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A critical review on farmers' migration induced by climate change

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Abstract
Migration is defined as movement of people, either within a country or across international borders. It includes all kinds of movements, irrespective of the drivers, duration and voluntary/involuntary nature. It encompasses economic migrants, distress migrants, internally displaced persons (IDPs,) refugees and asylum seekers, returnees and people moving for other purposes, including for education and family reunification. It severely impacts social, economic, cultural and psychological life of people both at the place of in-migration and out-migration. In India, the migration of farming community is mostly influenced by social structures and overall pattern of development. Thus keeping the above mentioned agrarian distress, the paper focuses on different dimension of migration of farming community as a adaptive and coping mechanism from climate change.

Keywords: Climate change, farmer, migration, mitigation, weather

Introduction
Climate change is a term that refers to major changes in temperature, rainfall, snow, or wind patterns lasting for decades or longer (IPCC, 2007) [15]. Climate change is the subject of how weather patterns change over decades or longer. Climate change takes place due to natural and human influences. Since the Industrial Revolution (i.e., 1750), humans have contributed to climate change through the emissions of GHGs and aerosols, and through changes in land use, resulting in a rise in global temperatures. Increases in global temperatures may have different impacts, such as an increase in storms, floods, droughts, and sea levels, and the decline of ice sheets, sea ice, and glaciers (CIA, 2015) [6].

It is characterized based on the comprehensive long-haul temperature and precipitation trends and other components such as pressure and humidity level in the surrounding environment. Besides, the irregular weather patterns, retreating of global ice sheets, and the corresponding elevated sea level rise are among the most renowned international and domestic effects of climate change (Lipczynska-Kochany 2018; Michel *et al*. 2021; Murshed and Dao 2020) [17, 19, 20].

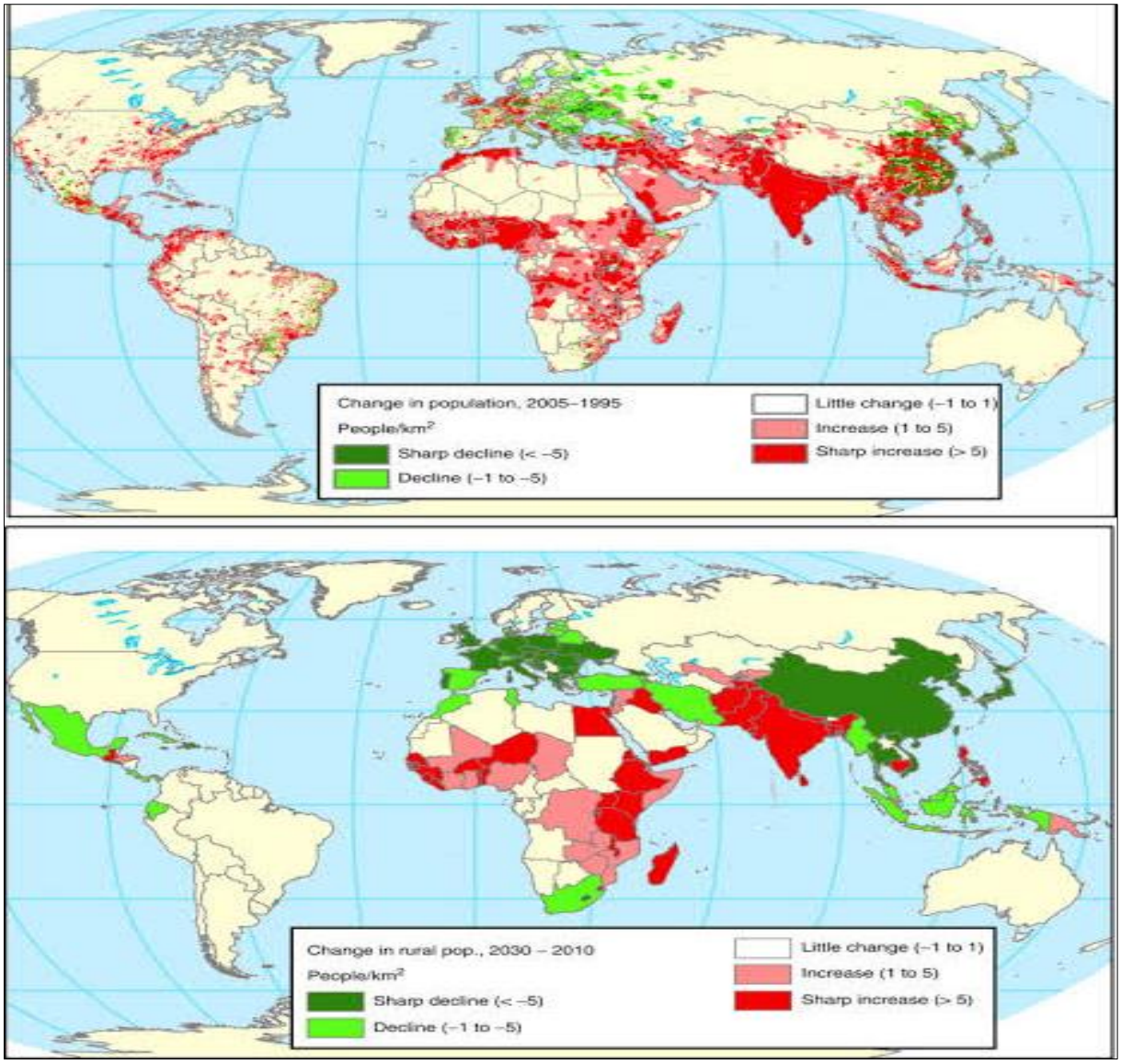
Climate change is a serious risk to poverty reduction and could undo decades of development efforts. While climate change is global, its negative impacts are more severely felt by poor people and poor countries. They are more vulnerable because of their high dependence on natural resources and limited capacity to cope with climate variability and extremes. Restoring and maintaining key ecosystems can help communities in their adaptation efforts and support livelihoods that depend upon the services of these ecosystems. Moving towards low-carbon societies can help reduce greenhouse gas emissions, improving human health and well-being and creating green jobs (Adedeji *et al*., 2014) [4].

