Understanding climate change – internal migration/displacement nexus in the context of coastal cities.

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Introduction

The Coastal City Resilience and Extreme Heat Action Project (CoCHAP) aims to build climate resilience of urban communities, particularly to extreme heat and coastal threats through expanding risk knowledge and strengthening local action in nine cities in Bangladesh, Indonesia, Honduras and Tanzania. The Project is funded by the USAID/BHA and has been implemented by the Red Cross Red Crescent (RCRC) National Societies of project countries with management and technical support from the International Federation of Red Cross Red Crescent (IFRC), American Red Cross and the RCRC Climate Center. During the inception period of the Project (Sept. 2022-Feb. 2023), a study was planned to analyse current and projected populations (e.g. implications on displacement and migration) in coastal and shoreline urban settlements at-risk of sea level rise and other processes related to climate change.

The results of the literature and data review showed that t**here are inherent uncertainties in the way climate will impact a given locale**, and this will affect the magnitude and pattern of climate induced displacement and internal migrations. Estimating the populations exposed to sea level rise has intrinsic uncertainties since characterization of potential exposure depends on robust

representations not only of coastal elevation and spatial population data but also of settlements along the urban–rural continuum [1]. It should also be noted that most of the available (and publicly accessible) data on displacement and migration are aggregated at the country level and do not indicate the type of settlements – arrival or destination – i.e., rural vs urban or coastal vs inland. In the humanitarian sector, generally the data on risks and disaster impacts is not disaggregated spatially. NASA's sea level projection tool [2] which provides an indicative sea level rise for coastal locations around the world and the International Displacement Monitoring Center (IDMC) are two prominent accessible relevant data sources. IDMC keeps track of in-country population movements and provides insights into displacement towards urban centres [3].

Environmental change will affect mobility of people now and in the future, specifically through its influence on a range of economic, social, and political drivers which themselves affect the mobility. However, establishing causal relations between displacement/migration and environmental changes including sea level rise is not straightforward and remains to be a demanding task [4].

In this space, the recently published ground-breaking African Shifts report by the African Climate Mobility Initiative (ACMI) provides unique insights documenting the current realities of climate-forced migration[i] in Africa and provides possible scenarios for future climate displacement [5]. The report is a result of an extensive literature review, field research in seven communities affected by climate hazards across the continent and modelling possible future scenarios for climate mobility (refers to involuntary displacement or relocation) in Africa. In addition, the nine-month consultation carried out with 537 organizations highlights the challenges of data availability.

This study presents a synthesis of the currently available data, analysis and projections, and reports on climate induced displacement and migration in coastal communities. It attempts to unpack the compounding effects of internal migration/displacement caused by climate-weather related events on cities and towns located in low-lying coastal/shoreline and delta areas (for abbreviation, hereinafter referred to as "coastal cities").

Climate change impacts on coastal cities

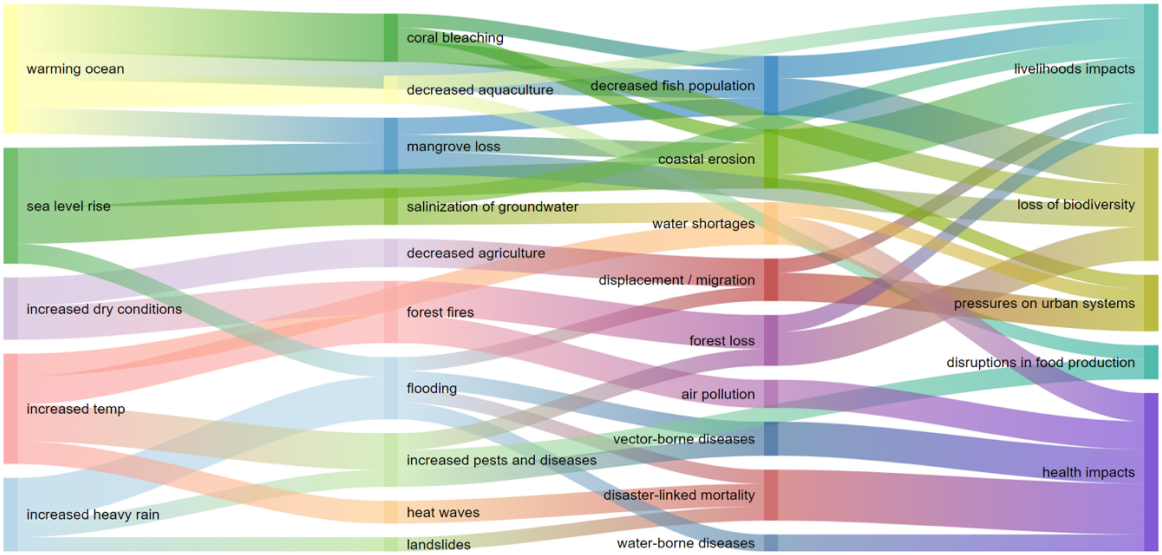
It is projected that approximately 800 million people in 570 cities will be exposed to the risks related to rising seas and storm surges by 2050 [6]. The impacts of climate change, particularly climate- and weather-related disasters are already having a large effect on global migration and displacement patterns globally [7]. In the past decade, 86% of all disasters triggered by natural hazards were caused by weather-and climate-related events, killing over 410,000 people, and affecting 1.7 billion [8].

