WORLD BANK GROUP

GROUNDSWELL

Acting on Internal Climate Migration

POLICY NOTE #4

Internal Climate Migration in the Middle East and North Africa

Climate change is emerging as a potent driver of mobility. The report *Groundswell Part II: Acting on Internal Climate Migration (2021)* projects that, by 2050, without concrete climate and development action, just over 216 million people—or around three percent of the population in Sub-Saharan Africa, East Asia and the Pacific, South Asia, North Africa, Latin America, and Eastern Europe and Central Asia—could move within their own countries due to the slow-onset impacts of climate change. In North Africa alone, "internal climate migrants" could number as many as 19.3 million, representing 9.0 percent of the subregion's total projected population.

Climate migrants will move from less viable areas with lower water availability and crop productivity and from areas affected by rising sea level. The poorest and most climate vulnerable areas will be hardest hit. These trends, alongside the emergence of "hotspots" of climate in- and out-migration, will have major implications for climate-sensitive sectors and for the adequacy of urban infrastructure and social support systems in both rural and urban areas. While some climate migration cannot be avoided due to the lock-in of climate effects of past emissions, the report results also indicate that future trajectories of climate migration are not set in stone.

Climate migration in the Middle East and North Africa can have substantial development implications, and the stakes are high. Achieving a resilient society—where people can either adapt in place and thrive or migrate with dignity toward areas of higher opportunity—is an important part of meeting national development goals. Policy decisions made today will shape the extent to which the effects of climate change will be positive for migrants and their families. Inaction would mean missing a window of opportunity to reconfigure where, when, and how climate resilient investments are made in support of robust economies.

This Policy Note #4 is the fourth in a series of six notes drawn from the Groundswell reports. It provides an overview of results and their implications for the Middle East and North Africa, one of the six regions of focus.

CLIMATE CHANGE AND MIGRATION: SETTING THE CONTEXT

Climate change will intensify environmental degradation and natural hazards in many regions. Related impacts are already directly and indirectly shifting human mobility—both within countries and across borders—and will do so increasingly. Sometimes, ensuing migration can be an adaptation to climate change. At other times, climate change impacts increase the probability of migration under distress, creating growing challenges for human development. In some areas, the most vulnerable will be unable to move, "trapped" in at risk locations.

Recent compounding shocks are also increasing the complexity and interconnectedness of underlying drivers of mobility. The COVID-19 pandemic and its associated economic crisis, and the effects of fragility and conflict, have compounded the shocks already faced by vulnerable people, reversing hard-won gains in poverty reduction and shared prosperity, and adding to policy challenges.

The objective of the *Groundswell* reports, and the modeling applied, is to provide policymakers with a way to better understand and plan for the likely movement of people within their countries—over time and across different geographies—due to slow-onset climate change impacts. These include impacts on water availability, crop productivity, and sea-level rise. The focus on "internal" climate migration is driven by the consensus that migration within countries, rather than cross-border migration, will be by far the larger phenomenon—yet both require concerted action.

The reports model three internal climate migration scenarios. This helps to address the uncertainties of analyzing migration over the next 30 years. The scenario-based results should be seen as a plausible range of outcomes rather than precise forecasts. The three scenarios are:

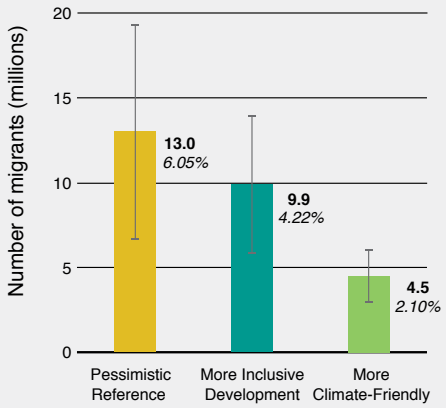
- Pessimistic (the reference scenario for this report): high global greenhouse gas emissions combined with an unequal development pathway;
- More inclusive development: with equally high emissions, but a more equal development pathway; and
- More climate-friendly: with lower emissions, combined with an unequal development pathway.

