Wide angle

Disability and Climate Change: How climate-related hazards increase vulnerabilities among the most at risk populations and the necessary convergence of inclusive disaster risk reduction and climate change adaptation

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Foreword

Humanity & Inclusion (HI) wishes to contribute to the analysis of vulnerabilities caused by climate-related disaster risks, in a context of worldwide hydro-meteorological changes.

With generous financial support from the Hilton Foundation, we took a first step in 2017 by launching a study. Through it, HI begins to paint a more accurate account of the vulnerabilities related to climate change, with a particular focus on the situation of people with disabilities.

Two study's two authors conducted a non-exhaustive literary review, yielding varied but reliable sources. Through several examples, they point out how climate change impacts a community's basic needs during an acute crisis. They also show how climate change chips away at communities' economic resilience, access to safe housing, and to water during a non-emergency situation.

To a lesser extent, this document explores technical links—links that could be further developed—between inclusive disaster risk reduction practices and climate changes adaptation initiatives. Finally, the authors explore several good practices of inclusive climate-related risks mitigation.

Executive summary

Coffee farmers in Ethiopia, coastal dwellers in the Philippines, and almond growers in the western United States all have something in common—a changing climate and associated climate-related, hydrometeorological hazards are all threatening their lives and livelihoods.

When livelihoods disappear due to drought, or an intense tropical storm destroys a home, it is typically the most vulnerable who experience the greatest hardship. Several analysts demonstrate that climate changes should not only be considered as threats, but opportunities to support climate-resilient strategies[1]. In any case, it appears even more urgent to reinforce population capacities to cope with hydrometeorological hazards that are becoming more problematic to model, and then to predict. It requires substantial efforts to reduce their vulnerabilities.

Vulnerability can be defined as "the propensity or predisposition to be adversely affected. It encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt."[2] People with disabilities tend to be among the most vulnerable in communities across the globe, and this increased vulnerability often leads to them being disproportionately impacted by the consequences of climate change and climate-driven hazards. Yet this report finds that climate change discussions and research rarely broach the subject of disability.

Chapter One highlights the scientific links between changing measures of climate and changes in the rates and intensity of climate-driven hazards such as droughts, precipitation events, wildfires and others. These hazards, while all driven by climate, may occur across timeframes ranging from years to months to hours. Similarly, the onset of various climate-driven hazards yields varying consequences that are dependent on the nature of the hazard and the level of vulnerability experienced by the impacted population. A drought may reduce a family's or community's ability to produce food over the course of several years, potentially resulting in food insecurity, conflict, migration, and/or malnutrition. A typhoon that quickly strikes a coastal

[1] Pouliotte, Jennifer & Smit, Barry & Westerhoff, Lisa. **Adaptation and development: Livelihoods and climate change in Subarnabad, Bangladesh**. Climate and Development. 2009

[2] IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. **Summary for policymakers** & **Part A: Global and Sectoral Aspects**. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014, pp. 1-32. pp. 5

region may result in an entire community being left without shelter or access to medical care and clean water, and may eventually cause migration or other long-term consequences. Whether the hazard is sudden-onset or slow-onset, the consequences can be long-term and life-changing for those involved.

The first chapter also discusses the consequences experienced by individuals and communities that are specifically related (though not limited to) climate-driven hazards. Importantly, this section recognizes the specific ways in which people with disabilities may be disproportionately impacted by climate-driven hazards. A climate-driven hazard may present a double-burden for people with disabilities as they experience the same challenging event as everyone else, as well as the additional challenge of operating in a disrupted and resource-limited context with a disability.

Addressing the impacts of climate-related hazards often occurs through the process of disaster risk Reduction (DRR) and includes prevention, mitigation, and preparedness activities related to anticipated climate-hazard events.

Chapter Two makes the case for pursuing inclusive climate change adaptation (CCA) activities in conjunction with inclusive Disaster Risk Management (DRM) activities. DRR, which includes DRM activities, has a history of inclusive practice and has yielded a number of best practices. These may be easily translated into CCA best practices, such as designing inclusive early warning systems (EWS), including disability in baseline vulnerability and capacity assessments, and providing trainings to empower people with disabilities to participate in the DRM planning process. There is a significant overlap between DRR and CCA operations; however, it is critical that CCA personnel and CCA program funders prioritize the development of inclusive practices in order to ensure that any CCA project, regardless of DRR integration, is fully inclusive.

Chapter One - Climate change and its societal impacts

Increased global temperature is one of the most easily measured and frequently cited indicators of climate change. Each of the past 40 years have been warmer than the 20th century average, the 12 warmest years on record have all occurred since 1998, and 2016 was the hottest year on record.[3] The Intergovernmental Panel for Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer" [4] Simply stated, "Climate change is a long-term shift in global or regional climate patterns."[5]

According to the World Meteorological Organization, measures of climate include (but are not limited to) temperature, precipitation, wind, ozone, cloud properties, greenhouse gases, and air pressure.[6] Changes in average temperatures and other climate measures are not in and of themselves the cause of climate change; rather they are a demonstration of an "expansion of the greenhouse effect."[7] The greenhouse effect is the term commonly used to describe the natural way the earth's atmosphere keeps the planet warm[8]. However, the strength of the greenhouse effect has been increasing at a concerning rate—and increased ambient temperature is a direct result of a stronger greenhouse effect in a context of increased carbon dioxide emissions. As temperatures rise, they drive other climate changes and there are a number of cascading hydrometeorological effects, including increased evaporation of earth's surface water, increased precipitation, the expansion of ocean water as the water warms, and the melting of glaciers (which also contributes to sea level rise).

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[3] Northon, K. (2017, January 18). NASA, NOAA Data Show 2016 Warmest Year on Record Globally. Retrieved February 12, 2018

[4] IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Summary for policymakers & Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014, pp. 1-32

[5] National Geographic Society (2012, October 09). Climate change. Retrieved February 12, 2018

[6] World Meteorological Organization. Essential Climate Variables. 2018

[7] National Aeronautics and Space Administration. A blanket around the Earth

[8] For more information on the science behind the greenhouse effect, visit: National Aeronautics and Space Administration. A blanket around the Earth

In addition to increasing temperatures and the occurrence of dangerous heatwaves, the rise of sea levels is accelerating, and the numbers of record-breaking wildfires is growing.[9] Currently, an increase in severe droughts spares no continent,[10] and "extreme precipitation events" are increasing globally.[11] Atmospheric and oceanic variations dictate both the occurrence and the intensity of hydrological events. Sustained climate changes are likely altering the patterns of hydrometeorological hazards (many of which are referred to as natural disasters) resulting in more frequent and more intense events such as stronger hurricanes and more frequent flash floods[12]. Recent scientific modeling techniques have developed the ability to determine how much event intensity is attributable to climate change. For example, several studies published in December 2017 agree that climate change contributed 15-38% additional intensity to Hurricane Harvey, one of the most devastating climate-driven events in 2017.[13] Hurricanes, floods, droughts, fires, heat waves, and other hydrological hazards do not typically occur without inflicting significant consequences on populations, and forced evacuation, inadequate temporary shelter and housing resources, lack of clean water, decreased agricultural yields, and adverse health impacts are some of the most devastating consequences of new hydrological hazard patterns. These consequences and many others are changing the health, economic, and even physical landscape of societies and especially the less prepared ones.

A report published by CBM in 2018 noted that "the impacts of climate change are intersecting with all key current concepts and priority areas of international development and poverty alleviation."[14] Communities across the globe are facing increased rates of natural disasters (See *Table 1.1*) related to changes in hydrometeorological patterns, and these disasters are affecting livelihoods, migration patterns, housing, food security, access to clean water, and the overall health of communities spanning the globe from densely populated New York City to the rural villages of Bangladesh. Furthermore, the predictions for how increased disasters will affect both the wellbeing of people and the health of the global economy are concerning, and the predictions are even more unpalatable if international mitigation efforts do not transpire). More and more people are likely to be in harm's way as the climate continues to change, and the 2015 Global Assessment Report on Disaster Risk Reduction produced by the United Nations

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[9] Meyer, Robinson. **Has Climate Change Intensified 2017's Western Wildfires?** The Atlantic. September 7, 2017

[10] Union of Concerned Scientists. Global Warming Science. **Global Warming**

[11] Westra, S., L.V. Alexander, and F.W. Zwiers, 2013: **Global Increasing Trends in Annual Maximum Daily Precipitation**. J. Climate, 26, 3904–3918

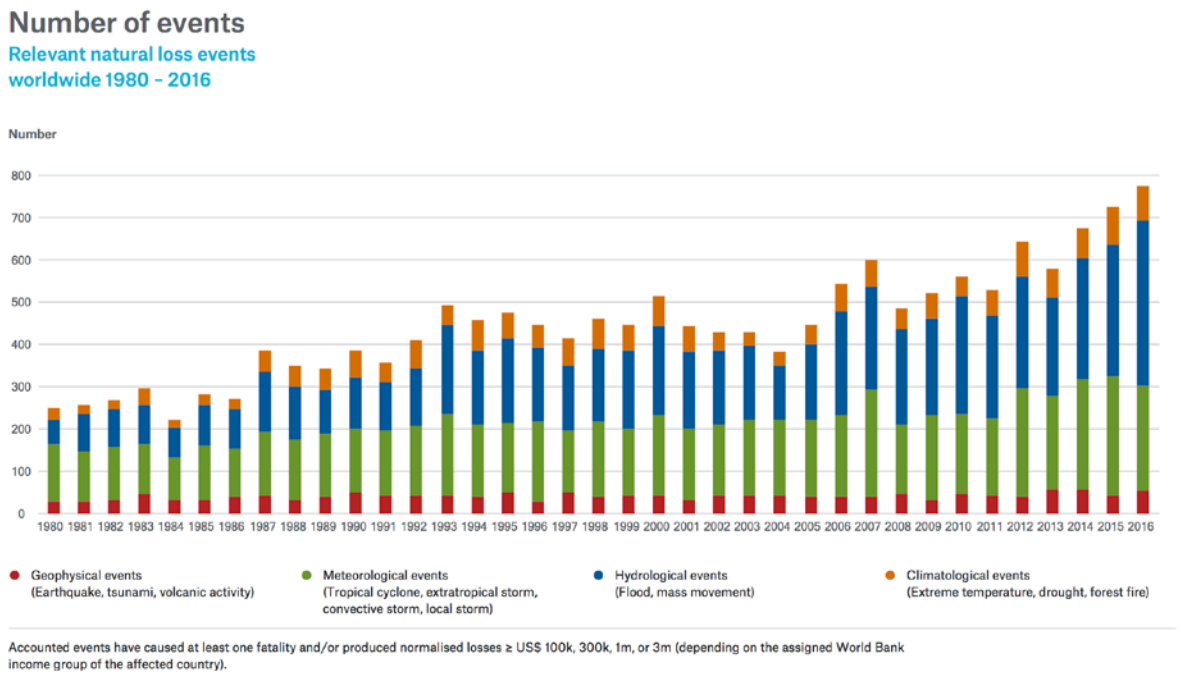
[12] Munich RE. **Natural Catastrophe Losses at their Highest for Four Years**. 2017

[13] Fountain, Henry. December 13, 2017. **Scientists Link Hurricane Harvey's Record Rainfall to Climate Change**. The New York Times

[14] Lewis, David., Ballard, Kath. **Disability and Climate Change-Understanding Vulnerability and Building Resilience in a Changing World**. 2018. CBM

Office for Disaster Risk Reduction (UNISDR) estimates that by 2050 "40 percent of the global population will be living in river basins that experience severe water stress."[15] In 2015, the Asian Development Bank said this about the predicted economic impact of climate-related disasters: "Without adaptive measures, disaster damages are expected to rise to $185 billion a year from economic and population growth alone…these estimates would be even higher if climate change and urbanization were incorporated."[16]

Figure 1 - Table produced using NatCat services from Munich Re in February 2018



Climate change and the accompanying hydrometeorological hazards, which we will expand upon in the following sections, are not currently and will not in the future have the same impact on every person or on every community. Without effective interventions through climate change adaptation (CCA) and disaster risk reduction (DRR) plans, those who are already disadvantaged (economically, socially, physically, or otherwise) will feel the negative impacts of climate change exponentially more than their less-disadvantaged counterparts. The IPCC states: "People who are socially, economically, culturally, politically, institutionally, or otherwise

[15] UNISDR. Global Assessment Report on Disaster Risk Reduction 2015. Making Development Sustainable: The Future of Disaster Risk Management. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction. 2015

[16] Independent evaluation at Asian Development Bank. Global Increase in Climate-Related Disasters. 2015, Page 2

marginalized are especially vulnerable to climate change and also to some adaptation and mitigation responses (medium evidence, high evidence). This heightened vulnerability is rarely due to a single cause. Rather it is the product of intersection social processes that result in inequalities in socioeconomic status and income, as well as in exposure. Such social processes include, for example, discrimination on the basis of gender, class, ethnicity, age, and disability."[17]

One population in particular that climate change will continue to impact disproportionately is people with disabilities. The following sections of Chapter One will describe the hydrometeorological consequences of climate change and how they impact the general population, and particularly how several disaster risk management organizations demonstrated that women, older people, young people and people with disabilities are disproportionately affected by the climate related hazards. While the topics discussed in this report zoom in on the experiences of people with disabilities and focus on best practices for that particular population, many of the impacts and practices discussed may also apply to other groups at increased risk including older people, women, and children.

