Effect of Climate Change on Migration

Paras Kasmalkar

Introduction

Climate change is one of the major issues facing human civilization today. Industrialization and the burning of fossil fuels, among other factors, have caused the temperature of the planet to rapidly rise in the past few decades, causing a rise in sea levels (Biermann and Boas, 2010).

This rise in sea level is expected to reduce the amount of land available to sustain communities. Small island nations such as Tuvalu may slowly become uninhabitable in a few decades (Constable, 2016). Even larger countries like Bangladesh may lose a large amount of their land, causing declines in food production, loss of livelihoods, and destruction of homes (Choi et al, 2021).

Even independent of the rise in sea levels, climate change has other detrimental effects. Rising temperatures can reduce crop yields and lead to water shortages. Inhabitants can face adverse health effects from long term exposure to excessive heat (Lin et al, 2021).

This essay argues that climate change, through a variety of effects, will cause a significant increase in migration in the near future and that it is imperative that policymakers at the local, national and international levels put in place a framework to prepare for it.

The Complexity of Climate Change-Induced Migration

Currently, there is no universally accepted definition for a “climate refugee”. People may be incentivized to move from their current location for a wide range of reasons. Some may choose to move for a marginal increase in income, while others may move because their original livelihoods or homes were destroyed or they faced life-threatening circumstances attributable to climate change (Biermann and Boas, 2010).

While there is a clear correlation between environmental changes and migration, any person’s decision to migrate is based on a large number of additional factors, such as socio-economic conditions. Although low-income households may be more vulnerable to the effects of climate change, they often lack the resources needed to relocate. Conversely, while high income households typically are more able to withstand the effects of climate change, they also have a greater ability to relocate quickly. As a result, there isn’t a clear correlation between income and likelihood of migration (Kaczan and Orgill-Meyer, 2019).

Effects of Climate Change

People may be motivated to relocate for a wide variety of reasons that are influenced by climate change. These include attempts to find better economic opportunities, relocate to a country with better functioning institutions and government, escape food or water insecurity or even simply to escape physical danger which might be caused by floods, hurricanes, earthquakes and so on.

Flooding and Sea Level Rise

Global temperature rise melts ice in the Arctic and Antarctic, which in turn causes sea level rise in coastal areas throughout the world.

A region particularly vulnerable to flooding is South Asia, because of its proximity to the coast, low altitude and high population density. Flooding is projected to cause water borne diseases such as cholera, loss of agriculture and loss of livelihoods (Mirza, 2011).

Rise of Temperatures to Dangerous Levels

A significant rise in heat can also cause immediate harm to humans, in the form of heat exhaustion, heat stroke and heat-related respiratory diseases. For example, New York State's mean daily summer temperature is projected to rise to 82.8 °F around 2080-2099 from a baseline of 72.1 °F in 1991-2004. This is estimated to cause a 2-6 fold increase in the number of hospitalizations for heat-related respiratory diseases (Lin et al, 2012).

A Simplified Model of Climate Migration

Here, I attempt to construct a rudimentary model that can be used to find the number of people that would move out of a particular area based on a particular amount of temperature rise.

Climate change has a wide range of effects across various regions, so this model focuses on the country of Bangladesh, a country uniquely vulnerable to climate change because of its low average income, low altitude and proximity to the coast.

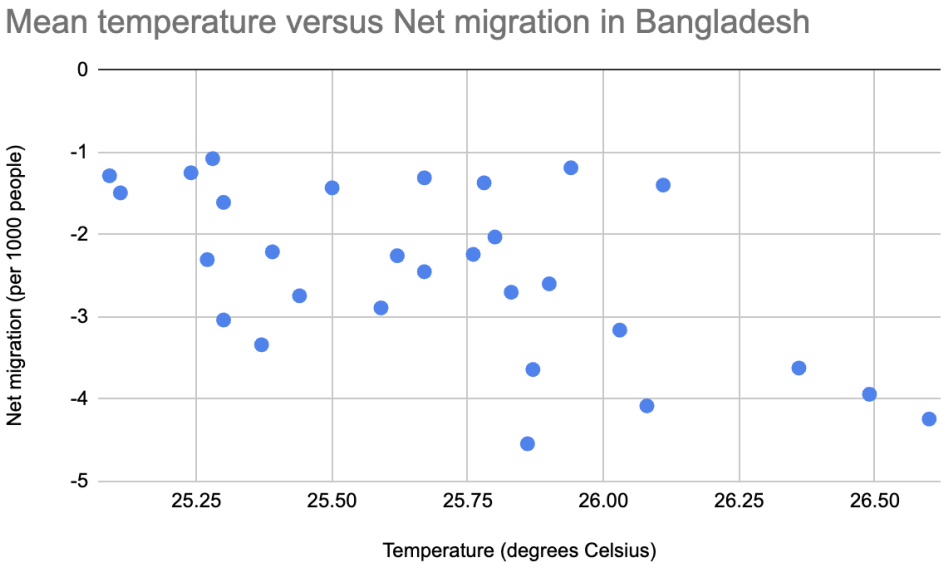
This model uses the temperature data from the World Bank Climate Knowledge Portal and net migration data from the United Nations World Population Prospects Portal. Its purpose is to test for a correlation between mean temperature and net migration in Bangladesh, notwithstanding other variables that may affect migration.

