



The Impact of Climate Change on Livelihoods

Case Studies from India, Bangladesh and Indonesia

September 2015

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Cover Photo: 'Field trip to Bagerhat in Bangladesh'
The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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FOREWORD

As climate experts, environmental activists, and energy policymakers look toward the most anticipated climate change summit in recent memory — the United Nations Climate Change Conference, or COP21, to be convened in Paris this December — the global debate on the climate revolves around familiar topics: greenhouse gas reduction targets, the global temperature rise, and the schism between developed and developing countries on climate action.

Meanwhile, the true impact of climate change on people and their livelihoods rarely takes center stage. For most participants at the Paris conference, climate change is still an abstraction — felt, perhaps, in unusually hot summers. But for millions of people around the world, climate change is already disrupting something far more fundamental: their ability to earn a living and provide for their families. This impact of climate change must be addressed in the context of the

new Sustainable Development Goals Agenda 2030, adopted in September, which recognizes that eradicating poverty is the greatest global challenge and an indispensable requirement for sustainable development.

Climate change is a formidable threat to the working lives of people across the globe — especially those whose employment depends on agriculture. From erratic rainfall to flash floods, from salinity intrusion to altered ocean currents, the impacts of climate change are forcing people to search for new livelihoods. For many, that search takes them far from home.

The trade union movement must step up its work and attention on climate change, as it poses one of the gravest threats to ensuring workers around the world have just jobs. Not only do the impacts of climate change take away people's livelihoods; they also speed up the processes that are making

work more precarious. Climate-induced migration accelerates migration to cities, saturating urban labor markets and placing downward pressure on wages. Climate migrants, like other migrant workers, are more likely to wind up in temporary contracts with few legal rights.

In a globalized world, a threat to the well-being of workers anywhere becomes a threat to workers' well being everywhere. The current refugee crisis in Europe is evidence of this.

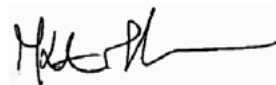
The global movement to address climate change needs the strength of workers and unions to succeed. As Sharan Burrow, General Secretary of the International Trade Union Confederation,

recently remarked: "Industrial transformation is critical to achieve a zero-carbon future. We know it can't happen without dialogue with workers in the workplace and in national plans for our economies and industries."

In the context of accelerating climate change, trade unions have an opportunity and a responsibility to broaden their mandate. They must make climate change advocacy one of their central goals, pressing governments and the private sector to focus on the workers whom climate change displaces and facilitating research and dialogue on the nexus of climate change and employment.



Sabina Dewan
Executive Director
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INTRODUCTION

For decades, Abdul Gaffar etched out a living by working the three acres of land he owned on Kutubdia Island in the Cox's Bazar District of Bangladesh. But today, he works for others, catching fish in the same Bay of Bengal waters that swallowed the plot he used to own. Kutubdia once contained 54 square kilometers. Today only 27 square kilometers remain. The rising sea level has claimed the other half. Unlike Abdul, many more have been forced to leave the island. Over 100,000 of Kutubdia's residents are now displaced throughout Cox's Bazar District.¹ The sea has consumed people's land, drowned their homes and forever changed their livelihoods.

From Kutubdia to Java, from Nepal to New Zealand, climate change is transforming the way people live and work. In some cases, climate change manifests in swift and drastic occurrences such as cyclones or storm surges. In other cases, slower, prolonged changes – visible in gradually rising sea levels, salinity intrusion and diminishing

precipitation, for example – are playing out in the environments where millions of people reside. In all instances, climate change is dramatically changing economic activity, reshaping migration and altering patterns of development.

Understanding these changes is paramount to mitigating the negative impact of climate change on what matters most to regular people – their jobs and incomes.

The nexus of climate change and employment

Climate change and employment interact in four ways. First, whether through a natural disaster or gradually over time, climate change

has a direct bearing on jobs and incomes in affected geographies, and especially in regions that depend on agriculture. For instance, in Tanzania, changes in the mean temperature and rainfall patterns will

extend dry seasons and make periodic droughts more severe,² directly altering the livelihood of thousands of farmers and their families.

From Kutubdia to Java, from Nepal to New Zealand, climate change is transforming the way people live and work.

Second, these types of changes set off a chain reaction that disturbs a whole host of ancillary services and sectors – the indirect impact of climate change on jobs and incomes. Staying with the example of Tanzania, as crop yields fall because of changes in precipitation, this affects those responsible for transporting the products to market, and the associated processing and export industries. Retailers, meanwhile, may see their inventories diminish or consumer demand dwindle as market prices rise or fluctuate unpredictably in response to disruptions in the supply chain.

Third, as the effect of climate change becomes more severe, people are forced to relocate. Climate-induced migration, whether temporary or permanent, affects the labor markets in host geographies. Such migratory pressures fuel rapid urbanization. But cities frequently lack the infrastructure, governance and services – clean water, sewage systems, housing – to manage migration. This can lead to urban slums where residents face poor health and economic outcomes.

Finally, on the flip side of the adverse effects of climate change on livelihoods is the potential for

job generation that arises from climate adaptation and mitigation. Disasters, for instance, generate jobs in relief, clean up and construction. Swedish farmers are leading in the field of conservation agriculture that sequesters carbon into the soil, reducing carbon emissions. This is also a prevalent practice in Latin America and has the potential to generate jobs in other regions. Expanding the production of renewable energy as a strategy to combat climate change has the potential to spur new employment in grid construction and upgrading to smart grids, production of small-scale renewables, distribution, installation and maintenance.³ The International Labour Organization (ILO) and the International Trade Union Confederation find that policies facilitating climate transition could generate up to 60 million net jobs.⁴

But managing the negative effects of climate change on employment and incomes on one hand, and leveraging the positive job generation potential of mitigation and adaptation on the other, requires action on behalf of multiple stakeholders including governments, the private sector and trade unions.