As the scientific consensus grows that forceful climate change, in particular, increased precipitation and temperatures, is very likely to appear over the 21st century (Hansen, 2007) [13], economic research has attempted to measure the possible effects of climate change on society. Due to universal climate change, one of the biggest effects is expected to be on agriculture and many impacts also expected (Nordhaus 1991; Pearce 1996; Cline 2007) [21, 22, 7]. Agriculture production is directly dependent on weather and climate change. Possible changes in rainfall rates, change in temperature and CO2 concentration are expected to significantly impact crop growth. Worldwide food production is considered to be little cautious with successful adaptation and adequate irrigation due to brunt of climate transformation (IPCC 1998). Yet another important socio economic impact of climate change which is often ignored is migration of farming community from rural to urban areas in search of bread.

Migration is defined as movement of people, either within a country or across international borders. It includes all kinds of movements, irrespective of the drivers, duration and voluntary/involuntary nature. It encompasses economic migrants, distress migrants, internally displaced persons (IDPs,) refugees and asylum seekers, returnees and people moving for other purposes, including for education and family reunification (FAO, 2014). It severely impacts social, economic, cultural and psychological life of people both at the place of in-migration and out-migration. In India, the migration of farming community is mostly influenced by social structures and overall pattern of development (Bhat and Nagesha, 2018) [5].

Global significance of climate change

Global agendas and frameworks recognize the positive contribution of migrants for climate risk reduction, resilience building, food security, poverty reduction and economic growth. The 2030 Agenda for Sustainable Development emphasizes the need for international cooperation to enable safe, orderly and regular migration and so ensure this positive contribution (FAO, 2017). In an increasingly globalizing and specializing society, we are ever more dependent on what Giddens (1990) [12] termed *abstract* or *expert* systems. This is especially true for potentially globalized phenomena such as nuclear war or ecological catastrophe that people cannot "opt out of" (Giddens, 1990, p. 84) [12]. Such large-scale phenomena necessarily place the responsibility for management of associated risks on large, complex institutional contexts (Freudenburg, 1993) [11]. As society has become progressively more reliant on expert systems to manage risk, trust in the capacity of those systems and their component agencies and organizations to fulfill their mandate has come to have a significant influence on perceptions of large-scale risk (Freudenburg, 1993; Kahan *et al*., 2011) [11, 16]. While "the central tendency is to see most such technological systems as having worked properly, the vast majority of the time" (Alario & Freudenburg, 2003, p. 199) [3], periodic failures that cause harm can also lead to questioning of the ability "of institutional actors to carry out their responsibilities with the degree of vigor necessary to merit the societal trust they enjoy" (Alario & Freudenburg, 2003, p. 200) [3]. Thus, perceptions of the seriousness of risks depend in large part on the degree to which we trust actors in expert systems to manage them appropriately (Freudenburg, 1993; Kahan *et al*., 2011) [11, 16]. The figure given below shows a comparison between human displacement from 1995 to 2005 relative to what is expected from 2010 to 2030.



***Source*:** Anonymous, 2011

Pattern of climate change induced migration

There are three major ways in which global warming could affect agriculture and migration patterns (Martin, 2010) [18]. First, more severe storms such as hurricanes are likely to be generated that destroy housing, erode land and encourage migration, at least until recovery.