1. Hydrometeorological impacts

Hydrometeorology is the branch of meteorology that "deals with the occurrence, motion, and changes of state of atmospheric water."[18] Significant and sustained changes in measures of climate can lead to changes in long-term hydrometeorological patterns, and typically result in an increase in both the frequency and the intensity of hydrometeorological hazards. Changes in patterns do vary by region and are dependent on a region's geography. Hydrometeorological hazards include tropical cyclones (also known as typhoons and hurricanes**),** thunderstorms, hailstorms, tornados, blizzards, heavy snowfall, avalanches**,** coastal storm surges, floods **(**including flash floods), drought**,** heatwaves and cold spells.[19]

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[17] IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. **Summary for policymakers** & **Part A: Global and Sectoral Aspects**. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014, pp. 6

[18] Houghton Mifflin Harcourt Publishing Company. **The American Heritage® dictionary of the English Language**, Fifth Edition. 2016

[19] Prevention Web. **Terminology**

While natural disasters are often considered linked to climate change, not all "disasters" are of the same nature. Events such as earthquake and volcanic activity are referred to as geophysical hazards, and while hydrometeorology is sometimes linked to or occur as a result of geophysical events, there is a low correlation between geophysical hazards and climate change, and this report will not analyze adaptation to disasters that are geophysical in nature. However, some best practices identified may still be transferrable to the preparation for and response to geophysical disasters. Hydrometeorological hazards are frequently referred to as natural disasters, and while not all natural disasters are hydrometerological phenomena, people often perceive hydrometeorological hazards as natural disasters when they occur. The frequency of these hazards is on the rise. Globally, there were three times as many natural disasters[20] from 2000 through 2009, as there were during the same time span just a decade earlier (1980-1989).[21] Furthermore, the trend is maintained regardless of how the decades are broken up during analysis. The Asian Development Bank notes that while there were only 1,300 disaster events[22] between 1975 and 1984, there were 3,900 disaster events between 2005 and 2014.[23]

Climate change and its hydrological impacts are not limited to only particular societies; rather the effects are being felt globally and are creating challenges for even the most developed, resource-laden countries. The past two decades have been host to some of the most extreme hydrological events ever recorded. Cyclone Nargis killed over 84,000 in Myanmar in 2008, and the 2013 tropical storm season resulted in the pummeling of the Philippines by Typhoon Haiyan—the strongest and deadliest storm to ever hit the island nation. In 2014, the western United States (U.S.) experienced the most severe drought to occur in the past millennium.[24] Soon after, 2016 was the hottest year (globally) in the past millennium.[25] The year 2017 appeared to be aiming for its own place in history. The Atlantic hurricane trifecta of Harvey, Irma, and Maria, devastating mudslides in Sierra Leone's capital of Freetown, a record-breaking

[20] The term "disaster" is borrowed from a variety of sources many times throughout this document. Not all sources define "disaster" in the same way, and not all sources specify their working definition of disaster. Definitions of "disaster" used in this report (independent of outside sources) are discussed in the following sections.

[21] Weibgen, Adrien. **The Right to be Rescued: Disability Justice in an Age of Disaster**. The Yale Law Journal. Vol. 127.7. 2015

[22] The total numbers compiled by the Asian Development Bank include geophysical hazards in addition to climate-related hazards; however, the increase is due almost completely to an increase in climate-related hazards, as there was no notable increase in geophysical hazards.

[23] Independent evaluation at Asian Development Bank. **Global Increase in Climate-Related Disasters**. 2015, pp. 1

[24] Independent evaluation at Asian Development Bank. **Global Increase in Climate-Related Disasters**. 2015, pp. 6

[25] NASA, **NOAA Data Show 2016 Warmest Year on Record Globally**, 2017

monsoon season in South East Asia, and a North American wildfire season that startled the U.S. with its ferocity and endurance. If scientific models are correct, next decades will begin to look more like the average than the outlier—and climate change will be increasingly difficult to ignore.

1.1 Slow-onset vs. sudden-onset climate change hazards

Hydrometeorlogical hazards such as flash floods and hurricanes occur quickly, typically without much warning for impacted populations, and as mentioned before, are frequently considered "natural disasters." There is a tendency to think of natural disasters only as events that occur suddenly. However, some of the most devastating hydrometeorlogical hazards occurring right now are events that are taking place over a longer period of time, such as a drought or ocean acidification. Natural hazards can be categorized two ways: sudden-onset and slow-onset. Both types of phenomenon are generating severe impacts on environment and human settlements with clear socio-spatial disparities —and both have the potential to be exacerbated by sustained climate changes.[26] One of the most devastating tropical storms to hit North America, dubbed "superstorm Sandy", is a premier example of how sustained climate changes, such as warmer sea surface water temperature and a rise in sea level, helped to turn what may have been a severe storm to begin with, into a record-breaking event.[27]

The United Nations Office for Disaster Risk Reduction (UNISDR) defines slow-onset disaster as "one that emerges gradually over time. Slow- onset disasters could be associated with, e.g., drought, desertification, sea-level rise, epidemic disease."[28] Sudden-onset disaster is defined as "one triggered by a hazardous event that emerges quickly or unexpectedly. Sudden-onset disasters could be associated with, e.g., earthquake, volcanic eruption, flash flood, chemical explosion, critical infrastructure failure, transport accident."[29] Sudden-onset disasters, such as the cyclones, tidal water incursion, and river bank erosion experienced by Bangladesh,[30] tend to receive a faster media response and can be much easier to identify than slow-onset disasters. Slow-onset disasters, such as drought, occur over long periods and cannot sustain media

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[26] Freedman, Andrew. Climate Change Is Increasing the Severity of Natural Disasters. Are Natural Disasters Increasing? edited by Roman Espejo, Greenhaven Press, 2014; Originally published as How Global Warming Made Hurricane Sandy Worse, Climate central, 1 Nov. 2012

[27] Ibid.

[28] United Nations Office for Disaster Risk Reduction. Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction. 2017. pp 13.

[29] Ibid.

[30] Islam, R., Shamsuddoha, M. Socioeconomic consequences of climate induced human displacement and migration in Bangladesh. International Sociological Association, 32, 277-298, 2017

attention in the same way as sudden-onset disasters, but this does not make them any less consequential. Drought is a great illustration of this and is one of the most devastating slow-onset disasters with a strong link to climate change. Peduzzi et al say this about drought: "Drought is a complex process to model as it is not clear when a drought starts both in spatial and temporal terms. The same deficit in precipitation may not induce similar impacts depending on types of soil, vegetation and agriculture as well as on differences in irrigation infrastructures. Moreover, casualties are not directly induced by physical drought but rather by food insecurity which is not purely a natural hazard as it includes human induced causes (such as conflicts, poor governance, etc.)."[31]

Certain slow-onset impacts of climate change such as desertification, ocean acidification, or rising sea level are not usually referred to as disasters. However, based on how "disaster" may be defined, an argument could be made that these long-term effects of climate change are indeed "disasters." Quarantelli et al (2008) use a simple definition in their *Handbook of Disaster Research (*2008) calling disaster "social disruption."[32] Another possible definition is proposed by Keim (2008) who says that disaster occurs when an event causes a mismatch between needs and resources.[33] Long-term climate changes have already begun to cause social disruption, and climate-driven events frequently overwhelm resources. For the purposes of this report, we will confine our discussion to the impacts of sudden-onset disasters and drought, which serves as a sufficient example of the ramifications of other slow-onset climate change impacts. Finally, there is an additional clarification: one event cannot by itself be said to have been caused by climate change, rather it is the accumulation of more frequent and/or more extreme events over time that indicate a trend where climate changes share a strong correlation with extreme disaster events.[34]

1.2 Global variation in climate-change trends

Climate change is happening in every corner of the globe and every region is experiencing extremes events, but the measures of climate oscillations do vary by location. Some regions are expected to feel the consequences of climate change more than others, and the level of impact

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[31] Peduzzi, P., Dao, H., Herold, C., and Mouton, F. **Assessing global exposure and vulnerability towards natural hazards: the Disaster Risk Index**, Nat. Hazards Earth Syst. Sci., 9, 1149-1159, 2009

[32] Havidan, R., Quarantelli, E., Dynes, R. **Handbook of Disaster Research. Handbooks of Sociology and Social Research**. Springer Press, 2007

[33] Keim, Mark E. **Building Human Resilience**. American Journal of Preventive Medicine, Volume 35 .5, 508-516

[34] IPCC; WHO; UNEP. **Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation**. Cambridge University Press, Cambridge, 2012, pp. 109-230

is not only determined by the hydrological events expected to occur, but also a region's ability to respond to and adapt to those hydrological impacts. Furthermore, certain vulnerabilities may become more or less important to address based on the expected climate changes in the region. For example, Africa and Asia are expected to experience dramatic economic losses from climate change due to their economic dependence on agriculture—a sector that will experience heavy consequences from drought and higher temperatures.[35] The following discussion is not an exhaustive exploration of every changing trend, but rather focuses on overarching regional trends[36]. In their 2014 report, the Intergovernmental Panel for Climate Change identified these trends and variations:

1. Sub-Saharan Africa is experiencing warming trends, extreme temperatures, drying trends, rising sea level and extreme precipitation events. Drought and the resulting declines in yield, causing food insecurity are the climate change consequences that tend to dominate regional headlines. However, extreme precipitation events recently resulted in deadly landslides in Sierra Leone in August 2017.
2. South East Asia is experiencing extreme precipitation events at alarming rates, damaging cyclones, rising sea levels, warming trends, extreme temperatures, and drying trends. These climate changes are resulting in deadly floods and increasingly deadly storm seasons. "Since 2000, 1.2 billion people have been exposed to hydrometeorological hazards alone through 1,215 disaster events"[37] Furthermore, rising sea levels and warming trends are significantly disrupting both livelihoods and the ability to produce or find traditional food sources.
3. Latin America is experiencing a warming trend, drying trend, extreme precipitation but less snow cover, extreme temperatures, and carbon dioxide fertilization.
4. Europe is experiencing extreme precipitation, rising sea levels, warming trends, extreme temperatures, and drying trends.
5. North America is experiencing warming trends, drying trends, extreme temperatures, extreme precipitation, damaging cyclones (hurricanes), and rising sea levels. In 2016, there were 19 flood related disasters in the US, the highest number ever recorded,[38] and an increase from just 15 catastrophic floods in 2015. Overall, there were 91 weather,

[35] Organization for Economic Cooperation and Development. **Adaptation to Climate Change: Policy Perspectives**. 2015

[36] Regional trends have been taken from the 2014 IPCC report (pp. 21-25)

[37] Hashim, Jamal Hisham; Hashim Zailina. **Climate Change, Extreme Weather Events, and Human Health Implications in the Asia Pacific Region**. Asia Pacific Journal of Public Health. Vol. 28.2 8S-14S

[38] Rice, Doyle. **U.S. had more floods in 2016 than any year on record**. USA Today. 2017

climate or geological disasters in the U.S. in 2016, the second-most on record[39] including severe storms, hurricanes, wildfires, earthquakes, heat waves and droughts.

6. Islands across the globe tend to be experiencing drying trends, damaging cyclones, ocean acidification, extreme precipitation, and perhaps most critically, rising sea levels.

The trends identified by the IPCC and highlighted above are important to understand due to the impacts they are having on both communities and individuals. The following section will describe and discuss the impacts that changing hydrological hazard patterns are having on the human population at large as well as populations at particularly higher risk of impact.

2. Consequences of hydrometeorological events on populations

Certain consequences of climate change, such as ocean acidification and increased temperatures, are not usually a tangible experience in people's day to day lives. Rather, many consequences of climate change happen over long periods. However, these consequences eventually start to present themselves in more sudden and immediate ways—such as a flash flood washing a house away, or a crop that never comes to yield because the ground has been too dry for too long. Discussed previously, sustained climate change also leads to extreme, sudden-onset disasters such as flash floods and hurricanes that are stronger than they would be in the absence of sustained climate changes[40]. Whether slowly or suddenly, changes in hydrometeorological patterns impact the day-to-day lives of people, and can change the long-term trajectory for individuals, families, and communities.

Research coming from the social science field as well as post-disaster research demonstrate that disasters may have long-term health, mental, and socio-economic impacts. Children especially may incur long-term health and psychological consequences. [41] Researchers have also found correlations between the levels of disaster exposure and psychological distress. For example, a study conducted after Hurricane Sandy revealed that "as damage increases so do rates of moderate mental health distress."[42] For the aforementioned reasons, and many others,

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[39] Munich RE. Climate Change. 2017

[40] Independent evaluation at Asian Development Bank. Global Increase in Climate-Related Disasters. 2015, pp. 10

[41] Weissbecker, I & Sephton, Sandra & Martin, M.B. & Simpson, David. Psychological and physiological correlates of stress in children exposed to disaster: Review of current research and recommendations for intervention. Children, Youth and Environments. 18. 30-70. 2008

[42] Abramson David, Van Alst Donna, et al. The Hurricane Sandy Person Report: Disaster Exposure, Health Impacts, Economic Burden, and Social Well-Being. Sandy Child and Family Health Study, Rutgers University School of Social Work, New York University College of Global Public Health, Columbia

it is critical to understand the impacts that climate-driven disasters are having on people and communities so that communities can plan, mitigate, and respond to disasters appropriately.

Not everyone feels the effects of climate change in the same ways. Those who are most vulnerable are disproportionately impacted by the negative consequences of climate change.[43]

Throughout this section we will look at the impacts of slow-onset and sudden-onset, climate-driven disasters and how they affect the general population and how they differentially impact vulnerable populations. It is critical to realize that the consequences of climate change are rarely felt at only one time, rather there is significant overlap between the slow-onset and sudden-onset impacts of climate change and both their causes and impacts are difficult to disentangle. This report will highlight the impacts that slow-onset and sudden-onset climate driven disasters have on societies and individuals. It is therefore just as important that climate change adaptation (CCA) strategies plan for the consequences of those climate change impacts that do not fall into the highest disaster categories.

2.1 Climate-related hazards and multifactorial disasters

Societal impacts of hydrometeorological disturbances, partly due to climate changes, include, but not exclusively, migration, economic loss, adverse health impacts, infrastructure damage, conflict, food insecurity, and water scarcity. Many of these impacts occur simultaneously and may have causal relationships with one another, such as how food insecurity may lead to malnutrition (an adverse health impact) or how significant economic loss may cause a person or a family to migrate to a different location in search of livelihood opportunity. Additionally, there is a distinction to be made between direct consequences of climate change and indirect consequences of climate change. This paper will identify infrastructure damage, water scarcity, and food insecurity as direct consequences of climate change. On the other hand, migration, economic loss, and conflict will be considered indirect consequences of climate change. Adverse health impacts can be categorized as both a direct and indirect consequence of climate change, depending on the particular health impact in focus. The following section will address some of these impacts, provide examples and attempt to describe how these impacts come to affect the larger population.

