Climate Migrants and Urban Adaptation in India and China

Prepared for University of Notre Dame Global Adaptation Index (ND-GAIN)

By
Kaubin Wosti Neupane
Lara Rubinyi
Thirunavukkarasu Sivappha
Yimin Wang

Workshop in International Public Affairs
Spring 2016

Robert M. La Follette
School of Public Affairs
UNIVERSITY OF WISCONSIN–MADISON

For an online copy, see
www.lafollette.wisc.edu/research-public-service/workshops-in-public-affairs
publications@lafollette.wisc.edu

Table of Contents

List of Tables

List of Figures

Foreword

The La Follette School of Public Affairs at the University of Wisconsin-Madison offers a two-year graduate program leading to a Master of Public Affairs or a Master of International Public Affairs degree. In both programs, students develop analytical tools with which to assess policy responses to issues, evaluate implications of policies for efficiency and equity, and interpret and present data relevant to policy considerations.

Students in the Master of International Public Affairs program produced this report for the University of Notre Dame Global Adaptation Index (ND-GAIN). The students are enrolled in the Workshop in International Public Affairs, the capstone course in their graduate program. The workshop challenges the students to improve their analytical skills by applying them to an issue with a substantial international component and to contribute useful knowledge and recommendations to their client. It provides them with practical experience applying the tools of analysis acquired during three semesters of prior coursework to actual problems clients face in the public, non-governmental, and private sectors. Students work in teams to produce carefully crafted policy reports that meet high professional standards. The reports are research-based, analytical, evaluative, and (where relevant) prescriptive responses for real-world clients. This culminating experience is the ideal equivalent of the thesis for the La Follette School degrees in public affairs. While the acquisition of a set of analytical skills is important, it is no substitute for learning by doing.

This report deals with the implications of climate change for cities. Specifically, climate change is expected to increase stressors and shocks on the environment that will increase migration. The implication for cities is significant. The report notes how cities in India and China will face growing demand on infrastructure and social services with new migrants. At the same time, neither these cities nor the migrants themselves identify climate migrants as separate group from economic migrants. This makes it even more important for good analysis to understand how an invisible population is reshaping cities.

The opinions and judgments presented in the report do not represent the views, official or unofficial, of the La Follette School or of the client for which the report was prepared.

Professor Donald P. Moynihan
Epstein Professor of Public Affairs
May 2016
Madison, Wisconsin

Acknowledgments

We would like to thank the entire La Follette School faculty and administrative staff for their assistance and feedback throughout this policy report. Their dedication and support were critical to the development and publication of our policy report. Specifically, we thank Professor Donald Moynihan for his invaluable counsel, patience, and direction throughout this project, and for his generous grant that facilitated our fieldwork. Our report would not be possible without passionate insight and colorful stories of the people we spoke with in China and India. We are humbled by their hospitality and generosity. We thank all 31 informants we spoke with, and in particular, Su Shijie, Mo Fengwen, Amrita Sharma, and Chandra Shekar for allowing us to share their knowledge.

Executive Summary

The effects of climate change on migration present unprecedented challenges, especially in developing countries (IPCC 2014). India and China are of particular importance due to their population size, climate risks, and global economic influence. This project, designed for the University of Notre Dame Urban Adaptation Assessment initiative, aims to enhance the understanding of climate-induced internal migration in developing countries and the resulting adaptation challenges in urban areas. Using climate migrants as units of analysis, our findings suggest that economic integration, social inclusion, and public service accessibility are important determinants of how well cities are equipped to adapt to the influx of migrants within India and China.

To better understand the role of climate-induced internal migration on urban adaptation in China and India, we explore two key questions: 1) are people moving from rural areas to urban centers due to climate change, and 2) if so, what are the resulting challenges of urban planning and development. Literature indicates that people migrate due to either climate stressors (droughts, land degradation, etc.) or shocks (floods, landslides, etc.). We found stressors are more difficult to assess, as their direct effects are often neither acute nor pronounced. Therefore, in this analysis we examine shocks, whose effects are more acute. We conduct in-depth case studies on floods of comparable magnitude in China and India to understand the reasons people do or do not move. We do so with a framework that incorporates socio-economic and political variables as well as factors that hinder or facilitate migration decisions. To add on-the-ground perspectives to this framework and to understand the migrants' urban experiences, we conducted fieldwork in China and India.

Seven key findings based on analysis and fieldwork helped shape our recommendation:

- Climate change will increase migration volume, exacerbating existing problems in cities.
- National population-planning policies can disincentivize post-disaster migration.
- There is no official recognition for climate migrants as a population.
- Large gaps exist between cities' migration policies and implementation.
- Nongovernmental organizations (NGOs) play an important role in communicating policies and providing services.
- Migrants' economic integration in urban areas is hindered by informal job markets.
- Language barriers and discrimination hinders migrants' social integration.

With the goals of migrant rehabilitation and urban development, we recommend that the University of Notre Dame Global Adaptation Index (ND-GAIN) consider our findings to indictors for the Urban Adaptation Assessment (UAA), integrating three categories of issues: economic integration of migrants in urban settings, access to and consistent use of public services, and social inclusion of migrants in urban settings. Specifically, we recommend ND-GAIN use indicators including, but not limited to, unemployment rates, formal labor contracts, access to financial services, presence of NGOs, migrants' awareness and ability to access public services, language barriers, and socio-cultural stability.

Section 1: Background and Rationale

Introduction

There is a growing scientific consensus that changes in the climate system will increase the likelihood of severe, pervasive, and irreversible impacts to people and ecosystems (IPCC, 2014). Among several adverse effects of climate change, the consequences on migration present a growing challenge. When people in rural areas leave their homes, they often move to cities. This leads to a set of socio-economic, political, and environmental challenges for urban areas.

In this report, we address two questions: In China and India, 1) are people moving from rural areas to urban centers due to climate change, and 2) if so, what are the resulting challenges of urban planning and development. To answer these questions, we first use the Decision-to-Migrate framework to analyze a migrant's decision-making process. Next, using a combination of literature research and information gathered through fieldwork, we identify the challenges migrants face in their destination cities. In addition to being the most populous countries in the world, China and India are steadily growing economies that are also the most vulnerable to climate-change driven rural-urban migration (IPCC, 2014). We explore climate stressors (droughts, deforestations, etc.) and shocks (floods, landslides, etc.) in the study; however due to lack of adequate data for stressors, we conduct in-depth case studies of two "shock" incidents: flood and landslide disaster in Sichuan, Southwest China (2013) and floods in Orissa, Northeast India (2011). We use a decision-to-migrate framework of analysis, which conceptualizes what factors affect individuals' choices to migrate and then examine the urban adaptation implications of their choices.

We structure this report in seven sections. In the first section, we explore climate and migration literature to provide background and rationale for the project. We show the climate-change-led migration patterns in the world and in China and India, and their implications to urban adaptation. Section 2 describes the project's framework and methods of analysis. Here, we describe the Asian Development Bank's agent-based migration model (2012) as means to understand people's decisions to migrate. In addition, we discuss the nature of our fieldwork in China and India and how it informs the understanding of urban adaptation implications. Sections 3 and 4 are the applications of the decision-to-migrate framework in China and India. We explore countrywide trends and specific case studies of the Sichuan (2013) and Orissa (2011) floods to discuss relevant socio-economic, political, and governance factors that hinder or facilitate migration decisions. Sections 5, 6, and 7 pertain to urban adaptation. In section 5, we compare the urban adaptation responses in the two countries, looking at country-level trends and specific cases on two cities Chengdu (China) and Surat (India). Section 6 presents our findings based on the framework analysis and field studies. Finally, section 7 recommends indicators ND-GAIN should consider for use in their Urban Adaptation Assessment (UAA).

1.1 Defining Climate Migrants

In 2014, the Intergovernmental Panel on Climate Change (IPCC) released its updated assessment on observed changes in climate, their causes, future risks and impacts, and pathways for adaptation and mitigation. The report warns that changes in the climate system will increase the likelihood of severe, pervasive and irreversible impacts to people and ecosystems (IPCC, 2014).

These risks are even greater for disadvantaged people and communities in developing and emerging countries.

Among a plethora of adverse effects of climate change, the IPCC report projects an increase in displacement of people. The report further warns that displacement risks will especially increase for people in developing countries that lack adequate resources to plan their migrations in cases of extreme weather events or long-term climate variability.

Despite the severity of the issue, migration literature has yet to settle on a definition of climate-induced migration. A fundamental problem is that it is difficult to isolate environmental factors from other drivers of migration and to clearly distinguish between forced and voluntary migration (Dun and Germenne, 2008). It is also difficult to know if any individual natural disaster was made more likely by climate change, even if incidents have become more frequent in aggregate. Similarly, there is always some underlying rate of migration that occurs, often for economic reasons, and climate migrants move in large part because of the effect of environmental factors on economic opportunity.

Despite these measurement difficulties, a working definition is necessary to conceptualize the phenomena and to develop policy responses. In this report, we assess migrants who are displaced due to changes in climatic condition, specifically who leave their homes in rural areas to move to urban areas within their country. As such, for the purposes of this report we narrow the scope of the term "climate migrants" and define it as follows:

> *Persons who leave their habitual homes in rural areas and move to the urban areas within their country for reasons of change in the environment that adversely affects their lives.*

Climate Change Increases Migration

There are few studies that assess direct impacts of climate change on urban migration. Although scarce, the literature presents cases where people from rural areas migrate to urban areas because their lives and living conditions were adversely affected by changes in the environment. Barrios et al. (2006) studied how rainfall patterns (as a proxy to climate change) have affected urbanization in Sub-Saharan Africa. The authors find that weather can affect migration because of its impact on agricultural productivity in the rural areas and because of amenities of urban areas that rural sectors lack. Because rural wages depend on climate factors, migration can be induced by shocks to the rural climate.

Similarly, Henry et al. (2003) analyze the factors that cause inter-provincial migrations in Burkina Faso, West Africa. The study focuses specifically on the environmental factors and their effects on large migration flows in ecologically vulnerable areas. The study finds that although socio-demographic variables had stronger impacts, environmental factors were significantly associated with migration patterns. In addition, Saldana-Zorrilla and Sandberg (2009) test the contribution of natural disasters to the migration process in vulnerable regions throughout Mexico and find that the effect of economic losses from disasters coupled with adverse production and trade conditions during the 1990s led to out-migration from rural areas.

Cumulatively, these studies highlight that climate-change-driven rural-urban migration is an emerging global phenomenon that needs serious considerations, while also pointing to the difficulty in specifying the degree to which climate change affects these patterns of migration.

