middle of the road emissions scenario (SSP2-4.5 Shared Socioeconomic Pathway) from the Coupled Model Intercomparison Project - Phase VI (CMIP6) multi-model GCMs ensemble provided in the IPCC, 2021.

[vi] Within the IPCC and other major sources of climate projections, confidence levels are given on a scale of low, medium, high. The ranking refers to the robustness of the evidence available and the agreement between climate models.

Who is particularly affected?

Dialogue participants highlighted the following groups as those particularly affected by climate change or at risk for climate-mental health impacts. For additional research and context, please see Appendix 9.

- Children and youth
- Elderly populations
- Indigenous, coastal and small island communities
- Marginalised communities
- Migrant and displaced communities
- Rural and agricultural communities
- People with pre-existing mental and physical health conditions
- Women and girls

What are the pathways and mechanisms linking these climate hazards to mental health outcomes?

Dialogue participants highlighted how climate change impacts in the region led to disruptions of social and economic determinants of mental health. For example, participants described the mental health impacts resulting from not being able to access healthcare or education, a change to and/or loss of livelihoods, disruption to cultural practices and traditional ways of being, increased gender-based violence and forced relocation and displacement. The role of the loss of social connection and increased isolation on mental health was frequently mentioned in the dialogues, for example, extreme heat preventing people from being able to leave their homes.

When exploring pathways and mechanisms, dialogue participants raised the importance of considering the compounding nature of climate impacts and interactions between multiple pathways and mechanisms affecting mental health and mental wellbeing. For example, recovering from one extreme weather event while simultaneously experiencing anticipatory stress and fear of future climate events could worsen mental health outcomes. There is a pre-identified gap in research around the biological and physiological pathways; however, these pathways were mentioned only briefly in the regional dialogues.

Lack of sufficient climate action, particularly from governments, was also raised as having harmful impacts on mental health and mental wellbeing. Dialogue participants also highlighted the role of communication pathways for information about climate change influencing perceptions about climate change and having either positive or negative impacts on mental health and mental wellbeing.

What climate adaptation and mitigation actions have benefits for mental health?

There was consensus during the dialogues that climate adaptation and mitigation actions with win-win benefits for mental health potentially span various sectors. Integration of mental health programmes into grassroots organisations, research institutions and government initiatives in climate action can benefit communities. Application of a degrowth economic model in EU-NA as a climate mitigation action could positively impact the mental health industry, while successful government policies addressing climate-related mental health challenges serve as models for effective integration. Indigenous climate knowledge systems, adapted and scaled, offer preventive and healing methods, creating a beneficial scenario for both climate resilience

and mental health and/or mental wellbeing. Government policies that effectively address climate-related mental health challenges exemplify a commitment to holistic mental wellbeing and community resilience by allocating resources strategically and engaging communities in collaborative efforts to build adaptive and supportive societies.

Practical applications and real-world scenarios were emphasised in the dialogues, ensuring a holistic understanding of the intersection between climate actions and mental health.

What mental health actions can help respond to these mental health impacts?

Various interventions are being explored and implemented to address mental health challenges in the context of climate change, drawing insights from diverse lived and professional experiences.

Social health interventions: These interventions include identifying programmes designed for non-climate-related social health challenges, like loneliness and social isolation, exploring the potential co-benefits for specific climate-mental health challenges and fostering virtuous cycles that benefit both mental health and climate adaptation/mitigation activities. An example is the "Creative Art Therapy" guides, a resource from the Climate Mental Health Network.[29]

Climate education programmes: This includes efforts to increase the effectiveness of climate education programmes, particularly from elementary through high school institutions, by integrating mental health considerations into daily education. As an example, the PERSIST programme in Italy involves a systematic review to identify gaps in educational systems and strategise how climate awareness can be incorporated to mitigate mental health impacts on children and youth.[30]

Decolonial and Indigenous knowledge systems: Exploring and integrating wisdom and resilience practices from outside traditional Western medicine can potentially support communities most impacted by climate hazards, offering culturally relevant approaches to protect and promote mental health and/or mental wellbeing. The Native Hope initiative counters injustices done to Native Americans by addressing mental health challenges, emotional wellbeing, climate and the environment; these practices are rooted in decolonial and Indigenous knowledge systems.[31]

Disaster risk reduction (DRR): Research is dedicated to defining climate change-specific adaptations to DRR guidelines. Strategies include integrating DRR awareness in vulnerable communities, ensuring that disaster preparedness efforts consider climate impacts and addressing the mental health implications of climate-related disasters. The Columbia Climate School National Center for Disaster Preparedness works with populations most vulnerable to climate related disasters through community outreach, education, and trainings for communities to better prepare for climate disasters.

Climate-aware psychotherapy: Efforts are being made to build evidence-based therapeutic practices in clinical climate psychology that explore therapeutic approaches to specifically address the psychological impacts of climate change, such as with Climate Aware Therapist Directory from

the Climate Psychology Alliance North America. Therapists from the US, UK and Canada can register their practice and participate in training to best support clients with mental health impacts from climate change.

Potential efficacy of 'lifestyle medicine' for mental health challenges in the context of climate change: Lifestyle medicine manages chronic physical and mental diseases by modifying unhealthy behaviours and promoting healthier ones, such as eating better, sleeping more, increasing activity levels and managing stress. Groups such as the Clinicians for Planetary Health aim to understand and address the role of lifestyle medicine within the context of changes to our planet (e.g., climate change, biodiversity loss, air and water pollution, etc.) and its impact on mental health challenges and wellness. They focus on healthcare practitioners and healthcare facilities prescribing lifestyle medicine for personal and Planetary Health.

Health technology that addresses mental health: Health technology, including mobile apps, offers numerous advantages in mental healthcare, such as anonymous and private treatment, an introductory step for hesitant individuals, cost-effectiveness, expanded outreach to remote areas or during crises, increased accessibility, 24-hour service, consistent treatment programmes, supportive features and valuable data collection capabilities. Options range from simple phone lines such as the 988 Suicide and Crisis Lifeline to sophisticated apps using device sensors to monitor behaviour patterns. In the face of climate event-related barriers (e.g., isolation), the growing mental health technology field offers a more inclusive, flexible, and supportive approach to mental health treatment.

In summary, interventions span social, educational, cultural and healthcare domains, reflecting a holistic and varied approach to address climate-related mental health challenges. These efforts draw on the diversity of experiences and perspectives to develop comprehensive strategies that cater to the specific needs of different communities and individuals. More examples of programmes and solutions addressing climate-mental health can be found here. Learning from, evaluating, adapting, and scaling existing solutions and identifying gaps where novel interventions and solutions are needed is critical for addressing the mental health challenges of climate change.

Research agenda

Priority research themes

Background to research categories and priority research themes

This research agenda presents an aligned vision to guide the climate and mental health field in EU-NA. Research priorities have been generated through consultation with experts across disciplines, sectors and geographies in the region and iterated with experts regionally and globally. The priority research themes represent areas where targeted research investment could create a full picture of impacts, mechanisms and solutions across both mental health and climate actions.

Research priorities are presented within four overarching research categories that were identified as critical areas of need for further work globally and that map the climate and mental health research space at a high level, based on an initial review of global literature. Note that some priorities span multiple categories.

- **Impacts, risks, and vulnerable groups**: This category focuses on improving our understanding of the extent to which mental health is affected by climate change and for whom. For example: what mental health outcomes are impacted or at risk; the prevalence, severity and economic and societal costs of these impacts; and who is most vulnerable to these impacts.
- **Pathways and mechanisms**: Here, we aim to improve our understanding of how climate change affects mental health and whether there are factors specific to climate change that increase mental health risks or create new experiences of mental health challenges. This includes considering biological, psychological, societal, cultural or environmental pathways and mechanisms.
- **Mental health benefits of climate action (adaptation and mitigation)**: This area will focus on understanding and quantifying when and how climate adaptation and mitigation actions, across sectors, can also have co-benefits for mental health.
- **Mental health interventions/solutions in the context of climate change**: Finally, this priority will identify the most effective mental health interventions and/or solutions to support mental health in the context of climate change across diverse sectors and disciplines. This encompasses providing support to people already experiencing negative mental health impacts and reducing the risk or severity of future negative impacts.

We hope that these priorities act as an inspiration to guide the research community, provide investment targets for funders, and generate evidence to enable policymakers and practitioners to address the emerging and predicted mental health needs in response to climate change in EU-NA.

Priority research themes

Table 5 below lists the EU-NA research themes. For broader methodology and metric suggestions for the research categories, please see Table 6.

Table 5: Priority research themes for EU-NA

Research category	Priority research theme
1. Impacts, risks and vulnerable groups	1a. Understanding how individuals with pre-existing mental health challenges are affected by the compounding effects of multiple climate disasters and related stressors, and how these symptoms manifest across different cultures.
	1b. Identifying which strategies are effective in preventing a cascading effect on mental health challenges in the face of multiple climate disasters and related stressors.
	2. Identifying the protective and risk factors affecting an individual's susceptibility to climate-related mental health challenges.
	3. Understanding how both individual and community mental health outcomes are related to climate action (including individual, community, and system level action), especially for groups experiencing overlapping disadvantages (e.g., low socioeconomic status, youth, Indigenous populations, and racialized populations).
	4. Measuring the mental health impact of climate change-related disruptions on culturally based ceremonial practices in Indigenous populations.
	5. Establishing effective approaches to monitor short-, mid- and long-term mental health responses to compounding climate disaster events.
	6a. Understanding whether and how awareness of climate change hazards can be related to suicidality and severe mental health challenges in Europe and North America (bearing in mind the complex and multifactorial nature of suicide).
	6b. Evaluating and understanding the increased risk, if any, of suicide/suicidal ideation and its drivers for climate change professionals (i.e., scientists, researchers, programme leads, communication specialists, teachers, students, activists, etc.).
	7. Identifying, measuring and tracking the short-term and long-term mental health challenges for populations that have suffered Universal Declaration of Human Rights (UDHR) violations in the context of climate change (e.g., right to an adequate standard of living, right to health, right to water, etc.).

8. Understanding how and why the perception of climate-related institutional betrayal (such as government inaction relating to climate) from governments, workplaces, social institutions and/or political stakeholders and lobbyists impacts the mental health of certain individuals.

9. Measuring the impact of different features of climate change communication (for example, the validity and quality of information, tone, strategy, style of messaging, formatting [image, audio, written, etc.], dominant narratives, misinformation, and mode of communication) on mental health challenges in Europe and North America. (Reference theme 9 in the pathways and mechanisms section for more context)

10a. Understanding and measuring how the loss of blue and green spaces (rivers, oceans, seas and lakes; forests, parks, grasslands and recreational areas) due to climate change impacts the mental health of individuals and communities who previously had access to these spaces.

10b. Evaluating the efficacy of prescribing lifestyle changes which integrate blue and green spaces (e.g., forest bathing, gardening, tree planting initiatives, conservation work, etc.) on mental health outcomes at the individual and community level and the synergies with climate action. *(Reference theme 10 in Pathways and mechanisms for additional context.)*

11. Quantifying the additional economic impact of mental health challenges caused or exacerbated by climate change in EU-NA.

12a. Identifying examples of climate-resilient communities with high levels of mental wellbeing and/or low levels of mental health challenges in the context of climate change.

12b. Establishing which metrics and methods could be used to identify these communities across the region and their specific protective factors.

12c. Identifying the specific protective factors within these communities that foster resilience to mental health and/or mental wellbeing challenges in the face of climate hazards and exploring how to adapt to other populations and contexts.

13. Exploring ways to leverage new or existing health technology (such as data from health apps or wearable devices) safely and ethically to better understand or attribute the mental health challenges resulting from climate impacts.

2. Pathways and mechanism

1. Understanding how different communication channels that share climate-mental health information influence the mental health of individuals

with pre-existing mental health challenges and the mental wellbeing of a broader population (acknowledging that select communication channels, such as scholarly publications, have more credibility than others, such as social media platforms).

2. Understanding political, social, economic and environmental pathways stemming from climate fragility that impact mental health

Climate fragility occurs when there is a lack of coping or adaptation mechanisms for countries, communities and individuals to respond to climate shocks (i.e., climate events, biodiversity loss, and environmental degradation) and can lead to political instability, food insecurity, economic weakness and large-scale migration.

3. Evaluating methods to measure how climate change exacerbates mental health inequities (such as access to care, pre-existing disparities, etc.) in EU-NA, and explore if and how this acts as a mechanism by which climate change is worsening mental health outcomes for vulnerable groups.

4. Understanding the climate-related mental health outcomes and experiences of individuals who are living with multiple intersecting or compounding risk factors for poor mental health and/or climate change-related impacts (for example, an Indigenous person living with physical disabilities).

