

# The Changing Face of Humanitarian Crises

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FREDERICK M. BURKLE, JR.	GERALD MARTONE	P. GREGG GREENOUGH
Senior Fellow and Scientist	Associate Professor	Director of Research
Harvard University	Columbia University	Harvard University

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THE SCALE AND CADENCE OF crises that demand international humanitarian response is increasing. The cumulative frequency and severity of climate change on large populations, rapid and unsustainable urbanization, decreasing biodiversity, and the impending realities of resource scarcities and the armed conflicts they might catalyze are only some of the challenges that loom ahead. It is ironic that while human civilization today possesses the most advanced technologies, global prosperity, and abundance, we face the greatest absolute number of people lacking access to clean water, food, shelter, and basic healthcare.<sup>1</sup> Worldwide standards of living show that health status, life expectancy, child survival, democratization and political participation, literacy and matriculation, and gender equality are at their best while the incidence of armed conflicts is at the lowest level in human history.<sup>2</sup> Yet despite the improvement in global standards, the shortcomings in worldwide accessibility to basic needs make the preparation of the humanitarian complex even more urgent in the face of emerging crises.

Critical masses of evidence indicate that the frequency, duration, and intensity of extreme events affecting populations are on the rise.<sup>3</sup> These “megacatastrophes” are attributable to a number of converging megatrends, defined here as global, sustained, and often slow to form forces that will define our future. An increasing number of droughts on every continent; rapid and unsustainable urbanization plagued by insufficient public health infrastructure and

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FREDERICK M. BURKLE is senior fellow and scientist at the Harvard Humanitarian Initiative at Harvard University and senior international public policy scholar at the Woodrow Wilson International Center for Scholars.

GERALD MARTONE is associate professor at Columbia University, vice-chair of the NGO Working Group on the UN Security Council, and former director of humanitarian affairs at the International Rescue Committee.

P. GREGG GREENOUGH is director of research at the Harvard Humanitarian Initiative.

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social protections; scarcity of water, food, energy, and arable land; and the loss of biodiversity systems that serve as the biological oxygen of the world and the major safeguard against infectious diseases exemplify the megatrends of climate extremes. These megatrends may lead to an additional and potentially explosive trend where conflicts increasingly emerge as populations desperately compete for limited resources necessary for survival.

The term “mega-catastrophe” is now being invoked to describe extreme events that are global in scale and irreversible, distinguishable from previous disaster taxonomy by their cataclysmic consequences. The colossal Haiti earthquake in 2010 was the “perfect storm” of megatrends, a veritable worst-case scenario. The chronically resource-poor and politically unstable country, often affected by tenuous governance, represents a remittance-dependent population prone to seismic events under a densely urbanized impoverished city, whose deforested and degraded environment has little capacity to respond to increasingly intense tropical meteorological events.<sup>4</sup> Haiti, one of the most disaster-prone countries in the world, suffers on average one major catastrophe every three years. It is becoming increasingly unlikely that the vulnerability of the coastline and rivers to flash flooding, the risks of landslides, the emergence of epidemics, and the geospatial juxtaposition of population to seismicity are reversible (or at least mitigable). This is especially the case as the global community’s attention is drawn to other vulnerabilities such as worsening conflicts in the Middle East and Eastern Europe. The former distinction between naturally occurring disasters and man-made crises is becoming less relevant in light of recent multifaceted crises that are human as well as natural. Haiti’s chronic preexisting susceptibility to external shocks revealed a new phenomenon of compound vulnerability, making climate-related disasters increasingly devastating.