Key Recommendations

- **This issue of climate change's impact on employment must receive more international attention.** While the need to curb climate change is now widely acknowledged, how to minimize the detrimental impact of climate change on jobs and incomes receives considerably less attention. The impact of climate change on livelihoods and real people is lost amid government and private sector chatter about cap and trade, subsidies and targets for emissions reductions. This issue must be elevated in the global debate, especially as the world prepares for the upcoming Paris Climate Summit in December 2015.
- **Trade unions must play a central role.** Trade unions must press governments and the private sector to focus on the nexus of climate change and employment by advocating at international forums, utilizing the media, and by facilitating research and dialogue.
- **More research is needed to understand climate change's impact on jobs and migration.** Existing research, much of

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which is based on anecdotal evidence, is woefully inadequate and inconsistent in estimating the direct and indirect impact of climate change on employment. The same is true for climate-induced migration and

its impact on labor markets, especially in host geographies. More research is needed to ensure that (i) policymaking to mitigate the negative impact of climate change on jobs and incomes is backed

by reliable data. (ii) businesses understand the potential disruptions to their value chains and hedge against them in ways that minimize the impact on jobs; and (iii) workers are protected in the event of temporary or permanent disruptions of their livelihoods brought on by climate change.

- **New indicators on climate vulnerability can help guide resource allocation.** A common set of indicators should be developed to assess the impact of climate change on employment over time. The lack of such indicators was an obstacle in preparing this report. These indicators will not only allow policymakers to measure progress, but they will assist in decision-

making on where to allocate resources to the places that are most vulnerable. Particular attention must be given to ensure that the needs of marginalized populations and circular migrants are taken into account when assessing vulnerability. Censuses should include questions pertaining to migration, including climate migration.⁵ All three key stakeholders – governments, businesses and trade unions – must facilitate research to these ends.

- **Governments must pursue climate adaptation strategies that create jobs.** Governments must examine the employment potential of mitigation and adaptation strategies and pursue those that have the greatest capacity to create jobs. For example, they should support the development of the renewable energy sector, especially labor-intensive manufacturing, that will generate new jobs, therefore helping to offset some of the job and income losses that occur as a result of climate change.
- **Social safety nets are essential to protect workers displaced by climate change.** Whether government-based or employer-based, social safety nets are essential not only to protect workers whose livelihoods are impacted by climate change but also to smooth consumption and maintain

aggregate demand during times of climate-related adversity. Trade unions must push for the establishment and strengthening of these safety nets.

- **Businesses should boost resilience of climate-affected sectors.** Private sector companies should plan for the potential supply chain disruptions that climate change may cause and invest proactively in innovations that can increase resilience of affected sectors – for example, new seed varieties that have higher tolerance for salinity. This in turn will help protect the livelihoods of workers dependent on those affected industries.
- **All stakeholders have a responsibility to help affected workers transition to climate-resilient sectors.** Over the long-term, all three stakeholders must invest in skills training and apprenticeships that can help transition people out of affected activities and sectors into those that are resilient to climate change.
- **Integrating climate migrants into host community labor markets must be a top priority.** The new world of work, under stress from climate change, requires innovative approaches to incorporating climate migrants into host communities.

Governments can reduce barriers for migrants to join vocational training programs, for example. Trade unions should

proactively reach out to and help to organize climate migrants joining the labor market.

Climate change and livelihoods in three geographies

This report examines how climate change, through drastic as well as protracted developments, affects livelihoods and migration patterns. It examines Bangladesh, India and Indonesia as country case studies.

The life-altering effects of climate change are especially pronounced for the people in these three developing nations. The phenomenon's most drastic disruptions will occur in tropical zones – home to some of the highest populations and population densities in the world. Together, Bangladesh, India and Indonesia make up almost a quarter of the Earth's inhabitants. Because these events immediately affect such a large share of the world's population,

their consequences will reverberate everywhere in the world.

Understanding the effects of climate change on people, labor markets and economies in Bangladesh, India and Indonesia will provide insights relevant to other countries in the Global

Understanding the effects of climate change on people, labor markets and economies in Bangladesh, India and Indonesia will provide insights relevant to other countries in the Global South.

South. The report's recommendations will enable stakeholders – governments, NGOs, businesses and unions – to take immediate action to mitigate the potential devastation that climate change threatens to wreak on individual workers and their families in these three nations, as well as on local, national, and global economies.

UNDERSTANDING HUMAN MOBILITY: FOUR KINDS OF MIGRATION

Distress migration

Distress migration is the movement of people, often temporary, before, during or after a natural disaster. People choose destinations based on community networks; ethnicity; regional stability; social capital; personal assets; presence of aid agencies; the availability of needed provisions; and the distance from the affected person's home to the relief area.⁶ Local displacement – moving to the nearest safe location – is the most common response to a disaster. In the long run, people generally do not move away permanently from affected areas in situations where disaster aid is well-organized and distributed equally.⁷ As a consequence of involuntary migration, the displaced face socio-economic impoverishment and marginalization. This is exacerbated in situations where people do not have dependable social networks and aid is inequitable or poorly managed. In extreme cases, distress migration can result in abject misery, destitution, beggary and fatalities.⁸

Circular migration

Circular migration is the temporary and often repetitive movement of people from their homes to host areas. Typically, people migrate in this manner for employment. The United Nations

Development Programme estimates that there are roughly 100 million circular migrants in India alone.⁹ Unemployment will rise in rural areas due to higher variability in crop yields as a consequence of climate change. Correspondingly, circular migration, as it is a way to cope with economic or climate shocks, is expected to increase significantly. Circular migrants tend to be concentrated in sectors such as construction, textiles, brick-making, stone quarries, mines, seafood processing and hospitality services.¹⁰

Studies have shown that poor migrant labor is the preferred labor by industrialists, agriculturalists, and service providers for work that does not require skills. To them, migrant workers are flexible, cheap, and can be hired and fired at will since they tend to fall beyond the purview of labor protections.¹¹ And even when labor laws exist and apply to migrant workers, enforcement is often lacking. In addition, minimum wage and equal pay laws are not fully implemented.¹²

Permanent out-migration

Permanent out-migration shares many of the same characteristics as circular migration such as being driven by employment motives. The major difference is that migrants relocate permanently.