Coastal settlements range from small settlements to small island states with maritime populations and/or beaches and atolls that are major tourist attractions, large cities that are major transport and financial hubs in coastal deltas, to megacities and even megaregions with several coastal megacities. The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) [9] mentions involuntary displacement and migration among the many adverse impacts of climate change. It notes the ocean-driven coastal risks to people, land and infrastructure in places

[i] In this context, "climate forced migration" is understood to reflect the involuntariness and compulsion of displacement, while migration is regarded as at the other end of the continuum reflecting more "voluntary" forms of movement. While it is also understood that this dichotomy between displacement and migration is not perfect, and they exist along a continuum. Some of the resources cited here uses the term "climate mobility" referring to both involuntary and voluntary population movements caused by climate change related events.

associated with higher inequality and high growth rates, especially in deltas, leading to larger vulnerability and exposure *(with high confidence[ii])*, respectively, under higher warming levels. Coastal areas also face climate hazards that are not specific to the coast, including heat waves, snowstorms, heavy rainfall, flooding, storms, and landslides. Rapidly urbanizing coastal areas are at particularly high risk of losses due to their location and exposure to extreme natural events including tides, currents and waves, runoff, storms, sediment flow, and erosion.

Figure 1: Impacts of Climate Change (Illustration by American Red Cross).



As temperatures and sea levels rise, climate change contributes to flash floods, salinization of water sources, and more intense storm surges associated with severe cyclones. The Asia and Pacific region have the highest risk of flood displacement, with more than 86% of those at risk living in urban and peri-urban areas [10].

Figure 1 illustrates the complex web of impacts of climate change on five main impact areas relevant to coastal cities: water shortages, coastal erosion, loss of livelihood, health impacts and decreased water quality. The risk of water-borne diseases increases in parallel to the risk of flooding leading to reduced water quality. Similarly, risk of heat-related mortality is projected to increase from less than 1 per 100,000 to up to 25 per 100,000 by 2050. For example, about 20 million people in coastal Bangladesh are already having their health affected by saltwater intrusion into drinking water supplies related to sea level rise [11].