University National Center for Disaster Preparedness, Colorado State University Center for Disaster and Risk Analysis. 2015. pp. 10

[43] Independent evaluation at Asian Development Bank. Global Increase in Climate-Related Disasters. 2015, pp. 8

2.1.1 Water: Access, quantity, and quality

Water availability, or rather the lack thereof is a driver of almost every other climate change impacts that will be discussed, and is directly linked to food security and adverse health impacts, while indirectly linked to economic loss, migration, and conflict.[44] Climate change has introduced the conundrum in which some regions have far too much water and some places have far too little. Both extremes affect livelihoods, agriculture, health, and infrastructure. There are two primary, climate-driven concerns regarding water: 1) the decreasing availability of clean drinking water,[45] and 2) the decreasing availability of water for agriculture and sanitation[46].

Many regions of the world, particularly sub-Saharan Africa, the Middle East, and South East Asia suffer from chronic water shortages, droughts, and poor water delivery infrastructure. Climate models predict that water shortages will increase, and that the shortages may be exponentially worse in regions already struggling to access and maintain sufficient water supplies. One study predicts that "a global warming of 2°C above present (approximately 2.7 °C above preindustrial levels) in 2100 will result in an additional 15% (approximately) of the global population facing a severe decrease in water resources and will increase the number of people living under absolute water scarcity (<500 m3 per capita per year) by another 40%."[47]

According to the Water Resources Institute, the world's demand for water is likely to surge in the next few decades, and especially in developing countries[48]. 'But it's not clear where all that water will come from' explains the Institute. 'Climate change is expected to make some areas drier and others wetter. As precipitation extremes increase in some regions, affected communities face greater threats from droughts and floods'.

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[44] World Bank. Climate-Driven Water Scarcity Could Hit Economic Growth by Up to 6 Percent in Some Regions, Says World Bank. May 3, 2017

[45] IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Summary for policymakers & Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014, pp. 4.

[46] Islam, R., Shamsuddoha, M. Socioeconomic consequences of climate induced human displacement and migration in Bangladesh. International Sociological Association, 32, 277-298, 2017

[47] Schewe Jacob, Heinke Jens , et al. Multimodel assessment of water scarcity under climate change. Proceedings of National Academy of Sciences, 2014, 111 (9) 3245-3250

[48] World Resources Institute. Ranking the World's Most Water-Stressed Countries in 2040, August 26, 2015

Using an ensemble of climate models and socioeconomic scenarios, WRI scored and ranked future water stress—a measure of competition and depletion of surface water—in 167 countries by 2020, 2030, and 2040. The analysts found that 33 countries face extremely high water stress in 2040. It has also been found that Chile, Estonia, Namibia, and Botswana could face an especially significant increase in water stress by 2040, whereas 80% of agriculture worldwide and 95% in Africa is rain-fed, putting it at the mercy of changing rainfall patterns and intensity[49]. This means that businesses, farms, and communities in these countries in particular may be more vulnerable to scarcity than they are today. More generally, developing nations and low-income populations will feel the pinch of water scarcity the most severely as they currently have and will continue to have fewer resources to call upon either to mitigate water scarcity before it becomes unmanageable, or to provide solutions for people when they no longer have adequate water access.

It is also important to note that the water crisis is a health crisis. According to the World Health Organization: "Diarrhea occurs world-wide and causes 4% of all deaths and 5% of health loss to disability [...] As a symptom of infection, it is caused by a host of bacterial, viral and parasitic organisms most of which can be spread by contaminated water. Hygiene practices remain the primary determinant of the prevalence of diarrhea, but the infection is even more common when there is a shortage of clean water for drinking, cooking" say the analysts[50]. In a context of climate change, diarrhea is widespread throughout the developing world and worldwide, around 1.1 billion people already lack access to improved water sources and 2.4 billion have no basic sanitation[51].

2.1.2 Livelihood

The working definition of livelihood utilized in "Livelihoods and Climate Change (a report published by the International Institute for Sustainable Development in 2003) is as follows: "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base."[52] Many regions heavily impacted by climate change, particularly Africa and South Asia are facing livelihood sustainability concerns due to their overwhelming dependence on the agriculture economy. A

[49] Oxfam. **How will climate change affect what we eat?** 2014
[50] WHO, **Water-related diseases**, 23/05/2018
[51] Ibid.
[52] International Institute for Sustainable Development. **Livelihoods and Climate Change**. 2003

study conducted in Ethiopia in 2009 demonstrated that families in Eastern Lowlands, on average, faced a 70% decrease in their oxen and even higher losses for cows and goats. These losses affected families so severely that resource driven conflicts became frequent.[53]

Central America also has to cope with aggravated crises that become emblematic, notably the dissemination of plant-choking fungus called coffee rust, or 'roya', which has swept across Central America. Rising temperatures resulting from climate change are fueling the growth of rust, a disease ravaging coffee plantations, reports Oxfam[54.] All the coffee-producing countries of Central America have seen drops in production of 30% or more in each of the past two years, reports The Guardian. [55] However, according to the same article, the rust cannot survive temperatures below 10C. In Nicaragua for instance, it usually occurred only below 1,300 meters. Up in the hills, cold nights and drier weather kept the disease at bay, where the coffee farms are more and more abundant. It also leads to more deforestation across the mountains, increasing the risks of soil deteriorations for the farmers of the bay. [56] "In many cases, the area suitable for coffee production would decrease considerably with increases of temperature of only 2-2.5C," said a leaked draft of a new report from the Intergovernmental Panel on Climate Change. The panel predicts falling coffee production in a range of countries, largely because of warmer weather. [57]

Food security is closely linked to the ability to sustain a livelihood whether that is agriculture or small community business operations. Importantly, food security is also closely linked to water resources, and it can be argued that food insecurity is an indirect consequence of climate change due to the links between water resources and the ability to produce food. According to the World Bank, "agriculture accounts for 70% of water use"[58], and if water scarcity predictions are anywhere close to being accurate, there is great cause for concern regarding the global food supply. Additionally, like water scarcity, food insecurity is a driver of many other climate change consequences. A blogger for the Borgen Project makes this astute observation: "Without enough water to meet the rising demand for food, expected to be 60 percent higher than today by 2030, this spikes food prices and worsens food scarcity. For Sub Saharan Africa, food prices are expected to rise by 77 percent by 2080 as a result of climate change, compared to a worldwide average increase of 17 percent."[59]

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[53] Wynter, Alex. **Livestock in Ethiopian lowlands decimated by climate-change impacts**. International Federation of Red Cross and Red Crescent Societies. 2009

[54] Oxfam International. **Nicaragua: Impacto de la roya del café**. Dec. 9, 2014

[55] Alex Renton. **Latin America: How climate change will wipe out coffee crops – and farmers**, 30 March, 2014

[56] Ibid.

[57] IPCC, Fifth Assessment Report (AR5), 2014

[58] World Bank. **Agriculture and Food**. 2017

[59] Krejci, Cleo. **The Drastic Impacts of Climate Change and Water Scarcity**. The Borgen Project. 2017

2.1.3 Economic loss

The consequences of climate change that could be categorized as "economic loss" are endless. For the purpose of this report, we will define economic loss as a piece of capital that currently exists or an industry that is currently operating that may cease to exist or operate in the face of climate changes and hydrometeorological hazards. Most of the consequences of climate change discussed above are strongly tied to and are drivers of economic loss, with infrastructure being perhaps the most obvious indicator of loss. However, economic loss can also be measured by loss of livelihoods or loss of work due to changing climate or a disaster that affects a work area or industry.

For example, a report produced by HI regarding the 2010 Bangladesh floods revealed said that "The most frequently reported impact of the flood was loss of, or damage to property and assets. These included losing fish from ponds, livestock and poultry, and houses damaged or destroyed."[60] These particular floods also prevented the affected communities from returning too much of their agriculture industry because their land was ruined by salt-water incursion and severe erosion. Just as water scarcity, food insecurity, infrastructure damage, or adverse health impacts may be drivers (directly or indirectly) of economic loss, economic loss may at times be a driver of other consequences, and may be an especially strong driver of migration. When the Bangladesh floods destroyed families' assets and livelihood opportunities, many of them left their community for a period of time to work elsewhere, demonstrating that economic loss, even if the scale is small, can cause severe disruption for entire communities.

In this context, social protection services, where it exists, face major challenges such as the often limited capacity to cover the increased livelihood and economic loss of an entire affected population. In a context of climate changes, 'Adaptive social protection systems (ASP) are supposed to go one step further by helping ensure that these critical investments in human capital are not undermined by a crisis or shock' ensures ASP stakeholders, such as the World Bank[61].

Such coping mechanisms share many of the same features as regular social protection systems to help meet critical needs, access to health, education, and other social services, but they also include features that allow us to know not just who is poor right now, but who is vulnerable to becoming poorer in the face of a shock, what they may need to recover, as well as how to finance and deliver support to them in times of crisis. However, despite increased global

[60] HI. Coping Capacity of Persons with Disabilities in South Asia: A Qualitative Study of the Impacts and Coping Strategies of Persons with Disabilities in Communities in India, Nepal, Bangladesh and Sri Lanka. 2012, pp. 9

[61] World Bank. Using adaptive social protection to cope with crisis and build resilience. 02/2018

recognition and national and international political commitment: “social protection continues to play an under-utilized role” explains the Institute of Development Studies and the Food and Agriculture Organization[62]. Furthermore, even as programs and investments expand towards universal coverage, in fragile contexts coverage is often limited or non-existent.

2.1.4 Shelter

Infrastructure damage that is a direct consequence of climate change typically occurs during or immediately following a sudden-onset disaster such as a hurricane, mudslide, flash flood, or wildfire. Infrastructure damage following a disaster can include damage to roads and transportation systems, damage to communication channels, damage to sewer and sanitation systems, damage to water delivery and storage systems, damage to buildings (both public and private), and damage to electricity systems. While damage is most obvious following a disaster, there may also be damage created over time due to overall changes in weather patterns such as increased precipitation or decreased precipitation and increased temperatures. For example, changing precipitation patterns have significant implications for electricity systems. Many power plants require water to operate; when there is not enough, or when water temperatures get too high, they must reduce production or shut down entirely.

Over the past decade, the world has witnessed a dramatic increase in the cost of infrastructure damage due to disasters. Converse to many of the other impacts of climate change, infrastructure damage is costing high-income countries far more than low-income countries simply because high-income countries have significantly more infrastructure. 2017 was the most expensive year for disaster-related damage that the U.S. has ever experienced (costing $306 billion)[63], however, unlike the U.S. and other high-income countries, low-income countries often do not have the capacity to rebuild infrastructure once it has been damaged.

One of the most concerning infrastructure issues following a climate hazard is the loss of shelter. Shelter destruction typically occurs during sudden-onset events and is devastating for family units and communities. Following shelter loss, sustainable long-term shelter is often difficult to establish and there may not be resources to rebuild homes quickly, leaving communities unable to return and seeking employment/resources elsewhere. As demonstrated by a case study of a flood event in Bangladesh, the loss of shelter can have severe impacts at

[62] FAO and IDS. Social Protection and Resilience – Supporting Livelihoods in Protracted Crises and in Fragile and Humanitarian Contexts. 2017

[63] Wilts, Alexandra. Natural disaster damage cost America $306 billion in 2017. The Independent. 2018

the family level.[64] When a permanent shelter is destroyed families often disrupts the livelihood and long-term financial stability of a family, which may lead to a number of other consequences discussed in this section including migration, health impacts, lack of protection and family safety, and food insecurity.

2.1.5 Adverse health impacts

The health of individuals and communities is intimately connected to the climate in which they live, and when climate changes new health risks and more extreme versions of existing health risks are introduced into a population. Patz et al (2016) describes the following as just some of the potential adverse health impacts driven by climate change: "The adverse health aspects related to climate change may include heat-related disorders, such as heat stress and economic consequences of reduced work capacity; respiratory disorders, including those exacerbated by air pollution and aeroallergens, such as asthma; infectious diseases, including vector-borne diseases and waterborne diseases, such as childhood gastrointestinal diseases; food insecurity, including reduced crop yields and an increase in plant diseases; and mental health disorders, such as posttraumatic stress disorder and depression, that are associated with natural disasters."[65]

Slow-onset and sudden-onset disasters are both to blame for adverse health impacts, but the type of health impact tends to vary depending on whether the climate event occurred suddenly or over a longer period of time. Sudden-onset disasters including cyclones, floods, heatwaves, and fires are responsible for physical injuries, an increase in waterborne diseases[66], cases of hyperthermia and heat stroke, heat-related mortality, and interrupted access to critical medical care. Severe flooding in Bangladesh in 2010 demonstrated that "diarrhea, fever and skin diseases, tension and stress"[67] are health impacts that may result from a flash flood. Sudden-onset disasters have the potential to be events with a high number of fatalities occurring in a very short period of time. In 2003, over 14,000 people died in France from dehydration,

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[64] HI. Coping Capacity of Persons with Disabilities in South Asia: A Qualitative Study of the Impacts and Coping Strategies of Persons with Disabilities in Communities in India, Nepal, Bangladesh and Sri Lanka. 2012, pp. 9

[65] Patz JA, Frumkin H, Holloway T, Vimont DJ, Haines A. Climate Change: Challenges and Opportunities for Global Health. JAMA. 312(15):1565–1580, 2014

[66] Azage M, Kumie A, Worku A, C. Bagtzoglou A, Anagnostou E. Effect of climatic variability on childhood diarrhea and its high risk periods in northwestern parts of Ethiopia. PLoS ONE 12(10): 2017

[67] HI. Coping Capacity of Persons with Disabilities in South Asia: A Qualitative Study of the Impacts and Coping Strategies of Persons with Disabilities in Communities in India, Nepal, Bangladesh and Sri Lanka. 2012, pp. 12

hyperthermia, and heat stroke during an extreme heat wave lasting fourteen days.[68] In 2005, 1,200 people died during Hurricane Katrina in the Gulf Coast of the U.S.[69] Adverse health impacts resulting from sudden-onset events occur quickly, but they may have life-long consequences. For example, certain communities that survived Hurricane Katrina demonstrated increased rates of long-term mental health conditions and increased reporting of "fair or poor health".[70] A sudden-onset disaster may also affect the ability of people to access medical care, as medical infrastructure is typically no exception to the consequences of a disaster and medical personnel may be in short supply.[71]

Direct health impacts from sudden-onset disasters may occur quickly and without warning, but the health impacts from a slow-onset disaster, especially increasingly severe droughts, slowly and painfully change the health landscape of entire communities. Drought is not a high-fatality event initially, but an extended period of drought can cause death indirectly. According to Keim (2008), "Drought-related deaths are generally secondary to the agricultural, economic, and health effects of drought, such as famine, malnutrition, poverty, poor public health practices, contamination of existing water supplies, infectious diseases, social strife, and heat-related illness."[72]

