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Climate Migration and Moral Responsibility

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Abstract

Even though anthropogenic climate change is largely caused by industrialized nations, its burden is distributed unevenly with poor developing countries suffering the most. A common response to livelihood insecurities and destruction is migration. Using Peter Singer's "historical principle" this paper argues that a morally just evaluation requires taking causality between climate change and migration under consideration. The historical principle is employed to emphasize shortcomings in commonly made philosophical arguments to oppose immigration. The article concludes that none of these arguments is able to override the moral responsibility of industrialized countries to compensate for harms that their actions have caused.

Keywords

Historical Principle; Causality; Justice; Climate Change; Immigration; Migrant; Refugee

Introduction

The high standard of living in all major industrialized societies depends on a large amount of fossil fuel combustion. This has resulted in the emission of substantial amounts of CO₂ in the atmosphere. The increase in the atmospheric abundance of CO₂ and other greenhouse gases (GHGs) alters the energy balance of the climate system, and causes a variety of natural phenomena such as increased desertification, more severe droughts, floods, tropical cyclones, more frequent wildfires, rising sea levels and melting glaciers (IPCC 2007). According to the UN Office of the High Commissioner of Human Rights, poor people from developing countries will suffer earliest and most seriously from climate change (UNHR 2007), even though they have contributed the least to its emergence (Huq et al. 2003, Roberts and Park 2006). A common strategy for humans to escape the consequences of a changing climate, such as malnutrition, disease, or even death, is human migration (Kniveton et al. 2008, McLeman and Hunter 2010, Bardsley and Hugo 2010). The numbers of climate change migrants is likely to increase substantially later in the 21st century, with estimations ranging from 50 million to 1 billion displaced people (Boano 2008, Stern 2007, Myers 2002, 2005). Despite the significance of the issue of climate migration, only a few articles have touched on its ethical implications (e.g., Reuveny 2005). This article sets out to begin filling this gap by using a justice claim approach rooted in the utilitarian school of thought that highlights the causal link between anthropogenic climate change and migration.

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The Impact of Climate Change on Livelihood in Developing Countries

Climate change is likely to increase weather extremes across the globe (IPCC 2007). The nature and strength of these weather events will vary between geographical locations. The following sections present different effects of climate change on the livelihoods of rural households in less developed countries (LDCs).

Flooding

It is a well established phenomenon that an increase in the global mean temperature leads to the increase in atmospheric moisture content (Kundzewicz et al. 2010). Through this mechanism, climate change has begun to alter the monsoon onset in south Asia, impacting the magnitude, frequency, and duration of floods (Douglas 2009). These variations pose major problems to the local livelihoods of farmers, because agriculture is highly sensitive to changes in the rainfall regime. For example, the 1998 floods in Bangladesh led to a lower food intake alongside deteriorating human health conditions especially among children (Del Ninno and Lundberg 2005).

Sea level rise

Sea-level rise has the power to impact a large number of people (Nicholls 2004), based on the global tendency to settle close to the ocean. For example, already in 2003, more than half of the world population lived within 200 kilometers of a coastline (Creel 2003). Small island nations are particularly vulnerable to sea level rise. The best known case is probably Tuvalu (Farbotko and McGregor 2010), a pacific island state, which is in danger of inundation if the sea-level continues to rise, due to its low elevation (Dickinson 1999, Yamano et al. 2007). On other islands, such as the coral atolls of Micronesia, sea-level-rise events have led to coastal erosion, shoreline inundation, and saltwater intrusion, resulting in crop losses and contamination of freshwater sources, severely impacting local livelihoods (Keim 2010).

Droughts and decrease in rainfall

It has been projected that climate change will cause an increase in droughts and desertification (IPCC 2007). Especially in sub-Saharan Africa, these tendencies have received scientific coverage. For example, Elagib (2009) found a trend towards intensifying and more recurrent droughts over a time period of 34 years in Sudan. Zeng and Yoon (2009) used a coupled atmosphere-ocean-land model to predict an expansion of the world's major subtropical deserts by 34% at the end of the 21st century. Droughts and an increase in desertification are likely to lead to food insecurity (Stringer 2009), requiring people to respond with changes in livelihood strategies (Nielsen and Reenberg 2010).

Water shortage due to melting glaciers

Global warming is impacting the water supply in countries like Nepal and China. Through the ongoing retreat of major glaciers, which serve as giant water storage units, the flow of rivers will gradually decrease (Shen 2010, Chalise et al. 2003). In addition, global warming has begun to reduce annual snowfall. Both effects, will severely impact the water availability and food production in areas such as the Karnali region of Western Nepal (Chalise et al. 2003).

Tropical storms

Finally, climate change has been related to an increase in oceans' water surface temperatures with a trend toward more frequent and intense hurricanes (Webster et al. 2005). In May 2008, cyclone *Nargis* hit Myanmar. It killed thousands of people and destroyed the majority of the rice fields. Survivors of the cyclone faced a severe food shortage and tried to escape to bordering countries such as India and Thailand, which created regional tension (Rice 2008)

Climate Change, Livelihood Strategies, and Human Migration

Listed above are only a few examples that illustrate the range of impacts of climate change on LDCs. Its adverse impact will be felt most by the rural poor who depend heavily on agriculture as the main source of household income. In the face of a decline in livelihood options, migration becomes a significant adaptive strategy at the household level (McLeman and Hunter 2010). Even though the IPCC stated as early as 1990 that human migration might be the greatest single impact of climate change (Brown 2008), the link between climate change and migration is an area of research that is only emerging slowly. Henry et al. (2004) broke ground in the study of population environment interactions and proved a significant association between reduction in rainfall and out-migration for Burkina Faso. Similarly, some other studies have linked migration to droughts in Africa (Findley 1994, Nielsen and Reenberg 2010). In addition, a recent study undertaken in Nepal provides evidence that environmental change increases migration, especially short-distance moves (Massey et al. 2010).

The Invisible Climate Migrant

The lack of a solid empirical foundation for the causal link between climate change and migration might explain why environmentally displaced people are not recognized under international law, and are therefore invisible (Johnson 2009). Often, they fall through the cracks of international refugee and immigration policies (Brown 2008). A major obstacle to legal recognition is the lack of an officially accepted definition of who qualifies as a climate migrant/refugee. However, some unofficial definitions are available: The International Organization for Migration (IOM) defines environmental migrants as "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" (Kniveton et al. 2008:31). Even stronger legal protection would result from ascribing refugee status to environmentally displaced individuals. El-Hinnawi (1985) described three major types of environmental refugees: 1. Those temporarily dislocated due to disasters, whether natural or anthropogenic; 2. Those permanently displaced due to drastic environmental changes, such as the construction of dams; 3. Those who migrate based on the gradual deterioration of environmental conditions. Although theoretically appealing, this classification does not allow distinguishing between migration for environmental reasons and migration for economic reasons, especially for El-Hinnawi's third category (see Johnson 2009). Adding to the complexity, environmental problems are themselves caused by population related factors. For example, unsustainable natural

resource extraction, as well as population growth and related increases in consumption patterns, are factors that contribute to environmental degradation and may subsequently influence migration dynamics. As such, economic considerations interact in complex ways with environmental factors and population growth, leading to a certain migration outcome based on the specific cultural, historical, political, and geospatial context.

