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REVIEW

Climate Change, Human Rights, and Social Justice

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Abstract

The environmental and health consequences of climate change, which disproportionately affect low-income countries and poor people in high-income countries, profoundly affect human rights and social justice. Environmental consequences include increased temperature, excess precipitation in some areas and droughts in others, extreme weather events, and increased sea level. These consequences adversely affect agricultural production, access to safe water, and worker productivity, and, by inundating land or making land uninhabitable and uncultivatable, will force many people to become environmental refugees. Adverse health effects caused by climate change include heat-related disorders, vector-borne diseases, foodborne and waterborne diseases, respiratory and allergic disorders, malnutrition, collective violence, and mental health problems.

These environmental and health consequences threaten civil and political rights and economic, social, and cultural rights, including rights to life, access to safe food and water, health, security, shelter, and culture. On a national or local level, those people who are most vulnerable to the adverse environmental and health consequences of climate change include poor people, members of minority groups, women, children, older people, people with chronic diseases and disabilities, those residing in areas with a high prevalence of climate-related diseases, and workers exposed to extreme heat or increased weather variability. On a global level, there is much inequity, with low-income countries, which produce the least greenhouse gases (GHGs), being more adversely affected by climate change than high-income countries, which produce substantially higher amounts of GHGs yet are less immediately affected. In addition, low-income countries have far less capability to adapt to climate change than high-income countries.

Adaptation and mitigation measures to address climate change needed to protect human society must also be planned to protect human rights, promote social justice, and avoid creating new problems or exacerbating existing problems for vulnerable populations.

KEY WORDS climate change, human rights, inequalities, low-income countries, public health

"Climate change is a global problem with grave implications: environmental, social, economic, political and for the distribution of goods. It represents one of the principal challenges facing humanity in our day. Its worst impact will probably be felt by developing countries in coming decades."

Pope Francis
Laudato Si
June 2015

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INTRODUCTION

Climate change—the global climate crisis—may be the defining moral issue of the 21st century.[1,2] The environmental and health consequences of climate change, which disproportionately affect low-income countries and poor people in high-income countries, have profound effects on human rights and social justice.[3-11] These consequences threaten rights embodied in the Universal Declaration of Human Rights, such as the right to security and the right to a standard of living adequate for health and well-being, including food, clothing, housing, medical care, and necessary social services.[12] They threaten civil and political rights, such as "the inherent right to life" and rights related to culture, religion, and language, as embodied in the International Covenant on Civil and Political Rights.[13] They threaten economic, social, and cultural rights, as embodied in the International Covenant on Economic, Social, and Cultural rights, including the following[14]:

- The right of self-determination.
- The rights to freely determine one's political status and freely pursue one's economic, social, and cultural development.
- The right "to the enjoyment of the highest attainable standard of physical and mental health".
- The right to education.

And they threaten the rights of women, as embodied in the Convention on the Elimination of all Forms of Discrimination against Women, especially women living in rural areas of developing countries, who are particularly vulnerable to the consequences of climate change.[15] National governments have a duty to ensure that all of these human rights are promoted and protected.

The United Nations Framework Convention on Climate Change (UNFCCC) is an international mechanism for facilitating international cooperation in stabilizing atmospheric concentrations of GHGs. It states: "Parties should, in all climate change-related actions, fully respect human rights."[16] The UNFCCC has concluded that human-rights considerations should guide the development, implementation, and monitoring of policies, institutions, and mechanisms related to climate that have been established under the UNFCCC.

Adverse environmental effects caused by climate change include increases in the following[17]:

- Temperature, as well as increased frequency and/or duration of heat waves.
- Heavy precipitation events.
- Intensity and/or duration of droughts.
- Intense tropical cyclone activity.
- Sea level.

Other environmental phenomena related to climate change include the shrinking of land-based glaciers, increases in chemical pollutants and aeroallergens in ambient air, and changes in ecosystems that reduce biodiversity.[17] The Intergovernmental Panel on Climate Change has performed comprehensive assessments of (a) changes that have occurred and the human contribution to these changes and (b) the probability of further changes[17] (Tables 1 and 2).