5. Identifying the pathways to standardise climate-mental-health terminology that is culturally informed and holistic.

6. Understanding the pathways through which experiencing compounding climate events impacts mental health (e.g., recovering from one climate event while experiencing anticipatory stress or fear for future impacts).

7. Understanding how climate-related disruptions to accessing healthcare, education, livelihoods, cultural practices and/or traditional ways of being impact mental health.

8. Exploring and understanding how loss of social connection and increased isolation caused by extreme weather events (e.g., heatwaves) influences mental health outcomes.
(Reference theme 2 in the mental health interventions/solutions in the context of climate change section for more context.)

9. Assessing how climate misinformation impacts the mental health challenges of vulnerable populations.

	(Reference theme 9 in the impacts, risks, and vulnerable groups section for more context.) 10. Understanding how the loss of blue and green spaces due to climate change impacts the mental health outcomes of communities most at risk for biodiversity loss (e.g., coastal and Indigenous communities). *(Reference theme 10a and 10b in in the impacts, risks, and vulnerable groups section for more context.)*
3. Mental health benefits of climate action (adaptation and mitigation)	1. Assessing how applying alternative economic theories (such as the degrowth economic model or the doughnut economics model) to climate mitigation actions would impact the mental health sector (e.g., behavioural health providers and organisations, pharmaceutical companies and other private enterprises) in EU-NA. 2. Exploring ways to safely integrate mental health programmes into grassroots organisations, research institutions and governments working on climate action to protect the mental health of the people working on these programmes and benefit the mental health of the communities with whom they work. 3. Evaluating how various levels of government can most effectively enact policies and allocate funding to support climate adaptation and mitigation strategies that address mental health challenges in low socioeconomic communities in EU-NA. 4. Identifying the climate policies that prioritise youth mental health and wellbeing and addressing political barriers in EU-NA. 5a. Evaluating how climate mitigation and adaptation strategies (such as green infrastructure) impact those with mental health challenges, in both positive and negative ways. 5b. Understanding the impacts of these strategies on mental health at both the community and the population level. 5c. Identifying methods for data collection to model and capture the co-benefits of climate mitigation and adaptation strategies, including development of appropriate metrics/indicators. 6a. Evaluating how the integration of child rights principles within climate mitigation and adaptation policies in EU-NA might influence mental health outcomes in children and youth (given the unique strengths and vulnerabilities of these groups).

6b. Identifying the critical factors that shape how climate mitigation and adaptation policies could either mitigate or exacerbate mental health challenges among young populations, especially considering varying socioeconomic, cultural and environmental contexts.

7. Assessing which types of financing and implementation models optimise and facilitate policies and interventions at the intersection of climate change and mental health.

8. Understanding how mental health and mental wellbeing policies and programmes that directly or indirectly respond to climate change are evaluated and prioritised across different levels of government in EU-NA.

9. Understanding whether and how individual- or community-level climate action has co-benefits or negative effects on mental health and/or determinants of mental health (e.g., sociopolitical forces and inequality).

10. Assessing whether and how climate mitigation and adaptation projects contribute to the cultivation of social capital (defined as the community's ability to collaborate and achieve common objectives) and assessing the resulting effects on mental health risks within a specific region.

4. Mental health interventions/solutions in the context of climate change

1. Identifying the cross- and multisectoral interventions (e.g., social and cultural health) needed to alleviate climate-induced mental health challenges across different settings and how to implement them.

2. Exploring ways to harness and enhance the protective effects of social and cultural connectedness on the mental health of communities before, during and after acute climate disaster events.

3a. Identifying methods to evaluate the efficacy of climate education programmes that include mental health considerations in educational institutions.

3b. Assessing how to best integrate climate awareness into education programmes in ways that promote mental health and wellbeing while mitigating the potential mental health impacts on children and youth.

4. Exploring methods to research, evaluate, adapt, cost and scale Indigenous climate knowledge systems and wellness practices as preventative and healing mental health interventions for the broader population in EU-NA.

5. Evaluating the effects of prescribing ecotherapy (a type of therapeutic treatment, also known as nature therapy, that involves participating in

outdoor activities in nature) for climate-related mental health challenges within the formal mental health sector.

6. Assessing methods to equip the mental health workforce serving communities affected by climate change with culturally and regionally specific decolonial practices, and the effects on mental health outcomes for the populations they serve.

7. Identifying, developing, implementing and evaluating existing mental health and mental wellbeing education programmes that include relevant information on climate change for healthcare practitioners (including medical students and other professionals in the health sector) globally, especially for those engaging with vulnerable groups impacted by climate change.

8. Evaluating short-term, mid-term and long-term mental health interventions to address the mental health challenges from systemic neglect of unhoused populations and other disadvantaged groups during climate-related disasters.

9a. Measuring the extent to which healthcare practitioners, educators, social welfare workers and policymakers are aware of the connection between mental health challenges and climate change.

9b. Identifying where these groups acquire information about climate-mental health.

9c. Determining the most effective methods to disseminate the most relevant climate-mental health information to these groups.

10a. Identifying and evaluating effective government policy and programmatic solutions to address climate-mental health challenges and improve mental wellbeing in the context of climate change.

10b. Exploring ways for European and North American multi-level governments to adapt these solutions.

11a. Identifying cross-sector interventions, beyond focused mental health and psychosocial support strategies, that support positive mental health and psychosocial outcomes in vulnerable populations in the context of climate disasters.

11b. Assessing methods to evaluate, recognise and integrate these interventions (which could include nutritional programmes, prenatal

healthcare, educational supports, traditional/Indigenous practices, etc.) within broader public and private sector mitigation and adaptation policies.

12. Evaluating the economic cost-benefit of interventions designed to support mental health in the context of climate change.

13. Exploring ways to deliver low-cost, highly accessible and effective services for people experiencing mental health challenges because of climate change.

14. Developing standardised assessment tools to collect region-specific climate and mental health data and track mental health trends to improve understanding of mental health impacts of climate change and evaluate interventions.

While this research and action agenda focuses on EU-NA, there will likely be overlap and synergies with climate and mental health research in other regions of the world. Researchers and experts need to identify which of the above research topics and questions within the EU-NA research agenda have significant overlap with other regions, and which would be best pursued from a global, cross-cultural lens. One priority that exemplifies the overlap is standardising climate change and mental health terminology using scientific, academic, cultural and colloquial input. There may be opportunities to partner with other regions to enact certain elements of this regional agenda; this has been done at a global level for the global research and action agenda of CCM.

Overview of themes

Why were these themes chosen as priorities? What would be the potential benefits of addressing these research themes?

We recognise that around 77% of climate- mental health research is generated in high-income countries.[8] Much of this research already focuses on the identification of vulnerable groups and potential climate hazards that disproportionately impact these groups. A focus on any specific climate hazard or at-risk group could limit the conversation to one region or population subset and risk excluding others. Therefore, except for a few targeted questions, these research themes were kept broad to ensure that researchers or experts can focus on any at-risk populations. One targeted population was Indigenous Peoples, selected for many reasons, but the transdisciplinary nature was captured by a quote from a dialogue participant:

> "Our Indigenous communities are not well funded, and not just for health but for all aspects of living. So there's a lot of reliance and hopes that provincial and federal governments are helping to respond to some of these issues, and a lot of sense of hopelessness and despair and frustration and anger about seeing populations being put in a position where they can't actually help themselves or mitigate against some of the challenges that they're facing." – Dialogue participant

There are many cascading and amplifying risks from climate change and mental health individually. As such, we prioritised pathway and mechanism questions focusing on the compounding effects of climate change on mental health. Dialogue discussions also focused on communication issues in the field, in terms of the impacts of different communication modes on climate-mental health as well as standardisation of terminology used when discussing climate-mental health. Understanding sources of inequity and how that can exacerbate mental health impacts in the context of climate change also emerged as a key theme.

> "It's the compounding impacts of different hazards and disasters that is of most concern, not to say that the specific nature of the hazard or disaster itself isn't concerning… And so it's a layering effect on *how* the community is managing those circumstances that is more concerning" – Dialogue participant

The climate adaptation and mitigation questions reflect areas with the most potential for co-benefits between climate action and mental health, as identified by experts with whom we consulted. These questions were developed to have significant implications for policy prioritisation. Discussion centred on equity, community-level solutions and using new models and sources of data to identify co-benefits. A key piece of this work will focus on identifying and evaluating the best sources of integrating mental health within climate policies, and vice versa, to capture the most impact for both sectors. One dialogue participant identified climate activism as a tool for resilience building, nicely highlighting the multi-faceted nature of the co-benefits of climate action:

> "… I guess, activism, at times, of restoration, is also just community resilience building, which is beneficial to every member of the community that you're part of and not just yourself. And so, I think that's what I feel is the most prominent overlap between mental health and climate crisis work, and that gets me passionate." – Dialogue participant

Finally, the mental health intervention research themes were selected to expand the knowledge of climate-mental health interventions while building on lessons from other countries and communities. Understanding the direct and indirect impacts on mental health informs tailored interventions, aids vulnerable communities, and shapes evidence-based policies. These research themes would enable an evidence base of the most effective ways to foster resilience, raise public awareness, and guide ethical decision-making to improve climate-related mental health outcomes for different communities. Addressing climate-mental health challenges is pivotal for supporting affected populations and proactive adaptation efforts. Research that can support the identification of effective interventions is an urgent priority, as the pace of research may take several years or even decades to articulate and test successful interventions.

What are examples of methodologies, metrics and datasets that could be used to address these?

Researchers have an array of research methods from which to choose; they should identify research methods based on particular research themes/questions and target populations, ensuring that they are culturally appropriate. Stratification will sometimes be necessary; for example, if looking at 'youth' as a disadvantaged population, researchers should consider stratifying across age, socioeconomic background or education level. Some sample methodologies, metrics and datasets for each category, based on dialogue discussions, are outlined below (Table 6).

Table 6: Methodologies, metrics, and datasets to address priority research themes

Research category	Methodology/metrics/datasets
1. Impacts, risks and vulnerable groups	Developing risk profiles for different vulnerable groups, keeping decolonising principles in mind when doing so to prevent unjust or discriminatory profiling. Because of stigmas and biases, methods like mental health surveillance systems may be inadequate; instead, consider adapting culturally based approaches. Conducting semi-structured qualitative interviews combined with anxiety and/or depression inventories to assess how climate change impacts the lives of people with mental health challenges. Adapting existing tools, like comprehensive clinical assessments or the Homeless Engagement and Acceptance Scale, when working with populations affected by climate change. Leveraging UNICEF's MMAPP initiative to collect reliable and quality data on population-level mental health outcomes among children and adolescents or following OECD recommendations on measuring population mental health. Encouraging the integration of climate-specific indicators and outcomes into these frameworks may be an efficient way to measure climate-mental health metrics. Using large cohort data to understand the prevalence of different climate-mental health outcomes, although further research and collaboration is required to standardise the metrics needed to measure these outcomes and the corresponding conceptualisations. Considering evidence of, and accounting for, causality when attempting to attribute a mental health challenge to a specific source.
2. Pathways and mechanism	Using case studies that emphasise the importance of storytelling to create better linkages between mental health datasets and physical healthcare services. Combining this principle with physical evaluations could create a more comprehensive understanding of the mind-body connection in the context of climate change induced mental health challenges, and therefore enable a deeper understand of the pathways and mechanisms by which climate change affects mental health. Using climate data such as temperature data, satellite images of climate hazards, or air pollution records to complement interviews and surveys to understand the ways in which these hazards are affecting mental health outcomes can lead to more robust results.

	Taking care to not rely exclusively on quantitative metrics. Qualitative stories, ethnographies, oral histories, etc. can inform metrics and be used as valid monitoring methods, especially in conjunction with a quantitative approach.
3. Mental health benefits of climate action (adaptation and mitigation)	Leveraging different research methods, such as mixed-method research, cohort studies, or qualitative methods such as surveys to provide a broader understanding of the co-benefits of climate action on mental health and give context to quantitative data. Introducing methods that civil servants can use for climate policy (e.g., mental health cost-benefit analysis) to make it easier for them to identify co-benefits when creating policy. Using scales that measure connectedness to nature to assess how strongly people from various cultural backgrounds feel connected to the natural world; the perceived stress scale can be modified to align with climate change impacts. Longitudinal, mixed-methods studies to learn how individual and community-level indicators of mental health relate to climate action, controlling for other external factors that may influence mental health.
4. Mental health interventions/solutions in the context of climate change	Creating an experimental design with short- and long-term exposures to interventions to develop quantifiable data. Stratifying populations by socioeconomic status, age, prevalence of disabilities, ethnicity and/or geographic location, for example, to increase inclusivity and understand equity impacts in these research topics. Understanding gaps in community education systems as well as the overall structure of schooling before implementing climate-mental health programming; this applies to the health sector as well. Using implementation science, complex intervention frameworks and an anthology of community and personal success stories, particularly when working with Indigenous knowledge. Conducting community-level interventions after a climate event and measuring the impacts on mental health.