It is therefore crucial to speculate and anticipate how the humanitarian system will respond to such extraordinary scenarios that are beyond their current capacities. We argue in this essay that achievable solutions to these crises require an unprecedented multidisciplinary collaboration among scientists, policy makers, managers, educators and providers. Each must have a working knowledge of the evolving science and its interplay with nature, the threatening public health consequences that may occur, and an understanding of why a reasoned paradigm shift in global management from response alone to robust prevention and preparedness initiatives is both necessary and inevitable. The megatrend variables that are highlighted in this essay challenge the global humanitarian community to regroup if it is to adequately address populations in crises. Despite the appeal of describing these crises separately, the common thread of complex

public health emergencies that trigger unprecedented mortality and morbidity for the global community inextricably link all megatrends.<sup>5</sup>

## CLIMATE CHANGE

### *EXTREME WEATHER EVENTS*

What are the implications of the humanitarian system's finite capacity when, in a typical year, as many as 250 million people are affected by climate-related disasters? When the 2010 Pakistan floods occurred around the same time as the cholera epidemic in Haiti, the strain on the humanitarian response enterprise was glaring. The year 2011, which saw 302 natural disaster events worldwide, was the most expensive year in disaster losses to date. It included the first famine to affect Somalia in 20 years, which demonstrated the deadly interaction of conflict, political instability, and climate-induced drought.<sup>6</sup>

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The conflict in Darfur, which is likely to go down in history as the "first environmental conflict," is illustrative of the complex interaction of extreme climate-related events and population pressures that face the humanitarian community. Drought, as well as a 30 percent decrease in rainfall over the last 40 years, brought food and water scarcity combined with progressive desertification and amplified by unmitigated human rage in the heart of the Sahara; a scenario not dissimilar to what preceded the current war in Syria.<sup>7</sup> Temperatures in the African interior are predicted to rise one and a half times the global average, making the continent with the least adaptive capacity the most vulnerable to climate extremes.<sup>8</sup> Pastoralists have already left their livelihoods, migrated to urban areas, or have become entirely dependent on humanitarian aid while hoping circumstances will change. But circumstances are unlikely to change: the drought cycle of the Ogaden desert, historically occurring once every 10 years, has accelerated to once every other year.<sup>9</sup> The ability of the continent to produce food for itself, let alone as a significant contribution to its GDP, is seriously at risk. Given that 75 percent of sub-Saharan agriculture is rain-fed, crop yields are projected to decline by as much as 50 percent in some countries by 2015.<sup>10</sup> Availability and accessibility of food are key components of food security and the immediate cause of malnutrition. In 2013, the Geneva-based Intergovernmental Panel on Climate Change, which independently analyzes

all peer-reviewed research, concluded that agricultural output worldwide could drop 2 percent each decade against a food demand rise of 14 percent.<sup>11</sup> These numbers will intensify as greenhouse emissions rise.

Well-documented trends in heat-related deaths and morbidity correlate with more frequent periods of extreme heat in all global regions. In developed countries where hospitalization and death event data are robust, extreme heat events have increased hospitalizations and deaths among the elderly with chronic cardiovascular, pulmonary, and chronic kidney disease; urban dwellers, particularly those in lower socioeconomic classes; and the disabled.<sup>12</sup>

Estimates indicate that in less than three decades, as many as six billion people, nearly 75 percent of the world's population, will live within coastal zones (an area within 100 kilometers of a coast and up to 100 meters above sea level).<sup>13</sup> To date, over 130 global port cities are at risk of climate-induced storm-surge flooding, damaging winds, land subsidence, and health threats from antiquated urban water and sanitation systems—built for fractions of the current populations—leading to all manner of fecal-oral transmission by bacteria, virus, or parasite.<sup>14</sup>

#### *ECOLOGICAL EFFECTS OF CLIMATE CHANGE*

Melting ice sheets and severe flooding redistribute weight over fault lines and damage the earth's crust, lightening its load and allowing it to move more. Recent research in Haiti by the University of Miami's School of Marine & Atmospheric Science demonstrates that large earthquakes often occur within four years of a heavy tropical cyclone season in areas already prone to erosion and landslides from heavy rainfall. As the surface load above a seismic zone lessens, it unclamps the fault line, provoking an earthquake.<sup>15</sup>

