



Government
Office for

Science

 **Foresight**

Migration and Global Environmental Change

Future Challenges
and Opportunities

FINAL PROJECT REPORT

Migration and Global Environmental Change

Future Challenges and Opportunities

This report is intended for:

Policy makers and a wide range of professionals and researchers across the world whose interests relate to environmental change and the many forms of human migration. It will also be of interest to those working in the many areas that interact with migration, for example conflict and security, the sustainability of communities, food supply, climate change mitigation and adaptation, and also developmental and humanitarian agendas.

This Report should be cited as:

Foresight: Migration and Global Environmental Change (2011)
Final Project Report
The Government Office for Science, London

Foreword



A range of major forces are set to cause profound changes in natural and human environments across the world over the next 50 or so years. Besides climate change, examples include the growth of mega-cities, land degradation and the profound consequences of an increasing global population which is consuming ever more natural resources. The key aim of this Foresight project has been to consider how these global drivers could affect the volume and patterns of human migration out to 2030 and thence to 2060; and, importantly, the decisions that need to be taken today by policy makers at national and international levels to address the future challenges.

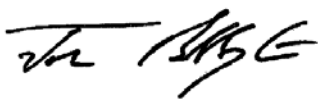
Some of the results have been surprising, if not counterintuitive. For example, recognising in particular that most migration will be within countries, the project has found that broadly as many people could move *into* areas of environmental risk as migrate from them. Also, a major challenge concerns the large populations in vulnerable areas that may become trapped, or indeed choose not to move. Such consequences raise concerns for policy makers which go far beyond the management of migrating populations. These relate to issues such as climate change adaptation, urban planning, developmental assistance and conflict management. The diversity of these challenges argues for a new strategic approach towards policy development, and exploring this has been a theme running throughout the work.

I am particularly grateful to the lead expert group who oversaw much of the work and also to the Foresight team.

I am also most grateful to the group of senior stakeholders who have provided advice throughout the project, and to the 350 or so contributing experts based in over 30 countries, and representing disciplines as diverse as geography, migration studies, climate science, anthropology, economics and international politics. They have all made important contributions, whether in producing evidence papers, undertaking essential peer review or providing regional perspectives by participating in our international expert workshops. Together they have ensured the project and report have a broad, global perspective.

Other important elements of the work include the use of cutting-edge science and the innovative approach taken in considering the issues of migration and environmental change. The result has been a range of fresh insights across a broad front. A report of this breadth aims to provide signposts to important future challenges, and to present a range of options for policy makers.

Through the publication of this final report, I have pleasure in presenting the findings to the many interested stakeholders from across the world.



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<http://www.bis.gov.uk/foresight/our-work/projects/current-projects/global-migration>



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Executive Summary

Key conclusions

This report considers migration in the context of environmental change over the next 50 years. The scope of this report is international: it examines global migration trends, but also internal migration trends particularly within low-income countries, which are often more important in this context. The report has the following key conclusions:

- **Environmental change will affect migration now and in the future, specifically through its influence on a range of economic, social and political drivers which themselves affect migration.** However, the range and complexity of the interactions between these drivers means that it will rarely be possible to distinguish individuals for whom environmental factors are the sole driver ('environmental migrants'). Nonetheless there are potentially grave implications of future environmental change for migration, for individuals and policy makers alike, requiring a strategic approach to policy which acknowledges the opportunities provided by migration in certain situations.
- **Powerful economic, political and social drivers mean that migration is likely to continue regardless of environmental change.** People are as likely to migrate to places of environmental vulnerability as from these places. For example, compared to 2000, there may be between 114 and 192 million additional people living in floodplains in urban areas in Africa and Asia by 2060, in alternative scenarios of the future. This will pose a range of challenges to policy makers.
- **The impact of environmental change on migration will increase in the future.** In particular, environmental change may threaten people's livelihoods, and a traditional response is to migrate. Environmental change will also alter populations' exposure to natural hazards, and migration is, in many cases, the *only* response to this. For example, 17 million people were displaced by natural hazards in 2009 and 42 million in 2010 (this number also includes those displaced by geophysical events).
- **The complex interactions of drivers can lead to different outcomes, which include migration and displacement.** In turn, these types of outcomes can pose more 'operational' challenges or more 'geopolitical' challenges. There are powerful linkages between them. Planned and well-managed migration (which poses operational challenges) can reduce the chance of later humanitarian emergencies and displacement.
- **Environmental change is equally likely to make migration less possible as more probable.** This is because migration is expensive and requires forms of capital, yet populations who experience the impacts of environmental change may see a reduction in the very capital required to enable a move.
- **Consequently, in the decades ahead, millions of people will be *unable* to move away from locations in which they are extremely vulnerable to environmental change.** To the international community, this 'trapped' population is likely to represent just as important a policy concern as those who do migrate. Planned and well-managed migration can be one important solution for this population of concern.
- **Preventing or constraining migration is not a 'no risk' option.** Doing so will lead to increased impoverishment, displacement and irregular migration in many settings, particularly in low elevation coastal zones, drylands and mountain regions. Conversely, some degree of planned and proactive migration of individuals or groups may ultimately allow households and populations to remain in situ for longer.

The challenges of migration in the context of environmental change require a new strategic approach to policy. Policy makers will need to take action to reduce the impact of environmental change on communities yet must simultaneously plan for migration. Critical improvements to the lives of millions are more likely to be achieved where migration is seen as offering opportunities as well as challenges.

- **Measures that prevent harmful environmental changes, reduce their impact, and build resilience in communities** will diminish the influence of environmental change on migration but are unlikely to fully prevent it.
- **Migration can represent a ‘transformational’ adaptation to environmental change, and in many cases will be an extremely effective way to build long-term resilience.** International policy should aim to ensure that migration occurs in a way which maximises benefits to the individual, and both source and destination communities.
- **Cities in low-income countries are a particular concern, and are faced with a ‘double jeopardy’ future.** Cities are likely to grow in size, partly because of rural–urban migration trends, whilst also being increasingly threatened by global environmental change. These future threats will add to existing fragilities, whilst new urban migrants are, and will continue to be, particularly vulnerable. Yet this report argues against trying to prevent rural–urban migration, as this could lead to graver outcomes for those who are trapped in vulnerable rural areas.

In summary, the key message of this report is that migration in the face of global environmental change may not be just part of the ‘problem’ but can also be part of the solution. In particular, planned and facilitated approaches to human migration can ease people out of situations of vulnerability. In light of this, international policy makers should consider the detailed evidence from this report in a range of areas, with the following of particular priority:

1. **Many of the funding mechanisms for adaptation to environmental change are currently under discussion.** It is imperative that these mechanisms are not developed in isolation from migration issues and, furthermore, that the transformational opportunities of migration is recognised.
2. **Whilst the twin challenges of population growth and environmental change will pose an increasing threat to urban areas in the future, cities in many countries are already failing their citizens.** Action is required before the situation becomes irreversible, to build urban infrastructure that is sustainable, flexible and inclusive.

The cost of inaction is likely to be higher than the costs of measures discussed in this report, especially if they reduce the likelihood of problematic displacement. Giving urgent policy attention to migration in the context of environmental change now will prevent a much worse and more costly situation in the future.

1. The aims and scope of the project

The aim of this report has been to use the best available science and other evidence to:

- develop a vision for how human population movements across the world could be affected by global environmental changes between now and 2060; with a focus on the diverse challenges and opportunities for migrants and populations in originating and receiving regions;
- identify and consider the decisions and choices that policy makers need to take today so that new policies are resilient to the wide range of future uncertainties.

A global perspective

The report takes an unequivocally global approach to the issue of migration in the context of environmental change. This has involved:

- analysing international migration on a global level, between low-income and high-income countries and among low-income countries;
- analysing internal migration, particularly in low-income countries, which are most vulnerable to environmental change;

- looking at the impact of environmental changes arising from climate change, as well as land degradation and coastal and marine ecosystems degradation;
- understanding that links between migration and environmental change are particularly important in three key global ecological regions: drylands, low-elevation coastal zones and mountain regions;
- recognising that the impact of environmental change on future migration is uncertain – different growth, governance and environmental scenarios have diverse implications for migration influenced by environmental change.

A robust and independent approach

The analysis provides an independent look at the challenges ahead and how they might best be addressed. Whilst the work has been led by the UK Government Office for Science, the findings do not constitute the policy of the UK or any other government. The report's added value is the robustness of the evidence it uses, and the scrutiny and engagement it has received from a wide range of experts:

- The report uses cutting-edge science from the broadest possible range of disciplines: from migration studies, economics, climate and environmental change, social sciences, demography, and geography. More than 70 papers and other reviews of the state of the art of diverse areas of science were commissioned to inform the analysis¹.
- The development of the report has seen the involvement of around 350 leading experts and stakeholders from 30 countries worldwide. This has been crucial in enabling diverse regional perspectives and understanding to inform the work.

2. What is the relationship between migration and environmental change?

It is almost impossible to distinguish a group of 'environmental migrants', either now or in the future.

There are a number of existing estimates of the 'numbers of environmental/climate migrants', yet this report argues that these estimates are methodologically unsound, as migration is a multi-causal phenomenon and it is problematic to assign a proportion of the actual or predicted number of migrants as moving as a direct result of environmental change. A deterministic approach that assumes that all or a proportion of people living in an 'at-risk' zone in a low-income country will migrate neglects the pivotal role that humans take in dealing with environmental change, and also ignores other constraining factors which influence migration outcomes.

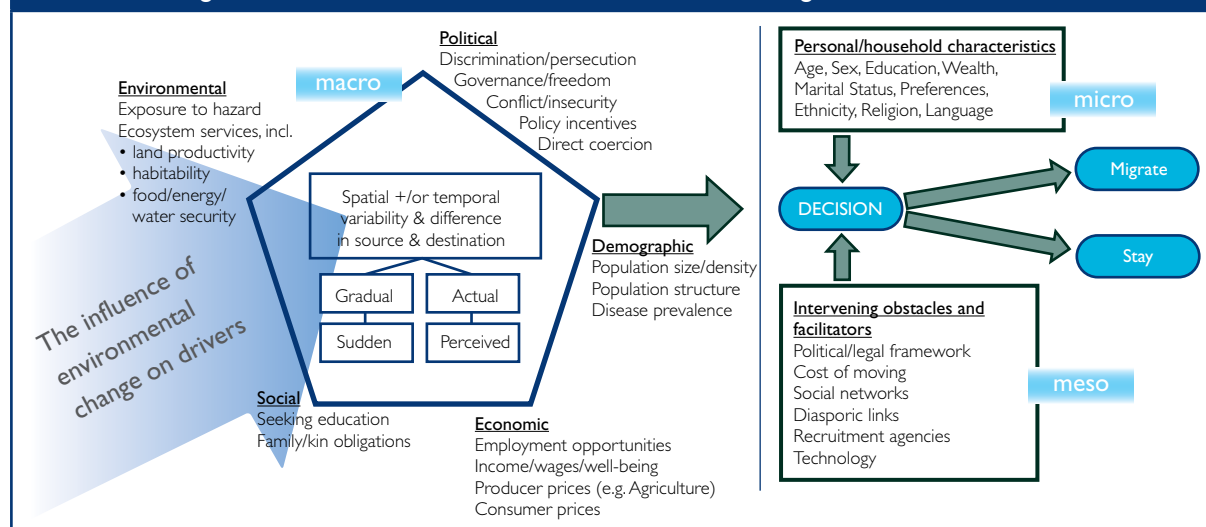
This is not to say that the interaction of migration and global environmental change is not important: global environmental change does have real impacts on migration, but in more complex ways than previous cause-effect hypotheses have indicated.