Adverse health consequences caused by climate change include heat-related disorders, vector-borne diseases, waterborne and foodborne diseases, respiratory and allergic disorders, malnutrition, violence, and mental health problems.[18,19]

DISPARITIES AMONG COUNTRIES

There are large inequalities among countries in both the amounts of greenhouse gas (GHG) emissions and the magnitude and severity of adverse health consequences experienced as a result of climate change. Developing countries will experience the greatest impact of climate change.[20-25] In general, those countries that contribute the least to GHG emissions currently experience, and will likely continue to experience, the most adverse health consequences as a result of climate change (Fig. 1).[26] For example, in 2004, per-capita GHG emissions in the United States, Canada, and Australia approached 6 metric tons (mt), and those in Japan and Western European countries ranged from 2 to 5 mt. In contrast, annual per-capita GHG emissions in developing countries overall approximate 0.6 mt, and more than 50 developing countries have annual per-capita GHG emissions less than 0.2 mt.

Economic Impact on Poor Countries. As global temperature increases, rich countries' economies continue to prosper, but the economic growth of poor countries is seriously impaired—more than previously estimated.[27] The consequences for economic growth in poor countries will be substantial if we continue on a "business-as-usual" path of increasing carbon dioxide concentrations and rapid climate change, with poor countries' mean annual growth rate decreasing from 3.2% to 2.6%.[27] Poor countries are likely to suffer a greater adverse effect than rich countries from climate change because

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Table 1. Assessment That Various Changes Have Occurred and Assessment of a Human Contribution to Observed Changes

Phenomenon and Direction of Trend	Assessment that Changes Occurred (Typically Since 1950 unless Otherwise Indicated)	Assessment of a Human Contribution to Observed Changes
Warmer and/or fewer cold days and nights over most land areas	Very likely	Very likely
Warmer and/or more frequent hot days and nights over most land areas	Very likely	Very likely
Warm spells/heat waves: Frequency and/or duration increases over most land areas	Medium confidence on a global scale Likely in large parts of Europe, Asia, and Australia	Likely
Heavy precipitation events: Increase in frequency, intensity, and/or amount of heavy precipitation	Likely more land areas with increases than decreases	Medium confidence
Increases in intensity and/or duration of drought	Low confidence on a global scale Likely in some regions	Low confidence
Increases in intense tropical cyclone activity	Low confidence in long-term (centennial) changes Virtually certain in North Atlantic since 1970	Low confidence
Increased incidence and/or magnitude of extreme high sea level	Likely, since 1970	Likely

From IPCC, 2013: Summary for Policymakers. In: Stocker TF, Qin D, Plattner GK, et al., eds. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press; 2013:7.

(a) they are more often exposed to very high temperatures; (b) their economies heavily rely on agriculture, natural resource extraction, and other sectors exposed to extreme weather variability; and (c) air conditioning, insurance, and other risk-management approaches are less available in poor countries than in rich countries.[27]

Risk Factors. Various socioeconomic, demographic, health-related, geographic, and other risk factors, such as poverty, minority status, female gender, young age or old age, and various diseases and disabilities, make populations or subgroups within populations more vulnerable to the adverse health effects of climate change. Adverse health effects caused by climate change will likely be heavily concentrated in low-income populations at low latitudes, places where important climate-sensitive health outcomes (eg, malnutrition, diarrhea, and malaria)

Table 2. Assessment of the Likelihood of Further Changes in the Early and Late 21st Century