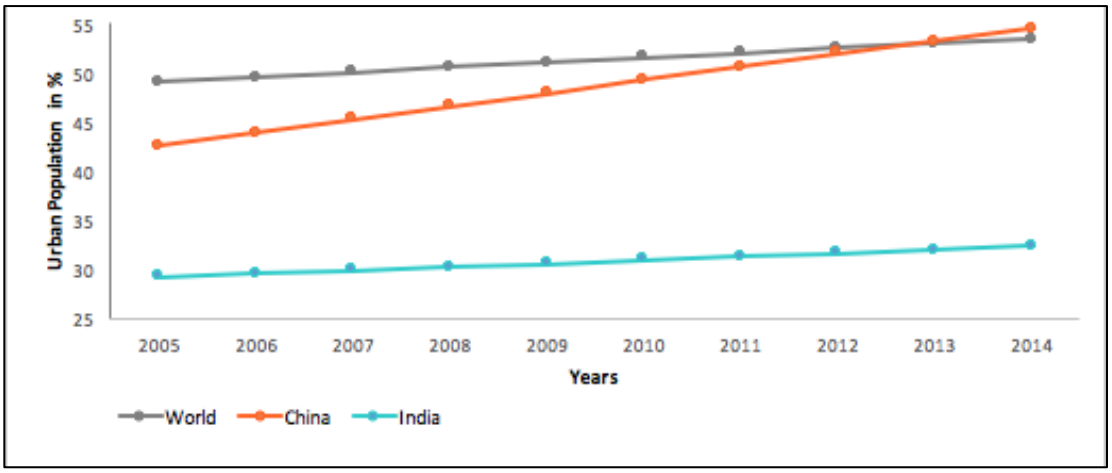
What is Urban Adaptation?

Urban adaptation is the ability of cities to create policies and infrastructure that adjust to new challenges. When people in rural areas leave their habitual homes because of changes in the environment, they usually move to urban areas within their countries, exerting socio-economic, political, and environmental challenges for adaptation (Georgi et al 2014). It is important to look at the implications of migration on urban adaptation to assess how cities will address future challenges, including the needs of incoming migrants.

1.2 Introducing India and China

We have chosen to examine China and India as cases of emerging, environmentally vulnerable countries. China and India make up about 36 percent of the world population and about 23 percent of the world GDP (World Bank, 2016). In addition, the following graphs show growing urbanization trends in India and China, which mirror global trends.

Figure 1. Urban Population, % of Total



Source: Authors based on World Bank Data 2016

Section 2: Methodology

2.1 Measurement Difficulties

Measuring the impact of something as large as global climate change is difficult, and we hit two major barriers when attempting to measure the effect of climate change on migration. The first was to separate migration due to climate stressors, such as drought, and migration due to economic reasons, such as the difficulty of maintaining a farm and whether a stressor was to blame.

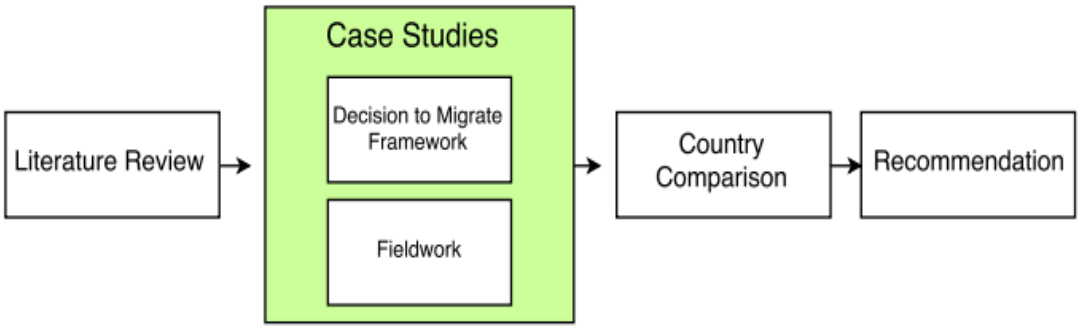
The second major issue was trying to define 'climate migrant.' People who are moving may not realize they are doing so because of climate change. Even if they did self-identify as climate migrants, official surveys or censuses do not collect data on this group. This makes it incredibly difficult to find data on rates of climate migration.

2.2 Methodology

Due to these difficulties, we decided to focus on climate shocks and, in particular, floods. We did this because we knew that if an individual lived in the flood zone that they were exposed to the flood, and therefore their actions were affected by an environmental force. By focusing on an environmental shock, it allows us to narrow the group of people we are looking at to possible 'climate migrants.' While floods may not always be the result of climate change, the effects of climate change make them more likely to occur (IPCC, 2014). They also offer a proxy for other types of climate stressors.

Figure 2 shows the tools we used to determine whether climate migration is occurring, and if so, what challenges cities in India and China were facing for urban adaptation. Our analysis is framed in a broad literature review of climate migration, climate change, urbanization, and urban adaptation as explored above. We use this base to examine two climate shock events, the Orissa flood of 2011 in India and the Sichuan flood of 2013 in China, in our case studies portion. By choosing two comparable case studies, we can examine the different cultural and governmental factors that led people to migrate or stay after the floods. We first examine whether individuals are moving by using the decision-to-migrate framework, which allows us to look at what goes into an individual's decision to migrate. This framework is informed by literature and the fieldwork conducted to supplement findings and gain on-the-ground perspectives. We find in our analysis that people do move after these shock events and identify destination cities. We then compare the urban adaptation challenges in India and China, and recommend indicators to capture migrant experience.

Figure 2. Methodology Outline

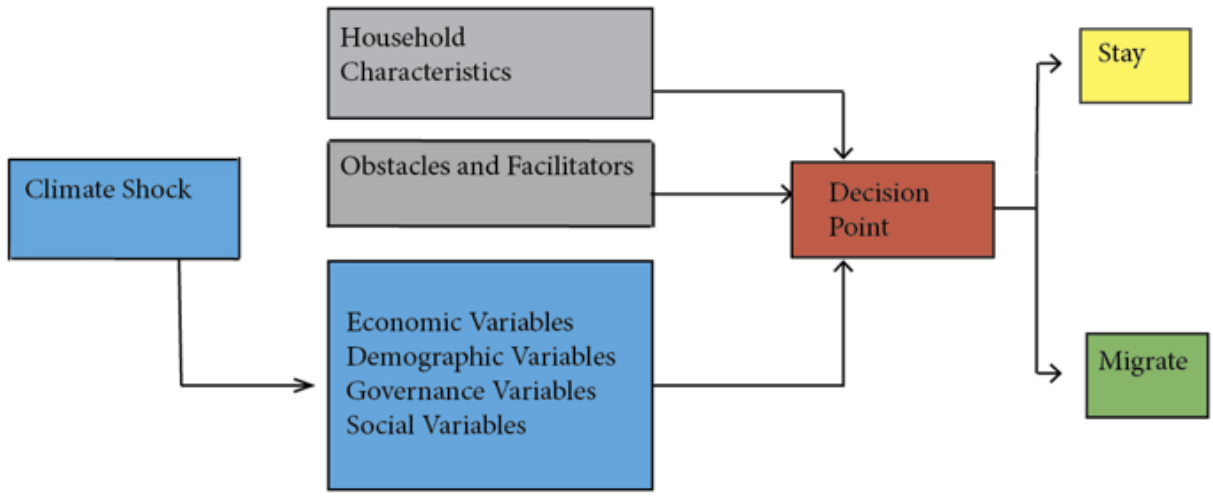


Source: authors.

Framework analysis

To evaluate these two case studies in a comparable way, we apply a common framework that models the factors involved an individual's decision to migrate. The framework takes the Asian Development Bank's conceptual framework for climate-induced migration and adds modifications from an agent-based study of climate change and internal migration in Bangladesh (Hassani-Mahmooei and Parris 2012; Manila 2014). By combining agent-based and conceptual models, the framework used in this paper examines individual-level motivation for migration while also recognizing the broader context in which decisions occur.

Figure 3. Decision-to-Migrate Framework



Source: Hassani-Mahmooei, 2012; and Asian Development Bank, 2012

As Figure 1 shows, the decision to migrate in this analysis will begin with environmental change. Environmental change acts as a trigger. This environmental change affects certain economic, demographic, political, and social variables, as shown in blue.

For example, climate change may increase income differentials (Waldinger, 2015); there may be slimmer profit margins and a larger benefit to moving to an urban area. In places with a politically determined minimum urban wage, this wage is often substantially higher than possible agricultural earnings not subject to wage regulation (Harris, 1970). If floods threaten agricultural earnings, for example, they may damage crops and further intensify the effect. Other economic variables include producer and consumer prices, which may rise as infrastructure has increased environmental pressure.

Population size and density, structure, and disease prevalence all are important demographic variables when making a decision. Political drivers such as discrimination, governance, conflict, policy incentives, and coercion also influence where and if people migrate. Social drivers such as education and family also are important. Among other factors, these demographic variables can determine an individual's ability to gain employment in the destination city and integrate socially, which could influence whether or not they migrate.

Household characteristics, shown in gray above, are other salient factors that remain largely fixed in light of environmental change. Characteristics such as age, sex, wealth, marital status, ethnicity, preferences, religion, language, and education are included in this step of analysis. For example, poorer individuals may lack the resources to migrate (Waldinger, 2015), raising concerns about the distributive effects of climate migration.

Also constant in the short-term are intervening obstacles and facilitators, shown in gray. These factors can be country-level and individual-level. Some factors include the cost of moving, diasporic links, recruitment agencies, geography, technology, social networks, and political and legal frameworks. National policymakers and NGOs have the greatest potential leverage on climate migration in this area, where they can choose to reduce obstacles to migration and increase the facilitation of adaptation strategies.

All of these factors will help an individual or family group decide whether or not to migrate. As disasters and environmental stressors likely increase individuals might have to make the decision to move more than once. Factors leading to the decision will also change with increased iteration. A negative feedback loop was reported in the Hassani-Mahmooei and Parris study, as certain areas became less desirable to move to as population density increased (2012).

Fieldwork

Using the decision-to-migrate framework, we identified cities where migrants go. We arranged field visits to China and India to better answer the questions of 1) if people migrate after disasters, and 2) if so, what factors are important to measure for urban adaptation. By talking to migrants, officials, and other people, we have been able to better understand our question and the differences and similarities between India and China.

In China, we visited Chengdu City Qingyang District People's Government Department of Civil Affairs and the Chengdu Human Resources Market. In speaking with the staff and users, we attempted to follow the footsteps of a migrant who needs to access public services and look for employment. In addition, we were able to identify and visit one NGO in the city of Chengdu, the Chengdu Volunteer Association. In a meeting with their director, we discussed urban adaptation challenges the Association identified and learned about its research and aid strategies for migrants. We casually spoke with migrant workers in neighborhood businesses about their life back home and in Chengdu. From meetings with Dr. Jay Pan, a PhD student in environmental ecology and architecture and an expert on child and maternal health, we learned about specific policies and realities of migrants' access to health care and the government's disaster rebuilding and prevention efforts. We also more generally discussed the rural-urban migration trend in China. In addition, we spoke with a local business law professor regarding access to legal services for migrant workers.

In India, our researcher met with several NGOs, including the Center for Science and Environment (CSE), a research and advocacy organization that has been working on documenting migrants' stories, and the Society for Labor and Development, an organization that is interested in socio-economic development of migrants. In addition, our researcher met with Dr. Saon Ray, a researcher with the Indian Council for Research on International Economic

Relations, who has worked on migration issues and the challenges of urban adaptation. He also talked with four migrants - two street vendors, one barber, and one security guard. Some common themes of the four conversations were climate-dependent migration, attractive urban amenities, and a hope for a better future.

A complete list of informants is in Appendix A. These field visits allowed us to have a more nuanced and on-the-ground understanding of the social and political implications of aid and policy. By speaking to people and forming relationships with migrants, we will better be able to represent their needs through the indicators we suggest to ND-GAIN.