It is rare that climate changes and climate-driven disasters create a brand new type of health hazard; rather, climate change is making some health hazards factors of daily life rather than occasional occurrences. Azage et al (2017) highlight that "Increases in the frequency and severity of floods and droughts are expected to exacerbate the occurrence of diarrheal diseases due to deterioration in water quality, water scarcity and increasing burden of malnutrition," and that both extreme precipitation and severe drought will impact water quality negatively, resulting in an increase in waterborne diseases.[73] Drought is also connected to an increase in vector-borne diseases like chikungunya due to changes in water storage patterns.[74]

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[68] Poumadère, M., Mays, C., Le Mer, S. and Blong, R. **The 2003 Heat Wave in France: Dangerous Climate Change Here and Now**. In Risk Analysis, 25: 1483–1494, 2005

[69] Trimble, Megan. **Top 10 Deadliest Hurricanes in U.S. History**. US News. August 31, 2017

[70] Rhodes, J., Chan, C., Paxson, C., Rouse, C. E., Waters, M., & Fussell, E. **The Impact of Hurricane Katrina on the Mental and Physical Health of Low-Income Parents in New Orleans**. The American Journal of Orthopsychiatry, 80(2), 237–247, 2010

[71] James, Eric. **Managing Humanitarian Relief: An operational Guide for NGOs**. 2008

[72] Keim, Mark E. **Building Human Resilience**. American Journal of Preventive Medicine, Volume 35 .5, 508-516, pp 4

[73] Azage M, Kumie A, Worku A, C. Bagtzoglou A, Anagnostou E. **Effect of climatic variability on childhood diarrhea and its high risk periods in northwestern parts of Ethiopia**. PLoS ONE 12(10): 2017

[74] Krystosik AR, Curtis A, Buritica P, Ajayakumar J, Squires R, Da´valos D, et al. **Community context and sub-neighborhood scale detail to explain dengue, chikungunya and Zika patterns in Cali, Colombia**. PLoS ONE 12(8), 2017

A discussion on all of the potential adverse health impacts of climate-driven disasters is not the aim of this report, but the aforementioned impacts are predicted to occur with increasing frequency. The diagram in Table 1.1 provides an overview of the health impacts of climate change and of what drives particular health outcomes.[75]

Figure 2 - Examples of climate impacts on human health[76]

	Climate Driver	Exposure	Health Outcome	Impact
Extreme Heat	More frequent, severe, prolonged heat events	Elevated temperatures	Heat-related death and illness	Rising temperatures will lead to an increase in heat-related deaths and illnesses.
Outdoor Air Quality	Increasing temperatures and changing precipitation patterns	Worsened air quality (ozone, particulate matter, and higher pollen counts)	Premature death, acute and chronic cardiovascular and respiratory illnesses	Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone and particulate matter, elevating the risks of cardiovascular and respiratory illnesses and death.
Flooding	Rising sea level and more frequent or intense extreme precipitation, hurricanes, and storm surge events	Contaminated water, debris, and disruptions to essential infrastructure	Drowning, injuries, mental health consequences, gastrointestinal and other illness	Increased coastal and inland flooding exposes populations to a range of negative health impacts before, during, and after events.
Vector-Borne Infection (Lyme Disease)	Changes in temperature extremes and seasonal weather patterns	Earlier and geographically expanded tick activity	Lyme disease	Ticks will show earlier seasonal activity and a generally northward range expansion, increasing risk of human exposure to Lyme disease-causing bacteria.
Water-Related Infection (*Vibrio vulnificus*)	Rising sea surface temperature, changes in precipitation and runoff affecting coastal salinity	Recreational water or shellfish contaminated with *Vibrio vulnificus*	*Vibrio vulnificus* induced diarrhea & intestinal illness, wound and bloodstream infections, death	Increases in water temperatures will alter timing and location of *Vibrio vulnificus* growth, increasing exposure and risk of waterborne illness.
Food-Related Infection (*Salmonella*)	Increases in temperature, humidity, and season length	Increased growth of pathogens, seasonal shifts in incidence of *Salmonella* exposure	*Salmonella* infection, gastrointestinal outbreaks	Rising temperatures increase *Salmonella* prevalence in food; longer seasons and warming winters increase risk of exposure and infection.
Mental Health and Well-Being	Climate change impacts, especially extreme weather	Level of exposure to traumatic events, like disasters	Distress, grief, behavioral health disorders, social impacts, resilience	Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.

[75] U.S. Global Change Research Program. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. 2016

[76] The diagram is taken from The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. 2016

2.1.6 Conflict

Climate change is creating insecurity in food availability, water resources, livelihoods, housing and overall infrastructure, and population movement. Where there is insecurity, there is room for conflict to emerge and take root. Conflict is not a direct impact of climate change, but is an indirect consequence often resulting from a climate-driven insecurity in a community or region. Somalia provides an unfortunate example of climate-driven conflict. *Climate Diplomacy* says this: "In Somalia, for instance, droughts often lead to a decrease in livestock prices and thus also in the incomes of pastoralists. This in turn can be exploited by militant groups such as Al Shabaab to recruit fighters among destitute herders".[77] A report recently released by *A New Climate for Peace* concludes that "large-scale environmental and climatic change contributes to creating an environment in which non-state armed groups can thrive and opens spaces that facilitate the pursuit of their strategies.[78] Similar to what has happened in Somalia, a case study on climate changes in the Lake Chad region in Africa revealed that decreased water and food resources has resulted in vulnerability and created social tensions that are resulting in opportunities for extremist group, Boko Haram, to increase recruitment.[79] Climate-driven conflict may not always involve extremist groups, but the above examples are an illustration of why the potential for climate-driven conflict should not be taken lightly.

2.1.7 Migration

Climate change adaptation is predicted to precipitate massive dislocation and migration, and almost every hydrometeorological hazard has the potential to cause migration in either the short term or the long term. The International Organization for Migration (IOM) predicts that migration is likely with hundreds of millions of people displaced from their homes by mid-century. IOM refers to these individuals as "climate migrants"–and warns that migration can lead to social and political strife worldwide.[80] Climate migration can happen for a number of reasons, including: evacuation ahead of and during strong storms but never returning; individuals, families and communities moving in search of resources, such as food and water; unlivable homes and damaged infrastructure (e.g. flooded by rising oceans and rivers); fleeing from conflicts sparked by climate -related factors. Migration, especially if unplanned, can

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[77] Detges, Adrien. **What quantitative analyses tell us about climate change and conflict**. Climate Diplomacy. 2017

[78] Ruttinger, Luke. **Insurgency, Terrorism and Organized Crime in a Warming Climate-A Summary**. A New Climate For Peace. April 20, 2017

[79] Ibid.

[80] International Organization for Migration. **Key Migration Terms**. 2011

dramatically impact people's access to basic needs such as food, water, and shelter. Migration due specifically to climate change may also put people in a vulnerable position legally (if they must leave their own country) as there are not currently any legal protections for "climate migrants" like there are other types of refugees.[81] Climate-migration does not always lead to leaving the country, but can lead to dramatic population changes within a country as happened in Syria between 2006 and 2011 when severe droughts caused one and a half million people to move into urban areas.[82]

2.2 Disproportionate impacts of climate-related hazards on societal and environmental vulnerabilities

This section discusses the ways in which persons who are more vulnerable, specifically people with disabilities, may be disproportionately impacted by the climate change consequences mentioned above. In order to move forward with this discussion, it is necessary to define "vulnerability" and "disability" for the purposes of this report, and to establish how they relate to one another.

2.2.1 Defining vulnerability and disability

Humanity & Inclusion defines vulnerable populations as: "Persons or population groups who, because of their health or social condition may find themselves unable to satisfy their fundamental needs, are particularly exposed to risks and therefore require specific measures to be put in place. The generic notion of "vulnerable population" is variable according to the context. It may include persons made vulnerable by age, gender or temporary impairment, and notably includes destitute and excluded people"[83].

On its side, the Intergovernmental Panel on Climate Change defines vulnerability as "the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt."[84] Expanding upon the previous definition, Cutter and Emrich (2017) critically

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[81] Lieberman, Amy. **Where will the climate refugees go?** Aljazeera. December 22, 2015

[82] Taylor, Matthew. **Climate change 'will create world's biggest refugee crisis'**. The Guardian. November 2, 2017

[83] HI. **Mission, Scope of activity, Principles of intervention, Charter**. 2013

[84] IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. **Summary for policymakers** & **Part A: Global and Sectoral Aspects**. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy,

point out that vulnerability is a result of a number of intersecting factors that are usually socially constructed: "underlying drivers of social vulnerability such as gender, social status, age, race and ethnicity, and wealth"[85]. The previous definition is most appropriate for determining vulnerability at the individual level, but vulnerability can be defined at either the societal or the individual level, and there are merits to both perspectives. The Asian Development Bank identifies the following as drivers of societal or community vulnerability: poor economies, weak governments, being a "developing country", and urban centers in geographically vulnerable locations. [86] Some definitions of vulnerability are all encompassing and apply to either the individual or societal level, such as the following definition proposed by UNISDR: "The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards."[87]

"Disability" can fall into several different categories depending on the disability definition framework used. For instance, the medical model of disability primarily views disability as the result of an individual medical or biological condition. The social model offers a different perspective and views disability as "being socially constructed and resulting from environmental barriers"[88]. According to the UNCRPD, "persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others"[89]. This definition and a similar definition proposed by the World Health Organization combine the two frameworks, recognizing that both biology/physical function and environment play a role in disability. The language surrounding "vulnerable populations" or "disability" or "disabled persons" can be contentious. Several analyses have demonstrated, with relevance and research findings, that "disability" does not equal "vulnerability". However, the frequent correlation between disability and vulnerability (per the above definitions) is well documented. People experiencing disability are more likely to live in poverty, to be less educated, and to have less access (physically and in terms of the ability to acquire resources as

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S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014, pp. 1-32. pp. 5

[85] Cutter, S., Emrich, C. **Helping Those Most in Need First: Leveraging Social Vulnerability Research for Equitable Disaster Recovery**. Natural Hazards Center. 2017

[86] Independent evaluation at Asian Development Bank. **Global Increase in Climate-Related Disasters**. 2015, pp. 9

[87] United Nations Office for Disaster Risk Reduction. **Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction**. 2017. pp 13

[88] Mirza, Mansha. **Unmet needs and diminished opportunities: disability, displacement and humanitarian healthcare**. The United Nations Refugee Agency. 2011

[89] United Nations. **Convention on the Rights of Persons with Disabilities**. 2006

needed) than people without a disability.[90] It is common that a physical or mental disability occurs in conjunction with another measure of vulnerability such as being a woman or being older, and that this happens far more frequently in lower-income countries than in higher-income countries.[91] Certain drivers of vulnerability, such as gender, age, race, and ethnicity all occur independently of disability, however, other drivers such as social status, wealth, and level of education are proven to be closely linked to disability and the correlation is positive: the presence of disability often indicates lower social status, less wealth, and fewer years of education attained.[92]

Everyone is "vulnerable or at risk" during a disaster or from the impacts of climate change, but there are certain individuals and communities who suffer greater consequences than others due to any number of vulnerability indicators. For the purposes of this report, we will be focusing on the portion of the population that is vulnerable specifically due to a disability. Also note that while some people may be facing climate change with a pre-existing disability, climate related disasters is also likely to lead to disabilities in individuals or communities that are already vulnerable in other ways. This will be examined in a later section.

2.3 Exacerbated vulnerabilities of people with disabilities in the context of climate change related hazards

An emergency of any kind, whether or not it is related to climate change, puts people with disabilities at an increased risk due to their heightened vulnerability. A person with a disability experiences the same emergency situation that everyone else faces, in addition to the extra challenges they face on a daily basis—and the emergency is highly likely to exacerbate daily challenges. A guidance note created by the World Health Organization regarding disability and emergency risk management describes just a few of the obvious, additional challenges faced by people with disabilities in an emergency: "Emergencies can increase the vulnerability of people with disabilities, as people with disabilities may be less able to escape from hazards; may lose essential medications or assistive devices such as spectacles or hearing and mobility aids; or may be left behind when a community is forced to evacuate. People with disabilities may also have greater difficulty accessing basic needs, including food, water, shelter, latrines and health-care services."[93]

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[90] World Health Organization & The World Bank. World Report on Disability 2011. Geneva: World Health Organization, 2011

[91] Ibid.

[92] Ibid.

[93] World Health Organization. Disability and Emergency Risk Management for Health. 2013

Beside the physical barriers (lack of accessibility of the distribution areas, of the water and sanitation facilities etc.), a policy brief published by HI observes, "By the time of disasters, persons with disabilities tend to be invisible in emergency registration systems and excluded from disaster management efforts"[94]. Several technical baselines produced by the organization demonstrate that following a natural disasters the social barriers faced by people with disabilities have an impact on their own safety: lack of inclusive awareness and disaster preparedness initiatives limit their capacity to observe safety instructions; many of them consider that their participation will not be effective, or even that their participation could prejudicially affect them[95], emotional distress and trauma unnoticed by emergency services but caused by a crisis situation often has long term consequences and especially on people with disabilities etc.[96] The following sections will highlight the disproportionate impact experienced by people with disabilities during climate-driven disasters and will address the consequences that have been described for the general population including water scarcity, food insecurity, adverse health impacts, infrastructure damage, migration, and economic loss.