Global warming also threatens to dramatically alter insect biomass. In 2009 Liberia declared a national emergency when armyworm caterpillar hordes devoured crops and vegetation, triggering a major food crisis. Adding insult to injury, the caterpillar excrement polluted countless wells and rivers affecting over 500,000 people, the worst pest infestation in 30 years.<sup>16</sup> Similar armyworm infestations have previously rattled Ethiopia, Somalia, Kenya, and Tanzania, countries already plagued by food insecurity.<sup>17</sup> Rising land and sea temperatures will change the range of infectious disease vectors, opening the door to non-immunized populations in temperate latitudes. Research studies examining the consequences of ocean warming have found that *Vibrio* species of bacteria, including cholera, are now found off the coast of Scandinavia.<sup>18</sup> Integrated

climate and biological models predict that with global temperature increases of two to three degrees Celsius, an additional 5 percent of the world's population will be at risk for malaria—a scenario replicated for vector-borne dengue, West Nile encephalitis, Lyme disease, and yellow fever.<sup>19</sup> The critical determinant in limiting an outbreak and managing the caseload is the public health capacity of the local, regional, and national health systems in the country of origin, which in most of the developing world remain nonexistent.

*RISING SEA LEVELS*

There is a curious debate occurring in the United Nations Security Council about whether climate change should be an issue of global peace and security, and whether the subject deserves to be part of the Council's formal agenda. With the predicted prospect that the collapse of the West Antarctic Ice Sheet could lead to a sea-level rise of anywhere from two to seven meters, the security implications of rising sea levels are no longer hypothetical for the Pacific Ocean's small island nations. More than 80 percent of the Maldives is less than one meter above sea level.<sup>20</sup> These populations are already experiencing salt water intrusion into groundwater sources, coastal flooding, acidification of ocean waters, and the degradation of coral reefs.

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The island countries of Kiribati, Tuvalu, the Marshall Islands, and the Maldives are predicted to vanish entirely by the end of the century.<sup>21</sup> Environmental migration has already begun from these nations, with diminished fish catches leading to substantial livelihood loss. Threatened coastal countries are petitioning the Security Council on the principle that climate change jeopardizes international peace and security. Framing the issue as one of occupation—the occupiers being the rising sea levels and extreme weather events mentioned earlier—this coalition of vulnerable countries has successfully moved the issue to priority status on the Council's agenda.<sup>22</sup>

Although the dominant theme around sea-level rise debates is international conflict, the reality of mass population movements will necessarily focus on health, livelihood, and protection for humanitarian responders. The growing global coastline populations will suffer from the economic impacts caused by rising sea levels and coastal storms—the effects of which are not solely economic. Saltwater intrusion into Kiribati's fresh water sources has led to an infant death rate twice that of other Southeast Asian countries.<sup>23</sup> The Marshall Islands has an under-age-five mortality rate (probability of dying per 1,000 live births) six times that of the United States.<sup>24</sup> Of the largest 50 cities in the world, the 20

with the greatest predicted increases in population that are currently exposed to extreme sea-level rise are all in the developing world. Out of those 20, 17 are in Asia and three are in Africa.<sup>25</sup> The top three most exposed cities—Dhaka and Chittagong (both in Bangladesh), and Ningbo (China)—are projected to have ten-fold population increases by 2070 and, simultaneously, a more than 200 percent increase in hazard exposure.

### RAPID UNSUSTAINABLE URBANIZATION

Urbanization accounts for more than 90 percent of the economic growth of nation-states. However, it assumes that water, sanitation, shelter, food, energy (for heating and cooling), and healthcare access and availability are adequate for the population demands. Rapid unsustainable urbanization, on the other hand, is problematic as it occurs when the population exceeds the capacity of the civil and public health infrastructures to provide the essential services previously mentioned. It also exceeds social protections such as programs for vaccinations, maternal and child health, and mental health. This phenomenon is not only most dramatic in the poorest countries of the world, especially Africa and Asia, but it also occurs in the same urban zones most exposed to climate extremes.