Distress Migration



Circular Migration



Permanent Out Migration



International Migration

The incidence of permanent out-migration is much lower than circular or temporary distress migration. Climate change will induce permanent out-migration predominantly in the cases of chronic threats such as drought and salinity intrusion. If floods become incessant, as they often do in Bangladesh, they can also cause permanent out-migration.¹³

International migration

International migration is when an adult member of a household migrates to another country, often with the goal of sending home remittances. The migrant keeps ties with his or her country of origin. As climate change affects rural areas, workers often migrate to the cities. As the labor markets in cities become saturated with labor, this exerts downward pressure on wages and working conditions. Under such circumstances, many may find working overseas alluring.

International migration routes from India and Bangladesh to the Middle East are well established. The majority of migrants who follow

these routes are unskilled men who mostly work in construction.¹⁴ However, two-thirds of international migrants from Indonesia are women. Usually they work as domestic workers in East and other Southeast Asian countries.¹⁵ Tragically, international immigrants arrive in countries where they have few or no rights and protections. Many are cheated out of wages, and subject to dangerous working conditions as well as densely packed and unsanitary living conditions. There are many instances where passports are confiscated and wages withheld. In these cases, migrant workers have little recourse to escape or protest.¹⁶

A terrifying example of these abuses is the building of stadiums in anticipation of the 2022 FIFA World Cup in Qatar. Roughly 1.4 million migrant laborers, who are mostly from India, Bangladesh, Sri Lanka and Nepal, work long hours in temperatures that are regularly above 50 degrees Celsius. The heat along with workplace accidents result in about one death per day.¹⁷

Note: People who leave their countries of origin due to the effects of climate change are not legally considered refugees. While the term “climate change refugee” is sometimes used rhetorically, the definition of a refugee - as written in the 1951 United Nations Convention Relating to the Status of Refugees - is an individual who “owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality.

Understanding Climate Migration

Climate migrants generally follow the same pathways as other migrants, but climate-induced migration is adding to the pace and scale of human mobility. In the next several decades, climate change's impact will likely intensify and put more stress on existing migration patterns rather than create new migration destinations, flows and behaviors.¹⁸ Current trends are therefore a guide for how people will move in the future, albeit varying based on how climate change unfolds in specific geographies.

Acute disasters such as landslides and cyclones affect migration differently than chronic, persistent hazards such as droughts or salinity intrusion. The former will fuel rapid out-migration that is likely to be temporary in nature, while the latter will induce a slower outflow, with relocation that may become permanent over time.

Distress migration patterns emerge with the onset of sudden disasters or ongoing chronic hazards. Distress migration looks different depending on the severity and geography of the disaster, capabilities of households to respond, evacuation possibilities, vulnerabilities, relief and intervening government policies. Most communities encounter three options in disaster relief: one, to depend on social networks; two, to depend on agencies who have access to aid and explore resettlement; three, to go to relocation

camps for temporary or long-term resettlement help. Ultimately, return rates for disaster victims are high.

In the short-term, climate change will lead to temporary rather than permanent displacement. Those with means may have the option to migrate internationally, but others will migrate internally to nearby geographies.¹⁹

Temporary displacement poses its own challenges in terms of employment. When livelihoods are disrupted in places of origin, the uncertainty about how long the dislocation will last makes it hard to assimilate workers into the labor market in host locations. Such temporary migrants have little recourse but to work in provisional and frequently precarious forms of employment. Internal migrants are likely to be poor and unskilled, making them highly susceptible to labor exploitation.

Individual, community and national vulnerabilities affect the ability to adapt to changes as a result of climate change. The ability to effectively incorporate risk depends on available assets. People mitigate the adverse impact of climate change principally by diversifying income streams. Often, circular labor migration to rural and urban areas is a way of diversifying income.

To understand how local labor market conditions, unique vulnerabilities, and the particularities of climate change intersect in specific countries, the

following sections take up Bangladesh, India and Indonesia as case studies.

Bangladesh

Bangladesh is among the nations most vulnerable to inclement weather. The densely populated nation of about 150 million people has a long history of floods, cyclones, salinity intrusions, and droughts. Many argue that such frequent disasters are the primary explanation for the country's ongoing poverty.²⁰ In the future, these weather catastrophes are expected to intensify and become more common. The impact of climate change will not just be isolated to particular regions within the country, but will be felt profoundly throughout Bangladesh, potentially derailing the benefits accrued through economic growth at over six percent per annum over the last decade.²¹

Floods

Roughly a quarter of Bangladesh floods in a normal year. Over the last 25 years, there have been six severe floods, which can inundate up to two-thirds of the country. Climate change is expected to increase the frequency and severity of floods even more this century.²²

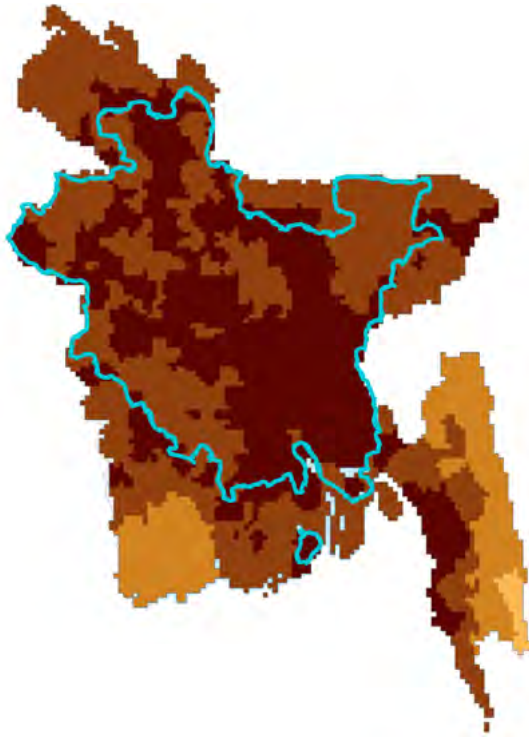
Principally, there are four types of floods that happen in Bangladesh: flash floods, rainwater floods, river floods and coastal floods from storm surges. Increasing and volatile rainfall patterns in the Ganges-Brahmaputra-Meghna system during monsoon season and the melting of Himalayan Glaciers²³ are responsible for the first three.