Photo Credit: World Bank

NORTH AFRICA COULD SEE AS MANY AS 19.3 MILLION CLIMATE MIGRANTS BY 2050

North Africa is projected to have the largest proportion of climate migrants relative to total population, compared to the other regions of focus in the *Groundswell* reports.[1] In the pessimistic reference scenario, the projected number of climate migrants could reach 19.3 million or 9.0 percent of the total population of the subregion at the high end of the pessimistic reference scenario. The average for this scenario is 13.0 million people (6.0 percent of the total population). Severe water scarcity and impacts associated with sea-level rise in densely populated coastal areas and the Nile Delta explain these projected trends.

Figure 1: Projected total numbers and shares of internal climate migrants in North Africa in three scenarios by 2050



Note: The whiskers on the bars in the charts represent the 95th percentile confidence intervals.

On average, in the more inclusive development scenario, the number of climate migrants is cut by almost a quarter down to 9.9 million (4.2 percent of the total population), and in the more climate-friendly scenario, it is cut by over 65 percent to 4.5 million (2.1 percent of the total population). The differences between scenarios highlight the roles of both more inclusive development pathways and global emission reductions in easing climate pressures on livelihood systems and population centers.

SPOTLIGHT ON INTERNAL CLIMATE MIGRATION IN NORTH AFRICA AND MOROCCO

Climate migration in the North Africa subregion is discussed in more detail below to illustrate specific spatial and temporal trends of climate migration within a local development context, using highlights from the example of Morocco.

North Africa is particularly vulnerable to the effects of climate change

The population of North Africa is heavily concentrated along the Nile Valley and Delta and along the Mediterranean coast, with some clusters scattered in oases in the Sahara, and extremely low population densities in most arid areas. The largest cities are located in the north, with denser settlements along the coast. The share of North Africans living in urban areas has grown steadily over the past 50 years, except in Egypt, where it has stabilized since the 1970s. There are important differences in the share of each country's land that is arable, but overall, agriculture is important for employment and livelihoods in North Africa.

Water scarcity is a major concern and decreases in rainfall could intensify droughts and diminish freshwater resources, with implications across economic sectors. Climate change impacts are also set to exacerbate already existing environmental issues, including soil degradation, desertification, and deforestation. As coastal populations and assets continue to grow, exposure to impacts associated with sea-level rise is also increasing. In the vast agricultural lands along the Nile Delta, rising sea levels could lead to saltwater intrusion, threatening access to freshwater for drinking and agriculture. At the same time, extreme heat, combined with increased dust storms, can have wide-ranging impacts on air quality and on human health, especially respiratory diseases.

1 North African countries were modelled for the Middle East and North Africa region. These included Algeria, Egypt, Libya, Morocco, and Tunisia. The modeling approach could not be applied to the countries of the Mashreq and they are discussed in a qualitative narrative covering environmental and climate-induced mobility drivers, trends, and patterns in the report.

Climate data for North Africa show significant warming trends over the last decades, with increases in very hot days, high nighttime temperatures, and longer heat waves. In much of the subregion, mean precipitation has decreased over the last decades, with the strongest declines over the Mediterranean parts of Morocco and Algeria and in parts of Libya, while Mediterranean Egypt has seen a slight increase. Increasing temperature trends are expected to continue, accompanied by strong increases in heat waves. Precipitation is also expected to further decrease over large parts of the subregion, resulting in greater aridity.

North Africa has a long history of both internal and cross-border migration, with internal migration linked to economic modernization, improved education, service sector growth, and economic activities in towns and cities. Environmental stress, including water scarcity, associated pressures on agriculture and water, and accelerated desertification and land degradation may already be part of the drivers of internal mobility.