Foresight's conceptual approach: global environmental change affects the drivers of migration.

The decision to migrate is influenced by five broad categories of 'driver'. These drivers are set out at the vertices of the pentagon in Figure ES.1. This framework acknowledges that migration is already occurring in most parts of the world as a result of these drivers: indeed there were approximately 740 million internal migrants in 2009 and approximately 210 million international migrants in 2010. Environmental change will influence migration outcomes through affecting existing drivers of migration. This influence is most pronounced for economic, environmental and, to a lesser degree, political drivers. This conceptualisation recognises that the powerful existing drivers of migration, with economic drivers foremost, will continue to be the most powerful in most situations. However, environmental change will affect these drivers by having impact, for example, on rural wages, agricultural prices, exposure to hazard and provisioning ecosystems.

¹ See Annex D for a complete list. Apart from workshop reports and working papers, all evidence papers have been peer reviewed to a 'double-blind' standard. All are freely available, as indicated in Annex D.

Figure ES.1: The conceptual framework that has been used in this project, showing the 'drivers' of migration and the influence of environmental change²



Environmental change is equally likely to prevent migration as it is to cause migration.

An important feature of the diagram above is that the existence of migration drivers does not necessarily imply that migration will occur: whether migration occurs or not depends on a series of intervening factors and personal and household characteristics. This is important in the context of environmental change. Substantial social, economic and human capital may be required to enable people to migrate, especially internationally.

This may mean that environmental change affects a driver, for example agricultural productivity, yet affected individuals do not have the financial capacity to respond to this change by migrating. Environmental change may also erode important assets, meaning that in some situations environmental change can make migration less likely. This has important implications for poorer individuals who are unable to finance migration, but are also vulnerable to environmental change. For example, evidence from Uganda suggests that, in contrast to Kenya (see below), migration is costly with high 'barriers to entry'. In situations like this, where there are reduced opportunities for migration, soil quality acts as capital to facilitate migration; deterioration in soil quality makes migration less likely.

3. What does future migration in the context of environmental change look like?

Key themes about future migration in the context of environmental change have been distilled through evidence gathering across three vulnerable regions, and applied to the socioeconomic and political dimensions of four future scenarios. The themes are as follows:

Migration is often undertaken to secure livelihoods in adverse environmental conditions.

A powerful conclusion from the analysis of the three key vulnerable ecological regions is that migration is often a response taken at the household level to diversify income streams and secure livelihoods in the face of deteriorating environmental conditions. For example:

- A case study in Kenya between 2004 and 2005 found that migration was an important form of income diversification for households which experienced poor soil quality, and reduced agricultural yields.
- In Burkina Faso in the 1970s, a common and widespread early response to drought was short-term, rural–rural migration to diversify incomes.
- A study in the Ethiopian highlands between 1996 and 2001 found that labour-related migration was a key coping strategy following drought.

² The Final Project Report explains this in more detail in Chapters 1 and 2.

- Evidence from Vietnam suggests that flooding can destroy crops and act as a trigger to livelihood stress, which then directly causes migration.

Migration as a form of livelihood diversification has been shown to occur after environmental events such as drought and flooding. Climate models predict that events such as these are likely to become more frequent for some regions after 2030 and 2060.

Rural–urban migration is increasing in some situations because of environmental change, and people arriving in cities are vulnerable.

Evidence from Bangladesh suggests that rural–urban migration can be a coping strategy for households affected by environmental events. A survey from the island of Hatia, coastal Bangladesh, found that 22% of households used migration to cities as a coping strategy following tidal surges, and 16% following riverbank erosions. A cross-country analysis of determinants of urbanisation in sub-Saharan Africa suggests that deteriorating rainfall conditions do increase rural–urban migration. In contrast, however, evidence from Mali during the 1983–85 droughts shows that people who have been affected by drought are less able to afford to migrate to cities.

In some respects, whether environmental change affects these rural migration flows is of less importance than the fact that major economic, political and social factors will continue to drive migration to cities in low-income countries, and that many of these cities are particularly vulnerable to environmental change.

- The number of people living in floodplains of urban areas in East Asia may rise from 18 million in 2000 to 45–67 million by 2060, and:
- from 4 million in 2000 to 35–59 million by 2060 in South-Central Asia;
- from 7 million in 2000 to 30–49 million by 2060 in South-Eastern Asia;
- from 2 million in 2000 to 26–36 million by 2060 in Africa (depending on various scenarios of the future).

Environmental change can influence future displacement, as well as migration.

- There is evidence that exposure to hazards such as floods and storm surges is a major source of displacement of populations, both temporary and permanent, in coastal areas. For example, in the New Orleans area in 2005, Hurricane Katrina displaced north Gulf Coast residents for months and, in some cases, years: by 2010 (using 2005 as a base year) the population of the New Orleans region had declined by 25.4%. Texas received over 250,000 Katrina migrants.
- Displacement can also occur in drylands. In the late 1980s and early 1990s, around 100,000 people moved out of Karakalpakstan, in part because of loss of livelihoods related to the desiccation of the Aral Sea, representing 1 in 16 of the population.

Where people have reduced options for migration, they are likely to be trapped in locations vulnerable to environmental hazards, or be forced to migrate in ways which increase their vulnerability.

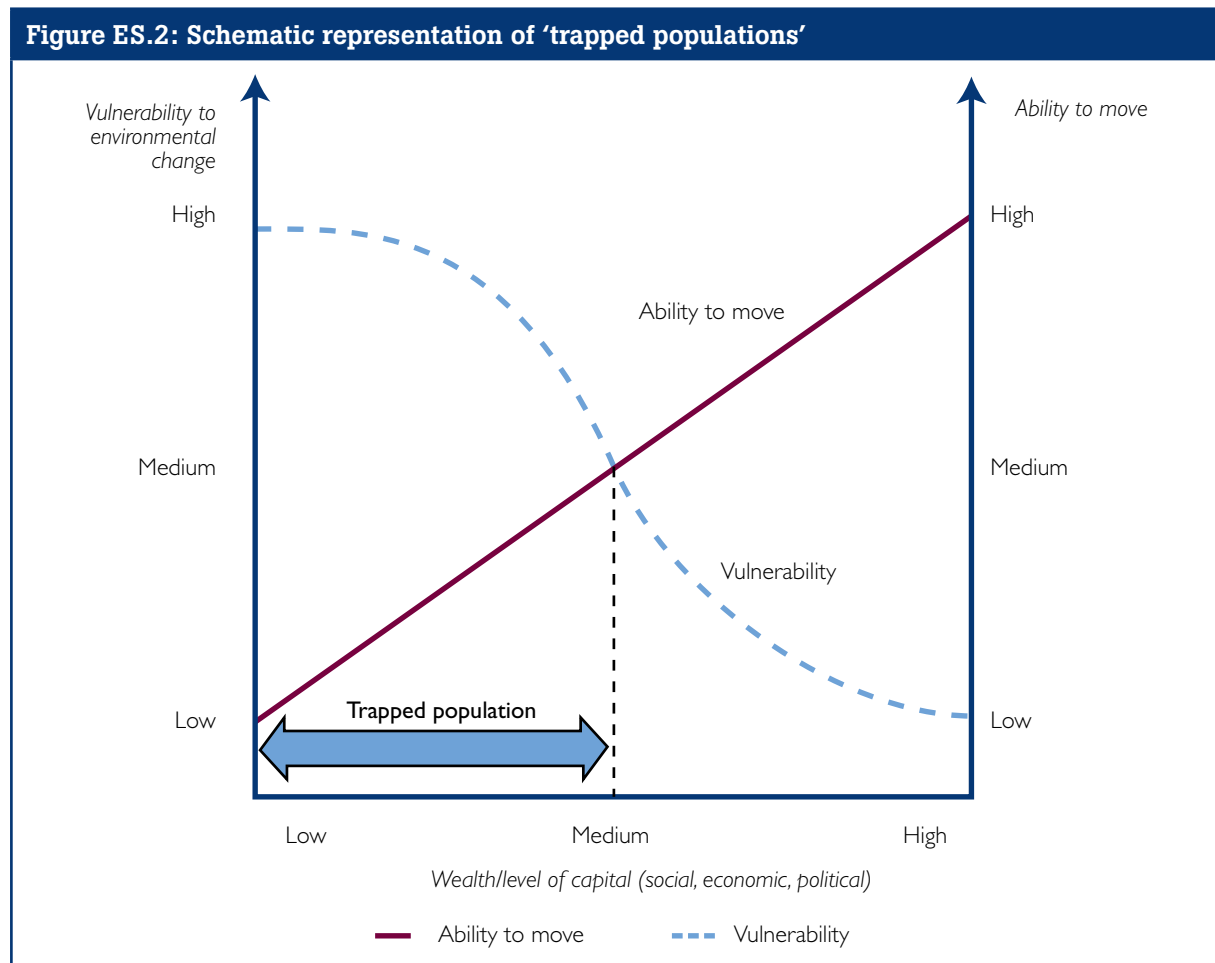
Reduced options for migration, combined with incomes threatened by environmental change, mean that people are likely to migrate in illegal, irregular, unsafe, exploited or unplanned ways. People are also likely to find themselves migrating to areas of high environmental risk, such as low-lying urban areas in mega-deltas or slums in water-insecure expanding cities.

Many populations will be at risk because safe migration channels from small island environments and marginal agricultural lands in the world's drylands and mountains are unavailable to them. This means that they may become trapped in poor areas, where they are likely to be more vulnerable to increasingly worse environmental conditions.

- For example, in small island states and other islands, people living in flood-prone areas, or close to exposed coasts, are already relatively poor and are unable to respond to hazards by moving, since migration (especially international migration) is selective by economic status.

- In New Orleans during Hurricane Katrina, the wealthy were able to migrate proactively, whilst the lower-income and less educated population group remained in their homes, or sought shelter in makeshift and potentially dangerous emergency shelters in the aftermath, and were disproportionately affected.