In the next several decades, climate change's impact will likely intensify and put more stress on existing migration patterns rather than create new migration destinations, flows and behaviors.

Flash floods are caused by runoff from extremely heavy precipitation in upland areas. The water rushes down from the hillside, destroying crops and infrastructure

and adversely affecting both agricultural and non-agricultural productivity. Flash floods most frequently occur at the foot of Bangladesh's northern and eastern hills.²⁴

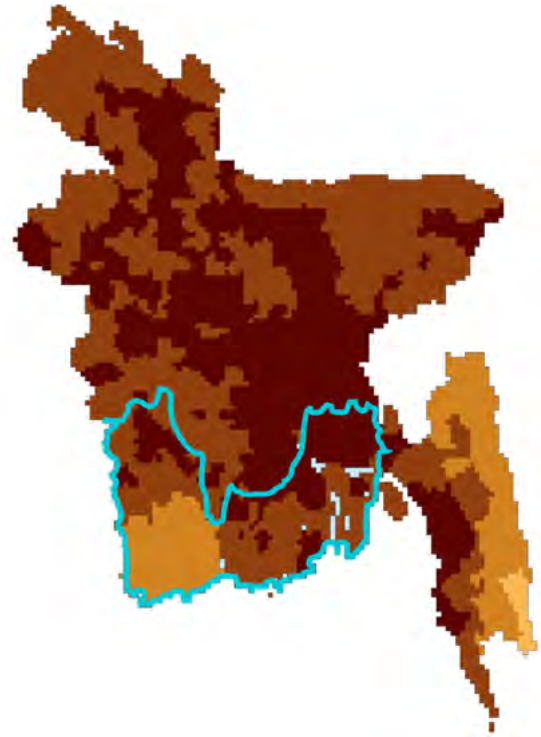
Severe floods of all kinds cause profound mass displacement and distress migration. For example, severe floods in 2007 affected 32,000 square kilometers, displacing 16 million people and 3 million households. Moreover, 85,000 homes were significantly damaged and 1.12 million hectares of cropland destroyed.



Floods

2/3 of Bangladesh can be inundated in the event of a severe flood.ⁱ

- Floods are caused primarily by heavy rainfall, snow melt, and cyclones.
- About one-quarter of the country floods in a normal year.ⁱⁱ
- In 2007, severe floods displaced 16 million people and destroyed 1.12 million hectares of farmland.ⁱⁱⁱ



Sea Level Rise & Salinity Intrusion

01 million hectares of land – nearly the size of metropolitan Tokyo – is vulnerable to salinity intrusion.^{iv}

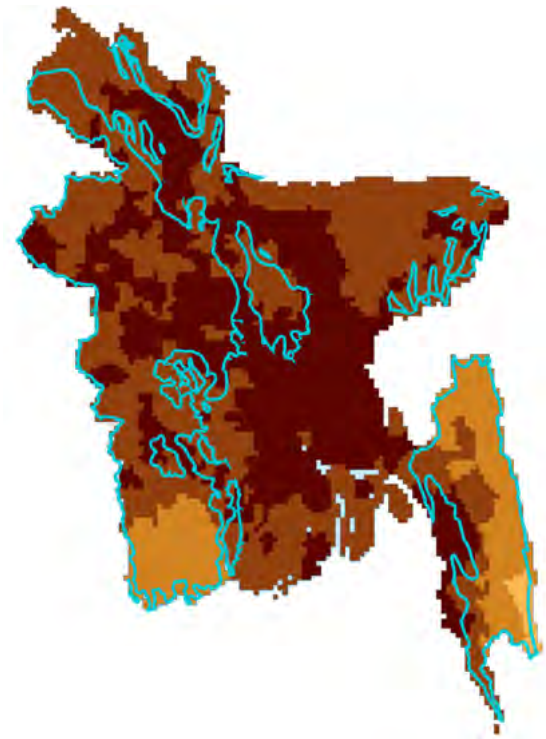
- Salt intrusion into agricultural lands is a result of storm surges that bring seawater into farms. Dry conditions raise salt levels further.
- Farmers cannot grow traditional crops on land where salinity intrusion has occurred.
- By infiltrating groundwater aquifers, salinity can also destroy sources of freshwater.

ⁱ Matthew Walsham, *ibid.*

ⁱⁱ Matthew Walsham. 2010. *Assessing the evidence: Environment, climate change and migration in Bangladesh.*

ⁱⁱⁱ Mahmuda Khatun. 2013. *Climate Change and Migration in Bangladesh: Golden Bengal to Land of Disasters.*

^{iv} Timothy Russell. 2015. Interview with Jit Shankar Banerjee, July 25, 2015. (Dhaka: IIRI)



Droughts

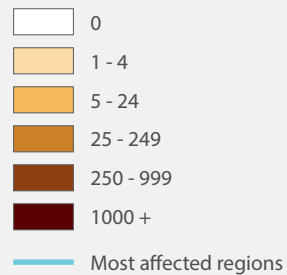
53% of Bangladeshis, or 83 million people, live in areas susceptible to drought.^v

- Bangladesh has experienced many droughts over the last 50 years, but climate change will increase their intensity and frequency.
- Droughts routinely decrease yields of critical crops and staple foods, like wheat, sugarcane and potatoes.
- 47% of land area in Bangladesh is vulnerable to drought.^{vi}

0 200km

LEGEND

Population Density
Persons per km²



^v IOP, *ibid.*

^{vi} IOP, 2009. *Adaptive measures for coping with increased floods and droughts in Bangladesh.*

Floods will also contaminate the fresh water supply and cause havoc with sanitation services. Consequently, drinking water becomes less available, and a lack of clean water leads to the proliferation of contagious diseases.

Cyclones and Salinity Intrusion

On average, a cyclone from the Bay of Bengal hits Bangladesh once every three years. According to the IPCC's Fourth Assessment Report, climate change is likely to produce an increase in wind speeds and precipitation during cyclones as well as an increase in the frequency of the most intense storms.²⁵ Cyclones especially affect the Southwestern coastal areas of the country as they are often flooded by high tidal surges. These surges suddenly, though temporarily, inundate coastal areas with saltwater or brackish estuarine water for kilometers inland during cyclones.²⁶

Cyclones typically cause mass displacement and death. For example in 2009, Cyclone Alia killed more than 300 and affected 3.9 million people. Storm surges breached more than 1,742 kilometers of embankments and displaced more than 76,748 families Satkhira and Khulna alone.