Speaking with a migrant in New Delhi, India

Conversation with the Chengdu Volunteer Association

Section 3: Decision to Migrate in India

3.1 Macro-Level Trends in India

Overview of Climate Risks in India

In this section, we show that Indian cities are vulnerable to losses from climate change because of: 1) an increasing influx of migrants from rural areas, and 2) the existing urban planning challenges. The urban population of India is expected to increase by 500 million people by 2060. Among other factors, droughts, flooding, and deforestation drive increased migration from rural to urban areas (Deshingkar and Matteo, 2012). Moreover, many cities face problems regarding inadequate water and sewage systems, weak physical infrastructure, and inefficient transportation, drainage, and solid waste management facilities. Perhaps the most compelling evidence of urban India's inability to adapt to rapid urbanization is the fact that about 50 percent of people in urban areas are forced to live as illegal squatters (Sharma and Tomar, 2010). When people escape environmental stressors and shocks in rural areas and migrate to big cities, they often use poorly managed urban amenities. Based on the decision-to-migrate framework, we attempt to understand the push and pull factors of climate migration dynamics.

Overview of Urban India

In 2006, an estimated 30 percent of India's population lived in over 5,100 urban centers. India is also recognized as one of the more vulnerable and multi-hazard, risk-prone countries in the world – rapid population growth, high densities, poverty, and high differentials in access to housing, public services, and infrastructure have increased the vulnerability of India's urban regions (Revi, 2009). In addition, the increasing frequency and intensity of adverse effects of climate change is expected to further degrade the resilience and coping capacities of poor and vulnerable communities, who form 25 percent to 50 percent of the population of most Indian cities.

Country-Level Obstacles and Facilitators

Obstacles: The Government of India (GoI) has taken measures to reduce poverty and implicitly discourage rural-urban migration. Perhaps the most prominent social welfare policy is the 2005 Mahatma Gandhi National Rural Employment Guarantee Act, which aims to provide guaranteed 100 days of unskilled manual labor to willing adult members of rural households across all Indian districts (GoI, 2005). Since its adoption, the GoI has recorded about 194 million rural households participating in the program. The program has been hailed as the most successful social protection measure for gender equality, reduction of migration, and ecological regeneration (Chopra, 2014). The policy is intended to disincentivize rural homeowners from moving, even in cases of environmental stressors such as droughts. However, our meeting with the Society for Labour and Development, an NGO based in New Delhi, suggests that the program has not helped reduce rural-urban migration due to the 100-day limit and minimal pay. There are also reports of delays in payments from the government, which has made the program less attractive.

Facilitators: Although the Rural Employment Act guarantees employment in rural areas, low quantity and quality of government services fail to keep people in the villages. From our fieldwork, we found that inadequate employment opportunities, loss of income from traditional agriculture-based livelihoods, rising aspirations of the rural people for economic prosperity, and other factors are major facilitators of rural-urban migration. These "push" factors are inevitably exacerbated by unreliable climatic conditions, which increase the incentives to move especially for rural populations with little or no cultivable land.

Our interviews reveal several "pull" factors in urban areas including, availability of unskilled and semi-skilled work, perception of upward socio-economic mobility in the cities, availability of transportation to reach out to urban areas, and use of mobile phones to remain in contact with family in villages. According to research conducted by the Centre for Science and Environment (2015), an environmental advocacy NGO in New Delhi, industrial laborers earn as much as 100 percent more on average than what farm laborers earn. And because industries are not as dependent upon climatic variation as agriculture, many farm laborers naturally migrate for economic stability. When we asked a migrant in New Delhi if he would return to his village if he were hypothetically guaranteed free tools he needed to farm his small land, his response was that he would still remain in the city because: 1) he would make more money in the city, and 2) his farm would still be at risk of droughts and floods. In other words, erratic weather patterns in rural

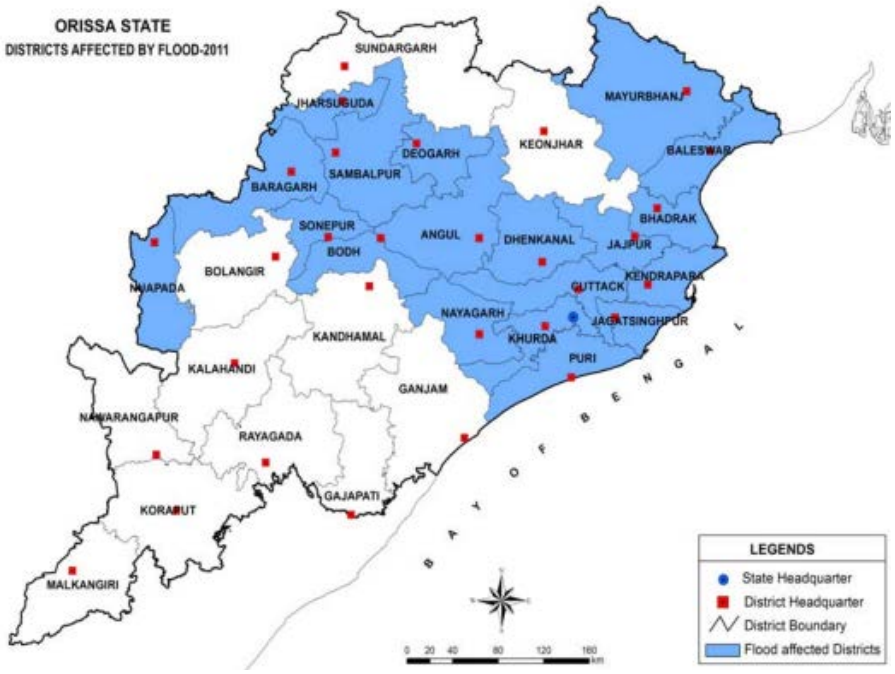
areas, proliferation of industries in cities, and better wages create an incentive for farm workers to migrate.

3.2 India Case Study

Overview of the Incident

Critical analysis of the floods in the State of Orissa during 2011 will help us understand climate migration in India due to a sudden environmental shock. Orissa (also known as Odisha) is situated on the east coast of India along the Bay of Bengal. The state's sub-tropical coastal location makes it highly vulnerable to regular natural disasters such as floods, cyclones, drought, and unseasonal cyclonic rains due to geo-climatic conditions. There are 11 major river systems in Orissa, each with little carrying capacity to collect rainfall, resulting in frequent floods (Govt. of Orissa, 2014). In September 2011, enormous precipitation in the upper catchment of the Mahanadhi River System resulted in massive floods, affecting about 3.44 million people in 19 districts (Govt. of Orissa, 2014). The standing crops in 323 thousand hectares were damaged with estimated cost of $415 million (Govt. of Orissa, 2011).

Figure 4. Map of Affected Area in Orissa State



Source: Memorandum of Govt. of Orissa

Decision-to-Migrate Framework Analysis

Rural households in the flood-affected regions of Orissa adopt various coping strategies to mitigate impacts of the climate-induced event. The adaptation strategies depend on the household's perception of the extremity of the event and associated problems, including loss of property and life, loss of livestock, damage to crops, decrease in grazing land and fodder availability, and loss of income and employment. Appendix B enumerates some of the strategies adopted by the population exposed to regular floods in this region (Roy, Mruthyunjaya and Selvaraja, 2002).

Of the various strategies, migration is one of the alternatives after experiencing severe economic loss and environmental change. In our conversation with Chandra Sekhar Bahinipati, professor and climate change expert at the Gujarat Institute of Development Research, we learned that most of the flood-affected people decided to migrate to other places based on the advice of their relatives, or they moved to those places where people from their region had already settled.

Household Characteristics: Almost 60 percent of migrants are small farmers, are below the poverty line, have lower education levels, are from lower caste communities (74 percent), and are dependent on government schemes and local natural resources (Aajeevika, 2014). For instance, from 2010 to 2013 in the coastal region of Orissa, migrations in the severely impacted districts of Kendrapada and Khorda were 47 percent and 42 percent, respectively, and the migrants were predominantly young single males between the ages of 18 and 25 (Aajeevika, 2014). Frequent natural disasters in these districts hamper the continuity of employment, and a large number of households migrate as a coping strategy. Almost 40 percent of these migrants are unable to read or write. This lack of literacy pushes these migrants to take up mostly manual, unskilled jobs in the labor economy.

Economic Changes: The wage-earning capacity of the labor community is especially weakened during cyclone and flood years because traditional employers who are large farm owners are also impacted. A research study conducted through focus group discussions in the flood-affected regions of Cuttack, Khordha, Jarjpur, Balasore and Ganjam highlight the same fact that migration is generally driven by lack of sufficient local employment, land degradation, periodic floods and cyclones, and better opportunities in other locations (InsPIRE, 2012). This flood resulted in huge losses. The fishing community lost its boats and nets, the farmers lost their livestock, and the artisans lost their equipment and raw materials. Rural roads were washed away, bridges were damaged, and government and private buildings were destroyed resulting in enormous infrastructural loss and damage to trade. There was a severe disruption of essential supplies like drinking water, energy, and health facilities. Many lost their homes and settlements, 116,706 houses were estimated to be damaged, and the total costs amounted to millions of dollars (Govt. of Orissa, 2011).

Political Actions: The state government immediately responded to the disaster by expediting various relief measures, including rescue and evacuation, food supplies, temporary shelters, mobile medical teams, provision of drinking water, animal care and safety, and repair and restoration of public utilities (Govt. of Orissa, 2011). The government also took active measures to calculate the extent of damage done to agriculture, horticulture, and sericulture crops (Govt. of Orissa, 2011). Female-headed households, orphans, and the destitute were given preference in providing relief measures at the time of damage assessment (Govt. of Orissa, 2011). However, these relief measures were short-term and did not help overcome long-term employment losses.

Obstacles: The Rural Employment Act offers 100 days of promised employment in 11 local administrative units in two districts (Government of Odhisa). The state government has initiated 'Residential Care Centers,' a program for retaining and providing education to the children whose parents have migrated (Infochange, 2003). These programs are intended to discourage migration.

Facilitators: Migration in Orissa is predominantly carried out through the ‘Dadan’ system. In this system, people from tribal and rural Orissa are often recruited by labor contractors and taken to various states within India for employment. In 1975, Orissa was the first state in India to formulate a state-level law – the Dadan Labor (Control and Regulation) Act – to protect the interests of migrants. The Act facilitates creation of a 'registering authority' to record agents and workers, to ensure minimum wage and basic labor welfare facilities, and a 'competent authority' for dispute settlement. Modeled on this law, the federal government passed the Inter-State Migrant Workmen Act in 1979, which is applicable across the country. Such laws provide some basic guarantees for migrants, and thereby should facilitate migration.

Where are Flood Victims Going?

Tracking migrants from a particular event is difficult because they do not report their movement to any government agencies, and there is no formal mechanism that exists to document these movements. Thus, we need to depend on the reports and studies conducted by nongovernmental organizations (NGOs) that closely work with the population vulnerable to environmental change. These NGOs emphasize that the primary consequence of climate change is economic, and the main reason people move is to find employment opportunities. About 66 percent of workers from the flood-prone Orissa region travel to both neighboring as well as far-off states of India to find work (Aajeevika, 2014). Some of the important destinations for these migrants are Surat in Gujarat, Maharastra, Tamil Nadu, Andhra Pradesh, Gujarat, Kerala, West Bengal, Himachal Pradesh, Punjab, Karnataka, and Delhi. The migrants find work as unskilled laborers in the construction, transportation, industrial, and other sectors.