2.3.1 Livelihood and economic loss

Even outside of times of crisis, the most vulnerable groups and especially people with disabilities face more significant difficulties and challenges than the rest of the population, as demonstrated by a more limited access to education, health and other essential services, a higher unemployment rate, a very low access to micro-financial services etc. All over the most disaster prone areas, the "most-at-risk populations" are more challenged in case a climate-related hazard strikes. Following a climate-driven event, people with disabilities face similar economic losses as the rest of their community, but tend to have an exponentially more difficult time securing additional resources or recovering from the loss. A study of people with disabilities following flooding in Bangladesh showed that "persons with disabilities were identified as having fewer avenues to search for economic alternatives."[97] People with disabilities are frequently unable to access established distribution points following a disaster, meaning they do not receive relief items directly or at all.[98] The report on Bangladesh, in addition to a case study following floods in India, agree that economic recovery takes longer for

[94] HI. Inclusive Disaster Risk Reduction. 2017
[95] Emergency Livelihood toolbox, 2018, '**Inclusive data collection process**', Humanity & Inclusion
[96] HI. Inclusive Disaster Risk Reduction. 2017
[97] HI. Coping Capacity of Persons with Disabilities in South Asia: A Qualitative Study of the Impacts and Coping Strategies of Persons with Disabilities in Communities in India, Nepal, Bangladesh and Sri Lanka. 2012
[98] Ibid. pp. 27

those with disabilities. Additionally, people with disabilities tended to spend more time in shelters or away from home than those without disabilities.[99] These dynamics do not only occur in developing countries or in rural areas. For example, following Hurricane Katrina, the entire city of New Orleans was dealing with catastrophic economic loss. However, reports showed that those who were already disadvantaged due to their lower income were more likely to lose their homes due to living in cheaper housing located in the flood zone.[100] Many of these homes remain in disrepair.

2.3.2 Water shortages an adverse health impacts

It has been previously mentioned that nations with fewer resources will be the ones hit hardest by water scarcity, and the same principle holds true for people at increased vulnerability. Specifically, the most-at-risk populations and especially people with disabilities will be disproportionately impacted by water scarcity and will suffer the most from a lack of water resources, and while climate change overall may make water access more difficult for people with disabilities, disasters certainly increase access difficulties. A 2011–12 survey of 16 Area Development Programs run by World Vision in Ethiopia showed that 96.6% of people with disabilities and older people faced difficulties in accessing basic water facilities, notably in the southern part of the country, where droughts are the most severe. Another survey of people with disabilities affected by floods in Sri Lanka revealed that even though most of them did receive water during response efforts, they frequently had to rely on others to obtain water and other distributed materials.[101] According to the World Bank, there is "a strong correlation between aging and the onset of disability". "Persons with disabilities make up a sizable portion of the 2.4 billion people who still lack access to sanitation, and the 663 million who lack access to safe drinking water" add the study[102]. Although there are inadequate data to assess the exact number of people with disabilities who face water scarcity and lack of access, there is evidence that points to the relative marginalization and invisibility of this population in water sector development programs. This situation is getting worse in a context of climate changes.

In addition to health impacts faced by the general population following a disaster, people with disabilities are likely to experience health complications that are unique to their disability. For example, during flooding in Bangladesh it was noted that in addition to the health issues that everyone faced following the floods (diarrhea, fever, skin diseases, tension, stress), people with

[99] Ibid. pp. 24
[100] Osunsami, Steve. **Poorest Hit Hardest by Hurricane Katrina**. ABC News, 2005
[101] HI. **Coping Capacities of People with Disabilities in Disasters: Reflective Study of Sri Lanka Floods January 2011**. 2012
[102] Including Persons with Disabilities in Water Sector Operations : A Guidance Note, World Bank, 2017

disabilities also faced additional health complications related to their previous impairment.[103] Many people with disabilities rely on assistive devices that enable them to hear better, see better, achieve mobility, or that enhance physical function in other ways. During a disaster, these devices are often lost or damaged, leaving people with no adaptive assistance when they may need it most, and adaptive assistive devices are not typically included in distributed relief materials. Not only is it difficult for people with disabilities to access assistive devices, but access to both standard and specialized medical care can be difficult or non-existent. Following severe floods in Sri Lanka in 2011, people with disabilities reported difficulty accessing necessary medical care and first aid services during the response phase, presumably due to an inability to access medical service sites. [104]

Certain climate-driven disasters, such as heat waves, put people with disabilities at an increased risk simply due to the nature of the event. Martiello et al (2008) notes that people with disabilities are not the only vulnerable population at increased risk for heat-related mortality during heat waves and that "Groups at risk include older people, the urban population, individuals with impaired health and those with low income."[105] In Nairobi, for instance, summer temperatures in Kibera, Mathare and Mukuru slums are often higher than in other parts of the city. A study by scientists at Johns Hopkins University found "The slums are hotter because of lack of trees and vegetation…poor construction materials and, in some cases lower elevation also contributes to the warming in the slums.[106] Furthermore, according to Mengmeng et al (2015), "those with low SES (socioeconomic status) had increased morbidity and mortality during extreme heat."[107] Discussed previously, there is often a correlation between disability and low SES, and people with disabilities are at increased risk during heat emergencies due to a lack of access to mitigating resources and due to the potentially deadly interaction between the heat and particular physical impairments. Similar principles hold true during other disasters, such as floods where people with disabilities may not be able to escape to higher ground on their own, or during cyclones when people with disabilities may not be able to access the shelter site.

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[103] HI. **Coping Capacity of Persons with Disabilities in South Asia: A Qualitative Study of the Impacts and Coping Strategies of Persons with Disabilities in Communities in India, Nepal, Bangladesh and Sri Lanka**. 2012, pp. 12

[104] HI. **Coping Capacities of People with Disabilities in Disasters: Reflective Study of Sri Lanka Floods January 2011**. 2012

[105] Martiello, MA., et al. **Health Effects of Heat Waves**. Ig Sanita Pubbl. Nov-Dec;64(6):735-72, 2008

[106] Suliman, Adela. **Flexibility, long-term planning reduce Somali famine threat, report says**. Thomson Reuters Foundation, August 22, 2017

[107] Li, Mengmeng, et al. **Heat Waves and Morbidity: Current Knowledge and Further Direction-A Comprehensive Literature Review**. Int. J. Environ. Res. Public Health 12, no. 5: 5256-5283, 2015

2.3.3 Infrastructure

Infrastructure damage can have a dramatic impact on how people with disabilities are able to recover from a disaster, and whether not infrastructure is accessible and has been built with people with disabilities in mind can often make a life or death difference during a disaster. People with disabilities and other vulnerable or disadvantaged people/communities often find themselves experiencing insufficient infrastructure even before a climate-driven event occurs (sometimes due to the inaccessible design of the infrastructure). The *Global Assessment Report on Disaster Risk Reduction* (2015) notes that "just as vulnerability is not evenly distributed through the hazardscape, infrastructure robustness is not equal across communities."[108] Marccus Hendricks, a researcher at the Natural Hazards Center at University of Colorado agrees saying, "Changing climate and growing infrastructure demands have led to already socially vulnerable populations experiencing a more threatening hazardscape."[109] For people with disabilities, a pre-existing lack of sufficient infrastructure sets them up for exponential difficulties, and climate change consequences are exacerbating pre-existing inequalities. The *Global Assessment Report on Disaster Risk Reduction* (2015) states that "Socially segregated urban development in turn generates new patterns of disaster risk. Low-income households are often forced to occupy hazard-exposed areas with low land values, deficient or non-existent infrastructure and social protection, and high levels of environmental degradation."[110]

When a disaster damages infrastructure, , roads in particular, people with disabilities have an even harder time moving about, accessing shelter (even if one exists, it may not be accessible for certain persons), or obtaining resources.[111] Infrastructure damage is far more than an inconvenience for people with disabilities and often results in life or death situations and a lack of access to protections and resources dictated by human rights agreements. A case study on flooding in India revealed that "Water and sanitation was a major concern for people with disabilities who due to lack of mobility reported drinking flood water into which they have defecated."[112]

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[108] Hendricks, Marccus. **Understanding the Unprecedented: Social Vulnerability, Infrastructure Failure, and Catastrophe**. Natural hazards center, 2017

[109] Ibid.

[110] UNISDR. **Global Assessment Report on Disaster Risk Reduction 2015. Making Development Sustainable: The Future of Disaster Risk Management**. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction. 2015

[111] HI. **Coping Capacity of Persons with Disabilities in South Asia: A Qualitative Study of the Impacts and Coping Strategies of Persons with Disabilities in Communities in India, Nepal, Bangladesh and Sri Lanka**. 2012, pp. 25

[112] Ibid, pp. 24

2.3.4 Migration

People with disabilities will have an especially difficult time managing mass displacement and migration. Among other things, they may lack access to reliable, accessible transportation, have difficulty finding accessible and appropriate housing, become disconnected from personal or social support networks, experience difficulty enrolling in social services, protection or maintaining healthcare, and/or be unable or not allowed to cross borders because of their disability.[113] In 2011, the United Nations High Commissioner for Refugees explained the experience of migration for those with disabilities as follows: "Persons with disabilities are not a homogeneous group; they have different capacities and needs, and contribute in different ways to their communities. When displaced, they have the same basic needs as other persons. In addition, they may experience difficulty in moving, hearing, seeing, communicating or learning. These difficulties amplify the often severe challenges posed by forced displacement. Persons with disabilities may also need additional protection. They are at heightened risk of violence, including sexual and domestic abuse; exploitation by family members; discrimination; and exclusion from access to humanitarian assistance, education, livelihoods, health care, nationality, and other services."[114]

Clearly, being forced to move from one's home is an extraordinarily traumatic experience for everyone—and even more so for those contending with a disability. The slower impacts of climate change, such as ocean acidification, desertification of agricultural lands, or the encroachment of the ocean on homes and communities are not invisible to the people who live in those communities. For some, if adaptation is not pursued, the issue of migration is more a question of when they will have to migrate rather than a question of if they will have to migrate —the writing is on the wall, so to speak, and unfortunately, no amount of climate change mitigation is going to alter the sustainability of living in particularly at risk locations in the short term. As previously discussed, people with disabilities are more likely to live in poverty and to have fewer resources in general. Bangladesh is an example of a country where floods and extreme and erratic precipitation are washing away land more frequently, forcing people to migrate from their homes. Islam and Shamsuddoha (2017) highlight that those with resources in Bangladesh often migrate after planning for it, "while those who are poorer, especially

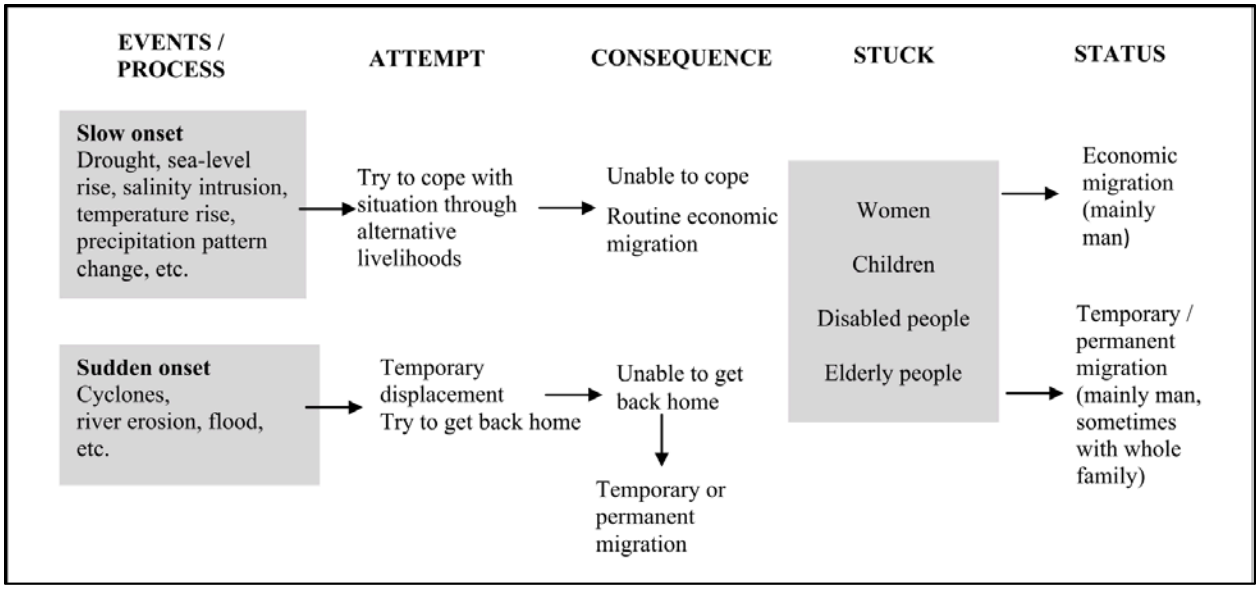
[113] Ghenis, Alex. Making migration accessible: Inclusive relocation for people with disabilities. Environmental Migration Portal, Policy Brief Series 6.2, 2016

[114] United Nations High Commissioner for Refugees. People with Disabilities. 2011

women, children, older people and disabled people, have fewer options for either planned or forced migration"[115]

The other issue arising with migration is the inability to migrate when migration is necessary. Those without access to resources, with physical limitations, or who are tied to a livelihood only available in a climate-affected area may not only be unable to leave in the middle of a sudden-onset disaster, but they may be unable to migrate in search of better livelihood opportunities. Islam and Shamsuddoha (2017) observed that "those who are stuck, usually women, children, disabled and elderly people, were particularly vulnerable as they stay and starve in unsafe locations where they faced other forms of oppression."[116]

Figure 3 – Migrations to cope with slow or sudden onsets, 2017



Adopted from Islam and Shamsuddoha (2017), the above diagram depicts how migration may occur differently depending on whether the disaster predicating migration is slow-onset or sudden-onset in nature. The diagram also shows how those who become "stuck" are individuals with increased vulnerability.

[115] Islam, R., Shamsuddoha, M. Socioeconomic consequences of climate induced human displacement and migration in Bangladesh. International Sociological Association, 32, 277-298, 2017, pp. 279
[116] Ibid. pp. 293

Chapter Two - Disaster risk reduction, climate change adaptation, and disability inclusion: A necessary convergence

The impacts of climate change are necessitating both informal and formal adaptation processes to occur around the world, and these processes and plans are typically referred to as Climate Change Adaptation (CCA). According to the United Nations Development Programme, CCA is a "process by which strategies to moderate, cope with and take advantage of the consequences of climatic events are enhanced, developed, and implemented."[117] It is important to note the difference between climate change "adaptation" and climate change "mitigation." Mitigation (in the case of climate change) is an attempt to slow down or reverse the current climate change trends (i.e.; reducing carbon dioxide emissions in order to slow down global temperature increases).[118] Adaptation consists of efforts to ensure that people and communities survive and thrive in spite of the climate changes that are currently occurring and are anticipated to occur for many generations. In 2009, Global Leadership for Climate Action said that "Given the far-ranging adverse impacts of climate change, adaptation must be an integral component of an effective strategy to address climate change along with mitigation. The two are intricately linked—the more we mitigate, the less we have to adapt."[119] Princiotta and Loughlin (2016) agree stating "Even with an aggressive international mitigation effort, humanity will still need to adapt to significant climate change."[120]

It is becoming increasingly clear to people from all varieties of scientific and political backgrounds that some level of adaptation to our changing world is necessary. Adaptation needs and strategies vary depending on regional climate challenges and specific country concerns. Ethiopia, for example, is quickly realizing a need to adapt their premier industry, coffee bean development, to the realities of a hotter, drier climate in order to preserve both individual livelihoods as well as the economic stability of the country as a whole.[121] In light of increasingly dry landscapes and increasingly severe forest fires, the western region of the U.S. will likely need to alter housing development patterns in order to preserve lives and limit

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[117] Victorian Centre for Climate Change Adaptation Research. Climate change adaptation definitions

[118] United Nations Office for Disaster Risk Reduction. Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction. 2017. pp 20.