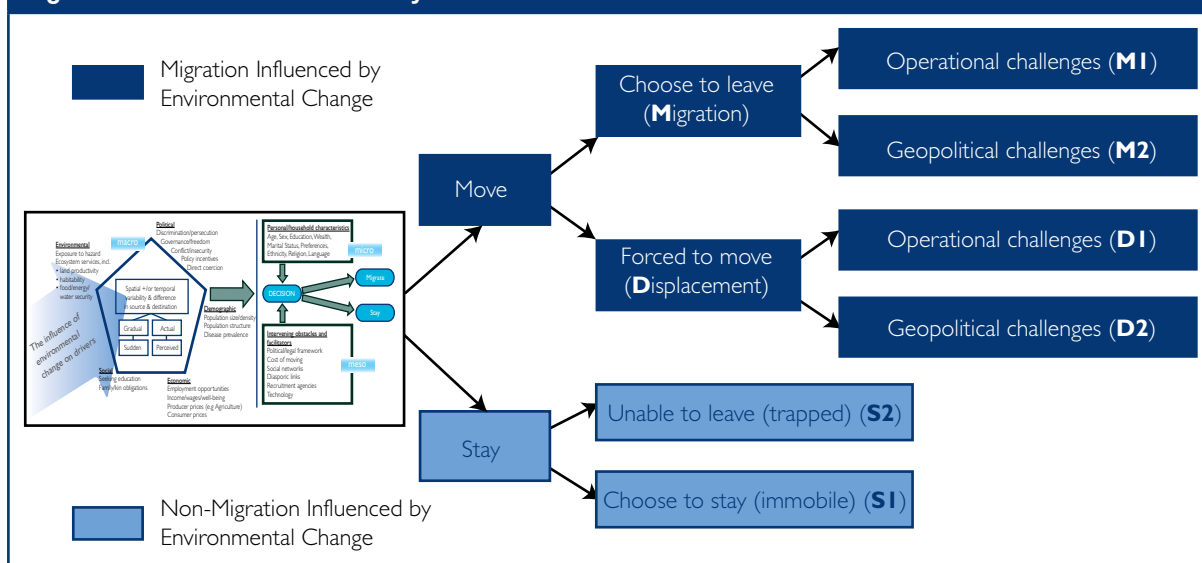
Many studies in a wide range of countries have shown that migration is positively associated with wealth and social capital, while vulnerability to environmental change is negatively correlated with wealth and social capital, as shown in Figure ES.2 below. Those with lower wealth or capital face a double set of risks from future environmental change: their reduced level of capital means that they are unable to move away from situations of increasing environmental threats; yet, at the same time, this very lack of capital makes them even more vulnerable to environmental change. These populations are likely to become trapped in places where they are vulnerable to environmental change (see Figure ES.2).



4. What are the implications for policy makers?

The evidence suggests there are a range of outcomes which result from the impact of global environmental change on migration.

This report has found that migration in the context of environmental change can lead to six distinct 'human mobility outcomes' which represent challenges to policy makers. These are shown in Figure ES.3.

Figure ES.3: Six human mobility outcomes

- Migration posing operational challenges:** Future environmental change, in combination with other factors, could significantly alter existing volumes and patterns of migration. These may pose relatively routine, if diverse, operational challenges if they represent small or slow adjustments to the status quo. For example, *the number of African urban poor is expected to exceed 400 million by 2015, compared with 240 million in 1990*. If, as predicted, rural–urban migration increases, whilst environmental conditions worsen, this trend will represent a significant operational and technical challenge for city planners in terms of sustainable urban growth, pressure on water and transport, increased pollution in large cities and waste creation.
- Migration posing geopolitical challenges:** Unplanned, unpredictable and concentrated movements of people are more likely in scenarios of the future characterised by high global growth, but fragmented social, political and economic governance. Whenever migration becomes large or rapid, or sensitive international boundaries are crossed, then geopolitical challenges may follow. For example, destination areas may face challenges relating to economic integration, social cohesion and increased tension/conflict. It is estimated that *1.5–2 million Zimbabweans have migrated to South Africa since 2000, and in May 2008 a spate of xenophobic attacks took place on migrants, leading to 65 deaths and the further displacement of 150,000 people*.
- Displacement posing operational challenges:** Environmental change is likely to increase the occurrence of human displacement, where individuals have little or no option to remain where they are in the short or long term. For example,
 - 17 million were displaced by natural hazards in 2009
 - 42 million were displaced by natural hazards in 2010³

This kind of displacement has significant impacts on economic growth, human security and social protection, but, if it occurs within the borders of a country, is short term and not involved with existing conflict, it poses *relatively* routine operational challenges that can be managed through emergency planning, for example the provision of emergency and humanitarian relief such as food, water, health care and shelter.

- Displacement posing geopolitical challenges:** Some impacts of environmental change may give rise to significant permanent displacement of whole populations as a consequence of existing settlements being rendered uninhabitable. This movement may be long term and sometimes across international borders, presenting geopolitical challenges. *For example, the potential displacement of entire islands represents significant implications for sovereignty and citizenship of those displaced*. Evidence suggests that political leadership is critical in the successful management of mass displacements.

3 This definition of natural hazards includes geophysical events such as earthquakes and tsunamis.

- **Choosing to stay:** The opportunity to stay in a location represents a positive outcome in many respects, but there are important issues concerning the provision of services and protection to potentially vulnerable populations, and whether people want to stay because of certain obligations. Furthermore, a community's ability to stay may depend on opportunities for voluntary migration. *For example, in small island states, reduced options for migration may cut off important forms of income support, such as remittances, and in the long run lead to a larger migration of whole households or communities in an unplanned and unpredictable way.*
- **The challenges of 'trapped' populations unable to leave:** The challenges associated with those who remain may become more severe and more geopolitical in nature if these people become trapped in vulnerable locations.
 - *For example, in Somalia, armed conflict hinders both the movement of pastoralists, who would otherwise relocate in the face of drought, and the access of humanitarian organisations to those who are drought affected.*
 - *There are likely to be between 472 and 552 million people directly or indirectly affected by floods in rural areas in Africa, Asia and Latin America and the Caribbean by 2060.*

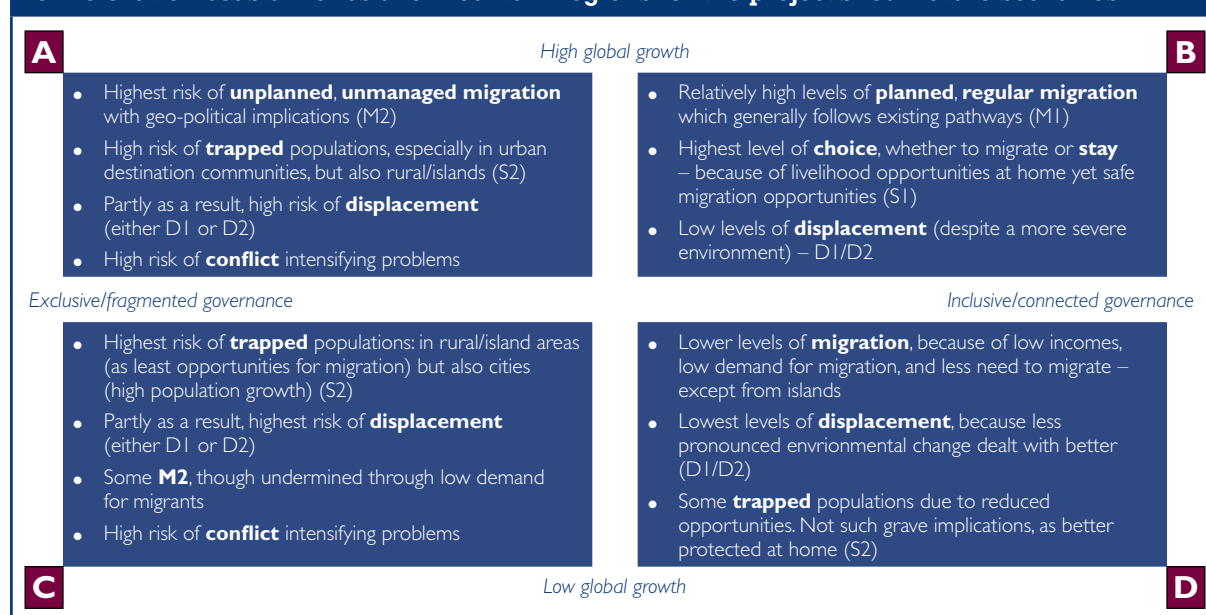
People who are trapped may become more prone to humanitarian emergencies and possibly even displacement if their situation worsens, or if extreme events occur. In such cases, human survival may depend upon unplanned and problematic displacement.

None of the future scenarios offer a 'no risk' situation for policy makers.

Figure ES.4 is a synthesis of the human mobility outcomes resulting from environmental change, taken across the three ecological regions, and based on an analysis of the trends in the drivers of migration in the four future scenarios. *This synthesis reveals that 'no migration' is not an option in the context of future environmental change: migration will continue to occur in the future and can either be well managed and regular, or, if efforts are made to prevent it, unmanaged, unplanned and forced.* Furthermore:

- The existence of trapped populations is a significant risk in three of the four scenarios.
- There are high risks of displacement influenced by environmental change in two of the scenarios.
- Unplanned, unmanaged migration with geopolitical challenges is driven by a combination of high growth and exclusive, fragmented governance.

Figure ES.4: Synthesis of the likelihood of human mobility outcomes across drylands, low-elevation coastal zones and mountain regions for the project's four future scenarios



The evidence from this report shows that some migration in the context of global environmental change is inevitable in the future, even if its nature is uncertain. This has two important implications for policy makers:

1. The most future-resilient policies are those that move households and communities from situations in which they are trapped, or from where they are in vulnerable circumstances where displacement may occur.
2. Proactively facilitated and managed migration should lead to improvements in each of the future scenarios, as it will reduce the chances of populations being trapped and/or being displaced in circumstances which raise wider geopolitical challenges. A proactive approach can also capitalise on and maximise the benefits from migration, building resilience and transforming adaptive capacity.