Action agenda

As the climate change and mental health field in EU-NA builds and the evidence base grows, it is crucial to avoid perpetuating existing challenges, including 1) disconnections across disciplines and between researchers and policymakers; 2) unequal focus on topics and geographies; and 3) and siloed decision making for climate and mental health. This action agenda sets out a shared vision as a rallying focus of the mental health and climate change field in EU-NA. This includes guidance on how to best support the growing community of practice, how to translate evidence to action, and the principles that should guide this approach. Enacting this agenda will require transdisciplinary effort and coordinated action across research, research funding, policy, and practice. This action agenda aims to guide this work by setting out the challenges that must be addressed, opportunities that can be harnessed, and priority actions to work towards a thriving climate and mental health field.

Regional vision for mental health in a changing climate

Vision statement

The EU-NA RCoP aspires to foster a society resilient to climate-induced mental health challenges. We aim for individuals and communities to receive ample support, prioritise mental health without stigma and effectively address mental health impacts amid climate change. Envisioning a future with education, resources and compassionate care, our goal is to empower everyone to navigate climate-related stress, fostering resilient minds and interconnected communities. Through a culture of understanding and support, we strive to build sustainable, inclusive and mentally resilient communities, where collective action and empathy prevail in adapting to climate-mental health challenges.

Key characteristics of the desired future state for climate change and mental health in the region

- EU-NA regional dialogue participants envision a resilient, inclusive and integrated society where mental wellbeing is safeguarded amidst environmental challenges. Key characteristics of this future state include:
- **Holistic resilience by integrating mental health considerations into climate change adaptation strategies:** Individuals and communities will possess adaptive capacities to cope with and recover from climate-related stressors, fostering emotional strength and psychological wellbeing in the face of environmental changes. An emphasis on risk prevention to address problems at the source can lead to fewer climate-mental health challenges.
- **Integrated climate change and mental health policies and services:** Governments and institutions will collaborate to develop comprehensive frameworks that address the mental health impacts of climate change, ensuring accessible and effective support systems for affected populations. The deep integration of mental health within climate policies, and vice versa, will capture the complex dynamics of the climate-mental health crisis and allow for comprehensive, deeply impactful policy solutions.

- **Equitable, universal access to mental health support, devoid of stigma:** Efforts will be made to eliminate barriers to access, such as socioeconomic disparities and geographical limitations, ensuring that marginalised and disadvantaged communities have equitable access to resources and care.
- **Widespread education and awareness:** Societies will prioritise education and awareness campaigns, fostering a deeper understanding of the mental health implications of climate change. Schools, workplaces, and communities will engage in initiatives that promote resilience-building, empathy and proactive coping mechanisms. Educators will emphasise mental health and emotional wellbeing when discussing issues with children and youth and will communicate climate change risks in a way that is focused on pathways to hope and action.
- **Investment in transdisciplinary and culturally appropriate research and innovation:** This investment will drive the development of tools and interventions at the intersection of climate change and mental health. Transdisciplinary collaboration among scientists, policymakers and community leaders will stimulate the creation of effective strategies and technologies. Culturally appropriate research methods and approaches will be needed to ensure data is owned by the communities it stems from and that permissions are obtained at every step of the process.
- **Global partnership and collaboration**: EU-NA will actively engage in global partnerships, sharing knowledge, resources and best practices to collectively tackle climate-induced mental health challenges.
- **Empowerment of individuals and communities:** Everyone will be empowered to actively engage in climate action alongside mental health research and resilience-building efforts. Encouraging participation in decision-making processes and fostering a sense of agency will be paramount in creating sustainable and mentally healthy societies. Partnering with established activist groups and learning from other social movements can advance mental health policies, human rights and justice.

Creating an enabling environment for research at the intersection of climate change and mental health

The identified research priorities will only be of value if they are enacted. The climate and mental health field is relatively new and rapidly growing, and now is the time to ensure that it is designed to deliver a mentally healthier future in the context of the climate crisis. In a field that spans multiple disciplines and sectors, each with different cultures and ways of working, and on a topic with low awareness in many countries, what is needed to support capacity-building efforts? What principles must guide the field, and what are the challenges and opportunities in the region to create an environment that would enable such research?

This section presents a synthesis of dialogue discussions and survey results on what is needed to implement the research agenda and foster an enabling research environment for climate change and mental health.

A desired state of climate change and mental health research in Europe and North America

There are several principles underlying the desired state of climate-mental health research in EU-NA; at the core are accessibility and inclusion. Research should be available and understandable to a wide variety of people of varying education levels, socioeconomic backgrounds, and physical or mental abilities. Inclusion spans different cultures and languages and involves working closely with different communities, particularly at-risk populations, throughout the research process. Keeping equity at the forefront of research going forward is essential, and researchers should be mindful not to impose Western customs on non-Western populations. Additionally, this field should aim to be highly collaborative and transdisciplinary to produce robust, applicable, solutions-oriented results. While often difficult, researchers should strive for independent scientific rigour and resist external influence or pressure that may create conflicts of interest.

Climate-mental health research is crucial due to its interconnected impact on individuals and societies. On short timescales, extreme weather events can lead to immediate mental health challenges, including trauma, anxiety and depression. Understanding these acute effects is vital for prompt intervention and support. Research planning and implementation should engage all stakeholders throughout with in-depth discussion with communities, co-creating research with involved populations, and engaging them during multiple phases of the research. This process should respect and incorporate different knowledge bases, such as Indigenous knowledge or Traditional Ecological Knowledge.[32, vii]

Challenges holding back research

Several challenges were identified for reaching the desired state of climate-mental health research in EU-NA, including:

- **Funding:** Fundraising is an expected obstacle for research, but even more so in a nascent and highly transdisciplinary field. Competition for funding, especially for transdisciplinary research, can make the process very difficult. Additionally, there is a lack of awareness of this kind of work and its importance among funders.
- **A lack of reliable data to support critically important research:** Mental health data is difficult to collect, especially in developing countries. Research addressing the indirect or upstream causes of mental health impacts is extremely valuable, but only with reliable data, which is currently limited. Both quantitative and qualitative data is needed in this field, meaning studies need to be carefully and thoughtfully designed.
- **Breaking silos to encourage transdisciplinary collaboration:** Within the research community, there is a lack of nuanced collaboration between climate scientists and mental health researchers. This creates silos and leads to duplication of work or research that does

[vii] The U.S. Fish and Wildlife Service defines Traditional Ecological Knowledge as follows: "Traditional Ecological Knowledge, also called by other names including Indigenous Knowledge or Native Science…refers to the evolving knowledge acquired by indigenous and local peoples over hundreds or thousands of years through direct contact with the environment. This knowledge is specific to a location and includes the relationships between plants, animals, natural phenomena, landscapes and timing of events that are used for lifeways, including but not limited to hunting, fishing, trapping, agriculture, and forestry."

not fully consider all the angles of a climate-mental health problem. Similarly, a lack of clarity and standardisation in terminology complicates disseminating research outcomes and can be confusing, particularly when working across fields. Systems for academic advancement are not well aligned with transdisciplinary research or translational science, further preventing collaboration. These reward systems need to be overhauled to encourage transdisciplinary and inclusive climate-mental health research.

- **Climate change denialism:** Climate change and mental health research have been subject to denialism, such as from those with competing political or financial interests with the power to de-prioritise research.
- **Distrust of researchers among groups with negative past encounters:** It is possible that local communities may be distrustful of researchers if they have encountered extractive or insensitive researchers in the past. Scientists must recognise local and Indigenous scientific knowledge and ensure that equity is at the heart of their research. Researchers should take care to avoid co-opting local knowledge without credit and work to protect the mental health of the populations that they work with.
- **Burnout:** Factors including the sense of urgency and scale of the climate-mental health crisis, coupled with facing climate denial and the de-prioritisation of mental health, can hinder progress and demotivate people in the field, leading to worsened mental health outcomes for those working on climate-mental health (i.e., the prevalence of burnout that can functionally impair climate researchers who aren't sufficiently resourced or supported.[33]
- **Challenges that stem from a nascent field:** Within government, new ideas often spread slowly; it will take time for climate-mental health research to become a priority for government funding, further underscoring the need for research, action and advocacy in the field.

In addition to these challenges, this work is highly susceptible to appropriation, corruption or exploitation of those impacted by the mental health impacts of the climate crisis in EU-NA. Researchers must take care to avoid co-opting local knowledge without credit and imposing Western views or expectations on disadvantaged populations. Stigmas around the validity of different knowledge systems or socioeconomic status, for example, can hinder progress and lead to inaccessible, culturally insensitive results.

Opportunities and enablers

Several opportunities and enablers exist for advancing climate-mental health research in Europe and North America.

- **Learning from public and global health history:** Reflecting on the COVID-19 pandemic, researchers can analyse the short- and long-term impacts of a public health shock on mental health and mental wellbeing and employ methods which can be implemented and evaluated in iterative cycles. Researchers can pull case studies, global policies and programmes and existing effective models as a basis for new research that highlights gaps as well as insights on how to move forward. For example, the impact of isolation on mental

health during COVID-19 is relevant for extreme temperatures or other climate disasters that may isolate people for extended periods of time.

- **Capitalising on the growing interest in the climate-mental health space:** The climate-mental health field has expanded rapidly over the last several years.[2] Increased political will for climate-mental health can facilitate requests for government funding and support institutional priorities around planetary health. Given broader public interest, citizen engagement and citizen science can be leveraged as a viable tool to produce direct, impactful research.
- **Leveraging new data:** With the development of new data tools and collection methods, researchers can provide research outcomes that are meaningful for policymakers and global decision makers. For example, social media data can be used to extract popular narratives surrounding climate change. Applying knowledge from other related disciplines to this emerging field could be of value. It is important to prioritise the ethical collection and use of any personal data.
- **Establishing partnerships:** Collaborating with a wide range of partners will result in inclusive, comprehensive results; see the following section for details.
- **Communicating with those with lived experience:** Scientists should consider field research to understand first-hand the consequences of climate disasters on mental health and ensure that the expertise, experiences and priorities of people and communities who are living through these disasters are centred in their research.

Relevant potential partners

There are several groups to prioritise as potential partners to produce impactful results, including the following:

- Academic institutions and researchers (environmental and climate scientists, epidemiologists, public health experts, mental health experts, economists, etc.).
- Climate action groups and advocates.
- Climate deniers and those with opposing viewpoints.
- Climate-conscious youth and youth with lived experience of mental health challenges.
- Foundations, funders & charities.
- Government organisations at the community, national, and international levels.
- Healthcare institutions and healthcare practitioners (including physical, behavioural, and mental health).
- Impacted populations.
- Innovative start-ups, think tanks and action tanks.
- Legal experts specialising in human rights and environmental law.
- Media companies, journalists, and environmental communication specialists.
- Private sector, including private companies and expert consultants.

Building partnerships across these diverse groups will enhance the impact and relevance of climate-mental health research. This is a priority list of partners identified during the dialogues and is not exhaustive.

Priority next steps/recommendations to investors and actors

The academic community and researchers should:

- Ensure research is understandable to diverse audiences, considering variances in education, socioeconomic status and physical or mental abilities.
- Co-create research with impacted groups, prioritising inclusivity across cultures and languages.
- Uphold equity and respect for diverse knowledge systems such as Indigenous knowledge, avoiding the imposition of Western customs.
- Collaborate across disciplines to foster a transdisciplinary field and support the development of robust, applicable solutions.

Investors should:

- Increase access and inclusion by funding groups outside of major universities.
- Fund transdisciplinary work encouraging collaborations across disciplines and sectors.
- Support an array of Indigenous and traditional knowledge-centred research.

Translating a growing evidence base into action that can respond to the mental health impacts of climate change

The current evidence base on the interconnections between climate change and mental health compels action in policy and practice to protect escalating mental health needs and promote co-beneficial climate actions. How can current evidence and new insights created through implementing this agenda best translate into changes to policy decisions and practices across both climate and mental health regional spaces?

This section presents a synthesis of dialogue discussions and survey results, setting out the challenges and opportunities to translate evidence generated through research into policy and practice.

