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Equity in Disaster Recovery, Mitigation and Adaptation

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I. Introduction

The term **equity** can be defined as the absence of disparities (Putnam-Walkerly and Russell 2016). With regards to disasters, the term equity is essential to the way we understand the root causes of catastrophes, how we recover from them, and how we devise and implement mitigation and adaptation programs. Consequently, if there is one point we wish to communicate in this white paper, it is that **disaster mitigation and risk reduction must become synonymous with inequity reduction and equity making**. In the early 20th Century, disasters were often conceptualized as unavoidable calamities, "acts of god," or acts of nature. Consequently, governmental and non-governmental organizations charged with the task of responding to disasters saw these phenomena as discrete unpreventable events that could only be prepared for and responded to, but not necessarily mitigated or prevented before they occurred (Oliver-Smith 1999).

In the 1970s, a number of geographers, sociologists, and anthropologists began to notice a particular trend that challenged established understandings of disaster as unavoidable events (Hewitt 1983, Maskrey 1993, O'Keefe et al. 1976). Researchers involved in comparing disasters at a global scale noticed that the magnitude or presence of a hazard alone (e.g. earthquakes, hurricanes, tornados) did not guarantee the manifestation of a disaster. Earthquakes of magnitude 7 on the Richter scale, for example, can present a minor inconvenience in places where proper seismic resistance building construction codes are enforced, and construction is restricted to areas where terrain is less likely to magnify seismic waves. In contrast, an earthquake of the same magnitude can kill 25,000 people, as in the case of Guatemala in 1976, or more than 50,000, as we saw in Haiti in 2010. What transforms the hazard into a disaster are human practices that a) enhance the materially destructive and socially disruptive capacities of geophysical phenomena, and b) **inequitably** distribute the effects of a disaster along socially defined lines of gender, race, class, and ethnicity. Socially created **inequity**, then, is something that shapes disaster at various scales. It differentiates disasters at national and regional levels – as in the case of disasters that impact entire regions or nations because of historically imposed conditions of subordination to imperial and colonial global powers – and at local scales – as in the case of disparities along lines of race, class, gender, and ethnicity in affected localities that influence who is impacted and how, and who makes a speedy recovery and who does not.

Because **inequity** is such a critical element in the transformation of a hazard into a disaster, it is of paramount importance that it be addressed in disaster mitigation, recovery, and adaptation programs. Furthermore, addressing inequity requires an emphasis on equity in disaster risk reduction. In this white paper, we examine how inequity and equity matter in recovery, mitigation, and adaptation programs individually. We also provide examples of case studies that illustrate the diverse ways equity matters in these three realms of practice (recovery, mitigation, adaptation), and conclude by

making a series of policy recommendations that should be prioritized in all disaster risk reduction programs, especially in the context of anthropogenic climate change.

II. Recovery

Post-disaster recovery involves the interaction between a variety of people in varying positions of social and political influence. These people include disaster survivors of a variety of socio-economic backgrounds, urban planners, disaster recovery experts, developers and industry leaders, elected and appointed government officials from local, state, and national levels, and non-governmental and non-profit organization staff to name a few. In the aftermath of catastrophic events, these reconstruction actors engage one another in a variety of contexts. In some instances, recovery planning processes require a participatory element where these people might interact. In other cases, non-governmental organizations bypass central and local state institutions and approach disaster survivors directly, carrying out recovery projects that aim to achieve specific institutional objectives. Other instances may involve the development of reconstruction programs through collaborations between the private sector, local and state governments, and these initiatives can include varying levels of public input (or none at all). What is relevant to this discussion is whether the concept and goal of **equity** is included in the policies and practices that emerge out of the discussions, planning processes, and policy development initiatives that so often characterize disaster recovery.

Social science research has demonstrated that some disaster recovery experts (e.g., urban planners), local government officials, and local elites can sideline concerns with equity in disaster recovery (Adams 2013, Barrios 2017, Marchezzini 2015). Recovery experts, for example, may emphasize the importance of "best practices" over equity concerns. The term "best practice" is problematic because it assumes that a particular course of action or policy is universally applicable, without considering the particularities of local histories of inequity-making, or the cultural specificities of the communities impacted by recovery programs. Additionally, local government officials and elites may regard those most vulnerable to disasters as "social undesirables" whose communities sit on prime real estate, and may consequently see disaster recovery as an opportune moment to carry out gentrification and urban renewal projects that do not address equity issues. Although this is not always the case, there are notable examples in the disaster recovery literature that point to key **instances when concerns with equity (and addressing inequity) are not** considered a primary focus of disaster recovery (Barrios 2014, 2017).

What is important to highlight once again is that disasters are not mere events, they are lengthy historical processes that begin long before a hurricane makes landfall, or a seismic fault line releases its tension. Disasters are historical-ecological processes where human actions enhance the socially disruptive and materially destructive capacities of geophysical phenomena. Furthermore, disasters do not end with the receding of flood waters or the cessation of tremors, they continue and can be compounded by recovery processes that do not take equity, local histories, and cultural practices into account (Oliver-Smith 1999). Because socially created inequalities are a

key element giving a particular disaster its form (i.e., who is affected, who dies, who takes longer to recover or never recovers), equity concerns must be central to all recovery processes. Additionally, conditions of inequity are historically produced, and present long before a natural hazard makes is way through a community, city, or nation. Consequently, **it is imperative** that concerns with equity in disaster recovery take local histories of inequity-making into account.

To highlight key instances when concerns with equity have been quite purposely sidelined in disaster recovery, we present two cases. The first is the case of recovery in New Orleans, Louisiana in the aftermath of Hurricane Katrina. The second is that of The US Gulf Coast and Houston, Texas following both Hurricane Katrina and Hurricane Harvey.

i. Example 1: Hurricane Katrina

When Hurricane Katrina's rainwaters caused multiple levee failures in New Orleans in 2005, they inundated a city that was the product of three centuries of race and class-based inequities. At the time New Orleans was first founded in the early 18th Century, flood risk was officially inequitably distributed along lines of race. The old colonial center, known today as the French Quarter, was constructed over the ancient natural levees of the Mississippi River, which, to this day, are above sea level and are very unlikely to flood (Campanella 2006). Under French Colonial law, only people who could prove a complete French genealogy could legally purchase land within the colonial city (Hirsch and Logsdon 1992). In a similar way, the plantations outside the city usually featured the construction of the owner's mansion on the river's levee, at higher elevation and less flood risk, while servant's quarters were constructed on the lower elevation land away from the river's shore, making them more flood prone.

New Orleans' late 18th Century expansion beyond the French Quarter, known today as Faubourg Tremé, was the first part of the city where free people of color could legally purchase land (Campanella 2006, Toledano et al. 1980). Because the Tremé is located to the northwest of the French Quarter and extends away from the Mississippi River, it features a gradual elevation loss and is therefore more likely to flood (Campanella 2006). Throughout the city's Colonial period and the 19th Century, the city's elite families constructed their homes on the ridges left behind by the Mississippi's ancient levees. To this day, major thoroughfares where elite homes are located feature higher elevations. Such is the case of Gentilly Boulevard, St. Charles Avenue, and Esplanade Avenue. Across the urban landscape of New Orleans, social inequity along lines of race and class is inscribed into the city's architecture, and is directly related to the inequitable distribution of flood risk. In the present, New Orleanians recognize the distinction between Front of Town (elite, predominantly white, less flood prone, showcase thoroughfares) and back of town (working class, racially and ethnically mixed, more flood prone neighborhoods)(Breunlin and Regis 2006, Regis 1999).

Race, space, and flood risk distribution was also shaped by the white flight that followed desegregation in the 1960s. In 1960, the city of New Orleans had a population

of 627,525, with 233,514 (37%) of these residents self-identifying as Black in the US Census. By 2004, New Orleans' population had declined to 462,269, and the percentage of residents who self-identified as Black increased to 68% (Campanella 2006, US Census 2016). Prior to desegregation, the City of New Orleans observed a practice of providing separate and unequal public services to its white and black residents. Public schools with African American students, for example, systematically received less than one third the financial resources per student of their white counterparts (Cowen Institute 2018). With de-segregation, many white New Orleanians chose to relocate to suburbs in western Jefferson and eastern St. Bernard Parishes, taking job opportunities and well-funded public schools with them, and forcing many working class African Americans into an imposed condition of urban squalor. Middle class and affluent African Americans also left, some leaving the State of Louisiana to seek employment opportunities in job markets less fraught by racism, others moving to New Orleans East (Jackson 2011). Following de-segregation, the Housing Authority of New Orleans (HANO) followed a pattern of systematic neglect of public housing facilities, allowing the buildings to deteriorate to the point where their demolition and privatized re-development could be easily justified. Many New Orleanians, in turn, often turned to racist discourses to explain the demise of public housing, blaming its African American residents for its condition, rather than white flight and structural racism (Breunlin and Regis 2006).

While a new plan for the city was being created, so was an immediate plan to tear down public housing. Housing in the aftermath of Hurricane Katrina is a multi-layered, complex and divisive topic, particularly in public housing. In New Orleans, the homes that were the strongest and built on the highest ground housed the city's poorest people. The public housing developments in New Orleans that existed during the most active hurricane season on record at the time were built during the WPA program of the Roosevelt Administration. While New Orleans' public housing developments had various challenges around social policy, crime, and generational poverty, the physical structures of the buildings were established to withstand both hurricane force winds and the water that would eventually come based on the city's topography.

As Katrina turned towards southeast Louisiana, officials in New Orleans began to contemplate the worst and many of the city's poorest residents prepared to ride out the storm in the public, housing. Law enforcement raided the homes of tenants in the St. Bernard and Iberville public housing developments (and in public housing across the city), and forced them to leave their homes at gunpoint. Limited space of mass emergency transportation resulted in a limited amount of personal belongings allowed to travel with each passenger. Residents were not told where they were being forced to go and almost all who were evacuated by gunpoint were given one-way tickets to cities that they had never been and had no family or other support system. Meanwhile, homeowners in the city's wealthy uptown neighborhoods were offered the choice of evacuation- and when refused, their homes were patrolled to ensure looting and other criminal activity was kept to a minimum.

In the months of recovery – after the flood waters subsided, residents of public housing fought to retrieve personal items that were barricaded-in as part of a public

housing lock out. And while public housing residents, activists, lawyers and national political leaders fought to have public housing re-opened to residents – the City of New Orleans joined with national organizations, architects, businesses and urban planners to seek the right opportunity to re-conceptualize public housing and lead a new round of significant federal financial investments. This unprecedented disaster had become an opportunity to make citywide changes that would impact the physical look and demographic reality of New Orleans.

What could have been weeks of climate displacement turned into months of government (local and national) forced displacement for the city's poorest residents. Decision-makers seized mass displacement as an opportunity to address "population density" in public housing. Plans to restore the city centered on proposals to tear down and rebuild public housing in New Orleans, including buildings that neither flooded nor succumbed to wind damage during the hurricanes of 2005. Public housing residents were locked out of their homes for more than a year, and many – unable to return from their one-way tickets out of New Orleans – never retrieved their personal photos, diplomas, documents, or generational family objects. This type of planning went on throughout the Gulf Coast, as many cities engaged in an immense and decade-long recovery. Whole communities and cities were "re-conceptualized". The rebuilding of the Gulf Coast cities like Bayou Labatre, AL, Biloxi, MS, New Orleans, LA, brought together the best minds putting forth the best ideas on top of a devastated landscape devoid of most of its people. And if the notion of equality made it into some conversations of recovery, the concept of equity was elusive, if present at all.

In the aftermath of Hurricane Katrina, recovery and planning experts working for the Unified New Orleans Plan (UNOP) failed to make equity a central concern of the city's recovery. The Department of Housing and Urban Development (HUD) and HANO saw the floods triggered by the hurricane as an opportune moment to expedite a long-standing trend of disinvestment from public housing. Without public input, HUD and HANO ordered the city's four main public housing facilities closed after the storm (even though they were all minimally damaged) and planned for their demolition and redevelopment as mixed income housing. At the same time, the US Federal Government required the City of New Orleans to devise a plan for urban recovery through a participatory process, and UNOP was designated to fulfill this requirement. Even though local government authorities characterized UNOP as a planning process where all residents of New Orleans could be potential author's of the city's reconstruction directive, residents were later informed that some key recovery decisions, like the demolition of public housing, had been made *a priori*, and residents would have little say over the fate of this public resource (Barrios 2011, 2017).

In neighborhoods like Tremé, many residents passionately argued for the preservation of public housing during UNOP participatory planning activities, but urban planners denied their requests, insisting New Orleanians should think about their city as a site of capital investment, and not the provision of public services. These capitalist narratives of disaster recovery on the part of planning experts upheld the idea that the city is, first and foremost, a site of capital replication as an unquestionable "best practice." In

doing so, they promoted capital replication as a priority over equity. Equity, in this instance, would have recognized that the overrepresentation of African Americans in public housing, poverty levels, and vulnerability to floods, was the product of historically imposed inequity, and that recovery should therefore address inequity reduction in the form of providing safe and affordable housing for New Orleans' most socio-economically vulnerable residents. In contrast, narratives of the city as a site of capital investment completely ignored the city's history of inequity, and effectively eradicated equity from recovery priorities.

A case in point was the redevelopment of Lafitte Public Housing, which housed 900 families before the storm. Nearly ten years after Katrina, only 120 of the facility's previous families had been able to return. In 2013, the city was missing 111,000 of its African American residents, demonstrating that the lack of focus on equity resulted in recovery efforts that failed to assist those who needed help the most. To this day, urban planners and recovery experts involved in UNOP defend their roles in the planning process, insisting that the decision to redevelop public housing was imposed on them by HUD and HANO. Nevertheless, if equity were at the forefront of recovery priorities, it would have been their ethical obligation to work as advocates of New Orleans' most vulnerable residents, rather than powerful institutional stakeholders.

ii. Example 2: FEMA recovery funding after Hurricane Katrina and Hurricane Harvey in the US Gulf Coast

In the aftermath of both Hurricanes Katrina and Harvey, the Federal Emergency Management Agency (FEMA) upheld the policy that its funds can only be used to cover the expense of damage done by the natural hazard that triggered the emergency phase of the disaster in question (floods), and not the expense of addressing long-standing neglect of infrastructure due to political and socio-economic factors. This policy reinforces a view of "the disaster as hazard," in other words, erroneously conflating the hazard with the disaster. As explained in the introduction of this white paper, a hurricane itself is not a disaster. A disaster is a process that is, more often than not, a historically lengthy one, where human actions give a catastrophe shape and magnitude. The cases of the Lower Ninth Ward in New Orleans, Louisiana; Biloxi, Mississippi; and East Houston in Houston, Texas in the aftermaths of Hurricanes Katrina and Harvey demonstrate how the hazard-centered approach of FEMA's policy runs counter to established scientific knowledge about disasters, and not only disregards **equity** as a key element of recovery, it actually perpetuates **inequity**.

The Lower Ninth Ward is a neighborhood that experienced systematic marginalization and neglect on the part of New Orleans City Government for decades prior to Hurricane Katrina. The neighborhood was originally founded in the late 19th Century by German and Italian immigrants and free people of color, and developed as an area of small family farms (GNOCDC 2007). In the early 20th Century, real estate brokers marketed the neighborhood as a place of residence for working class African Americans who had limited options for housing due to segregation. At the same time, the

US Army Crops of Engineers built a navigation channel and wharf know as the Industrial Canal, which cut the neighborhood off from easy access to the rest of the city, and effectively increased the neighborhood's flood risk (the levee failures along this canal catastrophically flooded the lower 9th Ward and killed at least 75 residents). In the mid-century, the Industrial Canal was directly connected to the Gulf of Mexico via another human-made navigation channel, the Mississippi River Gulf Outlet (MR-GO), which had a significant environmental impact on surrounding wetlands, causing saltwater intrusion that devastated nearby cypress forests and bayous, which would have diminished Katrina's impacts on the area. The construction of the Industrial Canal and the MR-GO are classic cases of **environmental injustice**. These infrastructure features were built in areas populated by working class and minority New Orleanians who had little input on the development process, and who were left to suffer the ensuing **inequitable** flood risk. Meanwhile, the Port of New Orleans and maritime companies benefitted from increased revenue.

Like many other parts of New Orleans, the Lower 9th Ward was hit hard by post-desegregation white flight. Today, the Lower 9th Ward is composed of two neighborhoods, Holy Cross and the Lower Nine. Pre-Katrina, Holy Cross had a population of 5,507 residents living in 1,982 households. Of these residents, 87.5 % self identified as Black in the 2000 census, while 9.4% self identified as white, with much smaller percentages self-identifying as Hispanic, Asian, and American Indian. Forty eight percent of Holy Cross households reported an income lower than $20,000 per year, while 3.3% reported an income over $100,000. At the same time, the Lower Nine had a population of 14,008 residents who lived in 4,820 households. Of these residents, 98.3% self-identified as Black in the 2000 Census, while only .5% self-identified as White. No residents self identified as Asian or Native American, and only 0.5% identified as Hispanic. In the Lower Nine, a greater percentage of households reported earning less than $20,000 per year (50.4%) than in Holy Cross, and a lower percentage reported earning more than $100,000 per year (1.6%). While a significant proportion of residents in both neighborhoods lived in precarious economic conditions (as evidenced by the percentage of households earning less than $20,000 per year), both neighborhoods also featured socio-economic heterogeneity, with 18.1% of all Lower Nine and 22.5% of Holy Cross households reporting incomes between $40,000 and $70,000 per year. Even though the neighborhoods were home to a significant number of economically marginalized families, the neighborhoods also counted a small number of households whose income was higher than the average income for Orleans Parish households, earning less than $200,000 per year (35,693). Finally, a greater number of residents owned their houses in the Lower Nine (59%) than in Holy Cross (41.8%), and the Lower Nine percentage exceeded the homeownership rate in Orleans Parish as a whole (46.5%) (GNOCDC 2007, United States Census Bureau 2000).