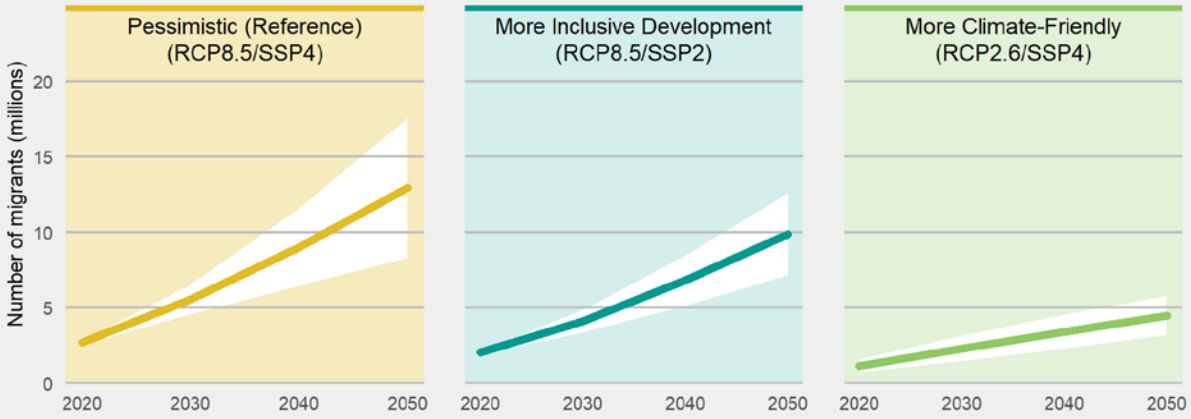
Climate migration is set to ramp up to 2050 in North Africa

As mentioned above, the number of climate migrants in North Africa is projected to increase over time reaching 4.5 to 13 million people by 2050 (2.1 to 6.0 percent of the total population) across scenario averages (Table 1 and Figure 2).

Table 1: Projected numbers and shares of internal climate migrants by 2050 in three scenarios, North Africa

	Scenario					
Subregion	**Pessimistic reference**		**More inclusive development**		**More climate-friendly**	
North Africa						
Average number of internal climate migrants by 2050 (million)	**13.0**		**9.9**		**4.5**	
Minimum (left) and Maximum (right) (million)	6.6	19.3	5.8	13.9	2.9	6.1
Internal climate migrants as percent of population	**6.05**		**4.22**		**2.10**	
Minimum (left) and Maximum (right)	3.08	9.02	2.5	5.94	1.36	2.84

Figure 2: Projected number of internal climate migrants in North Africa in three scenarios, 2020-2050



Climate migrants as a percentage of the total population

Year	2020	2030	2040	2050	2020	2030	2040	2050	2020	2030	2040	2050
%	1.4	2.8	4.3	6.0	1.1	2.0	3.0	4.2	0.6	1.1	1.6	2.1

Note: Dark lines represent the average runs for each scenario. Unshaded white areas represent the 95th percentile confidence intervals. The wide intervals are in part a reflection of the fact that climate and sectoral models were selected to represent the widest possible range of outcomes.

While the study did not model climate migrants beyond 2050, the results of the water and crop sectoral models, which are available through to 2100, show more extensive climate change impacts on water availability and crop productivity in general, which could have ramifications for population movements.

A mostly drying trend is projected in the northwest and western areas of North Africa, and a mostly wetter trend in eastern areas by 2050. In the second half of this century, the pessimistic reference scenario for water availability in the northern areas (with a more Mediterranean climate) are dire, with declines of 70–90 percent over much of those areas. Crop productivity models for 2050–2100 show declines in the northwest portion of the subregion, and in the west, declines of 30–50 percent under the pessimistic reference scenario are projected. In addition, sea-level rise will continue to be of particular concern for low-lying areas such as the Nile River Delta.

Hotspots of climate in- and out-migration reflect the vulnerabilities of ecosystems and livelihoods