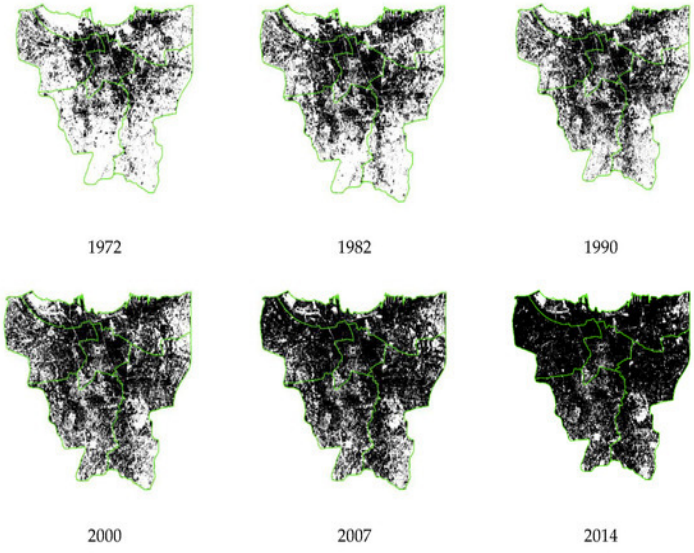
Coastal cities also face climate hazards that are not specific to their coastal location, including heat waves, snowstorms, heavy rainfall, flooding, storms, and landslides. While large scale sudden-onset events such as flash floods have the potential to destroy assets, lives, and livelihoods, slow-onset events, such as sea level rise, drought, and desertification may interact with and aggravate sudden-onset hazards such as storm surge [12]. In 2013, the sudden onset of Typhoon Haiyan within the Philippines caused significant damage to buildings and infrastructure, flooding in low-lying areas, landslides and storm surges [13]. For coastal cities and urban areas,

[ii] IPCC describes the level of confidence as very low, low, medium, high and very high, expressing evidence, agreement and confidence. For a given evidence and agreement statement, increasing levels of evidence and degrees of agreement are correlated with increasing confidence.

the heat island effect[iii] worsens the impacts of drought and aridity. The IPCC assessment report notes that droughts, whether meteorological, hydrological, agricultural, or ecological, and while differing by region, also significantly impact cities through groundwater withdrawal and thus depletion [14].

Sea level rise poses a particular threat to large urban settlements and major infrastructure along the coast, particularly in small island developing states, where the ability to retreat to higher ground is limited, and in the coastal cities in Southeast Asia. While the current global mean sea-level rise is at 3.7 mm per year, certain regions are experiencing much higher rates. One study showed that the median sinking speed of 48 coastal cities in Southeast Asia was 16.2 mm per year [15]. A recent study which combines the impact of climate change with natural oceanic fluctuations predicts that in the Philippine capital Manila coastal flooding events within the next century will occur 18 times more often than before, solely because of climate change [16].

Figure 2: Expansion of built-up area of Jakarta from 1972 to 2014.



In Jakarta, Indonesia, uncontrolled groundwater extraction for private and industrial uses and land compaction due to expanding construction of buildings and other infrastructure have led to rapid subsidence, with rates up to 25 cm per year [17]. Figure 2 illustrates the expansion of built-up area of Jakarta (276%) from 1972 to 2014. Particularly the northern, coastal parts of the city that are characterized by a very low-lying topography absorbed most of the urban growth.