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Salinity invading land areas is a critical problem affecting nearly all of Bangladesh's coast. In particular, the major urban centers of Chittagong and Khulna are drastically impacted. Salinity damages crops, hampers irrigation efforts for crops in freshwater areas and decreases agricultural productivity. Fields intruded by saltwater are rendered useless.²⁷

By infiltrating groundwater aquifers, salinity destroys the amount of readily available freshwater. Currently, some wells in coastal areas are required to reach 250m deep to obtain fresh water. And as sea levels rise with the changing climate, salinity will creep farther inland.²⁸

Droughts

Droughts have frequently plagued Bangladesh's past, striking 19 times between 1960 and 1991. Research suggests that 47% of Bangladesh's area and 53 percent of the population in these areas are susceptible to drought. Droughts routinely reduce yields of aman, boro, aus, wheat, pulses, sugarcane, and potatoes – all staple crops for the country's farmers.

Even more worrisome is that under climate change, evapotranspiration will increase considerably. Correspondingly, drought

conditions are expected to degenerate in the western and northwestern parts of the country (Ahmed 20-24). Prolonged dry spells as a result of climate change mean water shortages at a time when population growth and economic development are increasing the demand for water.

The impact on livelihoods and migration

The deleterious effects of climate change – manifest in its floods, cyclones, droughts and increasing salinity, will disproportionately affect Bangladesh’s poor, especially the millions that reside in its low-lying Delta region.²⁹ The government and residents themselves are increasingly turning to internal and international labor migration of unskilled workers as a coping mechanism for environmental and associated economic challenges.³⁰

Approximately 40 percent of migrant workers come from 5 of 64 districts: Brahmanbaria, Chittagong, Comilla, Dhaka, and Tangail – in the south of the country.³¹ These areas are especially prone to flooding and environmental events. Protracted droughts and salinity intrusion will result in job losses that will produce two effects.

First, there will be a high degree of rural-to-urban permanent out-migration. To begin, migrants will move to the nearest cities, and then they will move to major cities such as Dhaka and Chittagong.

Second, the pace of international migration will likely pick up. Emigrants will follow already well established labor migration routes to Abu Dhabi and Dubai, with most international migrants to the Middle East being male and either unskilled or semi-skilled.³² Along well established irregular migration routes from Bangladesh to the Indian states of West Bengal and Assam, the number of undocumented migrants will also climb.

Salinity damages crops, hampers irrigation efforts for crops in freshwater areas and decreases agricultural productivity. Fields intruded by saltwater are rendered useless.

Migration serves as a highly imperfect coping mechanism, for the host locations are themselves vulnerable to the adverse effects of climate change. Overcrowding in areas such as Dhaka further fuels ecological and

social degradation. Dhaka’s own vulnerability to flooding and cyclones makes it a poor destination for the displaced—temporary or permanent. The city is 2–13 meters above mean sea level, while most urbanized areas are at elevations of 6–8 meters, yet Dhaka continues to attract large numbers of migrants.³³

From damaged infrastructure to the reduced availability of fresh water for consumption and development, the impact of climate change in Bangladesh will be devastating not just for agricultural production, but also for other export sectors such as apparel. These changes will inevitably disrupt supply chains – affecting everyone from workers and their families, especially women, to the multinational companies that rely on Bangladeshi suppliers.

All these disasters, whether immediate or prolonged, disproportionately affect women. For instance, gender barriers not only prevent women from migrating, but also from learning how to swim. The death toll from floods therefore tends to be higher for women than men.³⁴ Disasters such as cyclones also increase the risk of sexual exploitation and trafficking of young women and children in the affected areas. Households where a woman is the head

are especially susceptible to exploitation.³⁵ And women, typically responsible for obtaining drinking water, have to travel further to obtain it as salinity makes fresh water scarce.

Most of those displaced will eventually return to their homes. But reoccurring crises will increase circular migration, and protracted ones will increase permanent migration.

In the immediate aftermath of a natural disaster such as a cyclone, relief efforts and the need to rebuild will generate jobs. And in the face of protracted crises, people will be forced to adapt. For instance, Bangladesh has seen a rise in shrimp farming as salinity increases. But these transitions occur faster than the ability of institutions – government, business or unions – to keep up. The ultimate result is more precarious work and more vulnerable workers.

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India

Climate projections through 2030 suggest that the likely impact of changing temperatures will be concentrated in four major regions in India: the Himalayan region, the Western Ghats, northeast India and the coastal zone.³⁶ These regions are not only home to hundreds of millions of people; they also host some of India's most important economic sectors and industries – with manufacturing activities on the southeastern and western coastlines and tea and coffee cultivation in the hills of the Western Ghats and the northeastern state of Assam, to name a couple examples.

Himalayas

In the Himalayan region, increasing forest fires will result in a loss of wood and other fuels used for heating. Glacier melts will produce flash floods and landslides, leading to a loss of valuable agricultural land and undermining access to fresh water in the region. Over time, places where drinking water is no longer easily available become uninhabitable, fueling migration. Lastly, the region should expect to see higher incidences of malaria due to expansions of transmission windows at higher latitudes.

According to EMDAT, an emergency events database created by the WHO and the Belgian government, extreme cold is not associated with significant out-migration,³⁷ but flash floods do induce temporary distress migration to local relief sites.