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With more than half of the world's population now living in urban settings, UN HABITAT warns that by the middle of this century seven out of 10 people in the world will be living in cities. In developing countries, mostly in Africa and Asia, the urban population grew by 1.2 million people per week on average. In comparison, urban population growth in the developed world is "next to stagnant." The annual population growth in six major developing country cities, including New Delhi, Mumbai, Dhaka, Lagos, Kinshasa, and Karachi, is higher than Europe's entire population.<sup>26</sup> In the developed world, 4 to 6 percent of the population is composed of urban squatters, whereas in the developing world urban squatters make up to 70 percent of the population. The absolute numbers of slum dwellers is even more sobering. UN HABITAT estimates that the current one billion slum dwellers will rise to two billion by 2030.<sup>27</sup> Most live in tenuous, marginalized areas of the urban environment that harbor the most risk for climatological disasters—flood plains, unstable deforested hillsides, low-elevation zones, and high-seismic zones—and are often

inaccessible to transportation links that would provide emergency services. The density of the population may pose increased challenges for contemplating urban catastrophes. For example, the lethality of the 2010 Haiti earthquake was due in large part to the seismic force unleashed on a highly dense population. In just 35 seconds, hundreds of thousands of Port-au-Prince's two million died. Over 70 percent of the deaths occurred in two of the five population zones where the population was dense and "more vulnerable by their lack of infrastructure and structurally sound dwellings."<sup>28</sup> Given the scope of rapid urbanization occurring across the world, and the fact that most large cities are located on the coast and in seismically active zones, the catastrophic public health effects of hazards threaten to overwhelm international humanitarian response mechanisms, especially if they happen to occur concurrently or in rapid succession.

Compounding the humanitarian response challenge, rapidly urbanizing informal settlements such as slums have little or no population data on age, gender, or other critical demographics needed to plan and target humanitarian aid. Population figures are heavily influenced by density, yet figures for the densest places on earth are hard to come by and are often imprecise. For example, imprecise methods in Mumbai estimate an average density of anywhere from 30,000 people/km<sup>2</sup> to over one million people/km<sup>2</sup>. As density increases, the population's health suffers. Although obtaining accurate health statistics in dense urban settings is difficult, some of the highest global death rates among infants, children under age five, and pregnant women are now assumed to be found in these urban enclaves.<sup>29</sup>

Because the international humanitarian community has geared itself to provide immediate care within organized refugee camps—or a similar austere setting with limited supplies—urban zones pose serious challenges for the humanitarian response community. Multiple factors drive the need for a major paradigm shift in the way that the humanitarian community must participate. There is need to rely less on traditional "immediate response" activities and more on unfamiliar but critically productive prevention and preparedness initiatives. Determinates for success include population density, the multiple national and local stakeholders that represent the unwieldy control of urban neighborhoods, the absence of population data, public health infrastructure and protections, tenuous land ownership, and the profound poverty in a cash exchange system. In these places there is scarce international humanitarian representation and limited national programs of merit from which to enhance or build capacity. The sovereign countries in which they occur often ignore what they do not see.

## SCARCITY EMERGENCIES

Rapid urbanization and population growth in areas vulnerable to extreme weather will place new demands on sustainable agriculture land, water, and energy sources. The UN Report on Sustainable Development estimates that the world's population will require 50 percent more food, 45 percent more energy, and 30 percent more water by 2030.<sup>30</sup> Research planners predict that this will inevitably lead to "resource wars" over water, land, food, and fuel. In many respects the global scarcity of energy, water, and food is now defining the public health status of nations.<sup>31</sup> Rich, import-dependent countries have invested heavily in farmland and resources in foreign countries to meet their national resource needs. In Madagascar, the government negotiated away half of its arable land, much of it covered by vital forestry, to South Korea in a 100-year no-cost lease agreement. These negotiations, developed without input from the local population, finally led to a political coup and the cancellation of the agreement. South Korea's response was prophetic: "We want to plant corn there to ensure our food security. Food can be a weapon in this world."<sup>32</sup> This case is not limited to Madagascar; foreign firms have now acquired 15–20 million hectares of African land for biofuel development, often compromising the food security and livelihoods of local communities.<sup>33</sup>