Source: Garschagen M, et al., (2018),

Compounding Risks – Physical & Social

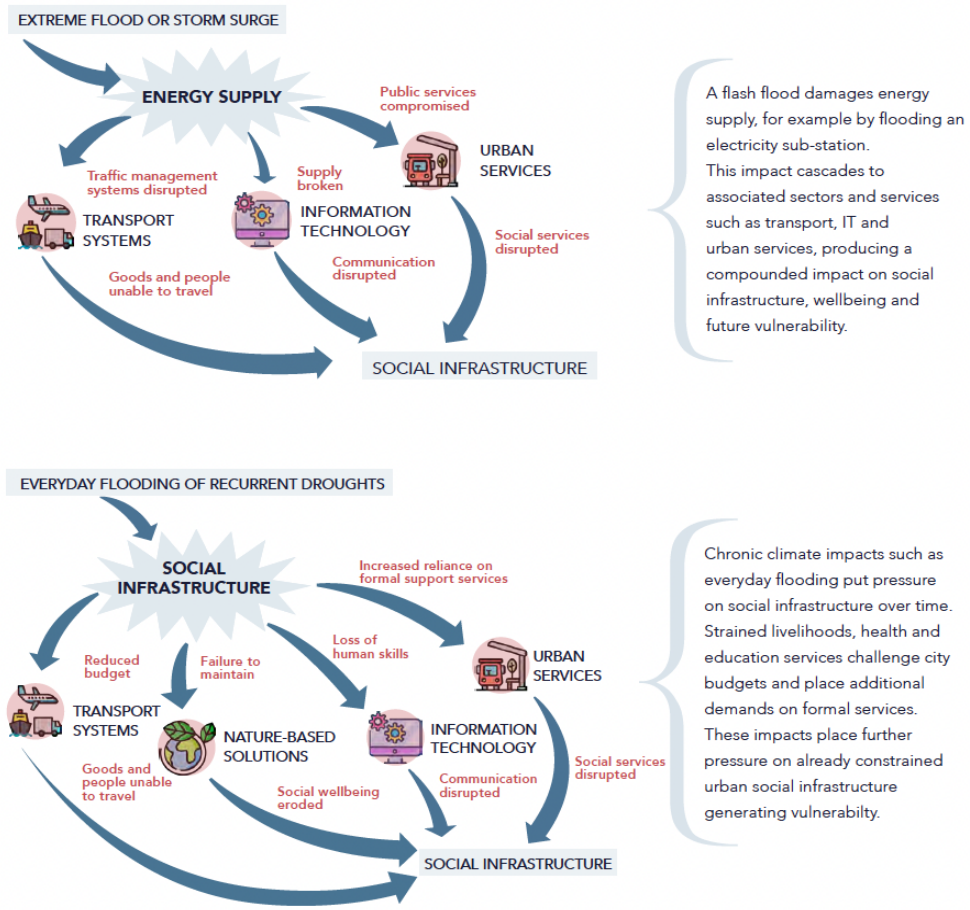
For urban areas, it is important to understand the compounding and cascading nature of the risks. Given the complexity of city systems and structures, even non-extreme events when occurring simultaneously or in succession can lead to extreme impacts that far exceed the impact of individual events (see Figure 2). In many cities and low-lying areas, concurrent storm surges and high river flows have led to compound flooding. The IPCC projects that such events will increase in frequency, along with wildfires which are compounded hot, dry, and windy conditions [18].

The social construction of risk is particularly important in urban contexts. The rapid and unplanned pattern of urbanization occurring in developing countries forces newcomers to settle in disadvantages places. These places are where densities are high, houses, often constructed illegally and without adherence to building codes, and critical infrastructure, including piped

[iii] *Urban areas, where built-up structures and traffic flows are highly concentrated and greenery is limited, become "islands" of higher temperatures relative to outlying areas. These pockets of heat are referred to as "heat islands."*

water, sanitation, drainage, solid waste collection, and roads are often inadequate or absent, increasing risk.

Figure 2: Compounding and cascading impacts of extreme and everyday weather-related events in cities,



Source: IPCC (2022).

In Khulna, Bangladesh—ranked one of the top 20 cities in number of people projected to be exposed to coastal flooding by 2070 in the country—the underlying social and political marginalization of low-income communities and informal settlements has been identified as the single most important factor contributing to their vulnerability. Many of these informal settlements are also the likely destination of Khulna's growing low-income migrants displaced by disasters [19]. Despite its relevance, the impacts of urban poverty are often ignored within city planning, new urban growth areas, or national climate policies.

Climate change and internal migration-displacement nexus

In 2021, weather and climate hazards were cited as the reason for the 94 percent of the 23.7 million people who were internally displaced by disasters [20]. A recent report by the IFRC reiterates the well documented fact that most people who move because of the impacts of climate change are displaced within their own country. People and communities moving across borders because of climate change are smaller in numbers but face a critical legal protection gap [21]. The scale of movements across international borders is smaller although no global estimates

are available. While many people are able to return home in the days or weeks after a disaster and begin to rebuild their lives, it is a mistake to assume that all displacement due to disasters is short-term. The World Bank (2018) estimates that about 60%–80% of the world's forcibly displaced population lives in urban areas [22].

Internal migration is a large contributor to urbanization. According to the International Organization for Migration (IOM), approximately 40 percent of the urban growth rate in low- and middle-income countries is related to migration although the pattern is not uniform across countries; Migration represents less than one-third of urban population growth in Sub-Saharan Africa but far more in Asia [23]. Climate change affects people's livelihoods both directly and indirectly. People can decide to migrate as a livelihood strategy when climate change affects overarching variables such as the economy, environment, and political system they live in. Climate change can also affect inhibitors or facilitators of migration, and people's natural, financial, human, and social capital [24].

