EBB AND FLOW: KEY MESSAGES

MIGRATION shapes the lives of people who move and transforms the geographies and economies of their points of departure and destinations.

THE WATER SECTOR, and the availability of water itself, implicitly or explicitly shape migration flows.

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From the earliest days of human activity, rains, rivers, coasts, and seas have determined the spatial distribution of economic activity. Even today, water has the potential to influence the process of economic transformation by affecting movement and migration. Water availability can have a large effect on regional economies and hence where people choose to live and work and the skills they carry. In turn, the regions where people settle require access to adequate water resources—accompanied by commensurate infrastructure investments—to sustain growth and allow populations to survive and thrive. This report examines the nexus of water, migration decisions, and economic development.

VOLUME 1

Water, Migration, and Development (Zaveri et al. 2021) provides a global perspective on these issues and focuses on internal migration. It offers the first global assessment of the empirical link between water, migration, and development.

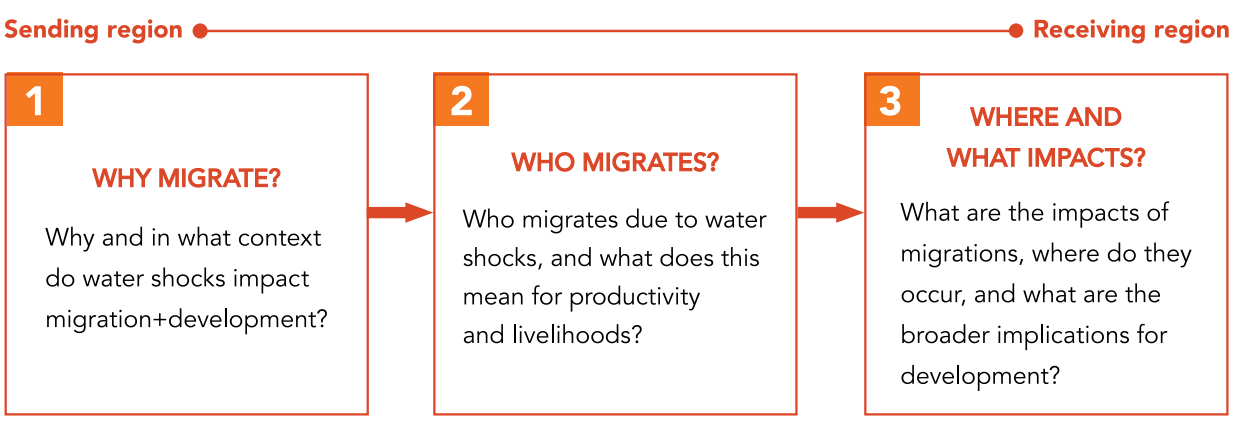
VOLUME 2

Water in the Shadow of Conflict in the Middle East and North Africa (Borgomeo et al. 2021) focuses on the world's most water-scarce region, which is experiencing high levels of intraregional and international migration, and unprecedented levels of conflict-induced forced displacement.

FOCUS OF THE REPORT

The report examines the role of water availability fluctuations in the migration and development nexus. It assesses the impacts of changes in water availability that are induced by "rainfall shocks," in which rainfall is significantly above or below the long-run average for that region. These deviations from trends and long-run averages are increasingly more widespread—and climate change will accelerate the process. Adapting to rainfall variability is often much more challenging than acclimating to averages because of the deviations' unpredictable duration, uncertain magnitude, and unknown frequency. Thus, water availability fluctuations will likely be the main driving force underlying water-induced migration and development.

Figure 1 The Report Addresses Three Key Questions



This report's new findings explore the why, who, where, and what of water and migration. It combines several national and global data sets, employs multiple statistical techniques that rely on machine learning and causal inference, and harnesses case studies based on semi-structured interviews.

