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Training in Climate Impacts and Planning in Complex Humanitarian Emergencies: A Review

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Abstract
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Climate change is a significant global threat with current and potential future broad-ranging effects on public health. Recent research suggests that the burden of climate change is increasing and affecting the most vulnerable international populations. Public health emergency managers need climate change training to properly prepare and respond to climate emergencies, particularly those within the realm of Complex Humanitarian Emergencies (CHE). Within the Emory Rollins School of Public Health (RSPH), there currently needs to be a class that addresses planning in the context of climate change and complex humanitarian emergencies. At RSPH there is both a CHE and a Climate and Health Certificate which could provide a possibility opportunity for course creation. This thesis aims to 1) Identify whether training dealing with the intersection of climate change, CHEs, and emergency planning exists within public health graduate education and 2) Develop recommendations for RSPH course development for future public health students. A systematic scoping review following the Cochrane Handbook guidelines was conducted to identify the existing landscape of training within public health master programs as well as existing continuing education materials. Materials were reviewed to assess the applicability, quality, and relevance of the content to the intersection of CHE, climate change, and emergency planning. We used an inclusion criterion that mandated sources must include the following intersection 1) climate change 2) humanitarian emergencies 3) planning in the context of the public health training curriculum at a graduate level public health program or continuing education public health curriculum. Literature was excluded if programs that address the intersection between climate change, health, and CHEs were outside of public health graduate programs or related continuing education. After identifying the sources, the sources were reviewed to assess adaptability to RSPH's context and best practice methods for a future course at RSPH for climate change and CHE intersection. We reviewed 13 databases, locating 1,579 potential sources. After performing a Cochrane-based systematic review, 20 sources met inclusion criteria as training materials courses or curricula, representing nine different organizations or authors. Overall, there are minimal materials on the intersection of CHE, climate change, and applied planning; furthermore, given the importance, the RSPH course has to take components of what exists and design its curriculum using the components, due to the severity and time sensitive need presented by climate change. Additionally, existing curriculum is from reputable sources. However, these materials should be further informed by key informant interviews and discussions with future stakeholders from both the academic and professional sectors to further evaluate the need and course creation. Based on the current information independent of the interviews, the following recommendation was made for creating this curriculum. The final course should include elements from WHO's continuing education materials, John Hopkin's Humanitarian certificate, and John Hopkin's Climate and Health certificate, as well as incorporating aspects of the University of Vermont's Climate Emergencies course, and finally pulling from related information from the Sphere handbook and materials specific to climate change adaption.

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Training in Climate Impacts and Planning in Complex Humanitarian Emergencies:
A Scoping Review and Comparison

<u>**Chapter 1**</u>

The Global Context

Climate change poses an urgent public health problem that is growing globally. The effects of climate change on health are multifaceted and complex, ranging from direct impacts, such as heat-related illnesses and injuries from extreme weather events, to indirect impacts, such as disease pattern changes and food insecurity. As noted by the U.S. Embassy in Italy, "as global temperatures and sea levels rise, the result is more heat waves, droughts, floods, cyclones, and wildfires. Those conditions make it difficult for farmers to grow food and for the hungry to get it" (U.S Mission Italy, 2022). These climate-related health consequences are emerging at an alarming rate, posing significant challenges to the global public health community (Ros et al., 2020).

The World Health Organization has recognized climate change as the defining public health issue of the 21st century, emphasizing its importance in shaping global health outcomes (Cromar et al., 2021). As well as dictating public health risks, adverse physical and mental health outcomes are directly associated with extreme events such as hurricanes, heat waves, and wildfires related to climate change (NIH, 2022). In addition, the Lancet Commission on Health and Climate Change has highlighted that tackling climate change could be this century's most significant global health opportunity (Cromar et al., 2021).

Managing the consequences and planning for a changing climate, particularly those of various climate-related disasters and deaths, will fall on various sectors. However, it is important to note that the chief managerial components will fall on the Emergency Management field. Emergency Management is the "managerial function charged with creating the framework within

which communities reduce vulnerability to hazards and cope with disasters" (FEMA a.) While it is similar to traditional Emergency Management, Public Health Emergency Management (PHEM) is still considered a new and developing field and "draws on specific sets of knowledge, techniques, and organizing principles found in the fields of Emergency Management and public health that are necessary for the effective management of complex health events and emergencies with serious health impacts" (Rose et al., 2017). As climate change continues to be a public health issue, PHEM will fall critically within the umbrella to combat the effects of climate change on health: "the Emergency Management field must anticipate the increasing demands generated by more extreme and frequent disasters — from wildfires and coastal storms to inland flooding. Additionally, emergency managers must learn to manage and support climate-related emergencies such as drought and extreme heat" (FEMA, 2023).

Climate Change and Displacement

Climate change will increase the frequency and intensity of natural disasters such as hurricanes and more intense storms; Per the United States Geological Survey, "with increasing global surface temperatures the possibility of more droughts and increased intensity of storms will likely occur. As more water vapor is evaporated into the atmosphere it becomes fuel for more powerful storms to develop." (U.S. Geological Survey, 2023). In 2019 alone, climate change caused 24.9 million weather-related displacements.

Additionally, climate change will disproportionately impact countries considered to be underdeveloped or developing. As noted by the United States Global Leadership Coalition: "there is consensus that extreme weather and disruption from drought, flooding, and conflicts over natural resources disproportionately affect the developing world, particularly the poor and most vulnerable including women and children" (USGLC, 2021). When such displacements

occur in fragile states, which can be defined as a low capacity or low ability to absorb emergencies, these situations can create infrastructure and economic development challenges and threaten national and international security. Fragile or vulnerable areas overall resilience to these environmental threats "…can be further complicated by repeat events in areas already struggling to bounce back. These cascading and compounding impacts, propelled by climate change, pose the greatest risk to our communal and nationwide resilience" (FEMA, 2023).

If unchecked, climate change can reverse years of sustainable development gains and fuel violent conflicts (Signé & Mbaye, 2022). In light of this, examining how climate change will further affect the overall landscape of disaster preparedness and the communities most at risk is essential.

Complex Humanitarian Emergencies

"Globally, complex humanitarian crises (Complex Humanitarian Emergencies)—such as armed conflict, forced displacement, natural disasters and major disease outbreaks—affect more people today than at any point in recorded history and continue to be on the rise"(Kohrt et al., 2019). Complex Humanitarian Emergencies (CHEs) can be summarized "as a breakdown of authority due to internal or external conflict and there is an emergency situation exceeding the ability of the country's government to respond that requires an international response beyond the capacity of any single agency and/or the UN country program" (RSPH, 2023b). As noted by the Center for Disaster Philanthropy: "in 2022, nearly 290 million people required humanitarian assistance and protection, a significant increase from 235 million people the year before" (Center for Disaster Philanthropy, 2022).

As further noted by UNHCR (2001), common features of complex emergencies include:

A large number of civilian victims, populations who are besieged or displaced, human

suffering on a significant scale; Substantial international assistance is needed, and the response goes beyond the mandate or capacity of any one agency; Delivery of humanitarian assistance is impeded or prevented by parties to the conflict; High-security risks for relief workers providing humanitarian assistance; and Relief workers targeted by parties to the conflict.

Given the diversity of public health concerns due to CHEs, a multi-sectoral coordinated approach is employed. Rather than using a traditional PHEM system, a cluster system is used to coordinate the multi-sectoral response efforts; this can be done at a local, national, or global level. Clusters are a means of organizing humanitarian organizations, governmental, and non-governmental organizations into eleven different sectors. This coordinated structure helps to ensure accountability, reduction of duplication of effort, and overall efficiency of the response. The standard cluster approach is noted below in Figure 1. In practice, a response might encompass a few sectors or clusters, while some responses may require all clusters to be activated. Within each sector, it is surprisingly not uncommon to have dozens or, in some cases, hundreds of organizations working in tandem to address the needs of the emergency.

Figure 1 *The Cluster Approach*
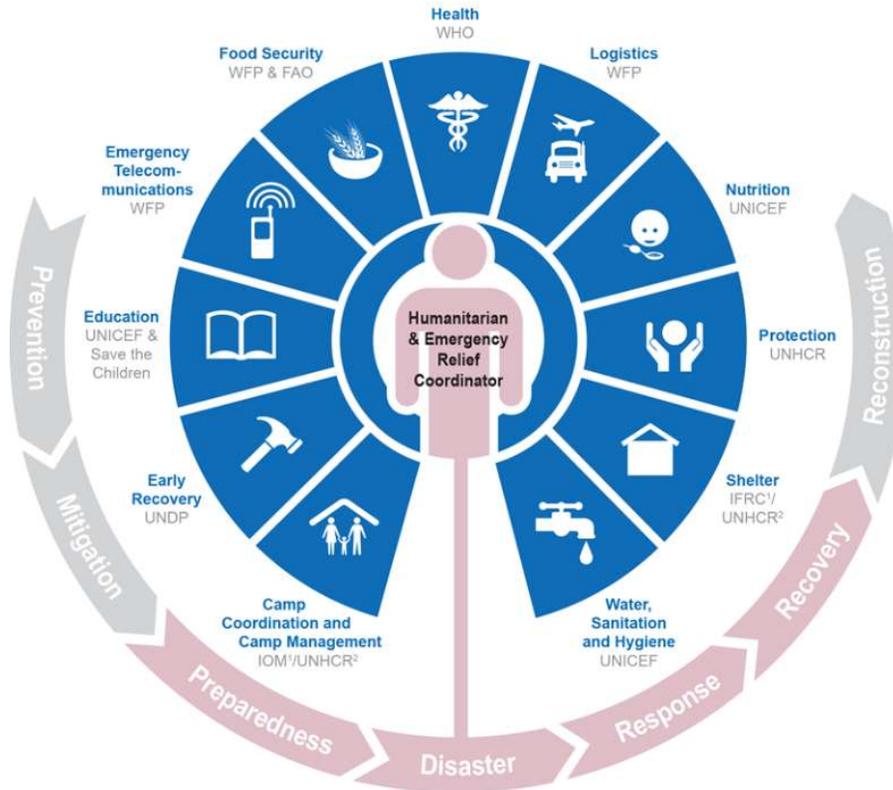
Note: Cluster system sectors illustrate the roles of UN entities during a humanitarian emergency (OCHA, 2020).