Phenomenon and Direction of Trend	Likelihood of Further Changes in the Early and Late 21st Century	
	Early 21st Century	Late 21st Century
Warmer and/or fewer cold days and nights over most land areas	Likely	Virtually certain
Warmer and/or more frequent hot days and nights over most land areas	Likely	Virtually certain
Warm spells/heat waves: Frequency and/or duration increases over most land areas	Not formally assessed	Very likely
Heavy precipitation events: Increase in frequency, intensity, and/or amount of heavy precipitation	Likely over many land areas	Very likely over most of the mid-latitude land masses and over wet tropical regions
Increases in intensity and/or duration of drought	Low confidence	Likely (medium confidence) on a regional to global scale
Increases in intense tropical cyclone activity	Low confidence	More likely than not in the Western North Pacific and North Atlantic
Increased incidence and/or magnitude of extreme high sea level	Likely	Very likely

From IPCC, 2013: Summary for Policymakers. In: Stocker TF, Qin D, Plattner GK, et al., eds. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press; 2013:7.

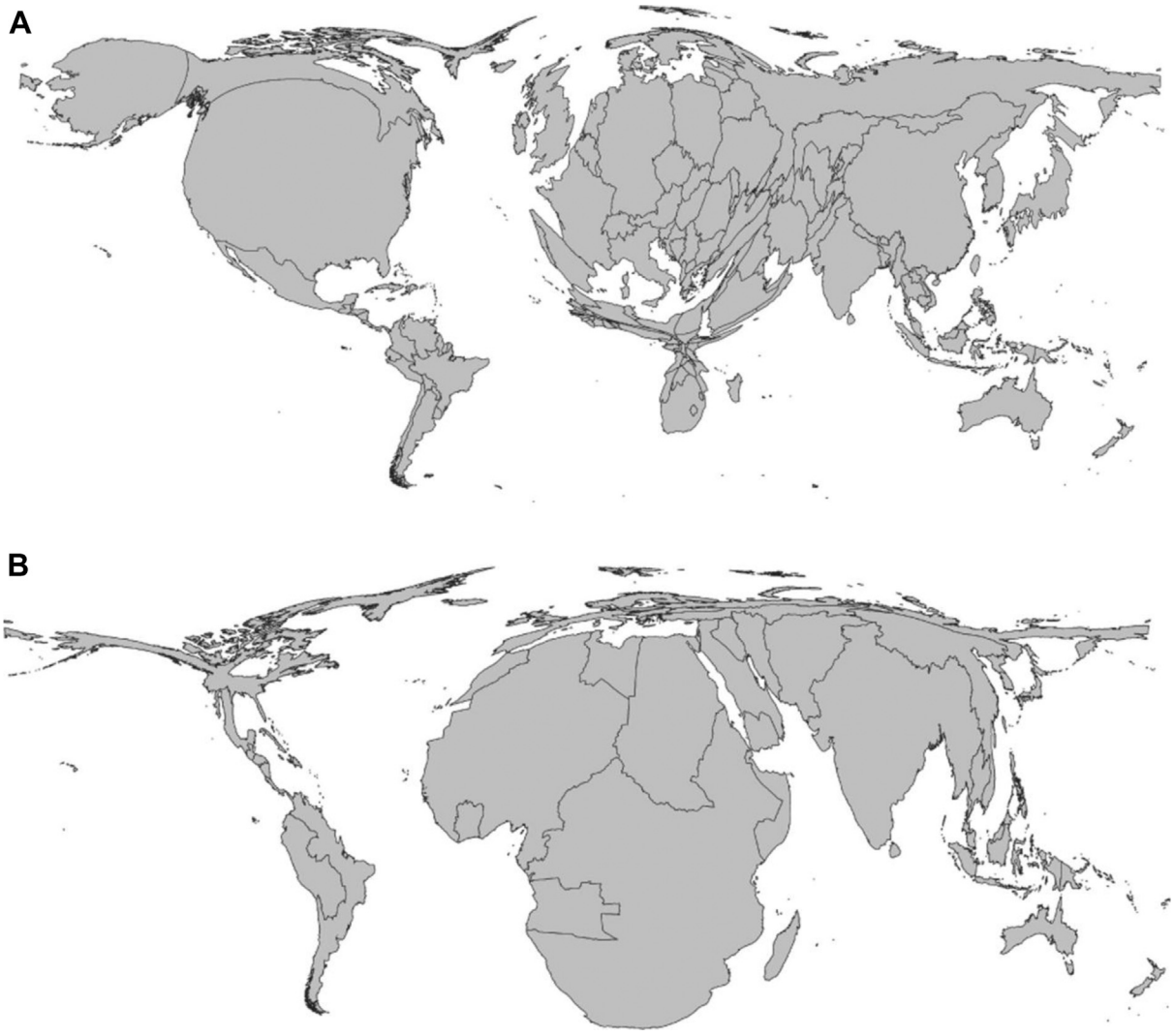

Figure 1. Data-driven cartogram maps demonstrating (A) relative proportions of cumulative carbon dioxide emissions, by country, and (B) magnitude and severity of the consequences of climate change for malaria, malnutrition, diarrhea, and drownings, by country. (From Patz JA, Gibbs HK, Foley JA, et al. Climate change and global health: quantifying a growing ethical crisis. EcoHealth. 2007; doi.10.1007/s10393-007-0141-1.)

are highly prevalent and where vulnerability to these outcomes is greatest.[28] Other geographic risk factors include residing in areas with (a) epidemic disease associated with climate patterns, such as cholera linked to the El Niño Southern Oscillation; (b) decreased access to water or food as a result of drought or other consequences of climate change; and (c) increased risk of vector-borne or waterborne disease.

DISPARITIES AMONG POPULATION SUBGROUPS

The adverse human-rights consequences of climate change are likely to have the greatest impact on populations already suffering from human rights violations, such as residents of low-income countries and residents of low-income communities in high-income countries, as well as minority groups, unemployed people, individuals with chronic diseases and disabilities, and people living in unsafe or marginal environments.

Women. There are many ways in which climate change disproportionately affects women.[29-31] In low-income countries, women generally assume primary responsibility for gathering water, food, and fuel for their households. Climate change–induced droughts make this work much more difficult because water becomes less accessible, agricultural