The census data for the Lower 9th Ward as a whole paint a picture of forced racial homogenization caused by white flight and imposed urban poverty. But the socio-economic marginalization of the Lower Ninth Ward did not end there. The general population decline translated into diminished tax revenue for the city, and a dramatic decline in the provision of public services. For decades, the City of New Orleans

systematically neglected the upkeep of neighborhood streets and sewage infrastructure in the area, effectively creating **inequity**. In the aftermath of Katrina, Lower 9th Ward civil society leaders and residents found themselves battling FEMA assessors who insisted much of the damage reported was not storm related, but the effect of decades of neglect. Therefore, key infrastructure recovery projects like road rehabilitation remained stalled.

In the case of post-Harvey Houston, the historically neglected and predominantly working class African American and Latino residential area of North East Houston faced similar aid denials on the part of FEMA, especially concerning applications for assistance with home repair (Snyder 2018). East Houston is known for its history of socio-economic marginalization and environmental injustice. It is disproportionately burdened with the presence of landfills and superfund sites (Bullard 1987). Post-Harvey, FEMA has denied claims in this part of Houston, alleging that the reported damage is the result of deferred home maintenance. This FEMA policy is based on an erroneous understanding of disaster as a hazard with a limited temporal span, and not disaster as a historical process with a limited emergency phase. Granted, FEMA personnel may make the case that their agency has a limited budget, and that addressing issues of long term marginalization along lines of race and class lies beyond the resources they command. This reality only serves to underscore the need for disaster mitigation and recovery experts to recognize that disasters are historical processes of **inequity.** It also underlines the need to foreground **equity** not only in disaster recovery, but in disaster mitigation as well, long before a hazard manifests itself and sets off the response phase of a disaster. To put it another way, disasters are not anomalies; they are engendered in normatively accepted everyday societal practices (Oliver-Smith 1999). Disasters are not things that besiege society from the outside, they are created *by* society.

Since the late 1970s, the United States has supported policies around labor laws and tax revenue collection that glorify inequity as the natural and just result of an imagined meritocracy that is not affected by racism, classism, sexism, xenophobia, or ethnocentrism. The result of this policy trend has been a dramatic rise in inequality among American citizens (Obama 2016), let alone the inequities between citizens and "undocumented" immigrants, who are now one of the most vulnerable populations in disaster contexts. **Disaster mitigation and risk reduction must become synonymous with inequity reduction and equity making**. Disaster risk reduction specialists may be frustrated by this observation, replying that such a broad focus on inequity reduction makes their work impossible due to their institutional and legal jurisdiction. It is necessary to transform our thinking about disasters in a way that recognizes equitable society-building as a key pillar of mitigation.

Equity requires recovery processes to find worth in the unwritten words of the most marginalized communities that have been devalued to invisibility through socio-political structures and processes of extraction and attack. For equity to be true, it must be at the core of disaster response, recovery and rebuilding plans. Those most marginalized must be included in the conceptualization, not just the conclusion, of the plan. They must be given the opportunity to contribute thought leadership, not just tokenized affirmations.

To choose equity is to dare to achieve a higher state of our humanity. There must be a social agreement to advance and protect the human rights of all people, thereby no longer sacrificing the most marginalized in favor of the few that have been structurally guaranteed to succeed. There can no longer be a simple calculation of equal parts for distribution, benefit, or shared work going forward. Instead, the ability to value repairing past harms and aggregated impact through an equity and justice lens must be the starting point for recovery in the new climate reality.

III. Mitigation

We define mitigation as the process of reducing disaster vulnerability, especially before a catastrophe-triggering hazard presents itself. As noted in the introduction, in the early 20th Century, many people saw disasters as unavoidable acts of God or "nature." With the development of the vulnerability approach to disasters from the late 1970s to the 1990s, a new possibility emerged. If disasters were, in fact, processes shaped to a great extent by people's actions (e.g., unsustainable land use and development practices, social inequity-making), then perhaps they could be mitigated before they even occurred, if not avoided altogether. While there have been great advances in academic knowledge about disasters in the last forty years, it is unfortunate that actual disaster risk reduction has not kept pace. The Hyogo Framework for Action 2005-2015 (HFA), for example, was an international agreement among 168 member states of the United Nations designed to reduce disaster losses in the form of human lives and the destruction of socio-economic and environmental resources at a global scale (UNISDR 2015). The creation of the Hyogo Framework was accompanied by the establishment of a series of repots known as the Global Assessment Report on Disaster Risk Reduction, also know as the GAR, which were meant to track the progress achieved under the international agreement. In 2015, the milestone year that marked the completion of the Hyogo Framework's timeframe, the GAR reported that:

> "The expected outcome of the HFA has only been partially achieved. Twenty-five years after UN Member States adopted the International Decade for Natural Disaster Reduction (IDNDR) and ten years after the adoption of the HFA, global disaster risk has not been reduced significantly. While improvements in disaster management have led to dramatic reductions in mortality in some countries, economic losses are now reaching an average of US$250 billion to US$300 billion each year…**More critically, both the mortality and economic loss associated with extensive risks in low and middle-income countries are trending up**" (UNISDR 2015, XIV, emphasis added).

To more thoroughly explore why risks are trending up in many parts of the world, we now turn to the example of the Road Home to Recovery program in post-Katrina New Orleans.

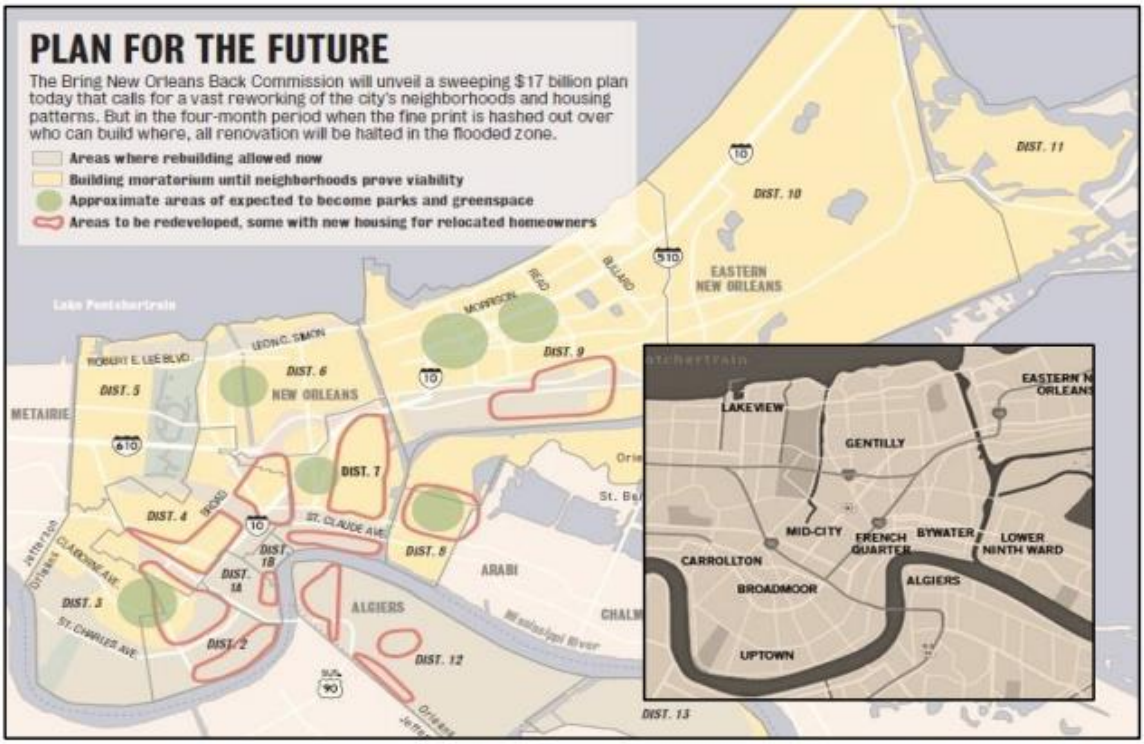
i. Example 1: Road Home to Recovery

One of the key limitations of FEMA disaster recovery programs is that they often assume the recipients of aid are home-owning, college educated, middle class people who head heterosexual nuclear families. These assumptions did not map very well onto In Pre-Katrina New Orleans, where more than 50% of city residents were renters (in public housing and also in generational rentals), who were poorly served by failing public schools, political representation was dominated by multi-national and fortune 500 corporations, and many experienced one of largest racial wealth divides in the country. Unfortunately, these realities present an ideal case study for identifying how current federal policies advance inequity in recovery. In addition, using these same outdated policies in coastal recovery against the backdrop of climate change is a missed opportunity to advance regional and system-wide mitigation efforts that use an equity framework.

The Road Home program of Louisiana was created to assist those New Orleanians who either did not have flood insurance, or whose flood and home owner's insurance payments failed to cover the cost of completely rehabilitating their homes after Hurricane Katrina. State grants for home repair were calculated using the market value of homes, the assessed damage, and the insurance payouts. Without an equity lens, this program allowed those who continue to benefit from historic systems of segregation and redlining to benefit once again. Legally mandated segregation was a main driver for locating Black communities in flood-prone areas, like the Lower 9th Ward. This area had the city's highest rate of Black homeownership, in large part because this is where Black people were allowed to own homes. Some may even argue that the low rate of homeownership and the higher than national average rate of renters in New Orleans is as much about poverty as it is about which geographic locations Black families are supported/encouraged to enter the homeowner market.

Federally supported approaches of devaluing Black community assets through the process of historic redlining continue to drive market values of majority Black neighborhoods. In the aftermath of Katrina, homeowners in majority Black neighborhoods with the same square footage as homeowners in majority White neighborhoods were awarded fewer grant dollars to repair their homes (Greater New Orleans Fair Housing Action Center, 2011). Although materials and hourly construction work cost the same for both, only the homeowners with higher market value home qualified for enough money to completely recover their homes and swiftly return to the city.

The injustice in the valuation of damaged homes is one part of the missed opportunity. An additional missed opportunity relates to how and where homes could be rebuilt. During the recovery, planners presented green dot maps to residents of New Orleans as notice of what would be rebuilt and what would remain "green space".



Because segregation led to high homeownership in flood prone areas, it was no surprise that a mathematical approach to urban redesign left minority communities out of the rebuilding plans. Community outcry helped to push for a more inclusive planning process that was never implemented – creating an even more tense recovery for residents dealing with new and generational trauma.

An equity approach to rebuilding New Orleans after Hurricane Katrina could have helped to usher in a process that addressed historic, current, and future threats to community property and autonomy. Instead of rebuilding back to the way things were, the recovery period in climate disaster presents an opportunity for the federal government to be a leader in developing policies that require new construction that mitigates current impacts of historic segregation of US cities, mitigates the likelihood of future flood (or wind) damage, and mitigates the role of the US in fossil fuel extraction and greenhouse gas emission by advancing solar and wind generated energy systems. With the right political will, mitigation using an equity lens allows for restorative justice, economic justice, and climate justice.

IV. Adaptation

Anatomically modern human beings (*Homo sapiens*) first appear in the archaeological record between 200,000 and 150,000 years ago. Originating in the African Continent, our species has radiated throughout the planet in the succeeding millennia, settling and devising means of subsisting and thriving in a variety of environments. From frozen arctic latitudes to coastal and mountainous regions, people have developed toolkits

that include technologies, social organization, and cultural values that are key to their survival in very different localities. We call this ability to not only survive, but to thrive in a manner that is meaningful and sustainable over prolonged periods of time "adaptation."

A key challenge of understanding and operationalizing the concept of adaptation is that we often make a number of assumptions in speech or writing that do not bear out in the anthropological and historical record. One of these assumptions is the idea of stability and lack of change that can accompany the concept of adaptation. Adaptation, for example, might conjure visions in our minds of a harmonious and unchanging relationship between people and their environment, an ecological utopia. These visions of adaptation uphold the idea that there is first an environment that is then populated by people who devise ways of leaving it unchanged. In contrast, the archaeological and anthropological records reveal that human beings play an important role in modifying, if not altogether transforming, the environments in which they live. Even seemingly pristine environments populated by indigenous communities in the Amazonian rainforest, for example, have featured careful modifications on the part of people that transform the forest into a garden. While this transformation is invisible to the outsider's eye, for whom the forest continues to look like an unchanged environment, local populations know very well where they may harvest the fruits of their gardening labors. The key point here is that environments, with or without human presence, never remain unchanged (Descola 2005, Pickering 2008). In the last 200,000 years, new species have evolved (especially ours), others have become extinct, and no environment has remained static. The meanders of the body of water we call the Mississippi River, for example, have moved with or without human presence, and it is this movement that led to the development of the Mississippi River Delta itself (Pickering 2008).

While no environment has remained unchanged, what we must account for in order to understand equity issues in adaptation are changes in the rate of environmental change itself, especially since the mid 19th Century. Scholars who research the relationship between people and their environments (Descola 2005, Ingold 2000, Latour 1993) agree that all people, regardless of cultural background or historical period, have modified their environments. Nevertheless, they also agree that not all people have changed their environments in the same way and to the same effect, and they notice significant changes in human-environment relations beginning in the 16th Century era of European colonial expansion, and even more so following the onset of coal and oil driven industrial production in the 19th Century.

Colonization of the Americas in the 16th Century, for example, featured the dramatic disruption of agricultural production and ecological systems that had calamitous effects on local indigenous populations. Highly sustainable and well-adapted agricultural systems in Central Mexico and what is today's Central America were replaced with inequitable land tenure systems and cattle ranching that favored the economic interests of Iberian settlers, and dramatically impoverished indigenous peoples. The results of this were both environmental degradation and an exponential rise in mortality, claiming millions of indigenous lives. The environmental impacts of colonization compounded

with the colonial practices of ethnicity-based discrimination; gave form to the disasters of the 20th Century. Some of these disasters, like the Guatemalan 1976 earthquake, were so dramatic in their inequitable effects that they became exemplary studies of the role of inequity in disaster vulnerability (O'Keefe et al. 1976). While the adaptations of pre-Columbian indigenous populations were far from perfect, and sometimes resulted in mismanagement of natural resources (as in the case of the 10th Century Central Maya Lowlands), the impacts of colonization were dramatically more severe and had longer-lasting implications. The inequities in access to natural resources and wealth distribution instituted over colonization made it so small scale farmers are incapable of adapting to their environment in many parts of Central America and Mexico to this day, as they are besieged by land tenure laws, economic policy, and armed conflicts that impede their ability to take ownership and stewardship of their territory (Barrios 2017, Jansen 1998, Stonich 1993).

Concerns with adaptation must then take into consideration structural inequities that inhibit the ability of certain groups (often differentiated along socially created lines of race, class, ethnicity, and gender) to fully practicing their adaptive abilities. A case in point here are the Native American communities of Alaska (Marino 2015), some of which have resided in their present localities for over 1,000 years (Maldonado et al. 2015), which is evidence of their capacity for adaptation. Unfortunately, due to anthropogenic climate change and its related polar ice cap melt and sea level rise, communities like Shishmaref and Barrow, Alaska, are now facing the decision to relocate. In this instance, the rate of environmental change is driven not by the practices of these communities, but by industrialization that made other human beings wealthy in remote locations; yet indigenous communities are the ones who must pay the ultimate price of industrial development.

Prior to colonization, adaptation to a rising sea and melting North Pole would have involved movement to a locality that would allow continuity of livelihood and cultural patterns (Marino and Lazrus 2015) and, to this day, this is the vision of successful relocation among members of these communities. Nevertheless, under conditions of colonization that continue to this day, the movement of communities within the territory of settler nation states is severely curtailed by foreign cultural values such as private property ownership and foreign economic forces. Imposed conditions of inequity introduced through colonization, then, inhibit the adaptive capacities of those communities that are most impacted by anthropogenic climate change. Discussions of adaptation and resilience that ignore **histories of inequity**, then, fall into the intellectual trap of assuming all human beings affected by disasters or disaster risk enjoy the same white colonial settler privilege, which they do not. An emphasis on equity in adaptation, then, must recognize that human beings confronting the effects of coastal loss, sea level rise, and anthropogenic climate change are not all on a level playing field, and that equity in adaptation requires an **environmental justice approach** that preferentially allocates resources to those who need them most, in order to make up for centuries of inequity.

Equity as Adaptation – New Orleans is often thought of as a coastal city. And while it sits near the Gulf of Mexico and hosts the Mississippi River's busiest, largest and oldest port,

New Orleans is not located on Louisiana's coast – at least not yet. Louisiana loses the equivalent of a football field of land every hour, and it has lost land the equivalent of the Grand Canyon since the turn of the 20th century. The climate crisis has accelerated sea level rise around the globe, and the extraction of fossil fuels contribute to both extreme weather and the subsidence of land by the sea in deltas around the globe – including south Louisiana.

Land loss in south Louisiana necessarily means a different reality for the cities just north of the coast (like New Orleans) that depend on coastal land as disaster protection. Science proves that flooding once relegated to the lower parishes of Louisiana will now be an issue for communities further inland. To address this changing reality, various adaptation efforts are being considered and attempted. Adaption efforts, however, are not always connected to the climate crisis and the known realities expected in the near future.