Burden of Climate Change and CHE Intersection

CHEs provide an even more complicated consideration when it comes to climate change. As climate change can exacerbate existing health problems and create new challenges, the intersection of climate change and CHEs on human health could be staggering between displacement, conflict, and extreme weather effects. While some effects have already become visible, the exact scale of these effects is still being determined. As noted in the climate change

literature, extreme weather events will increase, particularly those of wildfires and hurricanes, as well as general illness and premature deaths. The IPCC full report notes that "climate change will significantly increase ill health and premature deaths from the near- to long-term (high confidence). Further warming will increase climate-sensitive food-borne, water-borne, and vector-borne disease risks (high confidence), and mental health challenges including anxiety and stress (very high confidence)" (IPCC, 2023). Many of these health challenges are already risks in CHEs.

It will be difficult to parse out what specific health effects can be attributed to CHEs versus climate change because of their frequent intersection. What is clear is that when they occur concurrently, health risks are magnified. These intersections include but are not limited to climate change and extreme weather events, wildfire, heat-related deaths, drought, and hurricanes being salient examples, and on the CHE level, malnutrition, famine, drought, and mass migrations. However, there are already numerous current examples of climate change and CHE interaction, "of the 25 countries deemed most vulnerable to climate change, 14 are mired in conflict" (International Committee of the Red Cross, 2021). One notable example would be in the horn of Africa, where "populations across Ethiopia, Kenya, and Somalia struggle with a confluence of recurring climatic shocks, widespread food insecurity, and reduced access to livelihoods. These challenges, exacerbated by persistent conflict and resultant displacement, contribute to sustained humanitarian needs and ongoing complex emergencies" (USAID, 2022).

Furthermore, modeling is predicated on specific constants or predictive factors that require making many assumptions regarding stability. These assumptions introduce a degree of uncertainty: As CHEs result from unstable situations with multiple unpredictable and fluid crises, CHEs may create worse scenarios than the projected models. In the event of an increase in

CHEs, particularly in countries that are vulnerable to climate events, it is very likely that models showcasing impact from climate change would require adjustment from the resulting displacement and climate effects. As climate-vulnerable countries are already mired in conflict, it is vital for planning considerations.

To effectively respond to the complex intersection between climate change, health, and CHEs, a comprehensive training curriculum in public health is necessary. Therefore, public health training programs in continuing education and university-based settings should prioritize integrating competencies related to climate change and health across multiple domains (Hartwell et al., 2023). As part of this integration, it becomes critical to include CHE planning strategies into the climate and health domains.

<u>Chapter 2</u>

Intersectionality in Planning

The global increase in refugees and displacements due to CHEs has underscored the changing dimensions of humanitarian responses. Ivor Prickett from UNHCR stated: "By December 7, more than 911,000 refugees arrived in Europe since the year began and some 3,550 lives were lost during the journey. Over 75% of those arriving in Europe fled conflict and persecution in Syria, Afghanistan or Iraq" (UNHCR & Ivor Prickett, 2015). By the conclusion oof 2022, "108.4 million people worldwide were forcibly displaced as a result of persecution, conflict, violence, human rights violations and events seriously disturbing public order" (UNHCR, 2023). These ongoing global crises, combined with climate change and man-made and natural hazards, have created a vicious cycle of compounding disasters and humanitarian emergencies as displaced individuals seek to find homes and a place of refuge.

A climate-related disaster can have a cyclic effect by producing displacement, which, in turn, could create conflict, facilitating even more favorable conditions for future CHEs. As noted by Juan Manuel Santos Calderón, President of Colombia and Nobel Peace Prize laureate at the UN Security Council, "in the real world, the consequences of climate change and conflict very clearly converge. Climate change exacerbates threats to human security and war damages nature and the environment in numerous ways" (Security Council, 2023), including environmental protective terrain that reduces effects from climate effects. One such example includes "wetlands which can offset changes in precipitation and snow melt by storing water and reduce the effects of drought and severe storms. The cumulative presence of wetlands and lakes in a watershed can reduce flood flows during big storm events" (Washington State Department of Ecology, 2023). Thus, including an intersectional component encompassing climate change in planning considerations is essential. To understand how that would best be accomplished, it is crucial to understand that climate change planning is divided into two major concepts: mitigation and adaptation.

Public health professionals, especially those in PHEM roles, play a crucial role in these emergencies by defining health risks, monitoring the capacity and reconstruction of public health systems, ensuring essential health services, and promoting mitigation strategies. Mitigation is a key phase in the Emergency Management cycle (Figure 2), and according to FEMA, "mitigation is the effort to reduce the loss of life and property by lessening the impact of disasters. Mitigation can keep natural hazards, like flooding and hurricanes, from having catastrophic impacts" (FEMA, 2017). Conversely, climate change has a more limited definition, where mitigation in climate change is usually more focused on legislation and policy and "refers to efforts to reduce or prevent emission of greenhouse gases" (UN Environment Programme, 2023).

Climate change adaptation encompasses more than legislation and policy. It describes the challenges of implementing practical mitigation measures to address the repercussions of climate change. As noted by the UN, there is a demonstrated need for adaptation and overall modification to systems and planning for climate change. According to the United Nations Framework Convention on Climate Change (UNFCCC)

"Adjustments are needed in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects. It refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change. In simple terms, countries and communities need to develop adaptation solutions and implement actions to respond to current and future climate change impacts." (UNFCCC, 2023)

Adaptation is broad and overarching, and it can include modifications to the built environment, population migration patterns, agriculture practices, and diet. Although adaptation does not appear within the standard framework that Emergency Management or PHEM follows, it most closely aligns with the preparedness and mitigation phases within Emergency Management as it seeks to prevent future harm through various preparatory activities (See Figure 2 for the Emergency Management cycle). As the Emergency Management cycle progresses, elements of adaptation planning can be combined into the recovery phase to better prepare for future disasters, wherein communities experiencing disaster are able to use the recovery phase as a time to demonstrate need and change before climate change impacts hit. Consequently, it would be beneficial to consider climate change adaptation planning within the mitigation and preparedness phases associated with various activities, including standard operating procedure (SOP) development, hazard mitigation, emergency operation plan development, and target

hardening. Target hardening is the process of using the built environment or natural terrain features to reduce the effects of hazards. For example, wetland revitalization is a way to reduce the risk of flooding in an area. As demonstrated, adaptation is clearly an important aspect of preparedness and should be a consideration in the Emergency Management Cycle.

Figure 2. *The Emergency Management Cycle*
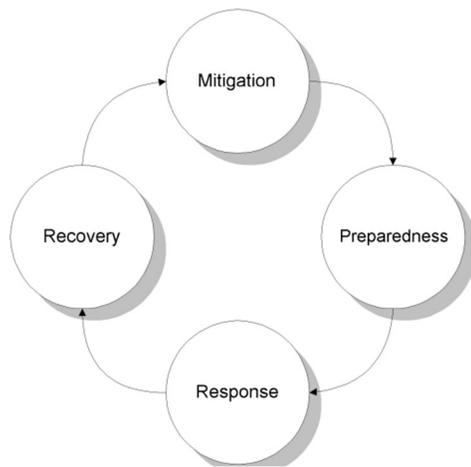
Note: This figure shows the Emergency Management cycle with the four phases: mitigation, preparedness, recovery, and response. The cycle illustrates the phases of activities carried out by Emergency Management professionals. (FEMA b.)

Furthermore, Emergency Management planning processes demand an understanding of climate change to assess threat levels, resulting in plans and processes that more accurately reflect the current global context. Assessments often factor in historical trends and previous climate trends but have little data to forecast future hazards. Due to the evolving nature of climate change and CHEs, new patterns of disasters are hard to predict, so the overall process must adapt to this change. Emergency Management planners must find new ways to perform these tasks in a new uncertain environment.

Likewise, Emergency Management professionals, particularly those working within the international sphere in the cluster system introduced previously, must include multi-sectoral planning for future responses. Within the cluster systems, different UN agencies will need to work in tandem to address the effects of climate change health effects, including incorporating aspects of adaptation into response work.

The School of Public Health Context

Complex Humanitarian Emergencies Certificate

As discussed previously, climate change and CHEs have an intricate link. Currently, Rollins School of Public Health (RSPH) at Emory University, a premier public health university, has no course dedicated to climate change planning in the CHE context. However, RSPH does offer a CHE certificate within their 2-year master's programs that prepares graduates for competitive careers in the complex humanitarian management space. The program includes courses focusing on a range of disciplines encompassing the many facets of CHEs. Some course examples include; Epidemiology, Mental Health, Risk Communications, Planning, and Sexual and Reproductive health, among others. The availability of these courses is inconsistent from year to year as it is subject to the demand at Emory University and the instructors' workload. In addition to these courses, many other courses are considered eligible for the CHE certificate. While many elements of CHEs are covered in these courses, the certificate does not offer training directly on climate change's relationship with CHEs. Still, it does have courses that address some of the impacts of climate change, such as Preparedness and Planning within Complex Humanitarian Emergencies.

Climate and Health Certificate

The Climate and Health Certificate at RSPH is a certificate that aims to:

Prepare students to make strong contributions to climate change research, policy, and/or practice. Through coursework and an Integrative Learning Experience (thesis or capstone), students will develop the skills and expertise to be competitive in challenging climate-related careers and/or to pursue a doctoral degree in the field.

The certificate also declares the following competencies:

1. A strong understanding of the health impacts of climate change.

2. A strong understanding of possible solutions to mitigate and prevent the health impacts of climate change.

3. A strong understanding of research, programmatic, and policy tools for describing the health impacts of climate change and advancing solutions that address those impacts. (Rollins School of Public Health, 2023a)

The introduction GH/EH course introduces climate science, covering a broad range of topics, including adaptation and mitigation planning, with a primary focus on policymaking. Meanwhile, the culminating course centers on foundational material regarding climate science, and students then work on a grant proposal using the Building Resilience Against Climate Effects (BRACE) framework. It focuses on domestic climate effects in the United States. While both classes highlight climate change's effects and the need for climate adaptation and planning, there is no focus on CHEs. Furthermore, the course material is highly localized to the domestic context and does not emphasize a global or humanitarian lens.

A Training Need

With no existing training on emergency planning in the context of climate change and CHEs at RSPH, it was hypothesized that most US-based public health schools or supplemental online

training courses do not address the intersection between climate change, CHEs, and emergency planning in public health graduate training programs. As an additional outcome, the researcher aimed to include training programs that exist to better inform the potential of a new combined Climate Change and CHE course at the RSPH. Therefore, from January 31, 2023, to March 27, 2023, a scoping review was conducted to systematically search for relevant literature on the intersection between climate change, emergency planning, and CHEs, examining the relevant training programs available to students from January 1, 2000, to March 27, 2023.