A desired state of climate change and mental health evidence to action in Europe and North America

Translating evidence to action must meaningfully engage the at-risk populations that decision makers are trying to help, with specific attention to underserved or disadvantaged populations, such as youth, Indigenous communities, people with lived experience of mental health conditions and other equity-deserving groups. The desired state of translating climate change and mental health evidence to actionable next steps should be inclusive, flexible, proactive, collaborative and just. Inclusion encompasses protecting community and local knowledge systems from being indirectly harmed via appropriation as their cultural practices are scaled up and implemented without proper credit, intellectual property protections and/or financial compensation.[34, 35] Flexibility is important in ensuring that solutions are oriented to individual communities and that plans can be modified based on feedback from those communities. Taking a strong, proactive approach to action with an emphasis on mitigation and prevention may reduce the severity of problems at the source and prevent downstream or ripple effects. Two guiding principles of justice in this context are intergenerational health equity and the

recognition that what humanity does to the planet, it does to themselves and future generations. Additionally, justice is ensuring quality of life, liveability of conditions, and the ability to continue traditions or cultural practices within Indigenous populations.

Co-creating policies and plans with a team of people with lived experience, politicians and researchers, while letting the needs and expertise of affected communities drive this process, will likely result in more effective and inclusive outcomes. Transdisciplinary, intersectoral communication and collaboration, underscored by principles of solidarity and justice, can help address silos to ensure the right voices are being heard in the right spaces. Collaborating with Indigenous Elders and centring Indigenous voices can tap into their wealth of knowledge and begin to decolonise Western methods of action. Systematically engaging young people and supporting their mental health will amplify the voices of future leaders and those affected by climate-mental health impacts. Finally, it is important to recognise the risk of imposing Western viewpoints, ideas and/or customs on non-Western populations and to truly centre the voices of stakeholders throughout the evidence-to-action process.

Challenges holding back translation of evidence

Several challenges prevent progress in the translation of evidence to action within the climate-mental health space, including those listed below.

- **Topic complexity:** The intersection of climate change and mental health is at the same time universal (as climate change affects everyone) and individualistic (as mental health conditions can be highly personal), making it a difficult area for targeted research and policy action.
- **Stigma:** Existing stigmas around mental health present a challenge for ensuring that mental health is a viable area of concern within the context of climate change, and more broadly, that it should be considered under the umbrella of climate change and health. It is difficult to communicate this message effectively, especially to policymakers and others outside of the field.
- **Political barriers:** Across the region, some governmental actors subscribe to climate denial and misinformation, and the politicisation of climate change prevents or slows meaningful action. Similarly, mental health is an under-prioritised issue for many governments. This relates to an overall lack of political will for action on climate-mental health, perhaps due to stigma, political risk and/or pressure, or the siloed nature of government preventing ministries from taking action.
- **De-motivation and feelings of hopelessness:** Individuals engaged in the climate-mental health space can feel helpless, powerless, or distressed about the issue. These feelings negatively impact mental health and/or motivation for action and can serve as a barrier to engagement for climate action. EU-NA dialogue participants have observed that eco-anxiety is becoming more prevalent and is exemplified by youth who have voiced feeling overwhelmed by the scale and magnitude of the climate-mental health crisis.
- **Systemic injustice and historical appropriation:** There is an unfortunate history of cultural appropriation in the region, where aspects of a minority culture are taken without acknowledgement of the history or significance. While it is critical to involve minority

populations in developing policy, generational trauma might lead to diminished participation; time and continuous engagement are necessary to rebuild these connections.

- **Implementation challenges:** Before implementing climate-mental health programmes, there is a need to develop standardised assessment tools to collect region-specific data and track mental health trends. Other hurdles to implementing the findings from research include the long timeframe of climate-mental health research and the challenge of evaluating policies in the real world versus simulations or studies.
- **Regional differences and nuances:** As EU-NA is a diverse region, healthcare systems and access to mental health support vary widely. Similarly, vulnerability looks different across the region, and each community faces a unique set of challenges, making the balance between top-down and bottom-up solutions tricky.
- **Institutional inertia:** This presents a barrier for research organisations and government, as institutional change happens slowly while the climate-mental health crisis does not.

Opportunities and enablers

Several opportunities and enablers were identified in the dialogues.

- **Increased political will and growing public support:** Participants noted that public support will be crucial to persuade policymakers to take action; it could potentially be enhanced by the use of social media to spread knowledge and awareness, build connections and generate greater levels of support and pressure. Several existing policies, plans and case studies can be used as a basis for next steps.
- **Leveraging technology**: Social media can be used as an avenue for sharing information, resources and even interventions. Artificial intelligence (AI) and integrated climate modelling tools could be adapted to include mental health impacts, although this capability has not yet been fully developed. For example, AI could potentially be used to identify climate-mental health conditions or trends through language patterns or images from social media; predictive analytics can detect issues early, deliver interventions and provide evidence to guide national climate-mental health policies.[36]
- **Creating a structured approach to knowledge-sharing:** A first step is creating a platform where community members can share their experiences and expertise with decision makers. This could facilitate community-oriented solutions and enable at-risk populations and people with lived experience to be represented throughout the entire policy process; this type of integrated research provides an avenue to explore the interconnectedness of the human condition that purely quantitative research can lack. Additionally, a structured gathering would build strong connections between people in the field, promote the breaking of silos, and help identify a path forward. Ideally, this will be a transdisciplinary space involving researchers and scientists, community representatives and policymakers who are committed to translating evidence to action. Finally, venues like the annual UN Climate Change Conference (COP) have provided an ideal setting to present and share ideas in addition to hearing from stakeholders directly. For example, mental health and wellbeing were incorporated within the Climate and Health Declaration at COP28, and mental health is increasingly featured. However, there are concerns about the

effectiveness of multilateral conferences and how participants would respond to incorporating mental health into these agendas.

Relevant potential partners

There are many potential partners and areas for community to global leaders to translate evidence to action:

- **Establishing partnerships with local community leaders and people with lived experience** to ensure work is inclusive, relevant, and guided by the needs of the people affected.
- **Collaborating with governments** (local, national, or multilateral) and policymakers.
- **Working with non-government partners** like NGOs, the private sector (including small businesses), and community or grassroots organizations to provide an on-the-ground perspective when working within a specific geographic area.
- **Engaging with the health and education sectors** to implement sector-specific policies.
- **Working with unlikely partners** such as fossil fuel representatives, banks and insurance companies, or motorists to gain a deeper understanding of their perspectives to then negotiate and find common ground.
- **Leveraging existing networks** (groups working on homelessness, migration, gender equality, etc.) to enable resource and knowledge sharing across industries.
- **Engaging consultants** to streamline the policy process or working with charities and philanthropic organizations to identify funding sources.
- **Leveraging communication and media experts** to assist with the dissemination and framing of information, and working with influencers (e.g. celebrities, royals, social media influencers) to spread messages to a wide audience.
- Involving **activists and advocates** to publicise issues and put pressure on policymakers.

Priority next steps/recommendations to investors and actors

The academic community and researchers should:

- Link outcomes to specific policy mechanisms and present them in a concise manner for policymakers' understanding.
- Translate evidence into briefs with key quantitative data for policymakers, covering incidence rates, economic costs, co-benefits and associated mortalities.
- Ensure that research establishes a connection between lived experiences and measurable costs to authentically depict the impact on affected communities.
- Partner with networks and organisations to boost funding for policy-oriented research and integrate climate-mental health knowledge into education programs.

The healthcare sector should:

- Educate all healthcare professionals on climate-related mental health issues.
- Establish guidelines for healthcare professionals defining 'normal reactions to abnormal situations' in the context of climate-mental health, particularly for cases reaching clinically-diagnosable levels or requiring clinical services.

Communication and dissemination of information for research and action

Translating evidence into action involves the communication and dissemination of highly accessible information to promote climate-mental health literacy.

- **Accessibility** can be defined in terms of language inclusion and translation, but also how complex, nuanced, scientific information can be conveyed to those outside the field, especially policymakers and practitioners. This may involve creative approaches like using visual frameworks to show how climate change impacts mental health or other practical examples to put complicated results into context. Emphasizing citizen science and public platforms with easy-to-navigate features can generate both buy-in and evidence.
- **Adapting one's communication style** depending on the audience is hugely important. For example, healthcare practitioners need a standardised way to inform their patients of potential impacts, and simple and clear messaging is essential when talking to groups that may not be familiar with certain climate-mental health terminology or jargon. Policymakers tend to prefer briefs or one-pagers with key data points; translating evidence into this form will take effort, but clear communication can lead to high-impact outcomes.
- **Science communication specialists** have a role to play here in helping the climate-mental health community translate their results; in particular, they should focus on how to adjust communication for various education levels, age groups, cultures, and languages. Media professionals can assist in the dissemination of information and overall messaging. Collaborating with established media channels that use accessible and precise language to describe the climate-mental health crisis can bolster public support.
- Before disseminating research findings, it is important to **clarify key climate and mental health terminology** as a field to create a broader and more unified understanding of this vernacular, while allowing for different expressions across cultures.
- One opportunity for communication is **employing social and online media to create new spaces** to highlight and broadcast climate-mental health information. A widely accessible online platform based on citizen science can highlight lived experience stories to generate evidence and promote broader buy-in and support for climate-mental health issues. A key challenge, however, is misinformation and avoiding amplifying the voices of those without substance and truth.
- **Stronger collaboration within and across research disciplines** will support clarifying of priorities and avoid duplicating efforts. Aligning with other relevant messaging and for a for connecting with policymakers and practitioners, such as aligning with climate-health advocacy and policy work, can build momentum and expand networks to promote research and action.

Discussion: strengths, limitations and next steps for the research and action agenda

Specific strengths and limitations of this research and action agenda are outlined below.

Strengths

- Capturing and articulating the unexplored needs and experiences of lived-experience experts through their valuable insights which have shaped this agenda and enhanced the awareness of and connection between climate change and mental health.
- Transdisciplinary collaboration through the integration of diverse disciplines (e.g., psychology, environmental science, public health) in developing this agenda, which fostered holistic understanding and multi-sectoral solutions and elevated the quality and depth of discussions.
- Research themes that centre around policy action whose findings have the potential to inform mental health and climate policy changes, strategies, and interventions.
- Meaningful engagement of Indigenous leaders whose expertise was centred in developing research themes and priority next steps, which included traditional knowledge, ceremonial practices and the importance of land and people.
- The opportunity for participants to share what they and their communities face in a safe space, as noted by the positive feedback from the post-dialogue surveys which indicated appreciation for the dialogue format and safeguarding resources.
- The opportunity for dialogue participants to build skills, expand knowledge bases and develop connections through the global CCM network, as noted by positive feedback from the dialogue surveys.

Limitations

- The scope of the agenda may not have covered all key research priorities for the EU-NA; potential research gaps may exist outside of the ones identified in this agenda.
- Climate and mental health terminology can be academically informed or lack cultural influences, and therefore is challenging to use and be understood consistently by research teams, dialogue participants, and the broader community. While terminology was defined in this agenda, there was a lack of agreeable standardisation, creating potential for misunderstandings.
- Identifying an accurate and updated list of research gaps within a one-year project timeframe was a challenge, given the rapid pace and increasing volume of climate and mental health research in the EU-NA region.

- Balancing the urgency to build a comprehensive network with creating meaningful relationships given the large volume of climate and mental health experts in the region – again while moving at the pace of the CCM project timeline – proved challenging.
- Capturing full thoughts and expert insights in a virtual convening where technology was a barrier for some regional dialogue participants created difficulties.
- The region is diverse, with each category within the sub-regions (Canada, US and Europe) being extensively distributed. This dispersion poses challenges in achieving equitable and proportional representation from each group. Various forms of diversity encompass land, biome, climate, economic factors, cultural and religious aspects, language and generational differences.

Conclusion

This project confirms previous findings that the changing climate significantly contributes to mental health challenges. Extreme weather events, such as hurricanes, heatwaves, landslides and wildfires have been linked to heightened stress, anxiety and trauma among populations in EU-NA. The visible consequences of these events, including displacement, loss of livelihoods and the destruction of communities, amplify the risk of developing mental health challenges. While the impact of climate change on mental health is evident across both continents, variations exist in the vulnerabilities and coping mechanisms observed. Understanding these regional disparities is crucial for tailored interventions addressing mental health concerns. Additionally, resilience and adaptive capacities within communities can offer promising avenues for mitigating climate-induced mental health challenges.

This research and action agenda highlights the urgency of generating evidence that can support the cross-collaboration of integrating mental health considerations across every stage of climate action and vice versa. Policymakers need to prioritise the inclusion of mental health services and mental health interventions as integral components of broader climate action plans, and research will need to provide the data to support selection of appropriate approaches. Similarly, those in the mental health field should incorporate the implications of climate change within mental healthcare. Collaborative efforts between stakeholders across healthcare, social care, and environmental systems – including government bodies, healthcare providers and community-based organisations – are essential to develop comprehensive policies addressing the mental health impacts of climate change.