Western Ghats

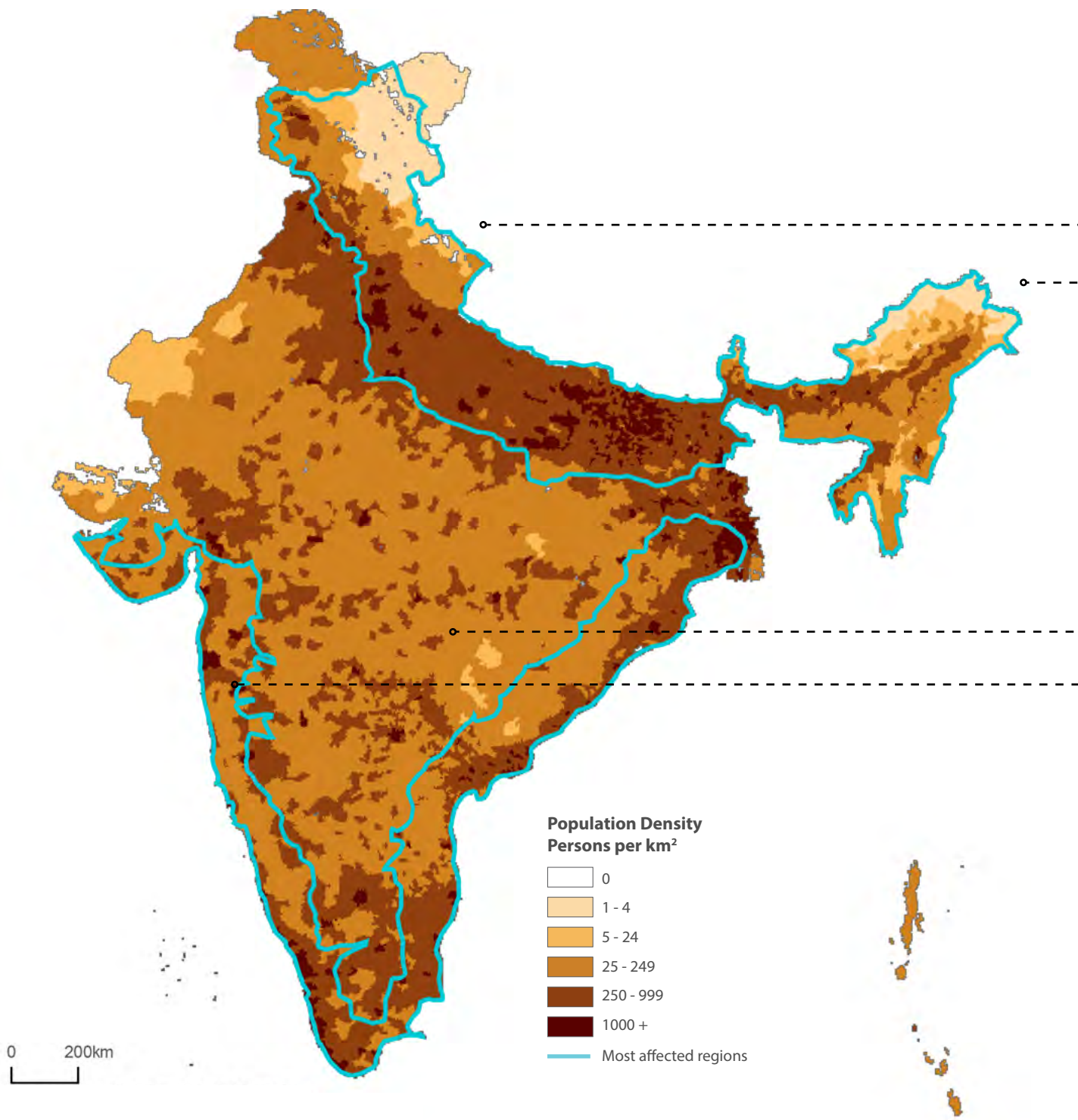
In the Western Ghats – a north-south mountain chain near the western coastline – variable rain

All these disasters, whether immediate or prolonged, disproportionately affect women. For instance, gender barriers not only prevent women from migrating, but also from learning how to swim, meaning women die disproportionately in floods.

patterns, rising sea levels, an increase in flash floods and soil erosion are the likely effects of climate change. Variable rain patterns will decrease crop yields, threatening both farmers' livelihoods and food security. Given that the Western Ghats are home to most of India's coffee production as well as some of its tea plantations,

these diminishing crop yields will also impact the companies that depend on this supply chain.

Unprecedented flooding and soil erosion caused by increased rainfall will result in a loss of lives and temporary distress migration. Rising sea levels will increase the incidence of floods, exacerbate soil erosion, and raise water tables. Resulting



Himalayan Region

500 million people depend on glacial melt water from the Himalayas.^{vii}

- Precipitation will increase 5-13% by the 2030s as compared to the 1970s, leading to flooding and landslides and threatening agriculture.
- Increased frequency of forest fires will endanger a major source of fuel: wood.
- Glacier melt causes soil erosion and flash flooding, hurting farmers.

Northeast India

01 million people depend on the tea industry in northeast India for their livelihood.^{viii}

- Tea plantations will experience negative consequence due to soil erosion, rising temperatures and unpredictable rainfall.
- Due to changing weather conditions, rice production will fall while cereal production has the potential to increase.
- Landslides and runoffs will increase in frequency during summer rains.

Western Ghats

50 million people are supported by the Western Ghats ecosystem.^{ix}

- Unpredictable rain will threaten the livelihoods of those who depend on the region's critical tea and coffee industries.
- Increased amount and intensity of rainfall will produce soil erosion and flooding.
- Flash floods are likely to cause temporary distress migration.

Coastal Zone

50cm sea level rise will be seen by India by 2100.^x

- An increase in intensity of cyclones will bring storm surges and salinity intrusion in critical farmland.
- Rainfall intensity will increase, while rainfall frequency will decrease, causing extra stress on the agriculture sector.
- Sea level rise will submerge crucial habitats and ecosystems, such as mangroves.

vii Nicholas Berini. 2010. *Himalayan glaciers: how the IPCC erred and what the science says*.

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migration could take the form of ‘managed retreat’ or ‘progressive abandonment’ of land and structures in extremely susceptible areas, wherein inhabitants eventually seek permanent resettlement as a reaction to rises in sea levels and erosion.³⁸

The Northeast

Northeast India is one of the most troubled regions in the nation. Separatist movements, political instability and inaccessible terrain make this one of the most difficult regions to develop. As a result, the economy largely depends on agriculture, which climate change is already disrupting.