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production decreases, and wood used for fuel needs to be obtained from increasingly distant places. As women face greater challenges in gathering water, they may develop increased risks of injury and rape.[30]

Women have higher rates of death than men from extreme weather events, such as hurricanes and other storms. Pregnant women are especially susceptible to vector-borne disease, such as malaria, and waterborne disease. Because of longstanding bias and discrimination, in many countries women have fewer resources to deal with damage and loss from extreme weather events.

Children. Climate change adversely affects children in many ways.[32,33] According to the World Health Organization (WHO), 88% of the burden of disease that can be attributed to climate change affects children younger than 5 years of age. Shortages of water and food lead to increased occurrence of childhood malnutrition and make it less likely that children will receive adequate education. In addition, children are more vulnerable than adults to extreme weather events and other disasters because they have less physical strength and during the disasters they may be separated from their parents. Like women, children are especially susceptible to vector-borne disease, such as malaria, and waterborne disease.

Because climate-sensitive health outcomes, such as malnutrition, diarrhea, and malaria, primarily affect children, the aggregate disease burden as a result of climate change appears to be borne mainly by children living in developing countries.[28] Climate change will likely increase the occurrence of all of the following[28]:

- Diarrhea in regions comprised mainly of developing countries by 8% to 9% by 2030.
- Malnutrition in a subregion of the WHO South-East Asian Region that includes India, Bangladesh, and 5 smaller countries by 17% by 2030.
- Mortality as a result of coastal floods in a subregion of the WHO European Region that includes Albania, Bulgaria, Poland, Romania, Turkey, and 11 other countries by 630% by 2030.
- Mortality as a result of inland floods in a subregion of the WHO Region of the Americas that includes the United States, Canada, and Cuba by 800% by 2030.
- Falciparum malaria, especially in African regions where it is highly endemic.

Indigenous People. Indigenous people are especially vulnerable to the adverse consequences of climate change, in part because their lives are closely tied to the natural environment. Environmental consequences of climate change can affect the physical well-being of indigenous people, such as their ability to obtain adequate food, water, and shelter, but also their spiritual well-being, in part because land is often an integral part of their culture and spiritual identity.