In its Climate Ready Estuaries report, the US. Environmental Protection Agency (EPA) addresses adaptation options that preserve coastal land and development, focus on land use planning and management, land exchange and acquisition programs, and changes to infrastructure:

> "These adaptation options primarily aim to preserve coastal land on which development is planned or already exists. Land use management involves using integrated approaches to coastal zone management as well as land use planning. Land exchange and acquisition programs allow for coastal land to be freed up for preservation uses. Changes to infrastructure can include limiting where hazardous and polluting structures can be built (including landfills and chemical facilities), as well as changing engineering structures that affect water bodies and will be impacted by climate change. Land use planning and management, as well as changes to infrastructure, would be appropriate adaptation options for programs looking to implement anticipatory changes. These options require working with various key stakeholders and a longer timeline for implementation. Land exchange and acquisition programs would be viable options for estuaries that have a management goal of acquiring more land in order to protect currently threatened areas" (2009, p. 10).

The Climate Ready Estuaries report (lists the creation of "permitting rules that constrain locations for landfills, hazardous waste dumps, mine tailings, and toxic chemical facilities" (2009, p. 10). As the reality of New Orleans becoming a coastal city draws closer every hour, adaptation planning and protocols must address the existing energy and economic infrastructure.

In March of 2018, Entergy – one of Louisiana's three fortune 500 companies – successfully lobbied the New Orleans City Council to approve a $210 million gas-fired power plant proposed for New Orleans East. New Orleans East is home to the city's largest Vietnamese community, a growing Latino immigrant community, and a long-standing middle-class African American community. It is also the area of the city that has

received the least amount (per capita) of recovery investment from the impacts of Hurricane Katrina in 2005. Asserted as a need to address peak power demand and provide electricity after storm impacts on electricity services, this Entergy gas-powered plant would be located in devastated marshland and shipping canals responsible for the region's worst environmental damage during Katrina. In addition to the questions of its need and higher rates for basic utility services, residents of New Orleans East and community groups emphasize the dangers of the location of this gas-powered plant, especially during what will be more frequent, extreme weather that causes widespread flooding (Litten 2018).

As part of a new terminology to acknowledge the economic opportunity in disaster, the business of adaptation is often understood as part of a restoration economy. State and municipal budget gaps, unemployment, and disaster planning are integrated into plans for economic growth with concepts of fairness, justice or environmental protection rarely used as guides for decision-making.

Adaptation requires an acceptance of the science of climate change and the inevitable changes in land and land use. Adaptation with equity requires an understanding of socio-political realities facing all levels of society, and requires a reexamination of industry and infrastructure located in and impacted by these changes.

As South Louisiana grapples with adaptation efforts on its coasts, it faces a federal mandate, as well as an opportunity to achieve the EPA Climate Ready Estuary standards and "preserve coastal land on which development is planned or already exists." Louisiana can do this by "limiting where hazardous and polluting structures can be built (including landfills and chemical facilities) as well as changing engineering structures that affect water bodies and will be impacted by climate change." The battle is not with the climate reality, but rather with how political leaders and decision makers balance supporting the profit margins of large corporations with the safety, vulnerability, and human rights of generationally marginalized communities located in the impact zone for more frequent and more extreme weather – the frontlines of climate disaster.

V. Policy Recommendations

The notion of "equality" generally sets the high-water standard for work, planning, and even disaster recovery. Equality looks forward, and is rooted in the privileged assumption that all is equal and should remain equal. Equity, however, is rooted in the notion of justice, and necessarily requires an acknowledgement and commitment to repair past wrongs.

Too often, plans for a new and better tomorrow are made without the voices of people who experienced our planet's most unjust and inhumane realities. Communities accessed only to affirm what has been decided for them are deprived of autonomy and, when done systematically for generations, have their human right to self-determination eroded. Equity in disaster recovery means that the people cannot just be consulted,

warned or put on notice, but rather should be invested in at the socio-political level to engage in processes that promote community autonomy, self-determination, and true democracy.

There is a current trend in policy that supports the reduction of state institutions and budgets charged with the task of providing society's most vulnerable populations with the resources they need (e.g., affordable housing, disaster recovery aid) in order live meaningful sustainable lives and recover from disasters. This logic upholds the idea that state resources are better spent on supporting the private sector, and that the private sector will one day provide the resources necessary for social wellbeing through trickle down economics. Another element of this policy movement is that environmental and labor regulations hinder the capacity of capital to replicate itself, and should therefore be diminished. This notion that market liberalization and the reduction of those governmental organizations that provide public services will lead to optimal social ends is known as neoliberalism. Neoliberal approaches to disaster recovery, however, are characterized by their willful ignorance of histories of inequity that make some populations disproportionately susceptible to the impacts of disaster and its aftermath. The case of the "recovery" of New Orleans highlighted in section II of this document is a case in point. Neoliberal approaches to disaster recovery uphold white middle class privilege, because they draw a purposeful curtain over the histories of racism and ethnocentrism that have limited the social and spatial mobility of ethnic and class minorities in disaster affected localities, and provide utopian solutions whose benefits are not accessible to members of historically marginalized groups. Consequently, disaster recovery, mitigation, and adaptation policy should never subject disaster survivors or populations living in conditions of disaster risk to cost benefit calculations. Instead, it must be understood that we have a collective societal debt to historically disenfranchised communities. Disasters present an opportunity to begin to ameliorate long-standing injustices.

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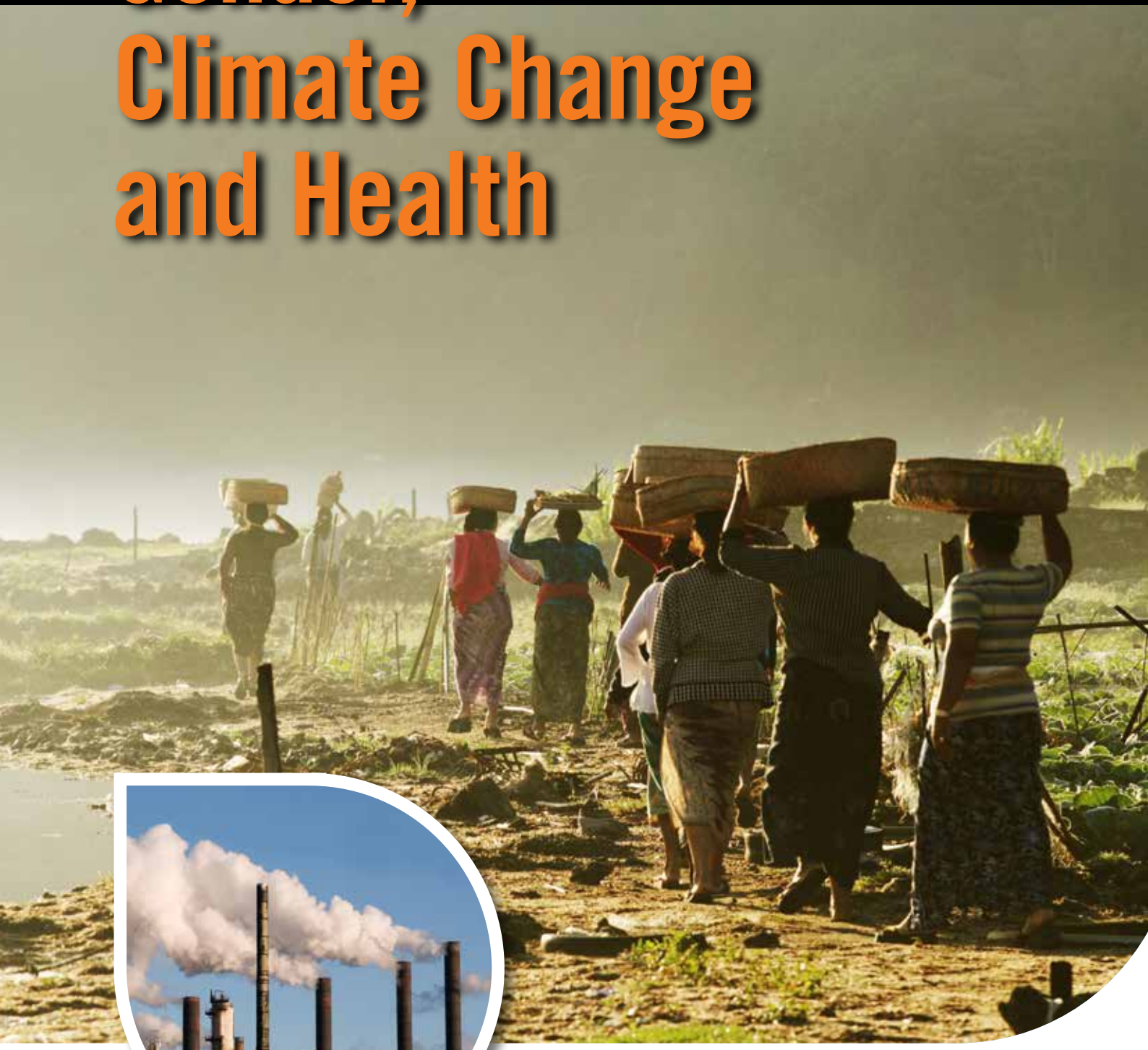
Gender, Climate Change and Health



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Abbreviations

CSW	Commission on the Status of Women
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th edition
FAO	Food and Agriculture Organization
IPCC	Intergovernmental Panel on Climate Change
OECD	Organisation for Economic Co-operation and Development
PTSD	post-traumatic stress disorder
UNFCCC	United Nations Framework Convention on Climate Change
WHA	World Health Assembly
WHO	World Health Organization

Executive summary

There is now strong evidence that the earth's climate is changing rapidly, mainly due to human activities. Increasing temperatures, sea-level rises, changing patterns of precipitation, and more frequent and severe extreme events are expected to have largely adverse effects on key determinants of human health, including clean air and water, sufficient food and adequate shelter.

The effects of climate on human society, and our ability to mitigate and adapt to them, are mediated by social factors, including gender. This report provides a first review of the interactions between climate change, gender and health. It documents evidence for gender differences in health risks that are likely to be exacerbated by climate change, and in adaptation and mitigation measures that can help to protect and promote health. The aim is to provide a framework to strengthen World Health Organization (WHO) support to Member States in developing health risk assessments and climate policy interventions that are beneficial to both women and men.

Many of the health risks that are likely to be affected by ongoing climate change show gender differentials. Globally, natural disasters such as droughts, floods and storms kill more women than men, and tend to kill women at a younger age. These effects also interact with the nature of the event and social status. The gender-gap effects on life expectancy tend to be greater in more severe disasters, and in places where the socioeconomic status of women is particularly low. Other climate-sensitive health impacts, such as undernutrition and malaria, also show important gender differences.

Gender differences occur in health risks that are directly associated with meteorological hazards. These differences reflect a combined effect of physiological, behavioural and socially constructed influences. For example, the majority of European studies have shown that women are more at risk, in both relative and absolute terms, of dying in heatwaves. However, other studies have also shown that unmarried men tend to be at greater risk than unmarried women, and that social isolation, particularly of elderly men, may be a risk factor.

Differences are also found in vulnerability to the indirect and longer-term effects of climate-related hazards. For example, droughts in developing countries bring health hazards through reduced availability of water for drinking, cooking and hygiene, and through food insecurity. Women and girls (and their offspring) disproportionately suffer health consequences of nutritional deficiencies and the burdens associated with travelling further to collect water. In contrast, in both developed and developing countries, there is evidence that drought can disproportionately increase suicide rates among male farmers.

Women and men differ in their roles, behaviours and attitudes regarding actions that could help to mitigate climate change. Surveys show that in many countries men consume more energy than women, particularly for private transport, while women are often responsible for most of the household consumer decisions, including in relation to food, water and household energy. There is also evidence of gender differences in relation to the health and safety risks of new technologies to reduce greenhouse gas emissions. Such information could support more targeted, more effective efforts to bring about more healthy and environmentally friendly policies.

These differences are also reflected in the health implications of potential greenhouse gas mitigation policies. For example, inefficient burning of biomass in unventilated homes releases high levels of

black carbon, causing approximately 2 million deaths a year, mainly of women and children in the poorest communities in the world. The black carbon from such burning is also a significant contributor to local and regional warming. At the household level, women are sometimes critical decision-makers in terms of consumption patterns and therefore the main beneficiaries of access to cleaner energy sources.

Resources, attitudes and strategies to respond to weather-related hazards often differ between women and men. For example, studies in India have shown that women tend to have much lower access to critical information on weather alerts and cropping patterns, affecting their capacity to respond effectively to climate variability. The same study showed that when confronted with long-term weather shifts, men show a greater preference to migrate, while women show a greater preference for wage labour.

Evidence from case studies suggests that incorporation of a gender analysis can increase the effectiveness of measures to protect people from climate variability and change. In particular, women make an important contribution to disaster reduction, usually informally through participating in disaster management and acting as agents of social change. Many disaster-response programmes and some early warning initiatives now place particular emphasis on engaging women as key actors.

There are important opportunities to adapt to climate change and to enhance health equity. Approaches to adaptation have evolved from initial infrastructure-based interventions to a more development-oriented approach that aims to build broader resilience to climate hazards. This includes addressing the underlying causes of vulnerability, such as poverty, lack of empowerment, and weaknesses in health care, education, social safety nets and gender equity. These are also some of the most important social determinants of health and health equity.

Gender-sensitive assessments and gender-responsive interventions have the potential to enhance health and health equity and to provide more effective climate change mitigation and adaptation. Gender-sensitive research, including collection, analysis and reporting of sex-disaggregated data, is needed to better understand the health implications of climate change and climate policies. However, there is already sufficient information to support gender mainstreaming in climate policies, alongside empowerment of individuals to build their own resilience, a clear focus on adaptation and mitigation, a strong commitment (including of resources), and sustainable and equitable development.

"Climate change affects every aspect of society, from the health of the global economy to the health of our children. It is about the water in our wells and in our taps. It is about the food on the table and at the core of nearly all the major challenges we face today."[1]

1 UN Secretary-General Ban Ki-moon. Opening remarks to the World Business Summit on Climate Change, Copenhagen, Denmark, 24 May 2009 (http://www.un.org/apps/news/infocus/sgspeeches/search_full.asp?statID=500).

1. Background

Gender impacts of climate change have been identified as an issue requiring greater attention by the Commission on the Status of Women (CSW).[II] Gender norms, roles and relations (Box 1) are important factors in determining vulnerability and adaptive capacity to the health impacts of climate change (Box 2). Women's and men's vulnerability to the impact of extreme climate events is determined not only by biology but also by differences in their social roles and responsibilities (Easterling, 2000; Wisner et al., 2004). Although they vary, these roles and responsibilities exist in all societies. The expectation that women fulfil their roles and responsibilities as carers of their families often places extra burdens on them during extreme climate events. The expected role of men as economic providers for their families often places extra burdens on them in the aftermath of such events.

Box 1: Definition of sex and gender

In this document "sex" refers to the biological and physiological characteristics of women and men, and "gender" refers to the socially constructed norms, roles and relations that a given society considers appropriate for men and women. Gender determines what is expected, permitted and valued in a woman or a man in a determined context.

Source: WHO (2011a).

Box 2: Definition of climate change

Climate has always varied due to natural influences; however, there is now strong evidence that human actions, principally the burning of fossil fuels, are the main drivers of the recent increase in global temperatures and also affect precipitation patterns and extreme weather events.

This document follows the definition adopted by the Intergovernmental Panel on Climate Change (IPCC), in which "climate change" refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), which defines "climate change" as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".

Source: IPCC (2001a).

II Fifty-second session of the Commission on the Status of Women, 25 February to 7 March 2008 (http://www.un.org/womenwatch/daw/csw/52sess.htm).

At the 2007 World Health Assembly (WHA), Member States of the World Health Organization (WHO) adopted Resolution WHA 60.25 on the integration of gender analysis and actions into the work of WHO at all levels (WHO, 2007). A year later, at the 2008 WHA, 193 WHO Member States committed through Resolution 61.19 to a series of actions to confront the health risks associated with climate change (WHO, 2008a).

The overall aim of this work is to provide a framework for gendered health risk assessment and adaptation/mitigation actions in relation to climate change. This aims to strengthen WHO support to Member States in developing standardized country-level health risk assessments and climate policy interventions that are beneficial to both women and men.

This report therefore adopts a risk-assessment approach in considering the existing evidence for gender differences in vulnerability. Climate change is a long-term process, acting against a background of shorter-term climate variability and many other influences on health. Under these circumstances, direct statistical attribution of even very large gender differences in health effects would generally require high-quality meteorological, health and other data collected over many years, and will therefore only be possible for a minority of effects, in specific locations. In contrast, there is strong evidence of gender differences in the health impacts of short-term climate variability and climate-sensitive conditions, such as malnutrition and incidence of infectious diseases. We use this information to assess likely gender differences in health risks and responses over the longer time periods associated with climate change.

1.1 Health and climate change

Effects of climate change on health will impact on most populations in the coming decades and put the lives and well-being of billions of people at increased risk (Costello et al, 2009). IPCC states that "climate change is projected to increase threats to human health".

Climate change can affect human health through a range of mechanisms. These include relatively direct effects of hazards such as heatwaves, floods and storms, and more complex pathways of altered infectious disease patterns, disruptions of agricultural and other supportive ecosystems, and potentially population displacement and conflict over depleted resources, such as water, fertile land and fisheries (Pachauri & Reisinger, 2007).

There is no clear dividing line between these divisions, and each pathway is also modulated by non-climatic determinants and human actions.

1.2 Health, gender and climate change

Limited case examples and research have analysed and highlighted the links between gender norms, roles, relations and health impacts of climate change (Box 3). The framework in Figure 1, adapted from the synthesis report of the International Scientific Congress on Climate Change (McMichael & Bertollini, 2009), is used in this paper to structure the available information on the gendered health implications of climate change, according to (i) the direct and indirect health impacts of meteorological conditions; (ii) the health implications of potential societal effects of climate change, for example on livelihoods, agriculture and migration; and (iii) capacities, resources, behaviours and attitudes related to health adaptation measures and mitigation policies that have health implications.