Section 4: Decision to Migrate in China

4.1 Macro-Level Trends in China

Overview of Climate Risks in China

Historically, China has experienced waves of deforestation, leading to increased land erosion and floods. During the Great Leap Forward from 1958 to 1960, deforestation occurred dramatically in an attempt to increase steel output and power iron furnaces. In the late 1960s and early 1970s, another round of deforestation occurred to make room for grain fields. Decades of deforestation have increased land erosion overall and desertification especially in dry regions. Since the 1980s, population growth and development has led to increased demand for timber, grain, and water, further stressing these vulnerable internal provinces (Vaclav, 1995).

China has heterogeneous climatic conditions, with different regions experiencing climate events differently. A recent publication from the Wilson Center names melting glaciers, glacier lakes overflow, decrease of water volume in major rivers, rising sea levels, loss of biodiversity, loss of coral reefs, and increase in natural disasters as potential biophysical impacts of climate change in China (Chih-Yin Lai, 2011). Among the most vulnerable regions for droughts and floods are the interior regions, whereas the coasts are more vulnerable to sea-level rise.

Overview of Urban China

China is rapidly urbanizing. As of 2012, more than half of the Chinese population lived in cities, and in the past two decades, an estimated 225 million people migrated from rural to urban areas (Xu et al., 2011). This acceleration in urbanization was spurred by China's transition from a state-controlled agrarian economy to a manufacturing-based market economy that offers more employment opportunities in cities (Wei et al., 2014). The full scale of urbanization in China may be even greater because large numbers of migrant workers belonging to the "floating population" migrate to cities temporarily and return home (Zhang et al., 2003). Assuming urbanization trends continue, new responses to the population growth will be necessary as urban areas become more resource-strained.

Country-Level Obstacles and Facilitators

Obstacles: Obstacles to migrate in China include strong regional ties, and the lengthy and difficult bureaucratic process to change household registration. These factors make it difficult for those wishing to migrate to leave, and to receive social services in cities. The Hukou is the Chinese household registration system. It began in 1958 as a social-planning measure. Individuals were registered as either "urban" or "rural" and can access public services only in the place of the registration. Although the Hukou covers similar public services, the quality of these services are better in urban areas compared to rural. Migrants to urban areas without special permits could be evicted. In this manner, migration was tightly controlled. In 2003, the Hukou system was reformed to allow migrants to work and live in cities without special permits. The most recent reforms went into place in July 2014. These reforms incentivize individuals to move to smaller and medium-sized cities by reducing education, income, and land requirements needed to switch to an urban Hukou (Bingqin Li, 2015).

There are a lot of local barriers to moving into cities, even with the reform of the Hukou system. Large cities such as Beijing and Shanghai attempt to control the inflow of migrants through stricter urban Hukou requirements. Even medium-sized cities restrict entry (Song, 2014). Local governments often put restrictions on low-skilled migrants, attempting to limit the amount of social services that would need to be provided to those with less wealth (Appendix C).

Facilitators: One facilitator is the pull of large businesses in cities that hire low-skilled labor and often arrange housing to workers. Rural areas have very low productivity (Waldinger, 2015). Due to environmental degradation, water shortages, and the lack of rural agriculture support, it has become increasingly more attractive to migrate to cities (Zhao, 1999). In addition, industrial production in the interior of China is limited due to resource constraints, pushing migrants toward the cities (Waldinger, 2015). Because it is so difficult to obtain an urban Hukou, and therefore be employed under contract, many migrants are employed in informal sectors. This makes the economic impact of migrants difficult to measure and track.

4.2 China Case Study

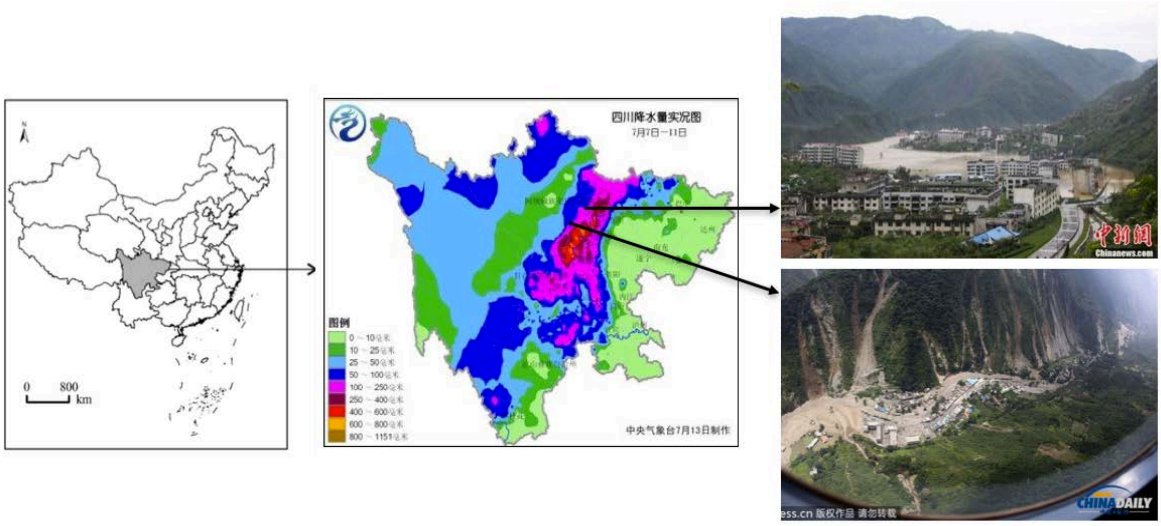
Overview of the Incident

Sichuan is a disaster-prone province situated in the heart of China. Geographically diverse, Sichuan Province is surrounded by the Qinghai-Tibet Plateau to the west, lesser mountains to the north and south, and fertile basin in the east. The four major rivers that gave the province its name – Jaling Jiang, Tuo Jiang, Yalong Jiang, and Jinsha Jiang – are prone to flooding.

Beginning on June 29, 2013, continued heavy rainstorms led to flash floods that swept bridges, houses, hillsides, and people into its torrents, eventually triggering multiple mudslides. From July 7 to 12 that same year, strong rainstorms continued in 15 cities and 90 counties in Sichuan, with accumulated precipitations up to 1,151 millimeters in certain areas (Xinhua News, 2013). Immediately following this flood disaster, the central government activated the "Level I Contingency Response" system, which mobilized People's Liberation Army soldiers, People's Armed Police Force, Police Force, civilian People's militia, and medical personnel. Within one county alone, over 20,500 people joined in the relief effort (Official Website of Wenchuan County, 2014).

According to China's official news agency, 3.44 million people were affected throughout the 21 prefectures and its hundreds of counties and townships in Sichuan. As of July 15, 2013, the floodwaters left 68 people dead, 179 missing, and 286,000 displaced.

Figure 5. Map of Affected Area in Sichuan Province



Source: China Meteorological Administration. Author compiled.

Decision-to-Migrate Framework Analysis

In this section, we use literature research and fieldwork to illustrate a disaster victim's migration decision. The information collected is analyzed using the Decision-to-Migrate framework – beginning with household characteristics of disaster victims, followed by variables directly affected by the shock, and obstacles and facilitators – to find out whether they migrate or stay after the disaster.

Household Characteristics: The regions of Chengdu, Deyang, Guangyuan, Ya'an. Mianyang, Aba, and Yibi have experienced the heaviest rainfall. The Sichuan Ministry of Civil Affairs, the agency that registers disaster victims, does not publish the exact identities of the 286,000 displaced people. However, drawing on statistics provided by local governments, we find that the residents of these heavily affected areas are largely low-income farmers (67.8 percent) with agricultural Hukou and an average annual per capita income of $1,248. The rest work in industry (10 percent), construction (7.8 percent), and other non-agriculture industries (14.5 percent). The

majority of people affected by this disaster are Han Chinese with small numbers of Tibetan, Qiang, and Yi people.

Economic Changes: The 2013 flood disaster caused devastating direct economic losses totaling $3.28 billion. In 10 days, 13,400 houses collapsed and millions more were damaged; transportation systems including highways, tunnels, and bridges collapsed; and water, power, and communication systems were interrupted (Xinhua News, 2013). Over 156.5 thousand hectares of crops were affected, and 26.8 thousand hectares of those lost their productivity. Many means of production for farmers were destroyed, fresh stocks rotted, and electronic appliances were damaged. With arable land rendered unproductive and rural flood victims losing their means of livelihood, it is reasonable to speculate that these victims might migrate to urban centers for employment opportunities.

Demographics Affected: Heavy rainfall, flash floods, and mudslides disproportionately damaged poorly constructed homes, affecting low-income individuals and families. News stories have highlighted that the able-bodied members of households were out tending corps or working, thus the young and elderly who usually stay behind are among the most-injured populations (CCTV Agriculture, 2013). Given that able-bodied members of households not only need to find alternative ways to earn income, but also must take care of those injured during the flood, this demographic change caused by the disaster may induce the working-age population to seek better prospects in the cities.

Political Actions: After the rainstorm disaster, many local governments enacted market regulatory policies and relief aid to mitigate the aftermath. For example, Wenchuan County reported increased price regulation checks in the necessity markets, adopted the economic development slogan “Development, Stability, Livelihood,” and reconstructed infrastructure in the city and its surrounding villages (Official Website of Wenchuan County, 2014). In addition, according to the Provincial Government in Sichuan, families whose homes have been completely destroyed received around $307 in transition aid and $3,075 in rebuilding aid. Those families whose homes were damaged but not destroyed received repair aid. Political actions triggered by the disaster were aimed at stabilizing the local economy and restoring homes; disaster victims were heavily incentivized to stay and rebuild (General Office of the People's Government of Sichuan, 2013).

Obstacles*:* Through government reports and fieldwork, we identify two obstacles against flood victims to migrate in Sichuan: locally tied post-disaster benefits and national-level population planning policies. The first obstacle is that official disaster reconstruction and employment policies are effective only within the flood-affected areas. Our fieldwork shows that housing discounts were available only for post-disaster reconstruction in the areas affected. Similarly, a preferential employment policy ensured that at least one person in a zero-employment family would be guaranteed a job locally. An official government statement encouraged local enterprises to “absorb the unemployed in disaster areas and provide flexible employment for workers… and give priority to the use of these workers” (Sichuan Poverty Alleviation and Immigration Website, 2013).

The second obstacle is the national population planning policy, the Hukou system. This household registration scheme restricts a villager’s access to public services to his or her Hukou

registration place. He and Yan (2014) observed that disaster migration in China normally follows a cyclical model of "Migrate – Return – Migrate Again – Return Again" pattern, partly due to the restriction to access urban benefits with a rural Hukou. During our fieldwork in China, we spoke with Mo Jie, a veteran migrant worker who has lived in both Beijing and Shenzheng. She returned and continued to stay at her hometown of New Beichuan even after the 2013 flood, explaining that her "child must go to middle and high school at the place of Hukou registration."

Facilitators: Media coverage of the floods pointed to two possible facilitators: health care and settlement location. First, disaster victim's temporary relocation to seek better health services in large cities is common. The Area Command in this Xinhua story suggested that injured and trapped victims, whose homes are likely destroyed, have been moved to Chengdu ("PLA." Xinhua News, 2013).