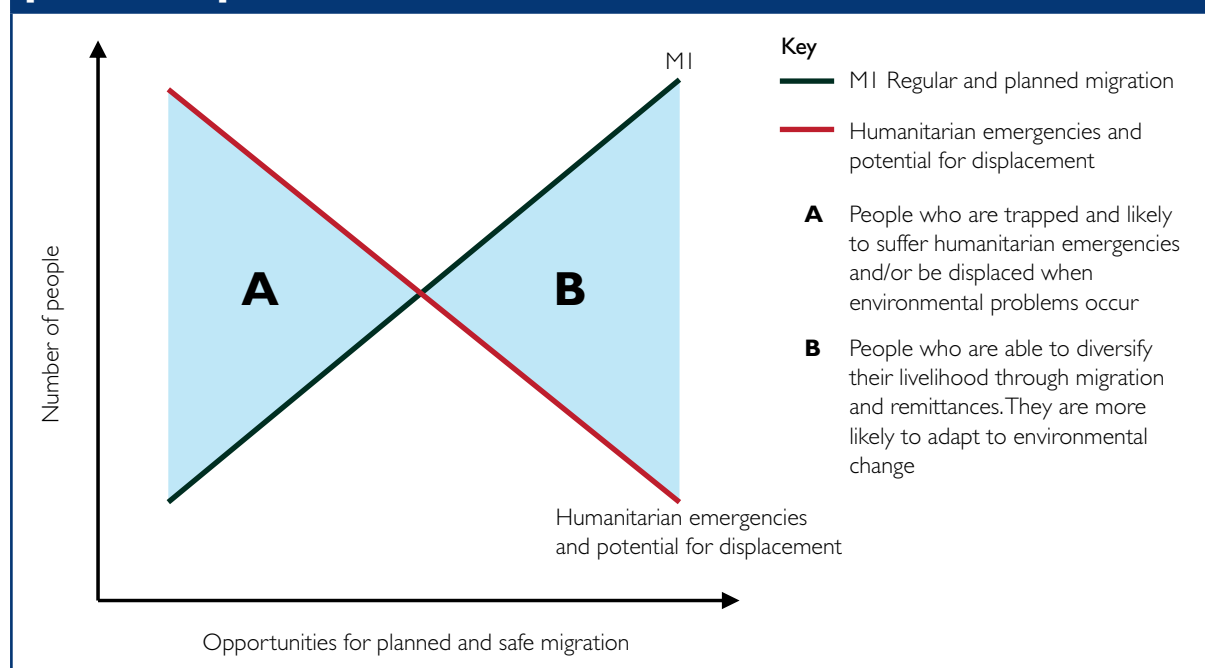
5. A strategic policy approach which plans for some forms of migration and recognises its long-term potential to build resilience

Whilst a policy approach focused on preventing migration would address certain policy challenges, it would risk worse outcomes in other areas. A more strategic approach is required.

Evidence shows that policies to prevent migration can be ineffective: for example, rural development intended to curb rural–urban migration in Africa has either had only a minimal effect on migration or has even encouraged it; there is evidence that migration policies in certain parts of the world have been unsuccessful because of underlying structural economic drivers. However, a more important reason why preventing migration is not an appropriate long-term solution in many circumstances, is that there are powerful links between different mobility outcomes, which means that trying to prevent migration may lead to worse longer-term outcomes:

- Migration is often an important method for households to diversify their incomes, and may be even more important if global environmental change affects other income streams.
- Reduced options for migration may cut off important forms of income support, such as remittances, and in the long run may make it unsustainable for households and communities to remain *in situ*, ultimately leading to a much larger migration at a later point, potentially in an unplanned and vulnerable way.
- Alternatively, the consequence of preventing migration may be for even more people to be trapped in situations where they have few alternatives to sustain their livelihood and thus are more vulnerable to environmental change. This may ultimately result in humanitarian risks, including displacement, a relationship shown in Figure ES.5.

Figure ES.5: Schematic representation of the relationship between well-managed migration and those who are trapped and more likely to suffer humanitarian emergencies and problematic displacement



A more strategic approach to policy in relation to migration in the context of global environmental change is required, which operates on three parallel levels.

Policy makers need to follow these different strategies simultaneously, and in coordination:

1. **Reducing the influence of global environmental change on migration:** This approach includes policies to arrest the long-term rate of change (including climate policy), policies focused on reducing the impact of environmental change and policies to build resilience to environmental change in communities.
2. **Planning for and responding to migration influenced by environmental change (and non-migration, as appropriate):** This approach includes closing protection gaps for those displaced, planning for urban growth and adaptation and dealing with tensions and conflicts associated with migration and non-migration influenced by environmental change.
3. **Recognising the opportunities inherent in migration in the context of environmental change:** This approach includes relocation as adaptation, building new cities and making migration work as adaptation.

Policy makers may be tempted to try and focus their efforts on just one of these three approaches; in particular, there may be a temptation to focus all efforts on reducing migration influenced by environmental change so as to eliminate the need for policies in the second and third categories. However, it is important to emphasise that policies in the first group are unlikely to ever fully eliminate the impact of environmental change on the drivers of migration. For example, the full impact of climate policy is likely to be felt most towards the second half of the century; forecasting and warning policies require effective governance and coordination of emergency responses, which is highly dependent on the sociopolitical context; and institutions in low-income countries may have limited financial and human capital to fully implement infrastructural measures such as flood defences and non-structural measures such as different crop varieties. For this reason, it is essential that policy makers consider all three approaches in parallel.

6. There is a need for global policy makers to focus on the vulnerability of growing urban populations

Migration in the context of environmental change is likely to lead to increased rural–urban migration and city expansion. Cities will face a ‘double jeopardy’ future, in which this challenge is multiplied by increasing threats from environmental change. Yet the third challenge is perhaps the most critical, the fate of the new migrant arrival to the city, who will often be in the most vulnerable situation.

Cities will face compound future challenges, which will reinforce each other or ‘multiply’ the consequences. These challenges are:

1. *Cities are growing in terms of their populations as a result of natural population growth and increased rural–urban migration.* For example, Dhaka’s population increased from 1.4 million in 1970 to 14 million in 2010, and is expected to rise to 21 million in 2025; similarly, Shanghai’s population increased from just over 6 million in 1970 to over 16 million in 2010 and is expected to rise to just over 20 million in 2025. In a ‘business as usual’ scenario this expansion alone would represent a huge set of operational challenges for cities, including housing provision and land-use planning, particularly for those in low-income countries.
2. *Cities are extremely vulnerable to future environmental change, particularly those located in vulnerable areas, such as drylands, low-elevation coastal zones or mountain regions, where inundation, reduced availability of water resources and threats to health will variously be experienced.* For example, the populations living in urban floodplains in Asia may rise from 30 million in 2000 to between 83 and 91 million in 2030, and then to 119–188 million in 2060 according to different scenarios of the future. The future expansion of cities needs to be understood in the context of this increasing risk.
3. *Migrants are particularly vulnerable, as they tend to live in high-density settlements in areas prone to environmental risks, and may not have the human, social or financial capital to protect themselves from these risks. For example:*
 - In Dakar, Senegal, 40% of new migrants arriving in the past decade have moved to zones with high flood potential.
 - Immigrant populations in Mombasa, Kenya, and Estelí, Nicaragua, suffer disproportionate impacts from localised hazards, such as flooding and winds.
 - Around 20% of the population of Rio de Janeiro live in favelas, which are susceptible to landslides and floods, with a significant proportion of those being migrants coming from dryland areas in north-eastern Brazil.

The urgency of the issue in respect of cities needs to be emphasised. Whilst trends in population growth and environmental change are likely to multiply the challenges faced by cities in the future, it is important to recognise that these challenges will add to *existing* fragilities. Many cities in low-income countries are already failing in several respects, and citizens, especially low-income groups such as migrants, are already vulnerable. For example:

- There are already 150 million people living in cities with significant water shortages.
- The number of African urban poor is expected to exceed 400 million by 2015, compared with 240 million in 1990.

Future trends will exacerbate these challenges, and action is required now.

Urban strategic planning must focus on these increasing environmental threats in the context of growing populations, with a focus on the vulnerability of migrants. Cities require much more strategic decision making about long-term location and protection.

- *Much greater emphasis now needs to be given to planning for long-term environmental change in expanding cities.* Planning for sustainability and for resilience to global environmental change requires addressing critical issues of water availability and quality in growing cities, long term land loss, more frequent hazards, waste, mobility and congestion.

- *Migrants moving to cities present particular policy challenges, as they are often the most vulnerable yet also have inadequate voice and representation.* Migrants are often low-skilled, and, especially in cities in low-income countries, are often concentrated in dense and new housing, and in informal settlements with low levels of health, water and other services. Robust urban planning and policies specifically focused on the welfare of new city migrants are required.
- *Environmental change and urban population growth require national and subnational planners to take a much more strategic and long-term approach to city planning.* When urban areas are protected, 'they have to be protected forever' as development occurs and populations grow in protected areas. Agglomeration effects, moral hazard and path dependency effects will make it ever more difficult to abandon or shift urban developments, particularly because protection in the short run induces new migrants into these areas. Urban planning should take into account future changes in climate risks (and sea level for coastal cities) and the likelihood of continuing rural–urban migration, and recognise in particular the irreversibility of defending areas, as well as the indirect and social costs.

7. Protection gaps for those displaced by environmental change

There are protection gaps for populations who experience displacement influenced by global environmental change. Yet this report argues that a global framework for 'environmental migrants' is highly unlikely to be a 'silver bullet', and moreover would neglect key populations at risk.

There have been recent arguments made by academics and advocates for the creation of a new category of 'climate refugee'. However, this report has shown that migration is a multi-causal phenomenon, that environmental change will affect migration through its effects on drivers, and that each migrant is likely to have a multitude of drivers and motivations behind migrating, some of which may be influenced by environmental change and some of which may not. For this reason a global framework for 'environmental refugees' is considered inappropriate.

There is a multitude of existing international relationships, legal agreements and institutions involved in governance which can and should be built on in the first instance. For example, 'soft law' approaches, such as the Guiding Principles on Internal Displacement and, potentially, the recently proposed Nansen Principles⁴, are 'bottom-up' approaches which build consensus and allow for adaptable and tailored adoption by states.

A particular challenge relates to small island states. Here, there is the clearest case for reassessing the scope for new definitions and structures within the framework for international climate governance. In this instance, as in others, *the array of existing governance fora and processes should be utilised to address humanitarian needs relating to those displaced by environmental change. Where protection gaps are identified, these are the appropriate places to address them, and ultimately the discussion should be widened to migration more generally.*

8. Managing social tensions and conflicts associated with migration influenced by environmental change

There is little evidence available to support the theoretical notion that environmentally induced conflict will cause migration, or that migration influenced by environmental change will cause conflict. However, there are two linkages between migration, environmental change and conflict which are particularly important:

1. *Migration, including that influenced by environmental change, can amplify political or geopolitical problems, and in particular can raise tensions and interact in problematic ways with conflict in destination areas.* This is more likely to be the case if the migration is long term, across international borders, illegal/irregular, concentrated in particular source destinations and/or is unexpected. In low-income countries, the majority of such problematic migration in the future is expected to be to cities, but in some circumstances may be rural to rural. Displacement influenced by environmental change may also pose geopolitical tensions if it results in large numbers of people arriving in specific locations over a short duration, with an absence of political leadership to manage these tensions.

4 For more discussion on the Guiding Principles on Internal Displacement and the Nansen Principles see Chapters 7 and 9 of the main report, respectively.