Geographic factors can also influence vulnerability of indigenous people to the adverse effects of climate change. For example, the Inuit and other Arctic peoples are experiencing major consequences of climate change because of the unusual warming in the Arctic region.[34] Settlements on low-lying deltas or floodplains are at risk from sea level rise and flooding. Mountain settlements, such as those in the Andes and Himalayas that are dependent on snow pack for freshwater, are also at high risk.

Workers. Workers in many occupations are also at increased risk. They include the following[35]:

- Outdoor workers performing jobs in extreme heat.
- Other workers exposed to extremes of temperature or precipitation.
- Workers exposed to air pollutants, infectious agents, wildfires, extreme weather events, and/or psychological stress.
- Workers in specific industries: utilities, transportation, emergency response, health care, environmental remediation, construction, demolition, landscaping, agriculture, forestry, wildlife management, heavy manufacturing, and warehouse work.

ENVIRONMENTAL AND HEALTH CONSEQUENCES AFFECTING VULNERABLE POPULATIONS

Heat Waves. Heat waves, which have increased in frequency in recent years, cause a variety of heat-related disorders and exacerbations of cardiovascular diseases, respiratory disorders, and other chronic conditions. (In addition, increased heat has adverse consequences on work productivity and activities of daily life.) Studies of heat waves and their adverse health consequences have identified vulnerable populations at especially high risk of morbidity and mortality, including older people, people living alone, urban populations, and those living in homes without air conditioning.[36] A study in Europe demonstrated geographic differences in mortality as a result of heat waves.[37]

Extreme Weather Events. Climate change has increased and is likely to produce more extreme weather events, such as cyclones or hurricanes, and has increased precipitation and flooding in some areas. In addition, climate change in other areas is increasing the number, intensity, and duration of droughts. Poor and marginalized people who live in flood plains and drought-prone areas are especially vulnerable to extreme weather events and their adverse consequences on health and human rights. Compared with other populations, they generally lack access to protective and preventive services and lack the socioeconomic resilience to withstand the adverse consequences of these events.

The risk of being affected by weather-related natural disasters is approximately 80 times greater in developing countries than it is in developed countries.[38] The disproportionate adverse impact of extreme weather events on the poor was demonstrated by Hurricane Katrina in 2005.[39] Warmer water temperature in the Gulf of Mexico, resulting from climate change, increased the power of Katrina as it passed over the Gulf on its path to New Orleans and adjacent areas. However, although this hurricane affected all of New Orleans, the most vulnerable populations, including the poor, those with little or no political power, and people of color, suffered the most.[40,41] Whereas helicopters removed affected people from the roofs of private hospitals, the pleas for assistance from charity hospitals were often ignored. Residents of rich neighborhoods were able to leave New Orleans in their own vehicles, whereas poor people, often from low-lying areas, were often trapped in or near their homes, and, if they survived, had to seek short-term shelter, such as at the overcrowded Superdome, and long-term shelter, often outside of New Orleans because low-income housing there became much more limited.[42,43]

Sea Level Rise. Average sea level throughout the world has increased about 20 cm (8 inches) during the past 100 years, a far greater amount than in the previous 2000 years.[44] Increased sea level will worsen coastal erosion, exacerbate storm surges, inundate low-lying areas, and cause salinization of coastal aquifers. Sea level rise also threatens to inundate low-lying coastal nations, such as Bangladesh, and small, low-lying island nations in the Pacific Ocean, such as Tuvalu and Kiribati. Sea level rise and other consequences of climate change (such as drought) are likely to make millions of people environmental refugees.[45] There are many other reports and studies concerning the ways in which climate change will create forced migration.[1,46-49]

Air Pollution. Climate change is likely to increase chemical air pollutants, such as ozone.[50-55] Resultant respiratory disorders, which are already most prevalent among low-income and minority populations,[56] are likely to increase, with the impact being greatest in these populations.[57-61]