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Declines in arable land and climate-driven droughts have resulted in conflict driving up food prices and severe food insecurity. In places like Yemen, where malnutrition had been uncommon, several years of severe drought followed by water shortages, civil unrest, and higher food prices have led to acute and chronic malnutrition. According to UNICEF's 2012 report, chronic food insecurity has contributed to the "stunting" (the ratio of height to age that defines chronic malnutrition) of more than 50 percent of Yemeni children under age five.<sup>34</sup>

Water will be the crux of resource scarcity conflict since it is necessary for the production of food, biofuel, and alternative energy. A 2011 UN World Water Development Report cites that by 2030, 40 percent of the world's population will lack adequate water supply.<sup>35</sup> A 2012 study from *Nature* reveals that non-renewable aquifers supplying the world's "breadbaskets"—northern China, central India (Upper Ganges), the central western United States, and the northern Middle East—are being depleted at three-and-a-half times the area needed to sustain the 1.7 billion people dependent on them. And yet, by 2030, 14 percent more freshwater will need to be extracted to meet the 55 percent increased demand in food production to sustain the global population.<sup>36</sup> Overlaying the climate-modeled certainty of frequent and longer droughts with such popula-

tion pressures portends a scramble for securing water sources among nations. Since the turn of this century alone the Pacific Institute has mapped over 100 water conflicts.<sup>37</sup>

## **BIODIVERSITY CRISES**

Many scientists feel that the global decline in vital biodiversity areas is the greatest threat to humankind today. Megatrend factors of climate change and rapid urbanization directly impact biomes, which in turn determine the likelihood of food and water scarcity. The humanitarian community must understand these interrelationships if it seeks to protect biodiversity while managing crises.

Biodiversity areas contain the majority of the world's plants and vertebrates that produce our "biological oxygen." Biodiversity systems provide food, fresh water, balanced species of bacteria, viruses and other microorganisms, and raw materials and fuel, and they regulate climate and air quality, maintain social fertility, and pollinate crops on all continents. Unfortunately, 80 percent of major conflicts over the last 50 years have occurred in 23 of the 34 most biologically diverse and threatened places.<sup>58</sup> Biodiversity "hotspots" are those that have lost at least 70 percent of their original habitat.<sup>59</sup> A new class of professionals, "warfare ecologists," has emerged with the intent to enter post-war and disaster zones and work to recover these areas quickly. The 2003 invasion of Iraq contributed to biodiversity loss, as have dams in Syria and Turkey that brought both the Tigris and Euphrates' river flows to a trickle. Iraq, formally a country of agricultural abundance, must now count on oil production to buy food for its population.

A recent University of Arizona study estimates that major species would need to evolve 10,000 times faster than they have historically to keep pace with the warming planet. The unlikelihood of this feat sets the stage for mass extinctions. A scientific team from the United Nations Environment Program's World Conservation Monitoring Centre has modeled climate-induced habitat destruction and concluded that, depending on certain climate warming scenarios, 15 to 37 percent of species vital to biodiversity will become extinct across a variety of habitats.<sup>60</sup>

In addition to warfare and climate, the primary threats to continuing biodiversity loss are overharvesting and deforestation, habitat loss by human appropriation, direct extirpation by invasive species, and alteration of the habitat by climate change and pollution.<sup>61</sup> While these factors are not usually prioritized in the planning and strategy of humanitarian response, subsistence economies, and the poor in particular largely depend on the biodiversity systems for food,

fresh water, seed propagation, control of infectious species, raw materials and air quality that allow ecosystems to survive. The way in which recent epidemics of HIV, Ebola, West Nile fever, SARS, and Lyme disease started, spread, and became dominant in societies directly relates to human intrusion into previously biologically diverse, protected areas. Post-crisis developmental efforts to reestablish populations and

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their livelihoods should be made with ecosystem rebuilding and preservation in mind. In declaring 2011–2020 as the “Decade on Biodiversity,” the UN hopes to inculcate human lifestyles with the tools to limit species decline and ecosystem loss.<sup>38</sup>