Box 3: Why gender and health?

The distinct roles and relations of men and women in a given culture, dictated by that culture's gender norms and values, give rise to gender differences.

Gender norms, roles and relations also give rise to gender inequalities – that is, differences between men and women that systematically value one group often to the detriment of the other. The fact that, throughout the world, women on average have lower cash incomes than men is an example of gender inequality.

Both gender differences and gender inequalities can give rise to inequities between men and women in health status and access to health care. For example:

- **a woman cannot receive needed health care because norms in her community prevent her from travelling alone to a clinic;**
- **an adolescent boy dies in an accident because of trying to live up to his peers' expectations that young men should be "bold" risk-takers, including on the road.**

In each of these cases, gender norms and values, and resulting behaviours, are negatively affecting health. But gender norms and values are not fixed and can evolve over time, can vary substantially from place to place, and are subject to change. Thus, the adverse health consequences resulting from gender differences and gender inequalities are not static. They can be changed.

Source: WHO (2011b).

Figure 1: Effects of climate change on human health and current responses: a gendered perspective

Impact pathways		Current responses	
Meteorological conditions exposure	**Human/social consequences of climate change**	**Mitigation actions**	**Adaptation actions**
Examples: • Warming • Humidity • Rainfall/drying • Winds • Extreme events	*Examples:* • Displacement • Shift in farming and land use	*Examples:* • Alternative energy • Accessible clean water	*Examples:* • Addressing water shortage • Crop substitution • Community education on early warning systems and hazard management
Examples of impact outcomes and responses that are gendered in their effects			
• Injury/death from hunger • Epidemics • Mental health issues • Water-related infections	• Migration • Exacerbation of malnutrition • Increased violence against women and girls	• Hydropower – leading to more snail hosts for schistosomiasis • Cleaner air – less cardiorespiratory diseases (gendered profiles)	• Unexpected nutrient deficiencies • Impacts of water quality • Fewer deaths in extreme events

Source: Adapted from McMichael & Bertollini (2009).

2. Impacts: health

2.1 Meteorological conditions and human exposure

There is good evidence showing that women and men suffer different negative health consequences following extreme events such as floods, windstorms, droughts and heatwaves. A review of census information on the effects of natural disasters across 141 countries showed that although disasters create hardships for everyone, on average they kill more women than men, or kill women at a younger age than men. These differences persist in proportion to the severity of disasters and depend on the relative socioeconomic status of women in the affected country. This effect is strongest in countries where women have very low social, economic and political status. In countries where women have comparable status to men, natural disasters affect men and women almost equally (Neumayer & Plümper, 2007The same study highlighted that physical differences between men and women are unlikely to explain these differences, and social norms may provide some additional explanation. The study also looked at the specific vulnerability of girls and women with respect to mortality from natural disasters and their aftermath; the study found that natural disasters lower the life expectancy in women more than in men. Since life expectancy of women is generally higher than that of men, natural disasters actually narrow the gender gap in life expectancy in most countries. The research also confirmed that the effect on the gender gap in life expectancy is proportional to the severity of disasters – that is, major calamities lead to more severe impacts on women's life expectancy compared with that of men. The study verified that the effect of the gender gap on the gender gap in life expectancy varied inversely in relation to women's socioeconomic status. This highlights the socially constructed and gender-specific vulnerability of women to natural disasters, which is integral to everyday socioeconomic patterns and leads to relatively higher disaster-related mortality rates in women compared with men (Neumayer & Plümper, 2007).

2.1.1 Heatwaves and increased hot weather

Warming and increased humidity have already contributed to observed increases in some health risks, and these can be anticipated to continue in the future.

Direct consequences

Several studies, mainly in cities in developed countries, have shown that death rates increase as temperatures depart, in either direction, from the optimum temperature for that population. There is therefore concern that although warmer temperatures may lead to fewer deaths in winter, they are likely to increase summer mortality. For example, it is estimated that a 2 °C rise would increase the annual death rate from heatwaves in many cities by approximately two-fold (McMichael & Bertollini, 2009). There is evidence that vulnerability varies by sex: more women than men died during the 2003 European heatwave, and the majority of European studies have shown that women are more at risk, in both relative and absolute terms, of dying in such events (Kovats & Hajat, 2008). There may be some physiological reasons for an increased risk among elderly women (Burse, 1979; Havenith et al., 1998). Social factors can also be important in determining the risk of negative impacts of heatwaves. For example, in the United States of America, elderly men seem to be more at risk than women in heatwaves, and this was

particularly apparent in the Chicago events of July 1995 (Semenza, 1996; Whitman et al., 1997). This vulnerability may be due to the level of social isolation among elderly men (Klinenberg, 2002). In Paris, France the heatwave-related risk increased for unmarried men but not for unmarried women (Canoui-Poitrine et al., 2006). Men may also be more at risk of heatstroke mortality because they are more likely than women to be active in hot weather (CDC, 2006).

Indirect consequences

Rising temperatures may increase the transmission of malaria in some locations, which already causes 300 million acute illnesses and kills almost 1 million people every year (WHO, 2008b). Pregnant women are particularly vulnerable to malaria as they are twice as "appealing" as non-pregnant women to malaria-carrying mosquitoes. A study that compared the relative "attractiveness" to mosquitoes of pregnant and non-pregnant women in rural Gambia found that the mechanisms underlying this vulnerability during pregnancy is likely to be related to at least two physiological factors. First, women in the advanced stages of pregnancy (mean gestational age 28 weeks or above) produce more exhaled breath (on average, 21% more volume) than their non-pregnant counterparts. There are several hundred different components in human breath, some of which help mosquitoes detect a host. At close range, body warmth, moist convection currents, host odours and visual stimuli allow the insect to locate its target. During pregnancy, blood flow to the skin increases, which helps heat dissipation, particularly in the hands and feet. The study also found that the abdomen of pregnant women was on average 0.7 °C hotter than that of non-pregnant women and that there may be an increase in the release of volatile substances from the skin surface and a larger host signature that allows mosquitoes to detect them more readily at close range. Changes in behaviour in pregnant women can also increase exposure to night-biting mosquitoes: pregnant women leave the protection of their bednet at night to urinate twice as frequently as non-pregnant women. Although the important role of immunity and nutrition is recognized, it is suggested that physiological and behavioural changes that occur during pregnancy could partly explain this increased risk of infection (Lindsay, 2000). Maternal malaria increases the risk of spontaneous abortion, premature delivery, stillbirth and low birth weight.

Evidence for connections between weather and pre-eclampsia varies between studies. Some studies have looked at links between meteorological conditions and the incidence of eclampsia in pregnancy; the studies found increased incidence during climatic conditions characterized by low temperature, high humidity or high precipitation, with an increased incidence especially during the first few months of the rainy season (Agobe et al., 1981; Crowther, 1985; Faye et al., 1991; Bergstroem et al., 1992; Neela & Raman, 1993; Obed et al., 1994; Subramaniam, 2007). A study from Kuwait found that incidence of pre-eclampsia was high in November, when the temperature was low and the humidity high (Makhseed et al., 1993). On the other hand, the incidence of pregnancy-induced hypertension was highest in June, when the temperature was very high and the humidity at its lowest. Another study, from the southern province of Zimbabwe, evaluated hypertensive complications during pregnancy and observed a distinctive change in the incidence of pre-eclampsia during the year. These changes corresponded with the seasonal variation in precipitation, with incidence increasing at the end of the dry season and in the first months of the rainy season. This observed relationship between season and the occurrence of pre-eclampsia raises new questions regarding the pathophysiology of pre-eclampsia. Possible explanations could be the impact of humidity and temperature on production of vasoactive substances. Dry and rainy seasons, through their influence

on agricultural yields, may also impact on the nutritional status and play a role in the pathophysiology of the women (Wacker et al., 1998).

2.1.2 Windstorms and tropical cyclones

Direct consequences

In the 1991 cyclone disasters that killed 140 000 people in Bangladesh, 90% of victims were women (Aguilar, 2004). The death rate among people aged 20–44 years was 71 per 1000 women, compared with 15 per 1000 men (WEDO, 2008). Explanations for this include the fact that more women than men are homebound, looking after children and valuables. Even if a warning is issued, many women die while waiting for their relatives to return home to accompany them to a safe place. Other reasons include the sari restricts the movement of women and puts them more at risk at the time of a tidal surge, and that women are less well nourished and hence physically less able than men to deal with these situations (Chowdhury et al., 1993; WEDO, 2008).

In May 2008, Cyclone Nargis came ashore in the Ayeyarwady Division of Myanmar. Among the 130 000 people dead or missing in the aftermath, 61% were female (Care Canada, 2010).

Indirect consequences

Women, young people, and people with low socioeconomic status are thought to be at comparatively high risk of anxiety and mood disorders after disasters (Norris et al., 2002). One study of anxiety and mood disorder (as defined by the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders*; DSM-IV) after Hurricane Katrina found the incidence was consistently associated with the following factors: age under 60 years; being a woman; education level lower than college completion; low family income; pre-hurricane employment status (largely unemployed and disabled); and being unmarried. In addition, Hispanic people and people of other racial/ethnic minorities (not including non-Hispanic black people) had a significantly lower estimated incidence of any disorder compared with non-Hispanic white people in the New Orleans area, as well as a significantly lower estimated prevalence of post-traumatic stress disorder (PTSD) in the remainder of the sample. These same associations have been found in community epidemiological surveys in the absence of disasters, suggesting that these associations might be related to pre-existing conditions (Galea et al., 2007). A follow-up study that looked at patterns and correlates of recovery from hurricane-related PTSD, broader anxiety and mood disorders and suicidal behaviour found a high prevalence of hurricane-related mental illness widely distributed in the population nearly 2 years after the hurricane (Kessler et al., 2008).

2.1.3 Sea-level rises, heavy rain and flooding

Increasing temperatures are contributing to sea-level rises, and precipitation is becoming heavier and more variable in many regions, potentially increasing flood risks and multiple associated health hazards. There has, however, been only limited systematic research and gender analysis on the health outcomes of flooding (Few et al., 2004). It is important to recognize that vulnerability to flooding is differentiated by social dimensions. In both developing and industrialized nations, health and other impacts may fall disproportionately on women, children, people with disabilities and elderly people (Few et al., 2004).

Direct consequences

A report on the health effects of climate change in the United Kingdom showed that age- and gender-related information on flood deaths is incomplete. Published reviews have shown, however, that men are much more at risk of drowning than women, probably due to taking more risky or "heroic" behaviour (Kovats & Allen, 2008) (Box 4).

Saline contamination is expected to be aggravated by climate change and sea-level rises (Nicholls et al., 2007). A paper on saline contamination of drinking water in Bangladesh indicated that large numbers of pregnant women in coastal areas are being diagnosed with pre-eclampsia, eclampsia and hypertension. Although local doctors and community representatives have blamed the problem on increased salinity, no formal epidemiological study has been done (Khan et al., 2008).

Box 4: How gender norms, roles and relations explain the differences in fatality between women and men in floods in Nepal

In 1993 a severe flash flood devastated the district of Sarlahi in the southern plains of Nepal. After an unprecedented 24-hour rainfall, a protective barrage on the Bagmati River was washed away during the night, sending a wall of water more than 7 metres high crashing through communities and killing more than 1600 people. Two months later, a follow-up survey assessed the impact of the flood. This survey was unusual in that an existing prospective research database was available to verify residency before the flood. As part of a large community-based nutrition programme, longitudinal data existed on children aged 2–9 years and their parents from 20 000 households, about 60% of the households in the study area. The survey established age- and sex-specific flood-related deaths among more than 40 000 registered participants (including deaths due to injury or illness in the weeks after the flood). Flood-related fatalities were 13.3 per 1000 girls aged 2–9 years, 9.4 per 1000 boys aged 2–9 years, 6.1 per 1000 adult women and 4.1 per 1000 adult men. The difference between boys' and girls' fatalities existed mostly among children under 5 years of age. This possibly reflects the gender-discriminatory practices that are known to exist in this poor area: when hard choices must be made in the allocation of resources, boys are more often the beneficiaries. This could be reflected in rescue attempts as much as in the distribution of food and medical attention.

Source: Adapted from Bartlett (2008).

Indirect consequences

In Bangladesh and the eastern region of India, where the arsenic contamination of groundwater is high, flooding intensifies the rate of exposure among rural people and other socioeconomically disadvantaged groups (Khan et al., 2003). Studies have also found a negative correlation between symptoms of arsenic poisoning and specific socioeconomic factors, in particular educational and nutritional status (Mitra et al., 2004; Rehman et al., 2006; Maharajan et al., 2007). Health problems resulting from arsenic poisoning include skin lesions, hardening of the skin, dark spots on the hands and feet, swollen limbs and loss of sensation in the hands and legs (UNICEF, 2008).

In the south-west region of Bangladesh, waterlogging (local increases in groundwater levels) has emerged as a pressing concern with health consequences. Women are often the primary caregivers of the family, shouldering the burden of managing and cooking food, collecting drinking water, and taking care of family members and livestock. Because of these responsibilities, women often spend time in waterlogged premises and other settings. Research reveals that waterlogging severely affects the health of women in affected communities. Women are forced to stay close to the community and drink unhygienic water, as tube wells frequently become polluted. Pregnant women have difficulty with mobility in marooned and slippery conditions and thus are often forced to stay indoors. Local health-care workers have reported that there are increasing trends of gynaecological problems due to unhygienic water use. Since men are often out of the area in search of work, they are frequently not as severely affected as their female counterparts. Waterlogging, therefore, has given rise to differential health effects in women and men in coastal Bangladesh (Neelormi et al., 2009).

Socially constructed roles also influence the individual disaster responses of men. Within Latino cultures, for instance, expectations of male "heroism" require men to act courageously, thus forcing them into risky behaviour patterns in the face of danger and making them more likely to die in an extreme event. In contrast, women's relative lack of decision-making power may pose a serious danger itself, especially when it keeps them from leaving their homes in spite of rising water levels, waiting for a male authority to grant them permission or to assist them in leaving (Bradshaw, 2010).

Girls and women may experience decreased access to important life skills due to gender norms or expectations around behaviours deemed "appropriate". For example, in some Latin American and Asian countries, women and girls are often not taught to swim, for reasons of modesty (Aguilar, 2004). In the South Asian context, social norms that regulate appropriate dress codes in accordance with notions of modesty may hinder women and girls from learning to swim, which can severely reduce their chances of survival in flooding disasters (Oxfam, 2005).

Possible health consequences of hazards associated with flooding and typhoons include stress-related illness and risk of malnutrition related to loss of income and subsistence, which are known to have a strong gender dimension (FAO, 2001, 2002; Cannon, 2002). Studies from Viet Nam found that stress factors were apparent at the household level. People interviewed in cities in the Mekong Delta referred to increased anxiety, fears or intra-household tension as a result of the dangers and damage associated with flooding and its livelihood impacts. Interviewees in the central provinces referred to food shortages and hunger potentially resulting from crop and income losses following destructive floods and typhoons (Few & Tran, 2010).

In flooded areas of Bangladesh, women are often the last people to receive assistance, as some men push them out of the way in the rush for supplies. Women who have lost clothing in the flood are unable to enter public areas to access aid because they can not cover themselves sufficiently (Skutsch, 2004). A further example of this is the loss of culturally appropriate clothing, which inhibits women from leaving temporary shelters to seek medical care or obtain essential resources (Neumayer & Plümper, 2007).

2.1.4 Drought

Direct consequences

Globally, fresh water resources are distributed unevenly, and areas of most severe physical water scarcity are those with the highest population densities. The health impacts of drought and their gender dimensions may be exacerbated further by climate change. Shifting rainfall patterns, increased rates of evaporation and melting of glaciers, and population and economic growth are expected to increase the number of people living in water-stressed water basins from about 1.5 billion in 1990 to 3–6 billion by 2050 (Arnell, 2004). Almost 90% of the burden of diarrhoeal disease is attributable to lack of access to safe water and sanitation (Prüss-Üstün et al., 2008; WHO, 2009a); reduction in the availability and reliability of fresh water supplies is expected to amplify this hazard.

In arid, semi-arid and dry sub-humid areas, drought already presents a serious threat to the well-being and health of the local populations. Extended periods of drought are linked not only to water shortages and food insecurity but also to increased risk of fires, decreased availability of fuel, conflicts, migration, limited access to health care and increased poverty. Few studies are available on the consequences of droughts for human health, but all of them point to differing impacts on men and women.

In times of water scarcity women have little choice but to carry water home from unsafe sources, including streams and ponds that are likely to be contaminated. This can lead to water-related diseases such as diarrhoeal disease, which in developing countries is a leading cause of death among children under 5 years of age (WHO & UNICEF, 2005). Moreover, when water is scarce, hygienic practices are commonly sacrificed to more pressing needs for water, such as drinking and cooking. The lack of hygiene can be followed by diseases such as trachoma and scabies, also referred to as "water-washed diseases" (WaterAid, 2007). Almost half of all urban residents in Africa, Asia and Latin America are already victims of diseases associated with poor water and sanitation facilities (WHO & UNICEF, 2006).

Indirect consequences

Droughts and drying can lead to social instability, food insecurity and long-term health problems and can damage or destroy related livelihoods (Pachauri & Reisinger, 2007).

In most developing countries, women are intrinsically tied to water. They are responsible for collecting, storing, protecting and distributing water. For women, long journeys walking to the nearest wells and carrying heavy pots of water not only causes exhaustion and damage to bones but also is accompanied by opportunity costs, such as time that could be spent productively going to school or working.