Because carbon dioxide stimulates plant growth, including growth of allergenic species, climate change will likely increase the allergenicity and distribution of pollen and other aeroallergens, resulting in increased prevalence and severity of allergic respiratory disorders.[62-66]

Food Insecurity and Malnutrition. Climate change and related environmental conditions, such as droughts and floods, are likely to adversely affect the ability to grow sufficient amount of food for rapidly increasing populations. As a result, food and nutrition security will likely worsen, especially for poor people living in low-income countries. The prevalence of acute and chronic childhood undernutrition, with accompanying adverse effects on physical and mental development, is likely to increase, especially in those low-income countries already seriously affected by malnutrition.[67] There are many other reports and studies addressing food insecurity and malnutrition.[68-71] Increases in food prices resulting from climate change will also adversely affect the nutritional status of children and other vulnerable populations.[72]

Vector-borne Diseases. Climate change, along with human population growth, increased urbanization, political and demographic changes, and increased international movement of people and materials, has a profound impact on the distribution and abundance of vectors and the pathogens that they can transmit. As a result, there have already been, and will continue to be, major changes in the patterns of vector-borne diseases, including malaria,[73-75] Rift Valley fever,[76,77] tick-borne encephalitis,[78,79] and West Nile virus disease.[80-82] In general, people in low-income countries and impoverished people in high-income countries are more vulnerable to these diseases.

Waterborne and Foodborne Diseases. Climate change affects the occurrence of waterborne and foodborne disease in a number of ways.[83] Heavy rainfall and resultant floods can contaminate water supply systems and result in increased gastrointestinal illness[84]; for example, a study in India found an association between extreme precipitation and hospital admissions related to gastrointestinal illness.[85] Droughts can reduce the availability of safe drinking water; for example, a global study found that childhood diarrhea may increase in incidence

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when there is decreased rainfall, suggesting that when water availability is lower, poor hygiene could account for increased gastrointestinal illness.[86] In addition, storm events can overwhelm deteriorating sewer infrastructure in urban areas.[87]

Collective Violence. Climate change likely increases the global frequency of collective violence, which includes war and other forms of armed conflict, state-sponsored violence (such as genocide and torture), and organized violent crime (such as gang warfare).[88] Meta-analyses provide strong evidence of a causal association between climate change and violence; for example, a meta-analysis and review based on 50 quantitative studies of the association between climate variables and violent conflict (as well as sociopolitical instability) found that when temperature is high and there is extreme precipitation, there are increases in both sociopolitical instability and conflict.[89] This meta-analysis demonstrated that the best designed studies found strong associations between anomalies of climate and both social instability and conflict; it also found that climate events can influence various types of conflict on a broad range of spatial scales.[89]

Scarcity of key environmental resources, such as farmland, forests, river water, and fish, can contribute to violent conflict, such as by generating social stresses that lead to urban unrest, clashes among ethnic and cultural groups, and insurgency campaigns.[90] Collective violence is more likely to adversely affect populations in low-income countries and poor people in mid- and high-income countries. Findings from a recent study in St. Louis suggest that, even in high-income countries, neighborhoods with higher levels of social disadvantage probably experience higher levels of violence because of unusually warm temperatures.[91]

Mental Health Problems. Mental health impacts of climate change include (a) direct impacts of extreme weather events, disasters, and a changed environment; (b) indirect vicarious impacts, based on observation of global events and concern about future risks; and (c) indirect psychosocial impacts at the community and regional levels.[92,93] These mental health impacts disproportionately affect people of lower socioeconomic status.