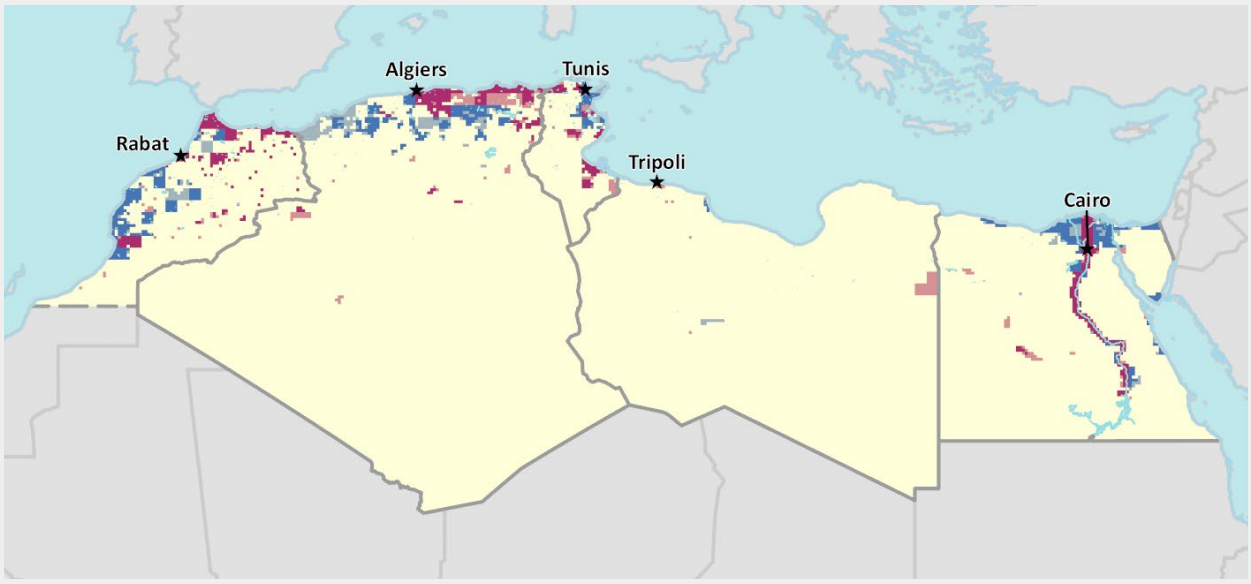
Spatial development is climate-sensitive, and hotspots of climate in- and out-migration will matter critically in the future. Climate out-migration will occur in areas where livelihood systems are increasingly compromised by climate change impacts, while climate in-migration will occur in areas with better livelihood opportunities.

Climate migration hotspots begin to emerge by 2030, and by 2050, these spread and intensify all over the subregion (Figure 3). Climate out-migration hotspots include important coastal areas, such as the eastern and western parts of the Nile Delta (including Alexandria); the northeast coast of Tunisia, including Kelibia; coastal areas in northwest Algeria, including Oran; and smaller areas of the west and southwest coast of Morocco, including Agadir and Safi. Overall, rural coastal areas also tend to see climate out-migration. Driven mainly by declining water availability, population growth in these coastal areas could thus be dampened. In the Nile Delta, sea-level rise and decreased water availability drive climate out-migration. Certain inland areas affected by increasing water scarcity are also projected to be climate out-migration hotspots, such as the central Atlas foothills of Morocco.

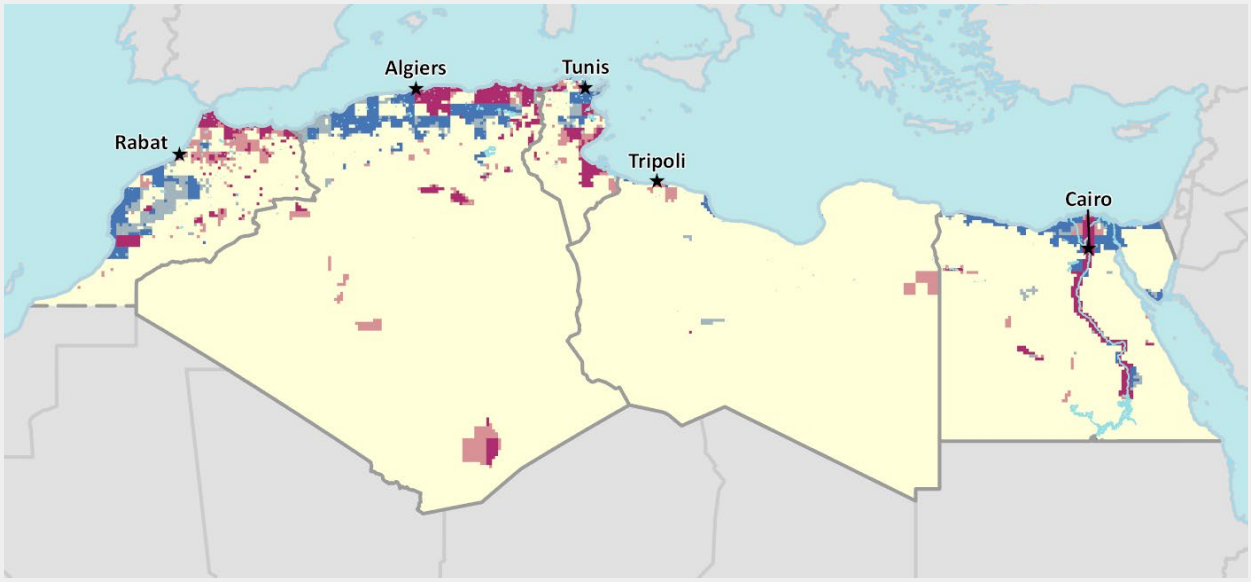
Climate in-migration hotspots are expected in the Nile Valley and central Delta; the north and south coast of Tunisia, including the Gulf of Gabes; the eastern section of the Algerian coast, and the northern coast of Morocco. These climate in-migration hotspots include large and mid-size urban areas such as Cairo, Algiers, Tunis, Tripoli, the Casablanca-Rabat corridor, and Tangiers, amplifying projected population growth trends in these areas. Specifically, climate in-migration hotspots coincide with areas projected to have increased crop productivity and water availability, including very arid areas in southern Algeria (where the oasis and city of Tamanrasset are located). These projections do not take into account the current carrying capacity of agricultural lands in the Nile Valley and arid areas.