Methods

The scoping review provided in this thesis included relevant studies from academic databases and gray literature and followed the guidelines set by the Cochrane Handbook (Higgins et. al, 2023). The following databases were searched on March 27th, 2023 using the search terms and strategy described in Table 1 of the Appendix: Medline (Ovid), Embase, CAB Abstracts, Global Health, PsycInfo, Cochrane Library, Scopus, Academic Search Complete, CINAHL, Education Database (ProQuest), ERIC (ProQuest), ProQuest Central, Global Index Medicus (WHO), and the Virtual Health Library (WHO). Additional grey literature was captured using search engines with similar search terms. Results were limited to studies published in English from the year January 2000 to March 27, 2023. The parameters in the initial search were courses focused on climate change and humanitarian emergencies in formal academic settings or in continuing education that contained some aspect of applied planning to climate adaptation in the CHE sphere. Keywords in the initial search that were used included "climate change," "health," "complex humanitarian emergencies," and "public health training". The terms were kept broad to ensure a comprehensive search strategy. The search strategy also included variations and synonyms of these keywords to best capture additional relevant literature

that might be missed in the original search. The complete search strategy is included in Table 1 of the Appendix.

The inclusion criteria for the scoping review involved training programs that discuss the intersection between 1) climate change 2) humanitarian emergencies 3) planning in the context of the public health training curriculum. Literature was excluded if programs that address the intersection between climate change, health, and CHEs were not in public health graduate programs or related continuing education training (e.g., WHOs Climate and Health training Program), as referenced later. Literature dated before the year 2000 was also eliminated to try to capture programs that have relevance to current emergency management principles and modern climate change considerations. These criteria were applied through all stages of the literature review and ensured that the selected manuscripts included a focus on humanitarian emergencies, climate change, and emergency planning.

The literature review followed a three-phase process highlighted in Table 2 in the Appendix. A systematic search (Phase 1) was the broad search with the outlined key words, inclusion, and exclusion criteria, utilizing a series of databases described in more detail below. Phase 2 consisted of an abstract title review, and the review of the titles of the grey literature that were found. Phase 3 consisted of a full-text review of the article or the information available of a course program or curriculum. Screenings were all conducted via Covidence (Covidence, 2023) "Covidence is a web-based collaboration software platform that streamlines the production of systematic and other literature reviews to perform a pre-screen, abstract, and full-text review" (Covidence & Goulas, 2023). All screenings and reviews were conducted by a single reviewer (NCG).

In Phase 1, the systematic search used the following databases (shown in Appendix Table 1): Medline, Embase, CAB Abstracts, Global Health, PsycINFO, the Cochrane Library, Scopus, Academic Search Complete, CINAHL, ProQuest Central, PubMed Central, WHO's Global Index Medicus, and WHO's Virtual Health Library. Additionally, a follow-up search was conducted using Google search engine, focusing on university programmatic material identified in the literature search but information was not readily present in the databases, to better understand the courses taught and their alignment with the search material. After identifying the literature that contained the relevant keywords, the sources were uploaded into Covidence for review.

In Phase 2, the initial screening process was conducted by examining the abstract titles and the titles of courses to determine if they fit the search parameters. This also occasionally required a quick screen of some of the sources beyond the title, as many of the programs did not explicitly say what the program contained in the title alone. The sources that fit the search parameters were screened to ensure they met the inclusion criteria, excluding those that met the exclusion criteria. In the screening process, it was necessary to include literature that appeared to contain a singular focus or a mixed focus to better examine the material in more depth, as many of the programs did not explicitly say what the program included in the title. If they fit both humanitarian and climate change content criteria, the literature was also examined for the planning and applied aspects.

Finally, in Phase 3, once the literature was examined and programs that had all technical topics (climate change, humanitarian emergencies, and some elements of planning in the Emergency Management or climate adaptation realm) were determined, each source was reviewed systematically for a more in-depth confirmation of meeting relevant

inclusion/exclusion criteria. The overall gap in the literature and the specific training deficiencies were identified. In this phase, additional screening was necessary to further parse the overall alignment with the original search materials by ensuring that the materials contained the mixed focus intersection. The method to accomplish this was to read the literature in more depth and look for possible additional keywords on the material, such as conflict, low-resource settings (as a surrogate marker for CHEs since they often exist in low-resource settings), and emergency planning. This was an important distinction in the methodology due to the broad search capturing many classes and curricula that focused on high-resource settings in stable environments but having some mention of humanitarian aid.

After the final sources were identified, a further examination was conducted to examine the literature in-depth and benchmark it against the existing certificates at RSPH in Climate, Health, and CHE. This examination sought to determine similarities and differences between the programs and to further highlight some best practices for creating curriculum or course materials for an intersecting course in Climate Change and CHE emergency planning at RSPH. This examination broke the remaining literature into the four following categories: Academic Certificate, Course, Curriculum, and Full Graduate Program. Literature also was sectioned into overarching programs or institutions due to redundancy in some of the topics and materials at the same institutions. Table 3 in the Appendix shows how these training materials were divided.

IRB approval was waived for this project, given that it is a review intended to look at broader program materials and not human subjects. Thus, it was not considered human subject research, and Emory IRB approval was not required.

Results

In Phase 1, a total of 3830 sources were identified, with a large number of duplications between databases. As shown in Table 1, 2251 results were initially removed as duplicates resulting in 1579 remaining. Utilizing Covidence, 15 more duplicates were identified. As part of Phase 1 sources missing 1 or more inclusion criteria were removed, those removed are listed as follows: There were 1411 unrelated to continuing education or graduate-level public health studies. An additional 26 were removed because, although they referenced climate change, they did not contain humanitarian components. Another 21 failed the criteria as they included humanitarian elements but not climate change. That left a total of 106 sources for inclusion at the end of Phase 1.

Two rounds of reviews were necessary to further filter our results in Phase 2. From our 106 results in Phase 1, we narrowed the list to 67. Of those removed, 27 were not public health graduate related, 8 were toolkits but not actual curriculums or courses, and 4 were studies that discussed class material but did not result in the creation of curriculum.

For Phase 3, a full-text review was conducted, ensuring all included sources met the required criteria. During this phase, starting with 67 sources, 19 sources were removed because they met the climate and health focus but failed to contain emergency planning or CHE. Another 11 sources were removed because they contained humanitarian content but no climate focus or emergency planning. A further 10 were removed because they contained some element of both humanitarian focus and climate focus but did not contain emergency planning. Finally, 6 programs were removed for being associated with non-public health masters programs, and 1 source was removed as it was bachelor-level material. Additional articles were merged if they were identified as sources of the same program, or a sub-program of the same source, as reflected in Table 3. Literature examined in Phase 3 were subject to the information available on

the sources available, and in many cases the literature information varied greatly in depth and explanation.

Based on this scoping review, which was limited to the English language and to content created after the year 2000, we identified nine institutions or organizations with 20 individual titles of courses, curricula, or programs (Table 3) that have some element of climate change, CHEs, and emergency planning in their scope. This was consistent with the hypothesis that fewer than 10 different organizations/schools would satisfy the various criteria for the CHE, Climate Change, and emergency planning intersection. Of the 20 pieces of literature, six were academic certificates, 11 were courses, and three were continuing education curriculumThe continuing education curriculum in all cases is designed for public health professionals, whereas the academic certificates were for public health graduate students. Meanwhile the six courses WHO has and the course study that the Sphere organization later would turn into course material was geared towards public health professionals, with the remaining four courses being housed and more oriented towards public health students.

The most robust materials associated with the overall focus may be the existing planning and training curriculum presented by the World Health Organization (WHO) (World Health Organization [WHO], 2020), which has detailed discussions on humanitarian response, climate change, and specific tools and mitigation strategies for low-resource settings. Significant highlights from the WHO climate courses include three specific modules particularly relevant to this study: 1) Policies and Practices of Mitigation and Adaptation, 2) Disaster Risk Management, and 3) Assessing Health Vulnerabilities. These specific modules contain some level of all three of the primary focuses of this project, particularly that of applied planning and climate change. The modules all highlight the use of various planning tools, particularly in terms of mitigation

and adaptation in international context. Further, the global focus and health vulnerabilities portion in the Assessing Health Vulnerabilities piece helps to provide the CHE piece, as does the Assessment and Prediction of the Health Impacts of Climate Change module, which illustrates the vulnerabilities that result from CHEs.

Johns Hopkins has two programs that take different approaches but have some overlapping coursework or focus, similar to those programs found in RSPH's certificates. With four courses identified as overlapping. These programs include the Humanitarian Health Certificate and the Climate and Health Certificate.

The following educational objectives were cited from the Climate and Health Certificate (Johns Hopkins Bloomberg School of Public Health, 2023a):

- Explain the connection between climate and public health, ranging from temperature-related mortality and increasing rates of disease to mass migration, food, and water shortages, and the resulting conflict.

- Describe policies and practices in the US and around the world addressing the impact of climate change on health.

- Summarize the role of various sectors (government, private, and non-profit) in addressing climate change's impact on public health.

- Distinguish between climate-related risks in developed countries versus those in low to middle-income countries.

- Evaluate research related to climate change and health.

- Discuss and predict how climate change will affect economics and social structures, including inequities in the risks and benefits associated with climate change.

- Develop and discuss strategies that effectively mitigate and prevent adverse health effects caused by climate change.

The educational objectives were cited from the Humanitarian Health Certificate (Johns Hopkins Bloomberg School of Public Health, 2023b):

- Assess an emergency to identify immediate and longer-term assistance needs and additional resources required.

- Identify specific health (including psychosocial and mental health) needs of populations affected; plan and implement activities to meet these needs; and monitor and evaluate the effectiveness of assistance provided.

- Understand the principles of organization and administration of relief services in collaboration and cooperation with local and international non-governmental organizations, host governments, military forces, and United Nations agencies.

- Use epidemiologic skills to collect, analyze, and use information about natural and man-made disasters.

- Plan and implement disaster preparedness, response, and mitigation activities.

- Identify disease outbreaks and know how to contain them in a timely manner.

- Know the public health consequences of natural disasters and their management.

- Outline the basic requirements for a food and nutrition program for a disaster-affected population.

- Use the basic principles of International Humanitarian Law (IHL) and human rights principles to understand displaced populations' protection needs and identify and document abuses.

- Have a basic understanding of the political environment and use this to explain the various forces that affect population displacement.

Both certificates indirectly address CHEs and climate change planning. The climate change certificate focuses on the health effects of climate change more generally, and the integration of climate science and the humanitarian health program emphasizes a lens more specifically on humanitarian response and human rights. Further, one of the tracks offered as part of the Humanitarian Health certificate includes a Climate Change and Preparedness Track, which seeks to unify emergency planning and climate change concepts.

A similar certificate program is found at Colorado State University: the Certificate in Climate & Disaster Resilience. In this certificate program, students focus heavily on the "all hazards" approach to disasters and specifically include climate-related events and their relation to both the primary and secondary humanitarian effects. (Colorado School of Public Health, n.d.) This course emphasizes incorporating vulnerability considerations and social determinants of health into global emergency planning. While the course does not explicitly use the term CHE, the content would satisfy what would typically be covered in this content area.