Diversifying the climate-mental health research field to include, for instance, studies that track the long-term mental health effects of repeated climate-related disasters, comprehensive assessments of at-risk populations and the development of culturally sensitive interventions across all facets of climate action are areas that demand greater research attention. Join us in fostering a collective commitment to climate-mental health research in EU-NA advocating for awareness, resilience and compassionate support to build a sustainable and resilient future for all of our communities.

Hearing from the Regional Community of Practice

In the second regional dialogue, participants were asked to make statements on what they will do to contribute to the climate-mental health field as well as what they would like to see happen within the regional community of practice. The following quotes capture these hopes and ambitions.

I will...

I will work to build community in my university to find others interested in mental health impacts and new ways to quantify and address them!

I will work on enabling transdisciplinary research and action.

I will amplify and share the perspectives and resources curated and originated by those in underserved communities.

I will contribute to this space by continuing to talk with people about the importance of taking mental health into consideration.

I will engage with my research colleagues to better explore the climate/mental health paradigm.

I will partner with others (researchers, community members, policymakers) with interest in this area insofar as I can within my capabilities, resources, etc.

Continue trying to advocate for better integration of MH into climate mitigation, adaptation and L&D policy mechanisms.

I will contribute to this space by bringing my perspective and the knowledge shared by my community.

I will contribute to this space by advocating for the meaningful inclusion and representation of young people in climate-mental health action.

I will work continue to train researchers to work at the intersection of cc & mh.

I will contribute to this space by speaking with my patients about eco-anxiety.

I will help to get climate change and mental health integrated into the priorities of our university.

I'll encourage the young people I know to prioritise their mental wellbeing in the face of climate change and give visibility about this crucial connection to raise awareness and understanding.

I want...

Mental health acknowledged as any other areas of health.

I want to see more collaboration between the public, service users, researchers, practitioners and policy makers.

I want to see the inclusion of those not heavily involved in research or in the climate change realm already to gain a scope of perspectives.

… more intervention and policy work (with a climate justice lens).

Out of this community, I want to see more cross-sector conversation. It has been so helpful and interesting.

I want to see a vision of how we can unite people across society and to foster strong, widespread networks.

I want the protection of mental health and addressing the Earth crisis to be seen as intertwined and urgent global priorities.

I want to see intentional collaboration across sectors/communities that makes sure to address the needs of the most vulnerable/affected in our regions.

I want to see - a working group to help develop meaningful research focused on successful interventions and policy.

I want to see more clear summary of mental health and CC connections and more materials to be shared with other for a.

I want to see more global funding for grassroot organizations in cmh.

A coordinate research structure for a multi nation, multi-disciplinary approach to investigate the intersection of climate change and mental health.

Out of this community I want to see more sensibility of anxiety in general and as an important cause climate change can be affecting.

I want to see continued connections with the CMM community, and see CMM advocate the importance of this field.

Glossary of terms

For a glossary describing relevant concepts and key words for the Connecting Climate Minds research and action agendas, please download from here.

Climate-mental health terminology

Throughout the research process, it became clear that a significant issue in the climate-mental health field is how terminology being developed to understand a broad range of experiences and actions is used and defined. Terms vary across research studies, are not well known across different disciplines, and can be confusing or insensitive to people with lived experience of climate-related mental health challenges if not clarified properly. Having standardised language

for climate-mental health terms may also help catalyse research and convince funding bodies to financially support this type of research. It is important to avoid colonial methods to produce and disseminate these terms and to consider non-Western viewpoints. Considering this, we do not attempt to use one standard definition for each of these concepts throughout this report but rather define them in context when used in the agenda. Terms that could benefit from a standard definition include but are not limited to the following:

- Climate action
- Climate activist
- Climate anxiety/Eco-anxiety
- Climate awareness
- Climate collective trauma
- Climate disaster
- Climate emotional burnout
- Climate grief
- Climate hazard
- Climate-mental health governance
- Climate resilience
- Institutional betrayal
- Lifestyle medicine
- Pre-traumatic stress disorder
- Social connectedness
- Solastalgia

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Conflicts of interest

The authors have no conflicts of interest to declare.

Appendix

Appendix 1: Literature review search query

The following search queries were used to include papers in the literature review:

PubMed: ((((Climate events OR Climate threats)) AND (Volcano OR Volcanic eruption OR earthquake OR earthtremors OR Tsunami OR Tidal wave OR high temperature OR extreme temperature OR temperature stress OR heat OR heatwave OR warming OR hot OR flash flooding OR flooding OR floods OR Landslide OR hurricane OR drought OR water scarcity OR wildfire OR forest fire OR forestfire OR thunderstorm OR cyclone OR tornado OR bushfire OR natural disaster* OR forced displace* OR forced migrant* OR climate refugee* OR climate migrant*)) AND (mental health OR mental illness OR mental disorders OR psychiatric illness OR psychiatric disorder OR suicide OR psychosis OR anxiety OR depression OR PTSD OR post-traumatic stress disorder OR psychosis OR anxiety OR depression OR eco-anxiety OR esanxiety OR psychogeriatic OR solastalgia OR ecocatalysis OR ecological grief OR ecopsychology)) AND (United States OR Canada OR Europe OR US Territories OR North America)

Web of Science: (((TS=(Climate events OR Climate threats)) AND TS=(Volcano OR Volcanic eruption OR earthquake OR earthtremors OR Tsunami OR Tidal wave OR high temperature OR extreme temperature OR temperature stress OR heat OR heatwave OR warming OR hot OR flash flooding OR flooding OR floods OR Landslide OR hurricane OR drought OR water scarcity OR wildfire OR forestiere OR thunderstorm OR cyclone OR tornado OR bushfire OR natural disaster* OR forced displace* OR forced migrant* OR climate refugee* OR climate migrant*)) AND TS=(mental health OR mental illness OR mental disorders OR psychiatric illness OR psychiatric disorder OR suicide OR psychosis OR anxiety OR depression OR PTSD OR post-traumatic stress disorder OR psychosis OR anxiety OR depression OR eco-anxiety OR esanxiety OR psychogeriatic OR solastalgia OR ecocatalysis OR ecological grief OR ecopsychology)) AND TS=(United States OR Canada OR Europe OR US Territories OR North America)

Appendix 2: Lived Experience stories

For details on how the Lived Experience Stories were collected, please reference this document.

Appendix 3: Dialogue agendas

To access the agenda and running sheet for Dialogue 1, please reference this document. To access the same materials for Dialogue 2, please reference this document.

Appendix 4: Coding frameworks

Dialogue 1

The following framework was used to categorise outputs from Dialogue 1 into research categories and sub-categories. Each transcript was analysed and coded manually to extract the primary research themes and categories that emerged from the breakout room discussions.

For the full dialogue transcripts with the tagging analysis, please reference this folder.

Table 7: Coding framework for Dialogue 1

Research Category	Sub-categories
1. Impacts, Risks and Vulnerable Groups This category is about improving our understanding of the ways in which mental health is affected by climate change. For example, what mental health outcomes are impacted or at risk, the prevalence, severity, economic and societal cost of these impacts, and who is more vulnerable to these impacts. This category also includes the ways we can go about getting this improved understanding of mental health impacts of climate change - the methods and metrics we need to assess and monitor mental health in ways that are relevant to climate change, contextually appropriate, comparable etc.	*Cross cutting considerations to keep in mind for all sub-categories:* *Timeframe* *Geographical variation*
	1.1. Research that focuses on the **prevalence, severity and nature** of the experience of different mental health outcomes/challenges/experiences affected by different aspects of climate change. This may include research to understand the emergence of climate-specific mental health experiences and their relationship to already defined mental health challenges.
	1.2. **Quantifying the fraction of mental health burden** (including mortality) caused by climate change.
	1.3. Understanding the **risk factors to mental health** that are caused or affected by climate change as well as **protective factors**.
	1.4. Identifying **population sub-groups** (e.g. demographics, livelihoods, life stage, pre-existing mental health challenges) who experience **increased vulnerability** to mental health challenges caused by climate change, and conversely those experiencing **resilience** to these effects (i.e. vulnerable groups).
	1.5. **Quantifying the cost** (e.g. economic, social) of the additional mental health burden caused by climate change and insufficient climate action.
	1.6. Methods research to identify the **most appropriate ways to assess and monitor the mental health impacts of climate change** [including adapting pre-existing scales, creating new ones, determining appropriate mental health metrics and indicators for inclusion in global processes like Lancet Countdown]. This can also include the need for cross-cultural validation and development of culturally appropriate metrics.
2. Pathways and mechanisms	*Cross cutting considerations to keep in mind for all sub-categories:* *What factors are linked with increased vulnerability or increased resilience for the associated mental health outcomes.*

This category is about improving our understanding of *how* mental health is affected by climate change.

We are interested in research themes that can help identify, categorise and understand the range of ways that climate change or climate action may act to affect mental health. This can include considering pathways and mechanisms that are biological, psychological, societal or environmental in nature, and may be direct or indirect.

Note that mechanisms can include mechanisms to the development, maintenance, and/or resolution of mental challenges, so this includes also mechanisms relevant to guide development or understand workings of interventions

2.1. Categorising and understanding the **societal mechanisms** by which climate change negatively impacts mental health [e.g. changes to livelihoods, disruption to cultural practices, food and water insecurity, forced migration, political factors]

2.2. Categorising and understanding the **environmental mechanisms** by which climate change negatively impacts mental health [e.g. air pollution, reduced exposure to biodiversity]

2.3. Categorising and understanding the **psychological mechanisms** by which climate change negatively impacts mental health [e.g. how temperature affects cognitive changes relevant to symptoms of mental health challenges].

2.4. Categorising and understanding the **biological mechanisms** by which climate change negatively impacts mental health [e.g. impacts of psychotropic medication on thermoregulation, neurodevelopmental factors].

2.5. Understanding mechanisms whereby climate action or mental health **interventions benefit climate and mental health** (i.e. co-beneficial mechanism).

2.6. Methods research to identify the **most appropriate ways to assess and monitor pathways and mechanisms** by which climate change negatively impacts mental health and wellbeing (e.g. systems mapping across disciplines)

3. Mental health benefits of climate action [adaptation and mitigation]

This category is about how climate adaptation and mitigation actions, across sectors, can also have win-win benefits for mental health. This includes quantifying costs and

3.1. **Identifying climate actions** that integrate or align with mental health benefits [co-beneficial climate actions, e.g. increased tree cover in cities]

3.2. **Quantifying co-benefits of climate action** for mental health (including number of people experiencing the benefit, size of effect, economic considerations).

3.3. Exploring how the mental health costs and benefits of climate action may **differ across population sub-groups** (e.g. demographics, livelihoods, life stage)

benefits of climate action for mental health, understanding what is needed to support better alignment between climate action and mental health action, and identifying where this integration is already happening across strategies and policies.	3.4. Understanding the **governance structures/decision support tools** that enables alignment of action for climate change and for mental health across sectors
	3.5. Mapping and monitoring the integration of mental health within **adaptation and mitigation policies** across sectors [e.g. National Adaptation Plans, energy, transport, food, water, agriculture]
	3.6. Exploring opportunities for mental health to be integrated into **other climate priority areas** i.e. loss and damage and climate finance.
	3.7. Determining best approaches for climate action (e.g. emissions reductions or climate adaptation) **within the mental health sector** (ensuring psychiatric facilities can be kept cool in heatwaves; green space projects in mental healthcare facilities)
	3.8. Methods research to identify the **most appropriate ways to assess and monitor mental health benefits of climate action** [e.g. place-based approaches, methods for attributing and quantifying co-benefits, methods for assessment of the mental health implications of decisions in other sectors]
4. Mental health interventions/solutions in the context of climate change This category is about identifying the most effective mental health interventions/solutions to support mental health in the context of climate change. This might be about providing support to people already experiencing negative mental health impacts, or about reducing risk or severity of future negative mental health impacts. This includes learning from knowledge	*<u>Cross cutting considerations to keep in mind for all sub-categories:</u>* *LEVEL (e.g.)* *Individual, Family, Community, Systems* *MECHANISM (e.g.)* *Biological, Psychological, Social, Environmental* *SECTOR (e.g.)* *Education, Healthcare, Public Health* *Effectiveness considerations include impacts across different population groups, and implementation considerations might*

held by different disciplines, communities and cultures, understanding how existing mental health interventions are affected by climate change, identifying and evaluating existing interventions that are relevant to the context of climate change, and developing new interventions. Interventions are relevant at all levels (individual, family, community, systems) and across sectors.	*include providers, cost and time.* 4.1. Understanding different **ways of knowing, being and doing** in different cultures and communities that can build individual, community and ecological resilience 4.2. Understanding how **existing mental health interventions are affected** by climate change 4.3. Identifying and evaluating mental health interventions that are **already designed for or relevant to the context of climate change** and/or integrate climate change considerations 4.4. Amending, implementing and evaluating relevant **mental health interventions from other settings** to be appropriate for climate-related impacts? 4.5. Co-designing, implementing and evaluating **novel interventions** that meet climate-related mental health needs 4.6. **Comparing** cost-effectiveness, implementation considerations, and effectiveness across interventions for a particular setting and particular population group to determine "best buys" 4.7. Identifying, developing and evaluating approaches to **awareness-raising and capacity building** to upskill workforces to recognise and respond to the mental health impacts of the climate crisis (e.g. mental health professionals, emergency responders)

Dialogue 2

The analysis team used the coding framework below as well as additional "terms" defined by the team to categorise the output of Jamboard 2. For the full tagging and analysis, please see this document.