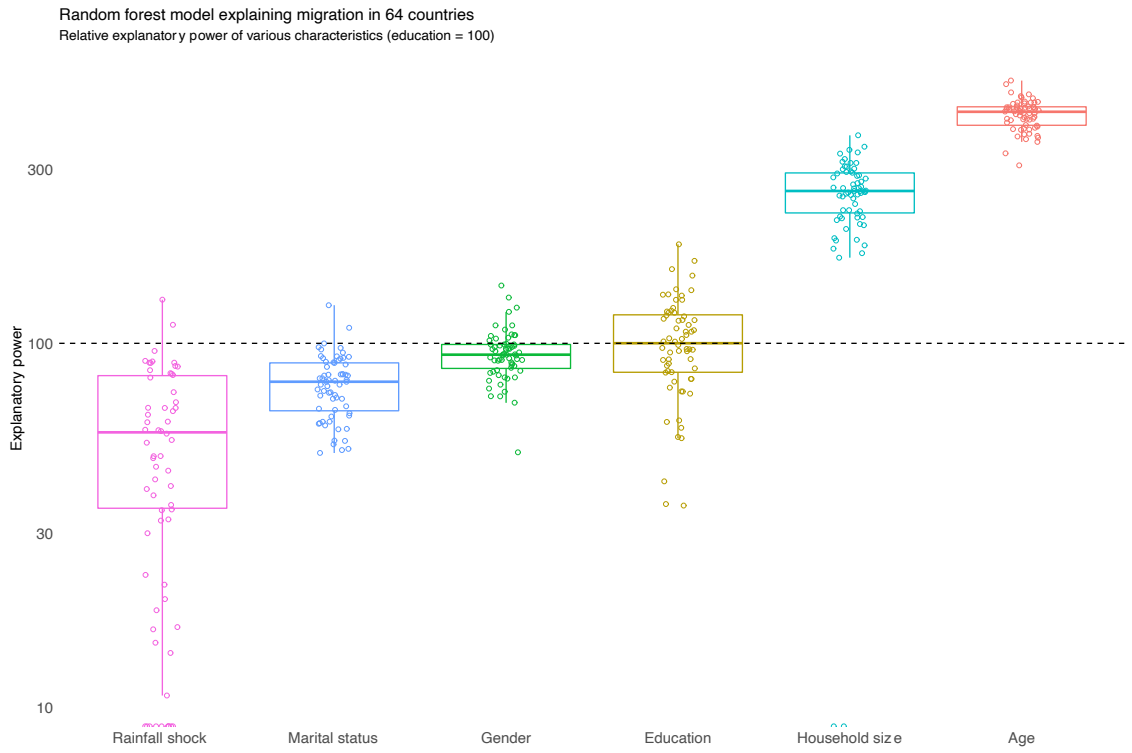
Learning about Water's Role in Migration from Half a Billion Records

Before turning to the why, who, and where of water and migration, a more fundamental question must be asked: *how much of a role does water play in global migration?* (See figure 1.)

To shed light on the link between water shocks and migration, this report employs the largest data set on internal migration ever assembled. This includes data from over 442 million individuals from 189 different population censuses in 64 countries between 1960 and 2015. Through machine learning, the analysis tests how well rainfall deficits, as measured by periods of low rainfall relative to long-run averages, predict migration decisions relative to other crucial variables that determine whether a person migrates: a person's age, gender, educational level, household size, and marital status.

The machine learning analysis shows that rainfall deficits are significant predictors of population movements within countries around the world. Each dot in figure 2 shows the importance of each

Figure 2 Importance of Characteristics in Explaining Migration



Source: World Bank figure based on analysis using data from 189 different censuses and weather data from Willmott, C. J., and K. Matsuura. 2018. Terrestrial Air Temperature and Precipitation: Monthly and Annual Time Series (1900–2017).