A study on drought management in Ninh Thuan, Viet Nam showed that 64% of respondents agreed that recurring disasters have differential impacts on women and men, and 74% of respondents believed that women were more severely affected than men by drought, due to differing needs for water. Women collect water from sources that are increasingly further away as each drought takes its toll. With fewer water sources nearby, women often walk long distances to fetch drinking water. Women also cook, clean, rear children and collect firewood, so they cope with enormous physical burdens on a daily basis (Oxfam, 2006).

Women and girls fetch water in pots, buckets and more modern narrow-necked containers, which are carried on the head or the hip. A family of five people needs approximately 100 litres of water, weighing 100 kg, each day to meet its minimum needs. Women and children may need to walk to the water source two or three times each day. The first of these trips often takes place before dawn, which involves sacrificing sleeping hours, which can pose a serious strain on health. During the dry season in rural India and Africa, 30% or more of a woman's daily energy intake is spent fetching water. Carrying heavy loads over long periods of time causes cumulative damage to the spine, the neck muscles and the lower back, thus leading to early ageing of the vertebral column (Mehretu & Mutambirwa, 1992; Dasgupta, 1993; Page, 1996; Seaforth, 2001; Research Foundation for Science, Technology and Ecology, 2005; Ray, 2007). More research is needed to uncover the negative health implications of the burden of daily carrying of water, as it seems to fall outside of the conventional categories of waterborne, water-washed and water-related ailmentsDrought increases the family's physiological need for water and also results in greater distances travelled to the water source. According to available data, the quantity of collected water per capita is reduced drastically if the walk to a water source takes 30 minutes or longer (WHO & UNICEF, 2005). As a result, the quantity of collected water often does not even cover the basic human physiological requirements. This puts women in a very difficult position, as in many societies women are socially responsible for the family's water supply. According to a study on water needs and women's health in Ghana, women who maintain traditional norms are particularly vulnerable during water scarcity, as they often give priority to their husbands, ensuring that the man's water needs are met before their own (Buor, 2003).

The stresses of lost incomes and associated indebtedness can spill over into mental health problems, despair and suicide among men. There is some empirical evidence linking drought and suicide among men in Australia (Nicholls et al., 2006). This negative health outcome among Australian rural farmers has been linked to stoicism and poor health-seeking behaviour, which is an intrinsic element of rural masculinity (Alston & Kent, 2008; Alston, 2010). In India, there has been consistent reporting of increased suicide among poor male farmers following periods of droughts in contiguous semi-arid regions (Behere & Behere, 2008; Nagaraj, 2008).

3. Impacts: social and human consequences of climate change

3.1 Migration and displacement

Climate change can affect migration (Box 5) in three distinct ways. First, the effects of warming and drying in some regions will reduce agricultural potential and undermine "ecosystem services" such as clean water and fertile soil. Second, the increase in extreme weather events – in particular, heavy precipitation and resulting flash or river floods in tropical regions – will affect ever more people and may generate mass displacement. Finally, sea-level rises are expected to destroy extensive and highly productive low-lying coastal areas that are home to millions of people, who will have to relocate permanently. In this context, health challenges can involve, among other things, the spread of communicable diseases and an increase in the prevalence of psychosocial problems due to stress associated with migration. The human and social consequences of climate change in this context are studied very poorly, if at all.

Box 5: Definition of environmental migrants used in the context of this document

"Environmental migrants are persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad".

Source: International Organization for Migration (2007).

There are few studies on the linkages between extreme events and domestic and sexual violence. However, a report that looked into the issue of recovery after the Indian Ocean tsunami in 2004 indicated that women and children were very vulnerable in these situations. Although the occurrence of tsunamis is not attributable to weather or climate change, one can assume that in the aftermath of extreme events and the ensuing displacement of groups of people that may occur, scenarios similar to the post-tsunami conditions are plausible.

The *World Disaster Report* recognizes the widespread consensus that "women and girls are at higher risk of sexual violence, sexual exploitation and abuse, trafficking, and domestic violence in disasters" (IFRC, 2007). Women who were subjected to violence before a disaster are more likely to experience increased violence after the disaster, or they may become separated from family, friends and other potential support and protective systems. After a natural disaster, women are more likely to become victims of domestic and sexual violence and may avoid using shelters as a result of fear (Davis et al., 2005; IFRC, 2007).

Psychological stress is likely to be heightened after disasters, particularly where families are displaced and have to live in emergency or transitional housing. Overcrowding, lack of privacy and the collapse of regular routines and livelihood patterns can contribute to anger, frustration and violence, with children and women most vulnerable (Bartlett, 2008).

Adolescent girls report especially high levels of sexual harassment and abuse in the aftermath of disasters and complain of the lack of privacy in emergency shelters (Bartlett, 2008).

3.2 Shifts in farming and land use

For farmers, insecurity due to erratic rainfall and unseasonal temperatures can be compounded by a comparative lack of assets and arable land, and in some cases lack of rights to own the land they till. This means that credit available for suitable agriculture technology (e.g. watering implements, climate appropriate seed varieties, non-petroleum fertilizers, energy-efficient building design) is limited, as is their capacity to rebuild post-natural hazards in this context.

Loss of biodiversity can compound insecurity because many rural women in different parts of world depend on non-timber forest products for income, traditional medicinal use, nutritional supplements in times of food shortages, and a seed bank for plant varieties needed to source alternative crops under changing growing conditions. Thus, loss of biodiversity challenges the nutrition, health and livelihood of women and their communities (Boffa, 1999; Pisupati & Warner, 2003, Roe et al., 2006; Arnold, 2008).

Nutritional status partly determines the ability to cope with the effect of natural disasters (Cannon, 2002). Women are more prone to nutritional deficiencies because of their unique nutritional needs, especially when they are pregnant or breastfeeding, and some cultures have household food hierarchies. For example, in South Asia and South-East Asia, 45–60% of women of reproductive age are underweight and 80% of pregnant women have iron deficiencies. In sub-Saharan Africa, women carry greater loads than men but have a lower intake of calories because the cultural norm is for men to receive more food (FAO, 2001). For girls and women, poor nutritional status is associated with an increased prevalence of anaemia, pregnancy and delivery problems, and increased rates of intrauterine growth retardation, low birth weight and perinatal mortality. According to the Food and Agriculture Organization (FAO), in places where iron deficiency is prevalent, the risk of women dying during childbirth can be increased by as much as 20% (FAO, 2002).

Pregnant and lactating women face additional challenges, as they have an increased need for food and water, and their mobility is limited. Globally, at any given time, an average of 18–20% of the reproductive age population is either pregnant or lactating (Röhr, 2007). These biological factors create a highly vulnerable population within a group that is already at risk (Shrade & Delaney, 2000).

3.3 Increased livelihood, household and caring burdens

Apart from the nutritional impacts of livelihood, household and caring burdens, decline in food security and livelihood opportunities can also cause considerable stress for men and boys, given the socially ascribed expectation that they should provide economically for the household. This can lead to mental illness in some cases. It has been recognized that men and boys are less likely than women and girls to seek help for stress and mental health issues (Masika, 2002).

Women and girls are generally expected to care for the sick, including in times of disaster and environmental stress (Brody et al., 2008). This limits the time they have available for income generation and education, which, when coupled with the rising medical costs associated with

family illness, heightens levels of poverty, which is in turn a powerful determinant of health. It also means they have less time to contribute to community-level decision-making processes, including on climate change and disaster risk reduction. In addition, being faced with the burden of caring for dependents while being obliged to travel further for water and firewood makes women and girls prone to stress-related illnesses and exhaustion (CIDA, 2002; VSO, 2006).

Women and girls may also face barriers to accessing health-care services due to poor control over economic and other assets to avail themselves of health care, and cultural restrictions on their mobility that may prohibit them from travelling to seek health care.

Increased time spent collecting water means a decrease in available time for education and places women and girls at risk of violence when travelling long distances. A lower education status implies more constraints for women to access health information or early warning systems as they are developed. This also means that girls and women have decreased access and opportunities in the labour market, increased health risks associated with pregnancy and childbirth, and less control over their personal lives.

Elderly women may have heavy family and caring responsibilities that cause stress and fatigue, while also preventing wider social and economic participation. Their incomes may be low because they can no longer take on paid work or other forms of income generation. They may have inadequate understanding of their rights to access community and private-sector services. Even when they are aware of these services, nominal financial resources for clinic visits and drugs may be out of their reach. Access is further restricted for older women and older men living in rural areas, who are often unable to travel the long distances to the nearest health facility.

Older men are particularly disadvantaged by their tendency to be less connected than women to social networks and therefore unable to seek assistance from within the community when they need it (Consedine & Skamai, 2009).

3.4 Urban health

An individual's place of residence and their status within that place are important determinants of health. Urbanization is a dominant trend, with more people living in marginal conditions in cities in developing countries. Urban populations have distinct vulnerabilities to climate related health hazards (Campbell-Lendrum & Corvalan, 2007).

Limited access to land in rural areas, conflict, divorce and unemployment forces increasing numbers of women into living in marginalized urban and peri-urban areas and slums. These dwellings are often situated on ground with particular environmental risks, such as hillsides and low-lying plots.

The rising rate of female-headed households in urban/peri-urban areas results in a shift of urban sex ratios and feminization of urban poverty. Poverty, exposure of dwelling, and managing on their own the disproportionate daily burden of infrastructural needs such as waste management, fuel, water and sanitation make urban female heads of households particularly vulnerable to natural disasters (Chant, 2007).

4. Responses to climate change

"Climate change will affect, in profoundly adverse ways, some of the most fundamental determinants of health: food, air, water."[III]

"Climate change could vastly increase the current huge imbalance in health outcomes. Climate change can worsen an already unacceptable situation that the Millennium Development Goals were explicitly and intricately designed to address."[IV]

The international response to climate change is governed by the UNFCCC. The stated aim of the UNFCCC is to avoid the "adverse effects" of climate change, which it defines not only as impacts on "natural and managed ecosystems or on the operation of socio-economic systems" but also on "human health and welfare" (UN, 1992). Although climate change is widely considered to be one of the most significant threats to future human development, it is often analysed through an exclusively environmental or economic perspective, without adequately considering the extent to which it affects all aspects of human societies.

According to Article 4.f. of the UNFCCC, before parties propose new adaptation or mitigation initiatives, they shall assess its health benefits or negative impacts together with environmental and economic considerations. This article recognizes the importance of considering health and other social implications, including gender equality, when developing impact assessments and not basing decisions only on potential economic and environmental impacts. The correct implementation of this UNFCCC provision will bring opportunities to advance the sustainable development agenda.

In contrast, poorly designed policies could easily undermine gender equality, climate and health equity goals and reduce public support for their implementation. An essential aspect for achieving health equity and climate goals is therefore a commitment to intersectoral action to achieve "health equity and climate change in all policies" (Walpole et al., 2009).

Specific policies need to be carefully designed and assessed. Integrated assessment methods that consider the gendered range of effects on health and health equity can maximize synergies and optimize trade-offs between competing priorities. At the design stage, implementing safeguards and flanking measures, such as recycling revenue from carbon pricing measures, towards health outcomes for disadvantaged groups can help avoid or reduce inequitable effects (Walpole et al., 2009).

4.1 Mitigation actions and health co-benefits

The UNFCCC states that mitigation measures bringing about societal benefits should be prioritized. Health is one of the clearest of the societal benefits. Measures undertaken to reduce greenhouse gas emissions in the household energy, transport, food and agriculture, and electricity generation sectors, in both low- and high-income settings, can have ancillary health benefits (or "health co-benefits"), which are often substantial.

III Chan (2007).

IV Ibid.

There is growing interest in the links between gender and mitigation efforts. To develop effective mitigation policies and programmes that will also impact on key health outcomes, it is crucial that equity and gender perspectives are integrated into relevant policy and programme design.

There is accumulating evidence of important differences in the circumstances, attitudes and behaviours of women and men in relation to decisions on mitigation policies and their relation to health. For example, a study that looked at gender differences in energy consumption patterns and greenhouse gas emissions among single households in Greece, Sweden, Norway and Germany found that the average single man consumed more energy than the average single woman in all four countries studied. The largest difference in absolute energy use between single men and single women was in the category of transport (primarily due to cars). In the study the average single man spent more money on vehicles and fuel than did the average single woman. Men also spent more money on buying cars and other vehicles than did women, resulting in higher indirect energy use by men. Women on the other hand consistently used more energy than men in consumption categories such as food, hygiene, household effects and health, although the differences were small (Räty & Carlsson-Kanyama, 2010). Studies for the Organisation for Economic Co-operation and Development (OECD) have shown that women make over 80% of consumer decisions and are more likely to be sustainable consumers, with a higher propensity to recycle and placing a higher value on efficient energy compared with men (OECD, 2008). Such differences are likely to be particularly important in relation to choices such as food, because decisions such as moderating meat and dairy consumption can help to reduce the large contribution of agriculture to greenhouse gas emissions and at the same time bring very large health benefits.

Gender differences extend beyond individual consumer choices and also apply to attitudes to wider policy decisions. For example, a large survey in Australia examined attitudes towards carbon capture and storage from power plants and other stationary sources (IPCC & TEAP, 2005), which has been advocated as a potential measure to reduce greenhouse gases but which also raises environmental, health and safety concerns related to possible leakage of carbon dioxide. The survey showed women were less accepting of carbon capture and storage and more concerned than men about safety, risk and effectiveness (Miller et al., 2007).

When devising and applying policy instruments for energy efficiency or emission reductions, it is important to know the target groups. If women and men differ regarding their use of energy and emission profiles, then the mitigation policy instruments should reflect these differences to achieve the maximum benefits from the policies (Miller et al., 2007). The integration of a gender analysis component will help in understanding how gender norms, roles and relations determine the different patterns of obtaining and using fuel, energy and water by both women and men. The following sections examine these interactions for two of the sectors that make the largest contribution to greenhouse gas emissions and health outcomes, and that have the strongest evidence of gender-specific differences.

4.1.1 Access to energy

One of the main responsibilities of women in developing countries is ensuring energy supply and security at the household level. It is therefore crucial to involve women in the design, negotiation and implementation of clean energy choices that have the potential to improve health and well-being, both through reduced risks to health, and through savings in time and financial resources

(Aguilar, 2009). In addition, involving men is also important because they are often the decision-makers in households in many parts of the world. Involving both women and men will increase the chances of adoption and sustenance of alternative energy strategies. There is also a need to address existing, often unequal power relations regarding decision-making on household security and energy consumption through empowerment of women.

Lessening the reliance on coal-fired generation of power will reduce air pollution and associated respiratory and cardiopulmonary disease and death (von Hilderbrand, 2009). Indeed, the provision of affordable clean household energy in developing countries can contribute to the attainment of the Millennium Development Goals through both co-benefits to health and contributions to poverty reduction – attained by the provision of productive work and the reduction of unproductive time. This in turn can lead to a reduction of gender inequities (Wilkinson et al., 2007).

Approximately 2 billion people lack access to electricity and suffer substantial ill-health as a result. Around half the global population cooks daily with traditional biomass fuels (e.g. dung, crop residues, wood, charcoal), resulting (particularly for women and children) in exposure to very high concentrations of indoor air pollutants and impacting on health by increasing the risk of chronic obstructive pulmonary disease, worsening lung function (Behera et al., 2001; Liu et al., 2007), and contributing to childhood pneumonia and lung cancer. In addition, fuel shortages increase the workload of women in places where they are responsible for collecting fuel.

More energy-efficient cooking stoves are becoming increasingly available in a number of countries and can substantially cut the use of biomass fuels, with subsequent health, environmental and economic benefits (Haines et al., 2006) (for an example, see Box 6).

Box 6: The Nepal Biogas Support Programme

Inefficient burning of biomass in unventilated homes releases high levels of black carbon, causing approximately 2 million deaths a year, mainly among women and children in the poorest populations. The black carbon from such burning is also a significant contributor to local and regional warming. Improved access to clean energy therefore presents opportunities for improving health, livelihoods and the environment.

Biogas systems convert cattle dung and other animal or human wastes into methane. This flammable gas is a simple-to-use fuel for lighting and cooking: it burns cleanly and efficiently on a conventional low-pressure gas burner. In Nepal, the Biogas Support Programme has installed more than 120 000 biogas plants over the past 13 years. About 3% of Nepalese homes now benefit from this intervention, with much lower levels of indoor air pollution and reduced time spent gathering fuel, with particular gains for women. Moreover, 72% of the biogas plants are connected to latrines, leading to improved cleanliness and reduced health risks in the vicinity of the home. The residual slurry is a valuable organic fertilizer.

This biogas programme was the first to be recognized under the Clean Development Mechanism. It trades certified emission reductions; each operational biogas plant is worth 4.6 tonnes of carbon dioxide (CO_2) equivalent per year. This success story points to new synergies between household energy programmes and efforts to reduce climate change.

Source: Adapted from Netherlands Development Organization & Biogas Sector Partnership – Nepal (2004).

Although hydroelectric power is a clean and renewable energy source and attractive as a mitigation strategy to reduce greenhouse gases, hydropower plants can significantly impact on the surrounding area and provoke opposition for numerous social, environmental, economic and safety reasons. It is estimated that the construction of hydropower plants has already displaced some 30–60 million people,[V] usually poor people who are further impoverished economically and suffer cultural decline, high rates of sickness and death, and great psychological stress. As the majority of impoverished people are women, and women also suffer specific health consequences of forced migration, it is expected that such displacement would have a gender dimension (Davis et al., 2005; IFRC, 2007; Bartlett, 2008). The livelihoods of people downstream of dams can also be severely affected through the destruction of fisheries, the contamination of water supplies and the loss of seasonal floods, which bring fertile silt and water to agricultural land. Dam reservoirs can also become breeding grounds for water-related diseases such as malaria and schistosomiasis (Diop & Jobin, 1994; Ghebreyesus et al., 1999).