Year	**Mean temperature (degrees Celsius)**	**Net migration (per 1000 people)**
1991	25.28	-1.075

1992	25.09	-1.283
1993	25.11	-1.491
1994	25.50	-1.430
1995	25.78	-1.369
1996	25.67	-1.308
1997	25.24	-1.247
1998	25.94	-1.186
1999	26.11	-1.397
2000	25.30	-1.607
2001	26.03	–1.818
2002	25.80	-2.028
2003	25.76	-2.239
2004	25.83	-2.700
2005	26.03	-3.160
2006	26.36	-3.621
2007	26.08	-4.081
2008	25.86	-4.542
2009	26.60	-4.241
2010	26.49	-3.940
2011	25.87	-3.639
2012	25.37	-3.338
2013	25.30	-3.037
2014	25.59	-2.890
2015	25.44	-2.743
2016	25.90	-2.597
2017	25.67	-2.450
2018	25.27	-2.303

2019	25.62	-2.255
2020	25.39	-2.208

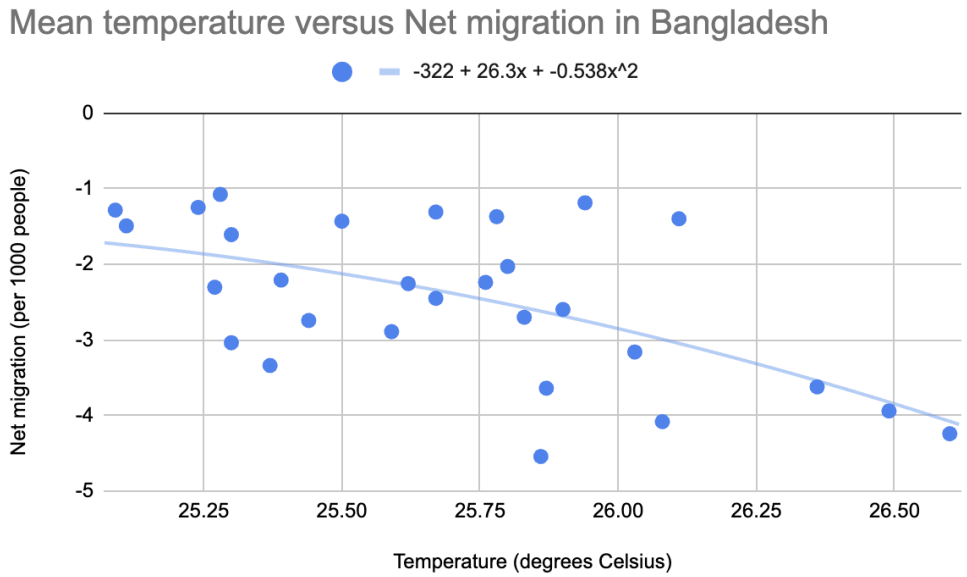
Plotting the net migration against the mean temperature for all the years from 1991 to 2020, the following scatter chart was obtained:



The polynomial curve of best fit for this data was the following:

$y = -0.538x^2 + 26.3x - 322$, where x is the temperature and y is the net migration.

As per the United Nations World Population Prospects, Bangladesh's population is projected to peak at about 207 million in the year 2060.



As per the World Bank's SSP2-4.5 prediction model, Bangladesh's average temperature is projected to rise to about $27.12\,^{o}C$. Using this predicted temperature in the above model, Bangladesh is projected to have a net migration rate of -4.440 per 1000 people, which when multiplied by the above population prediction of 207 million people would lead to a predicted net emigration of roughly 919080 people, an unprecedented number which would place enormous strain on the neighboring countries of India and Myanmar, among others.

Legal and Governance Gaps in Addressing Climate Migration

The majority of international migration today falls under the categories of employment-based migration or family-based migration. Most countries have restrictive asylum requirements and accept refugees only in highly restrictive circumstances as established by international law. Much of the existing framework for international refugee movements was built at a time when climate change wasn't considered a significant issue. These frameworks, such as the 1951 Geneva Refugee Convention and its 1967 Protocol, established pathways for refugees to seek asylum when their displacement was caused by a specific armed conflict. They do not recognize climate change as a valid reason for refugee status, potentially excluding millions of people from legal protection. Most national and international systems are unprepared for refugee movement resulting from slow-onset processes such as sea-level rise and desertification. (Martin, 2021)

Further, the countries most susceptible to the negative impacts of climate change are located in the Global South, in regions where governments are the least likely to have the infrastructure or

legal framework necessary to manage refugee movements in an orderly and equitable manner (Biermann and Boas, 2010).

While many major countries will face serious economic and social challenges due to climate change, small island nations such as Tuvalu face the unique challenge of attempting to preserve their culture and sovereignty while planning for the possibility that their entire landmass may soon be underwater. Given these circumstances, the government of Tuvalu is preparing contingency plans to move government operations online to preserve continuity of government in case of severe land loss, and proposing a form of international legal statehood that would persist even if the landmass of Tuvalu became uninhabitable (Rothe et al., 2024).

Climate change poses unique and unprecedented risks, such as the loss of landmasses of entire countries. For the first time in human history, hundreds of millions people will be forced to relocate both domestically and internationally due to causes that cannot be attributed to a specific party (Constable, 2016). It is imperative that governments and international institutions collaborate and create new frameworks to handle such events, in order to avoid global unrest and destabilization. Of course, such efforts must go hand in hand with efforts to reduce the emission of greenhouse gases in the first place, to mitigate the effects of climate change.

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