Note: The figure summarizes the results of 189 estimates derived using random forest techniques to explain the importance of various characteristics in explaining migration behavior. Each dot represents the results from a different country/year. The y-axis shows how critical each variable along the x-axis is for explaining migration in that country/year. Values are normalized with respect to education, such that the mean value of education takes a value of 100, and all other countries are shown relative to education's explanatory power, with values over (under) 100 implying that the value is more (less) important for explaining migration patterns.

characteristic for explaining migration in a given country relative to education, which is used as a benchmark because it is a critical determinant of migration. Not surprisingly, age and household size, on average, are more important than education, and have the largest explanatory power for out-migration. Other characteristics, such as gender or marital status, are, on average, as relevant as education. The results show that periods of low rainfall can strongly influence migration outcomes in addition to traditional drivers of migration. Even though their occurrence is slightly less important than education, figure 2 shows that the range of importance varies considerably, and in some countries dry rainfall shocks can be as important as gender, marital status, or even education.

Building on the machine learning analysis, the report digs deeper into some of the evidence and causal relationships between water, migration, and development, focusing on the cases of internal migration (Volume 1) and of forced displacement in conflict-affected areas of the Middle East and North Africa (Volume 2).

VOLUME 1: WATER, MIGRATION, AND DEVELOPMENT

Why. Water deficits result in five times as much migration as do water deluges, despite the national and international attention that floods receive. But there are important nuances to why and when these events lead to migration. Even when facing the loss of their livelihoods due to droughts and water deficits, people who are extremely poor may still lack the resources, access to credit, or networks that would enable them to move in search of a better life elsewhere. For this reason, the migration response to water deficits varies based on country income, with low-income country residents 80 percent less likely to move relative to higher-income residents. These trapped populations often face a triple whammy of water deficits, reduced economic opportunities in their region, and no means to move to places with more opportunities. While these groups are often hidden from media headlines, they represent a policy concern just as serious as migration.

Who. Water shocks can influence who migrates. Workers in developing countries, especially those in rapidly urbanizing middle-income countries, who move from rural to urban areas due to water deficits, often bring lower than average education levels and skills. These workers are typically less productive in cities because their skills and backgrounds do not match what is in demand. They can therefore face a wage gap of up to 3.4 percent at their destination compared to those moving from wetter regions. This has profound implications for the migrants as well as the regions they move to, highlighting that adverse shocks can have economic consequences far beyond the regions they affect immediately.

What. Cities are most often the destination of migrants, and they are often considered more resilient than rural areas to the types of water shocks that induce migration. But even in cities, water deficits can haunt migrants. Recent high-profile urban droughts in Cape Town, São Paolo, and Chennai show that some of the world's megacities are increasingly facing "day zero" events, in which water supplies become threateningly low. Dozens of smaller cities across the globe face similar fates of dwindling water supplies yet gain little attention. Such water shortages can significantly slow urban growth, compounding the vulnerability of migrants. Depending on the size of the water shock, city growth can slow by up to 12 percent during drought years, enough to reverse critical development progress.

VOLUME 2: WATER IN THE SHADOW OF CONFLICT IN THE MIDDLE EAST AND NORTH AFRICA

Why. Water shocks can lead to small-scale forced displacement: internally displaced people in southern Iraq and across Libya identify water scarcity and lack of access to basic services, including drinking water, as main reasons for moving. Contrary to common belief, the report finds that the evidence linking water shocks with conflict and forced displacement in the Middle East and North Africa is not unequivocal. Analysis of case studies and historical event databases shows that water shocks, notably droughts, are more frequently related to cooperation than conflict, both at the domestic and international levels. While conflict is a possible consequence of water shocks, the contrary is a real, more frequent and concerning outcome: water is a victim and casualty of conflict, with negative impacts on public health and the well-being of millions of people. Indeed, since 2011, in the region's conflicts in West Bank and Gaza, the Republic of Yemen, the Syrian Arab Republic, and Libya, water infrastructure has been targeted at least 180 times.