According to the World Bank, climate change is a growing driver of internal migration in at least three regions: Sub-Saharan Africa, South Asia and Latin America, and is projected to intensify over the next several decades and could accelerate after 2050 due to stronger climate impacts combined with steep population growth in many regions[iv]. Under the worst-case or "pessimistic" scenario[v], the number of 'internal climate migrants' could reach more than 143 million (around 86 million in Sub-Saharan Africa, 40 million in South Asia, and 17 million in Latin America) by 2050 [25].

Even though the urban populations in Africa and South Asia are expected to grow substantially, the World Bank (2018) predicts a decrease in the number of people living in coastal zones as a result of climate change, with the highest levels of out-migration. The **climate-driven "out-migration" will occur in areas where livelihood systems are increasingly compromised by climate change impacts**. These "hotspots" are increasingly marginal areas and can include low-lying cities, coastlines vulnerable to sea level rise and storm surge, and areas of high water and agriculture stress.

The report predicts that the major cities of Dhaka in Bangladesh and Dar es Salaam in Tanzania will experience dampened population growth due to rising sea level and storm surges. Climate "in-migration" hotspots across the three regions emerge in locations with better climatic conditions for agriculture as well as cities able to provide better livelihood opportunities. For example, the southern highlands between Bangalore and Chennai in India, the central plateau around Mexico City and Guatemala City, and Nairobi in Kenya are likely to become areas of increased climate in-migration.

A closer look into climate displacement-internal migration in Africa

The challenges in the availability of data connecting the climate change-migration-displacement in coastal areas, particularly to coastal cities are mentioned in the introduction. The recently published ground-breaking African Shifts report provides unique insights documenting the

[iv] The World Bank (2018), *Groundswell: Preparing for Internal Climate Migration*. This report, the first of its kind to introduce slow-onset climate impacts into a model of future population distribution also notes that robust projections of internal climate migration over large areas are rare.

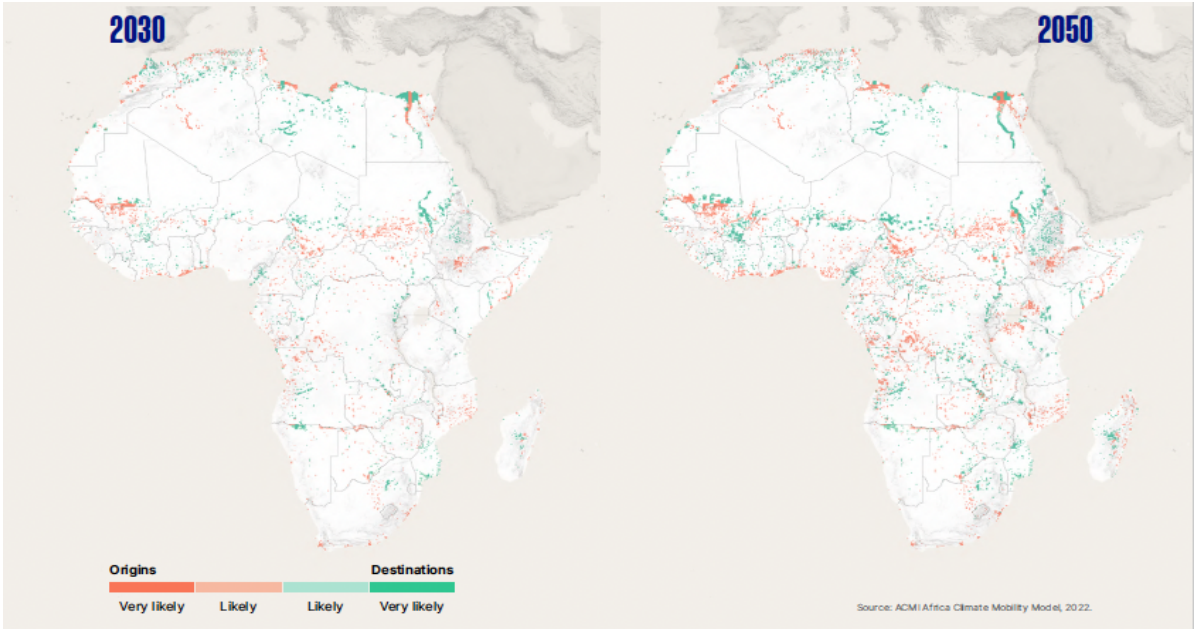
[v] The report considers three potential climate and development scenarios:

- "pessimistic" (high greenhouse gas emissions combined with unequal development pathways)—the "reference scenario" for the Report.
- "more inclusive development" (similarly high emissions but with improved development pathways).
- "more climate-friendly" (lower global emissions combined with unequal development).

current realities of climate-forced migration in Africa and provides possible scenarios for future climate displacement [26]. According to this study, in Africa, climate impacts generally act alongside other drivers such as the search for education and job opportunities, access to livelihoods and social services, and the draw of family ties. Two out of every five African youth consulted, some 40 percent, considered mobility normal. Almost one in five had concrete plans to move. That said, there is a widespread lack of knowledge about the connections between climate change and its impacts on livelihoods. Current coping responses are therefore unlikely to prove sustainable. People are deciding to stay or move without adequate information on the risks of remaining in place or those associated with relocation [27].

The report predicts that along the coasts, sea level rise and flooding will force people to move out of low-lying areas, despite the opportunities they currently provide, and Africa's cities will be dynamic hotspots of climate mobility. Coastal areas around Africa could lose up to 2.5 million people by 2050 due to steady sea level rise, flooding, and other climate stressors. The report also notes that, "of the top four climate mobility source cities — Accra, Desouk, Casablanca and Asmara — the first three are coastal or along major rivers and are projected to experience increases of either sea-facing or river system flooding". Abidjan is the largest among the top ten climate mobility source cities and is projected to see outward mobility due to impacts from sea level rise and flooding.

Figure 3: Internal climate mobility hotspots



(Source: ACMI, 2022)

In most **small African cities and towns**, **climate mobility will add to population growth**. Khartoum, Maputo, Goma, Tripoli, and Kigali are also emerging as important climate mobility destinations on the continent. The report also notes that populations in **informal settlements are particularly affected** by extreme heat, flooding, extreme rainfall, sea level rise, and erosion.

The capital city of Tanzania, Dar es Salaam, is expected to reach megacity status of more than 10 million residents by 2030 [28]. At the same time, about 8% of Dar es Salaam lies within the low-elevation coastal zone. This will make a significant part of the growing population in the city exposed to flood events and sea level rise and 122,000 people are projected to move out of the city by 2050 due to climate change [29].

Figure 4: Flooding in Buguruni ward after heavy rain in Dar es Salaam (2019). Photo by Chris Morgan.

Another interesting finding of the report is the gender disparity in climate stressors; women perceive and experience climate stressors more acutely than men, even if they are less climate literate. Despite their awareness of climate-related hazards, and the fact that more women than men had moved in the past (possibly for marriage), women were generally less likely to aspire to move than men. When people need to move in search of livelihoods, it is often young adults who move, in some cases men more often than women.

Adapting to the reality of climate induced migration-displacement in coastal cities

Unsustainable urban planning practices and unplanned development have been critical drivers of exposure and vulnerability to the devastating impacts of climate change in coastal cities. However, despite this challenging outlook, there are opportunities for coastal cities to mitigate some of the negative effects on their populations. These choices should aim to offset climate impacts as much as possible and enable people to stay in places of their choice rather than forcing them migrate or causing involuntary displacements [30]. As the African Shift report states, "*Africans generally want to remain in their communities and continue their way of life*".

The World Bank predicts that 1.2 million km² of new urban area will be built globally by 2030 [31]. We can argue that this presents opportunities for cities to adopt inclusive and sustainable urban development pathways including:

- Investing in sustainable and climate smart infrastructure and housing.
- Updating building codes and zoning to account for sea level rise and coastal flooding.
- Adopting nature-based low carbon solutions for urban systems including water, transportation, and energy.
- Improving locally owned and timely climate and disaster risk information services and literacy.
- Expanding and improving social protection measures.
- Diversifying income-generating activities.
- Adopting participatory and inclusive urban planning policy and practices.