2. **Global environmental change can contribute to impoverishment, and can raise the exposure and vulnerability of individuals to conflict, ecological disasters and economic hardship.** An associated reduction in financial assets can reduce the ability of individuals to move in a planned, safe way and lead to them effectively becoming trapped (see Figure ES.2). The implications, in particular the reduced ability to move in a planned and safe way in the context of high levels of vulnerability, means that there is a greater chance of humanitarian emergencies and potentially unmanaged and highly problematic displacement.

Strategic policy responses to these challenges include:

- **Policies and plans to reduce tension and avoid conflict in growing cities.** In turn, these include (a) policies which may be considered part of 'normal development practice', but are likely to reduce social unrest and tension by addressing material deprivation and social and economic inequality associated with rapid urban growth and major rural–urban migration; and (b) bespoke policies to address the particular challenges of tension and conflict, which are often built on collaboration among local agencies, criminal justice systems and civil society, and which often embrace the informal sector.
- **Policies to avoid populations being trapped in conflict situations, where they are in turn vulnerable to environmental change.** Where there is an endogenous and cyclical relationship between poverty, resources, conflict and the inability for people to move voluntarily (with humanitarian emergencies and displacement a likely outcome), an important set of policies should focus on reducing conflict and tension associated with natural resources. Environmental change is likely to affect these natural resources, potentially reinforcing this endogenous cycle; there is thus a clear requirement for policies to address the impact of environmental change on the resource–conflict relationship. Policies may also include ensuring that conflict 'early-warning systems' are adapted to assess the risk of vulnerable populations being trapped in situations where they are exposed to environmental events such as droughts or floods.

9. There is a need for adaptation planning and funding to recognise the role of migration in building long-term resilience

Policies to build long-term resilience are essential in the context of future global environmental change. Migration can represent a 'transformational adaptation' to environmental change, and in many cases is an effective means to build long-term resilience.

Environmental and development policy makers need to implement a wide range of policies in light of future global environmental change. There is no single solution, and a wide range of measures are required. Measures to slow the rate of environmental change are important, as are measures to reduce the impact of environmental events. However, equal priority should be given to policies that promote the long-term resilience of communities and households to environmental change. They include:

- measures to enhance livelihoods;
- the provision of insurance;
- social protection schemes.

There is evidence to suggest that migration is often the most effective approach to enhancing livelihoods and thus securing resilience. For example, a study in Ghana found that income diversification through non-farm activities such as trading and handicrafts was the second most widely used measure for enhancing livelihoods after the option of outmigration. Indeed, migration, and in particular the tools, such as training and skills, to make migration successful, can be considered a transformational adaptation strategy, as opposed to just 'improving' the coping of a community in particular vulnerable areas.

Furthermore, many poor households engage in migration of some family members as part of an income diversification and insurance strategy, with remittances flowing in response to shocks. For example, the relevance of the insurance strategy has been found for international migration from Mexico and Nigeria to the USA, and for internal migration in Botswana and Thailand. This is also reflected in the growth of international remittances in the aftermath of major climate-induced disasters. For example, international remittances increased after Hurricane Gilbert in Jamaica, whilst remittances increased in response to rainfall shock-related income losses in the Philippines.

Policies to achieve these benefits can focus on source areas or destination areas. In particular, future demographic deficits in some countries suggest that a 'win-win' solution may in some cases be found where there are opportunities for planned, circular migration from countries which are likely to be vulnerable to environmental change.

Relevant policies to promote and facilitate migration as an adaptation strategy to build long-term resilience can be focused on source areas, for example, building human capital and increasing skills, or destination areas, for example making cities more attractive for in-country migrants and guaranteeing rights to migrants.

However, regional or international circular migration schemes may offer benefits in the context of countries which are facing demographic deficits. For example, by 2050, the number of persons of working age for each citizen aged 65 or above in the EU will have dropped from four to only two; Europe's fertility rate is 1.5⁵, while Japan, Korea and countries in Eastern Europe have fertility rates of below 1.3; the UN projects that the populations of both Japan and Russia will shrink by 25 million between 2010 and 2050. Particular schemes of temporary and circular migration could enable international migrants with a wide variety of skills to play a role in countries with demographic deficits. This could be most effective where opportunities and thus movement are within regional groupings of countries.

Critically, funding is being discussed at an international level, for example through negotiations at the UNFCCC, the operationalisation of the Adaptation Committee, and the Green Climate Fund. It is imperative that these important, long-term initiatives recognise the links between global environmental change and migration, and avoid a missed opportunity: indeed, many of the objectives of these initiatives may be realised through harnessing the positive outcomes of migration.

Yet, perhaps more significant is that people will increasingly be trapped in vulnerable situations, where there are few safe migration options but staying also represents a danger because of the environment. The sooner action is taken, the sooner human suffering will be alleviated.

5 This is the average fertility rate for the EU, and masks significant regional variation. For example, for 2005-10, UK, Sweden and France had fertility rates between 1.84-1.89, whilst Slovakia, Germany and Romania had fertility rates between 1.28-1.32.



1 Introduction

Key messages

This report challenges the widely held view that future environmental change, if left unchecked, will lead to the migration of many millions of people, by 2060, away from affected areas. In contrast, it suggests that the situation could be very different in some circumstances, yet potentially just as serious for policy makers and individuals alike. In particular, subsequent chapters, looking to 2030 and 2060, show that:

- Migration will take people towards areas of environmental risk (notably low-lying megacities) as much as away from them.
- Large populations who do not migrate, yet are situated in areas under threat, will be at risk of becoming 'trapped', where they will be more vulnerable to environmental shocks and impoverishment. They are likely to represent an equal if not bigger challenge to policy makers as those who migrate.
- Preventing or constraining migration is not a 'no risk' option. Doing so will lead to increased displacement and irregular migration, conflict and human suffering in many settings.
- In some circumstances migration might constitute a strategic transformational adaptation, increasing individual and community long-term resilience to environmental change.

Recognising that the factors driving migration go far beyond the environment, and that the consequences go far beyond the movement of people, this report argues that policy makers need to take a broad and expansive perspective. Diverse areas of policy intervention, for example relating to sustainable urbanisation, climate change adaptation, conflict resolution and humanitarian assistance, will all be crucial to addressing the future challenges posed by environmental change and migration.

This report considers how changing environmental factors could combine with other important drivers of change to influence and interact with patterns of global human migration over the next five decades. The findings have implications for issues that are critical for policy makers, now and in the future, including human vulnerability, adaptation to climate change, economic development, conflict, and the location and quality of human settlement. Importantly, the report recognises that in the context of environmental change, migration can lead to complex mixes of benefits as well as costs, both for the countries and regions involved and for migrants.

A growing, urbanising global population over the next 50 years will create demand for more food, energy and water. Many of the modern 'megacities' are located in coastal areas or river deltas, which are vulnerable to rising water levels. Changes to our climate may cause degradation of agricultural land, desertification and increased levels of water and food scarcity. For some, this may threaten to create a 'perfect storm' of global events. Yet, until now, the connections between economics, demography, environment and migration have been far from certain, still less the consequences for public policy; consequently previous analyses of 'environmental migrants' have been variously described as anything from 'alarmist'⁶ to 'conservative'⁷. This report has therefore taken a global perspective to shed light on these connections and their implications for:

- the drivers of migration, and how global environmental change might directly and indirectly influence the pattern and volume of human migration;
- the consequences of migration, with a particular focus on three specific ecological regions particularly vulnerable to environmental change: low-elevation coastal areas, drylands and mountain regions;

6 Gemenne (2011).

7 Myers and Kent (1995); Myers (2002).

- the policy options and interventions in the face of the most likely and/or challenging scenarios for the future to 2030 and 2060, with a particular focus on climate change adaptation, urbanisation, management of the human consequences of environmental shocks, and avoiding and managing human conflict.

Box 1.1: Who should read this report and why?

This report argues that action is required by a broad group of policy makers, and not just those concerned with the environment or migration. Typically 'migration' policy falls within the remit of interior ministries, who are responsible for 'managing' international flows of people, while climate change is the remit of 'environment' or 'climate'/'energy' ministries. However, the interactions between environmental change and migration demand attention from a far broader spectrum of actors as the issue affects adaptation funding, development cooperation, urban planning, rural affairs, conflict management and disaster planning as well as migration and environmental policy.

Action and coordination will also be required between different tiers of policy makers. The implications of the findings and policy options discussed in this report are relevant to local authorities (including district and city governments), national governments around the world, and various international and inter-governmental organisations. Importantly, as subsequent chapters demonstrate, these different levels of governance will need to act in concert if policy responses are to address the complexity of the issue effectively.

1.1 Why the project was commissioned

1.1.1 Global concerns about climate and other environmental changes

Over the past two decades public attention worldwide has focused to an unprecedented degree on the relationship between environmental change and human action as a key area of public policy. There is widespread acceptance that climate change is occurring, primarily as a result of human activity, and that it poses significant challenges to economies and societies across the globe. Almost all countries in the world (194 in total) are engaged in negotiations on how to mitigate and adapt to climate change, as parties to the United Nations Framework Convention on Climate Change (UNFCCC), with some 1,380 international organisations and non-governmental organisations (NGOs) registered as observer organisations.

In addition to climate change, there are a number of other ways in which human activity is affecting global environments, with important consequences for people's well-being. For example, it is clear that a significant amount of land, water and ecosystem services is being converted to new uses, to the benefit of some, but with significant consequences for sustainability over the medium to long term.

1.1.2 Migration and environmental change: nature of the debate so far

Specific interest in the effects of environmental change on migration can generally be traced back to the 1970s and 1980s⁸, when influential reports by the UN Environment Programme (UNEP)⁹ and the Worldwatch Institute¹⁰ first discussed the term 'environmental refugees'. Two areas of concern were identified within a literature that has since broadened to encompass 'environmental migration' more generally.

The first has its origin in environmental issues, and is associated primarily with work of environmental scientists, for example Norman Myers. This strand of work has argued that the world faces a major challenge in dealing with millions of additional migrants or refugees, if no action is taken to address or mitigate environmental change. A related issue, especially amongst some NGOs, concerns the perceived need to develop new legal categories to ensure the 'protection' of these migrants or refugees who would likely fall outside existing legal provisions.

8 PD17 (Annex D refers).

9 El-Hinnawi (1985)

10 Brown (1976); Jacobson (1988)

The second concern has its roots in the growing concern with ‘new’ security challenges, and is associated in particular with the work of Thomas Homer-Dixon and others in the security field¹¹. Here the argument is not simply that environmental change will drive future migration, but that, in combination, they could lead to exacerbation of war and conflict. In part, the two areas of concern are related: the coining of the term ‘environmental refugee’ clearly anticipated the rise of this category of displaced person as primarily a security concern¹².

1.1.3 The problem with existing knowledge

Many existing estimates of ‘environmental migration’ have their roots in only one or two sources, and these sources have, in turn, been extensively criticised. This report counsels against re-using these estimates.