ADDRESSING CLIMATE CHANGE WHILE PROTECTING HUMAN RIGHTS

Strategies to address climate change fall into 2 broad categories: (a) mitigation (primary prevention), which consists of measures to stabilize or reduce the production of GHGs; and (b) adaptation (secondary prevention), which consists of measures to reduce the public health impact of climate change. The 2015 *Lancet* Commission on Health and Climate Change has identified the necessary policy responses to the impacts of climate change to "ensure the highest attainable standards of health for populations worldwide."[94] Because climate change adversely affects human rights, these rights need to be considered in designing and implementing mitigation measures[95-97] and adaptation measures.[98-101]

International organizations and governments at the national, state/provincial, and local levels should ensure that human rights are considered in developing and implementing mitigation and adaptation measures. Nongovernmental and humanitarian organizations need to hold governments accountable in protecting and promoting these human rights. When human rights violations occur, governments should develop and implement monitoring systems to detect and respond to any further violations. Governments should coordinate multisectoral participation of agencies and organizations, ensuring a focus on protecting vulnerable populations. Governments should not only address immediate problems but also develop long-term strategies and programs to protect and promote human rights that are threatened by climate change.[5]

Mitigation. Mitigation of climate change is necessary to attain health-protective solutions that will last.[102] Stabilizing or reducing GHG production can be done by implementing policies and using technologies. Policies to promote and facilitate mitigation can be developed and implemented in most sectors of society, producing large gains in efficiency in the energy, transportation, and agriculture sectors. Energy policies can promote use of renewable energy, decrease use of fossil fuels, and reduce energy demand. Transportation policies can promote walking and bicycling (active transport) as well as use of fuel-efficient vehicles. Agriculture policies can help to decrease meat production and meat consumption, appropriate development of biofuels, and reduce methane emissions. Mitigation can also be accomplished by increasing GHG removal from the atmosphere with carbon dioxide sinks (such as forests) and implementing land-use policies that promote use and expansion of forests. In addition, reducing population growth rates can play an important role in mitigation by energy demands.

Mitigation measures can be developed and implemented in a manner to both decrease GHG emissions

and improve human health. For example, transportation policies that promote and facilitate safe active transport can reduce GHG emissions and also increase physical activity, improve health status, and prevent cardiovascular diseases and other disorders.

Biofuels and food price shocks. Mitigation measures can potentially have unintended consequences that adversely affect vulnerable populations. Some mitigation measures that are designed to reduce GHG emissions and other causes of climate change may disproportionately harm the poor. For example, using agricultural land to grow crops for biofuels can decrease available land for growing food, thereby increasing food prices and reducing access to food.[26]

Biofuel policy affects commodity prices of food grains by linking oilseed to biodiesel prices and linking corn to ethanol prices. Biofuel production has been linked to food price shocks, which aggravate food insecurity, especially for the poorest people in the world, who spend the highest proportions of their income on food. Diverting food and feed to biofuel production has substantially increased food prices globally. In 2011 it was estimated that biofuels accounted for 20% to 40% of increases in food prices.[103] Ethanol and corn prices are closely linked; as the ethanol price increases by 1 cent per gallon, the corn price increases 4 cents per bushel.[104]

The average US household spends a lower proportion of income on food than the average household in any other country—only 6% compared with up to 80% in the poorest households in low-income countries.[105] Poor people in urban areas are especially vulnerable to food price shocks because they purchase most of their food, instead of growing it.

Carbon tax and equity. In any country, increases in fuel prices disproportionately affect poor populations. Globally, many households are considered to be in "fuel poverty" (needing to spend more than 10% of their income on fuel).[106] People in the household must therefore rely on cheaper energy sources, such as biomass fuel, that produce high concentrations of harmful indoor air pollutants. An estimated 2.4 billion people use biomass fuel for cooking, and an estimated 4.3 million people die annually from indoor pollution from stoves that are inefficient and/or unvented.[107] In addition, time spent collecting wood or manure for fuel precludes spending time on education, especially for girls.[108] In sum, mitigation measures can adversely affect health by raising energy prices and forcing people to use highly polluting fuels.