Categorical terms include:

- Action-Groups
- Burnout-Motivation (and/or)
- Capacity-building
- Communication-Media
- Concrete-outcomes-desired (e.g. inclusion of mental health impacts of

climate change in national adaptation plans)
- Data
- Funding
- Health-Practitioners
- Industry-Discipline
- Injustice-Systemic Corruption-Colonialism
- Institutional System-Mechanism
- Local Institutions-Community Building
- Milestones-indicators-of-success (how will we know we are achieving progress towards this desired state?)
- NGOs-Nonprofits-Third Sector
- Planetary-health
- Policymakers
- Principles-of-approach (e.g. LE inclusion; breaking silos)
- QA-Dataset
- Research-Method
- Researchers
- Terminology
- Vulnerable-Population
- Ways-of-working (modelling other theories, methods, Benchmark)
- Youth
- Governments
- Technology

The following framework was used to categorise outputs from Dialogue 2 into research categories and sub-categories. Note that sub-categories 1.6 and 2.6 were added by the analysis team as a priority theme that emerged from the review of dialogue discussions.

Table 8: Coding framework for Dialogue 1

Category	Sub-category	Cross-cutting themes to consider
1. Creating an enabling environment for research at the intersection of climate change and mental health	1.1 Desired state of research: This code captures what good looks like for climate change and mental health research in the region that implements the research agenda.	Funding Capacity building Structural and organizational mechanisms Data Ways of working Concrete outcomes desired (e.g. inclusion of mental health impacts of climate change in national adaptation plans) Milestones/indicators of success (how will we know we are achieving progress towards this desired state?)

	Principles of approach (e.g. LE inclusion)
	1.2 Opportunities and enablers This code captures opportunities to progress the climate and mental health research field in the region towards the desired state, and factors that would enable progress. May be general or specific and may link to what is required to overcome the challenges outlined in the next code.
	1.3 Challenges holding back research This code captures challenges that are stopping the climate and mental health field in the region from currently being in the desired state or are predicted to emerge in trying to create investment in and implementation of the research agenda.
	1.4 Partners/stakeholders This code captures any key individuals, organisations or stakeholder types identified as being particularly important to engage for implementation of the research agenda in the region and securing required investment.
	1.5 Priority next steps/recommendations to investors and actors This code captures the concrete next steps that need to be taken as priorities to create the conditions in the region to implement the research agenda. This section will be used in the agenda to inform potential investors and key actors/decision makers where the priorities should be for next steps.
	1.6 Communication and dissemination of research
2. Translating a growing evidence base into action that can respond to the mental health impacts of climate change	2.1 Desired state of evidence to action in policy and practice This code captures what good looks like for action on climate change and mental health in the region based on current and future evidence. What are the features of the kind of pathways for translating evidence into action that are desired or valuable? Are there specific attributes or milestones that would signify that evidence-based action is occurring?
	2.2 Opportunities and enablers This code captures opportunities to progress evidence-based action on climate and mental health in the region towards the desired state, and

factors that would enable progress. May be general or specific and may link to what is required to overcome the challenges outlined in the next code.

2.3 Challenges holding back action

This code captures challenges that are stopping desired actions to protect mental health from the climate crisis in the region, or to enable co-beneficial climate action. The code may also include challenges that are predicted to emerge in trying to ensure that current and future evidence translates into change on the ground and at all levels of policy and practice.

2.4 Partners/stakeholders

This code captures any key individuals, organizations or stakeholder types identified as being particularly important to engage for translation of evidence into relevant action and securing required investment.

2.5 Priority next steps/recommendations to investors and actors

This code captures the concrete next steps that need to be taken as priorities to translate the emerging evidence base on climate and mental health into action in policy and practice.

This section will be used in the agenda to inform potential investors and key actors/decision makers where the priorities should be for next steps.

2.6 Communication and dissemination of evidence to action

Appendix 5: Priority research themes

Initially, research gap questions were developed in the breakout room sessions of Dialogue 1; see this spreadsheet for additional details. We then used the research category codes to group these questions by category and looked at the frequency of the topics mentioned. This frequency table was used to identify the priority topics. Questions were supplemented with topics that may have not emerged from the discussions but were identified as key points or research gaps through the literature review.

Table 9: Frequency table for identifying priority research themes

Subcategory	Count	Percentage of total
1.1	22	18.3%
1.2	4	3.3%
1.3	15	12.5%

1.4	17	14.2%
1.5	7	5.8%
1.6	20	16.7%
2.1	22	18.3%
2.2	11	9.2%
2.3	7	5.8%
2.4	3	2.5%
2.5	17	14.2%
2.6	14	11.7%
3.1	28	23.3%
3.2	7	5.8%
3.3	8	6.7%
3.4	13	10.8%
3.5	9	7.5%
3.6	8	6.7%
3.7	9	7.5%
3.8	12	10.0%
4.1	23	19.2%
4.2	3	2.5%
4.3	7	5.8%
4.4	8	6.7%
4.5	7	5.8%
4.6	6	5.0%
4.7	20	16.7%
5.1	16	13.3%

After Dialogue 2, we incorporated the feedback received from the Jamboard activities (see results from Jamboard 1). Research questions were then further refined to incorporate terminology nuances most

accurately, such as “mental health challenges” versus “emotional wellbeing outcomes.” Finally, the updated questions were sent out for a final round of review from participants.

Appendix 6: Data collection and storage

Dialogues

Dialogues were conducted virtually on Zoom. Dialogues and breakout groups were recorded and transcribed by third party providers (Way with Words and Absolute Translations) and Zoom chat comments were saved. In Dialogue 1, Word documents were used to capture notes from breakout discussions. In Dialogue 2, Google Jamboard was used to capture notes and for participants to directly contribute comments.

Surveys

Survey distribution and data collection was carried out using the online platform Qualtrics. All survey data was collected by Imperial College London and anonymous data shared with the Planetary Health Alliance for analysis.

Data storage and sharing

Data was stored and managed by Imperial College London using a secure server. The Planetary Health Alliance was a Joint Data Controller for the data provided to this project for EU-NA and responsible for securely storing and sharing data with Imperial College London and with regional analyst teams. Data will be stored by Imperial College London for 10 years after study completion.

Appendix 7: Spectrum mapping results

Below are the full results of the spectrum mapping activity to generate regional definitions of climate-mental health terms.

Figure 3: Spectrum mapping results for ‘climate resilience.’

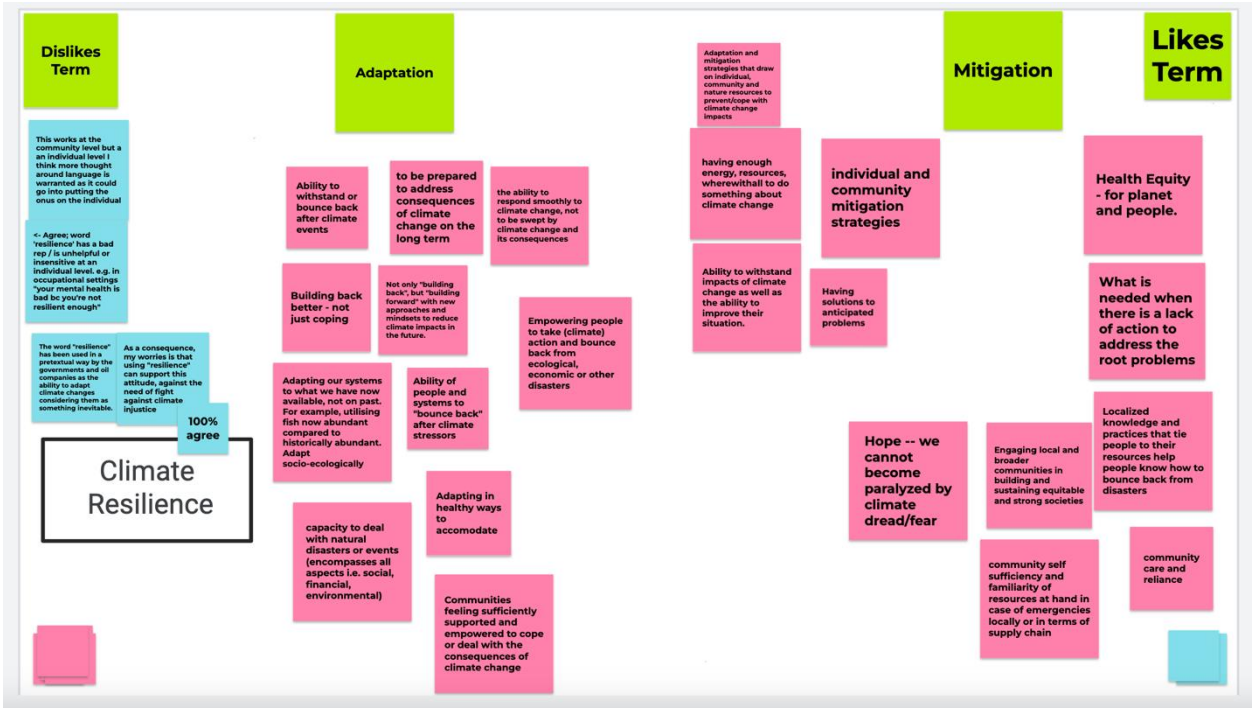


Figure 4: Spectrum mapping results for 'climate mental health governance.'