Despite these complexities, some countries have established legal provisions to protect environmentally motivated migrants and refugees. In member states of the European Union (EU) temporary protection can be applicable in cases of environmental displacement under Article 2 (c) of the Temporary Protection Directive (TPD). In addition, the principle of non-refoulement under the Qualification Directive (Article 21, sub-paragraph 1) may provide some basic protection against returning refugees to an area where their lives are under threat due to dangerous environmental conditions (Kolmannskog and Myrstad 2009). However, the mentioned laws apply only in cases of natural disasters, but not for slow-onset hazards and degradation of peoples' livelihoods. Although, a paradigm shift seems to take place at the office of the United Nations High Commissioner of Refugees (UNHCR), which acknowledged in a recent policy document that "some movements likely to be promoted by climate change could indeed fall within the traditional refugee law framework, bringing them within the ambit of international or regional refugee instruments, or complementary forms of protection, as well as within UNHCR's mandate" (UNHCR 2009:6). But at the same time, UNHCR cautions that further empirical research is needed prior to possible legal changes.

Besides the lack of empirical research and a clear legal standing, the problem of climate migration has received only superficial coverage in the philosophical literature. Thus, the remainder of this article investigates the ethical issues of climate migration with a focus on causality.

The Ethics of Migration

Scholars hotly debate the issue of immigration in the ethical literature. Some strongly defend closed borders (e.g., Meilaender 2001, Walzer 1984, Beck 1996, Wellman 2008), whereas others argue for less stringent border protection or they are outright proponents for open borders (e.g., Dummett 2004, Carens 1987, 2003, Exdell 2009, Huemer 2010, Hayter 2000). The debate follows either an egalitarian or a libertarian line of arguments, but is generally focused on the rights and responsibilities of nation-states. However, the issue of climate change induced migration warrants a different approach because it deals with a global phenomenon in which causality extends beyond borders. The climatic changes that destroy the livelihoods of individuals in less developed countries (LDCs) can be causally connected to century long emission of anthropogenic greenhouse gases (GHGs) in more developed countries (MDCs). Due to the fact that the literature on the ethics of immigration gives only little attention to causality, this paper borrows the evaluative principle from the broader literature on the ethics of climate change. The body of this paper then attempts to justify the use of these principles on utilitarian ground, followed by a discussion of major arguments made against immigration.

In order to make the ethical discussion more tangible, this paper will use Mexico as an example of an LDC, with a high percentage of agriculturally dependent rural populations that are experiencing the full impact of climate change, and the U.S. as an MDC that is mainly responsible for the emission of large amounts of GHGs (Caney 2010), though most of my arguments apply equally well to other countries. Migration from Mexico to the United States has a long history of public and political concern and has been the subject of a number of studies (e.g., Riosmena 2009, Massey and Espinosa 1997). About 30 percent of U.S. legal immigrants and almost 60 percent of the unauthorized foreigners are from Mexico (Martin and Midgley 2010, Passel and Cohn 2009). Political relevance is the reason why Mexico and the U.S. have been used by other authors to discuss the ethical implications of migration (Carens 2003).

For the present ethical discussion of climate change induced migration, Mexico provides a useful case study. Only 25 percent of Mexico's 20 million hectares of cropland are irrigated (Leiva and Skees 2008). The dependence on rain-fed agriculture makes rural Mexicans by default vulnerable to climatic changes that impact rainfall regimes and adversely impact crop yields (Vasquez-Leon, West and Finan 2003, Eakin 2005, Thomas and Twyman 2006). The inability to make a living from the land due to dry conditions is then an important contributor to the decision of rural Mexican families to send a member elsewhere (Schwartz and Notini 1994). Empirical evidence has begun to emerge which investigates the impact of droughts and changes in rainfall patterns, associated with climate change, on Mexico-U.S. migration. Munshi (2003) explored the impact of rainfall variability on migrant labor networks in the U.S. and found that rainfall deficits reduced employment in Mexico and increased migration to the U.S. A study by Feng, Krueger, and Oppenheimer (2010) observed at the state level that a decrease in crop yields, as a result of climate change, was significantly associated with international out-migration to the U.S. More recently, studies by Hunter, Murray and Riosmena (2011) and Nawrotzki, Riosmena, and Hunter (2012) have used data from the Mexican Migration Project and the year 2000 census to model the impact of state-level rainfall data on international out-migration from rural areas in Mexico. Although using different methodologies (event history models, multilevel models), both studies consistently demonstrate a positive association between a decrease in rainfall and Mexico-U.S. migration. Similar relationships have been confirmed for a number of Latin American countries such as Ecuador (Gray 2009, 2010) and El Salvador (Halliday 2006). Despite the significance of the observed associations, most of these studies fail to provide details regarding the magnitude of the migration stream. Although political and economic drivers likely displace larger numbers of people at present, the share of climate migrants might increase substantially in the near future, especially if dense social networks connect two countries and function as migration corridors (e.g., Bardsley and Hugo 2010). However, it is important to stress that the ethical argument developed in this paper is independent of the size of the actual migration stream, may it be large or small.

The Historical Principle

The following ethical discussion uses a principle that was introduced under the name "historical principle" by Peter Singer (2010).¹ At first, the paper establishes the principle in the abstract without reference to a particular country, which allows a more general

application. To discuss the practical application and to address major concerns, illustrations will then be based extensively on the Mexican case.

The historical principle is based on the “polluter pays” notion (Reuveny and Moore 2009:476). It takes historical wrongs into account and bases justice claims not only on unfair distribution at the current point in time but also on what has been done in past decades and centuries (Singer 2010). MDCs in general and the U.S. in particular, have built their wealth and prosperity by means of fossil fuel combustion and have enjoyed the benefits that these developments bring with them. LDCs, especially poor rural populations, on the other hand, have largely not shared in these benefits and now have to bear the costs in the form of crop failures and livelihood destruction. However, some residual responsibility resides with LDCs. For example, many scholars consider rapid population growth combined with increasing levels of natural resources consumption to be key drivers of global environmental change, of which climate change is but one component (Liverman 2001, Meyer and Turner 2002). The idea that human population growth can have adverse environmental consequences dates back to influential work by scholars such as Thomas Malthus (1798) and Garrett Hardin (1968). However, Ehrlich’s (1968) I=PAT formula, in which cumulative environmental impacts (I) are equal to the product of population numbers (P), the level of consumption (A), and the technologies (T) used to extract and consume resources, emphasizes that technological development, besides population increase, is a major determinant of environmental impacts. As such, the bulk of present and past atmospheric GHG emission that causes global warming can be empirically linked to the industrialization process of MDCs (Hoehne and Blok 2005).

Given this fact, justice claims call for the producer of the problems to take responsibility. Or as Singer (2010:190) puts it, “If we believe that people should contribute to fixing something in proportion to their responsibility for breaking it, then the developed nations owe it to the rest of the world to fix the problem with the atmosphere.” This claim is far-reaching since even for powerful MDCs such as the U.S., fixing climate change may be a project beyond their technological and financial abilities. Thus, if prevention is not possible, adaptation seems to be the only vital solution. At the very minimum MDCs should help LDCs to adapt in a way that restores the livelihood conditions of LDCs to the state prior to the adverse impact of climate change (Shue 2010a).² The logical argument takes the following form.