Colorado State University also has a physician-specific program, that is open to graduate public health professionals, for global health responders available to graduate public health students and medical trainees. This certificate primes students in the health field to work in applied scenarios for a variety of disasters. This course includes a focus on emerging climate threats and how to respond globally in resource-scarce humanitarian emergencies. (University of Colorado, 2019)

The University of Washington offers a climate and health certificate that primarily focuses on the domestic and scientific aspects of climate change with only some emphasis on

humanitarian emergencies. (University of Washington, n.d.) The current and projected health risks of climate change, as well as the policies and measures to manage these risks as the climate continues to change, are covered in the course work on the health risks of climate change in the field of public health. This course strongly emphasizes the science of climate change and many of the various emergencies that may transpire in a high-resource environment. However, although humanitarian efforts are mentioned in passing, there is limited commentary on humanitarian emergencies in low-resource environments or humanitarian emergencies in general.

At Downstate Health Sciences University, there is an Advanced Certificate Program in Climate Change and Planetary Health. "Planetary health focuses on the study of activities of global populations and resulting environmental changes at the planetary/ecosystem level that impact human health, with a particular focus on climate change." (SUNY Downstate, n.d.) This certificate uses a planetary health angle for climate change's impact on human health and strategy development for interventions in the public health realm. Additionally, there is a focus on policy-level carbon mitigation strategies, which is not necessarily what this review was searching for, but could be beneficial to some PHEM professionals work at the policy level. As part of the humanitarian component, there is also a heavy equity focus with community resilience as an element for low-resource communities. Although the content qualified the program for this review, the program does not explicitly mention emergencies in the humanitarian context.

Pan American Health Organization (PAHO) offers a free certificate-based course in Pan American Climate Resilient Health Systems geared towards public health professionals. (Pan American Health Organization, n.d.) This course structure is a biweekly series of webinars and

case studies with final exams to obtain a continuing education certificate. The goal of the course is to provide learners with the ability to make decisions for planning and responding to the changing climate. The webinars have students use hazard analysis strategies to assess vulnerability in humanitarian situations and apply the results to their assigned regions. Regions can be in both high- and low-resource settings with more examples of low-resources settings in the material reviewed mostly in the West Africa and South Asian context.

The University of Vermont's public health program has a course called Climate Change Emergencies. (University of Vermont, 2023) In this course, students learn about the multiple effects of climate change-related disasters ranging from floods to CHEs, migrations, and the overall policy implications of climate change. The course contains some applied methods for policy implications but only covered limited basic PHEM planning.

Finally, the literature review identified a study highlighting the need to create training materials for CHEs and climate change planning, which aligned with the Sphere standards specified in the study (Williams & Downes, 2017). In June 2023, the Sphere Standards website created some training packages in CHE settings using nature-based solutions to address climate adaptation planning (IUCN, 2023).

Discussion

As shown by the scoping review, the hypothesis was supported. There is a deficit of existing training, and few educational organizations and institutions (under 10) cover CHE, climate change, and planning together. While initially there did appear to be lots of sources that would fit the overlap inclusion and exclusion criteria identified in the initial search during the phases of the review the confirmation of the hypothesis became more apparent. With climate change coming to the forefront of public health emergencies, this deficit indicates a critical need

for additional curriculum or coursework for a CHE, climate change and applied emergency planning overlap.

In the initial searches many of the identified sources in Phase 3 were very close to satisfying the intersection of the various columns within Table 3 (see Appendix). Each highlighted program addressed climate change, CHE, and planning elements; however, they either satisfied the conditions by spreading the competencies over multiple courses, including electives, or not specifically dealing with CHE but rather humanitarian assistance related to CHE. The significance of this distinction is that the scope may fall out of the public health realm and may approach other disciplines. While still somewhat relevant to the study, they may not be the best candidate for an ideal program for RSPH. That said, after a basic course framework was established it may be beneficial to further examine the materials for additional content as RSPH build out the course and possible additional curriculum.

Further, after examining the literature in more detail in Phase 3 for specific overlaps of the CHE, climate change, and planning intersection, the quality of the programs for those particular needs came into question. While nine organizations or authors with 20 individual titles of courses, curricula, or programs were pinpointed as containing some level of all the search parameters, the training courses did not necessarily meet standards for an ideal training program on the intersection of climate change, CHE, and emergency planning for this researcher's search parameters. The ideal candidate would be ones that contained explicit mention of the three elements of CHE, climate change and emergency planning, from there an ideal candidate would showcase that knowledge surrounding the EM planning elements for climate change in a CHE environment as part of the competencies or course work. In the case of the programs that were

not ideal candidates, these courses may be good fit for other search parameters but simply did not align best with the current search.

In essence, a deeper dive into literature complicates the overall results. Many of the programs mention elements of climate change and respond to it with some form of mitigation or adaptation with a humanitarian component. Very few programs pinpoint specific strategies for planning or addressing humanitarian settings; many programs are geared towards addressing climate change locally in a high-resource setting through the lens of community resilience. This response, by default, has a tendency to eliminate or ignore areas that may be experiencing or are particularly susceptible to CHEs, as most CHEs are associated with low-resource settings and may not be easily addressed through community resilience. This in turn is not teaching future PHEM professionals how to appropriately plan and ultimately respond to climate change in the context of CHEs.

Three programs are good examples of meeting the parameters of the literature review but would not make ideal examples of a program or course for RSPH by the parameters defined by this researcher. At Colorado State University the Global Health Responder does not represent an ideal public health certificate as the focus of this program is relegated to a more "first responder" format and not on the day-to-day operations and coordination under which PHEM typically operates. A slightly refocused program would also be a model example for the purposes of RSPH. Downstate university is a good example of a certificate program that is related to both climate change and humanitarian emergencies but does not make it an ideal candidate for this review, because the humanitarian component is quite limited in scope. While there is some aspects of the program that are worth consideration for incorporating into a course for RSPH with its emphasis on equity, it is already addressed in other CHE courses and climate change

courses at RSPH. Finally, the study that later became curriculum for Sphere is less comprehensive than the WHO or certificate programs discussed. However, it is a novel and very recent approach that serves as another potential ideal candidate for examining programs for training curricula for climate change and CHE planning.

Out of the 20 identified sources, the ones most aligned with the initially stated objectives were the two John Hopkins certificates with joint elective courses (Johns Hopkins Bloomberg School of Public Health, 2023a) and (Johns Hopkins Bloomberg School of Public Health, 2023b), the WHO course materials (World Health Organization [WHO], 2020), the University of Vermont Climate Change Emergencies course (University of Vermont, 2023), and the Sphere additional course materials, (Williams & Downes, 2017).

John Hopkin's certificates have similarities to RSPH's Climate and Health and CHE certificates, as the focus of the John Hopkin's humanitarian certificate is similar to the CHE certificate and the likewise the John Hopkin's Climate and Health certificate has overlapping competencies as well. These existing parallels provide an easier avenue for change and building on the foundations that already exist at RSPH while addressing gaps that existing RSPH curriculum may have. In particular, using a specific climate-oriented track or a few courses that deal explicitly with climate change-oriented CHE events aligns with the structure of a possible additional course at RSPH. This course could create a joint training program for the CHE and Climate and Health intersection at RSPH. Some key highlighted differences from these programs largely surround RSPH's materials, which are somewhat less robust in course and class description and not as comprehensive in overall objectives and goals. Additionally, in the Climate and Health certificate at RSPH, there is less emphasis on the low resource settings.

Conversely, the CHE certificate at RSPH has a very heavy low resource setting aspect but has no climate change preparedness track like John Hopkin's humanitarian certificate does.

The WHO course materials provide a good foundation of supplemental information, particularly in the international side of PHEM. As WHO is the lead for the health cluster as discussed previously, its is critical to adopt materials and procedures for understanding how one would integrate climate change planning into the larger international CHE health context. The materials that WHO presents could be integrated within the course work to better achieve those goals.

Meanwhile, the University of Vermont Climate Change Emergencies course provides a great foundation for explaining pathways and linkages between climate change and CHEs. It further provides policy implications which can be used to flesh out the material gaps left by the John Hopkins materials and the WHO materials. While providing these links the course provides very little in terms of specifically PHEM planning which WHO and John Hopkin's materials cover in more detail.

Finally, the Sphere additional course materials are valuable for this course in three ways: 1) the initial study demonstrated the need for a similar course to the one proposed and would help to act as a guideline for the creation of such materials at RSPH, since the initial authors had success with their methods; 2) the resulting materials created for Sphere fall within the accepted Sphere guidelines which are used by the PHEM community for general guidelines in many CHE environments.; and 3) the resulting materials were extremely novel in their approaches to adaptation strategies with useful materials in low resource settings such as using indigenous building methods for climate adaptation, which satisfies multiple needs and provides a equity component.

Regardless of these existing sources, there is nothing existing that is comprehensive and complete, reinforcing the premise that there is a need for more training materials that address the intersection between climate change and complex humanitarian emergencies, as well as focusing on applied methodologies such as planning within that context. This is particularly notable within the academic sphere. However, this need is more comprehensive than certificate and degree programs. This review also highlighted various educational objectives that may be beneficial to course creation going forward for a climate change and CHE planning course. Of particular note would be the two John Hopkins certificates educational objectives which are listed below that RSPH could utilize:

- Distinguish between climate-related risks in developed countries and those in low to middle-income countries.

- Plan and implement disaster preparedness, response, and mitigation activities.

- Explain the connection between climate and public health, ranging from temperature-related mortality and increasing rates of disease to mass migration, food and water shortages, and the resulting conflict.

- Develop and discuss strategies that effectively mitigate and prevent adverse health effects caused by climate change.

Consequently, this reviewer recommends creating a course or additional curriculum for the Rollins School of Public Health to address this identified need; this course and additional supplemental courses could also be used as catalysts for other public health programs nationwide and internationally. Using the above educational objectives as a baseline for the course's objectives, as well as other best practices and challenges identified throughout the thesis, this course could fill a valuable niche within the RPSH program as a cross-listed certificate course.

A new course is likely to be met with similar issues as discussed with current CHE courses, wherein courses may be inconsistently taught based on student enrollment and instructor bandwidth. There may also be challenges in collaboration between the different subject areas. However, this course could act as a significant boon on both fronts. Student enrollment for the Climate and Health certificate has increased over the last year, with classes going as high as 50 people. Likewise, drawing on this collaboration could increase the pool of potential instructors and allow for more networking between colleagues, as well as learning new subject matter for professional development purposes.