Sources of renewable energy such as photovoltaic, solar, thermal, wave and wind power do not appear to have any important adverse effects on health, and their overall impacts are likely to be overwhelmingly beneficial (Haines & Kammen, 2000).

4.1.2 Transportation

Transport is currently responsible for about 23% of world energy-related greenhouse gas emissions (IPCC, 2007a). Transport is projected to create the fastest proportional growth in greenhouse gas emissions of any sector from 1990 to 2020, with direct connections with urban air pollution (around 1.3 million related lung cancer deaths per year globally), road traffic accidents (the first leading cause of death in 2004 in men aged 15–44 years, over 1.2 million deaths per year, and 20–50 million non-fatal injuries per year) and physical inactivity (more than 3.2 million deaths in 2004) (WHO, 2009a,b). The need to reduce greenhouse gas emissions is prompting consideration of a more sustainable focus where the emphasis is on public transport, active transport and road safety. The gender dimensions need to be studied further.

In 2002, males accounted for 73% of all road traffic deaths, with an overall rate almost three times that for females (27.6 males per 100 000 population; 10.4 females per 100 000 population). Road traffic mortality rates are higher in men than in women in all regions, regardless of income level, and also are higher across all age groups. The gender difference in mortality rates is probably related to both exposure and risk-taking behaviour (Waldron et al., 2005).

Despite traditional engineering approaches favouring high-cost infrastructure that provides greater speed for vehicles, it has been shown that measures that truly improve urban transport overall are those that reduce speeds and provide a safer environment for pedestrians (Broaddus et al., 2009). Speed-reduction policies have big environmental impacts and also result in great public health benefits: for every 1 km/h reduction in average speed, there is a 3% reduction in the incidence of injury-incurring car crashes (WHO, 2004). For example, in Israel, major highway projects are usually based on cost–benefit analyses in which the value of time saved on car travel, especially travel to work, is weighted heavily. Yet highway development, which also encourages suburbanization and fragmentation of commercial and residential functions and degrades public transport, leads to a loss rather than a saving of women's time (Fletcher et al., 1999).

V See http://www.internationalrivers.org/en/node/570.

Promoting active transport such as cycling and walking by providing cycling lanes, pedestrian paths and pedestrian precincts could result in very large public health benefits. It is well known that physical activity is a protective factor for a wide range of diseases, including coronary heart disease, stroke, type 2 diabetes, hypertension, osteoporosis, dementia and some types of cancer. An urban environment that encourages active transport and lifestyle overall would bring social and mental health benefits and potentially lower obesity rates (Woodcock et al., 2009). The extent to which active transport can be integrated into everyday life depends on the distances to be travelled, the available infrastructure and resources, and the respective cultural and social norms of a country. Cultural restrictions on the mobility of women can make them resort to other means of transport.

In some parts of Africa, women who ride bicycles are highly stigmatized, and cultural constraints may not permit a woman to ride a bicycle or a scooter. This cultural norm inhibits women's range of mobility and makes them more dependent on their male counterparts, thereby hindering appropriate health-seeking.

Further restrictions on women include gender-based issues around vehicle ownership. Men are typically the first to get access to a private vehicle in a household and, when possible, also the first to motorize. Furthermore, men are more likely to get a driving licence. Women on the contrary usually use the vehicle that is left behind and often rely on public transport for travelling longer distances (GTZ & Federal Ministry for Economic Cooperation and Development, 2007). A study on road transport, environment and social equity conducted in Israel in 1999 found that gender roles dictated different travel patterns for women and men. Israeli women made more short journeys and fewer interurban trips than men – a factor probably related to their multiple roles in the workplace and home. In metropolitan Tel-Aviv-Jafo, women made about 50% more trips daily in their community of residence compared with men. Conversely, men made about 60% more interurban car trips compared with women. The special needs of women in relation to short-distance travel networks – including pedestrian and urban mass transit routes – receive little attention from policy-makers, who focus largely on the planning of improved interurban and urban bypass roads (Garb & Fletcher, 1999).

A study that examined transportation improvement strategies for a major urban highway corridor in Dhaka, Bangladesh examined the impacts of different road-improvement strategies on transit passengers and rickshaw pullers. The primary focus of the road-improvement strategy was to reduce congestion by restricting non-motorized transport modes such as rickshaws, which were a major part of the travel flow in the corridor. Many of those interviewed stated that although congestion on the major road declined, the road-improvement strategies had a negative impact on women, especially those in low- and middle-income groups, who find it extremely difficult to ride in overcrowded local buses during peak hours (Salma, 2004).

These examples demonstrate that gender is a key component for planning, designing and implementing transportation policies. An example from Bogotá, Colombia (Box 7) illustrates that the implementation of sustainable transportation policies does not only impact on the immediate environment but also can have an effect on gender equality, health and quality of life.

Box 7: Sustainable transport in Bogotá[VI]

Until recently, Bogotá's growth has placed a strain on its roads and public areas. Due to inadequate urban and transportation planning, Bogotá's streets were congested and polluted, and public urban spaces, including parks, open spaces and pedestrian paths, were disappearing in favour of uncontrolled urban sprawl. This hostile environment provided a fertile ground for social and economic inequality and environmental degradation in the city, and contributed to the city's urban decay.

As Bogotá's urban population passed 6 million, there was increasing awareness that local and national policy-makers would need to work jointly to provide effective solutions. The implementation of a planned and sustained policy resulted in an urban renewal campaign over a period of 12 years. This included changes in planning methods, effective public and private management, and a new focus on public participation, with the aim of generating an inclusive, sustainable and just city, transformed from a city for cars into a city for its people.

The mass transport system TransMilenio is considered a cornerstone in this model of urban development. TransMilenio uses a large fleet of high-capacity buses operating in dedicated arterial lanes (84 km of arterial lanes and 512 km of feeder route lanes) offering coverage and accessibility to 536 neighbourhoods, mainly benefiting low-income populations living in the peripheries of the city. The system has an average of 1.66 million daily transit trips and accounts for 26% of all public transportation trips in Bogotá. The TransMilenio buses also include reserved seating, spaces for wheelchairs and pushchairs, and preferential entry doors for pregnant women, people with disabilities, children and older people.

The overall renewal campaign also included infrastructural improvements such as building and renovating cycle paths (354 km) and footpaths, outlawing cars from using the footpaths, closing several streets to cars to convert them into pedestrian areas, creating and renewing green spaces and parks, and improving public facilities.

Data from TransMilenio and the ITSD indicate large and rapid benefits. Using 1998 base year data, the system is estimated to have saved up to 40 minutes per trip, and traffic accidents have been reduced by approximately 50% in the corridors where TransMilenio operates, with a reduction in injuries of more than 80%. There has been a reduction of 3–10 decibels in noise levels in the main arterial corridors. From its inception in 2001 until 2008, the project reduced CO2 emissions by over 1.6 million tons. Particulate matter and nitrogen and sulphur oxides decreased by over 60 000 tons, generating significant health benefits and creating health-care savings estimated at over US$ 428 million between 2006 and 2009. The crime rate also dropped notably over the same period.

The project is considered to have contributed to the social development of the city. TransMilenio is estimated to have generated almost 40 thousand direct jobs (supported by social security and health benefits, and welfare, epidemiological monitoring and disease-prevention programmes) and over 55 thousand indirect jobs. The system has also aimed at balancing the traditional dominance of men in the transport workforce, and prioritized the employment of groups such as single mothers, who comprise 62% of the female workforce. The female participation is currently 24% of the total system workforce, ranging from 2–8% in jobs such as bus driving, to 43% in bus washing, to 70% in fare collection.

This initiative is widely considered to have brought large improvements in health, gender equity and environmental sustainability to the people of Bogotá, and it is internationally recognized as an example for urban renewal.

Source: Adapted from Despacio (2008).

VI Source: Rodriguez Aponte, D. Subgerencia General, TRANSMILENIO S.A. 2010.

Providing opportunities for the use of safe mass transport can reduce levels of ambient air pollution and traffic-related injuries and deaths (von Hilderbrand, 2009).

4.2 Adaptation actions

Adaptation refers to changes in "processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate" and involves adjustments to decrease the vulnerability of communities and regions to the impacts of climate change and variability (IPCC, 2001b). Whereas adaptation was initially considered as a secondary and long-term option if mitigation efforts were not successful, it is now clear that some degree of adaptation is already necessary, particularly in developing countries (UNDP & GGCA, 2009). At the same time, there has been an expansion of approaches to adaptation, from an initial focus on interventions and infrastructure, to a more "development oriented" approach which aims to tackle the underlying drivers of vulnerability, rather than responding only to the symptoms (World Bank, no date).

This kind of second-generation approach helps to build resilience (Box 8) not only to climate change but also to other stressors that affect health and well-being, such as weaknesses in health care, education, social safety nets, and gender equity (World Bank, no date).

Box 8: Resilience to climate change (adaptive capacity)

When referring to human systems, the term "resilience" can be considered a synonym of adaptive capacity (IPCC, 2001b).

Adaptive capacity is the ability of a human or natural system to adapt – that is, to adjust to climate change, including to climate variability and extremes; to prevent or moderate potential damages; to take advantage of opportunities; or to cope with the consequences. The adaptive capacity inherent in a human system represents the set of resources available for adaptation (information, technology, economic resources, institutions and so on) and the ability or capacity of that system to use the resources effectively in pursuit of adaptation.

Source: World Bank (2010).

The following sections describe gender dimensions related to key components of adaptive capacity: coping strategies and local early warning systems.

4.2.1 Coping strategies

Adaptation measures in urban areas can reduce "heat island" effects, improve opportunities for social interaction and physical activity, and increase resilience to flooding. Similarly, improved building standards can reduce energy consumption, provide greater resilience to extreme weather, and reduce opportunities for infectious disease transmission (Campbell-Lendrum & Corvalan, 2007; Bloomberg & Aggarwala, 2008).

Although women and men can be powerful contributors of change in coping with changing climate conditions, the role of women is undervalued or undermined in many societies. There

is a need for women to be fully integrated into climate change adaptation strategies at all levels (Costello et al., 2009).

Case studies in Bangladesh, Ghana and Senegal have highlighted grassroots women's groups developing strategies to cope with issues related to energy and forestry, agriculture, water resources and trade.

FAO, in collaboration with local Indian institutions, conducted a survey on gender responses in coping with variability and long-term changes in climate. According to this survey, men are more likely to report that the weather changes have impacted farm production, while women are more likely to report that such changes have affected health. The study also explored differences in the preferred strategies for coping with long-term weather shifts. The preference to migrate was higher in men (47% of men versus 18% of women), whereas more women would opt to go for wage labour (57.5% of women versus 38% of men). Gender differences were also detected in access to vital information on weather alerts and cropping patterns. According to the farmers' reports, only 21% of women have access to this information, compared with 47% of men. These findings illustrate that gender is a cornerstone in dealing with adaptation strategies of climate change. Gender differences in access to resources and in selecting coping strategies have to be well understood and addressed because they matter both to farmers in their everyday experience of climate variability and to policy-makers in order to provide institutional support and the enabling environment (FAO, 2009).

In Nepal "mountain women" compared to women in the lowlands, and depending on the dominant culture within which they live, have a greater say in decision-making and have greater overall independence. The constant migrations of men mean that these women must be more involved in managing household and community resources. The women are able to maximize use of their available natural resources. Their knowledge helps in the survival and care of their families and permits adaptation in extreme situations such as conflicts, natural disasters and displacements. Unfortunately, their knowledge and skills are still not acknowledged and valued (WEDO, 1998). Box 9 shows another example of empowerment of rural women.

Box 9: Good practices: Bolivia – democratizing knowledge for rural empowerment

The Bolivian high-altitude plains are a harsh, arid, cold climate for agriculture, and innovative methods are needed for survival. An initiative started in October 2006 and concluded in July 2008, supported by Interccoperation, aimed to use traditional knowledge of climate prediction for better decision-making in agricultural production and risk management. This has helped to strengthen the capabilities in disaster risk management, monitoring bio-indicators of climate and weather-related hazards.

The programme was gender-sensitive, and the inclusion of women's expertise in the initiative was vital for transferring agricultural success into stable livelihoods, through women's traditional skills and roles in crop and seed storage, and in accessing markets. Women had the knowledge to design strategies for risk management and were able to assist other women farmers. They not only transferred knowledge but also helped to build up analytical capabilities of farming women.

The following lessons were learned from this experience: Agricultural risk management is a task for both women and men in rural contexts and empowerment can be achieved for women if they are recognized as knowledge managers.

The result is that farmers now lose less food because of climate threats. Also men and women are now capable of defeating frosts in the altiplano. In 2 years, more than 100 sound technologies and good practices were developed or reintroduced from traditional knowledge.

Source: Adapted from UNISDR (2008).

4.2.2 Early warning systems and hazard management

Case studies related to gender and natural disaster showed that women make an important contribution to disaster reduction, usually informally through participating in disaster management and acting as agents of social change. Women's resilience and women's networks are particularly important in household and community recovery (IPCC, 2007b).

After the 1999 Orissa cyclone, most of the relief efforts were targeted at or through women, giving them control over resources. Women received relief kits, including house-building grants and loans, resulting in improved self-esteem and social status. Similarly, following a disastrous 1992 flood in Pakistan in the Sarghoda district, women were involved in the reconstruction design and were given joint ownership of their homes, promoting their empowerment (Confalonieri et al., 2007).

After Hurricane Mitch in 1998, La Masica, Honduras surprisingly reported no deaths (Box 10). A disaster agency had provided gender-sensitive community education on early warning systems and hazard management 6 months earlier. Women were able to assume responsibility for continuously monitoring the early warning system, a role traditionally performed by men. As a result, the municipality was able to evacuate the area promptly when Hurricane Mitch struck (Buvinic et al., 1999).

Box 10: La Masica: Good practices in emergency preparedness

The municipality of La Masica in Honduras, with a mostly rural population of 336 people, stands out in the aftermath of Hurricane Mitch because, unlike other municipalities in the northern Atlantida Department, it reported no deaths. This outcome can be directly attributed to a process of community emergency preparedness that began about 6 months before the disaster.

The project involved the establishment of networks of local organizations in charge of risk and disaster management, coordinated through the municipality and the Municipal Emergency Commission. Networks were trained in the geographical mapping of hazards and use of an early warning system, and undertook an assessment of vulnerabilities differentiated by gender. Gender lectures were given and, consequently, the community decided that men and women should participate equally in all hazard management activities. When Hurricane Mitch struck, the municipality was prepared and evacuated the area promptly, thus avoiding deaths. Women participated actively in all relief operations. They went on rescue missions, rehabilitated local infrastructure such as schools, and, along with men, distributed food. Women also took over from men who had abandoned the task of continuous monitoring of the early warning system.

This experience shows that preparedness is an important step in saving lives. The engagement of women from the start, on an equal footing with men, contributed to the success in saving lives. In addition, and likely because of their active role, women reported a very low incidence of depression. In fact, contrary to repeated findings in the literature on disasters, the community assessed the psychological situation and concluded that help was required for men rather than for women to restore their capacity to contribute to the community.

One of the most important gains at La Masica was the empowerment of women and the community's recognition of women's capabilities and contributions. As a token of recognition, a new sign in the mayor's office reads: "Everything is easier with the cooperation of women."

Source: Buvinic et al. (1999).

Table 1 summarizes possible gender impacts of climate change and gender adaptive strategies, and provides recommendations for possible policy interventions to safeguard health, especially of women. The table reflects the gaps in data that can strengthen more specific and targeted interventions.

Table 1: Gender, adaptive strategies and interventions

Impact of climate change	Gender dimensions (examples)	Gender-sensitive adaptive strategies (examples)	Possible interventions beneficial to both women and men (examples)
Increase in infectious diseases	Women constitute the majority of those who take care of the sick (both as household caregivers and as front-line health workers) Women often lack, or have less access to, health services	A gender perspective must be incorporated into infectious disease analysis and research to target policies and programmes Collected data must be disaggregated by sex, age, socioeconomic status, education, ethnicity and geographical location, where appropriate An understanding of gender and its implications for health and health-seeking behaviour should be incorporated into training of health professionals and development of health-sector responses	Ensure better availability and access to, and support by, health systems for both women and men, but especially for women, given their caregiving roles Support outreach activities, using gender-sensitive information, education, and communication strategies and materials for advocacy and training Promote childcare facilities and other approaches to support women's caregiving role, while trying to transform related gendered roles and norms
Scarcity of water **Salination of water** **Increase in arsenic** **Flooding**	Health problems, especially for women and girls who have to walk long distances to fetch water Increase in work burden, which implies less time to access health-related resources such as education and economic resources	Promote water-saving practices that take into account the different uses and roles related to water for women, girls and men Address salination and arsenic contamination of water, proposing specific actions that consider the different patterns of exposure and impacts on women and men Counter social stigma attached to the effects of arsenic poisoning on women and men	Ensure affordable drinking water, taking into account the different roles and needs of women and men Empower women and facilitate their equal participation in management of water resources at national, regional and grassroots levels Appropriate technologies for assuring potable water closer to where families live Strengthen forestation and water-harvesting mechanisms, considering the different roles, needs and impacts on women and men Promote women's rights to own land and ownership of land use certificates Effective implementation of water policies that consider women's and men's different needs and roles for water use, provision and consumption Ensure equitable access to resources also in relation to payments for environmental services
Mortality through extreme weather events	Socioeconomic status, age and social gendered norms influence the risk of injury and death Women are vulnerable due to gender norms that dictate acceptable proper behaviours (e.g. not learning how to swim, not going out alone) Men's vulnerability because of gender norms that promote risk-taking	Provide safe shelters and homes for both women and men Training on gender-sensitive disaster risk reduction and early warning systems Promote programmes that facilitate men to seek help for psychosocial problems Empowerment of women to strengthen their capacity to question and change harmful behavioural norms that put them at risk in the case of extreme events	Gender-sensitive disaster preparedness Gender-sensitive early warning systems Ensure women's participation on equal basis in all policy and programme cycles Target women and men differently in communication campaigns and health-promotion strategies, taking into account their gender norms and roles Adopt strategies at all levels of programming to change norms and practices that prevent women or men from appropriate responses and coping mechanisms in situations of natural disasters

Continues..