¹Initially a second principle, the time-slice principle was considered as an evaluation standard. The time-slice principle focuses only on the current state of affairs, not taking historical wrongs into account. It grants that at the time when the “developed nations put most of their cumulative contributions of greenhouse gases into the atmosphere, they could not know of the limits to the capacity of the atmosphere to absorb those gases” (Singer 2010:190). The time-slice principle is thus based on the idea that help should be rendered irrespectively of alleged fault, putative guilt, and past misbehavior. Shue (2010b) proposes a progressive compensation rate, according to the ability of a certain country to pay, taking only the current wealth status into account, regardless of how the wealth was acquired. This quantifies the amount of assistance an MDC ought to provide in aiding the worst, based on their wealth status. This principle further qualifies the possible compensation in that it suggests that people should be guaranteed an “adequate minimum” (Shue 2010b: 210). The time-slice principle has been used in the ethical literature on immigration in reference to claims to distributive justice (Cavallero 2006) or more broadly to claims on global justice (Brock 2009). This principle frequently draws attention to the vast disparities in the survival chances of people in different countries, which lead many to live their lives in desperate poverty without being responsible for the condition they find themselves in. Thus, the time-slice principle argues that it would be morally unjust to not offer entry to as many immigrants as possible (Carens 2003). However, since the time-slice principle has been discussed extensively in the literature and does not provide unique insight on the evaluation of climate migration, this paper only employs the historical principle.

²Such adaptation assistance might include providing drought resistant seeds, training in different agriculture techniques, creating off-farm employment options, and developing more efficient rainwater harvest systems.

Premise 1

- a) The activities of country X cause a change in environmental conditions of country Y.
- b) The change in environmental conditions of country Y destroys the livelihoods of some residents (e.g., rural farmers).

Therefore, country X's activities cause livelihood destruction of some residents in country Y.

Premise 2

- a) Country X's activities cause livelihood destruction of some residents in country Y.
- b) Destruction of livelihoods is a morally wrong action.
- c) Morally wrong actions require restorative measures.

Therefore, country X's action required restorative measures towards country Y.

Two different types of action could be considered as restorative measures. Either MDCs transfer some of their wealth to LDCs in order to improve the livelihoods of poor rural populations, or MDCs allow the worst-off, who have lost the means to make a living, to enter the more resource secure MDC territory (cf. Wellman 2008). Some authors have argued in favor of sending financial aid to LDCs instead of facilitating migration by pointing out that open borders would not help the very poor (Miller 2005, Brock 2009, Cavallero 2006). They point out that people most likely to move would be highly educated individuals such as doctors, engineers, and other professionals but not the poorest of the poor (see Bloom 2009 for an example of Somali migrants to the U.K). Thus, increasing out-migration would further degrade the situation in the poor country through a process aptly termed "brain drain" (Tessema 2010). On the other hand, studies (see Taylor et al. 1996 and references therein) find that migration may have a very beneficial impact on migrant-sending households and communities since the additional income through remittances may relieve financial constraints and encourage investment in new technologies (e.g. drought resistant crops, rainwater harvest systems).

However, even if we assume that encouraging migration might not be the best way to address climate change induced livelihood problems, a number of reasons suggest that migration is unavoidable, thus requiring the ethical consideration of its implications: 1. Frequently, people have already lost their livelihoods through harvest failure and increased desertification and have left their homes (McLeman and Hunter 2010). For these migrants, long-term measures to improve livelihood situations in their country of origin will not provide the help necessary to improve their current situation. Also, in the case of sea level rise, where land completely disappears, adaptation "in place" is not an option (Shen and Gemenne 2011). 2. It is unlikely that transfer of funds from MDCs will be large enough to prevent livelihood destruction in all poor countries of the world and thus, outmigration is unavoidable. 3. A further problem is that LDCs frequently constitute what has been called "failed states" (Di John 2010), with highly corrupt or nonexistent governments. In such situations, it is difficult to ensure that funds for adaptation measures reach the needy

population. Henceforth, it appears to be important to develop clear ethical standards to evaluate the issue of climate migration as a problematic, yet unavoidable phenomenon.

Defense of the Principles

The historical principle rests on the concept of justice and points the way to the most equitable and libertarian solution of the climate migrant problem. From a deontological perspective (Ross 2003), it could be argued that it is the right thing, and a duty for everyone, to advance justice in society. However, the use of the suggested principles can also be defended on utilitarian grounds (Singer 2010). Classical utilitarianism evaluates all ethical issues in terms of their outcomes, whether the greatest net happiness for all parties involved is achieved (Hare 2003). Adherence to the historical principle increases utility in three ways: through deterring of additional emissions; through improvement of livelihood conditions of migrants; and through positive social change.

1. The historical principle provides a strong incentive for MDCs to reduce GHG emission. If MDCs were held accountable for the externalities of their emissions, they would be encouraged to decrease GHG production and invest more heavily in the development of clean energies. This would lead to an overall reduction in air pollution, reduce the likelihood of severe climate change, and in turn reduce the number of climate migrants. Thus, the outcome would be less pollution in MDCs and more secure livelihoods in LDCs, leading to a global increase in net-happiness.
2. Also, the admission of needy individuals from LDCs into MDCs should result in an increase in global net-happiness. For example, it will only slightly, if at all, decrease the overall wealth and well being of U.S. citizens if an additional 10,000 climate migrants from Mexico are allowed to enter the country (e.g. Hanson 2009, Holzer 2011). However, it will radically improve the well-being of the Mexican migrants and thus, result in an overall increase in happiness. In addition Hayter (2000) points out that migration increases happiness in that it encourages sending remittances back to native countries, which can be seen as a most effective form of wealth redistribution from the North to the South. However, also the receiving countries are likely to benefit from migration since migrants will bring new ideas and have been found to benefit the economy (Simon 1999). In addition, the mixing of cultures will contribute to mutual understanding, tolerance and acceptance of differences, and thus lead to a more harmonious and peaceful world (Hayter 2000). These scenarios might seem initially far-fetched to critics of immigration (e.g. Borjas 2001, Huntington 2004). Thus, it is important to address opposing arguments, which will be done in detail below.
3. Finally, Exdell (2009) suggests that migration-caused social tensions have the potential to provide an impetus for social change. This social change can in turn impact CO₂ emission and climate change awareness in a positive way. For example, it is hard to deny the existence of climate

change when a substantial number of individuals in one's own community are living examples for the existence of these changes. In this way "migrant communities are windows to the developing world" (Terrazas 2011:19), which help to show the connection between climate change and livelihood destruction more clearly.

New Perspectives for Old Arguments

The following sections discuss a number of arguments that have been used against immigration. The arguments include state's sovereignty and duties to their own citizens, market competition through immigration and associated economic hardship for citizens, states' right to disassociate, immigration related increase in carbon footprint, and ecosystem and habitat destruction due to competition of living space. However, none of these arguments has been made to directly deal with climate migration. Thus, it is the goal of this paper to add a new perspective to the ethical debate on immigration by applying the historical principle in order to emphasize the importance of causality.

Argument 1

A common argument for strict immigration control has been made based on the notion that control over immigration is so central to sovereignty that states must be permitted absolute discretion (Meilaender 2001). From this point of view, a state's sovereignty, to admit or exclude individuals based on free (arbitrary) choice, is morally justified since a state has no duties save to its own citizens. However, Dummett (2004) maintains that if the actions of an individual person or body of people can affect others, it has duties towards those others. In a globalized world, countries' actions are able to change the living conditions of numerous other nations across the globe. Global warming is a case in point. Century-long emission of GHGs by a small number of MDCs has started to change the global climate, with detrimental impacts for numerous other countries. However, the detrimental effects of climate change disproportionately impact the poorest, agriculturally dependent, nations of the developing world (UNHR 2007). Thus, the paper argues that since the influence of GHG emitting countries does not stop at their borders, the responsibility for their action extends towards all impacted individuals. However, this influence is not merely a function of current emissions, but rather climate change is the cumulative result of century long fossil fuel combustion. MDCs should take responsibility for their past and present actions by allowing climate migrants/refugees to enter their countries. To recognize this causal link is particularly important in times of rising anti-immigration sentiments (Espenshade and Huber 1999, Varsanyi 2011). Recognizing the causal link between GHG emission and migration would lead to the acknowledgement of MDCs' moral obligations toward environmentally displaced individuals. These obligations are substantial enough to trump obligations to MDCs' own citizens up to a certain limit (see Argument 6, below).