The region is home to a highly concentrated and productive tea industry in the state of Assam. But changes in rainfall patterns and high temperatures are threatening the sustainability of the tea plantations, which employ roughly one million workers.³⁹ While evenly distributed rain previously made year-round tea processing a possibility, more heavily concentrated rain today means that harvesting

happens less predictably. Only large plantations, as opposed to smallholder farms, have the capacity to cope. If the result is worker layoffs, it will reduce the bargaining power of tea plantation laborers, who have been striving to organize themselves and recently succeeded in arguing for a higher minimum wage.⁴⁰

Coastal zones

India’s coastal zones stand to witness some of the most deleterious effects of climate change.

These regions are not only home to hundreds of millions of people; they also host some of India’s most important economic sectors and industries – with manufacturing activities on the southeastern and western coastlines and tea and coffee cultivation in the hills of the Western Ghats and the northeastern state of Assam.

First of all, coastal flooding through sea level rise and storm surges has the potential to spread waterborne diseases, such as cholera. These changes will also bring salt intrusion, rendering fertile farmland useless for the crops it currently supports.

Sea level rise will also negatively impact the tourism industry, upon which millions of people in the states of Kerala and Goa depend for their livelihood. Dwindling fishing yields will also result from changing currents and water temperatures. Taken together, these negative impacts on employment will make circular

migration and some permanent out-migration more frequent.

Climate change will cause a significant increase in distress migration in all of these four regions. Currently, Delhi and the states of Gujarat and Maharashtra are top destinations for circular migrants.⁴¹ Migrants will leave their homes to gain short-term access to food, water and shelter, and will seek out temporary income generation activities. Such temporary forms of employment tend to be precarious. Moreover, migrant workers enjoy little to no legal protections when they

migrate making them particularly susceptible to exploitation.

For example, many of those who migrate due to climate-related changes will wind up working in the construction industry, which employs about 45 million people across India.⁴² Construction is one of the most hazardous and precarious sectors, particularly for women. About 97 percent of women working in construction in India are informal workers, hired on short-term verbal contracts or as day laborers.⁴³

Indonesia

Indonesia is the world's fourth most populated nation. The country is made up of 17,508 islands and contains over 80,000 km of coastline,⁴⁴ making it especially vulnerable to the harmful effects of climate change.

Like many other developing countries, Indonesia's economy relies heavily on its natural resources. Strong and stable economic growth, averaging five percent annually since the turn of the century, has lifted millions out of poverty. The share of the population living on US\$ 2 or less per day in purchasing power parity terms declined from 67 percent in 2002 to 43 percent in 2011.⁴⁵

Yet in addition to those that are still poor, much of Indonesia's population remains vulnerable to crises or shocks, such as sea level rise and flooding caused by climate change.⁴⁶ Many are just an emergency away from falling back into poverty, making the adverse effects of climate change particularly important to understand in an Indonesian context.

Temperatures in Indonesia are similar throughout the entire archipelago. For this reason, the projections are somewhat uniform for future climate change developments. One of the reasons for this homogeneity is the presence of warm

waters surrounding the islands. They ensure that temperatures on land remain fairly constant, with the coastal plains averaging 28°C, the inland and mountain areas averaging 26°C, and the higher mountain regions, 23°C. There is also relatively little seasonal variation in temperatures.⁴⁷

Shorter rainy season, more rain

Intense rainfall and rising sea levels as a result of climate change will have a significant effect on livelihoods in the nation. The intensity of rainfall is projected to increase by as much as 2 to 3 percent per year. Despite the increase in amount of rain, the rainy season is expected to grow shorter. This means a significant escalation in rainfall intensity, with a substantial increase in the risk of floods.⁴⁸

Rising sea levels

The mean sea level in the Jakarta Bay will rise as much as 0.57 cm per year. As a result, the land surface will recede up to 0.8 cm per year. The combination of rising sea-levels and land subsidence will move the coastline inland, which will cause an increased risk of flooding. A study published in 2007 by Indonesia's Institute for Technology in Bandung modeled sea level rises of

0.25, 0.57 and 1 cm per year, finding that by 2050 these rises would drown 40, 45 and 90 square kilometers of land, respectively.⁴⁹

The impact on agriculture

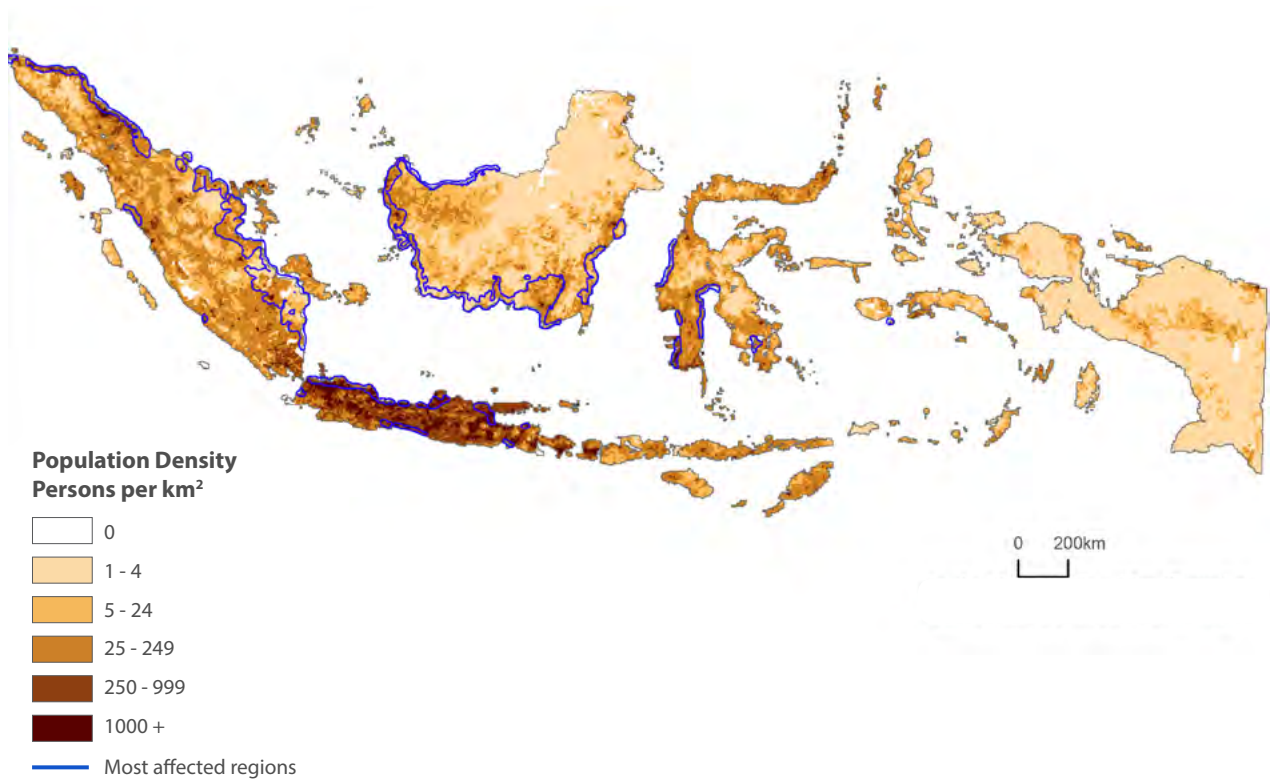
Shorter rainy seasons and flooding disrupt agriculture, adversely affecting the 35 percent⁵⁰ of Indonesians who rely on the sector to earn a living. Much of Indonesia's fertile agricultural lands are located in low-lying coastal areas. Both constant flooding and salinity intrusion due to sea level rise will drastically decrease their yields exerting downward pressure on wages in a sector that already has the lowest wages.