Predictions of the numbers likely to migrate as a consequence of environmental change have attracted significant and arguably disproportionate academic, policy and media attention, particularly in view of the fact that the validity of the figures has been questioned (see Box 1.2). Critics have commented on their speculative nature and the difficulty in defining and disaggregating ‘environmental migration’ from other forms of migration. It has also been suggested that some estimates and predictions do not distinguish between populations ‘at risk’ and those actually likely to migrate, and that they fail to account adequately the potential impact of adaptation strategies or demographic change¹³.

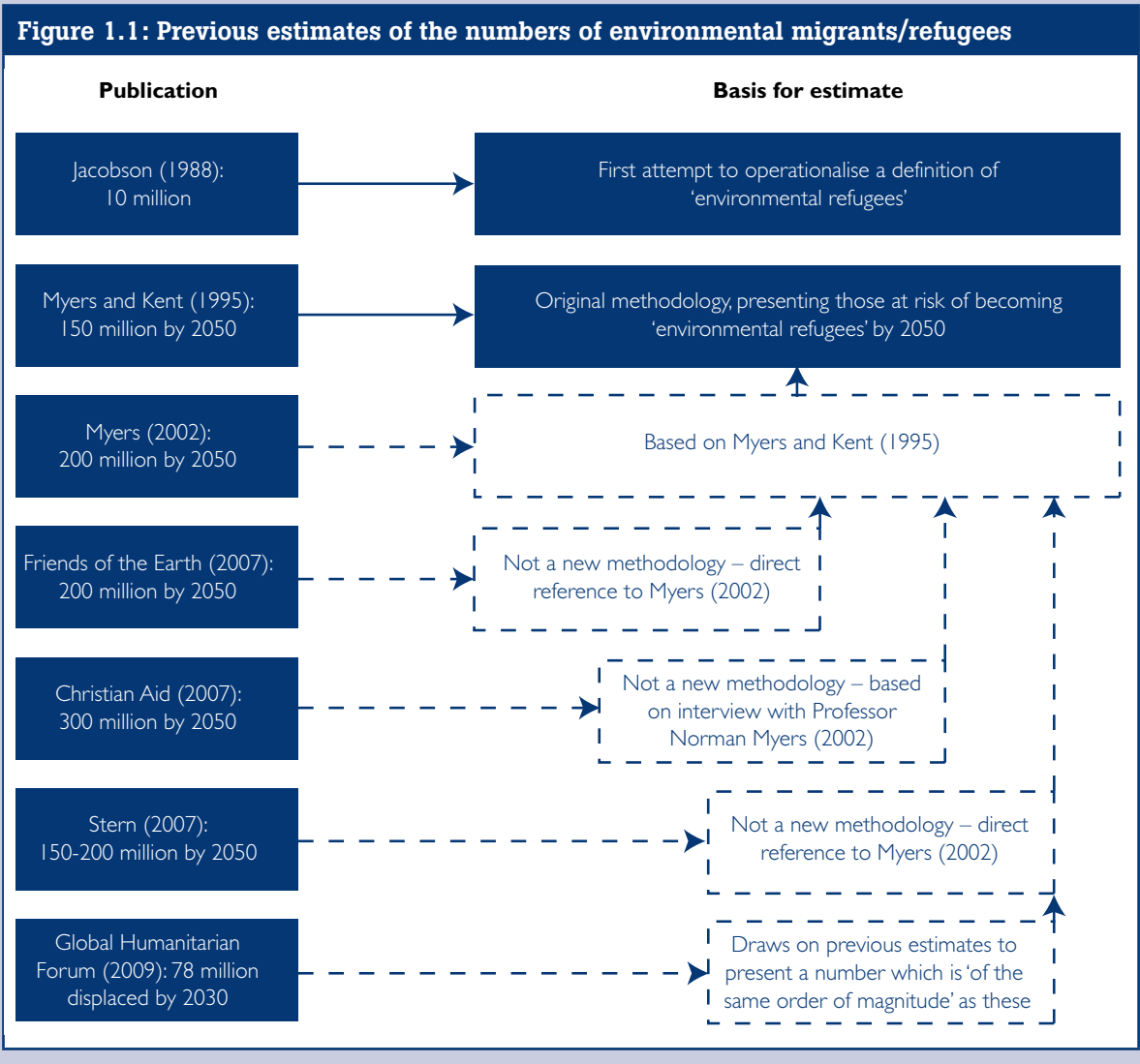
11 Homer-Dixon (1991); Kaplan (1994); Homer-Dixon (1999); Baechler (1999).

12 Lester Brown of the Worldwatch Institute was the first person to coin the term. See Brown (1976); Saunders (2000).

13 MR7 (Annex D refers).

Box 1.2: Existing estimates of ‘numbers of environmental migrants’ tend to be based on one or two sources

Figure 1.1 below¹⁴ shows that most recent estimates of the numbers of environmental/climate migrants have at their roots just one or two early publications. Furthermore, the methodology used in Myers (1995) has been criticised¹⁵. A particular concern is the ambiguity of the relationship between those ‘at risk’ of environmental events (sea-level rise and droughts for instance) and those forecast to be environmental migrants. Whilst the methodology does acknowledge the difference between susceptibility and adaptive capacity, it seems to negate the ability of those in low-income countries to cope with environmental events, presenting a relatively deterministic connection between risk and migration. Perhaps of greater significance, a focus on ‘numbers of environmental migrants’ neglects an equally or more serious implication of environmental change for individuals and policy makers alike. By trying to count those who move, those who *stay behind* or are *trapped* in the context of environmental change may be overlooked, a population who may be in an extremely vulnerable situation (see Box 1.3).



14 See MR7 (Annex D refers).

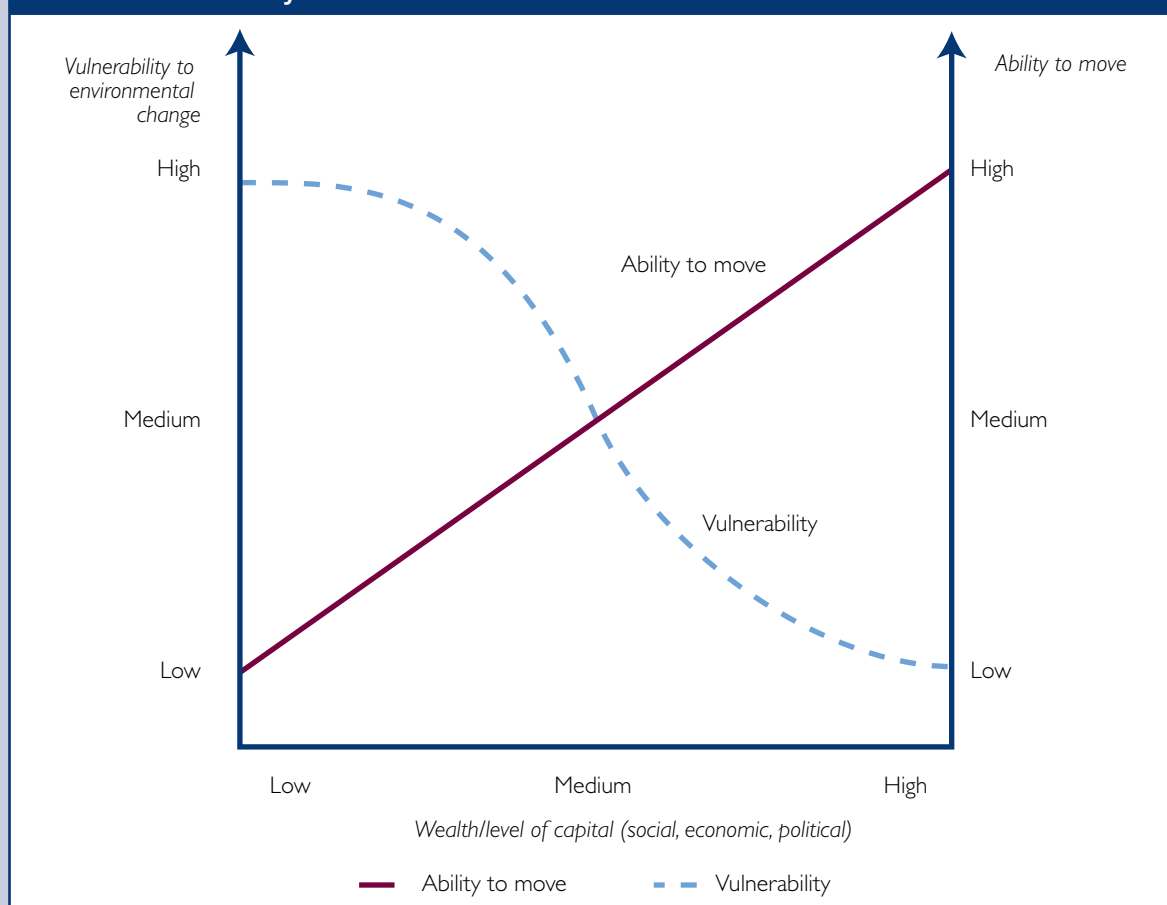
15 Castles (2002); Castles (2011); Gemenne (2011).

Box 1.3: Focusing on those who are trapped or stay behind when others migrate

A danger inherent in focusing on 'numbers of environmental migrants' is that it could mean neglecting the major humanitarian issues surrounding those who stay behind, and indeed those who are unable to migrate and who become trapped in parlous environmental circumstances.

There is much evidence that millions of people will reside in areas of high environmental risk over the next five decades; indeed, this evidence is cited in some of the sources in Box 1.2¹⁶. Other evidence reviewed in this report shows that a significant proportion of these people will lack the financial, social, political or even physical assets to migrate away from these environmentally dangerous areas, whilst those who have greater assets are more able to¹⁷. Yet it is those who have low financial, social, political and physical assets who are likely to be most vulnerable to the effects of environmental change, and less able to protect themselves. Hence a significant group of people living in environmentally prone locations in the future face a double jeopardy: they will be unable to move away from danger because of a lack of assets, and it is this very feature which will make them even more vulnerable to environmental change. This relationship is shown in Figure 1.2 below. As will be shown in this report, this 'trapped' population, and indeed those who choose to stay behind, both raise important issues for public policy.

Figure 1.2: Schematic representation of how the level of wealth/capital (social, economic or political) correlates with vulnerability to environmental change and at the same time determines the ability to move



¹⁶ Jacobson (1988); Myers and Kent (1995); Myers (2002); MR9 (Annex D refers).

¹⁷ See Skeldon (1997) for a discussion of the fact that, generally, it is not the poorest that move.

Trying to produce global estimates of ‘environmental migrants’ is methodologically unsound, unhelpful for policy purposes and may even be counterproductive. Therefore, this report takes a different approach.

A major concern with several existing estimates of ‘environmental migrants’ in the literature is that they are based on just one or two sources (Box 1.2). However, there is a further methodological problem with previous estimates. Indeed, this is so fundamental that it suggests that it will be impossible or at the very least unwise to try to produce robust estimates of global numbers of ‘environmental migrants’.