Recommendation

Using the Existing Certificate Programs at RSPH

The two certificate programs currently offered within RSPH, Climate and Health and CHE, present a unique opportunity to bridge these two programs with a class that develops synergies not common within training programs or universities within public health. While there are similarities between many of the programs, such as the John Hopkins certificates discussed previously, none contain a course that focuses on Climate Change CHE Planning, though many contain elements of this course. Johns Hopkins University's two previously mentioned certificates best fit that model. Therefore, it would be beneficial to utilize a similar framework to create a synergetic course at RSPH, and if enough interest is generated, perhaps more curricula could be built out. Furthermore, it is critical to utilize RSPHs' existing collaborations with the CDC to create a cross-listed, certificate-focused class to address this gap. As both certificate CHE and Climate and Health have a connection to the U.S. Centers for Disease Control and Prevention subject matter experts working in those specific technical areas, it provides an excellent bridge RSPH students to have exposure and understanding in an applied setting.

Key Informant Interviews

As part of evaluating a new course, it would be beneficial to perform a series of key informant interviews. It would be beneficial to draw on informants from both subject matter experts in humanitarian emergencies and climate change to decide on cross collaborations in PHEM planning within the shared CHE and climate change territory, particularly since they would likely be key to the regular teaching of this course. These individuals could be derived from the larger community of PHEM professionals as well as climate change professionals, but at a minimum should include key stakeholders in the nearby academic and professional community and their contacts. Key informants within the humanitarian space could include WHO, USAID, UNHCR, and many others, to provide added perspectives. Additional informants could include John Hopkins professors, as John Hopkins certificates align very well with the blueprint discussed. Key academic personal with overlapping subject matter interest at Emory or neighboring universities could also be beneficial. Finally pulling in other perspectives from traditional EM, or other federal agencies could be beneficial such as FEMA or the EPA, particularly since FEMA has recently published more materials related to EM and climate change planning, and EPA is working more and more on addressing climate issues as they occur.

Recommended Focus of Course

Utilizing the sources of note from the literature review, in particular the courses work themes from the John Hopkins certificates and WHO's coursework, as well as noting the background presented in the beginning of this paper the recommended Climate Impacts and Planning in Complex Humanitarian Emergencies course should include the following elements:

- Students will examine upcoming climate emergency trends with an international perspective, including how climate change influences potential disasters.

- Students will explore the relationship between climate emergencies and complex humanitarian emergencies.

    - Students will learn about displacement from climate effects and extreme weather events, including tsunamis, hurricanes, tornadoes, wildfires, extreme heat, drought, and famine.

    - Students will examine the relationship between increased conflict from resource scarcity and climate refugees.

- Based on current climate modeling, students will examine the projected most heavily climate-change-impacted areas.

- Students will examine and apply interventions through PHEM mitigation and climate adaptation frameworks.

    - Students will examine existing interventions, learn about various planning tools, and generate new planning techniques and interventions.

Limitations

The information presented is based on the search conducted on March 27, 2023, and subsequent follow-up searches consequently materials from March 28th, 2023 – present may not be included in this text. Due to the nature of course materials being spread across different technical areas and different structures sources beyond traditional study formats, materials may have been missed in this review. Further, during the writing of this thesis, there was a significant push for literature pertaining to the synergetic practice of climate change and Emergency Management planning practices. FEMA published additional related materials while this document was in its final review process, and this publication could not be considered before the final publishing of this thesis.

Additionally, the search itself only included information since the year 2000 that was published in the English language. This limitation means that programs that were discussed in other languages based in other countries that are not English speaking or ones that existed before the year 2000 and no longer exist may not be present in this search. The literature was also subject to the researcher's judgment concerning what constituted the intersection between CHE and climate change and was accessible on their websites review. In many scoping reviews, it is customary to have a second reviewer. However, this thesis was an individual endeavor, so the review was conducted with a single reviewer. Therefore, some information could have been missed or misinterpreted because it needed to be more apparent in its specific wording.

Further, there was limited information about the course materials for the full review, so while particular examples suggested humanitarian elements within the program, these elements were insufficient to determine that this topic was covered. Finally, due to the nature of the search, the layout of a course materials webpage or course description significantly influenced whether or not it was identified in the search. The search could have missed materials if they were not presented prominently and clearly.

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Appendix

Table 1

Literature Review Search Strategy and Mesh

Database	Strategy	Run Date	Records
Medline (Ovid)	(training* OR toolkit* OR curricula* OR syllabi* OR certificate* OR cme OR che OR coursera OR edx OR udemy OR MOOC OR moocs).ti. OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR Ph.D. OR professional* OR interprofessional* OR into profession* OR multidiscipline* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedical* OR public health* OR global health* OR population health*) adj3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)).ti. OR ((academic* OR college* OR university* OR degree* OR bachelor* OR master* OR doctorate* OR Ph.D.) adj2 (minor* OR major*)).ti. AND ((environment* OR climate* OR climatic* OR humanitarian*) adj3 (emergencies OR emergency OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)).ti. OR ((extreme* OR severe*) adj3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)).ti. OR ((sea* OR ocean* OR tide OR tides OR tidal*) adj3 (level*)).ti. OR (natural disaster* OR global warm* OR deforest* OR avalanche* OR cyclonic storm* OR cyclone* OR hurricane* OR typhoon* OR tropical storm* OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR tidal wave* OR tidal wave* OR tsunami* OR tornado* OR wildfire* OR brushfire* OR forest fire* OR blizzard* OR lightning* OR snowstorm* OR snow storm* OR climate event* OR climatic event* OR heat wave* OR cold wave* OR avalanche* OR hail OR hailing OR ice storm*	2023-03-27	310 articles – 2 duplicates = 308 articles

OR dust storm* OR sandstorm* OR sand storm* OR deglaciation*).ti. OR (fire* adj3 (forest* OR wild* OR brush* OR wildland*)).ti. OR ((volcan*) adj3 (erupt*)).ti. OR ((glacier* OR glacial*) adj3 (retreat*)).ti. OR (refugee* OR asylee OR asylees).ti. OR ((displace* OR stateless*) adj3 (person* OR population* OR people OR communit* OR internally)).ti. OR ((asylum*) adj3 (seek*)).ti.

Limits: English, 2000–

Embase (Ovid)	(training* OR toolkit* OR curricula* OR syllabi* OR certificate* OR cme OR che OR coursera OR edx OR udemy OR MOOC OR moocs).ti. OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR Ph.D. OR professional* OR interprofessional* OR into profession* OR multidiscipline* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedical* OR public health* OR global health* OR population health*) adj3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)).ti. OR ((academic* OR college* OR university* OR degree* OR bachelor* OR master* OR doctorate* OR Ph.D.) adj2 (minor* OR major*)).ti. AND ((environment* OR climate* OR climatic* OR humanitarian*) adj3 (emergencies OR emergency OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)).ti. OR ((extreme* OR severe*) adj3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)).ti. OR ((sea* OR ocean* OR tide OR tides OR tidal*) adj3 (level*)).ti. OR (natural disaster* OR global warm* OR deforest* OR avalanche* OR cyclonic storm* OR cyclone* OR hurricane* OR typhoon* OR tropical storm* OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR tidal wave* OR tidal wave* OR	361 articles – 291 duplicates = 70 articles

tsunami* OR tornado* OR wildfire* OR brushfire* OR forest fire* OR blizzard* OR lightning* OR snowstorm* OR snow storm* OR climate event* OR climatic event* OR heat wave* OR cold wave* OR avalanche* OR hail OR hailing OR ice storm* OR dust storm* OR sandstorm* OR sand storm* OR deglaciation*).ti. OR (fire* adj3 (forest* OR wild* OR brush* OR wildland*)).ti. OR ((volcan*) adj3 (erupt*)).ti. OR ((glacier* OR glacial*) adj3 (retreat*)).ti. OR (refugee* OR asylee OR asylees).ti. OR ((displace* OR stateless*) adj3 (person* OR population* OR people OR communit* OR internally)).ti. OR ((asylum*) adj3 (seek*)).ti.

Limits: English, 2000–

CAB Abstracts (Ovid)	(training* OR toolkit* OR curricula* OR syllabi* OR certificate* OR cme OR che OR coursera OR edx OR udemy OR MOOC OR moocs).ti. OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR Ph.D. OR professional* OR interprofessional* OR into profession* OR multidiscipline* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedical* OR public health* OR global health* OR population health*) adj3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)).ti. OR ((academic* OR college* OR university* OR degree* OR bachelor* OR master* OR doctorate* OR Ph.D.) adj2 (minor* OR major*)).ti.	169 articles – 40 duplicates = 129 articles
	AND	
	((environment* OR climate* OR climatic* OR humanitarian*) adj3 (emergencies OR emergency OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)).ti. OR ((extreme* OR severe*) adj3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)).ti. OR ((sea* OR ocean* OR tide OR tides OR tidal*) adj3 (level*)).ti. OR (natural disaster* OR global warm* OR deforest* OR avalanche* OR cyclonic storm*	

OR cyclone* OR hurricane* OR typhoon* OR tropical storm* OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR tidal wave* OR tidal wave* OR tsunami* OR tornado* OR wildfire* OR brushfire* OR forest fire* OR blizzard* OR lightning* OR snowstorm* OR snow storm* OR climate event* OR climatic event* OR heat wave* OR cold wave* OR avalanche* OR hail OR hailing OR ice storm* OR dust storm* OR sandstorm* OR sand storm* OR deglaciation*).ti. OR (fire* adj3 (forest* OR wild* OR brush* OR wildland*)).ti. OR ((volcan*) adj3 (erupt*)).ti. OR ((glacier* OR glacial*) adj3 (retreat*)).ti. OR (refugee* OR asylee OR asylees).ti. OR ((displace* OR stateless*) adj3 (person* OR population* OR people OR communit* OR internally)).ti. OR ((asylum*) adj3 (seek*)).ti.