This acknowledgement of obligations would be in line with historical responses of MDCs in other situations, for which the causal linkage has been more obvious. For example, after the Vietnam War, the U.S. was willing to absorb large numbers of refugees from Southeast Asia, presumably due to a "residual moral obligation from American involvement in the war that

led to their displacement” (Carens 2003: 100). This response to committed moral wrongs can be seen as laudable precedence that should be used as a blueprint for policy changes addressing climate migration.

Argument 2

Another common argument against immigration is that immigrants cause economic hardship for existing citizens in that they take jobs away, depress wages, and cause higher marketplace competition to drive up prices (Beck 1996). Also, applying the historical principle here sheds a different light on the situation. Since MDCs have generated their wealth and technological status through fossil fuel combustion, the whole economy has been financed without taking the entire costs into account. LDCs carry much of these externalities in the form of destroyed livelihoods resulting from the impacts of climate change. It appears to be fair to redistribute the externalized costs to the causal agents (MDC markets). The redistribution process might take the form of slightly increased prices and depressed wages through higher market competition. This argument does not falsify Beck’s (1996) objection of a potentially negative economic impact of immigration; rather, his objection is overridden by a more pressing moral claim of justice and equal distribution of costs, which trumps non-essential economic interests of citizens.³

Instead of looking at the issue from an egalitarian perspective, proposing the fair redistribution of costs, we can take a rights based approach. To this end, this paper modifies an interesting scenario originally presented by Huemer (2010):

Pedro is in desperate need of food since a large swarm of locusts has destroyed his harvest. The locusts have (noticed or unnoticed) escaped Sam’s barn, who is breeding locusts for sale as food for snakes and other reptiles to the local zoo. Fortunately, Pedro has a plan to remedy his food problem: he will walk to the local marketplace, where he will buy bread. Sam is aware of all this and is watching Pedro. Due to his economic circumstances, Pedro will have to buy the cheapest bread available at the market. Sam’s daughter, however, also plans to go to the market, slightly later in the day, to buy some of this same bread. This bread is often in short supply, so that the vendor may run out after Pedro’s purchase. Sam’s daughter could buy more expensive bread, but she would prefer not to. Knowing all this, Sam fears that if Pedro is allowed to go to the market, his daughter will be forced to pay a slightly higher price for bread. To prevent this from happening, he accosts Pedro and physically restrains him from traveling to the market. Pedro returns home empty-handed, where he dies of starvation.

In this scenario the marketplace is the territory of the U.S. The main actors are Pedro, the poor Mexican farmer who has lost his livelihood, and Sam, representing the U.S. population and government. Pedro’s livelihood destruction results from an environmental force (the locusts) representing climate change which can be causally linked to the economic activities of Sam. Sam’s action of actively preventing Pedro from entering the marketplace is

³Even though this moral claim has certain theoretical appeal, it will be difficult to design policies accordingly. It is hard to measure the magnitude of negative externalities, and consequently it will be difficult to determine how much added economic hardship existing citizens should endure before denying immigrants.

exemplary of strict U.S. border control. Even without the causal link to Pedro's harvest failure, Huemer (2010:432) concludes that Sam's behavior is extremely wrong since it constitutes "harmful coercion." The causal link to Pedro's plight makes the case even stronger. But could Sam's action be excused, since it was necessary to protect his daughter from economic disadvantage? Certainly not! Slight economic disadvantages can never justify preventing Pedro from reaching a place of livelihood security, especially if Sam is responsible for Pedro's livelihood insecurity.⁴

In addition to this moral argument, there is some ambiguity regarding immigrants' economic impact. While some authors have argued that immigration might reduce labor market opportunities of less skilled natives (e.g., Borjas 2001), the general opinion among migration scholars seems to be that the overall economic effects of immigration are negligible (Simon 1999, Card 2004, Hanson 2009, Holzer 2011).

Argument 3

Wellman (2008) argues for the state's right to limit immigration as an instance of its more general right to freedom of association. He points out that the right to freedom of association includes the right not to associate and even the right to disassociate. For example, when a group of people get together to form a private club of some kind, they will frequently wish to exclude some people from joining their association. Thus, Wellman argues that states have the same sort of rights to control the conditions for citizenship that private clubs have to control the conditions for membership. However, Huemer (2010) challenges the private club analogy since it fails to resemble the situation of states in a number of important areas. In contrast to states, private clubs do not have control over vital goods, no one is forced to belong to at least one particular club, and those who belong to inferior clubs usually do not suffer serious deprivation.

The historical principle adds another reason to this list. The activities of one private club usually do not adversely impact living conditions of another private club. However, at the country level and for the case of climate change, this is the case. Using the club metaphor we can construct the following example: Two private philosophy discussion clubs meet in two rooms next door to each other in one building. Club A does not like to fill the trashcans in their club-room since a full trashcan provides an unpleasant view and soon starts to smell. Instead club A starts littering the adjacent room where club B usually meets. The trash consists of uneaten food and half full wine and beer bottles. The mixture provides a perfect milieu for a fungus, *Trichoderma harzianum*, which starts growing and produces millions of toxic spores. Using the contaminated room would pose a health threat to members of club B. In this case it seems to be right if club A either pays for the cleanup or allows the members of club B to join their club and share their club room. At the country level, club A represents MDCs, which through emission (littering), cause a certain environmental response (growth

⁴This paper argues that MDCs are morally obligated to allow climate change displaced individuals to enter their territory. However, research suggests that these individuals might lack the means to migrate internationally and therefore are displaced internally (Warner et al. 2009, Black, Kniveton, and Schmidt-Verkerk 2011). A stronger version of the proposed argument of causality and moral obligation might therefore suggest that MDCs not only need to passively allow climate migrants/refugees to enter their countries, but also to actively assist them in the process of relocation to a safer international destination if these poor people lack the means to do so on their own.

of fungus) that poses severe health threats in an LDC country (room of club B). To take responsibility for this wrong, MDCs could either send financial aid to LDCs (pay for cleanup) or allow LDC members to immigrate (share their club room). This example illustrates that a country not only ought to maintain good environmental conditions for its own citizens (which is a matter of self interest) but rather that similar obligations extend towards non-citizens as soon as a link of causality is established, which connects two formerly independent entities with a chain of mutual responsibility.

Argument 4

Cafaro and Staples (2009) oppose immigration based on the observation that in developing countries, people have on average a far smaller carbon footprint than citizens of industrialized countries. Once migrants from LDCs have been integrated into the industrialized society, their carbon footprint will resemble that of the average person living in this country. Thus, if people migrate from Mexico to the U.S. and adapt their consumption patterns, the U.S. population will increase, resulting in larger CO₂ emission. In order to stop the growth of the U.S. carbon footprint, Cafaro and Staples argue for preventing immigration to keep the number of polluters down.

Even though a laudable approach to reduce GHG emission, this claim could only be made by neglecting the causal order. Cafaro and Staples overlook the reason for poor Mexicans' movement. It seems to be unfair if the U.S., through emission of large amounts of GHGs, causes the destruction of livelihoods in rural Mexico (cf. Schroth et al. 2009), but when these people in desperation request entry to the more livelihood secure U.S., they are denied access based on the argument that their presence would increase GHG emission. The first part of the argument needs to be disconnected from the second, and independent solutions are warranted.