> *"Injured people, pregnant women as well as trapped residents from Wenchuan County have been moved to Chengdu City, capital of Sichuan Province, for treatment and care, the Area Command said."*

State-sponsored travel reduces the cost for the victims to migrate, incentivizing them to stay and seek employment in Chengdu instead of returning home.

Secondly, the government's victim-settlement locations might play a facilitating role in bringing people into urban areas. The settlements are located in the town centers of villages and cities, providing a springboard to reach other urban areas ("四川境内," *Radio Free Asia*, 2013).

Where are Flood Victims Going?

Drawing on the large volume of policy incentives from local governments to rebuild, combined with the obstacles of high relocation cost and structural affinity of Hukou, we come to the conclusion that 2013 Sichuan flood victims did not participate in large volume of voluntary migration. However, fieldwork informed us that in the flood-affected town of New Beichuan "at least two-thirds of the able-bodied people have gone out to search for work" (Interview with Mo Jie). Pulled by labor demands of the cities and pushed by limited opportunities at home, young working-age men and women migrate to nearby industrial cities of Mianyang and Chengdu.

Section 5: Comparison of Urban Adaptation

Through our framework analysis, literature review, and fieldwork, we determined that in both India and China individuals are moving from rural areas to urban areas following a disaster. In the following section, we give an overview of urban adaptation in each country and we identify two destination cities, Surat in India and Chengdu in China, to examine the urban adaptation challenges migrants face and the cities' actions for addressing these challenges. Specifically, we examine the ease of economic integration, public service accessibility, and social inclusion, three factors that contribute to the quality of life for new migrants. This analysis will inform the indicators we suggest for use in the Urban Adaptation Assessment (UAA).

5.1 Macro-level Urban Adaptation

Urban Adaptation in India

Economic Integration: Although rural-urban migration in India happens for mostly economic reasons, we have found that the overwhelming majority of migrants are involved in the informal

or unorganized sectors. We visited several labor *chowks* (road intersections) across New Delhi and Jaipur and found migrants soliciting a day's work. About 93 percent of the Indian workforce is employed in the informal or unorganized sector (Gurtoo and Williams, 2009), which indicates an institutional gap in labor welfare. The number also accounts for 127 million workers in urban India (PTI, 2014). The stark absence of organizations to oversee workers' welfare makes it difficult for migrants to integrate in the urban economy.

Public Service Availability: Because the vast majority of urban migrants work in the informal sector without organizational sponsorships, they are left to access available public services independently. For example, during our field visits, we found that many migrant workers in India's capital region, New Delhi, live in slums, with little and unreliable amenities. Similarly, in *Chawls* (low-income housing projects), four to six workers live in 10-foot by 10-foot rooms without proper ventilation, clean water, electricity, and proper sewage and drainage systems (SLD, 2015). Our conversations with various NGOs suggest that these situations are common in most of urban India.

Social Inclusion: Migrants confront various problems integrating into the urban society. They face harassment from local residents in multiple forms: they deny the migrants certificate of tenure, which creates problems in getting voter IDs, bank accounts, and gas and electricity connections (SLD, 2015). Women are especially vulnerable to verbal, physical, and sexual abuse (SLD, 2014). There also is a sense of regionalism among the local residents in Indian cities. For example, on separate occasions in Mumbai in 2008, the native Maharashtra residents attacked, beat, shot, and lynched migrants from the states of Bihar and Uttar Pradesh (Zeenews, 2008). While an extreme example, it fits with a broader pattern of rural migrants struggling to socially integrate in urban settings.

Environment: Indian cities are exposed to climate risks, which are exacerbated with ever-increasing urban populations. Revi (2008) highlights that the most vulnerable populations in a typical Indian city are migrant populations residing in slums, squatters, and informal settlements. These settlements are also located in the most vulnerable locations, prone to wind, water, and geological hazards. Therefore, climate migrants that have moved from a disaster may still find themselves exposed to environmental risks.

Urban Adaptation in China

Economic Integration: The economic integration of migrants into Chinese cities is difficult due to the types of jobs migrants are often eligible for. Migrant workers tend to do jobs that are more physically demanding and receive lower pay, such as construction or manufacturing. This is due to differences in education as well as constraints of the Hukou. Those without local Hukou have limited access to jobs in the formal sector, pushing them into informal sector jobs with less stability and no benefits. The lack of employment contracts also makes migrants vulnerable to labor rights and disputes (Wang et Fan, 2012). These factors make it difficult for migrants to obtain wealth and lead to less economic integration within Chinese cities.

Public Service Accessibility: While China has a strong system for public services, many are out of reach for urban migrants. There remains a systematic rural bias against migrants in the form of gatekeeping measures for individual city's urban Hukou status policies. Without urban Hukou,

rural migrants do not have access to state-subsidized benefits (Xu et al., 2011). Employment-based social insurance programs have been created, though there are institutional and structural constraints to their success. Some of these structural constraints are that migrants are often employed in informal sectors, many programs are place-based and are costly to be transferred, and employers are reluctant to comply with social security entitlements provided to urban residents (Wang et Fan, 2012). These factors create barriers that migrants have to overcome that non-migrants may not face. This leads to disparities in public-service accessibility between migrants and non-migrants.

Social Inclusion: Migrants from rural areas often have a difficult time with social inclusion into the broader urban community. Those who have rural Hukou are viewed as having an inferior social position in cities, increasing social exclusion and marginalization. This exclusion is intensified with the physical separation of migrant housing. Often, migrants live in crowded dorms or poorly maintained rental units in urban villages (Wang et Fan, 2012). China has a diversity of languages and cultures. If an individual has difficulty speaking the language of his or her new city, or if cultural practices are different, it leads to a lower sense of social inclusion. Social inclusion is necessary to enable policymakers to make long-term decisions. If Chinese migrants continue to return to rural areas due to poor social inclusion, it hurts the city-level domestic market (Wang and Fan, 2012).

Environment: Chinese cities must take into account the changing environment as well. Currently, over 70 percent of cities and over 50 percent of the population are located within regions at serious risk of climate disaster (Zhou et al., 2014). This population will increase, and migrants are particularly vulnerable within these at-risk cities. They are more likely to live in disaster-prone regions of a city and in worse housing. In addition, they may not be eligible to receive post-disaster relief without the proper Hukou status.

Comparison of Urban Adaptation in India and China

Based on fieldwork and case studies, we find that cities in India and China are prone to the adverse effects of changing climate. In both countries, migrants are particularly at risk because they live in poor conditions, struggle to integrate into urban economy, lack access to public services, and have difficulty integrating in the urban society. In contrast to India, China has a strong system of public services, though we find that migrants are rarely able to access them. In both India and China, we find that an overwhelming majority of employment opportunities are in the informal sector, which deny workers benefits, and that migrants are forced to do hard labor to make ends meet. We also find in India that migrants are harassed verbally and physically based on race, caste, spoken languages, and cultural differences. In China, migrants are kept separate from urban residents. These factors lead to the conclusion that in both India and China, migrants are struggling to integrate.

5.2 Case Study City-Level Urban Adaptation

Urban Adaptation in Surat, India

To understand the climate migrants' urban adaptation process in India, we focus on Surat, a city that has seen an enormous inflow of migrants in recent years. Surat is the second largest city in the state of Gujarat, with a population of 4.66 million people (SMC Website), of which 58

percent are migrants (IOM, 2015). The city is a major center for textile manufacturing, trade, diamond cutting and polishing, intricate textile design, chemicals, petrochemical and natural-gas-based industries. In particular, the textile and diamond industries have attracted over 600,000 Orissa migrants (UNDP, 2009).

Surat's population is expected to reach nearly 7.53 million by 2025 (UN population data 2010), with the average decadal population growth rate of about 50 percent over the next 10 years. The successful inclusion of the incoming migrants requires significant investments for basic urban services such as water supply, sewerage, storm-water drainage, solid-waste disposal, roads, and streetlights (ACCCRN, 2013).

Economic Integration: Industrialization and continued economic development has made Surat a major employment destination. Migrants from Orissa are preferred in the textile industry because of their expertise in working with artificial rayon and silk fibers. On average, these migrants earn Rs 3,000-7,000 ($45 to $100) per month. Almost 75 percent of the migrant workers are not registered in the employer's formal payroll, are poorly paid, and are not provided with identity cards or pay slips (Chhotry, 2011). These violations of work ethics through long working hours, low wages, lack of provision of security nets, and exposure to hazardous environment without protection point to migrants' challenges of integrating into the economy.

Public Service Accessibility:

Housing: It is estimated that 40 percent of Surat's migrant population lives in slums characterized by poor sanitation, poverty, and overcrowding (Sharma et al., 2009). As of 2006, Surat housed 420 slums, which face high exposure to floods due to their location along the tidal creeks (ACCCRN, 2013).

Health Care: Located in a coastal terrain, the city is highly vulnerable for vector-borne diseases such as Filaria and Malaria. In addition, Orissa migrants in Surat are highly susceptible to AIDS due to unsafe sexual practices (UNDP, 2009), with more than 300,000 suspected HIV carriers working and living in the city (Vikraman Pillai, 2008). Because of riskier and harder jobs, migrant workers are exposed to various occupational health issues (Aajeevika, 2014). A research study conducted among 4,796 migrants found that migrants relied on private doctors and hospitals rather than government or nonprofit health facilities (Adhikar). This underutilization of public health services is attributed to lack of awareness about provision of health facilities and language and financial problems. However, Surat Municipal Corporation has established the Urban Health and Climate Resilience Center (UHCRC), which has developed a climate-specific vulnerability scoring method in health planning with specific interest on migrant populations in the city (Appendix C). This is the first of its kind in the country.

Education: Surat has one of the highest literacy rates (88 percent) in India (SMC Website). However, most of the migrant population are unskilled workers who are unable to read and write. In a study conducted among migrant construction workers in unorganized sectors of the city, it was found that 54 percent of the workers lack basic reading and writing skills. Among the literate workers, the highest education was high school level (Solanki and Zankharia, 2015).

Physical Infrastructure:
Water Supply: Droughts and late onset of monsoon are already creating stress on Surat's water supply system during peak summers. The current allocation of water is insufficient given Surat's growth. Tap water is a major water source for four-fifths of the slum-dwellers (CSS, 2002). The

Surat Municipal Corporation has created a non-revenue water cell to audit and prevent water loss through leakages in its water-distribution zones (NIUA, 2015). This leak-detection program initiated by Surat has been selected as a best practice for improving the water supply.

Waste Management and Sewage Disposal: Surat generates 1,400 metric tons of garbage every day, and 400 metric tons of waste is treated daily to make compost and fuel at the waste treatment plant (Bhattacharjee, 2014). However, rapid growth in the city's urban landscape raises new challenges in protecting water bodies and in managing sewage reuse and recycling (Jatin Shah, SMC). In a research survey, 60 percent of 2,003 residents in the city felt that city's sewage was a threat to the river (TERI, 2015).

Transportation: Inadequate mass transportation and heavy traffic congestion have been cited as major weaknesses in the city's infrastructure (SMC Proposal, 2015). The total vehicular distribution in Surat includes 77 percent two-wheelers, 13 percent motorcars, and 4 percent auto rickshaws, yet the share of passenger buses is only 0.5 percent (Gaurkar, 2013). There is a stark need for investment in public transportation, upon which most migrant workers depend.