- Embracing climate smart decisions based on known relevant climate hazards.
- Addressing inequalities in accessing basic services e.g., housing, health, education, finance, transportation, etc.
- Partnering with private sector, particularly in cities that are tourism centres or industrial and trade hubs.

Many of the world's cities that are facing sea level rise focuses on keeping water away from the built environment via two main ways: protecting coastlines from floods, storm surge and inundation – restoring natural coastal ecosystems or building physical, synthetic structures – or both [32]. Planning for possible relocations of the communities predicted to be displaced to due climate change (planned relocation or managed retreat) is increasingly becoming a topic of discussion at the international forums [33].

Managed retreat is a highly contentious topic and is often considered a last resort due to high cost and reluctance of people leaving their homes [34]. However, given the magnitude of the projected climate mobility, local to national governments and the international community should be prepared to manage the climate mobility in a way that protects the most vulnerable communities[vi]. IPCC warns that failure in adopting multi-sectoral and inclusive adaptation action to climate change can create lock-ins of vulnerability, exposure and risks that are difficult and expensive to change and exacerbate existing inequalities (*high confidence*) [35].

An IFRC report draws attention to the importance of community engagement and states that irrespective of the definition employed or context, to be successful, a planned relocation must provide a "durable solution[vii]" addressing two essential elements [36]: *re-location* – the physical movement of people from one place to another; and *re-settlement* – the re-establishment of lives and livelihoods post-physical movement.

Planned relocation is specifically recognised in decisions taken by parties to the United Nations Framework Convention on Climate Change as a measure by which States can enhance action on climate change adaptation [37].

Recommendations for adopting the realities of climate change in coastal cities.

It is important to adopt a holistic approach acknowledging the close linkages between rural and urban spaces shaping the future mobility of populations. National and local governments should adopt integrated spatial planning, flexible social service delivery and safety nets, and food systems for both rural and urban areas. A people-centered, locally-led, and integrated approach to migration governance at both local and national levels is critical.

National and local governments, as well as development and humanitarian communities, should also engage with diaspora communities and may opt to use remittances for building household

[vi] One of the successful examples of managed retreat/planned relocation is town of Valmeyer in in Illinois, US. After the village was engulfed in up to 16ft (5m) of floodwater in 1993, hundreds of people chose to move out of the floodplain as the entire town was rebuilt from scratch on a bluff a mile uphill. https://www.bbc.com/future/article/20220310-the-illinois-town-valmeyer-could-be-a-model-for-relocation?ocid=ww.social.link.email

[vii] According to the Inter Agency Standing Committee, a 'durable solution' is "achieved when internally displaced persons no longer have any specific assistance and protection needs that are linked to their displacement and can enjoy their human rights without discrimination on account of their displacement.

and community resilience and support trade and productive links, and encourage collaboration between communities and countries connected by climate mobility.

A consorted effort is needed by national and local governments, humanitarian and development actors to improve the spatial dimension of the data. In this effort, new data sources – including from satellite imagery, mobile phones, and crowd-sourced information – should help pinpoint the spatial movement of populations.

Above all, the future of sustainable cities and resilient communities calls for significantly increased community engagement, strengthening of social capital, and leveraging of local resources in addition to improving infrastructure and services by governments and development organizations. In this space, there is a lot that the RCRC National Societies and their local partners can do [38]. The IFRC is also committed to addressing climate related displacement as documented in the "Displacement in a Changing Climate" report [39].

Building climate resilience of urban communities, particularly to extreme heat and coastal threats is the aim of the "Coastal City Resilience and Extreme Heat Action Project" and a set of actions are articulated in the Project proposal that align with the above-mentioned recommendations. The city coalitions for climate resilience that are in the process of being set up in Project cities under the CoCHAP will be encouraged to look into internal migration/displacement issues while undertaking the city-wide risk assessments. The results of this process will increase the understanding of the demographic, socio-economic, and environmental impacts of climate change, and the need for strong climate resilience measures in affected coastal and shoreline urban settlements.

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