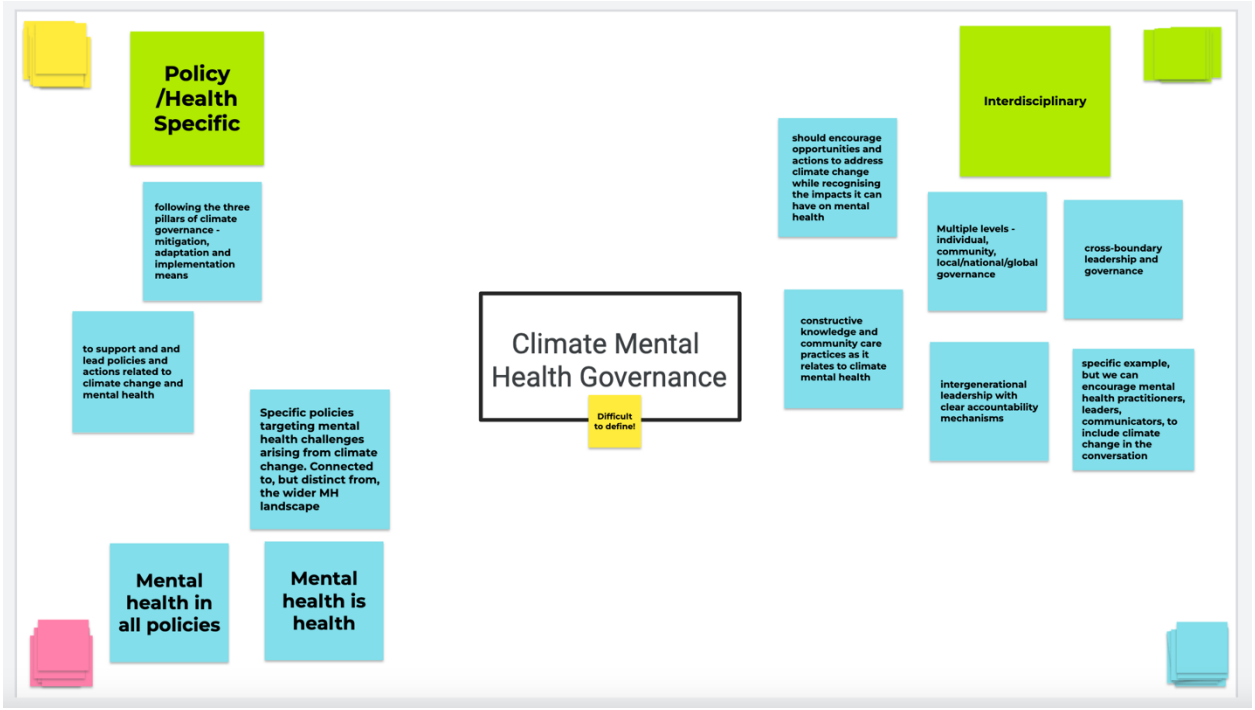
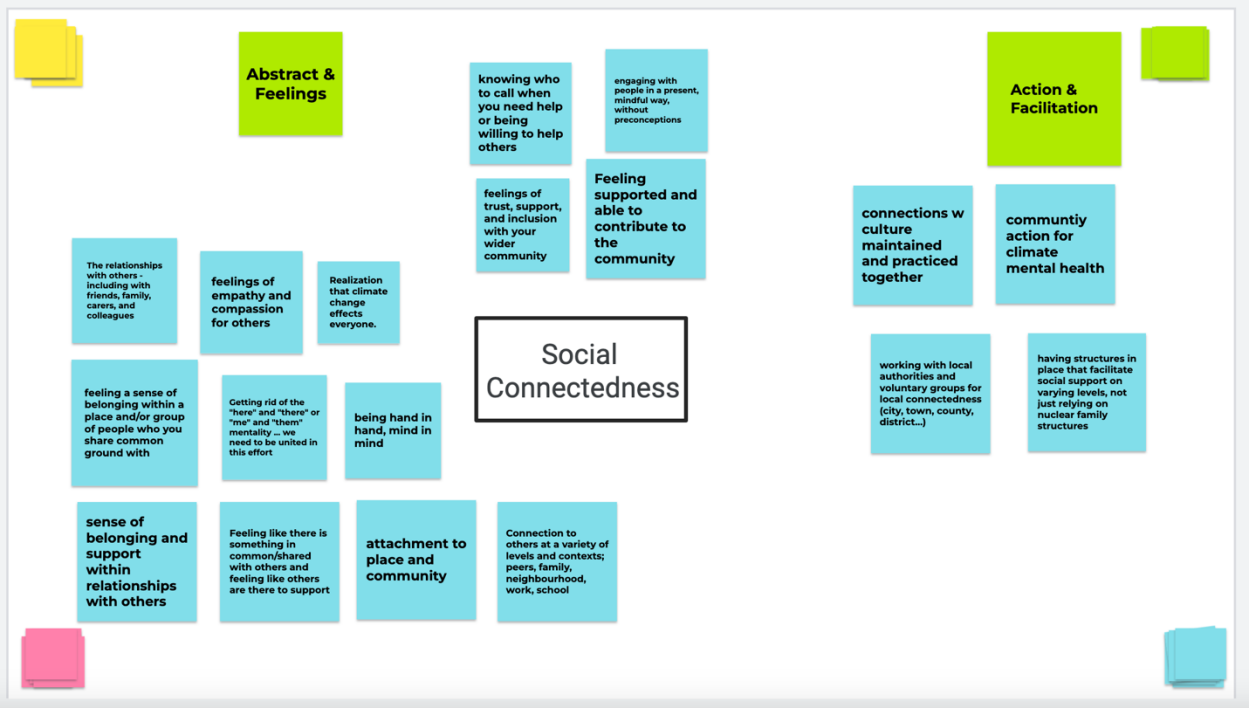


Figure 5: Spectrum mapping results for 'social connectedness.'



Appendix 8: Climate hazards in Europe and North America[27, 28, 37]

Observed climate-related hazards in EU-NA and projected changes

To guide informed discussions on the current and potential mental health consequences of current and future climate change in the region, it was vital to ensure a grounding in climate science. The Red Cross Red Crescent Climate Centre (RCCC) conducted a mapping of previous and projected climate hazards across the region to inform the dialogues and research agenda. The following is a summary of the climate-related hazards that Europe and North America have experienced over the last 30 years, and their projected increases to approximately 2030.

It is important to emphasise that the data gathered for the past and future periods differ not only in spatial resolution but are also based on different underlying principles. The former are through observations or documented occurrences such as those reported by national weather services and are aggregated at a country-scale. The latter are from climate modelling-based studies and assessment reports published by the Intergovernmental Panel on Climate Change (IPCC), which are at a more granular spatial scale. For the same reason, the categories of climate-related hazards in the past and future periods may at times not be identical, but are generally comparable or related. For instance, flooding that is reported as a relevant climate hazard in the last 30 years here is not a direct output of global climate models (GCMs). Instead, the underlying meteorological variable (rainfall) from the simulations of GCMs are used for deriving indices that can be considered as a proxy for potential flooding in a future warming climate.

EU-NA

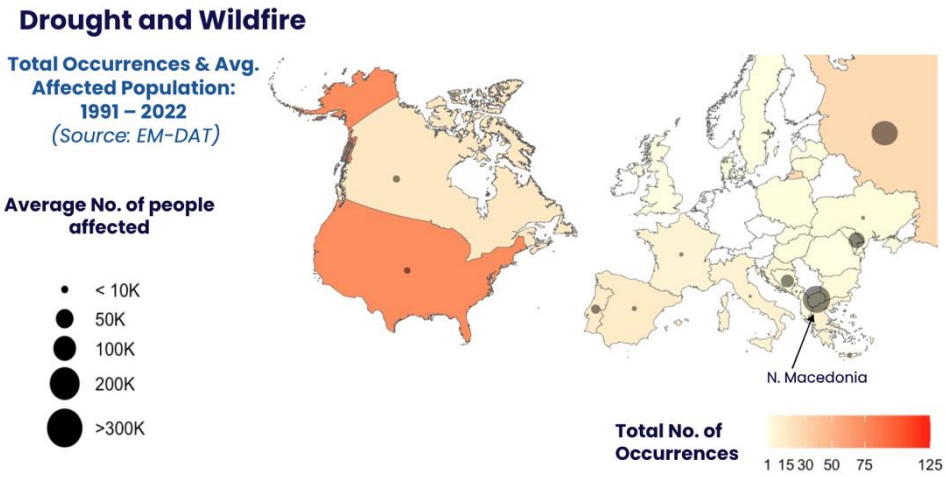
The region of EU-NA is vulnerable to climate change. This region has experienced droughts, wildfires, floods, landslides, storms and extreme temperatures in recent years according to the international disaster database EM-DAT (). Note that the limited number of extreme events recorded (e.g. extreme temperatures) may be due to the missing records in the EM-DAT data for various reasons, such as poor or limited network of satellite and surface observations over the region, or limited reporting from national

meteorological services. In addition, the spatial aggregation of the data to country-scales makes it difficult to map the occurrence of the past hazards to human settlements. The total number of people affected as reported in EM-DAT therefore may not always be truly representative of the frequency of occurrences of the underlying climate hazard. For instance, a country in EU-NA may have experienced frequent heatwaves, but if these events were not recorded or in uninhabited regions, the total number of occurrences discussed below may be an underreporting.

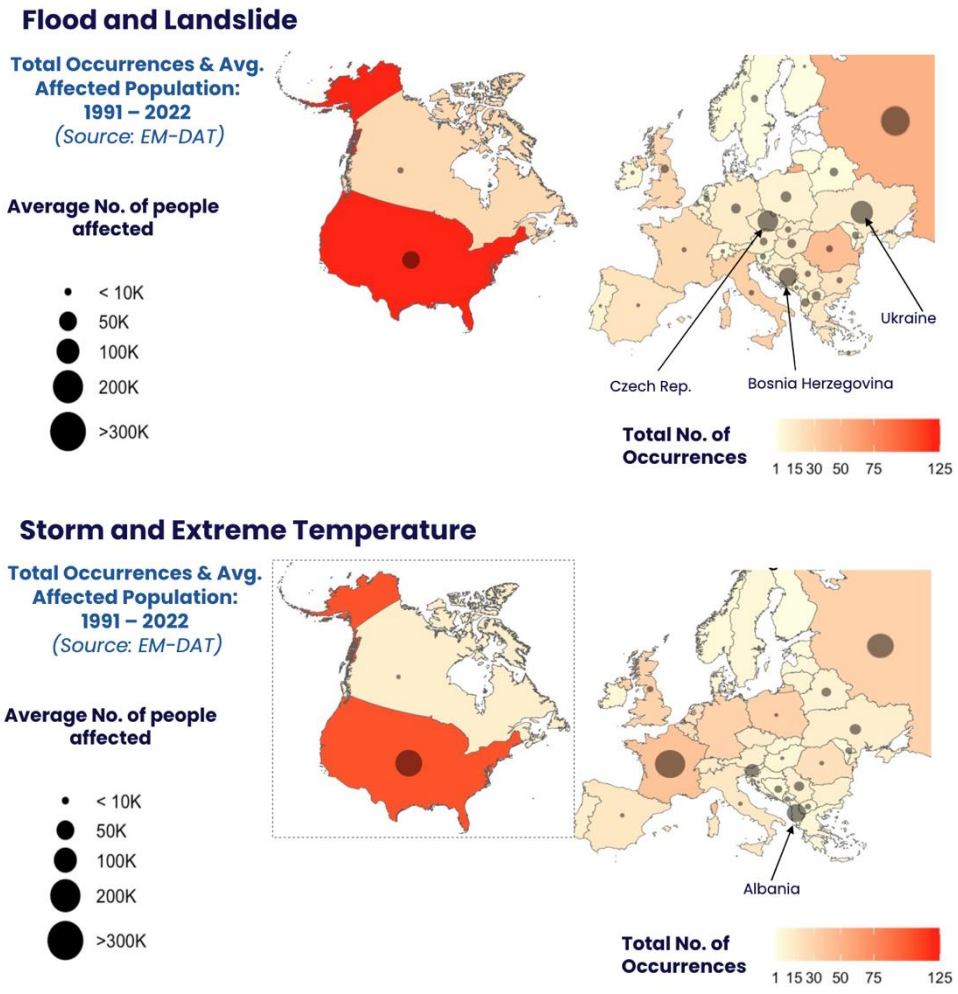
Previous Droughts

Droughts and wildfires were most frequently experienced in the United States, followed by Russia and Canada, with 74, 26 and 16 such climatological events occurring respectively in these countries between 1991-2022 (Figure 6, top). The highest populations affected[8] were in Russia where about 138,000 people were affected, followed by N.Macedonia where and Portugal where about 363,000 and 26,000 people were affected on any average by these climatological hazards during the same period.

Figure 6. Number of reported droughts and wildfires (top), flood and landslides (middle) and storms and extreme temperatures (bottom) between 1991-2022. Red legend depicts the total number of occurrences of each category of hazard between 1991-2022, the black circle size is representative of the average affected population in that period.



[8] Note, EM-DAT definition of "total affected" accounts for "the total of injured, affected, and homeless people."



Previous Floods

The number of floods and landslides was particularly high in the United States where 123 of these events occurred, affecting 137,000 people on average between 1991-2022 (Figure 6, middle). Other notable mentions include approximately 240,000, 203,000 and 144,000 people being affected respectively in Ukraine, Czech Republic and Bosnia and Herzegovina from 13 such hydrological events in each of these countries.

Previous Extreme (Hot) Temperatures and Storms

Within the same period, countries most affected by storms and extreme temperatures include the United States with 104 occurrences of these events, France where 41 occurrences of events, and both Germany and Poland where 30 occurrences separately took place (Figure 6, bottom). The population most affected by these meteorological events was in France, where an average of 328,000 people experienced such effects between 1991-2022.