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Impact of climate change	Gender dimensions (examples)	Gender-sensitive adaptive strategies (examples)	Possible interventions beneficial to both women and men (examples)
Disruption of human security force migration	Increase of violence at household level Harassment and loss of privacy in shelters Harassment in relief queues	Build strong and supportive networks for both women and men Promote gender-sensitive training to eliminate violence against women, girls and boys Capacity building within the health system to ensure early detection of domestic or sexual violence Involve women in management of shelters and distribution activities	Policy initiatives in the health, education, finance and labour sectors to be conceived as a part of a cohesive national/international violence prevention effort that includes women, girls, men and boys Implement appropriate health services that respond to the specific needs of women and men based on their respective needs, roles and capacities Design effective referral systems for cases of domestic violence Design referral system for cases of sexual harassment
Decreased income-generating and credit opportunities after extreme weather events	Women working in informal sector are also affected Increase in household expenses Out-migration of males Feminization of poverty, especially in urban/peri-urban areas Risk of malnutrition related to loss of income	Save on expenses or money for lean periods for both women and men Promote alternative income-generating activities	Proper and accessible credit facilities, both formal and informal, for women Establish market linkages that consider different patters of consumption of women and men Vocational training for women and men Promote social security and other safety nets among people working in the informal sector, both women and men
Change in agricultural production **Decrease in fishery stocks**	Increase of work burden Calories/micronutrients deficiencies	Involve women and men in conservation of biodiversity	Training on agricultural extension for both women and men Better nutrition supplements for needy families Marketing facilities Land rights for women
Other indirect health impacts following extreme weather events: **Increased burden of work and responsibility, especially on women and girls** **Increased anxiety, fears and intra-household tension** **Increased rates of suicide among men in cases of drought**	Suicide rates are higher, due to weaker or non-existent and effective social networks, among men Greater social responsibility on women to cater for family needs such as water and food	Promote programmes that facilitate men to seek help for psychosocial problems Empower women to enhance their capacities to look after themselves and their families and specifically to use available social and other networks to cope with increased burdens and tensions	Target women and men differently in post-disaster relief, taking into account gender norms, roles and relations

5. Conclusions, gaps in understanding and issues for urgent action

Preparations for, and responses to, climate change need to be sensitive to gender dimensions of health care (including mental) and health-seeking behaviours.

Policies to promote mitigation activities that have strong co-benefits in health and other development needs provide a potential political bridge across the "development gap" between rich and poor countries.

Adaptation strategies need to take into account women's and men's relative and different capacities, power, social resilience, vulnerabilities and resources, because gender norms, roles and relations can either enable or constrain adaptive capacities.

IPCC acknowledges that disasters affect men and women differently on a number of levels, including economically, socially, psychologically, and in terms of exposure to risk and risk perception. However, there remains a general lack of research on sex and gender differences in vulnerability to, and impacts of climate change especially health-related impacts.

Addressing the social and gender dimensions of climate change poses many challenges that are not insurmountable. It requires gender mainstreaming in climate change response activities, sustainable and equitable development, a clear focus on adaptation and mitigation, a strong commitment of resources, and empowerment of individuals to build their own resilience.

Equity and social justice cannot be achieved without recognizing the differences in vulnerability and strengths of women and men, and the various factors that contribute to vulnerability. Recognizing these differences is a necessary and important component of any prospective attempts to address the gendered health consequences of climate change. Gender-sensitive research is needed to better understand the health impacts of climate change in general and extreme events in particular. There is an urgent need to collect, analyse and report relevant data disaggregated by age and sex; and, depending on the context, other stratifiers should be included to enable thorough gender analysis. There is a need for the development of gender-responsive and accessible health services that reach the poorest populations, thereby addressing particular health needs of women and men throughout their entire life-cycle.

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PUBLIC HEALTH AND ENVIRONMENT

In this paper, available information on the differential links between climate change and the health of women and men has been collated and analyzed. The overall aim is to provide a framework for gendered health risk assessment and adaptation/ mitigation actions in relation to climate change.

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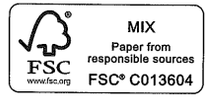

Case Study 5.7

Gender Aspects of Climate Change in the US Gulf Coast Region

Rachel Harris

Introduction

The US Gulf Coast – that extends from Florida, via Georgia, Mississippi and Louisiana towards the eastern coast of Texas – became a worldwide media scene after the events of 29 August 2005. On that date, Hurricane Katrina made landfall there, the aftermath of which still affects the area five years later. Though much publicity focused on New Orleans, Louisiana, several other communities were impacted including in Gulfport and Biloxi in Mississippi and Houma in Louisiana. Hurricane Katrina was soon followed by Hurricane Rita, a more intense storm that hit areas west of those affected by Hurricane Katrina. What these storms demonstrated to the world is that the US is vulnerable to what some would call climate-related disasters. Global warming is continuing to raise sea surface temperatures which, in turn, expand the intensity, lifespan and frequency of hurricanes in the Atlantic. In fact, the year of 2005 broke records for the number of hurricanes in one season as well as the most intense and enormous hurricanes ever on record. In the aftermath of Hurricanes Katrina and Rita, there was much research done to assess the situation and the effects on the communities in the Gulf Coast. One reoccurring factor in post-storm research and reports was that women, especially poor African-American women, were hit the hardest and had the toughest time recovering from the disaster. Most of the research was done in the hardest hit areas of the Gulf Coast, including southern Louisiana and southern Mississippi. These are the areas on which this case study will focus.

Physical vulnerability

Physically, the coastlines of Louisiana and Mississippi are extremely fragile and vulnerable. In the past, the Louisiana coastline was covered with wetlands, natural barrier reefs and natural levees that were once barriers against flooding and high water surges. These have been depleted and eroded over the past several years. Erosion and destruction of wetlands are due to natural and human processes. Human-induced processes, including dredging for canals and unnatural levee systems along the Mississippi River, have increased erosion and decreased sediments that help to build up wetlands in southern Louisiana. It is estimated that Louisiana loses an area of wetlands the size of a football field every 38 minutes (Lindquist et al, 2007). When a storm comes into the Gulf Coast these areas become even more depleted. It is estimated that Hurricanes Katrina and Rita transformed 217 square miles of marsh to open water in coastal Louisiana (USGS, 2006). More recently, a study concluded that oil and gas pipelines are also contributing to depleting critical wetland areas (Johnston et al, 2009). The United Houma Nation, the largest indigenous tribe in Louisiana, which consists largely of a fishing community, has noticed saltwater intrusion because of the location of the canals used by the oil and gas industry to distribute oil to different places (Dardar-Robichaux, 2009).

Women's vulnerability

The combined factors of pervasive gender inequality and race discrimination, high poverty rates, low-wage jobs and large numbers of female-headed households in the Gulf Coast contributed and still contribute to women's vulnerability to disasters in the region.

In general, women in the southern region of the US are more likely to be poorer and lack health insurance and are less likely to be gainfully employed when compared to women in other parts of the US (Gault et al, 2005). Women in this area are largely African-American and experience discrimination based on both race and sex. The hardest hit states by the hurricanes were Louisiana and Mississippi; both rank bottom in the nation among indicators of women's status according to the Institute for Women's Policy Research.

Particularly female-headed households faced very high poverty rates in the Gulf Coast regions (Gault et al, 2005). In New Orleans and the metropolitan area of Gulfport/Biloxi, Mississippi, two of the areas most impacted by Hurricane Katrina, women faced much higher poverty rates than the national average with 25.9 per cent and 18.6 per cent respectively living below the poverty line, compared to 14.5 per cent nationally.

Many of the poor (about 44 per cent) are working at low-wage jobs. The percentage of the working poor is high in the Gulf Coast region, indicating that many employers do not provide enough hours or dollars to allow persons a way out of poverty. The high poverty rates of female-headed households may partially be due to a single parent working at a low-wage job.

Race and sex discrimination are still pervasive in the workplace and such disparities are obvious in the Gulf Coast region, where women and persons of colour are more likely than white men to work low-wage jobs. In New Orleans in particular, men out-earn women in nearly every occupation. When comparing women across races, it was found that when white women and black women had the same occupation, black women earned less than white women, sometimes substantially so (Williams et al, 2006).

In several Gulf Coast areas, the rebuilding process involved a lot of new construction, an occupation dominated by men. No child care was available, limiting the mobility of female-headed households. Public housing developments were torn down, even if they were not damaged, leaving very little affordable housing. According to the Greater New Orleans Community Data Center, renters and homeowners are currently facing unaffordable housing costs as a result of the storms of 2005. Interviews of women from the Gulf Coast found that the most pressing needs reported to begin recovery for women were jobs and housing: people who went back to work had a job and a purpose to get through the aftermath of the storm (Davis and Land, 2007).

Women activists after the storm: Anecdotes

Despite their poverty, the race divide and the environmental disasters, women in the Gulf Coast have been leaders in rebuilding and empowering other women to be more involved in the rebuilding process in the aftermath of the storms. After interviewing some of these leaders – who represent significant communities of women – they seemed to agree that the storm has had three major positive impacts on their communities:

- Greater involvement of women, especially low-income women, in community activism, rebuilding and recovery efforts.

- More organizations that did not work together in the past are now coming together for a common cause; many of these organizations are being led or started by women who have stepped up for the cause.
- More women are elected officials and are key stakeholders in policy and decision-making. However, although more women are in power they are not necessarily gender sensitive and the public face of politics is still very male-dominated.

According to Sara K. Gould and Cynthia Schmae of *Women's eNews*, women's funds were quickly expedited to the affected areas after Hurricane Katrina. Much of the initial funding was given to various grassroots organizations (Gould and Schmae, 2007). The Ms Foundation started the Katrina Women's Response Fund intended to support low-income women and women of colour in the Gulf Coast to ensure prioritization of their needs during rebuilding and recovery. Funds in many of the states where evacuees went also helped women evacuees especially, in readjusting their lives and their families to a new place in a time of crisis.

Such targeted funding seems to have helped women have a greater role in rebuilding and recovery and put informal and formal community networks into place in the aftermath of the disasters. Women such as Sharon Henshaw of Biloxi, Mississippi, saw the need for community activism in the aftermath of the storms (Henshaw, 2009). She brought a community of women together for weekly meetings, which eventually grew into the non-profit organization she leads today, Coastal Women for Change (CWC). She states: 'Men migrated away to get a job somewhere else following the disaster... [Biloxi has a population of] more women than men since the storm... [therefore] women are pushed to become empowered.' However, they do not stay empowered in the presence of men. CWC works both on national and local legislation to protect the communities from future disasters. Henshaw believes that the new Gulf Coast City Works Act, which has an agenda to create green jobs in Biloxi will allow women to take advantage of a green jobs opportunity 'because women are at the table'. Women have been the key to recovery in Biloxi and, therefore, have their voices heard in support of their needs and the needs of women and men in Biloxi.

These sentiments were also expressed by Ann Yoachim, Programme Manager of Tulane University's Institute on Water Resource

Law and Policy in New Orleans (Yoachim, 2009). Able to come back to the city within the first few months after the hurricane hit, she saw a city of mainly men (construction, contractors and National Guard presence), very few women and no children. She says the city was 'very male dominated and there were no children right after the storm... [this] caused it to not feel like a city, home or community'. It was when women and children began returning to the city that community-led recovery and collaboration took root.

Despite larger participation of women in community organizing following the storms, Shana Griffin, founder of the Women's Health & Justice Initiative (WHJI), points out that policy-makers and organizers have not utilized the recommendations of gender and disaster studies (Griffin, 2009). She has not witnessed a change in attitude regarding the importance of centring women in the decision-making process nor has she seen people examining gender issues during the recovery process. However, more organizations are catering to their constituencies to better prepare them for future disasters. At WHJI, they have created sexual and reproductive health disaster preparedness kits and increased research and awareness on the rise of HIV/AIDS cases occurring after disasters. However, as far as progress with policy, while she sees more organizations advocating for more wholesale solutions and policies and more women stakeholders, she does not witness much advocacy on behalf of the needs of women. This is something she would like to see change.

Brenda Dardar-Robichaux is, Principal Chief of the United Houma Nation (UHN), a matriarchal Native-American tribe in southwest Louisiana. The majority of persons within the UHN are women, and in times of hurricane recovery and/or changes in the community women are primarily responsible for making families feel safe again and rebuilding homes (Dardar-Robichaux, 2009). Traditionally in the UHN, men have been the fishers in the communities and are often out earning a living to provide for the family, leaving the women in the role of home recovery. However, saltwater intrusion has made fishing harder for the men and a majority of the younger generation of the UHN works on offshore oil rigs. Offshore work is hard and men often come home with health problems after being offshore for 7–14 days out of the month. Women are then left with a greater burden of caring for the family.

Following the hurricanes there has been a necessity for UHN women to go into the workforce, changing the traditional roles of the family. This has been a difficult transition as most women have not previously worked outside of the home and jobs are scarce. Climate changes impact greatly on the roles of women and men in the tribal communities. As a woman leader, Dardar-Robichaux has worked to develop a three-step plan to try to ease the burden on families in the UHN. This plan includes evacuation, making homes resilient for persons who stay and easing the process of relocation for persons who leave.

One of the major problems for the UHN following Hurricanes Katrina and Rita resulted from the fact that the UHN is not recognized as a legitimate tribe by the federal government, only by the state. Therefore, in the immediate aftermath of the hurricanes, the UHN received very little help nationally and had to recover with little resources. In light of this, the UHN is developing a hazard mitigation plan that would allow it to apply for federal assistance programmes, which provide funds for disaster preparedness and long-term recovery and rebuilding.

Conclusions

The gender differences in the Gulf Coast became practically a determinant of who could move back to the disaster-ridden areas, who could get jobs and how well persons could recover. Women were often left poorer, less able to find jobs and, therefore, less able to move back to their previous homes following the storm. However, as many have mentioned, this reality has also caused women who are in the recovery areas to become more involved and more active in recovery and community efforts. There has been a greater community of people working together and women are stakeholders in many of the decisions being made around recovery and rebuilding. That does not mean gender considerations are well taken into account. In fact, though there are more women leaders, decisions are still being made that do not always consider the different roles and burdens that women and men have to bear. It is the hope that future policies in the Gulf Coast and national policies begin to heed recommendations of the gender and disaster vulnerability research that have come out in the aftermath of Hurricanes Katrina and Rita. It is the only way to prevent another disaster of this magnitude and make adaptation and disaster preparedness efforts effective in the short and long-term.

The author wants to thank Brenda Dardar-Robichaux, Shana Griffin, Sharon Henshaw and Ann Yoachim for their cooperation.

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Case Study 5.8

Women at Work: Mitigation Opportunities at the Intersection of Reproductive Justice and Climate Justice – Examples from Two Industrial Sectors in the US[1]

Ann Rojas-Cheatham, Dana Ginn Paredes, Aparna Shah, Shana Griffin and Eveline Shen

Introduction

Effectively solving the climate crisis demands that the mitigation and adaptation measures employed align with a justice agenda that improves the circumstances of poor people, people of colour, women, and children. If synergistic efforts to protect the planet and to improve the lives of the most vulnerable among us are made, we will create a sustainable system that asks more of those with the most to give and less of those with least to spare. There is no doubt that, in order to solve the climate crisis, a new economic and political system that is both sustainable and just will need to be constructed.

Women – who have and will continue to bear an increasingly disproportionate share of the climate change burden in coming decades – are central to the success of constructing this new system. The current working paradigm regarding women and climate change focuses on the fact that women, specifically women of colour, are disproportionately impacted by disasters and environmental degradation caused by climate change. In the US, women are 45 per cent more likely to be poor than men (National Women's Law Center, 2006). Low-income women, immigrant women and women of colour will be most impacted by the severe weather events, heatwaves and increases in disease rates that will characterize climatic changes. This paradigm encourages interventions to increase women's capacity to adapt to these changes. While a focus on women and adaptation is a vital undertaking, steps must also be taken to expand our

comprehension of how women are affected by climate change, its causes and by the solutions to mitigate it. In this case study, the current working paradigm regarding gender and climate change will be expanded by a framework that addresses an intersection of reproductive justice and climate justice. This new framework brings an understanding of the need to include strategies that improve the health and working conditions of women of colour working in low-wage toxic industries as part of climate change adaptation and mitigation. This approach allows us to more clearly identify mitigating solutions that advance both reproductive justice and climate justice.

The grassroots community-based organization Asian Communities for Reproductive Justice (ACRJ) has begun to develop and work within the intersection of reproductive justice and climate justice (ACRJ and WHJI, 2009). Before working within this intersection, ACRJ developed a reproductive justice framework that is described in detail in *A New Vision for Advancing Our Movement for Reproductive Health, Reproductive Rights and Reproductive Justice* (ACRJ, 2005).[2] Reproductive justice in the workplace includes having a healthy and safe work environment, access to health care, freedom from discrimination and the ability to earn a living wage with dignity and respect. Climate justice addresses the inequalities caused by climate change. Climate justice ensures the freedom and equality of all people by addressing the unequal oppression created and/or exacerbated by climate change, such as sexism, racism, classism and xenophobia.[3]

Healthy workplaces: Healthy women, healthy Earth

When looking at the causes that both contribute to climate change and harm the reproductive health of women of colour workers in low-wage toxic industries, an opportunity transpires to identify and implement strategies that advance both reproductive justice and climate justice. Because women of colour tend to work in mid-market industries (Ortiz, 2006) a focus on such industries is called for in order to identify strategic opportunities for working at that intersection.