A justice claim would require the U.S. to take responsibility for committed wrongs and help climate displaced Mexicans, regardless of the consequences. The solution to the second part would be that instead of encouraging newly immigrated individuals to develop a large carbon footprint, they should be educated in energy efficient ways of living. However, more important would be to start education campaigns or to develop incentive schemes to reduce the carbon footprint of all U.S. citizens. Clearly, the solution for the U.S.'s high levels of GHG emission should not be to turn away starving Mexicans, but rather to foster a change in environmental attitude and awareness.

Addressing unequal consumption patterns, Singer (2010) proposes to allow everyone on this planet an equal share in the GHG emission. If, for example, every person is allowed to emit one metric ton of GHG per year, no matter in which country he/she is located, migrating from one country to another would not change overall emissions. At the country level, the amount of emission allowance should be adjusted yearly based on the current number of residents, taking the influx of climate migrants into account. Thus, if 10,000 climate migrants from Mexico would be admitted to the U.S., the U.S. emission allowances should be increased by 10,000 metric tons of GHG whereas the emission allowances of Mexico would be decreased by the same amount.

However, one could argue that accomplishing equality of per capita emission would harm the living standards of people within MDCs, causing a large amount of disutility. This might be true at the beginning of an enforced emission reduction scheme, but it would provide a major incentive to develop efficient clean energy alternatives (Stern 2010). In the long run a similarly high living standard could be achieved by using clean energy options without the production of externalities. For example, Pollin, Wicks-Lim, and Garrett-Peltier (2009) outline how the U.S. can become an economy that functions effectively through renewable energy sources and through high levels of energy efficiency. This “clean-energy economy” may not only maintain but also improve overall living standards through the creation of new “green” investment opportunities, which in turn will result in expanding job opportunities. These predictions are in line with major frameworks, such as the ecological modernization theory (EMT), which have been created to explain how capitalist development may lead to improvements in environmental conditions (Spaargaren and Mol 1992, Mol and Spaargaren 2004).

Argument 5

Cafaro and Staples (2009) present another argument against migration from LDCs to the U.S. that an increase of people living in the U.S. would conflict with the interests of nonhuman beings since it results in large ecosystem and habitat destruction. Even though, appealing from an environmentalist perspective, this argument overlooks the fact that migration does not increase the absolute number of people living on the earth, but rather constitutes a redistribution of humans. More specifically, if 10,000 people leave Mexico to settle in the U.S. they may compete with nonhuman nature in the U.S. but at the same time more space will be created for the expansion of habitats somewhere in rural Mexico. It could even be argued that these spaces, created somewhere in developing countries, may be more bio-diverse, and be home to more endangered species than the parts of the ecosystems lost in the U.S. Regardless of this possibility, the main point is that preventing migration clearly does not change the global imbalance between developed areas and wilderness. Only if someone is narrowly concerned with this imbalance in their own “backyard,” can immigration be considered a problem.

However, it might be educative to use the narrow country focus for a thought experiment. Considering an isolated country, we face the moral dilemma of having to weight the welfare of humans against the welfare of non-human ecosystems. Cafaro and Staples (2009:22) take a clear ecocentric stance by stating that “serious environmentalists will not allow efforts to help poor people, run roughshod over their environmental commitments.” A more humanistic perspective would argue that it is morally sound to provide climate migrants with a secure livelihood even if the result is limited ecosystem destruction. This view is in line with Goodpaster (1978) who points out that we have an obligation to grant ethical considerations to all living things but for self sustaining purposes (e.g., nutrition demand, safety, housing), these ethical considerations can be practically extended only to a smaller class of things. Even though utilitarianism grants animals, as sentient beings, moral standing in the equation of maximizing happiness, it asserts, at least according to John Stuart Mill, that the happiness of humans is of higher order and has more weight in moral considerations (O’Neill 1997).

However, it might be helpful to take one step back to be able to apply the historical principle here. Rather than deciding whether the migrant or the nonhuman nature is more deserving of a secure livelihood, the historical principle first identifies the cause for the dilemma. At the very core, anthropogenic climate change caused by GHG emissions of the U.S. and other MDCs, has destroyed the livelihoods of rural Mexican farmers and has forced them to leave their homes in search of a more resource secure place (Munshi 2003, Feng, Kruger, and Oppenheimer 2010, Schroth et al. 2009). Thus, the fault for any potential ecosystem destruction in the U.S. by climate migrants needs to be blamed on the polluters. In this context the “polluter pays” principle takes on a different meaning and should not only be understood in monetary terms but rather, the “payment” might also be rendered as ecosystem losses in one’s country (but not necessary globally as discussed above). Moreover, the responsibility does not end here, but extends to the destruction of ecosystems and extinction of species in Mexico due to the adverse impact of climate change. Thus, MDCs should recognize that the destruction of ecosystems, as far as it can be attributed to the effects of climate change, both in countries such as Mexico and as a result of climate migration in MDCs territory, is the result of century long GHG emission and should not be blamed on the victims but on the causative agents. However, it is important to point out that certainly not all environmental destruction is a result of climate change. In those cases where habitat loss and destruction is a product of, for instance, abusive natural resource extraction or mismanagement, the responsibility for restoration, conservation, and protection lies solely in the hands of the causative agent (in this case LDCs) and cannot be blamed on MDCs.

Argument 6

The final argument addresses the notion that every country has a limited carrying capacity and that MDCs simply could not safely absorb all people that may be displaced by climate change in the near future. Garrett Hardin (1974) voiced this concern in his famous essay on the “lifeboat ethic.” However, even though it would be best to develop consumption patterns as if there were a limited carrying capacity, it is unclear whether this concept is applicable in modern societies. For example, economists such as James Tobin, Robert Solow, and William Nordhaus believe that the earth’s carrying capacity does not constitute an inflexible threshold “because it is a function or artifact of the state of knowledge and technology” (Sagoff 2004:155). Thus, as soon as scarcity arises, the incentives to develop a substitute product or production technique increase, and people shift their consumption to an alternative product. Also, the carrying capacity argument applies only under conditions of abrupt climate change that would lead to a massive exodus of people (Stern 2010), and abrupt climate change is not likely to occur in the twenty-first century (IPCC 2007).

Nevertheless, it might be educative to explore the ethical ramifications of the worst case scenario of abrupt climate change. Let us assume that, as a result of desertification or sea-level rise, millions of poor Mexican farmers are unable to make a living in their home-country and are “knocking at the door” of the U.S. requesting entry. The historical principle would first of all state that the U.S. is morally required to allow at least some impoverished Mexican farmers to enter its borders as a measure of compensation for the environmental degradation they have indirectly caused. Even though the historical principle assigns plain moral responsibilities, it is not clear on situations in which taking responsibility for the

caused harm (allowing additional climate migrants into the country) would severely harm the current population (e.g., exhaustion of the food supply leading to starvation). We might need to refer to the broader utilitarian framework to address this issue. Varner (1998:115) suggests, for a situation of extreme overpopulation, that “some number of innocent human beings ought to be killed to prevent the foreseeable deaths of some larger number.” In our hypothetical case, climate change related events, not overpopulation, cause resource scarcity. A catastrophic climate event might severely degrade the food situation outside the U.S. borders so that not entering the country would mean death by starvation. But admitting an additional person would degrade the living situations of 100 U.S. residents below a certain level, causing severe degradation in the overall health condition and putting at least 10 people at risk of death. Applying Varner’s utilitarian lens, it would maximize overall happiness to let the one Mexican farmer starve to guarantee the survival of the 10 U.S. residents.