#### **IMPACT OF ARMED CONFLICT AND INSECURITY ON THE HUMANITARIAN COMMUNITY**

34 Although the number of declared wars is lower than at any time in the twentieth century, there are more people exposed to conflict than ever before.<sup>39</sup> One out of every 170 people on the planet is already a refugee or an internally displaced person due to war or disaster. Many are in post-conflict areas that have less than 10 percent of the public health resources they had prior to the conflict. The attention of outside humanitarians and donors wanes with the decline in local violence, yielding an increase in indirect deaths and illnesses from a lack of water, sanitation, food, shelter, health access and availability, and energy infrastructures. In such settings, the risk of returning to war within a decade is over 50 percent.<sup>40</sup> In central Africa, the effects of climate change, resource scarcity, and abrupt shocks in rainfall patterns have demonstrated an increase in civil conflict in the succeeding years following reduced precipitation.

Although it appears that international conflicts are decreasing in frequency and scale, the conduct of contemporary warfare is still alarming. The impact of armed conflict and oppressive political violence is cruelly prejudiced toward women and girls. Although some progress has been made in reducing disparities with gender-sensitive programs and normative instruments designed to protect women, the humanitarian guild has not fully lived up to its rhetoric of inclusion. Programs from the outset must include debates of the risks to women and girls that might occur if projects are abruptly ceased when international security forces leave.

Each year the number of aid projects that are closed or suspended doubles

as a result of insecurity and dangers to national and expatriate staff.<sup>41</sup> In a politicized or polarized environment, security depends on the perception that aid workers are independent and impartial. The increasing use of aid as a policy instrument, and the perception—whether accurate or false—of an affiliation with political or military efforts, are toxic variables to aid workers.<sup>42</sup> For many armed actors, humanitarian aid is seen as pretext for occupation or an alibi for Western domination. As outsiders, relief workers carry the burden of proof that they are nonpartisan. Aid workers are routinely targeted not for their assets and resources, but rather for being unwelcome outsiders.<sup>43</sup> In order to adapt to these constrained environments, aid operations have increasingly relied on national staffing and a methodology of “remote programming” from distant locations. As a result of obstructions and insecurity, up to 50 to 60 percent of NGO projects are now being conducted remotely, a phenomenon occurring across all sectors of the humanitarian industry.<sup>44</sup>

Organized criminal groups and civil wars kill more people every year than traditional international armed conflict. Most of today’s wars are not primarily centered around ideological confrontations but rather on illicit commerce. The drivers of these conflicts are not grievances over ethnic identity, political participation, or the quest for democracy, but a war economy where mercenaries are merchants and insurgents are racketeers. Although crime and war can seem indistinguishable, it is greed—not grievance—that drives many of today’s conflicts.<sup>45</sup> More than half of the UN peacekeeping forces around the world are deployed to situations where mining of natural resources have played a role in the conflict. There is a sobering fear that this trend is on a steady and intractable incline. Fragile states prone to political instability are readily exploited to maintain a complicated network of illicit trade. In order to understand many of today’s intractable conflicts, we must understand not only who is harmed by war but also who is harmed by peace.

## LESSONS FROM GLOBAL PANDEMICS

In just the last three to four decades, over 30 new diseases have emerged including HIV, Ebola, new cholera strains, West Nile virus, SARS, and Lyme disease among others. There has also been a resurgence of old diseases such as dengue fever, tuberculosis, malaria, and the ominous evolution and spread of numerous, multiple-drug-resistant microorganisms and parasites.