Limits: English, 2000–

| Global Health (Ovid) | (training* OR toolkit* OR curricula* OR syllabi* OR certificate* OR cme OR che OR coursera OR edx OR udemy OR MOOC OR moocs).ti. OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR Ph.D. OR professional* OR interprofessional* OR into profession* OR multidiscipline* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedical* OR public health* OR global health* OR population health*) adj3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)).ti. OR ((academic* OR college* OR university* OR degree* OR bachelor* OR master* OR doctorate* OR Ph.D.) adj2 (minor* OR major*)).ti. | 82 articles – 63 duplicates = 19 articles |

AND

((environment* OR climate* OR climatic* OR humanitarian*) adj3 (emergencies OR emergency OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)).ti. OR ((extreme* OR

severe*) adj3 (heat* OR cold OR hot OR weather*
OR storm OR storms OR wind OR winds)).ti. OR
((sea* OR ocean* OR tide OR tides OR tidal*) adj3
(level*)).ti. OR (natural disaster* OR global warm*
OR deforest* OR avalanche* OR cyclonic storm*
OR cyclone* OR hurricane* OR typhoon* OR
tropical storm* OR drought OR droughts OR
earthquake* OR flood OR floods OR flooding OR
floodings* OR landslide* OR mudslide* OR
rockslide* OR tidal wave* OR tidal wave* OR
tsunami* OR tornado* OR wildfire* OR brushfire*
OR forest fire* OR blizzard* OR lightning* OR
snowstorm* OR snow storm* OR climate event*
OR climatic event* OR heat wave* OR cold wave*
OR avalanche* OR hail OR hailing OR ice storm*
OR dust storm* OR sandstorm* OR sand storm*
OR deglaciation*).ti. OR (fire* adj3 (forest* OR
wild* OR brush* OR wildland*)).ti. OR ((volcan*)
adj3 (erupt*)).ti. OR ((glacier* OR glacial*) adj3
(retreat*)).ti. OR (refugee* OR asylee OR
asylees).ti. OR ((displace* OR stateless*) adj3
(person* OR population* OR people OR
communit* OR internally)).ti. OR ((asylum*) adj3
(seek*)).ti.

Limits: English, 2000–

| PsycINFO (Ovid) | (training* OR toolkit* OR curricula* OR syllabi* OR certificate* OR cme OR che OR coursera OR edx OR udemy OR MOOC OR moocs).ti. OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR Ph.D. OR professional* OR interprofessional* OR into profession* OR multidiscipline* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedical* OR public health* OR global health* OR population health*) adj3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)).ti. OR ((academic* OR college* OR university* OR degree* OR bachelor* OR master* OR doctorate* OR Ph.D.) adj2 (minor* OR major*)).ti.

AND | 177 articles

– 48 duplicates

= 129 articles |

((environment* OR climate* OR climatic* OR humanitarian*) adj3 (emergencies OR emergency OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)).ti. OR ((extreme* OR severe*) adj3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)).ti. OR ((sea* OR ocean* OR tide OR tides OR tidal*) adj3 (level*)).ti. OR (natural disaster* OR global warm* OR deforest* OR avalanche* OR cyclonic storm* OR cyclone* OR hurricane* OR typhoon* OR tropical storm* OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR tidal wave* OR tidal wave* OR tsunami* OR tornado* OR wildfire* OR brushfire* OR forest fire* OR blizzard* OR lightning* OR snowstorm* OR snow storm* OR climate event* OR climatic event* OR heat wave* OR cold wave* OR avalanche* OR hail OR hailing OR ice storm* OR dust storm* OR sandstorm* OR sand storm* OR deglaciation*).ti. OR (fire* adj3 (forest* OR wild* OR brush* OR wildland*)).ti. OR ((volcan*) adj3 (erupt*)).ti. OR ((glacier* OR glacial*) adj3 (retreat*)).ti. OR (refugee* OR asylee OR asylees).ti. OR ((displace* OR stateless*) adj3 (person* OR population* OR people OR communit* OR internally)).ti. OR ((asylum*) adj3 (seek*)).ti.

Limits: English, 2000–

| Cochrane Library | (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs):ti OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") NEAR/3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)):ti OR ((academic* OR college* OR | 49 articles − 27 duplicates = 22 articles |

universit* OR degree* OR bachelor* OR master*
OR doctorate* OR phd) NEAR/2 (minor* OR
major*)):ti

AND

((environment* OR climate* OR climatic* OR
humanitarian*) NEAR/3 (emergency OR
emergencies OR disaster* OR collapse* OR crisis*
OR crises OR impact* OR change*)):ti OR
((extreme* OR severe*) NEAR/3 (heat* OR cold
OR hot OR weather* OR storm OR storms OR
wind OR winds)):ti OR ((sea* OR ocean* OR tide
OR tides OR tidal*) NEAR/3 (level*)):ti OR
("natural disaster" OR "natural disasters" OR
"global warming" OR deforest* OR avalanche* OR
"cyclonic storm" OR "cyclonic storms" OR
cyclone* OR hurricane* OR typhoon* OR "tropical
storm" OR "tropical storms" OR drought OR
droughts OR earthquake* OR flood OR floods OR
flooding OR floodings* OR landslide* OR
mudslide* OR rockslide* OR "tidal wave" OR
"tidal waves" OR tidalwave* OR tsunami* OR
tornado* OR wildfire* OR brushfire* OR
forestfire* OR blizzard* OR lightning* OR
snowstorm* OR "snow storm" OR "climate event"
OR "climate events" OR "climatic event" OR
"climatic events" OR "heat wave" OR "heat waves"
OR "cold wave" OR "cold waves" OR avalanche*
OR hail OR hailing OR "ice storm" OR "ice
storms" OR "dust storm" OR "dust storms" OR
sandstorm* OR "sand storm" OR "sand storms" OR
deglaciation*):ti OR (fire* NEAR/3 (forest* OR
wild* OR brush* OR wildland*)):ti OR ((volcan*)
NEAR/3 (erupt*)):ti OR ((glacier* OR glacial*)
NEAR/3 (retreat*)):ti OR (refugee* OR asylee OR
asylees):ti OR ((displace* OR stateless*) NEAR/3
(person* OR population* OR people OR
communit* OR internally)):ti OR ((asylum*)
NEAR/3 (seek*)):ti

Limits: English, 2000–

Scopus		705 articles
	TITLE(training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs)	

OR TITLE((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") W/3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)) OR TITLE((academic* OR college* OR universit* OR degree* OR bachelor* OR master* OR doctorate* OR phd) W/2 (minor* OR major*))

– 344 duplicates

= 361 articles

AND

TITLE((environment* OR climate* OR climatic* OR humanitarian*) W/3 (emergency OR emergencies OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)) OR TITLE((extreme* OR severe*) W/3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)) OR TITLE((sea* OR ocean* OR tide OR tides OR tidal*) W/3 (level*)) OR TITLE("natural disaster" OR "natural disasters" OR "global warming" OR deforest* OR avalanche* OR "cyclonic storm" OR "cyclonic storms" OR cyclone* OR hurricane* OR typhoon* OR "tropical storm" OR "tropical storms" OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR "tidal wave" OR "tidal waves" OR tidalwave* OR tsunami* OR tornado* OR wildfire* OR brushfire* OR forestfire* OR blizzard* OR lightning* OR snowstorm* OR "snow storm" OR "climate event" OR "climate events" OR "climatic event" OR "climatic events" OR "heat wave" OR "heat waves" OR "cold wave" OR "cold waves" OR avalanche* OR hail OR hailing OR "ice storm" OR "ice storms" OR "dust storm" OR "dust storms" OR sandstorm* OR "sand storm" OR "sand storms" OR deglaciation*) OR TITLE(fire* W/3 (forest* OR wild* OR brush* OR wildland*)) OR TITLE((volcan*) W/3 (erupt*)) OR

TITLE((glacier* OR glacial*) W/3 (retreat*)) OR TITLE(refugee* OR asylee OR asylees) OR TITLE((displace* OR stateless*) W/3 (person* OR population* OR people OR communit* OR internally)) OR TITLE((asylum*) W/3 (seek*))

AND

TITLE-ABS-KEY(health* OR infect* OR disease* OR pandemic* OR epidemic* OR medic* OR biomedic* OR health* OR mitigat* OR adapt* OR prepared* OR manag* OR emergency OR emergencies)

Limits: English, 2000–

Academic Search Complete (EBSCO)	TI (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs) OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") N3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)) OR ((academic* OR college* OR universit* OR degree* OR bachelor* OR master* OR doctorate* OR phd) N2 (minor* OR major*))	237 articles – 203 duplicates = 34 articles

AND

TI ((environment* OR climate* OR climatic* OR humanitarian*) N3 (emergency OR emergencies OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)) OR ((extreme* OR severe*) N3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)) OR ((sea* OR ocean* OR tide OR tides OR tidal*) N3 (level*)) OR ("natural disaster" OR "natural disasters" OR "global warming" OR deforest* OR avalanche* OR "cyclonic storm" OR "cyclonic storms" OR cyclone* OR hurricane* OR typhoon*

OR "tropical storm" OR "tropical storms" OR
drought OR droughts OR earthquake* OR flood
OR floods OR flooding OR floodings* OR
landslide* OR mudslide* OR rockslide* OR "tidal
wave" OR "tidal waves" OR tidalwave* OR
tsunami* OR tornado* OR wildfire* OR brushfire*
OR forestfire* OR blizzard* OR lightning* OR
snowstorm* OR "snow storm" OR "climate event"
OR "climate events" OR "climatic event" OR
"climatic events" OR "heat wave" OR "heat waves"
OR "cold wave" OR "cold waves" OR avalanche*
OR hail OR hailing OR "ice storm" OR "ice
storms" OR "dust storm" OR "dust storms" OR
sandstorm* OR "sand storm" OR "sand storms" OR
deglaciation*) OR (fire* N3 (forest* OR wild* OR
brush* OR wildland*)) OR ((volcan*) N3 (erupt*))
OR ((glacier* OR glacial*) N3 (retreat*)) OR
(refugee* OR asylee OR asylees) OR ((displace*
OR stateless*) N3 (person* OR population* OR
people OR communit* OR internally)) OR
((asylum*) N3 (seek*))

AND

TI,AB,SU (health* OR infect* OR disease* OR
pandemic* OR epidemic* OR medic* OR
biomedic* OR health* OR mitigat* OR adapt* OR
prepared* OR manag* OR emergency OR
emergencies)

Limits: English, 2000–, peer-reviewed

| CINAHL (EBSCO) | TI (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs) OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") N3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)) OR ((academic* OR college* OR | 208 articles − 173 duplicates = 35 articles |

universit* OR degree* OR bachelor* OR master*
OR doctorate* OR phd) N2 (minor* OR major*))