Figure 3: Hotspots projected to have high levels of climate in-migration and climate out-migration in North Africa, 2030 and 2050

a. 2030



b. 2050



IN-MIGRATION

- High certainty in high levels of climate in-migration
- Moderate certainty in high levels of climate in-migration

OUT-MIGRATION

- High certainty in high levels of climate out-migration
- Moderate certainty in high levels of climate out-migration

Note: High certainty reflects agreement across all three scenarios modeled, and moderate certainty reflects agreement across two scenarios.

Climate Migration in Morocco

In Morocco, the scale of climate migration is projected to increase by 2050 in all three scenarios modeled in the report. The number of climate migrants is largest in the pessimistic reference scenario, averaging 1.9 million (5.4 percent of the total population). Climate change may become an increasingly important driver of internal migration in a country where internal mobility is already well established. Table 2 summarizes key results for Morocco.

Concrete climate and development action are both needed to reduce the scale of internal climate migration. Lower global emissions pathways could lessen climate change impacts as a driver of internal migration by alleviating stressors related to declines in crop productivity, water stress and sea-level rise. Understanding the scale and trajectory and differing vulnerabilities and attractiveness of hotspots can provide a stronger basis for proactive and inclusive planning in sending and receiving areas.

Expanding coastal cities will need to undertake climate-resilient and inclusive urban planning that accounts for climate risks and their impacts on key economic sectors and urban infrastructure. Meanwhile, adaptation measures will continue be critical for the agriculture sector given its importance for livelihoods and employment. Integrated water resource management and development will also continue to be important to help mitigate water scarcity and increase economic and social resilience. At the same time, given the potential escalation of climate change impacts beyond 2050, continuing to pursue economic transformation toward low-carbon and resilient development pathways will be critical. National strategies across key sectors can help create an enabling environment aligned with the more inclusive and more-climate friendly scenarios in this report and shape future migration dynamics.

Table 2: Key climate migration results for Morocco

Projected number of climate migrants by 2050, pessimistic reference scenario (average)	1.9 million (5.4 percent of total population)
Climate in-migration hotspots	Coastal cities including Agadir, Rabat, and Tangier Around Fez, Tétouan and as far east as Bou Arfa
Climate out-migration hotspots	Central foothills including around Marrakech, west and southwest coast including around Casablanca and Safi
Climate migration in/out of livelihood zones*	In-migration: pastoral and rangelands with small net gain Out-migration: rainfed croplands with small negative net change

Note:
* In general, projections display large confidence intervals across livelihood zones, ranging from positive to negative depending on the category.