The importance of mid-market industries

Efforts to mitigate climate change have focused on energy producing industries and the transportation sector. It is also critical to investigate secondary industries that depend on fossil fuel energy production.

These industries that have indirect or 'secondary' greenhouse gas (GHG) emissions, and collectively are as dirty as the top emitters, are called mid-market companies (David and Lucile Packard Foundation et al, 2007). Reducing the emissions of mid-market companies has been identified as one of the top five most important strategies to reduce global warming by multiple experts (David and Lucile Packard Foundation et al, 2007). If mid-market industries don't alter their products and demands for energy, oil refineries and coal plants that are major sources of CO_2 emissions will continue to produce the same supply.

Understanding the life cycle of chemicals

Though mid-market industries do not directly emit significant amounts of GHGs, they have a greater than expected impact on global warming through GHG emissions released in the full life cycle (extraction, production, distribution, use and disposal) of the primary chemicals and materials used to make their products. Life cycle assessments (LCAs) can provide measurements of the impact of the entire life cycle of a chemical or material on particular environmental aspects such as energy consumption, GHG emissions or water contamination. LCA is a way to measure the GHG emissions from the products and supplies used by industries on top of the emissions from the production process.[4]

In the following low-wage industries with predominantly female workforces, climate change mitigation opportunities can also improve reproductive justice: the semiconductor industry and the nail salon industry.

The semiconductor industry

The semiconductor assembly industry[5] is a low-wage top-emitting industry that primarily employs women of colour. The industry is classified by the US Environmental Protection Agency (EPA) as one of the top six industrial processes that contribute to global warming (US EPA, 2010). Current semiconductor manufacturing processes require the use of high global warming potential (GWP) fluorinated compounds, including perfluorocarbons, trifluoromethane, nitrogen trifluoride and sulfur hexafluoride, collectively termed perfluoro compounds (PFCs) (US EPA, 2009). PFCs have been identified as some of the most potent GHGs measured (US EPA, 2010).

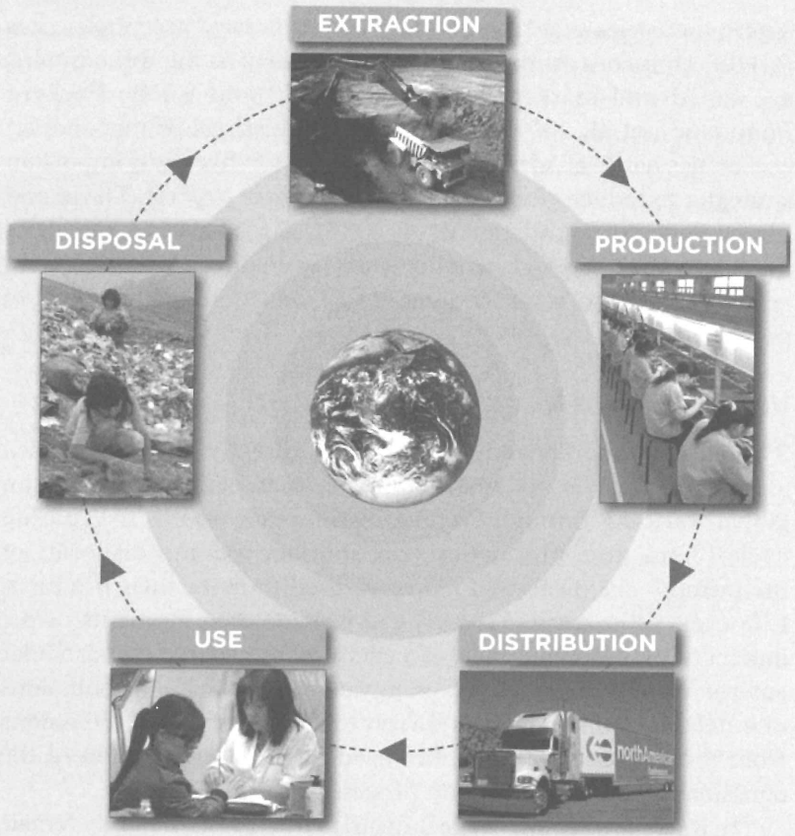

Figure 5.8.1 *Applying an LCA*

Source: ACRJ and WHJI, 2009, p13

While processes used in the semiconductor industry significantly contribute to global warming, the sector also considerably harms reproductive health and justice for women workers. Research has demonstrated that women working in the semiconductor industry may have an increased risk of delivering a low birth weight baby (Lipscomb et al, 1991), congenital malformation (Saillenfait and Robert, 2000), spontaneous abortion and subfertility (Correa et al, 1996; Schenker et al, 1995), cancer (Chen, 2007) and musculo-skeletal problems (Chee and Rampal, 2004). Initial research has found associations between these health effects and workers' exposure to chemicals, including PFCs, used to manufacture microchips

(Smith et al, 2006). Comprehensively defining reproductive and cancer risks of women working in the semiconductor industry has been difficult because the US semiconductor industry has not supported access for independent studies (LaDou and Bailar, 2008).

In the case of the semiconductor industry, if we would identify the reproductive health impact as the sole focus of workplace change, then it could be determined that a better ventilation system is needed to decrease workers' exposure to chemicals. But when we look both ways and in addition to reproductive justice take into account the semiconductor industry's contribution to global warming, we are prompted to seek more comprehensive solutions that eliminate or reduce the hazardous chemicals that are harmful to women workers and the environment with specific attention towards decreasing GHG emissions.

The nail salon industry

The second industry this case study will apply the reproductive justice and climate justice framework to is the nail salon industry. Nail care is the fastest growing sector in the beauty industry, generating more than US$2.8 billion in sales annually in the US in 2000 (US Census Bureau, 2002).[6] These salons provide a critical source of employment for women of colour. According to Federmann et al (2006) in California alone, there are approximately 8300 nail salons and more than 300,000 people licensed to work in them. The majority of the nail salons in California are owned and staffed by Vietnamese women (Federmann et al, 2006).

Nail salons use a large range of unregulated (in the US) chemicals in products for nails as well as products mandated for use in cleaning the salons. The chemicals used include solvents, hardeners, fragrances, glues, polishes, and dry/curing agents. In addition to the chemicals in the cleaning products they are required to use, these chemicals pose risks to the health of nail salon workers, the environment and the climate. Climate change contributors used in nail salons are acetone, aluminium, ammonia, petrochemicals, magnesium and phenols. If life cycle assessments of the chemicals used in nail products and cleaning materials were to be conducted, the assessment of the industry's GHG emissions would substantially increase as compared to figures in the traditional use analysis.

Volatile organic compounds (VOCs) are chemicals used in nail salon products that contribute to global warming through their role in

the formation of smog. Acetone, a solvent in nail polish remover, is an example of one of the VOCs emitted directly from the use of remover in the salon. Many nail polishes contain the chemical aluminium calcium sodium silicate which requires aluminium to produce. The production of aluminium is one of six industrial processes classified as having high GWP by the EPA (US EPA, 2010) because during primary aluminium production, PFCs are emitted as byproducts of the smelting process. Therefore, the production of nail polish is dependent upon one of the top six GWP gas emitting industrial processes.

The production of ammonia, used to clean nail salons, is the 14th largest source of CO_2 in the US (US EPA, 2009b). Petrochemicals are used in nail polish in the form of polyvinyl chloride; their production is the 18th largest source of CO_2 in the US (US EPA, 2009b). Magnesium is also found in nail polish, and magnesium production and processing is the second largest source of sulfur hexafluoride in the US. Sulfur hexafluoride has one of the largest GWP of all GHGs (US EPA, 2009b).

In the US, nail salons are required to use hospital-grade cleaners and disinfectants. Chemicals known as phenols are used in nail salons as disinfectants, degreasers and slimicides to clean the equipment and the salons themselves. In order to produce phenols, large amounts of the GHG nitrous oxide (N_2O) are used. Manufactured sources of nitrous oxide accounted for approximately 4.4 per cent of all GHG emissions in the US in 2007 (US EPA, 2009c). Although N_2O emissions are much lower than CO_2 emissions, N_2O is approximately 300 times more powerful than CO_2 at trapping heat in the atmosphere and nitrous oxide production is the third largest source of N_2O emissions in the US (US EPA, 2009c).

The impact of the use and disposal of nail salon products also creates GHG emissions. For example, at an ex-Revlon site in New Jersey that was used to manufacture nail salon products, tetrachloroethene (PCE) and other VOCs have been found to be serious polluting contaminants (Amuthan, 2008). The health effects of PCE in humans include neurological, liver and kidney problems following short-term and long-term inhalation. PCE evaporates readily from soil and surface water and undergoes degradation in air to produce direct and indirect GHGs that contribute to climate change including phosgene, trichloroacetyl chloride, hydrogen chloride, carbon monoxide and CO_2.

Reproductive justice is only possible when women are physically healthy and when their economic, political and social rights are assured. Although more longitudinal research is needed in order to fully understand the long-term health impacts of working in a nail salon, the research to date points to possible serious health effects. Studies have shown that manicurists and cosmetologists may experience disproportionate rates of multiple myeloma (Guidotti et al, 2007), spontaneous abortion (John et al, 1994), birth defects, reproductive problems and asthma (Porter, 2009). Moreover, a reproductive justice analysis of working conditions in nail salons directs improvements not only to making the nail salon environment one that is conducive to good health, but also to increasing wages, improving benefits, reducing working hours, reducing harassment and discrimination, and creating more educational opportunities for the workers.

POLISH: Nail salon workers looking both ways

ACRJ has applied the reproductive justice and climate justice framework to the nail salon industry, focusing specifically on nail salon workers in Oakland, California through the project POLISH (Participatory Research, Organizing and Leadership Initiative for Safety and Health) that organizes workers. POLISH is a leading member of the California Healthy Nail Salon Collaborative, an alliance of community, advocacy, policy and research organizations dedicated to advancing a preventative environmental health agenda for the nail salon industry in California. Over the past two years, this project has made gains in a successful campaign pressuring government agencies to prioritize education and access to health and safety information for workers and salon owners. Currently, POLISH is designing a local campaign in Oakland to improve reproductive justice for nail salon workers and reduce the GHGs emitted by products used in this industry.

Conclusions and lessons learned

In the US, both the semiconductor and nail salon industries employ significant numbers of immigrant women; both industries have been found to have possible negative reproductive health consequences for workers and both are, in their own way, complicit in the widespread chemical production and consumption that contribute to climate

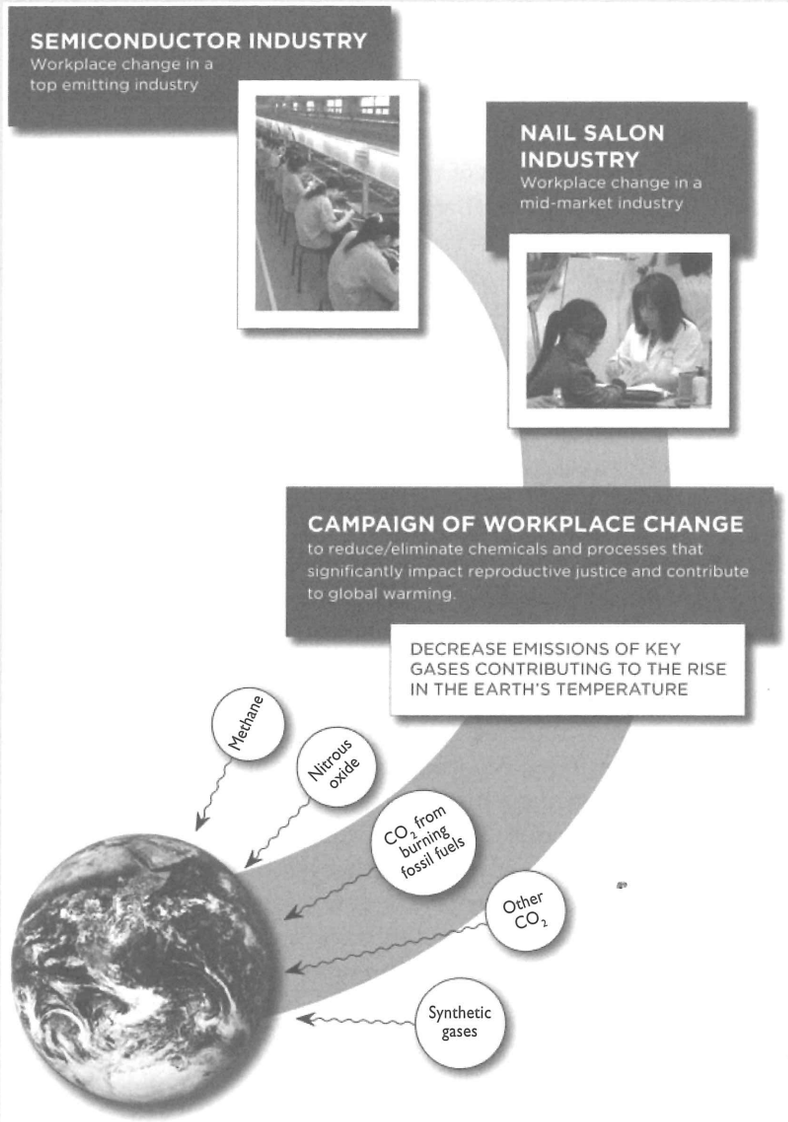

Figure 5.8.2 *Industry change that can mitigate climate change and improve the health of workers*

Source: ACRJ and WHJI, 2009, p18

change. The nail salon industry represents a mid-market industry that experts agree needs to be comprehensively addressing the climate crisis. The semiconductor industry has been identified as a top GHG emitter. Solutions that combine reproductive justice and climate justice within these two industries represent new, local and forward-looking strategies to the climate crisis – ensuring both sustainability and justice. Similar solutions should be strived for in other low-wage toxic industries with primarily female workforces. The opportunity is ripe for corporations and individual businesses to be accountable to the reproductive health of the women whom their success depends on and at the same time reduce or eliminate GHG emissions.

These changes can happen at multiple levels. Entire industries as well as individual businesses can take action at the intersection. Individual businesses can choose to change and/or eliminate hazardous products. Cities and regions can also provide incentives and support local businesses to make changes that advance reproductive justice and climate justice.

Change at the industry level can happen as a result of government regulations and/or voluntarily. For example, an industry can take preemptive actions or be regulated to change the chemicals and materials in the production that impact on reproductive health and global warming. Cities, counties and states can participate in creating an environment that supports industries to transition by rewarding those that incorporate greener and safer practices. In order for cities and/or states to make the link from products and chemicals used to global warming, several steps are important. First, they must incorporate an LCA framework to measure GHG emissions; thereby making tools and methods available to conduct LCA and analyse product and supply chains. Secondly, government and industry must collaborate with affected communities and incorporate the leadership and solutions from workers themselves. Ultimately through this range of government and community activity, it will be more probable for industry to be on a path towards altering the chemical composition of what they supply. This will result in healthier outcomes for workers, surrounding communities and the planet.

Moving beyond a gender analysis that solely focuses on the disproportionate impact of climate change on women, and embracing the complex interactions between women's well-being and climate change mitigation holds the potential to activate and mobilize larger

constituencies that advance reproductive justice and climate justice and keep our movements strong, relevant and forward-looking.

Notes

1 This case study is based on a report by Asian Communities for Reproductive Justice (ACRJ) and the New Orleans Women's Health & Justice Initiative (WHJI) entitled *Looking Both Ways: Women's Lives at the Crossroads of Reproductive Justice and Climate Justice* by A. Rojas-Cheatham, D. Paredes, S. Griffin, A. Shah and E. Shen. Elements of the original report have been updated for purposes of this case study. http://reproductivejustice.org/assets/docs/ACRJ-MS5-Looking-Both-Ways.pdf, accessed 4 January 2010.

2 Reproductive justice exists when all people have the economic, social, and political power and resources to make healthy decisions about our gender, bodies and sexuality for ourselves, our families and our communities. This definition was developed by ACRJ (2005).

3 This definition of climate justice was developed by members of ACRJ's youth project, Sisters in Action for Issues of Reproductive Empowerment (SAFIRE). The members of SAFIRE are currently learning about climate change and are designing a project at the intersection of reproductive justice and climate justice. SAFIRE members first learned about climate justice as defined by the organization, Environmental Justice and Climate Change Initiative (EJCC) and then developed their own definition described in this case study.

4 It is very apparent to the authors of this case study that LCAs would significantly assess increased emissions estimates as compared to a traditional point of use or point of production analysis. This was confirmed in a conversation between Ann Rojas-Cheatham (primary author of this case study) and Daniel T. McGrath, Director of the Berkeley Institute of the Environment on 16 October 2009. In the University of California Berkeley Climate Change Feasibility Study, adding the life cycle calculation to the emissions inventory can be expressed as a 130 per cent emissions increase (UC Berkeley Climate Action Partnership Feasibility Study 2006–2007 Final Report, http://sustainability.berkeley.edu/calcap/docs/CalCAP%20Report%20FINAL%202007.pdf, accessed 10 January 2010).

5 The semiconductor industry is a multiple lever and technology enabler for the whole electronics value chain (www.en.wikipedia.org/wiki/Semiconductor_industry). While the semiconductor industry embodies the aggregate collection of companies engaged in the design and fabrication of semiconductor devices, the assertions of this paper are specific to the fabrication phase (manufacturing and production) of these products.

6 Nail salons generate US$2.8 billion per year according the US census data from the year 2002. This number was generated by adding receipts from employers (US$1000) figures and from non-employers (businesses with no paid employees) (US Census Bureau, 2002).

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