[119] Global Leadership for Climate Action. Facilitating an International Agreement on Climate Change: Adaptation to Climate Change. 2009

[120] Princiotta, FT., Loughlin, DH. Global Climate Change: the quantifiable sustainability challenge. J Air Waste Manag Assoc. 64(9):979-94, 2014

[121] Columbus, Courtney. Ethiopia's Coffee Farmers Are 'On the Front Lines of Climate Change'. National Public Radio. June 19, 2017

economic losses during intense wildfire seasons.[122] While many agree that mitigation is necessary in addition to adaptation, mitigation efforts require both a scientific and political consensus regarding the cause of climate change and what kinds of mitigation measures are appropriate, and while scientific consensus exists (97% of climate scientists agree that humans have caused and continue to drive climate changes[123]), political will-power is lacking[124] Regardless of whether the international community is able to pursue mitigation efforts, adaptation is currently being pursued at many national and local levels. Decisions regarding how to pursue adaptation will have tangible impacts on entire communities, and the pursuit of climate change adaptation without the consideration of climate change's disproportionate impact on people with disabilities, adaptation efforts will continuously fall short. The remaining sections of this report will make two propositions:

- Incorporating climate change patterns as well as inclusion into all Disaster Risk Reduction (DRR) efforts is critical to achieving successful DRR;
- Climate Change Adaptation (CCA) personnel should pursue disability inclusive practices as a way to address the disproportionate impact of climate-related hazards on people with disabilities.

1. Making the case for increased integration of climate change adaptation into DRR Strategies

As discussed in the previous chapter, climate change is exacerbating the impacts of more frequent and more intense natural hazards, depending on geographic areas. In light of this, disaster risk management (DRM) personnel are more and more being forced to consider the potential impacts of climate change as they prepare for, mitigate, and respond to future disasters. However, DRM is not the only sector considering climate change impacts. International organizations, national governments, local governments, and local communities are pursuing climate change adaptation in a variety of both formal and informal ways. [125]

There have been several iterations of international priorities regarding DRR that have been established over the past several decades including the Hyogo Framework for Action and the

[122] Atkin, Emily. **Should We Rebuild Homes in Wildfire Zones?** New Republic. October 16, 2017

[123] Cook J., et al, **Consensus on consensus: a synthesis of consensus estimates on human-caused global warming**, Environmental Research Letters Vol. 11 No. 4, 13 April 2016

[124] Tollefson, Jeff. U.S. **Government Report Says Climate Change is Real, and Humans are to Blame**. Scientific American, 2017

[125] Kreslake, Jennifer; Sarfaty, Mona; Maibach, Edward. **Documenting the Human Health Impacts of Climate Change in Tropical and Subtropical Regions**. Am. J. Trop. Med. Hyg., 95(2), pp. 260–262, 2016

Sendai Framework for Disaster Risk Reduction (2015-2030). These international agreements, in conjunction with agreements and agendas established at national and local levels have helped to ensure that DRR is a political priority in many regions and nations. Regions that are highly impacted by climate-driven disasters have an especially strong incentive to create and sustain political will for the prioritization of DRR. In 2015 for example, Africa demonstrated regional commitment to DRR when it became the "first region to officially adopt a position (*the Yaounde Declaration*) on a post-2015 framework on disaster risk reduction at the 5th Session of the Africa Regional Platform."[126] The position was later formally adopted by the African Union and numerous other initiatives have followed, including various training programs and the development of the Africa Disaster Risk Financing Initiative.

Similar international agendas have recently been adopted regarding climate change, namely the Paris Climate Agreement established in 2016. While the Paris Climate Agreement primarily focuses on mitigation rather than adaptation (as mitigation will require international cooperation, adaptation should be individualized and occur at the national and local levels[127]), it is an indication of the level of priority placed on addressing climate change.

There is a natural point of overlap between climate change adaptation (CCA) and disaster risk reduction (DRR), and a large variety of organizations, including the IPCC, the World Meteorological Organization, CBM, the Asian Development Bank, the Organization for Economic Cooperation and Development, and many others, suggest that aligning CCA with DRR would benefit both efforts greatly. Moving forward it is critical to this report to define DRR, and The United Nations Office for Disaster Risk Reduction defines DRR as follows: "Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development"[128]

The argument to align CCA and DRR is difficult to make without also making the argument that DRR should be aligned with sustainable development practices. The goals of sustainable development, DRR, and CCA planners all overlap in such a way that it is nearly impossible to neatly separate these practices into three separate categories. Rather, they each are a key to the success of the other. Poor development choices that do not consider the impact of disasters on economies or infrastructure means DRR practitioners have very little to work with when disaster strikes. DRR practitioners who fail to consider how climate change may impact disaster

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[126] African, Caribbean and Pacifica Group of States. **Building Disaster Resilience in Sub-Saharan Africa**

[127] Keim, Mark E. **Building Human Resilience**. American Journal of Preventive Medicine, Volume 35 .5, 508-516

[128] United Nations Office for Disaster Risk Reduction. **Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction**. 2017. pp 13

patterns in their community are ensuring that they will not be adequately prepared nor able to adequately respond to a future disaster. CCA practitioners who do not collaborate with sustainable development planners or DRR personnel are missing critical opportunities for collaboration, for plans that yield co-benefits, and are forfeiting the opportunity to ensure that society (rather than just a handful of technical experts) incorporate climate change considerations.

Just as successful DRR goes hand in hand with sustainable development, so too does successful climate change adaptation. The IPCC recognizes this as well and says that "Steps that build resilience and enable sustainable development can accelerate successful climate-change adaptation globally." [129] Many people and organizations recognize the necessity of collaboration. "Reid (2013) states that creating climate awareness for all development work in climate sensitive countries and building the resilience of the poorest people should be embedded in development work…"[130] Keim (2008) highlights the economic argument: "Many economists believe that measures directed toward the underlying macro-level causes of climate change vulnerability should be broadly integrated into development policy, not confined to climate change adaptation strategies"[131] The efforts in Ethiopia to save their coffee industry from the impacts of climate change is a brilliant example of how climate change adaptation can be bolstered by sustainable development practices and how sustainable development must take into account the predicted impacts of climate change over the near and long-term. [132]

Returning to the opening argument, not only should both DRR and CCA practitioners be collaborating with sustainable development personnel, they should also be collaborating with each other. In 2004, a report issued by UNDP made the argument that "A developmentally informed perspective on disasters lies at the intersection of work normally undertaken by two different communities: development planners and disaster risk reduction practitioners."[133] This is still true today, and it could be argued that not only should DRR practitioners still be thinking about sustainable development, but that now they should also be thinking about climate

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[129] IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. **Summary for policymakers** & **Part A: Global and Sectoral Aspects**. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014, pp. 18

[130] Leonard Cheshire Disability. **Disability and Climate Resilience: A Literature Review**. 2017

[131] Keim, Mark E. **Building Human Resilience**. American Journal of Preventive Medicine, Volume 35 .5, 508-516, pp. 2

[132] Mullan, Michael. **Wake up and save the coffee: Making Development Climate-resilient**. OECD Insights. April 28, 2014

[133] UNDP. **Reducing Disaster Risk, a Challenge for Development**. 2004. pp. 17

change adaptation, and a number of organizations are already on board. The World Meteorological Organization includes linking CCA with DRR as part of their "two-tiered" plan to fulfill Hyogo Framework mandates: "The WMO DRR two-tier work plan (hereafter referred to as the DRR Work Plan) links, (i) Development of guidelines, standards and training modules for DRR thematic topics based on documentation and synthesis of good practices; and (ii) Coordinated DRR and climate adaptation national/regional capacity development projects, to strengthen hydrometeorological capabilities."[134] The Asian Development Bank says this: "Disaster risk management needs to be understood as an investment, going beyond relief and reconstruction to a dual approach of prevention and recovery. Economists can facilitate this understanding by building into their calculus the role of natural hazards and climate impacts in shaping lives and livelihoods. Factoring this into the influential growth scenarios could make a big difference to policy making. Climate mitigation and adaptation need to be seen as a vital and high return part of this approach."[135]

2. Inclusion of people with disabilities: Why is it important to CCA Efforts?

Discussed in Chapter One of this report, the impact of climate change on people with disabilities is exacerbated and for every challenge that climate change presents, a person with a disability typically faces an exponentially greater challenge than their non-disabled counterparts. And broadly speaking, disability-inclusive practices must be built into every stage of CCA.

Inclusion can be defined as the process of "respecting the full human rights of all persons, acknowledging diversity and ensuring that everyone can actively participate in development processes and activities, regardless of age, gender, disability, state of health, ethnic origin, or any other characteristics."[136] Ensuring that a program or an agenda for action is inclusive rarely happens naturally or by accident, rather efforts to ensure inclusion require intentional, purposeful language, advocacy, and action.

Like DRR, climate change adaptation initiatives must successfully address the current and future needs of the entire community, else DRR and CCA have not reached their full potential nor fulfilled their human rights obligations. While CCA might be a fairly recent priority for DRR

[134] World Meteorological Organization. **Essential Climate Variables**. 2018
[135] Independent evaluation at Asian Development Bank. **Global Increase in Climate-Related Disasters**. 2015, pp. 27
[136] HI. **Disability Inclusive Community Based Disaster Risk Management: A toolkit for practice in South Asia**. 2012

personnel, inclusion efforts have been taking place in DRR for the past several decades. There is still much progress to be made in DRR practices regarding inclusion, but their efforts have created a roadmap that CCA planners would be wise to follow. However, there is a concern that just as the integration of disability-inclusive practices did not get off to a good start in the DRR sector, inclusive practices are not typically being integrated into current CCA efforts. In addition to the opportunities presented via CCA/DRR coordination, there is both precedent for and legal obligation to practice inclusion during CCA planning and to execute inclusion during CCA implementation.

Over the past 20 years there has been a worldwide effort to advance the rights of people with disabilities, both as recipients of services and supports, and importantly as leading voices across all aspects of home and community life. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)[137] is an international human rights treaty of the United Nations intended to protect the rights and dignity of people with disabilities. The UNCRPD established a legal framework for the rights for people with disabilities and parties to the Convention are required to promote, protect, and ensure the full enjoyment of human rights by people with disabilities and ensure that they enjoy full equality under the law. Article 11 of the convention applies specifically to the rights and dignity of people with disabilities in disasters and reads: "Situations of risk and humanitarian emergency affirms that States Parties shall take, in accordance with their obligations under international law, including international humanitarian law and international human rights law, all necessary measures to ensure the protection and safety of persons with disabilities in situations of armed conflict, humanitarian emergencies and the occurrence of natural disaster."[138]

Over time, these ideas have slowly been incorporated into DRR legal frameworks and practices. The United Nations Global Platform and Sendai Framework for Disaster Risk Reduction 2015-2030 has been a model of progress towards disability inclusive disaster risk reduction.[139] The Sendai Framework recognizes that not only are women and people with disabilities disproportionately affected by disasters, but – crucially – that their knowledge and leadership skills are essential for building resilient, inclusive and equitable societies.

Legal frameworks concerning climate change have included similar language. Recently, the Paris Climate Agreement included the following: "The parties to this agreement… acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective

[137] United Nations. **Convention on the Rights of Persons with Disabilities**. 2006
[138] Ibid.
[139] United Nations Office for Disaster Risk Reduction. **Chart of the Sendai Framework for Disaster Risk Reduction 2015-2030**

obligations on human rights, the right to health, the rights of indigenous people, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, the empowerment of women, and intergenerational equity."[140]

Unfortunately, as time has shown, a statement of rights and obligations and the actual recognition of those rights and fulfillment of obligations are not the same thing. There is increasing global attention to the reality of climate change, a global sense of urgency regarding climate adaptation and compelling data about the disproportionate impact of disasters on children and adults with disabilities, older people, women, youth, indigenous people and people experiencing poverty. The successful implementation of inclusive CCA plans will likely depend on the degree to which CCA planners implement current disability-inclusion best practices, the degree to which there is cooperation between those currently practicing inclusion (various DRR personnel) and CCA personnel, and the degree to which the most pertinent stakeholders—those with disabilities—are consulted during CCA planning processes.

3. Convergence: The necessity of three-way coordination between climate change adaptation, disaster risk reduction, and inclusion

As CCA becomes more and more incorporated in DRR, it is natural that inclusion become a critical component of all CCA plans. Integration of CCA into DRR is not just a relevant opportunity to more efficiently utilize resources and plan for the future; it is a way to help ensure that CCA pursues inclusion from the start. Mr. Thomas Gass, then Assistant Secretary-General in the United Nations' Department of Economic and Social Affairs, put it this way during a panel discussion on Oct 10, 2013: "There is a growing consensus that incorporating climate change and disaster risk reduction will advance sustainable and resilient development, providing an opportunity to achieve an inclusive agenda for all."[141] Success will only truly occur when each sector is so enmeshed and coordinated with the other that they are no longer viewed as three independent initiatives.