AND

TI ((environment* OR climate* OR climatic* OR
humanitarian*) N3 (emergency OR emergencies
OR disaster* OR collapse* OR crisis* OR crises
OR impact* OR change*)) OR ((extreme* OR
severe*) N3 (heat* OR cold OR hot OR weather*
OR storm OR storms OR wind OR winds)) OR
((sea* OR ocean* OR tide OR tides OR tidal*) N3
(level*)) OR ("natural disaster" OR "natural
disasters" OR "global warming" OR deforest* OR
avalanche* OR "cyclonic storm" OR "cyclonic
storms" OR cyclone* OR hurricane* OR typhoon*
OR "tropical storm" OR "tropical storms" OR
drought OR droughts OR earthquake* OR flood
OR floods OR flooding OR floodings* OR
landslide* OR mudslide* OR rockslide* OR "tidal
wave" OR "tidal waves" OR tidalwave* OR
tsunami* OR tornado* OR wildfire* OR brushfire*
OR forestfire* OR blizzard* OR lightning* OR
snowstorm* OR "snow storm" OR "climate event"
OR "climate events" OR "climatic event" OR
"climatic events" OR "heat wave" OR "heat waves"
OR "cold wave" OR "cold waves" OR avalanche*
OR hail OR hailing OR "ice storm" OR "ice
storms" OR "dust storm" OR "dust storms" OR
sandstorm* OR "sand storm" OR "sand storms" OR
deglaciation*) OR (fire* N3 (forest* OR wild* OR
brush* OR wildland*)) OR ((volcan*) N3 (erupt*))
OR ((glacier* OR glacial*) N3 (retreat*)) OR
(refugee* OR asylee OR asylees) OR ((displace*
OR stateless*) N3 (person* OR population* OR
people OR communit* OR internally)) OR
((asylum*) N3 (seek*))

Limits: English, 2000–, peer-reviewed

| Education Database (ProQuest) | TI (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs) OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR | 105 articles – 55 duplicates |

interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") N/3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)) OR ((academic* OR college* OR universit* OR degree* OR bachelor* OR master* OR doctorate* OR phd) N/2 (minor* OR major*))

= 50 articles

AND

TI ((environment* OR climate* OR climatic* OR humanitarian*) N/3 (emergency OR emergencies OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)) OR ((extreme* OR severe*) N/3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)) OR ((sea* OR ocean* OR tide OR tides OR tidal*) N/3 (level*)) OR ("natural disaster" OR "natural disasters" OR "global warming" OR deforest* OR avalanche* OR "cyclonic storm" OR "cyclonic storms" OR cyclone* OR hurricane* OR typhoon* OR "tropical storm" OR "tropical storms" OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR "tidal wave" OR "tidal waves" OR tidalwave* OR tsunami* OR tornado* OR wildfire* OR brushfire* OR forestfire* OR blizzard* OR lightning* OR snowstorm* OR "snow storm" OR "climate event" OR "climate events" OR "climatic event" OR "climatic events" OR "heat wave" OR "heat waves" OR "cold wave" OR "cold waves" OR avalanche* OR hail OR hailing OR "ice storm" OR "ice storms" OR "dust storm" OR "dust storms" OR sandstorm* OR "sand storm" OR "sand storms" OR deglaciation*) OR (fire* N/3 (forest* OR wild* OR brush* OR wildland*)) OR ((volcan*) N/3 (erupt*)) OR ((glacier* OR glacial*) N/3 (retreat*)) OR (refugee* OR asylee OR asylees) OR ((displace* OR stateless*) N/3 (person* OR population* OR people OR communit* OR internally)) OR ((asylum*) N/3 (seek*))

AND

TI,AB,SU (health* OR infect* OR disease* OR pandemic* OR epidemic* OR medic* OR biomedic* OR health* OR mitigat* OR adapt* OR prepared* OR manag* OR emergency OR emergencies)

Limits: English, 2000–, peer-reviewed

ERIC (ProQuest)	TI (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs) OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") N/3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)) OR ((academic* OR college* OR universit* OR degree* OR bachelor* OR master* OR doctorate* OR phd) N/2 (minor* OR major*))	71 articles – 39 duplicates = 32 articles

AND

TI ((environment* OR climate* OR climatic* OR humanitarian*) N/3 (emergency OR emergencies OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)) OR ((extreme* OR severe*) N/3 (heat* OR cold OR hot OR weather* OR storm OR storms OR wind OR winds)) OR ((sea* OR ocean* OR tide OR tides OR tidal*) N/3 (level*)) OR ("natural disaster" OR "natural disasters" OR "global warming" OR deforest* OR avalanche* OR "cyclonic storm" OR "cyclonic storms" OR cyclone* OR hurricane* OR typhoon* OR "tropical storm" OR "tropical storms" OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR "tidal wave" OR "tidal waves" OR tidalwave* OR tsunami* OR tornado* OR wildfire* OR brushfire* OR forestfire* OR blizzard* OR lightning* OR snowstorm* OR "snow storm" OR "climate event"

OR "climate events" OR "climatic event" OR "climatic events" OR "heat wave" OR "heat waves" OR "cold wave" OR "cold waves" OR avalanche* OR hail OR hailing OR "ice storm" OR "ice storms" OR "dust storm" OR "dust storms" OR sandstorm* OR "sand storm" OR "sand storms" OR deglaciation*) OR (fire* N/3 (forest* OR wild* OR brush* OR wildland*)) OR ((volcan*) N/3 (erupt*)) OR ((glacier* OR glacial*) N/3 (retreat*)) OR (refugee* OR asylee OR asylees) OR ((displace* OR stateless*) N/3 (person* OR population* OR people OR communit* OR internally)) OR ((asylum*) N/3 (seek*))

AND

TI,AB,SU (health* OR infect* OR disease* OR pandemic* OR epidemic* OR medic* OR biomedic* OR health* OR mitigat* OR adapt* OR prepared* OR manag* OR emergency OR emergencies)

Limits: English, 2000–

| ProQuest Central (ProQuest) | TI (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs) OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") N/3 (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)) OR ((academic* OR college* OR universit* OR degree* OR bachelor* OR master* OR doctorate* OR phd) N/2 (minor* OR major*)) | 686 articles

– 551 duplicates

= 135 articles |

AND

TI ((environment* OR climate* OR climatic* OR humanitarian*) N/3 (emergency OR emergencies OR disaster* OR collapse* OR crisis* OR crises OR impact* OR change*)) OR ((extreme* OR

severe*) N/3 (heat* OR cold OR hot OR weather*
OR storm OR storms OR wind OR winds)) OR
((sea* OR ocean* OR tide OR tides OR tidal*) N/3
(level*)) OR ("natural disaster" OR "natural
disasters" OR "global warming" OR deforest* OR
avalanche* OR "cyclonic storm" OR "cyclonic
storms" OR cyclone* OR hurricane* OR typhoon*
OR "tropical storm" OR "tropical storms" OR
drought OR droughts OR earthquake* OR flood
OR floods OR flooding OR floodings* OR
landslide* OR mudslide* OR rockslide* OR "tidal
wave" OR "tidal waves" OR tidalwave* OR
tsunami* OR tornado* OR wildfire* OR brushfire*
OR forestfire* OR blizzard* OR lightning* OR
snowstorm* OR "snow storm" OR "climate event"
OR "climate events" OR "climatic event" OR
"climatic events" OR "heat wave" OR "heat waves"
OR "cold wave" OR "cold waves" OR avalanche*
OR hail OR hailing OR "ice storm" OR "ice
storms" OR "dust storm" OR "dust storms" OR
sandstorm* OR "sand storm" OR "sand storms" OR
deglaciation*) OR (fire* N/3 (forest* OR wild* OR
brush* OR wildland*)) OR ((volcan*) N/3
(erupt*)) OR ((glacier* OR glacial*) N/3 (retreat*))
OR (refugee* OR asylee OR asylees) OR
((displace* OR stateless*) N/3 (person* OR
population* OR people OR communit* OR
internally)) OR ((asylum*) N/3 (seek*))

AND

TI,AB,SU (health* OR infect* OR disease* OR
pandemic* OR epidemic* OR medic* OR
biomedic* OR health* OR mitigat* OR adapt* OR
prepared* OR manag* OR emergency OR
emergencies)

Limits: English, 2000–

| Global Index Medicus | TI (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR | 20 articles – 19 duplicates = 1 article |

remote* OR universit* OR college* OR academic*
OR student* OR medical OR biomedic* OR
"public health" OR "global health" OR "population
health") AND (degree* OR program* OR learn*
OR course* OR educat* OR specialization OR
specialty)) OR ((academic* OR college* OR
universit* OR degree* OR bachelor* OR master*
OR doctorate* OR phd) AND (minor* OR major*))
)

AND

TI ("humanitarian emergency" OR "humanitarian
emergencies" OR "humanitarian disaster" OR
"humanitarian disasters" OR "humanitarian crisis"
OR "humanitarian crises" OR "environmental
disaster" OR "environmental disasters" OR
"environmental collapse" OR "environmental
collapses" OR "environmental crisis" OR
"environmental crises" OR "environmental impact"
OR "environmental impacts" OR "environmental
change" OR "environmental changes" OR "climate
disaster" OR "climate disasters" OR "climate
collapse" OR "climate collapses" OR "climate
crisis" OR "climate crises" OR "climate impact"
OR "climate impacts" OR "climate change" OR
"climate changes" OR "climatic disaster" OR
"climatic disasters" OR "climatic collapse" OR
"climatic collapses" OR "climatic crisis" OR
"climatic crises" OR "climatic impact" OR
"climatic impacts" OR "climatic change" OR
"climatic changes" OR "extreme heat" OR "extreme
cold" OR "extreme weather" OR "Extreme storm"
OR "extreme storms" OR "extreme wind" OR
"extreme winds" OR "sea level" OR "sea levels"
OR "tide level" OR "tide levels" OR "tidal level"
OR "tidal levels" OR "tides level" OR "tides levels"
OR "ocean level" OR "ocean levels" OR "natural
disaster" OR "natural disasters" OR "global
warming" OR deforest* OR avalanche* OR
"cyclonic storm" OR "cyclonic storms" OR
cyclone* OR hurricane* OR typhoon* OR "tropical
storm" OR "tropical storms" OR drought OR
droughts OR earthquake* OR flood OR floods OR
flooding OR floodings* OR landslide* OR
mudslide* OR rockslide* OR "tidal wave" OR

"tidal waves" OR tidalwave* OR tsunami* OR tornado* OR wildfire* OR "Wild fire" OR "wild fires" OR brushfire* OR "brush fire" OR "brush fires" OR forestfire* OR "forest fire" OR "forest fires" OR "wildland fire" OR "wildland fires" OR blizzard* OR lightning* OR snowstorm* OR "snow storm" OR "climate event" OR "climate events" OR "climatic event" OR "climatic events" OR "heat wave" OR "heat waves" OR "cold wave" OR "cold waves" OR avalanche* OR hail OR hailing OR "ice storm" OR "ice storms" OR "dust storm" OR "dust storms" OR sandstorm* OR "sand storm" OR "sand storms" OR deglaciation* OR "volcanic eruption" OR "volcanic eruptions" OR "glacial retreat" OR "glaciers retreating" OR refugee OR refugees OR asylee OR asylees OR "displaced person" OR "displaced persons" OR "displaced population" OR "displaced populations" OR "displaced community" OR "displaced communities" OR "displaced people" OR "stateless person" OR "stateless persons" OR "stateless population" OR "stateless populations" OR "stateless community" OR "stateless communities" OR "stateless people" OR "transient person" OR "asylum seeker" OR "asylum seekers")