Catalyzed by the 2003 SARS pandemic, the 2005 International Health Regulations (IHR) Treaty moved the World Health Organization (WHO) from a

primarily passive responder to an unprecedented active authority with a mandate to address long-term prevention, preparedness, response, and recovery. A focus on public health information systems, prevention through active surveillance, and the establishment of shared communication and data networks promises early identification and the opportunity to scale up surge response and containment strategies. The WHO's 2008 guidelines for humanitarian agencies identify five strategies for pandemic preparedness in which aid should be engaged: reducing exposure to pathogens; participating in early warning systems; participating in rapid containment operations; building local capacity to cope; and assisting in the global science efforts that facilitate response.<sup>46</sup> Such initiatives make sense given that NGO sources have traditionally been faster at disseminating information about communicable disease outbreaks to the public than governmental sources.<sup>47</sup>

While awareness and vision are laudable in these prevention and preparedness efforts, the ground reality paints a more sobering picture. Early warning disease surveillance networks, health systems personnel, and equipment response capacities do not exist in less developed countries—or do not exist to a degree that allows them to be effective in preventing and containing outbreaks. Furthermore, there is ignorance of the geographic distribution of nearly all communicable diseases that are of immediate risk to the world. Of the 355 infectious diseases of global significance, only seven have been mapped completely.<sup>48</sup> Despite the speed and efficiency of digital data flow, inputting, and communicating disease information, surveillance data across global shared networks is still a holy grail that requires more political will to educate, prepare, and prevent epidemics within sovereign populations.

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## IMPLICATIONS FOR THE HUMANITARIAN COMMUNITY

Traditional crisis management takes place within the framework of a four-phase cycle: prevention (mitigation), preparedness, response, and recovery. The humanitarian community has focused primarily on response, with little attention or resources devoted to prevention and preparedness. Modern day large-scale disasters such as the 2004 Indian Ocean tsunami, the 2010 Haiti earthquake and Pakistan floods have all required a robust international response. But, like major disasters in the past, the responses have suffered from poor oversight, coordination, accountability, lack of professionalism, and corruption—particularly in urban areas. The humanitarian community is neither prepared to protect urban and aging populations nor the public health infrastructure that supports

the population's well being. It is not prepared to handle scarcity emergencies, the destruction that climate events will bring nor the pandemics that remain undefined. With the relative certainty of these megatrends, the public health infrastructure, already severely compromised, risks massive decline. Without a political commitment, which assumes a certain degree of science and public health knowledge, infrastructure recovery and rehabilitation will be limited.

Research requires a composite multisector and multi-ministerial approach that utilizes expertise in many disciplines. While it is easy to become preoccupied with the global health consequences these megatrends provoke, crises affecting the health of nations will not be solved by any one discipline, certainly not medicine or public health alone, or by any one nation-state. Many global health initiatives that dominate world powers' foreign policy agendas—for example, U.S. and Chinese short-term deployments of hospital ships to developing countries—are highly competitive, government-centric, and limited in providing substantive outcomes. Preventive solutions emphasizing preparedness will arise from multi- and trans-disciplinary collaborations among the social sciences, humanities, natural sciences, diplomacy, health and public health sectors, and civil engineering to name but a few. However, in addition to understanding the science, as emphasized in this essay, it is also universally necessary for all disciplines to increase their capacity to trespass professional boundaries, a process that, while easier said than done, is crucial to future success. While some progress has been made, it has been slow. Many traditionally grounded professionals remain averse to accelerating solutions outside their favored discipline. Worse still, political decision makers rarely see the benefits of science and are reluctant to engage in discourse with scientists. In emphasizing that science must be used to make informed decisions,

biologist Brett Favaro suggests that science needs a permanent pipeline into policy, not temporary windows cracked open by individual researchers, adding that “scientists must be impartial arbiters of data, not political agents... when politicians ignore science it is a failure of our system of governance.”<sup>49</sup> It is universally acknowledged that despite the calls from U.S. President Barack Obama and Secretary of State John Kerry for climate change legislation and public health infrastructure funding, there is little prospect of moving either through the U.S. Congress in the foreseeable future.