The convergence of inclusive DRR and CCA must be intentional. The history of humanitarian response has demonstrated that coordination between sectors requires enormous effort, especially before a history and pattern of coordination has been established. Unless coordination is pursued by all parties, it is unlikely that experts from one sector will recognize

[140] United Nations. **Framework Convention on Climate Change**: Adoption of the Paris Agreement. 2015

[141] Summary of remarks from Mr. Thomas Gass, Assistant Secretary General, Department of Economic and Social Affairs during a panel discussion on Oct 10, 2013: UNDESA; UNISDR. **Panel Discussion on Disaster Resilience and Disability: Ensuring Equality and Inclusion**. 2013

the priorities of another sector—people tend to operate in the world in which they are already an expert. A climate change adaptation expert who formerly worked for the United States government can testify to this, saying that "I hadn't considered the specific impact of migration, relocation and other aspects of climate change adaptation on people with disabilities, and I never considered how important it is to include disability experts in our research, discussions and planning."[142] The climate change adaptation sector cannot be expected to seamlessly and effortlessly coordinate their efforts with DRR and Inclusion personnel— there must be a reciprocal recognition of the importance of coordination.

DRR programs that prioritize inclusion of most vulnerable groups, while perhaps not as common as they should be, are common enough that we have a history of programs to learn from and a variety of successful programs to replicate. Similarly, DRR programs that contain an emphasis on CCA are becoming more and more common—and while the cache is not as large as inclusive DRR programs, it is growing larger every day. There are also a small number of organizations emphasizing inclusive CCA, such as the World Institute on Disability which is working to analyze "the connections between climate change and disability and addresses them head-on." [143] Notably, they do acknowledge the need for DRR integration in some of their literature. It is clear that the programming gap lies specifically within the realm of inclusive DRR/CCA, and as the need for such programming grows, so does the gap.

3.1 Current Programming at the Convergence of Inclusive DRR/CCA

There is a dearth of programming that demonstrates the convergence of inclusive DRR/CCA. The Resilience through Enhanced Adaptation, Action-learning and Partnership Activity (REAAP) Program was taking place in Ethiopia, funded by USAID and was implemented by Catholic Relief Service (CRS), HI, Cordaid, and the Ethiopian Catholic Church - Social and Development Coordinating Office of Harar (ECC-SDCOH).[144] According to CRS, the goal of the project is to "encourage almost half a million people to implement risk-reducing actions to improve resilience to climate change."[145] The project partners are utilizing a Community-Managed Disaster Risk Reduction (CM-DRR) process and are emphasizing the empowerment of person with disabilities to participate in the resilience-building process in their communities.[146] This program was slated to continue through the end of 2017, and hopefully successes and best practices as a result of this project will be forthcoming. While this program

[142] Informal interview note reported by Marcie Roth in June 2017
[143] World Institute on Disability. New Earth Disability
[144] Fact Sheet: REAAP. United States Agency for International Development
[145] REAAP. Catholic Relief Services
[146] Ibid.

is a promising example of CCA, DRR and Inclusion, a wealth of programs must exist in order to create a truly dynamic repertoire of examples, best practices, and lessons learned. Presented below are a handful of success stories and best practices that provide the start of a template for those bold enough to pursue programming in the gap.

4. Inclusive Best Practices Related to Disaster Risk Reduction and Climate Change Adaptation

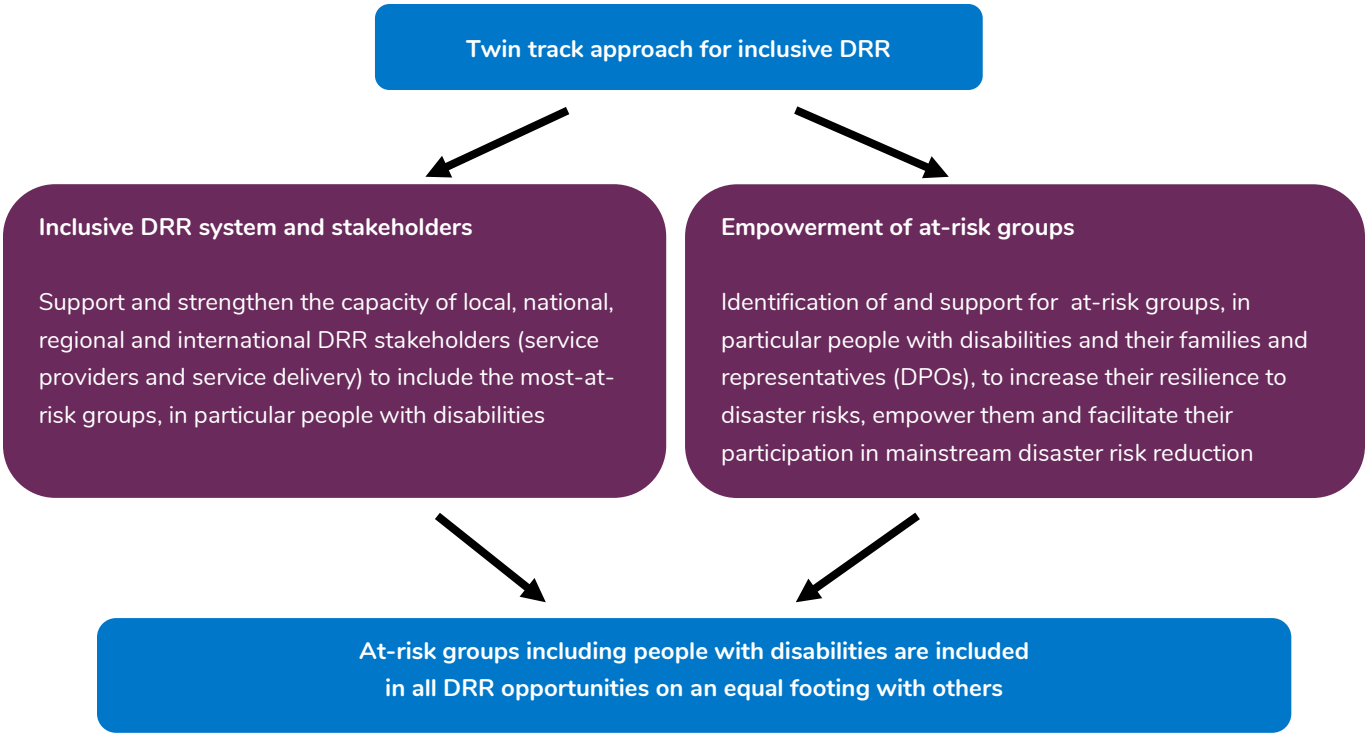
While the sole aim of this report is not to discuss best practices for inclusion in DRR, the DRR sector has a longer history of inclusion than CCA and may be able to offer a good starting point to understand how climate change adaptation initiatives can implement inclusive plans and practices going forward. Given the overlap between the two fields, a review of inclusive and climate-related DRR practices will present a roadmap for what successful CCA inclusion practices should look like. The following section will identify what is meant by "inclusive DRR" (iDRR), will describe overarching best practices regarding inclusion in DRR, and present examples of previous iDRR successes. The best practices identified should not be considered an exhaustive list, as there is other literature available that documents examples of successful inclusion practices in DRR. Rather, the following best practices have been selected because they have pertinence to and may be easily implemented by the CCA sector. The following best-practices for inclusion have been framed by a traditional DRR practices including risk mitigation and increasing resilience.

4.1 Inclusive Disaster Risk Reduction (iDRR)

Humanity & Inclusion (HI), one of the leading experts in inclusive DRR (iDRR), defines iDRR this way: "Inclusive Disaster Risk Reduction consists in building capacities of local, national and international DRR stakeholders to integrate the most at risk groups including persons with disabilities in their prevention, mitigation, preparedness and relief programming."[147] HI consistently promotes a "twin-track" approach to iDRR where one track address community level resilience and inclusion capacity and the other track addresses the resilience and empowerment of people with disabilities.

[147] HI. Inclusive Disaster Risk Reduction. 2017, pp. 4

Table 4 – Twin track approach & inclusive DRR



The twin-track approach is foundational to iDRR and has been successfully implemented by HI as well as a number of other organizations including CBM, the Disability inclusive DRR Network (DiDRR Network), Malteser International, and a number of local level organizations of persons with disabilities (DPOs). Considered an overarching best practice, the success of the twin-track approach can be demonstrated through a variety of examples from successful iDRR programs via both HI and other organizations. In Vietnam, Malteser International utilized the "twin-track approach" and provided programming in reducing community stigma and increasing the confidence of people with disability to advocate for themselves.[148] They recommend that other organizations emphasize empowerment of people with disabilities and as well as "awareness raising for relevant stakeholders about disability, participation and inclusion before doing disability-related work in the community."[149] Case studies conducted by HI of programming in the Philippines and in Indonesia recommended that DRR programs utilize the twin-track approach due to its success in increasing inclusion in a growing number of programs.[150]

[148] HI. Empowerment and Participation: Good Practices from South and South-East Asia in Disability Inclusive Disaster Risk Management. 2014, pp.19

[149] Ibid. pp.19

[150] Suprobo, Novina. Lessons Learned: Mainstreaming Disability into Disaster Risk Management Initiatives in Indonesia and Philippines. HI. 2011, pp. 59

CBM has been a consistently active partner in numerous iDRR project and initiatives. They have taken lessons learned during disaster response and worked to include them into iDRR programs. In one such instance, after responding to several disasters in Bangladesh, CBM partnered with the Centre for Disability in Development (CDD) in order to determine how to best implement inclusive DRR strategies. "A comprehensive DRR project was set up, based on a twin-track approach. People with disabilities received specific support in terms of sustainable livelihood training and transfer of assets, and disability was mainstreamed in all DRR activities."[151] Community level officials also received training as a part of this project. Involving local officials in IDRR training yields co-benefits: it ensures a more inclusive and appropriate disaster response, but is also reminds officials of the every-day needs of people with disabilities in their community. A local level chairman in Sreepur Union in Bangladesh said that "it was only after the training that the needs of persons with disabilities during disaster and ways to include them in the disaster preparedness activities started to become clear to us," and proposed that inclusivity be built into "all developmental planning and implementation."[152]

In a demonstration of additional iDRR best practices, the following section will describe HI's iDRR programming as well as the iDRR programming of other international and local level organizations in regions and countries especially prone to climate-related hazards. The best practices and lessons learned that are identified in the following section fall into various steps of a traditional DRM cycle of prevention, mitigation, and preparedness. Furthermore, these practices are being emphasized due to their demonstrated history of success, their ability to help translate successful iDRR programs into inclusive CCA programs, either independently or with local and international partners, and their ability to increase integration of climate change adaptation considerations into DRR programming.

4.1.1 Prevention

Successful initiatives during the prevention phase of DRM tend to rely heavily on the quality of information and type of information available to both project planners and the community. In order for a community to understand how to prevent the consequences of climate-related hazards, and to perhaps preventing a hazard from becoming a disaster, a community must know who is most vulnerable in the community as well as what kind of resources and capacities are available to those persons and to the community at large. Assessments should include information regarding traditional risks, as well as newer or changing risks due to a

[151] Axelsson Charlotte. **Disability Inclusive Disaster Risk Management**. Disability Inclusive DRR Network for Asia and Pacific. CBM, pp. 13
[152] Ibid., pp. 15

changing climate. Additionally, if prevention initiatives are to be disability-inclusive, vulnerability and capacity assessments must include information about people with disabilities. For example, in order to design an emergency warning system (EWS) that is inclusive and takes the needs of people with disabilities into account, the needs of the entire community must be known and documented. In order to accomplish this, disability must be included in any baseline assessments in addition to disaggregating the data. In 2011, in an effort to "mainstream disability," Intermon Oxfam conducted an assessment in Ethiopia that specifically aimed to gather disability data, and was able to conclude that the assessment was valuable because it "proved to be an important opportunity to raise awareness of both Intermon Oxfam field staff and key local decision makers in the project location."[153] Similar disability mainstreaming initiatives have also occurred in the Philippines and in Indonesia, and assessments published in 2011 concluded that the collection of baseline data that includes disability information was critical to the overall success of the projects.[154] The collection of baseline disability data in Pakistan during the implementation of a DRR project by HI revealed that 9% of the population lives with a disability as opposed to the projected 5%.[155] An accurate assessment of the disabled population allows for a proper distribution of project resources as well as provides a greater understanding of inclusion needs to local officials. It may also be valuable to collect data following a disaster event in order to better inform future prevention initiatives. In Sri Lanka, HI conducted a study in 2011 looking closely at the experiences of people with disabilities during and after severe floods. Results from the study yielded recommendations that include, "strengthening informal networks" (support networks), involving people with disabilities and DPOs in planning processes, so that disability needs are recognized and prioritized, and empowering people with disabilities to participate in DRR planning processes and to advocate for equal access.[156] Data collection that includes disability issues is a critical component to designing and implementing inclusive prevention initiatives, and these few examples show that inclusive data collection is as a best practice for many projects in a large variety of countries.