Social Inclusion: Social inclusion is the biggest challenge for migrant workers in Surat. Because they do not know the language, their children cannot go to school and are forced to work. An interview with Govinda Dalabehera, Secretary of Adhikar, na NGO working closely with migrants in Surat, revealed that migrant workers in Surat face constant harassment and ill-treatment.

Urban Adaptation in Chengdu, China

In the following section, we outline the city policies and observe the adaptation difficulties a climate migrant might face in his or her move to the provincial capital of Chengdu (11 million). This city was selected for its proximity to rural areas heavily affected by the flood, its employment opportunities, and its "floating population" of 4 million. A local newspaper, West China City Daily, reports that the population of Chengdu has been growing annually with 100,000 migrants since 2010. With 50,000 of them projected to have children in the city, adapting to the influx of migrants in Chengdu is important and timely.

Economic Integration: In 2014, 77.3 percent of the 4 million migrants came to Chengdu for employment (Bureau of Public Order Administration under the Ministry of Public Security, 2015). These migrant workers are mostly male (60 percent) and come from within the province (77 percent) to find low-skill work in Chengdu's main economic sectors of service and high-tech manufacturing. Migrant workers we spoke with reported stress related to city living but would not go back to their hometown because of employment opportunities in the city.

Public Service Accessibility: In 2011, Chengdu became the first city in China to remove its "Temporary Residence Permit," instead issuing migrants the "Chengdu Residence Permit." The new permit, aimed to erase rural-urban stigma, allows a "floating population" to enjoy the same rights to access employment, health care, education and other public services.

Health Care: According to a discussion with Dr. Jay Pan of Sichuan University, over 98 percent of rural residents are covered under the New Rural Cooperative Medical Scheme, and over 60

percent of urban residents are covered by either the Urban Employees Basic Medical Insurance or the Urban Residents Basic Medical Insurance. Continuous improvements have been made to these three systems. In March 2014, all those who held a Chengdu Residence Permit could access neighborhood health clinics, and create and track their health records; and in March 2016, Chengdu increased the reimbursement cap for its "Medicaid" program for low-income and unemployed people.

Increased health care utilization reduces financial burden for the poor (Wang et al., 2005). However, many migrants and their families remain outside of the formal insurance system due to low awareness rate (70 percent), inclusion rate (48 percent), and actual utilization rate (28 percent) of "Medicaid" programs (Deng et al., 2008). Complicated alternate-location reimbursement processes continue to pose a problem for migrants and their families (Barber and Yao, 2010).

Access to Education: Only those migrants who obtained a Chengdu Residence Permit can send their children to the city's primary and secondary schools and enjoy the same nine-year compulsory education as Chengdu Hukou children. Zou et al.'s 2005 survey found that 88.4 percent of the respondents' children attend public schools and 10.4 percent attend more reputable schools. A majority of respondents (88.6 percent) felt the government should clarify enrollment policies.

Ten years later, in a 2015 survey on the needs of migrant children, Chen et al. continue to find that Chengdu migrant parents' understanding of national and local migrant education policy is low, and their ability to access information is limited. More than half of the respondents reported that sending children to the city public schools is "not easy" due to high fees, complicated procedures, and restricted Hukou policy for continuing education.

Physical Infrastructure: Two low-income housing programs target migrants in Chengdu: Cheap Rental Housing and Public Rental Housing. Through both programs, qualified migrants can rent apartments at 70 percent to 80 percent less than the prevailing market price. People's Daily Online suggests there are 22 Cheap Rental Housing and Public Rental Housing communities in Chengdu, however; only about 18% of the residents in these communities are migrant families.

Research has shown that these programs have so far failed to provide adequate housing for the poor because of the central government's failure to define a clear mission, a lack of commitment from local governments, and an exclusionary policy toward migrants (Huang, 2012). Thus, very few migrant workers take advantage of the low-income housing programs. One survey of Yi migrants shows that only three of 368 respondents bought homes in Chengdu, while 59 percent of the respondents rent or live with relatives and friends, and 40.2 percent live in employer-provided arrangements in cramped quarters of the city (Guo, 2014). Similarly, Yang (2013) found that migrant families with children are more likely to rent than live under employer-provided arrangements. Due to cost constraints, 37.7 percent of migrant families must rent outside of Chengdu's 3rd Ring Road, which is over six miles outside of the city center.

Social Inclusion: Only 2.8 percent of all migrants in Sichuan are ethnic minorities; however, they make up close to 10 percent of the migration inflow into Chengdu (Yang, 2002). In addition

to difficulty accessing services, these migrants face social inclusion barriers such as language, religious practice, legal knowledge, and discrimination. One survey stated that 95.7 percent of Yi respondents reported being discriminated against by Han Chinese.

Comparison of Urban Adaptation in Surat, India and Chengdu, China

Our case studies and fieldwork suggest that Surat has a higher migrant-to-local resident ratio than Chengdu. Surat's projected inflow of migrants is also higher than that of Chengdu, though both cities are expected to grow in population. Migrants find informal jobs in Surat's textile manufacturers and diamond treatment shops, whereas in Chengdu they become contracted general labors in technology manufacturing and consumer services industries. In both cities, migrants have incomes well below the city average and live in clustered, densely populated areas. Surat's lack of low-income housing render these migrant communities' living conditions to be particularly unsanitary compared to low-income communities in Chengdu. However, while low-income housing for migrants in Chengdu exists, policy-awareness and accessibility is still a problem, resulting in young migrant workers living in dorm-like employer housing and migrant families renting on the outskirts of town.

Table 1. Urban Adaptation Challenges in Surat and Chengdu

	Surat, India	Chengdu, China
Economic Integration	• 75% migrants are not registered employees (Chhotry, 2011)	• Migrants work in low-skill jobs in service and manufacturing
Public Service Accessibility	• 40% of migrants live in slums (Sharma et al., 2009) • Highly vulnerable to vector borne diseases and HIV AIDS • Inadequate infrastructure (sewage, water supply, public transportation) • Under utilization of public service	• 40% of migrants live in employer-provided cramped dorms (Ma, 2014) • Low awareness, inclusion, and actual rate of low-income health care programs (Wang et al., 2015)
Social Inclusion	• Harassment, workplace neglect (SLD, 2015) • Different states speak different languages (interview at Adhikar)	• 10% migrants are ethnic minorities that face language barrier (Guo, 2014) • Over 95% of ethnic minority reported being discriminated against (Ibid)

Surat's coastal geography, compounded by weak infrastructure, makes the city vulnerable for endemic diseases. Chengdu, on the other hand, has no endemic health problems, but migrants face similar accessibility problems with health care services. Unlike Surat, where all migrants use private doctors and hospitals, migrants in Chengdu have only government health insurance to rely on, which comes with high deductibles and limited services. Chengdu shares Surat's social inclusion problem of discrimination toward migrants and ethnic minorities, language barriers, and varying cultural practices. Overall, Surat's urban adaptation challenges rest in the crippling physical infrastructure and under-utilized health care system, while Chengdu has struggled with migrants' lack of awareness and accessibility to the often-disparate public service providers.

Section 6: Key Findings

In this section, we describe the key findings from our analysis. We divided our key findings into two sections: migration and urban adaptation. The migration findings capture the results of the decision-to-migrate framework and important factors that are kept in mind when deciding to whether to move. The urban adaptation findings show the challenges migrants have upon entering the city and barriers to their integration.

Findings relevant to migration

- **Climate change will likely increase migration volume, exacerbating existing problems in cities.** We find through our analysis that young men and women migrate after climate shocks. Given that China and India are among the most vulnerable to climate change and climate-induced migration, this additional volume will likely increase the existing burden on cities (IPCC, 2014).
- **National population-planning policies can disincentivize post-disaster migration.** The Hukou system in China ties disaster victims' access to public services to their registered hometown, whereas Indian victims do not face this formal policy obstacle. In fact, the constitution of India allows freedom of movement (Article 19).

Findings relevant to urban adaptation

- **No recognition for climate migrants as a population.** Neither India nor China recognize climate migrants as a category of population in their national and city-level policies. There exists no preferential or tracking policy nor targeted office for them after they leave their hometown. This lack of consciousness is perpetuated by migrants themselves because they identify their reason for migration as economic (e.g., seeking employment) not climate-related. This is just one reason why it is exceptionally difficult to accurately estimate the proportion of migrants who are moving because of climate-related reasons.
- **Large gap between policy and implementation.** Though our literature review showed that both India and China have policies to serve migrants, our fieldwork pointed to a large gap between policies and practices. Although there are policies on migrants' welfare, problems of disparate services, accessibility constraints, corruption, and lack of accountability and transparency make the policy implementation especially complex. As a result, climate migrants face significant problems with inclusion.
- **NGOs play important role in communication and service provision.** NGOs are important for protecting migrant workers from employer exploitation, providing information regarding access to public services, and gathering migration data in Indian cities. Fieldwork in China revealed a limited but growing NGO presence.
- **Economic integration is hindered by informal job markets.** The lack of formal employment limits migrants' ability to access financial services, earn fair wages, and participate in labor rights movements.
- **Language barriers and discrimination hinders social integration.** India and China are very diverse, with many cultural and language differences between regions. When a migrant moves into a city where the local language is different, or if he or she is an ethnic minority, there are additional barriers to services as well as discrimination and exploitation in the workplace.

Section 7: Recommendations

Our urban adaptation findings in both Surat, India and Chengdu, China highlight the considerable difficulties that migrant populations face in the destination cities, and there are significant limitations in the urban development policies. Sustainable urban development requires careful and optimal allocation of resources to accelerate economic integration, enhance public services, and ease social inclusion of migrants. Thus, the use of measurable indicators (Morse and Bell, 2008) enables state and non-state agencies in the city to set urban development objectives and assess progress toward those objectives.

In coming up with our recommendation, we found that various organizations representing federal and state governments, research institutions, and philanthropic and nonprofit organizations have committed resources to develop effective methods for making cities more resilient and adaptive. First, we recommend that ND-GAIN utilize these existing indicators to strengthen the UAA. For example, the Rockefeller Foundation's Asian Cities Climate Change Resilience Network and the Integrated Research and Action for Development are two of the major organizations that currently assess, document, and rank Asian cities' urban climate vulnerabilities.

While international organizations such as the International Labor Organization, International Organization for Migration, and national and regional governments provide some general indicators on economic, demographics, and migration statistics, none of the existing research assesses the readiness of cities from the perspective of incoming migrants. China's Chengdu Volunteer Association, an NGO, was the only organization in this study that planned to survey pockets of migrant communities and assess their urban adaptation process to inform the city government.

Given this lack of attention to the migrant, and particularly to climate migrants, our second recommendation to ND-GAIN is to incorporate the following indicators into their Urban Adaptation Assessment. Informed by our literature review and fieldwork findings, we argue that the indicators listed below capture the unique challenges faced by the migrants in urban India and China. These indicators are grouped under our three urban adaptation categories: economic integration, public service accessibility and social inclusion. While many of them may not be readily available, efforts should be made to actively collect this information.