Centralized versus distributed electric power. Power outages are frequent in low-income countries, averaging more than 144 hours per month in about 17% of low-income countries.[109]

Rural electrification is uncommon in the least-developed countries, such as Ethiopia, where 85% of the population lives in rural areas.[110] From both economic and engineering perspectives, providing electricity to such dispersed people using traditional electrification models based on centralized power generation, transmission, and distribution is impractical. In contrast, the "bottom-up and widely distributed" electrification paradigm using microgrid technology, such as with small hydroelectric dams, windmills, and solar panels, offers a practical and more equitable alternative.[111,112]

Bikeable neighborhoods and equity. Equity issues arise when planning for more bikeable neighborhoods, because people with higher incomes are more likely to be regular bicyclists.[113] In addition, wealthier communities have higher tax bases to support active transport with bicycle lanes and sidewalks.[114] Residents of high-income neighborhoods report more favorable esthetics, greater traffic safety, less crime, and more access to recreational facilities than residents of low-income neighborhoods.[115]

Although wealthy neighborhoods can attract a disproportionate number of new bicycling projects, bicycling in the United States is also inversely related to income. Car ownership is lower among poor people and bicycling is an inexpensive and practical form of transport.[116] Although increased exercise from bicycling can lead to better health, roadways are generally less safe in poorer communities.

Adaptation. Adaptation measures are designed and implemented to decrease the impact of climate change on public health and social systems. For example, planning for extreme weather events can bring about better multisectoral preparedness, which, in turn, can improve emergency responses and can minimize morbidity and mortality from these weather events. As another example, public health surveillance to identify disease trends and outbreaks at an early stage can lead to more effective control and prevention of these problems.

Marginalized populations, such as low-income people, indigenous communities, and other disadvantaged groups, have, in comparison with other populations, an increased burden of adverse health effects because of climate change as well as decreased resources to adapt to climate change. These populations generally have little or no input

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into the decisions that affect their lives. As a result, climate change threatens to worsen existing socioeconomic and health inequalities within and among communities.

Adaptation and human rights. One group's adaptation measures should not create risks for other groups. For example, waste heat from air conditioning can warm outdoor air more than 1°C; therefore, air conditioning can exacerbate urban heat exposure and pose subsequent risks to people unable to afford air conditioners.[117]

Populations vary considerably in their capacity to adapt to an identical risk. For example, the Netherlands, with its well-established engineered system of dikes, has much greater capacity to adapt to sea level rise than does a developing country with similar flat terrain, such as Bangladesh. In addition, different adaptation measures will have different effects on human rights. Often an ecological approach, rather than an engineering approach, will benefit more people.[118] For example, as sea level rises, seawalls have often been used to stabilize shorelines. However, in Vietnam, planting mangroves for storm surge protection costs almost 85% less than building and maintaining seawalls or dikes for this purpose.[119] Mangroves also preserve wetlands and marine food chains that support local fisheries. Therefore, building seawalls can threaten the livelihoods of fishermen, whereas the ecological approach can potentially improve their lives.

Protecting Future Generations. How much money should the current generation spend to mitigate climate change for the benefit of future generations?[120-124] The claim by future generations against the current generation is partially a function of how bad the outcome might be.[125] Is a life that is saved today worth more than a life that is saved in the future? Should the health and well-being of future generations be discounted?[125] The rationale for discounting the health benefits of future generations include the following: people tend to value benefits in the present more than those in the future; the current generation is morally entitled to care more about itself than about future generations; and people in the future will enjoy better health and well-being than people now.[125]

Assumptions related to valuing the health and well-being of future generations influence policy decisions concerning climate change. For example, Nicholas Stern, an economist at the London School of Economics, uses a 1.4% discount rate, which supports more spending for climate change mitigation to protect future generations.[120] In contrast, Yale economist William Nordhaus uses a 6% discount rate, which supports more of a focus on the current generation.[126]

CONCLUSION

The global climate crisis threatens most people and their human rights. The adverse consequences of climate change will worsen. Addressing climate change is a health and human rights priority, and action cannot be delayed. Mitigation and adaptation measures must be equitable, protecting and promoting human rights.

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