Let us further assume that under these extreme circumstances, a U.S. scientist discovers a method to enrich bread with artificially synthesized nutrients, reducing the necessary daily per capita food intake, which provides an access of food for additional 10,000 people. Since the U.S. is now capable of safely allowing additional people to enter the country, the historical principle is not anymore overridden by a concern for the survival of one’s own population. Thus, the U.S. is morally compelled by the historical principle to admit Mexicans as a restorative measure.

The question arises of how to grant access to a subgroup from the large pool of people. No matter what the selection criteria are, some individuals will be discriminated against. Based on the notion of equality and fairness no arbitrary selection criteria, for example based on race, religion, or sexual orientation, should be used (Carens 2003). Wellman (2008) explains why these criteria are considered morally unacceptable: Nations have special obligations to their citizens and restricting migration, of for example people of color, would wrong and offend all black citizens already in the country. Rather, a randomized procedure ought to be employed, similar to the “Diversity Visa Lottery” used by the U.S. Department of State, which gives away 50,000 green cards to foreigners every year (Huemer 2010:452).

The preceding sections have discussed reasons for allowing climate migrants free entry to MDC territory. In contrast, this last point acknowledges that there might be situations in which countries could legitimately restrict immigration. The discussed worst case scenario has illustrated that under extreme conditions, livelihood concerns for one’s own citizen might be a morally acceptable reason to restrict further entrance. Other morally permissible exclusion criteria might be based on national security concerns (not allowing potential terrorists into the country), or based on national health concerns (not allowing people to enter with highly contagious diseases like tuberculosis) (Carens 2003).

Conclusion and Policy Recommendations

The question of climate migration is surely underemphasized in contemporary writings on environmental philosophy, given its political and humanitarian importance. Millions of lives among the poor in developing countries could be positively affected if climate migrants/

refugees were to be recognized under international law. Acknowledging the causal link between GHG emission in MDCs, climate change induced livelihood destruction in LDCs, and climate migration might help in the justification of greatly needed policies and programs to address the problem of climate migrants/refugees.

This paper has used the historical principle to emphasize the importance of causality in arguing for the admission of climate migrants into one's territory. Not taking causality into account constitutes a major shortcoming in the current ethical debate surrounding immigration. To be clear, the intention was not to argue for open borders, but rather to suggest revising current immigration policies to include environmental factors and to ease immigration restrictions for climate migrants/refugees. This paper appeals to countries to take responsibility for whatever harm their behavior has caused to citizens of other countries. More research is needed to establish the causal link between climate change and human migration in order to strengthen the empirical foundation of the advanced justice claims. In addition, further work should aim to develop clear criteria and standards to distinguish climate change induced displacement from other forms of migration.

Besides the development of clear standards to distinguish climate migrants, the paper recommends that policy initiatives begin to focus on the development of sound climate migrant governance mechanisms (Bardsley and Hugo 2010). Ideally, the management of climate refugee/migration streams should be conducted by an international authority that should be able to operate independently of country specific party politics. This international authority would determine whether the migrant has a legitimate reason for leaving his/her country based on a set of sound environmental criteria. For eligible individuals, this agency would then decide to which country the registered climate refugee/migrant should be assigned, taking into account their own wishes, social relationships, language, occupation, and also the needs and preferences of receiving countries (cf. Dummett 2001). International governance of climate migration would have the benefit of allowing for a more even distribution of migrants across receiving nations, facilitation of migration as a coping strategy to deal with the adverse impacts of climate change and livelihood insecurities, and would help decrease socio-economic inequalities between MDCs and LDCs. As a final advantage, an international governance system would provide the institutional platform to manage claims of moral responsibility within a space devoid of the influence of power disparity between MDCs and LDCs, and thus would help to increase global equality and justice.

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References

- Bardsley DK, Hugo GJ. Migration and climate change: examining thresholds of change to guide effective adaptation decision-making. *Population and Environment*. 2010; 32:238–262.
- Beck, R. The case against immigration: The moral, economic, social, and environmental reasons for reducing U.S. immigration back to traditional levels. W.W. Norton & Compnay, Inc.; New York: 1996.

- Black R, Kniveton D, Schmidt-Verkerk K. Migration and climate change: towards an integrated assessment of sensitivity. *Environment and Planning A*. 2011; 43:431–450.
- Bloom T. Just open borders? Examining Joseph Carens' open borders argument in the light of a case study or recent Somali migrants to the UK. *Journal of Global Ethics*. 2009; 5:231–243.
- Boano, C. FMO research guide on climate change and displacement. Forced Migration Online (FMO); 2008. Retrieved February 28, 2011 from <http://www.forcedmigration.org/guides/fmo046/fmo046.pdf>
- Borjas, GJ. *Heaven's door: Immigration policy and the American economy*. Princeton University Press; Princeton, NJ: 2001.
- Brock, G. *Global justice: A cosmopolitan account*. Oxford University Press; Oxford: 2009.
- Brown, O. *Migration and climate change*. International Organization for Migration; Geneva, Switzerland: 2008.
- Cafaro P, Staples W. The environmental argument for reducing immigration into the United States. *Environmental Ethics*. 2009; 31:5–30.
- Caney, S. Climate change, human rights, and moral thresholds. In: Gardiner, SM.; Caney, S.; Jamieson, D.; Shue, H., editors. *Climate Ethics: Essential Readings*. Oxford University Press; New York: 2010.
- Card, D. *Is the new immigration really so bad?*. Centre for Research and Analysis of Migration; London: 2004.
- Carens JH. Aliens and citizens: The case for open borders. *The review of politics*. 1987; 49:251–273.
- Carens JH. Who should get in? The ethics of immigration admissions. *Ethics & International Affairs*. 2003; 17:95–110.
- Cavallero E. An immigration-pressure model of global distributive justice. *Politics Philosophy and Economics*. 2006; 5:97–127.
- Chalise SR, Kansakar SR, Rees G, Croker K, Zaidman M. Management of water resources and low flow estimation for the Himalayan basins of Nepal. *Journal of Hydrology*. 2003; 282:25–35.
- Creel, L. *Ripple effects: Population and coastal regions*. Population Reference Bureau; 2003. Retrieved February 27, 2011 from http://www.prb.org/pdf/RippleEffects_Eng.pdf
- Del Ninno C, Lundberg MKA. Treading Water: The Long-term impact of the 1998 Flood on nutrition in Bangladesh. *Economics & Human Biology*. 2005; 3:67–96. [PubMed: 15722263]
- Di John J. Conceptualizing the Causes and Consequences of Failed States: A Critical Review of the Literature. *Revista De Estudios Sociales*. 2010:46–86.
- Dickinson WR. Holocene sea-level record on Funafuti and potential impact of global warming on central Pacific atolls. *Quaternary Research*. 1999; 51:124–132.
- Douglas I. Climate change, flooding and food security in south Asia. *Food Security*. 2009; 1:127–136.
- Dummett, M. *On immigration and refugees*. Routledge; London: 2001.
- Dummett M. Immigration. *Res Publica*. 2004; 10:115–122.
- Eakin H. Institutional change, climate risk, and rural vulnerability: Cases from central Mexico. *World Development*. 2005; 33:1923–1938.
- Ehrlich, P. *The population bomb*. Ballantine Books; New York: 1968.
- El-Hinnawi, E. *Environmental Refugees*. New York: 1985.
- Elagib NA. Assessment of drought across central Sudan using UNEP dryness ratio. *Hydrology Research*. 2009; 40:481–494.
- Espenshade, TJ.; Huber, GA. Fiscal impact of immigrants and the shrinking welfare state. In: Hirschman, C.; Kasinitz, P.; DeWind, J., editors. *The Handbook of International Migration: The American Experience*. Russell Sage Foundation; New York: 1999.
- Exdell J. Immigration, nationalism, and human rights. *Metaphilosophy*. 2009; 40:131–146.
- Farbotko C, McGregor HV. Copenhagen, Climate Science and the Emotional Geographies of Climate Change. *Australian Geographer*. 2010; 41:159–166.
- Feng SZ, Krueger AB, Oppenheimer M. Linkages among climate change, crop yields and Mexico-US cross-border migration. *Proceedings of the National Academy of Sciences of the United States of America*. 2010; 107:14257–14262. [PubMed: 20660749]