Estimates suggest that more than 43,000 farm laborers will lose their jobs in the Subang region of West Java alone.⁵¹ Overall, more than 81,000 farmers will have to seek other sources of income due to the flooding of farms from rising sea levels.⁵²

The impact on urban economies

Floods provoked by climate change have the potential to drastically impact economic activity in sectors beyond agriculture. As an illustration, the Jakarta flood in February 2007 affected 80 districts, paralyzing transportation and services

Much of Indonesia's population remains vulnerable to crises or shocks, such as sea level rise and flooding caused by climate change.



Sea Level Rise

60% of Indonesia's population and 80% of its industry is located in vulnerable coastal areas.^{xi}

- Over 80,000 Indonesian farmers will be forced to seek other income sources due to farm flooding from sea level rise.^{xii}
- Beyond flooding, sea level rise also causes salinity intrusion into agricultural land.
- Indonesia faces a paradox: Climate change will speed up migration to urban areas, but most of its cities are vulnerable to coastal flooding.

Rainfall

440,000 people displaced by the Jakarta floods of 2007 and caused US\$ 450M in damage.^{xiii}

- The intensity of rainfall is expected increase about 2% to 3% per year.
- The Maluku region in eastern Indonesia will see the largest increase in rainfall.
- Despite the increase in rainfall, many parts of the country will experience a shorter rainy season, threatening agricultural cycles.

^{xi} Triarko Nurlambang. 2011. *Public policy matters on climate change and migration in Indonesia. Climate change, migration and human security in southeast asia: 74.*

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in the affected cities. In the flood, an estimated 420,000 to 440,000 people were displaced from their homes.⁵³ The Indonesian government estimated that losses reached Rp 4.1 trillion, about US\$ 450 million.

The concentration of economic activity in areas susceptible to climate-related disasters is not unique to Jakarta. In fact, 60 percent of Indonesia's population and 80 percent of its industry is located in vulnerable coastal areas.⁵⁴ The potential consequences of flooding and sea level rise for Indonesia's economy and labor market are enormous.

These climate-induced changes will increase temporary distress migration and circular migration. As with Dhaka in Bangladesh,

climate change is likely to increase migration to Indonesia's urban areas. But these areas are some of the most vulnerable to climate change's adverse effects. Not only are most of Indonesia's major cities located in precarious coastal zones, they are also densely populated and lacking adequate infrastructure to deal with emergencies. This combination means susceptibility to disruptions in the flow of people, goods and services.

60 percent of Indonesia's population and 80 percent of its industry is located in vulnerable coastal areas.

When agriculture is disrupted, people are forced to flee because their livelihoods are destroyed. But on a different note, damage

from climate-related disasters in urban areas can actually increase employment, since rebuilding efforts typically require a large-scale deployment of labor. This demand attracts more migrants.

Conclusion

Climate change not only threatens to disrupt the impressive economic growth trajectories of Bangladesh, India and Indonesia, as well as other countries at similar stages of development; it also threatens to reverse the gains these countries have made so far. The experience of these three nations highlights a reality that must feature

prominently in debates on how to mitigate and adapt to climate change.

First, climate change, through both drastic disasters and protracted changes over time, will have a devastating affect on jobs and incomes. Disruptions of employment instigate mostly

temporary and circular migration that not only strips workers of their incomes, but also their rights and community networks, leaving them completely vulnerable. This is especially true in the absence of strong and stable governance, worker protections, social safety nets and institutions that provide basic services.

Second, climate migration leads to overcrowding, especially in urban centers, exerting downward pressure on wages in an oversaturated labor market. This gives rise to precarious work arrangements, informality and generates opportunities for exploitation.

Third, climate change especially affects the poor that tend to depend on natural resources for their livelihoods and whose incomes prohibit them from saving for the types of emergencies that climate change creates. Among the poor, marginalized groups such as women are most likely to bear the brunt of the challenges posed by climate change.

Leaving scores of workers vulnerable in this way is not only a gross violation of human rights, but is also a valuable loss of productive potential that calls for urgent action on part of governments, unions and the private sector.

The trade union movement must find new and innovative ways of mobilizing, organizing, and defending migrant workers, among which are climate migrants. Governments must adopt legislation and implement policies to protect the rights of migrant workers. They must work with the private sector to enhance the capacity of workers to adjust to changes through active labor market programs such as skills training and labor market matching. Moreover, they must invest in sectors such as renewable energy, which not only promote climate change mitigation and adaptation, but also generate employment.

The trade union movement must find new and innovative ways of mobilizing, organizing, and defending migrant workers, among which are climate migrants.

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