Who. The Middle East and North Africa region has the world's highest levels of forced displacement, with an estimated 7.2 million refugees, of whom 2.7 million are hosted in the region, and 12.4 million internally displaced people fleeing protracted armed conflicts. While these numbers reflect a stark reality, they do not fully reflect the additional challenges faced by individuals, especially those from socially excluded groups and marginalized communities. An average of 4 percent of refugees and asylum seekers in the region have disability status, with many struggling to access water services. Single women, widows, and children are a second group of forcibly displaced individuals facing heightened water risks, including higher rates of gender-based violence exacerbated by the inadequate access to water supply and sanitation facilities.

Access to safe drinking water is a daily struggle for millions of forcibly displaced Syrians, Iraqis, Palestinians, Yemenis, and Libyans and international migrants in the region, heightening public health risks.

What. Forcibly displaced people and their host communities face myriad water-related challenges. Access to safe drinking water is a daily struggle for millions of forcibly displaced Syrians, Iraqis, Palestinians, Yemenis, and Libyans and international migrants in the region, heightening public health risks. Tanker trucks often help fill the gap; however, significant issues of water quality, reliability, and affordability remain. Host communities face localized declines in water availability and quality, and unplanned burdens on water services following the arrival of the forcibly displaced. However, regional experiences suggest that empowering and working through local governments can adapt and expand coverage among the forcibly displaced and their host communities. In addition to water scarcity, floods threaten the lives and livelihoods of the forcibly displaced and undermine humanitarian and development responses. For those living in closed, remote camps and informal settlements, flood risks are particularly high.

POLICY CHALLENGE—THE THREE Ps

No single policy can adequately address the many impacts of water shocks. Instead, overlapping and complementary policies that target people and places are needed to improve livelihoods and turn water-induced crises into opportunities for growth.

Protect livelihoods in the place of origin.

- Water storage and supplemental irrigation can buffer vulnerable rural communities against water variability and scarcity, lessening the impact of rainfall deficits on migration. But there are caveats:
  - When irrigation water supplies are provided with little or no charge, it signals that water is abundant, even when it is scarce. This can counterintuitively reduce agricultural resilience and heighten vulnerability by incentivizing farmers to switch to more water-intensive crops. Thus, these investments must be combined with regulations and policies that promote judicious use.
  - Investments in physical infrastructure can generate a "moral hazard" by incentivizing people to remain in or even move to regions that are hydrologically and ecologically unable to support growing populations in the long run. In regions where sluggish migration traps people in nonviable places, the focus should be to remove barriers to mobility rather than place-based policies.
  - In resource-scarce settings, new irrigation systems are often at risk of becoming magnets for conflict. For instance, after the disruptions caused by the Arab Spring, irrigated regions of North Africa and the G5 Sahel countries were more likely to be sources of conflict. Decisions that alter access to shared resources may need complementary investments in governance, institutions, and effective social protection systems for the poorest and most vulnerable populations.
- Climate-smart agriculture and farmer-led irrigation can buffer rural livelihoods from climate change and increasing rainfall variability while minimizing the environmental footprint. Their context-sensitive nature makes these tools effective for increasing productivity, enhancing resilience, and reducing greenhouse gas emissions in a more inclusive and sustainable way.
- Either with or in lieu of physical infrastructure, green infrastructure (such as watersheds and their associated forests that store, filter, and gradually distribute both surface water and groundwater) can enhance the resilience and quality of water supplies. Investing in their preservation or restoration can provide long-term benefits while boosting shorter-term job creation. Forests are a vital source of drought-proof income for the rural poor, who often obtain a greater share of income from forest resources than from agriculture. Forests can act as a "green safety net" and buffer the amount of migration in times of drought. Finally, nature-based solutions are usually more cost-effective at providing protection against droughts and floods. Globally, on average it would cost about US$0.8 trillion to US$3 trillion in irrigation infrastructure to compensate for the buffering effects of lost natural capital due to a 10-percentage-point decrease in the share of forested land. Investing in complementary solutions to buffer incomes—such as protecting watersheds and forests while providing a canal or dam for irrigation—produces greater benefits than investing in any single one of these solutions.

Provide people-centered investments.