The issue is that predictions of future numbers require implicit assumptions that ‘environmental migration’ can be distinguished from other forms of migration. This is not a sound assumption to make as in practice migration usually has multiple causes. For example, should drier conditions materialise across the Sahel region of Africa in the decades ahead, conditions for agricultural production and human habitation would become more difficult in many areas. Yet it would not be feasible to separate this effect from those arising as a result of existing seasonal and inter-annual variations in rainfall, broader levels of impoverishment in the region, or the growth of employment and other opportunities in coastal regions to the south. Even in the archetypal cases of ‘climate refugees’, for example in Lateu Bay in Vanuatu¹⁸, the Cartaret Islands of Papua New Guinea¹⁹ or Bhola Island in the Meghna river delta in Bangladesh²⁰, the abandonment or potential abandonment of such places cannot be discussed without reference to ‘pathways’ carved out and networks established in previous patterns of migration, which have often been substantial. Migration is a multi-causal and complex phenomenon, where the role of human agency is paramount; a methodology which assumes that migrants move because one single determining factor seems incomplete (see section 1.2.2).

Aside from this seemingly insurmountable methodological issue, it is unclear whether global estimates of environmental migrants would add any value to the planning of public policy. Single numbers do very little to furnish policy makers with information about *what kinds* of people might migrate in various environmental situations, *whether* migration will be *new* or a *continuation* of existing flows, *why* some people move and not others, *how* the *relative vulnerability* of populations will be affected and, as described in Box 1.3, *what happens to the people who do not move*. In short, a single number provides very little indication of what kinds of policy issues are at stake, and this report is focused on doing exactly that.

In summary, this report has not sought to add its own estimate of numbers to the debate, because existing empirical evidence does not allow it, because of methodological considerations and because a global figure is not considered to be important for the development of policy responses. Instead this report ascertains how environmental change interacts with drivers of migration and how this leads to outcomes with relevance for policy makers. This approach is an essential starting point for the exploration of policy options which are based on scientific evidence, and is further described in the next section.

¹⁸ UNEP (2005).

¹⁹ Shears (2007).

²⁰ Wax (2007).

Box 1.4: Recent analyses of migration and environmental change which go beyond 'just the numbers'

Recent advancements in the study of migration associated with environmental change have been enabled through the utilisation of rich datasets at the local and household level. For example, Gray has examined the relationship between environmental factors and migration using household data in the southern Ecuadorian Andes, Uganda, Kenya and Ethiopia. In Ecuador, whilst both local and national migration flows increased with fluctuations in agricultural harvests, international migration was unchanged²¹. In Kenya, migration was significantly lower in places with better soil quality, but in Uganda it was marginally higher²². Henry *et al.* found that in drought years in Burkina Faso the volume of longer-term migration, especially by men, tended to fall, yet the short-term mobility of women and children increased²³. Van der Geest, as part of the EACH-FOR project, examined migration from the north of Ghana in the 1970s and 1980s and found that migration did not increase despite severe environmental circumstances. These studies build on a more nuanced understanding of the impact of the environment on migration, based on strong datasets, pioneered by Findley's seminal analyses of Mali migration in drought conditions in the 1980s²⁴. Unfortunately, the datasets required to do this analysis most effectively, using large longitudinal samples, are notably absent for many parts of the world.

1.2 Understanding the future: Foresight's conceptual approach

Previous work on the relationship between environmental change and migration has tended to analyse current and past trends as a guide to the future, generally starting with what is known or assumed about environmental change, and projecting this forward to estimate the numbers of people 'at risk' of migration. The analysis here differs from this standard approach in two important respects: first, it starts with current trends in migration, rather than with current trends of environmental change; and, secondly, it considers resulting migration in terms of outcomes which have *policy relevance*, rather than just presuming that migration is inherently something to be avoided. This section explains this twin approach, alongside the implications for policy.

1.2.1 Start with migration, or start with environmental change?

Migration is complex, multi-casual and non-linear. An environmentally deterministic approach is destined to fail because it does not account for the importance of human agency in migration outcomes.

Why should the analysis start with an understanding of migration, rather than environmental change? A common way to approach 'environmental migration' is to identify a series of environmental changes, such as sea-level rise or an increased frequency of extreme rainfall events or droughts, calculate the area and resident population 'at risk' from these developments and events, and then estimate that a certain proportion of this population is likely to move in the future (or impute that a proportion of people who have already moved from that area can be classified as 'environmental' migrants). The most widely cited prediction of 'environmental migration', produced in Myers and Kent (1995) and updated in Myers (2002), uses this method to estimate that, by 2050, 162 million people in Bangladesh, Egypt, China, India and other parts of the world, including small island states, will be vulnerable to sea-level rise and another 50 million to desertification, and will therefore be at risk of becoming 'environmental refugees'²⁵.

Approaches such as this are problematic in a number of respects. First, they rely on the ability to assign a proportion of the actual or predicted number of migrants as moving as a direct result of the environmental change. Yet beyond a small number of exceptional cases, where an environmental process makes a place uninhabitable, and there is no political, social or technical adaptation available that would restore habitability, there is no credible scientific methodology for assessing what this proportion is. An approach which effectively implies that a certain proportion of those in an 'at risk' zone in low-income

21 Gray (2009).

22 Gray (2011).

23 Henry *et al.* (2004).

24 Findley (1994).

25 Myers and Kent (1995); Myers (2002).

countries will move is deterministic, and neglects the potential of human agency in dealing with environmental events, particularly on a 50-year timescale.

Secondly, even if this approach could theoretically tell us how many people are at risk of migration, it tells us nothing about where they are likely to go to, for how long, or whether or not this is occurring in a way that is problematic for individuals and public policy. Yet such knowledge is critical in order to develop effective policy responses to 'environmental migration'. Clearly, movement to a nearby town or village for a matter of weeks or months involves entirely different policy challenges to permanent international displacement. Yet an approach that starts with environmental change which might entail loss of habitat or livelihood cannot tell us anything about which is more likely.

Thirdly, this approach rests on the implicit assumption that migrants can be divided into a typology based on the principal 'cause' of their migration. This might seem reasonable: many states seek to apply a typology on a regular basis by trying to distinguish 'refugees' (who move because of a 'well-founded fear of persecution') from 'economic migrants'. Yet such distinction is widely contested in the scientific literature²⁶. Indeed a wide consensus exists in the field of migration studies that migration is generally multi-causal.

However, perhaps most importantly, this approach to migration, in treating it as a residual 'effect' in places where (or affecting people for whom) adaptation is not possible, intrinsically treats it as an exception, and as a problem. Yet a simple analysis of past migration trends would indicate a high likelihood of migration continuing into the future (see Box 1.5). In turn, there is a growing consensus in the migration studies literature that migration is inherently neither 'good' nor 'bad' but a process with positive and negative outcomes²⁷. Remittances, for instance, while not a panacea for development²⁸, do have beneficial attributes, increasing the resilience and underpinning the household budgets of millions in low-income countries. Representing over \$300 billion, remittances are a source of international capital which exceeds overseas development aid²⁹ and is surpassed only by foreign direct investment (FDI)³⁰. This is not to say that migration is unproblematic – it clearly carries risks and costs both for some migrants, and for some host communities and societies. Yet there are also a range of ways in which it can contribute to the resilience or adaptive capacity of those left behind.

Box 1.5: Projecting migration trends

The projection of migration trends into the future on a global or decadal scale is fraught with difficulties. However, it is clear that international migration stocks have grown over the last 50 years, both in real numbers and as a percentage of the world's population (from 2% in 1960 to 3.1% in 2010). Even if it is assumed that the stock of international migrants remains at around 3% of the world's population to 2030, this implies a growth to 252 million by 2030, and 283 million by 2060 (69 million more than at present), without any contribution from global environmental change.

It should be noted that the figures for both 2030 and 2060 are dwarfed by the numbers of internal migrants in 2009, 740 million³¹. This is further considered in section 1.3.1.

1.2.2 A new conceptual framework

Environmental change can affect migration through influencing existing drivers of migration.

To address these problems, this report offers a new conceptual framework 'tested' in a number of international workshops involving academics, NGOs and policy officials (see Box 2.2 for more information on these workshops). It aims to explain first, what drives migration, and then focuses attention on how global environmental change might influence these migration drivers in the future. The framework acknowledges that migration is already occurring in most parts of the world, as a result of a

26 Zetter (1991, 2007); Castles (2003);

27 de Haas (2005); Bakewell (2008).

28 Skeldon (2008).

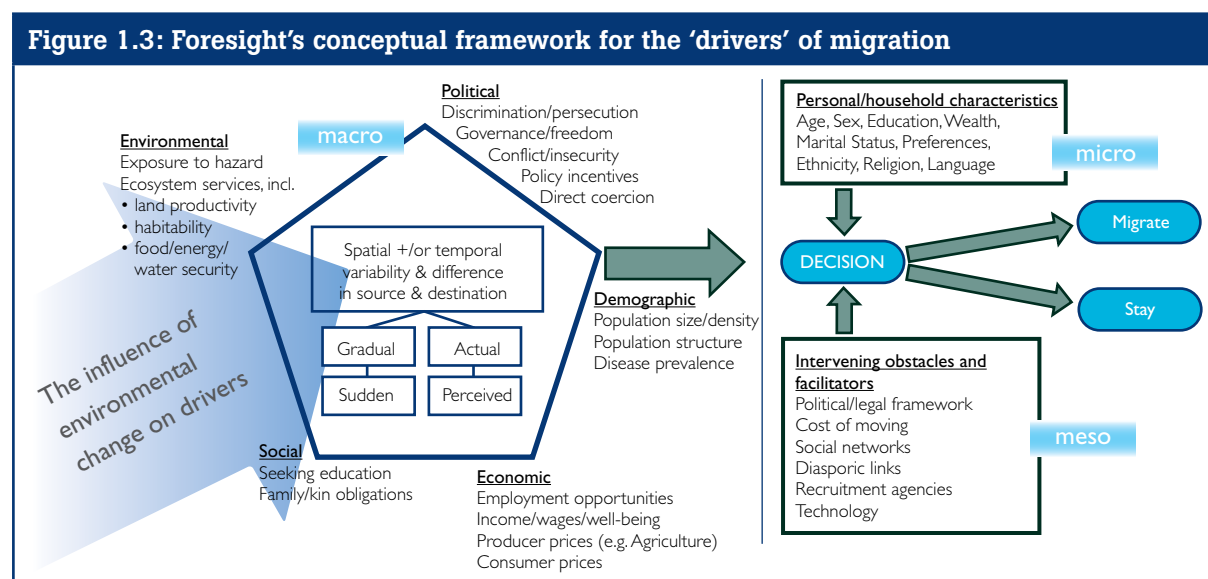
29 World Bank (2011).