IN MASHREQ COUNTRIES, HEAT STRESS AND WATER SCARCITY COULD ADD TO MOBILITY FACTORS

The Mashreq subregion already faces climate change impacts, particularly extreme heat and water stress, which are both are expected to worsen in the coming decades. Water scarcity is expected to increase amid rising temperatures and declining precipitation, putting further pressure on surface and groundwater resources. Less water would be available for urban areas, agriculture, and livestock production. This, in turn, could affect key economic sectors, rural livelihoods, and food security.

Projected increases in temperature and humidity could exacerbate heat stress, with more days on which temperatures exceed thresholds of human tolerance. These trends could seriously affect the habitability of densely populated and growing urban and coastal areas, particularly for vulnerable populations that may lack access to services and cooling.

At the same time, low-lying coastal areas face sea-level rise augmented by storm surge, which could lead to flooding, damage to infrastructure, and saltwater intrusion in freshwater aquifers.

Climate change could add to the factors that already drive mobility in the subregion. Environmental thresholds for water scarcity, land degradation, and heat stress could act as additional push factors for migration. Climate change and natural resource degradation may also act as threat multipliers, particularly in situations of fragility and conflict. Efforts to deepen understanding of those interactions and compounding risks need to be paired with an urgent shift towards long-term pathways for building resilience to future shocks.

USE THE WINDOW OF OPPORTUNITY TO ACT NOW

Internal climate migration may be a reality, but it does not have to be a crisis. Concerted action on climate change mitigation and adaptation together with inclusive development policies, and embedding climate migration into policy and planning, could help to substantially reduce the number of internal climate migrants by 2050. The *Groundswell* reports identify key policy recommendations to address the underlying drivers of internal climate migration and prepare for expected migration flows.

1. Cut global greenhouse gases now to reduce the climate pressures that drive internal climate migration.

Managing the scale of internal climate migration will require immediate collective action to get on lower global greenhouse gas emission trajectories with differentiated strategies across regions and countries. Five years after the Paris Agreement, the world is still headed for at least 3°C of warming by 2100. Ambitious action to curb global emissions is critical to reducing the burden of climate change impacts on key resources, livelihood systems, and urban centers that may drive people to migrate in distress.

In the lead-up to COP26 in Glasgow, countries are updating and enhancing their commitments under the Paris Agreement. This is a critical opportunity to ratchet up ambition to put the world on track for net-zero emissions by mid-century and have a chance at limiting global warming to 1.5°C. Adhering to the Paris Agreement, and staying close to the more climate-friendly scenario used in this report, would help substantially reduce internal climate migration. Urgent and aggressive action on inclusive, resilient, and sustainable development alongside global action on emissions reductions will also be needed.


Photo Credit: World Bank

2. Embed internal climate migration in far-sighted green, resilient, and inclusive development planning.

Integrating internal climate migration in development planning is critical to address the poverty factors that make people particularly vulnerable to climate change impacts, such as a lack of viable livelihood options and lower quality assets. This is particularly important as the most vulnerable groups tend to have the fewest opportunities to adapt locally or move away from risk—and when moving they tend to do so in adverse circumstances. Systematic planning at the nexus of climate, development, and migration can help broaden the opportunities for people to adapt where they live, or else enable them to move under better circumstances.

Far-sighted development planning can also enable countries to pursue green, resilient, and inclusive economic transformations. Notably, accounting for internal climate migration alongside broader demographic patterns can help fuel momentum towards the next generation of skills and jobs in both sending and receiving areas. Good management of demographic transitions is vital in this regard and will need to be accompanied by continuing investments to enable working-age populations to find opportunities in productive and climate-resilient labor markets, with good access to health care, education, and public services.

Climate-smart urban and rural transitions can also provide important win-win opportunities to drive economic transitions. Primary and secondary cities can be promoted as hubs of innovation and knowledge transfer, accelerators of the digital transformation, and centers of green technology and resilient infrastructure in key sectors, including energy, water, and transport. Cities have opportunities to leverage rural-urban migration and broader urbanization trends in many regions, capitalize on agglomeration effects, and develop economies of scale. In rural areas, nature-based solutions emphasizing the protection of ecosystem services can benefit agricultural productivity, provide buffers against floods and droughts, and enhance management of landscapes, forests, and watersheds on which livelihoods depend. More broadly, flexible social protection systems with robust and rapid delivery can significantly increase resilience to climate change and other shocks, particularly for the most vulnerable.