**While the attention to geophysical events is increasing within the humanitarian community, it lacks the multidisciplinary engagement crucial to understanding future humanitarian policy.**

The megatrend examples suggest that while the attention to extreme weather and geophysical events under the rubric of climate change is increasing within the humanitarian community, it lacks the multidisciplinary engagement crucial to understanding future humanitarian policy. When *AlertNet*, the humanitarian information network, asked the largest aid agencies to rank the factors most likely to intensify future humanitarian needs, 28 of 41 identified more frequent and destructive climate-related floods, droughts, and storms as the top factors.<sup>50</sup> The International Federation of Red Cross and Red Crescent Societies' climate unit is dedicated to assisting communities with disaster risk reduction. However, most large international humanitarian organizations lack the technical capacity to address the issues that they have identified. This capacity is further hindered by the shortsighted funding attempts that prioritize response over prevention. These funding methods continue despite studies suggesting that for every \$1 USD given for risk reduction policies and programs, \$4 of emergency response is saved.<sup>51</sup> Such lopsided funding streams could be ameliorated if the humanitarian community brought the evidence-based strength of climate and population research to their climate prevention goals. Both of these sciences—climatology and epidemiology/demography—have evolved to provide high-resolution images of vulnerable populations and to translate their findings into meaningful disaster risk-reduction strategies that can be evaluated over time.

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Unlike refugees from war who are protected under UNHCR mandates, no clear legal protection exists for climate/environmental refugees. Coincidental to targeted global preparedness strategies is the contentious debate concerning the legal norms that should protect climate-induced migrants. There is unclear doctrinal guidance addressing the issue of climate change mobility largely because migration for purely climate reasons is hard to define and deduce from other migration push factors. Some estimate that ecological fragility and competition for resources could produce as many as 200 million “environmental refugees” over the next few decades. Although the recent uprisings in the Arab world are attributed to a political wave of citizen outrage and disenchantment with their authoritarian governments, these revolutions did not appear out of the blue. Water shortages, drought, crop failure, and internal displacement were valid catalysts.<sup>52</sup> While attention to this thesis has only recently found its proper voice in the popular and political press, the humanitarian community—aware for decades that vital water aquifers would soon run dry in Yemen, then Afghanistan, Egypt, and Syria, fomenting more hunger and conflict as they progress—is not surprised that other disciplines have come to the same conclusion.

Some UN factions support the concept of Green Helmets, a modification

of the Blue Helmet concept of peacekeeping forces. This has been introduced with the intention of preventing violence and international humanitarian law abuses through arbitration, in the form of external interveners, to address issues of environmentally triggered conflicts and de-escalate resource competitions before they foment into armed conflict.

WHO's mandate through the IHR Treaty for pandemics represents the opening of a door for wider global cooperation. It also begs a larger question for the humanitarian community: can a similar model be introduced to guarantee the coordination and global authority required of all large-scale disasters and crises, which have hitherto been absent in recent catastrophes?<sup>53</sup> As Richard Horton and colleagues suggest in their 2014 call for a "collective manifesto to transform global public health," this would require "nothing short of a treaty-level global authority for prevention and preparedness, one that embodies and operationalizes the empirical work of the former Intergovernmental Panel on Climate Change and other scientists who have the technical expertise and institutional basis to devise the treaty content and implementation."<sup>54</sup> While "international treaties will never be entirely fair...they are nonetheless more impressive than the barrage of platitudes that passes for [current] political discourse." Treaties are crucial since "large powers adhere to their contents with care, as do smaller ones who crave international respectability."<sup>74</sup>

## CONCLUSION

The future crises described in this essay demand a paradigm shift within the humanitarian enterprise geared toward prevention and preparedness. Strengthening preparedness within and across nations can only happen with a profound knowledge of nations' populations in relation to risk and vulnerability. It is disconcerting that despite the current precision of climate models, demographic trends, and urban agglomerations, there is a failure to make sense of this information and risks to both potential victims and decision makers who are required to craft the necessary prevention strategies and policies. A continued focus on response alone will accomplish very little. The impacts on the health on populations will be direct, but even graver will be the indirect impacts as public health infrastructures break down, human insecurity becomes more prevalent, and large numbers flee. The common thread of these crises and public health emergencies they produce must be seen as a strategic and security issue, one that deserves both professionalization and an international monitoring system that would only be achieved through a global treaty.

NOTES

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