- Findley SE. Does drought increase migration - a study of migration from rural Mali during the 1983-1985 drought. *International Migration Review*. 1994; 28:539–553. [PubMed: 12345794]
- Franzen A, Meyer R. Environmental Attitudes in Cross-National Perspective: A Multilevel Analysis of the ISSP 1993 and 2000. *European Sociological Review*. 2010; 26:219–234.
- Goodpaster KE. On being morally considerable. *The Journal of Philosophy*. 1978; 75:308–325.
- Gray CL. Environment, Land, and Rural Out-migration in the Southern Ecuadorian Andes. *World Development*. 2009; 37:457–468.
- Gray CL. Gender, natural capital, and migration in the southern Ecuadorian Andes. *Environment and Planning*. 2010; 42:678–696.
- Halliday T. Migration, risk, and liquidity constraints in El Salvador. *Economic Development and Cultural Change*. 2006; 54:893–925.
- Hanson, GH. The economics and policy of illegal immigration in the United States. Migration Policy Institute; Washington, D.C.: 2009.
- Hardin G. The tragedy of the commons. *Science*. 1968; 162:1243–1248. [PubMed: 5699198]
- Hardin G. Living on a lifeboat. *BioScience*. 1974; 24:561–568. [PubMed: 11661143]
- Hare, RM. A utilitarian approach to ethics. In: Johnson, OA.; Reath, A., editors. *Ethics: Selections from classical and contemporary writers*. Thompson Wadsworth; Tampa, FL: 2003. Book 9
- Hayter, T. The case against immigration controls. Pluto Press; London: 2000.
- Henry S, Schoumaker B, Beauchemin C. The impact of rainfall on the first out-migration: A multi-level event-history analysis in Burkina Faso. *Population and Environment*. 2004; 25:423–460.
- Hoehne N, Blok K. Calculating historical contributions to climate change - discussing the 'Brazilian proposal'. *Climate Change*. 2005; 71:141–173.
- Holzer, HJ. Immigration Policy and Less-Skilled Workers in the United States: Reflections on Future Directions for Reform. Migration Policy Institute; Washington, D.C.: 2011.
- Huemer M. Is there a right to immigrate? *Social Theory and Practice*. 2010; 36:429–461.
- Hunter, LM.; Murray, S.; Riosmena, F. IBS Working Paper - POP2011-03. University of Colorado, Institute of Behavioral Sciences; Boulder, CO: 2011. Climatic variability and U.S. migration from rural Mexico.
- Huntington SP. The Hispanic challenge. *Foreign Policy*. 2004; 1–16.
- Huq, S.; Rahman, A.; Konate, M.; Sokona, Y.; Reid, H. Mainstreaming adaptation to climate change in least developed countries (LDCs). International Institute for Environment and Development Climate Change Programme; London: 2003.
- IPCC. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. In: Solomon, S.; Qin, D.; Manning, M.; Chen, Z.; Marquis, M.; Averyt, KB.; Tignor, M.; Miller, HL., editors. *Climate Change 2007*. Cambridge, United Kingdom New York, NY: 2007.
- Jamieson, D. Ethics, Public Policy, and Global Warming. In: Gardiner, SM.; Caney, S.; Jamieson, D.; Shue, H., editors. *Climate ethics: Essential readings*. Oxford University Press; New York: 2010.
- Johnson LS. Environment, security, and environmental refugees. *Journal of Animal and Environmental Law*. 2009; 1:222–248.
- Keim ME. Sea-Level-Rise Disaster in Micronesia: Sentinel Event for Climate Change? *Disaster Medicine and Public Health Preparedness*. 2010; 4:81–87. [PubMed: 20389200]
- Kniveton, D.; Schmidt-Verkerk, K.; Smith, C.; Black, R. Climate Change and Migration: Improving Methodologies to Estimate Flows. International Organization for Migration; Geneva, Switzerland: 2008.
- Kolmannskog V, Myrstad F. Environmental Displacement in European Asylum Law. *European Journal of Migration and Law*. 2009; 11:313–326.
- Kundzewicz ZW, Hirabayashi Y, Kanae S. River Floods in the Changing Climate-Observations and Projections. *Water Resources Management*. 2010; 24:2633–2646.
- Leiva AJ, Skees JR. Using Irrigation Insurance to Improve Water Usage of the Rio Mayo Irrigation System in Northwestern Mexico. *World Development*. 2008; 36:2663–2678.
- Liverman, DM. Vulnerability to global environmental change. In: Kasperson, JX.; Kasperson, RE., editors. *Global environmental risk*. United Nations University Press; New York: 2001.

- Malthus, T. An essay on the principle of population. J. Johnson; London: 1798.
- Martin, P.; Midgley, E. Population Bulletin. Population Reference Bureau; Washington, DC: 2010. Immigration: Shaping and reshaping America. Book 61
- Massey DS, Axinn WG, Ghimire DJ. Environmental change and out-migration: evidence from Nepal. *Population and Environment*. 2010; 32:109–136. [PubMed: 21350676]
- Massey DS, Espinosa KE. What's driving Mexico-US migration? A theoretical, empirical, and policy analysis. *American Journal of Sociology*. 1997; 102:939–999.
- McLeman R. Impacts of population change on vulnerability and the capacity to adapt to climate change and variability: a typology based on lessons from “a hard country”. *Population and Environment*. 2010; 31:286–316.
- McLeman R, Hunter LM. Migration in the context of vulnerability and adaptation to climate change: Insights from analogues. *Wiley Interdisciplinary Reviews: Climate Change*. 2010; 1:450–461. [PubMed: 22022342]
- Meilaender, PC. Toward a theory of immigration. Palgrave Macmillian; New York: 2001.
- Meyer, WB.; Turner, BL. Earth transformed: Trends, trajectories, and patterns. In: Johnston, RJ.; Taylor, PJ.; Watts, MJ., editors. *Geographies of global change: Remapping the world*. Blackwell; Malden, MA: 2002.
- Miller, D. On nationality. Oxford University Press; New York: 1997.
- Miller, D. Immigration: The case for limits. In: Cohen, A.; Wellman, CH., editors. *Contemporary debates in applied ethics*. 2005.
- Mol APJ, Spaargaren G. Ecological modernization and consumption: A reply. *Society & Natural Resources*. 2004; 17:261–265.
- Munshi K. Networks in the modern economy: Mexican migrants in the US labor market. *Quarterly Journal of Economics*. 2003; 118:549–599.
- Myers N. Environmental refugees: a growing phenomenon of the 21st century. *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences*. 2002; 357:609–613.
- Myers, N. Environmental refugees: An emergent security issue; 13th Economic Forum, Session III - Environment and Migration; Prague. 2005;
- Nawrotzki RJ, Riosmena F, Hunter LM. Do rainfall deficits predict U.S.-bound migration from rural Mexico? Evidence from the Mexican census. *Population Research and Policy Review*. 2012 DOI: 10.1007/s11113-012-9251-8.
- Nicholls RJ. Coastal flooding and wetland loss in the 21st century: changes under the SRES climate and socio-economic scenarios. *Global Environmental Change-Human and Policy Dimensions*. 2004; 14:69–86.
- Nielsen JO, Reenberg A. Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. *Global Environmental Change-Human and Policy Dimensions*. 2010; 20:142–152.
- O'Neill O. Environmental values, anthropocentrism and speciesism. *Environmental Values*. 1997; 6:127–142.
- Passel, JS.; Cohn, DV. A portrait of unauthorized immigrants in the United States. Pew Hispanic Center; 2009. Retrieved February 27, 2011 from <http://pewhispanic.org/files/reports/107.pdf>
- Pollin, R.; Wicks-Lim, J.; Garrett-Peltier, H. Green Prosperity: How clean-energy policies can fight poverty and raise living standards in the United States. Political Economy Research Institute, University of Massachusetts at Amherst; Amherst, MA: 2009.
- Potter, JE.; Mundigo, AI. Fertility Planning. In: Poston, D.; Micklin, M., editors. *Handbook of population*. Springer Publishers; New York: 2006.
- Reuveny, R. Environmental change, migration and conflict: Theoretical analysis and empirical explorations; International Workshop on Human Security and Climate Change; Oslo, Norway. 2005;
- Reuveny R. Ecomigration and violent conflict: Case studies and public policy implications. *Human Ecology*. 2008; 36:1–13.
- Reuveny R, Moore WH. Does Environmental Degradation Influence Migration? Emigration to Developed Countries in the Late 1980s and 1990s. *Social Science Quarterly*. 2009; 90:461–479.
- Rice M. Aceh model suggests long-term hope for Burma. *Eureca Street*. 2008; 18:35–36.