A highly successful prevention project model has been demonstrated to emphasize community trainings, with a special emphasis on trainings that empower people with disabilities to actively participate in the DRM process in their community. HI frequently approaches disability inclusive

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[153] Axelsson Charlotte. **Disability Inclusive Disaster Risk Management**. Disability Inclusive DRR Network for Asia and Pacific. CBM, pp. 24

[154] Suprobo, Novina. **Lessons Learned: Mainstreaming Disability into Disaster Risk Management Initiatives in Indonesia and Philippines**. HI. 2011, pp. 59

[155] Internal Mid-term Evaluation, Increasing community resilience to natural disasters by reducing vulnerability to risk, Province of Sindh in Pakistan (Sujawal District), Humanity & Inclusion, July 2017

[156] HI. **Coping Capacity of Persons with Disabilities in South Asia: A Qualitative Study of the Impacts and Coping Strategies of Persons with Disabilities in Communities in India, Nepal, Bangladesh and Sri Lanka**. 2012, pp. 47

climate change involvement by raising awareness, supporting empowerment and capacity building, developing training materials and other initiatives supporting inclusion of people with disabilities. In 2012, one particularly successful project in the Philippines, in partnership with Action Against Hunger, included a community training on disability-inclusive disaster risk management and had the effect of empowering people with disabilities in that community to such an extent that they began to take on leadership and advocacy roles regarding the rights of people with disabilities. The community of Cotabato in the southern Philippines has since achieved a census of people with disabilities, activated new local DPOs, and secured government funding.[157] The replication of this program, especially in conjunction with CCA planners, could yield similar achievements in other regions. Similarly, in Bangladesh, a local DPO emphasized iDRR and focused on training and confidence building for people with disabilities. "The confidence and capacity of people with disabilities to speak during meetings shall be reinforced to facilitate their involvement in disaster risk management."[158] Confidence for people with disabilities and their ability to participate in the DRM process may be heavily influenced by local culture and the level of stigma surrounding disability. Local organizations are well aware of stigma that may exist around people with disabilities, and recognize that it is difficult to achieve inclusion in the face of cultural stigma. Stigma reduction is becoming a critical piece of iDRR, and the awareness, information, advocacy and empowerment model may help tackle stigma. A project to increase drought resistance sponsored by Gayo Pastoralist Development Initiative (GDPI) in Ethiopia demonstrated that prevention projects could address and change stigmas regarding disabilities in the community. One participant with a disability said, "I benefited a lot from this project but what I liked most is change of community attitude. The way they treat me has totally changed, it is dignifying and respectful."[159]

4.1.2 Mitigation

Best practices for climate-related hazards in the mitigation phase of disaster risk management tend to emphasize infrastructure adjustments and increasing community and individual resilience through sustainable livelihood, protection works and financial security initiatives. The REAAP project conducted by USAID, HI, and local partners in Ethiopia from 2015 to 2017 recommended the following regarding successful mitigation: "Design holistic, systems-based programs that favor resiliency from the outset. Support to piecemeal aspects of livelihood

[157] HI. **Empowerment and Participation: Good Practices from South and South-East Asia in Disability Inclusive Disaster Risk Management**. 2014, pp. 9
[158] HI Empowerment and participation Inclusive DRM" (Dropbox) pp. 20
[159] Axelsson Charlotte. **Disability Inclusive Disaster Risk Management**. Disability Inclusive DRR Network for Asia and Pacific. CBM, pp. 25

systems (e.g. providing improved seed, providing hardware equipment for beehives, and training community animal health workers) will not contribute to sustained change within that system. Rather, support to the multiple constraints within a livelihood system would better support strengthening livelihood productivity and incomes, and, in turn, household resiliency."[160] Recovery efforts that are inclusively and sustainably designed can also be effective ways to mitigate the consequences of future events. While recovery/rehabilitation can often exclude the specific needs of people with disabilities, pursuing inclusive recovery can be a "means for sustainable development"[161] and inclusive recovery can benefit the entire community. According to a 2013 UN panel report, "In disasters, increased vulnerabilities lead to decreased resilience of an entire community. Engaging people with disabilities will increase resilience. It is important to identify possible solutions based on the needs of persons with disabilities and their families based on experience, in order to increase the resilience of the community."[162] Thomas et al (2009) agrees saying "Research has shown that recognizing and focusing on at-risk populations can create better mitigation, response, preparedness, and recovery capabilities, as well as lessening the economic and social impact of disasters."[163]

4.1.2 Preparedness

Historically, iDRR practices have had both profound room for improvement in the area of disaster preparedness, but due to a recent history of research on the experiences of people with disabilities during and after a disaster and due to successful, inclusive programming in these areas, a multitude of iDRR recommendations and best practices can be drawn from preparedness activities. Early-warning systems are a critical component of most disaster-preparedness efforts. The existence of effective and inclusive early warning systems can be the difference between life and death, especially for someone who may have difficulty getting out of harm's way quickly or on their own. The World Meteorological Organization advocates that all early warning systems (EWS) be developed with "consideration for hazard/risk levels, characteristics of the exposed communities—e.g., urban, rural, ethnic populations, tourists and particularly vulnerable groups such as children, older people and the hospitalized." [164] Keim

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[160] Ethiopia Performance Monitoring and Evaluation Service. **Final Performance Evaluation of the Community-Managed Disaster (CMDRR) Risk Reduction Activity**. 2017, pp. 19

[161] Thorlund, Ana, Potutan, Gerry. **Bangladesh forges ahead on recovery**. United Nations Office for Disaster Risk Reduction. 2015

[162] UNDESA; UNISDR. **Panel Discussion on Disaster Resilience and Disability: Ensuring Equality and Inclusion**. 2013

[163] Thomas Deborah S.K., Phillips Brenda D., Lovekamp William E., Fothergill Alice. **Social Vulnerability to Disasters**. CRC Press, 2013

[164] World Meteorological Organization. **Essential Climate Variables**. 2018

(2008) makes a similar recommendation, saying, "drills and exercises should include contingencies for population protection as well as alert/notification systems for public health and medical staff and for special populations."[165] However, in order to design an EWS that is inclusive and takes the needs of people with disabilities into account, the needs of the entire community must be known and documented by the surrounding DRM stakeholders. In other words, in order to mitigate hazards, one must first know the risks, who is at the most risk, and how they can be involved in preparedness efforts.

iDRR practices that highlight advocacy, education, and engagement of local officials as well as people with disabilities are showing promise as effective strategies for whole community inclusion in all of the aspects of the disaster cycle. Inclusive preparedness planning is critical to the experiences of people with disabilities. Mr. Chaiporn, the Director of the Council of Persons with Disability in Thailand highlights the importance of inclusive shelter and response planning and says "shelters must be accessible and the registration of evacuees must be disabilities sensitive, how to approach persons with disabilities in emergency rescue operation, the referral system for persons with disabilities must be thought of thoroughly."[166] A disability inclusive emergency management expert from the U.S. can testify to the importance of inclusive planning from personal experience: "I was one of the 2 million people who evacuated away from the coast of the U.S. in advance of hurricane Matthew. Even though I had transportation, as a person with a disability, I had nowhere to stop and rest, and nowhere to use the bathroom or get food. This was the second time I had to evacuate this year due to extreme weather." Participation in the planning process may have resulted in more inclusive preparedness efforts in the aforementioned circumstances.

In summary of this discussion of iDRR best practices, a valuable report published by the Disability Inclusive DRR Network (DiDRRN) strongly recommends adhering to the following six "key principles when pursuing inclusive disaster risk reduction policies":

- Participation;
- Twin-track approach;
- Comprehensive accessibility and universal design;
- Utilizing "build back better" principles;
- Non-discrimination;
- Coordination and collaboration.[167]

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[165] Keim, Mark E. **Building Human Resilience**. American Journal of Preventive Medicine, Volume 35 .5, 508-516, pp. 6

[166] Axelsson Charlotte. **Disability Inclusive Disaster Risk Management**. Disability Inclusive DRR Network for Asia and Pacific. CBM, pp. 9

[167] Axelsson Charlotte. **Disability Inclusive Disaster Risk Management**. Disability Inclusive DRR Network for Asia and Pacific. CBM, pp. 6

5. Room to grow: Climate change adaptation

Climate change adaptation is a nascent industry, and as such, it is a sector that is able to evolve, especially regarding disability-inclusive practices. The following section aims to highlight recommendations that do exist despite the overarching lack of historical precedent for inclusive CCA. Gaps in research and practice have been identified via a brief literature review, a review of both previous and current HI programs that are operating in areas heavily impacted by climate change, and through a review of inclusive climate change adaptation programs operated by other organizations. Also included is a summary of recommendations for inclusive CCA that have been put forth by a variety of organizations; these recommendations are primarily based on literature reviews and expert opinions, and have not necessarily been demonstrated by inclusive climate change programming. The inclusion recommendations discussed below are specific to programs with a climate change adaptation objective, and CCA should supplement these lessons learned with the iDRR best practices discussed above.

5.1 Literature review: Identifying best practices

Researchers conducted a literature review in May 2017, looking for articles published between 2000-2017 that addressed *both* climate change and disability. The review utilized the search terms “climate change” and “disability or people with disabilities” and ultimately yielded five peer reviewed academic journal articles and 20 other document types. The documents selected met the search criteria and also sought to examine issues including adaptation, rights, access, and inclusion as they relate specifically to disability as impacted by climate change.

Several themes emerged among the selected articles and documents. The majority of articles emphasized, though not exclusively, the reality of the “disproportionate impact” of climate change on individuals with disabilities (Caritas Australia, Ansell, Braw, Worbling, CBM). Many documents observed the lack of input from the disability community and from “disability leaders” (Wayne) in ongoing climate adaptation discussions and plans (Caritas Australia, Wayne, Worbling, Worbling et al). Similarly a number of documents raised the issue of inclusion and made a case for the importance of pursuing inclusion for individuals with disabilities as a critical component of any climate change adaptation planning (Ansell, Wilson, Worbling, Worbling et al). One document emphasized the need to specifically consider individuals with disabilities during disaster planning and response (Walker). A handful of the selected documents put forth several issues as causes or propagators of disability including climate change (Dahal), a lack of literacy (Hassan Foundation), a lack of information (Hassan Foundation), and a lack of economic inclusion (Braw).

5.2 Piecing it together: Inclusive climate change adaptation

As stated by Rozenweig et al, “Progress in reducing vulnerability and building adaptive capacity to respond to climate change depends on integrating the best available local and scientific knowledge with lessons learned from previous and current efforts.”[168] Due to the lack of literature and the lack of programming from which to draw best practices or lessons learned, the closest we can come to identifying best practices for inclusive CCA relies on a combination of what we already know works from iDRR and the opinions and recommendations of various inclusion experts, DRR experts, and CCA experts.

HI is one organization that is particularly equipped to deliver expert opinion in the area of inclusive CCA. While the organization is known for global leadership in rehabilitation, humanitarian demining, refugee camps management, distributions of essential items, social and economic inclusion efforts, health, inclusive education, local development, disaster risk reduction, reconstruction and advocacy, HI has also recently assumed a leadership role in disability inclusive climate change adaptation and climate justice mainly through its inclusive DRR projects. HI is well equipped to lead in the area of inclusive climate change adaptation due to its track record of leadership in IDRR and its growing list of successful inclusion programs. HI’s growing expertise on climate change should enable the organization to makes several recommendations:

- On a global or regional level, the development and institutionalization of a "disability marker" might be supported (similar to what was done in gender that requires gender equality placed inside funding criteria and guidelines of donor agencies for climate change projects);
- On a national level, officials should support the development of a national disability law specifically regarding people with disabilities in disasters/emergencies/ climate change risks;
- At a community level, projects should be implemented in both rural and urban setting (with increasing trend in urban) directly focusing on climate change including people with disabilities;
- Educate funders about disability inclusion as a fundamental element of all of their projects, but under the guidance of disability inclusion experts (funders often target “vulnerable populations” but disability accommodations and leadership development

[168] Annals of the New York Academy of Sciences. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State. 1244: 2–649

among people with disabilities is routinely disregarded or poorly executed without specific resources and expectations from funders);
- Pursue research that can contribute to work involving people with disabilities in climate change.

A recommendation that frequently comes up in the context of DRR and CCA is that one of the best ways to reduce the vulnerability to climate-driven disasters is to enhance both individual and community resilience. Keim (2008) urges adaptation planners to focus their efforts on reducing human vulnerability, because when vulnerability is reduced, climate change impacts are lessened.[169] Furthermore, this recommendation is in alignment with the twin-track approach and would easily accommodate inclusion best practices as well. Addressing vulnerability through resilience building tackles a whole host of other development issues in addition enabling climate change adaptation to occur. The IPCC says "Increased capacity, voice, and influence of low-income groups and vulnerable communities and their partnerships with local governments also benefit adaptation".[170]

Just as DRR, CCA and Inclusion programming is lacking, so too are recommendations aimed at that critical convergence. However, one particularly valuable report published by Leonard Cheshire Disability and UKAid aims to provide a list of recommendations that are targeting the convergence of the three initiatives.

Some recommendations include:

- Utilizing the twin-track approach;
- Ensuring the "active engagement and representation of people with disabilities in decision making bodies and the leadership roles of people with disabilities in informing practice";
- Inclusive practice should build the resilience of people with disabilities through effective empowerment;
- "Coordination and collaboration is required between the diverse range of actors in disaster and humanitarian response, the government, and people with disabilities and their representative organizations."

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[169] Keim, Mark E. **Building Human Resilience**. American Journal of Preventive Medicine, Volume 35 .5, 508-516, pp. 2

[170] IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. **Summary for policymakers** & **Part A: Global and Sectoral Aspects**. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2014, pp.19

Conclusion

This report, with the aid of a large number of outside documents, program evaluations, research studies, and expert opinions has demonstrated the following in regards to climate change and the hydrological hazards associated with climate change:

- It first consisted in reminding that there is a link between a changing climate and an increase in the frequency and severity of hydro-meteorological hazards, with a significant diversity of situations based on geographic location;
- The hydro-meteorological consequences of climate change are having an impact on the health and economic welfare of individuals and communities;
- The climate-related hazards are having a disproportionately negative impact on people with disabilities;
- Climate change hazards are a driver of disability.

In Chapter Two, the case was made that the disproportionate impact of climate change hazards on people with disabilities should not be ignored and that there is a template for inclusive climate change adaptation available through the body of previous inclusive disaster risk reduction work.

Additionally, this report aimed to demonstrate that cooperation and coordination between DRR and CCA experts and inclusion experts is critical to the long-term success of both DRR and CCA. Currently, there is an underwhelming amount of programming occurring at the convergence of DRR, CCA and Inclusion, and there is a wealth of evidence even beyond what has been mentioned in this report that demonstrates the importance of pursuing integrated programming. While it may be too soon to determine the successes of such programs (due to the minimal number in existence), it likely will not be long before our changing climate and its impacts on people with disabilities demonstrates the consequences of inaction. The burden of establishing best practices falls to those who are courageous enough to propose programs that fall outside of their “silo”, those who are bold enough to dedicate resources to those, and to those who are wise enough to look just a little farther down the road than most to find the spot where three separate sectors can become one.

Resources

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Disability and Climate Change: How climate-related hazards increase vulnerabilities among the most at risk populations and the necessary convergence of inclusive disaster risk reduction and climate change adaptation

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Humanity & Inclusion (HI) wishes to contribute to the analysis of vulnerabilities caused by climate-related disaster risks, in a context of worldwide hydro-meteorological changes.

Through this non-exhaustive literary review, HI begins to paint a more accurate account of the vulnerabilities related to climate change, with a particular focus on the situation of people with disabilities.

Through several examples, the authors point out how climate change impacts a community's basic needs during an acute crisis. They also show how climate change chips away at communities' economic resilience, access to safe housing, and to water during a non-emergency situation.

To a lesser extent, this document explores technical links between inclusive disaster risk reduction practices and climate changes adaptation initiatives. Finally, the authors explore several good practices of inclusive climate-related risks mitigation.

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