Limits: English, 2000–

Virtual Health Library	TI (training* OR toolkit* OR curricul* OR syllabi* OR certificat* OR cme OR che OR coursera OR edx OR udemy OR mooc OR moocs OR ((graduate* OR postgrad* OR undergraduate* OR bachelor* OR master* OR doctorate* OR phd OR professional* OR interprofessional* OR intraprofession* OR multidisciplin* OR interdisciplinary* OR continuing OR online* OR remote* OR universit* OR college* OR academic* OR student* OR medical OR biomedic* OR "public health" OR "global health" OR "population health") AND (degree* OR program* OR learn* OR course* OR educat* OR specialization OR specialty)) OR ((academic* OR college* OR universit* OR degree* OR bachelor* OR master* OR doctorate* OR phd) AND (minor* OR major*))) AND	397 articles – 330 duplicates = 67 articles

TI ("humanitarian emergency" OR "humanitarian emergencies" OR "humanitarian disaster" OR "humanitarian disasters" OR "humanitarian crisis" OR "humanitarian crises" OR "environmental disaster" OR "environmental disasters" OR "environmental collapse" OR "environmental collapses" OR "environmental crisis" OR "environmental crises" OR "environmental impact" OR "environmental impacts" OR "environmental change" OR "environmental changes" OR "climate disaster" OR "climate disasters" OR "climate collapse" OR "climate collapses" OR "climate crisis" OR "climate crises" OR "climate impact" OR "climate impacts" OR "climate change" OR "climate changes" OR "climatic disaster" OR "climatic disasters" OR "climatic collapse" OR "climatic collapses" OR "climatic crisis" OR "climatic crises" OR "climatic impact" OR "climatic impacts" OR "climatic change" OR "climatic changes" OR "extreme heat" OR "extreme cold" OR "extreme weather" OR "Extreme storm" OR "extreme storms" OR "extreme wind" OR "extreme winds" OR "sea level" OR "sea levels" OR "tide level" OR "tide levels" OR "tidal level" OR "tidal levels" OR "tides level" OR "tides levels" OR "ocean level" OR "ocean levels" OR "natural disaster" OR "natural disasters" OR "global warming" OR deforest* OR avalanche* OR "cyclonic storm" OR "cyclonic storms" OR cyclone* OR hurricane* OR typhoon* OR "tropical storm" OR "tropical storms" OR drought OR droughts OR earthquake* OR flood OR floods OR flooding OR floodings* OR landslide* OR mudslide* OR rockslide* OR "tidal wave" OR "tidal waves" OR tidalwave* OR tsunami* OR tornado* OR wildfire* OR "Wild fire" OR "wild fires" OR brushfire* OR "brush fire" OR "brush fires" OR forestfire* OR "forest fire" OR "forest fires" OR "wildland fire" OR "wildland fires" OR blizzard* OR lightning* OR snowstorm* OR "snow storm" OR "climate event" OR "climate events" OR "climatic event" OR "climatic events" OR "heat wave" OR "heat waves" OR "cold wave" OR "cold waves" OR avalanche* OR hail OR hailing OR "ice storm" OR "ice storms" OR "dust

storm" OR "dust storms" OR sandstorm* OR "sand storm" OR "sand storms" OR deglaciation* OR "volcanic eruption" OR "volcanic eruptions" OR "glacial retreat" OR "glaciers retreating" OR refugee OR refugees OR asylee OR asylees OR "displaced person" OR "displaced persons" OR "displaced population" OR "displaced populations" OR "displaced community" OR "displaced communities" OR "displaced people" OR "stateless person" OR "stateless persons" OR "stateless population" OR "stateless populations" OR "stateless community" OR "stateless communities" OR "stateless people" OR "transient person" OR "asylum seeker" OR "asylum seekers")

Limits: English, 2000–

Google	site:edu "climate change" "public health" curricul*	253 articles
	site:edu "climate change" "public health" syllabi*	– 66 duplicates
	site:org "climate change" "public health" course*	
	site:org "climate change" "public health" training*	= 187 articles
	site:edu "climate change" "humanitarian" curricul*	
	site:edu "climate change" "humanitarian" syllabi*	
	site:org "climate change" "humanitarian" course*	
	site:org "climate change" "humanitarian" training*	
	Scholar:	
	Allintitle: "climate change" "public health" curricul*	
	Allintitle: "climate change" "public health" syllabi*	
	Allintitle: "climate change" "public health" course*	
	Allintitle: "climate change" "public health" training*	
	Allintitle: "climate change" "humanitarian" curricul*	
	Allintitle: "climate change" "humanitarian" syllabi*	

Allintitle: "climate change" "humanitarian" course*

Allintitle: "climate change" "humanitarian" training*

De-duplicated in EndNote:	**1579 articles**

Table 2

PRISMA Table Indicating Literature Review Process
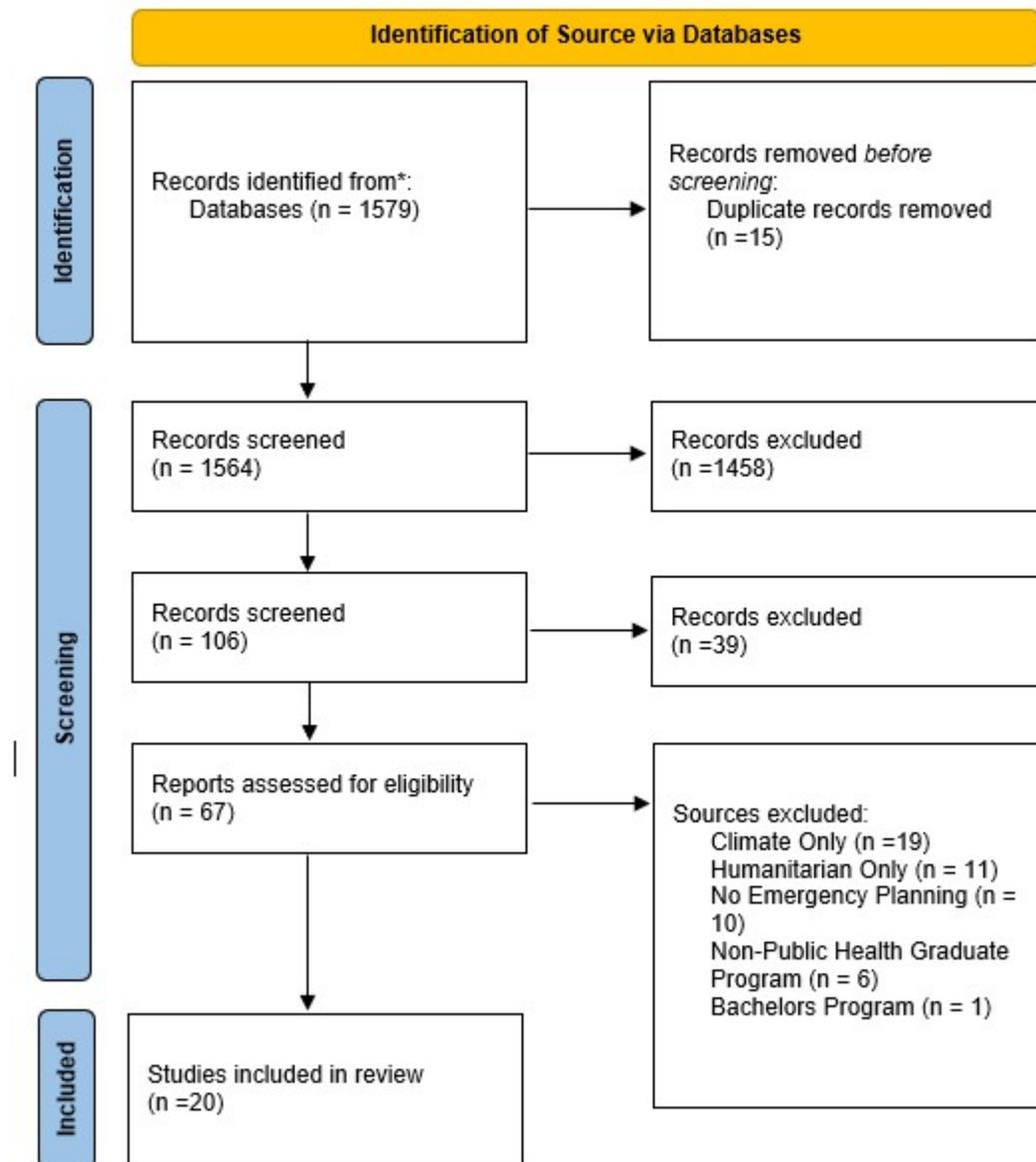
Table 3

Authors and Organizations	Title	Academic Certificate	Course	Full Grad Program	Continuing Education Curriculum
Colorado School of Public Health	Certificate in Climate & Disaster Resilience	Yes			
	Foundations for Global Health Responders		Yes		
University of Washington	Global Environmental Change and Public Health		Yes		
	Understanding and managing the health risk of climate change		Yes		
	Climate and Health Curricular Guide				Yes
Columbia University	Climate and Health certificate	Yes			
	Climate Change and Health Curriculum	Yes			
Downstate Health Sciences University	Advanced Certificate Program in Climate Change and Planetary Health	Yes			
John Hopkins Bloomberg School of Public Health	Climate and Health Certificate Program	Yes			
	Humanitarian Health Certificate Program	Yes			
Pan American Health Organization	Free Certificate-Based Course in Pan American Climate Resilient Health Systems				Yes
University of Vermont	Climate Change Emergencies		Yes		
Williams, Holly; Downes, Elizabeth	Development of a Course on Complex Humanitarian Emergencies: Preparation for the Impact of Climate Change		Yes		
World Health Organization	Climate Change and Health: Training Modules				Yes
	Human Health and Climate Change: e-course		Yes		

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	Building Resilient Communities: An Online Training		Yes	
	Climate Change and Health: Training modules		Yes	
	Human Health and Climate Change: e-course		Yes	
	ClimaHealth: eLearning and Courses		Yes	
	Environment Climate Change and Health		Yes	

Curriculum Identified that Contains Elements of Climate Change, CHE, and Planning

Note. In Table 3, the identified course materials appeared to meet all of the requirements: elements associated with climate change, CHEs, and some level of planning or applied processes for humanitarian and climate adaptation or emergency response. Multiple courses, curriculum, or certificates may fall under a single author or organization.