Economic Integration Indicators

- **Expected job availability** – This indicator measures the number of job openings available in the destination city based on projected employment growth. Migrants' urban economic integration is contingent on the availability of jobs because so many of them migrate for economic reasons.
- **Percentage of labor under formal contracts** – This indicator measures the size of a city's population under formal employment contracts. Formal job contracts ensure identity, minimum wage, and other work-related benefits.
- **Percentage of migrants who have savings schemes** – This indicator measures the migrants' ability to save money either in a bank account or other saving schemes in cooperatives and credit unions. Saving schemes enable migrants to access loans.
- **Presence of employment safety and labor legislation** – This indicator checks for the existence of laws that ensure workplace safety and protection of right to minimum wages.

Public Service Accessibility Indicators

- **Utilization rate of public health services** – This indicator estimates the percentage of households in the total population that uses the health services provided by the city government.
- **Availability of low-income housing** – This indicator measures the total units of affordable rental housing units available for people earning below the city's median income level.
- **Percentage of population living in informal settlements** – This indicator accounts for the number of people living in informal settlements. For example, the Global Housing Indicators currently has information on 27 cities in the developing world.
- **Demand for water supply** – This indicator measures the difference between the available water volume and the projected water needs for the growing urban population.
- **Capacity for waste management and sewage disposal (%)** – This indicator measures the percentage of total waste that is treated under a controlled disposal.
- **Percentage of population using public transportation (%)** – This indicator measures the size of the city population that uses public transportation services.
- **Presence of NGOs and Other Civil Organizations** – This indicator identifies the number of non-governmental and civil society organizations involved in urban-adaptation and migrant-resettlement initiatives in a city.

Social Inclusion Indicators

- **Percentage of migrants who are fluent in local language** – This indicator shows the size of the migrant population that could effectively communicate in the local language.
- **Local residents' attitude toward migrants** – This indicator helps gauge local residents' perceptions about the migrant population and could be based on a population survey.

Appendix

Appendix A: Summary of Field Interviews

Country	Interviewee	Organization Name	Organization Type	Contact Information
India N= 12	Sharmila Sinha and Jitendra Choubey	Center for Science and Environment	NGO	
	Vaibhav Raaj Research Coordinator	Society for Labor and Development	NGO	
	Saon Ray Researcher	Indian Council for Research on International Economic Relations (ICRIER)	NGO	
	Amrita Sharma Program Manager	Aajeevika Bureau- Center for Migration and Labour Solutions	NGO	cmls@aajeevika.org
	Brinda Viswanathan Associate Professor	Madras School of Economics	University	brinda@mse.ac.in
	Chandra Sekhar Bahinipati Director	Adhikhar	NGO	govinda@adhikarindia.org
	Kedareswar Chaudhury Chief Executive	Darabar Sahitya Sansad	NGO	darbar4@gmail.com
	Four migrants	Two street vendors (Mukesh Yadav and Naurangi Laal), one barber (Kumar), and one security guard (Sri Krishna)		
China N=19	Shijie Su Director	Chengdu Volunteer Association	NGO	zjsue@163.com
	Jie (Jay) Pan Associate Professor	Sichuan University West China School of Public Health	University	
	Julie Wang PhD Student	Sichuan University	University	
	David Shallcross Maternal and Child Expert	Affiliated with Sichuan University and London School of Economics	University	
	Hongjian Zhou Researcher	Ministry of Civil Affairs Commission for Disaster Reduction	Government Office	
	Two staff	Chengdu City Qingyang District People's Government Department of Civil Affairs	Government Office	
	Two staff	Chengdu Human Resources Market	Government Agency	
	Two migrant workers	Massage parlor		
	Eight disaster victims	Five shopkeepers, three older women		

Appendix B: District-Level Loss Information for Orissa Floods, 2011

Sl	District	Blocks Affected	GPs Affected	Villages Affected	ULBs Affected	Population Affected	Human Casualty	House Damage
1	Angul	2	12	49	1	15249		275
2	Balasore	6	49	252	1	239253		34
3	Baragarh	6	165	507		75000		2022
4	Bhadrak	4	39	173		28000	2	30
5	Boudh	3	22	122	1	57000		1779
6	Cuttack	14	169	508	3	526923	1	14880
7	Deogarh	3	44	123	1	25000		1350
8	Dhenkanal	1	4	8		5018	2	16
9	Jajpur	9	142	499		491114	13	8221
10	Jagatsinghpur	7	16	126		87661		5585
11	Jharsuguda	1	4	9	1	11679		357
12	Kendrapada	9	116	473	2	507145	13	27000
13	Khurda	6	48	236	1	161559	1	525
14	Mayurbhanj	1	6	24	1	6887	3	148
15	Nayagarh	3	15	110		73117		446
16	Nuapada	2	28	322	1	17300		3464
17	Puri	10	121	701	2	625897	2	38345
18	Sambalpur	9	27	515	3	440000	3	6491
19	Subarnapur	6	40	140	3	50187		5738
Total		**102**	**1067**	**4897**	**21**	**3443989**	**40**	**116706**

Source: Memorandum on Flood - 2011, Special Relief Commissioner, Government of Odhisa
GP – Gram Panchayat is a local village unit, ULB – Urban Local Body

References

Aajeevika Bureau, Of Hope, Health, and Survival in Surat, *Center for Migration and Labor Solutions*, Rajasthan, (Udaipur: 2014)

Adamo, Susana B. "Environmental migration and cities in the context of global environmental change." *Current Opinion in Environmental Sustainability* 2, no. 3 (2010): 161-165.

Aruna N. Solanki and Kirti S. Zankharia, Migrant Construction Workers in the Unorganized Sector of Surat City – A Socio Economic Analysis, *EPRA International Journal of Economic and Business Review,* (Tiruchirapalli: 2015): 21-30

Asian Cities Climate Change Resilience Network. Urbanization – Poverty – Climate Change, A Synthesis Report – India Case Studies Volume II, (Gurgaon: Taru, 2013): 27-37

Asian Development Bank, Urban Climate Change Resilience, A Synopsis, (Manila: 2014):12

Barber, Sarah L., and Lan Yao. "Health insurance systems in China: a briefing note." *World Health Report* (2010). http://www.who.int/healthsystems/topics/financing/healthreport/37ChinaB_YFINAL.pdf.

Barrios, Salvador, Luisito Bertinelli, and Eric Strobl. "Climatic change and rural-urban migration: The case of sub-Saharan Africa." *Journal of Urban Economics* 60, no. 3 (2006): 357-371.

Bell, Simon, and Stephen Morse. Sustainability indicators: measuring the immeasurable? *Earthscan*, (2008)

Bureau of Public Order Administration under the Ministry of Public Security. *National Transient Population Statistical Compilation* (Beijing: Qunzhong Publishing House, August 2015). [公安部治安管理局, *全国暂住人口统计资料汇编* (群众出版社, 2015 年 5 月).]

Center for Social Studies, *Slum Study in Surat*, Surat, Gujarat. (Surat: 2002)

Centre for Science and Environment (CSE), "Finding Answers to the 34 Million Question," *Down to Earth Magazine*, December 2015, 1-15.

Chengdu Statistical Yearbook 2014 (Beijing: China Statistics Press, September 2014).

Chen, Yong, "A Preliminary Study of Hazard-Induced Migration," Journal of Catastrophology 24, no. 2(2009): 138-143. [陈勇. 对灾害与移民问题的初步探讨. *灾害学*, 2009(02)]

Chen, Yunsong. "Network effects among rural-to-urban migrants in China." University of Oxford, *Sociology Working Papers* 6 (2009).

Chopra, Deepta. "The Mahatma Gandhi national rural employment guarantee act, India: Examining pathways towards establishing rights-based social contracts." *European Journal of Development Research* 26, no. 3 (2014): 355-369.

Co-benefits of Waste Management: A Case Study of Surat, School of Planning and Architecture – India, Responding to Climate Change. UK-Indian Perspectives – 2nd International Conference, *Queen's University*, (Belfast: 2012)

Deng, Kui, Ning-xiu Li, Dan-ping Liu, et al. "Cross-Sectional Study on the Medical Financial Assistance in the Poverty-Stricken Areas in Sichuan." *Modern Preventive Medicine* 35, no. 16 (2008): 3090-3091. [邓奎, 李宁秀, 刘丹萍, 任晓晖, 高博, and 何燕. "四川省贫困地区医疗救助现况研究." *现代预防医学* 35, no. 16 (2008): 3090-3091.]

Deshingkar, Priya, and Matteo Sandi. "Migration & Human Development in India: New Challenges & Opportunities." In *Workshop Papers*, vol. 2, pp. 48-85. 2012.

Dun, Olivia V., and François Gemenne. "Defining 'environmental migration'." (2008): 10.

"Focus on Agriculture: East Sichuan Rainstorm." *CCTV Agricultural*, July 6, 2013. ["聚 焦三农: 直击川东特大暴雨." *CCTV 农业*, 2013 年 07 月 06 日.] http://www.ntv.cn/v/20130707/1516.shtml.

Francis, John. "In our hands, the whole wide world," *National Geographic Magazine*, May 2011, 20. http://voices.nationalgeographic.com/2011/05/20/in-our-hands-the-whole-wide-world/. Accessed: 10 April 2016

Georgi, Birgit, et al. *Urban adaptation to climate change in Europe: Challenges and opportunities for cities together with supportive national and European policies*. No. 2/2012. EEA, 2012.

GoI (2005) National Rural Employment Guarantee Act. Ministry of Law and Justice, *The Gazette of India*, Government of India, New Delhi.

Government of India, Census 2011.

Government of Odisha. *Annual Report of Natural Calamities 2012-13*, Special Relief Commissioner, Revenue and Disaster Management Department: Odisha, India.

Government of Odisha. *Memorandum on Flood - 2011*, Special Relief Commissioner, Revenue and Disaster Management Department: Odisha, India.

Guo, Yukun. "Ethnic Minority Floating Population Social Inclusion Situation, Causes and Policies - Based on Investigation of Chengdu Ethnic Yi Population." *China Urbanization* (2014). [郭玉坤, 城市少数民族流动人口社会融入现状、成因及对策研究——基于对成都市彝族的调查 , 2014 年 8 月 7 日] http://www.curb.com.cn/dzzz/sanji.asp?id_forum=013461.

Gurtoo, Anjula, and Colin C. Williams. "Entrepreneurship and the informal sector: some lessons from India." *International Journal of Entrepreneurship and Innovation* 10, no. 1 (2009): 55-62.

He, De-gui and Wen Yan, "Migration Mechanism, Status and Countermeasures of Disaster-induced Migrants from Perspective of Disaster Risk." *Research of Agricultural Modernization* 35, no.3 (2014): 299-303.

Henry, Sabine, Paul Boyle, and Eric F. Lambin. "Modelling inter-provincial migration in Burkina Faso, West Africa: the role of socio-demographic and environmental factors." *Applied Geography* 23, no. 2 (2003): 115-136.

Huang, Youqin. "Low-income housing in Chinese cities: Policies and practices." *China Quarterly* 212 (2012): 941-964.

International Organization for Migration, World Migration Report 2015, Migrants and Cities: New Partnerships to Manage Mobility, (Geneva: 2015): 51.

Jagori, Migration, *Trafficking and Sites of Work: Rights and Vulnerabilities*, New Delhi, India.