- While the provision of irrigation infrastructure and nature-based solutions may provide buffers that reduce the impacts of drought, residual risks remain. Safety net programs, such as cash and in-kind transfers, are critical as a last backstop to prevent severe deprivation when water shocks hit.
- Migrants' net economic effect at the destination depends on how well they are socially and economically integrated into their new homes. Poor migrants in informal settlements often endure high levels of violence and insecurity; lack basic services such as water supply and sanitation, schools, and health care; and reside in unsafe housing. Efforts to improve these services will pay large dividends, both to the migrants and to the broader city. Active labor market policies that build skills through support and training modalities and integrate migrants into labor markets can help to ensure migrants can take advantage of the economic opportunities cities have to offer. "No-regret" solutions, such as investments in workers' education and training, can ensure that workers are productive wherever they choose to locate.
- The context of legacies of violence, disrupted economic and social networks, and grievances can affect the success of investments. Therefore, they require careful design to ensure that communities' voices are heard in decision-making. In addition, trade-offs between short-term uncoordinated measures and long-term water sustainability objectives need to be managed through extensive coordination between humanitarian, security, and development actors. For example, overreliance on private water vendors to deliver water in the short term can undermine institutional ability to provide sector oversight and deliver services in the long run.

Preserve and sustain resources and infrastructure in cities.

- As the challenges to absorb the growing demands of urban populations and shocks to water supplies increase, city planners will need to build greater resilience in cities. Increasing water supply through desalination or other supply-augmenting technologies may seem like a quick fix, but these can be costly, risky, and inefficient. Demand-side management might offer a better way forward. Dynamically efficient volumetric pricing, for instance, can adjust the price of water to better match the scarcity and reduce water footprints. Other technologies, such as smart water meters and water-conserving appliances, can help households reduce their water footprint with little sacrifice.
- Water reallocation may offer another solution for ever-thirstier cities. Flexible approaches that allow for emergency transfers of water when needed can protect cities during extreme droughts. Drought option contracts could give the city the right to buy a set quantity of water at agreed prices during a drought. Since the option would be exercised only under agreed weather conditions, this would preserve water for agriculture during normal situations and ensure adequate remuneration for any water transfers.
- Better urban planning is sorely needed. Cities lie on impervious concrete foundations that block drainage patterns and cause water to run through the city—causing floods—and then away from the city—creating a missed opportunity. If cities were redesigned to resemble sponges, they could soak up that water, storing it below ground for future use, and prevent it from damaging above-ground structures. Such designs can improve urban water security and build resilience to climate change, ensuring that the cities' bright lights remain attractive to future migrants and current residents.

- In cities vulnerable to conflict, expansion and rehabilitation of water infrastructure enhances water security, which in turn underpins the gradual restoration of key public services. City planners should protect water infrastructure through redundancies (replicating elements of infrastructure, designing systems with diversified supply sources), contingency plans (stocking up consumables for water treatment plants, nominating replacement staff), and prioritization of easy-to-operate wastewater treatment solutions (such as stabilization ponds and constructed wetlands). These infrastructure investments should be integrated within broader plans to extend basic services to camps and informal settlements, and expand urban water systems' capacity to respond to higher water demand.

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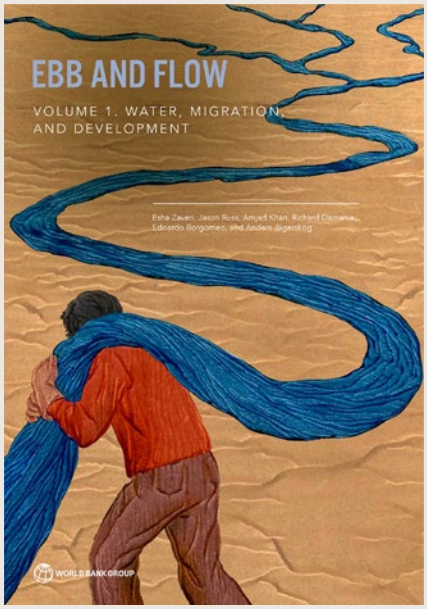

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