Second, there may be more competition for land and water, especially in arid areas with rapidly growing populations, such as sub-Saharan Africa. Rising temperatures are associated with more water available for irrigation, but also increased variability in precipitation, so that drier areas may experience more severe droughts and wetter areas more floods. Competition for land and water can lead to conflict and migration, as when herders come into conflict with crop farmers.

Third, gradually rising temperatures are likely to shift areas of viable and optimal food production, making agriculture less productive in densely populated areas in developing countries and more productive in sparsely populated areas of industrial countries. Indeed, several economic models project that global warming will have more effects on the distribution of farm production rather than on global farm output (Darwin *et al*., 1995; World Bank, 2008) [8, 25].

The areas in which agricultural productivity is expected to decrease because of climate change include sub-Saharan Africa, South Asia, and parts of South America, while agricultural productivity may increase in currently colder areas such as Canada and Russia (Darwin *et al*., 1995; World Bank, 2008) [8, 25].

Multilateral initiatives and mechanisms

Multilateral initiatives and mechanisms drive global engagements that elevate the issues and forge solutions around migration and climate change. The Nansen Initiative, launched by Switzerland and Norway, was created as a government-led, bottom-up consultative process intended to build consensus on the development of a protection agenda addressing the needs and legal rights of people displaced across international borders in the context of disasters and the effects of climate change. At the conclusion of the three-year (2012-2015) Nansen Initiative, the Platform on Disaster Displacement (PDD) followed the recommendations of the Nansen Agenda to build partnerships between policymakers, practitioners, and national engagement. The PDD is a group of states working together to forge durable solutions for displaced persons in the context of disasters and climate change. The PDD also leverages close partnership between governments, civil society groups, universities, and other key stakeholders, such as IOM, UNHCR, and the UN Environment Program (UNEP), by providing governments with a toolbox to address these challenges and build consensus, through knowledge sharing and consultations.

The 2030 Agenda for Sustainable Development, adopted by all UN Member States in 2015, recognized forcibly displaced people, including IDPs, as a vulnerable group in need of particular attention and calls for full respect of human rights. The Sustainable Development Goals (SDGs) recognize the positive contribution of migration to sustainable development, and the SDG's motto to "leave no one behind" is a clear call for sustainable development to be inclusive of the furthest left behind, including migrants and the forcibly displaced. Since then, the mechanisms used to provide opportunities for stakeholders to work together, including meetings, initiatives, working groups, and other facets, have been amplified to address the interconnection of climate change and migration, providing adaptation assistance, and supporting people on the move.

The UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) has 95 Member States and helps raise awareness of specific matters that are relevant to the broader international space community. "Space and Climate Change" is a standing agenda item at UNCOPUOS and allows Member States to share information highlighting the unique vantage point space provides to provide critical data to decision makers to mitigate climate change.

The Paris Agreement creates an unprecedented framework for global action to avoid potentially catastrophic planetary warming and for building global resilience to the climate impacts we are already experiencing. The decision adopting the Paris Agreement established a task force on displacement, under the Warsaw International Mechanism for Loss and Damage (WIM), to provide recommendations on integrated approaches to avert, minimize, and address displacement related to the adverse impacts of climate change. The task force issued its first set of recommendations in 2018 (White House Report, 2021)

Current actions for adaptation and mitigation in India

Adaptation, in the context of climate change, comprises the measures taken to minimize the adverse impacts of climate change, e.g. relocating the communities living close to the sea shore, for instance, to cope with the rising sea level or switching to crops that can withstand higher temperatures. Mitigation comprises measures to reduce the emissions of greenhouse gases that cause climate change in the first place, e.g. by switching to renewable sources of energy such as solar energy or wind energy or nuclear energy instead of burning fossil fuel in thermal power stations. Current government expenditure in India on adaptation to climate variability exceeds 2.6% of the GDP, with agriculture, water resources, health and sanitation, forests, coastal-zone infrastructure and extreme weather events, being specific areas of concern.

Conclusion

While some parts of the society may be capable of adapting successfully, other parts may not. Marginalised and disadvantaged groups like the poor or women are often unable to move away from climatic threats. Policies hence need to be adapted to facilitate migration and help remaining parts of the population without locking them into areas that become increasingly unviable (Rigaud *et al*., 2018) [23]. This is true not only in the interest of the trapped population, but also in the interest of the country as a whole, given that human mobility is an important engine of development and growth.

A main challenge for policy is to better coordinate development and social protection programmes and to increase the resilience of populations at risk by encouraging alternative adaptation strategies. On-farm adaptation measures such as crop rotation and irrigation are able to mitigate partially the effect of climatic shocks on migration. Improving adaptive capacity in the form of other strategies than migration is a better solution than progressive displacement as an involuntary outcome.

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