Jatin Shah, Service delivery of water and sanitation - challenges faced by metropolitan cities, *Indian Council for Research on International Economic Relations*, India (New Delhi: 2013).

Kamaal Saiyed. Cong, BJP bet big on Surat migrants, *Indian Express*, (Surat: 2012)

Kundu, Amitabh. "Trends and patterns of urbanization and their economic implications." *India infrastructure report* 2006 (2006): 27-41.

Laczko, Frank, and Christine Aghazarm, eds. *Migration, environment and climate change: Assessing the evidence*. Geneva: International Organization for Migration (IOM), 2009.

Lai, Fangjie, "Chengdu Migrants Can Build Health Records after 6 Months of Residence." *The West China City Daily*, March 3, 2014. [赖芳杰, "流动人口成都住 6 个月 可建健康档

案,” 华西都市报, 2014 年 03 月 03 日].
http://www.wccdaily.com.cn/shtml/hxdsb/20140303/192475.shtml.
“Landslide Hits SW China, 30-40 Buried.” *Xinhua News*, July 10, 2013.
http://news.xinhuanet.com/english/china/2013-07/10/c_132529142.htm.
Madhyam Foundation, *Migration Profile of Ranpur Block in Nayagarh District in Orissa*, Bhubaneswar, Orissa.
Ma, Dongmei. “Retrospect on the Study of Management Service for Floating Urban Minorities in China.” *Journal of Guangxi University for Nationalities (Philosophy and Social Science Edition)* 36, no. 3 (2014): 23. [马冬梅. "城市少数民族流动人口管理服务研究反观." *广西民族大学学报 (哲学社会科学版)*]
Mueller, Valerie A., and Daniel E. Osgood. "Long-term consequences of short-term precipitation shocks: evidence from Brazilian migrant households." *Agricultural Economics* 40, no. 5 (2009): 573-586.
Pachauri, Rajendra K., M.R. Allen, V.R. Barros, J. Broome, W. Cramer, R. Christ, J.A. Church, et al. "Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)." (2014): 151.
Pillai,Vikraman, Surat Diary, merinews.com, (2008)
“PLA Helicopters Help Flood-Hit SW China.” *Xinhua News*, July 16, 2013.
http://news.xinhuanet.com/english/china/2013-07/16/c_132546738.htm.
Press Trust of India (PTI), “India has a workforce of 47.41 crore: Government,” The Economic times. July 2014, 16. Web: http://articles.economictimes.indiatimes.com/2014-07-16/news/51600535_1_national-sample-survey-office-nsso-crore. Accessed: 10 April 2016
Priya Deshingkar and Shaheen Akter, Migration and Human Development in India, *The Human Development Research Series*, UNDP, (2009)
Puja Bhattacharjee, Surat: Where waste is not wasted, Governance Now, India (Noida: 2014)
Rajasekhar, D., Erlend Berg, Maitreesh Ghatak, R. Manjula, and Sanchari Roy. "Implementing health insurance: the rollout of Rashtriya Swasthya Bima Yojana in Karnataka." *Economic and Political Weekly* 46, no. 20 (2011): 56-63.
Rashmi Sharma, Vikas K Desai, and Abhay Kavishvar. Assessment of Immunization Status in the Slums of Surat by 15 Clusters Multi Indicators Cluster Survey Technique, *Indian Journal of Community Medicine*, (2009); 34(2): 152–155.
Revi, Aromar. "Climate change risk: an adaptation and mitigation agenda for Indian cities." *Environment and Urbanization* 20, no. 1 (2008): 207-229.
Roy, B.C., Mruthyunjaya, and S. Selvarajan, Vulnerability to Climate Induced Natural Disasters with Special Emphasis on Coping Strategies of the Rural Poor in Coastal Orissa, India, *UNFCC COP8*, (New Delhi: 2002)
Saldaña-Zorrilla, Sergio O., and Krister Sandberg. "Impact of climate-related disasters on human migration in Mexico: a spatial model." *Climatic change* 96, no. 1-2 (2009): 97-118.
Satterthwaite, David. "Climate change and urbanization: Effects and implications for urban governance." In *United Nations Expert Group Meeting on Population Distribution, Urbanization, Internal Migration and Development, UN/POP/EGM-URB/2008/16, New York*, pp. 21-23. 2008.
Sharma, Divya, and Sanjay Tomar. "Mainstreaming climate change adaptation in Indian cities." *Environment and Urbanization* 22, no. 2 (2010): 451-465.

"Sichuan Disaster Region Becomes Island Wenchuan Victims Protest Supressed." *Radio Free Asia*, July 15, 2013. ["四川境内灾区成孤岛 汶川灾民围堵官警抗议遭镇压." *Radio Free Asia*, 2013 年 07 月 15 日.] http://www.rfa.org/mandarin/yataibaodao/huanjing/xl-07152013111825.html.

"Sichuan Rain Storm and Flood Disaster Affects 3.444 Million Causes 68 Death 179 Missing." *Xinhua News*, July 15, 2013. ["四川暴雨洪涝灾害致 344.4 万人受灾 68 人死亡 179 人失踪." *新华网*, 2013 年 07 月 15 日.] http://news.xinhuanet.com/local/2013-07/15/c_116541277.htm.

"Sichuan Provincial People's Government on Rainstorm and Flood Disaster Recovery Efforts." *General Office of the People's Government of Sichuan*, August 2, 2013. ["四川省人民政府关于做好暴雨洪涝灾后恢复工作的意见." 省政府办公厅, 2013 年 08 月 02 日 .] http://www.sc.gov.cn/10462/10883/11066/2013/8/2/10271528.shtml.

"Sichuan Zero-Employment Households Affected by Rainstorm and Flood Affected Areas Promise to Have At Least One Person Employed." *Sichuan Poverty Alleviation and Immigration Website*, September 4, 2013. ["四川暴雨洪涝灾区零就业家庭至少 1 人实现就业.", 四川省扶贫和移民网站,2013 年 09 月 04 日.] http://www.scfpym.gov.cn/show.aspx?id=19862&cid=32.

Society for Labour and Development (SLD), "Home and Away: Researching Labour and Migration between Home and Destination States and Developing a Holistic Rural-Urban Approach." 2015, December.

Society for Labour and Development (SLD), "Struggle within the Struggle: Voices of Women Garment Workers" 2014.

Song, Yang. "What should economists know about the current Chinese hukou system?" *China Economic Review* 29 (2014): 200-212.

State Level Vulnerability Assessment and Adaptation Strategies – A Case Study of Orissa, *Inspire Network for Environment*, (New Delhi: 2012)

Studies, Stories and a Canvas, Seasonal Labor Migration and Migrant Workers from Odisha, Center for Migration and Labor Solutions, *Aajeevika Bureau*, (Udaipur: 2014)

Sudarshan Chhotry, Duped and Exploited: Orissa's migrant workers, Infochange India, (2011)

Surat Municipal Corporation (SMC) Website. https://www.suratmunicipal.gov.in/

Surat Municipal Corporation, Draft Smart City Proposal, *Smart Cities Mission*, (Surat: 2015)

The Energy and Resources Institute, TERI Survey, India (New Delhi: 2015).

Vaibhav Gaurkar. Systematic Organization of Paratransit System in Context of Public Transport System: A Case Study of Surat City, *International Journal of Engineering Research and Applications*, Vol. 3, Issue 6, (2013): 1372-1373

Waldinger, Maria. "The effects of climate change on internal and international migration: implications for developing countries." *Centre for Climate Change Economics and Policy Working Paper* 217 (2015).

Wang, Guilin, Qingyue Meng, Gang Cheng, et al. "Assessment of the Medicaid Program in Shenyang and Chengdu." *Chinese Health Economics* 24, no. 10 (2005): 74-76. [王桂林, 孟庆跃, 成刚, 贾莉英, 曲江斌, 李顺平, 孙晓杰, and 于贞杰. "沈阳市和成都市贫困医疗救助项目实施效果评价." *中国卫生经济* 24, no. 10 (2005): 74-76.]

Wang, Wenfei Winnie, and C. Cindy Fan. "Migrant workers' integration in urban China: experiences in employment, social adaptation, and self-identity." *Eurasian Geography and Economics* 53, no. 6 (2012): 731-749.

Wei, Yehua Dennis, and Xinyue Ye. "Urbanization, urban land expansion and environmental change in China." *Stochastic environmental research and risk assessment* 28, no. 4 (2014): 757-765.
World Commission on Dams. “Dams and Cultural Heritage Management Final Report.” (Beijing: *Development Center of State Council*, 2000:8).
Xu, Qingwen, Xinping Guan, and Fangfang Yao. "Welfare program participation among rural-to-urban migrant workers in China." International Journal of Social Welfare 20, no. 1 (2011): 10-21.
Yagnesh Mehta. *Times of India*, (Surat: 2013)
Yang, Jianwu, “A Survey of the Problem of Floating Minority People in Cities.” *Journal of Southwest University for Nationalities. Philosophy and Social Sciences* 23, no. 7 (2002): 245-252. [杨健吾, “城市少数民族流动人口问题研究 — 以成都市为例.”]
Yang, Yang, Qiu Peiyuan, and Ma Xiao. "A Research on Rural-to-Urban Migrants' Residence, Distribution and Their Urban Assimilation." *Journal of Sichuan University (Philosophy and Social Science Edition)* 2 (2013): 13.
Zeenews Bureau, “UP migrant lynched in Mumbai.” *Zee News*. 2008 October, 29. http://zeenews.india.com/news/nation/up-migrant-lynched-in-mumbai_479435.html Accessed: 10 April 2016
Zhang, Kevin Honglin, and S.O.N.G. Shunfeng. "Rural-urban migration and urbanization in China: Evidence from time-series and cross-section analyses." *China Economic Review* 14, no. 4 (2003): 386-400.
Zhang, Li, and Li Tao. "Barriers to the acquisition of urban hukou in Chinese cities." *Environment and Planning A* 44.12 (2012): 2883-2900.
Zhao, Yaohui. "Leaving the countryside: rural-to-urban migration decisions in China." *The American Economic Review* 89.2 (1999): 281-286.
Zhou, Hongjian, Weixing Zhang, Yehong Sun, and Yi Yuan. "Policy options to support climate-induced migration: insights from disaster relief in China." *Mitigation and adaptation strategies for global change* 19, no. 4 (2014): 375-389.
Zhou, Honjian and Yehong Sun, “Policy Responses to Disaster-Induced Migration in a Changing Climate.” *Advances in Earth Sciences* 27, no. 5 (2012): 573-580.
Zou Hong, Zhiyong Qu, and Qiuling Zhang. “A Survey on Development and Needs of Migratory Children in Nine Chinese Cities.” *China Youth Study* 2, no. 3 (2005).［邹泓, 屈智勇, and 张秋凌. "中国九城市流动儿童发展与需求调查." 青年研究 2.3 (2005).］
“2013 Government Work Report.” Official Website of Wenchuan County, February 9, 2014. [“2013 年政府工作报告.” *中国汶川网*, 2014 年 2 月 9 日] http://www.wenchuan.gov.cn/p/st_news_items_i_e78051f4cf314a3c94f734e3a788e33c/.
“58 Dead, 175 Missing in Sichuan Floods.” *Xinhua News*, July 16, 2013. http://news.xinhuanet.com/english/china/2013-07/16/c_132546912.htm