- Riosmena F. Socioeconomic context and the association between marriage and Mexico-US migration. *Social Science Research*. 2009; 38:324–337. [PubMed: 19756216]
- Roberts, JT.; Parks, BC. *A climate of injustice: Global inequality, North-South politics and climate policy*. MIT Press; Cambridge, MA: 2006.
- Ross, WD. *The Right and the Good*. In: Johnson, OA.; Reath, A., editors. *Ethics: Selections from classical and contemporary writers*. Thompson Wadsworth; Tampa, FL: 2003. Book 9
- Sagoff, M. *Price, principle, and the environment*. Cambridge University Press; New York: 2004.
- Schroth G, Laderach P, Dempewolf J, Philpott S, Hagggar J, Eakin H, Castillejos T, Moreno JG, Pinto LS, Hernandez R, Eitzinger A, Ramirez-Villegas J. Towards a climate change adaptation strategy for coffee communities and ecosystems in the Sierra Madre de Chiapas, Mexico. *Mitigation and Adaptation Strategies for Global Change*. 2009; 14:605–625.
- Schwartz, ML.; Notini, J. *Desertification and migration: Mexico and the United States*. U.S. Commission on Immigration Reform; San Francisco, CA: 1994.
- Shen DJ. Climate change and water resources: evidence and estimate in China. *Current Science*. 2010; 98:1063–1068.
- Shen S, Gemenne F. Contrasted Views on Environmental Change and Migration: the Case of Tuvaluan Migration to New Zealand. *International Migration*. 2011; 49:e224–e242.
- Shue, H. Global environment and international inequality. In: Gardiner, SM.; Caney, S.; Jamieson, D.; Shue, H., editors. *Climate Ethics Essential Readings*. Oxford University Press; New York: 2010a. p. 101-112.
- Shue, H. Subsistence emissions and luxury emissions. In: Gardiner, SM.; Caney, S.; Jamieson, D.; Shue, H., editors. *Climate Ethics Essential Readings*. Oxford University Press; New York: 2010b. p. 200-215.
- Simon, J. *The economic consequences of immigration*. University of Michigan Press; Ann Arbor, MI: 1999.
- Singer, P. One Atmosphere. In: Gardiner, SM.; Caney, S.; Jamieson, D.; Shue, H., editors. *Climate Ethics: Essential Readings*. Oxford University Press; New York: 2010.
- Spaargaren G, Mol APJ. Sociology, environment, and modernity - ecological modernization as a theory of social-change. *Society & Natural Resources*. 1992; 5:323–344.
- Stern, N. *Economics of climate change: The Stern review*. Cambridge: 2007.
- Stern, N. The economics of climate change. In: Gardiner, SM.; Caney, S.; Jamieson, D.; Shue, H., editors. *Climate ethics: Essential readings*. Oxford University Press; New York: 2010.
- Stringer LC. Reviewing the links between desertification and food insecurity: from parallel challenges to synergistic solutions. *Food Security*. 2009; 1:113–126.
- Taylor JE, Arango J, Hugo G, Kouaouci A, Massey DS, Pellegrino A. International migration and community development. *Population Index*. 1996; 62:397–418.
- Terrazas, A. *Migration and development: Policy perspectives from the United States*. Washington, DC: 2011.
- Tessema M. Causes, Challenges and Prospects of Brain Drain: The Case of Eritrea. *International Migration*. 2010; 48:131–157.
- Thomas, DSG.; Twyman, C. Adaptation and equity in resource dependent societies. In: Adger, WN.; Paavola, J.; Huq, S.; Mace, MJ., editors. *Fairness in adaptation to climate change*. MIT Press; Cambridge, MA: 2006.
- UNHCR UNHCR. *Climate change, natural disasters and human displacement: A UNHCR perspective*. Geneva: 2009.
- UNHR. *The human rights impact of climate change; United Nations Joint Press Kit for Bali Climate Change Conference*; Geneva, Switzerland. 2007;
- Varner, GE. *In nature's interests? Interests, Animal Rights, and Environmental Ethics*. Oxford University Press; New York: 1998.
- Varsanyi MW. Neoliberalism and Nativism: Local Anti-Immigrant Policy Activism and an Emerging Politics of Scale. *International Journal of Urban and Regional Research*. 2011; 35:295–311.

- Vasquez-Leon M, West CT, Finan TJ. A comparative assessment of climate vulnerability: agriculture and ranching on both sides of the US-Mexico border. *Global Environmental Change-Human and Policy Dimensions*. 2003; 13:159–173.
- Walzer, M. *Spheres of Justice: A defense of pluralism and equality*. Basic Books; New York: 1984.
- Warner, K.; Erhart, C.; de Sherbinin, A.; Adamo, S.; Chai-Onn, T. In search of shelter: Mapping the effects of climate change on human migration and displacement. CARE International; Chatelaine, Switzerland: 2009.
- Webster PJ, Holland GJ, Curry JA, Chang HR. Changes in tropical cyclone number, duration, and intensity in a warming environment. *Science*. 2005; 309:1844–1846. [PubMed: 16166514]
- Wellman CH. Immigration and freedom of association. *Ethics*. 2008; 119:109–141.
- Woodroffe CD. Reef-island topography and the vulnerability of atolls to sea-level rise. *Global and Planetary Change*. 2008; 62:77–96.
- Yamano H, Kayanne H, Yamaguchi T, Kuwahara Y, Yokoki H, Shimazaki H, Chikamori M. Atoll island vulnerability to flooding and inundation revealed by historical reconstruction: Fongafale Islet, Funafuti Atoll, Tuvalu. *Global and Planetary Change*. 2007; 57:407–416.
- Zeng N, Yoon J. Expansion of the world's deserts due to vegetation-albedo feedback under global warming. *Geophysical Research Letters*. 2009; 36:1–5.