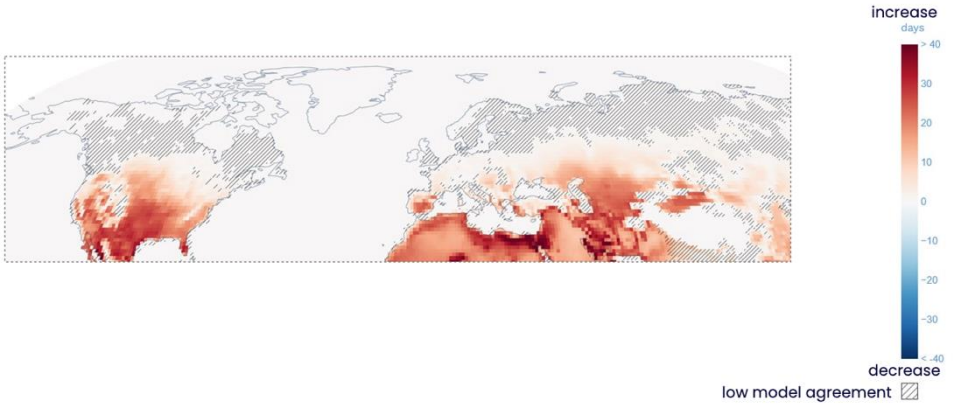
Future Projections

Future projections are based on the middle of the road emissions scenario (SSP2-4.5 Shared Socio-economic Pathway) from the Coupled Model Intercomparison Project - Phase VI (CMIP6) multi-model GCMs ensemble provided in the IPCC, 2021[2]. While not the worst-case emissions scenario, SSP2-4.5 assumes that the 2015 Paris agreement commitments are not achieved and 2°C global warming is not

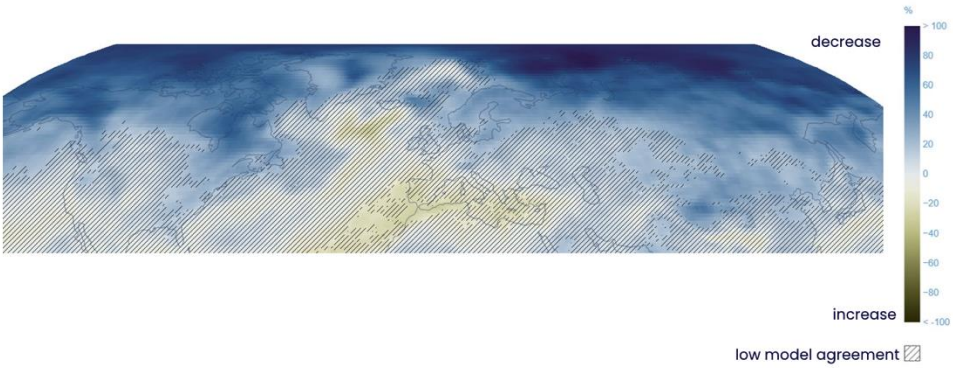
avoided. GCMs have varying climate sensitivity and generally also differ in their representation of earth system processes. While their projections in the intensity of a particular hazard in the future may therefore differ despite a persistent signal in historical observed records, the direction of the signal (i.e., a positive or negative change of a climate hazard) are generally more robust across the GCMs.

- **Mean and extreme temperatures:** Projections showing the average change in the number of hot days above 35°C for 2030 compared to 1986-2005 project an increase of 30 hot days in central north America and an increase of 20 days in southern Europe (high confidence) (Figure 7a). This can be associated with summer heatwaves.
- **Droughts and wildfires:** Both temperature increase and rainfall decrease would drive the projected increase in wildfires, particularly in the Mediterranean (high confidence), Western Russian Federation (medium confidence) and Central Canada (medium confidence). Models indicating the projected change in droughts for 2030 relative to 1986-2005 display an increase in summer droughts, particularly in the Mediterranean region (high confidence), northern Europe (medium confidence) and the southern United States (low to medium confidence) (Figure 7b).
- **Heavy precipitation events and flooding:** Extreme precipitation is projected to increase across many areas of North America (medium to high confidence), Europe (high confidence) and the Russian Federation (high confidence) in 2030 compared to 1986-2005 (Figure 7c). Such extreme precipitation will be associated with an increase in pluvial flooding in 2030 in these locations (high confidence).
- **Sea level rise:** Regardless of level of global warming, relative sea level will rise in all European areas except the Baltic Sea, at a rate close to or exceeding global mean sea level (high confidence). These changes are projected to continue till 2100 with extreme sea level events becoming more frequent and more intense, leading to more coastal flooding (high confidence). This will likely cause shorelines along sandy coasts to retreat throughout the 21st century (high confidence). Relative sea level rise is projected to increase along most coasts (high confidence) of Central and North America and will be associated with increased coastal flooding and erosion. Exceptions include regions with strong coastal land uplift along the south coast of Alaska and Hudson Bay (high confidence).
- **Tropical cyclones:** Category 4-5 tropical cyclones with higher precipitation are expected to become more extreme in the United States Gulf Coast, East Coast, Northern and Southern Central America. Additionally, models project an increase in severe windstorms in Northern Europe (medium confidence). However, the spread (indicating the range of change across models) is wide, the median increase is projected to be around 5% in the Northwest Pacific and a 3% in the North Atlantic relative to 1986-2005.

Figure 7. Projected changes in a) hot days above 35°C b) drought index SPI-6 and c) annual maximum 5-day precipitation for 2030 compared to 1986-2005 under the middle of the road emissions scenario SSP2-4.5.



a)



b)

c)

Note: Detailed information on the projections and the associated confidence were accessed from the IPCC Working Group I contribution to the Sixth Assessment Report "Climate Change 2021: The Physical Science Basis" and the associated IPCC WGI Interactive Atlas and regional factsheets: Fact Sheets | Climate Change 2021: The Physical Science Basis (ipcc.ch)

Appendix 9: Additional context for regional needs

Mental health impacts of climate change

- **Anxiety and stress**: Extreme weather events like hurricanes, wildfires and heatwaves can trigger anxiety and stress due to fear about personal safety, property damage, or displacement. Uncertainty

about future climate change events can exacerbate these feelings. Heightened concerns about the impact of climate change on health, including the spread of diseases, air quality issues, and access to healthcare can contribute to health-related anxiety among individuals in these regions.[38, 39] Additional anxiety can stem from the disruption of livelihoods and broader cultural lifestyle habits.[38]

- **Depression:** Communities affected by climate disasters often experience depression, especially when facing the loss of loved ones, homes or livelihoods. The long-term recovery process can further contribute to these mental health challenges. Prolonged periods of extreme weather, displacement, loss of livelihoods and environmental changes can contribute to depressive symptoms in affected populations.[40]
- **PTSD:** Evidence shows that climate-related traumatic experiences such as hurricanes, wildfires, floods, and extreme heat increase the risk of post-traumatic stress disorder or post-traumatic stress syndrome and increase the frequency of psychiatric emergencies.[39, 41, 42]
- **Ecological grief:** Witnessing the degradation of natural landscapes, loss of biodiversity and impacts on ecosystems can lead to a sense of environmental grief, particularly among individuals connected deeply to the environment.[43]
- **Climate-related migration stress:** As climate change affects liveability in certain areas, migration or displacement can cause psychological distress due to leaving behind homes, communities, and familiar environments.[44]
- **Eco-anxiety and climate distress:** The American Psychological Association (APA) defines eco-anxiety as a "chronic fear of environmental doom"[38] and is categorised by many emotions including guilt, sadness and anger around the consequences of climate change.[45] Eco-anxiety particularly among younger generations. This may also impact those with an acute awareness of climate change such as researchers, activists, etc.[46]
- **Social isolation:** Similar mental health challenges to what was experienced under the COVID-19 lockdowns are being reported when people need to stay indoors for long periods when the air quality is dangerous as in wildfire season, or when temperatures are extremely high.[47]
- **Substance abuse and domestic abuse:** These maladaptive coping mechanisms can spike after climate disasters and are highly detrimental to mental health and wellbeing, in addition to physical health and safety. These behaviours can be compounded by social isolation. Climate-related stressors, including loss of homes or livelihoods, can increase the risk of substance abuse as individuals attempt to cope with the emotional toll of these events.[48]
- **Sleep disruptions:** Extreme heat has been linked with sleep problems, and poor sleep hygiene is intricately linked with poor mental health outcomes. Sleep deficiency has been connected to depression, suicide, and impulsive risk-taking behaviour.[49]
- **Physical health**: The climate crisis makes people more prone to physical illness by impacting air quality, respiratory and heart diseases, pest-related diseases like Lyme disease and West Nile Virus, water- and food-related illnesses, and injuries and deaths. Climate change has also been linked to increases in violent crime.[50] Research from WHO indicates that 3.6 billion people already reside in areas highly susceptible to climate change and further predicts that between 2030 and 2050, approximately 250,000 additional deaths per year will be attributed to climate change-related malnutrition, malaria, diarrhoea, and heat stress alone.[51]
- **Suicide rates:** Some studies suggest a correlation between climate change-related events and increased suicide rates, particularly in regions affected by extreme weather events or agricultural challenges.[52, 53, 54]

Who is particularly affected?

1. **Marginalised communities:** Disadvantaged communities often reside in areas that are more susceptible to climate hazards and pollution due to a history of racist and other discriminatory policies. This often means that they face higher risks and fewer resources to adapt to climate-related impacts, leading to increased stress, anxiety, and trauma because of financial constraints, limited access to healthcare, and inadequate infrastructure. They might face additional challenges accessing resources and support systems, leading to higher susceptibility to mental health issues caused by climate change.[55] Marginalised communities include but are not limited to low-income groups, unhoused individuals, agriculture workers, outdoor workers, people with disabilities, people who are incarcerated, and people of colour.
2. **Indigenous, coastal, and small island communities:** Indigenous Peoples face disproportionate impacts from climate change due to their close connection to the environment and reliance on traditional practices. Disruptions to their ecosystems such as biodiversity loss directly affect their livelihoods, cultural heritage, and food security, making them especially susceptible to mental health issues as climate change alters their environment and traditional ways of life.[56] Populations in coastal or island areas face immediate threats from rising sea levels, storms, and erosion.[57] The constant fear of displacement and loss of homes and ancestral homelands contributes to anxiety, depression, and trauma.[58]
3. **Women and girls:** Women and girls, especially in developing countries, bear the burden of climate change impacts due to their roles in caregiving, food production, and water collection;[59, 60] in addition to the disruptions to food and water system from climate change, their increased workload heightens stress and can increase the negative influence of climate change on mental health.[61, 62] Women also face a heightened risk of gender-based violence, see below for more details. For pregnant women, already a highly at-risk population, climate change impacts can increase the risk of maternal and foetal mortality or birth complications; trauma from extreme weather events can cause psychological and emotional distress that may put a mother and her baby at risk.[63, 50] Additionally, gender and political ideology are associated with distinct responses to climate-related mental health impacts. One study shows how women are more likely to experience eco-anxiety and engage in pro-environmental behaviours.[64]
4. **Rural and agricultural communities**: Farmers and rural populations face mental health strains due to crop failures, changing weather patterns, and economic pressures caused by climate-related challenges and the uncertainties they cause for harvests.[65] These communities often lack adequate support systems and resources for adaptation, and experience heightened stigma around mental health.[66]
5. **Elderly population:** Older adults, particularly those living alone or in areas prone to extreme weather events, are vulnerable. Limited mobility, health concerns, and social isolation exacerbate their mental health challenges in the face of climate-related risks.[67]
6. **People with pre-existing mental and physical health conditions:** Climate change can exacerbate existing mental health issues like anxiety, depression, or post-traumatic stress disorder. Regions without adequate infrastructure for disabled populations can create challenges in accessing care.[61]
7. **Migrant and displaced communities:** Climate-induced migration leads to mental health issues stemming from displacement, loss of homes, livelihoods, and community ties.[68] These individuals face challenges in adapting to new environments and may encounter discrimination and social exclusion.[69] Additionally, climate change can indirectly exacerbate conflict under certain conditions, similarly leading to displacement and associated adverse mental health outcomes.[70, 71] Women have

experienced the threat of sexual violence while migrating and in conflict settings and subsequent deterioration of mental health and wellbeing; this threat is amplified by increasing climate impacts.[72, 62]

8. **Children and youth:** Children are especially vulnerable to physical and mental health impacts given the formative stages of growth and development in childhood and adolescence; they can experience psychological distress due to disrupted education, health issues, and fear of an uncertain future. Youth face a unique set of challenges in the context of climate change. They often experience heightened anxiety, eco-grief, anger, and stress over the uncertain future shaped by climate change. Additionally, they bear the generational pressure to "fix" a crisis they did not create, while many current power holders are not taking adequate action to address the climate emergency. The emotional toll on youth is significant, as they grapple with the impacts of climate change on their lives, communities, and the planet. This emotional burden can lead to mental health issues and a sense of powerlessness. It is essential to provide support and resources for children and youth to help them cope with these challenges and to empower them to become advocates for climate action. Additionally, involving them in decision-making processes and fostering their resilience can contribute to more sustainable and equitable solutions for the future. They might experience distress due to concerns about the future, anxiety related to extreme weather events, or the loss of a stable environment for growth and development.[73]

Appendix 10. Project scope

1. For details on how the Lived Experience Stories were collected, please reference this document.
2. For additional materials that were provided to participants prior to Dialogue 2, please see this document.
3. For mental health resources that were available to participants during both regional dialogues, please reference this document.

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