3. Plan for each phase of migration, so that internal climate migration as an adaptation strategy can result in positive development outcomes.

Planning for internal climate migration means accounting for all phases of migration—before, during, and after moving. Before migration, adapt-in-place solutions can help communities stay in place where local adaptation options are viable and sensible. During migration, policies and investments can enable mobility for people who need to move away from unavoidable climate risks. After migration, planning can ensure that both sending and receiving areas are well equipped to meet the needs and aspirations of their populations.

Policy makers will need to understand and account for differences in vulnerabilities across landscapes to provide a stronger basis for adaptive practices that would enable people to stay in viable livelihood systems. Integrated management of landscapes and natural resources, combined with resilient agri-food systems, will be central to ensuring livelihood sustainability and food security, particularly in densely populated localities or in productive areas that may already be stretched. Diversified livelihoods that are not tied to climate-sensitive sectors need to be available as options to adapt in place. Careful attention to the carrying capacity and reach of social, service delivery, economic, and livelihood systems is also key for spatial planning.

For people who need to move away from unavoidable climate risks, policy makers will need to enable mobility by creating supportive environments for planned and orderly migration into areas of low risk and high opportunity. Inclusion and sensitivity to migrants' needs will be crucial. In many regions, internal climate migration will have to be managed as an important part of a broader set of adaptation options and in the context of existing patterns of mobility. Targeted interventions can be deployed in the short and medium term to support migrants. For instance, informed decision-making can be facilitated for migrants through better access to financial resources and social services, increased financial literacy, secured legal

status, and pre-departure training, skills, and orientation. Investments can also make social protection portable and scalable by easing registration and communication in receiving areas, particularly major urban centers; improving access to benefits through mobile money and digital identification systems; and allowing for social welfare systems to be adaptable to changing needs. Policy can also maximize the potential of financial and social remittances to bolster adaptation investments and income-generating activities and encourage knowledge transfer through diasporas and social networks.

Policy makers will also need to ensure that both sending and receiving areas are adequately prepared to ensure the resilience of those who remain and to integrate additional flows of people. Many of the climate in-migration hotspots identified in the regions covered by this report are major urban areas. These cities will need to provide advanced public service provision, affordable housing programs, and employment opportunities for increasing numbers of people. Fostering integration and social cohesion can also help ensure that destination areas leverage the opportunities that migrants bring to fill labor and demographic gaps, diversify human capital, and bring new skills and knowledge.

National and city planning systems will need to account for important changes to existing settlement patterns. These will need to go hand in hand with climate-resilient infrastructure investments and improved connectivity networks, especially as cities continue to grow and draw migrants from rural areas. Even cities projected to be out-migration hotspots and thus see potentially slower population growth will still continue to support large numbers of people who may face escalating climate risks. Urban planning and land use management will need to be inclusive and address the needs of the most vulnerable, who often live in areas with inadequate services, including informal settlements, sometimes on marginal land exposed to floods and other hazards. Vulnerable people, including those that are lower-skilled, poorer, and older, may also be unable to move away from areas of high risk. Involuntary immobility in the context of climate change should therefore be equally considered in development planning.

4. Continue to invest in improving understanding of internal climate migration to inform well-targeted policies.

More investments are needed in research at scale, including new, more granular data sources and differentiated climate change impacts, to better contextualize and understand internal climate migration at the regional and country level. The novel and transparent modeling presented in the Groundswell reports is a starting point, but decision-makers will need more spatially detailed projections to identify the most appropriate strategies in each location.

State-of-the-art models on the current and future trends of internal climate migration continue to be crucial to inform early action. Updated models using an array of climate change impacts and other biophysical, socioeconomic, and political indicators factors can help better inform decision-making at appropriate scales. These should also account for the inherent uncertainties in the way climate change impacts will play out in given locales that will affect the magnitude and pattern of climate change-induced movements. Important strides have been also made in new research to extend regional and national-scale modeling, and to gain further insights into how climate stressors impact individual decisions to move. The need to create a shared understanding of the scale, trajectory and spatial dimensions of internal climate migration remains critical to support development policy and planning.