30 Ratha (2005).

31 UNDP (2009).

variety of factors, rather than there being a wholly new migratory phenomenon which is attributable to environmental change.

Conceptualised as a pentagon (Figure 1.3), the framework groups a wide range of migration drivers into five categories: social, political, economic, environmental and demographic. In each case, it is the existence of spatial and temporal variability in one or more of these five dimensions that creates the conditions (or 'drivers') for migration, allowing that these might interact or overlap in different ways in different places. This is akin, in some respects, to a combination of various 'push' and 'pull' factors, but allows for the development of more complex forces operating through networks or systems of influence³².



It is important to note that the existence of 'drivers' of migration does not necessarily imply that migration *will* occur. Whether migration occurs or not in any particular place also depends on a series of intervening or institutional factors. For example, the existence of strong border controls would limit migration. Individual and household characteristics also impinge on migration decisions. For example, it is widely accepted that migration is selective on the basis of factors such as age, sex, wealth and levels of education. These factors are depicted on the right-hand side of Figure 1.3.

This conceptual framework for the drivers of migration then allows a secondary, but crucial, question to be posed: whether environmental change over a certain time period is likely to alter the effect of these drivers. In this conceptualisation, rather than identifying a *group* of people who might be designated 'environmental migrants', it could be possible to identify a net *volume* of migration, the cause of which could reasonably be attributed to environmental *change*. For example, it is conceivable that environmental change might actually weaken the effect of a migration driver, instead of strengthening it. In other words, the net effect of environmental change on migration could in certain cases be negative. The effect could also be different for different sections of the population. However, such an analysis would require more quantitative research data than is currently available, and it was therefore not possible to undertake this for this report.

32 For further discussion of the conceptual framework see Black *et al.* (In press).

Box 1.6: Terms used in this report to explain how people migrate when there is environmental change

Existing literature on the relationships between environmental change and migration has been hampered by the usage of an unwieldy and imprecise collection of terms and phrases. These have included at various points 'environmental/climate migrants', 'environmental/climate refugees', 'environmentally induced population movements' and 'environmentally displaced persons'³³. This project has not used any of these terms as they imply a mono-causal relationship between environmental change and migration, a relationship which is dismissed by this report and other experts alike³⁴. Whilst the addition of another term to this lexicon may not be welcomed by all, a key principle of this report is that preciseness of terms is essential in what is arguably a politicised debate³⁵. For this reason the following are used to describe how environmental change affects decisions to migrate:

- **Migration influenced by environmental change:** Where environmental change can be identified as affecting the drivers of migration, and thus is a factor in the decision to migrate (as outlined in Figure 1.3);
- **Non-migration influenced by environmental change:** Where environmental change can be identified as affecting the drivers of migration, and thus is a factor in the decision not to migrate.

It is important to note that where migration occurs in the context of environmental change, it can increase or lower vulnerability to deteriorating environmental conditions even if these conditions have not themselves influenced the drivers of migration. An example here is strong economic and political drivers of migration to vulnerable Asian delta areas, which may increase the vulnerability of populations to sea-level rise in the future³⁶.

Based on the conceptual framework that defines the relationship between environmental change and migration, the project team commissioned a number of 'driver reviews' to explore the ways in which different drivers lead to migration, and the extent to which they interact with each other and with environmental change. These driver reviews examined a wide range of multidisciplinary evidence, both globally and in the context of specific regions of the world (Annex D). The project also commissioned a number of science reviews, to examine state-of-the-art knowledge on the nature of environmental change both in the present day and in the future. Both sets of reviews were peer reviewed, and are published separately to this report (see Annex D).

1.2.3 Implications for policy

Migration influenced by environmental change can take the form of either migration or displacement. In turn these may have operational or geopolitical implications.

The evidence reviewed in this report shows that there are four types of migration influenced by environmental change that deserve policy attention. 'Migration', as it is commonly understood, is taken to mean a broadly voluntary movement from one place to another for a period of 3 months or more. 'Displacement' implies a less voluntary movement that might involve a need for protection and/or assistance. In turn, both migration and displacement can be seen as posing 'operational' challenges on the one hand and more 'geopolitical' challenges on the other (see Figure 1.5).

The division between migration and displacement is reasonably well established in policy terms and is reflected in the existence of separate policy organisations and legal regimes dealing with each phenomenon at both international and national level in most countries, even if the distinction between migration and displacement is often itself quite blurred³⁷. This dual approach translates well to the context of environmental change, with certain changes to the environment, for example storm surges or sudden-onset events, more likely to lead to displacement, whilst other changes, such as a gradual process

33 See Castles (2002); Piguet *et al.* (2011); Gemenne (2011).

34 Castles (2002); Piguet *et al.* (2011); Findlay and Geddes (2011).

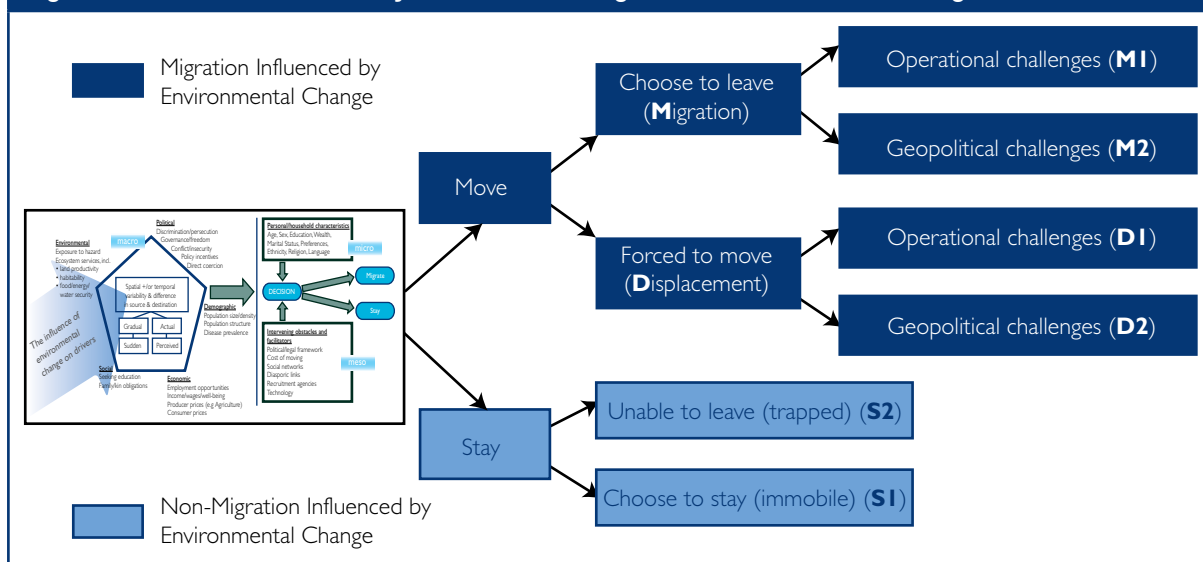
35 Castles (2002); Morrissey (2009).

36 See Chapter 3 and DR7b (Annex D refers).

37 Koser and Martin (2011).

of drought or land degradation, are likely to lead to increases in migration. Variations of this dual approach have previously been applied to the topic of migration influenced by environmental change, with 'voluntary' and 'involuntary' responses to environmental change conceptualised as existing at opposite ends of a continuum³⁸. This report builds on this approach to show that there are powerful linkages between the two types of migration, with migration potentially a better alternative to displacement.

Figure 1.4: Six human mobility outcomes arising from environmental change



Box 1.7: Migration, displacement and mobility: definitions

In line with the 2009 *Human Development Report*, this report uses the term 'migrant' or 'migration' to refer to individuals who have changed their place of residence either 'by crossing an international border [**international migration**] or by moving within their country of origin to another region, district or municipality [**internal migration**]'³⁹. People are normally considered to be 'migrants' if they remain outside their original place of residence for a period of at least 3 months.

Displacement is a particular form of migration, in which individuals are forced to move against their will. Where people are forced to move within their country of origin, this is referred to as **internal displacement**. Where people move to another country, they *may* become **refugees**, though in international law this term is reserved for people who meet the definition of a refugee in the 1951 Geneva Refugee Convention and its 1967 protocol and are recognised as such by their host state or the UN High Commission for Refugees (UNHCR).

It should be noted that within the wider literature and this report the term 'migration' is used as an umbrella term which incorporates two types of movement: voluntary 'migration' and involuntary 'displacement'. As is highlighted within this report, the distinction between these latter two terms is generally important in regards to the policy challenges, opportunities and responses, in the context of environmental change. Whilst it may be confusing in places to refer to migration and displacement as two forms of 'migration', this reflects the fact that these words are used interchangeably within the wider literature, and it is not within the scope of this report to set new definitions of these terms.

In turn, **human mobility** (or 'movement') is defined as 'the ability of individuals, families or groups of people to choose their place of residence', again in line with the 2009 *Human Development Report*⁴⁰.

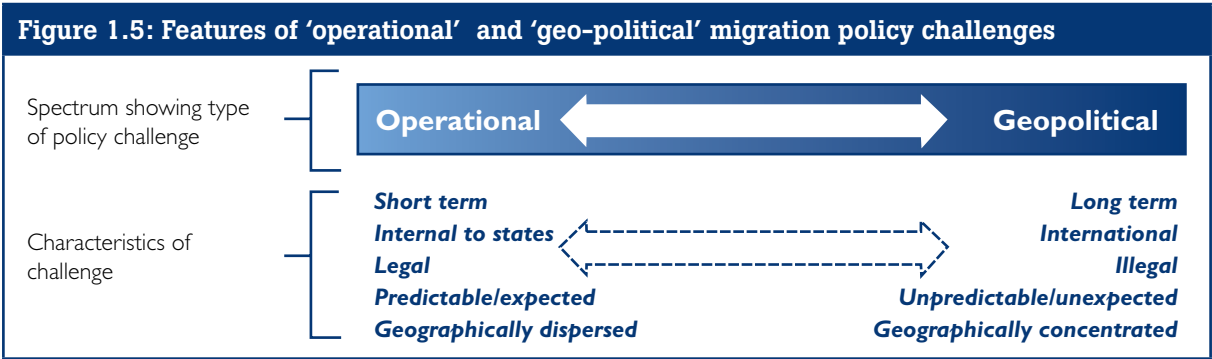
The distinction between 'operational' and 'geopolitical' challenges in migration and displacement is not a part of standard policy debate, but is intended to encapsulate the notion that there is a major difference in policy terms between different flows of people, depending on their volume, speed, direction,

38 Suhrke (1994); Hugo (1996); Bates (2002).

39 UNDP (2009).

40 UNDP (2009).

composition and permanence. For example, if environmental change were to add a net 1% to urbanisation rates over an extended period, this might be considered well within the operational capacity of most states to adapt their urban planning policies. In contrast, a substantial rise in net migration over a short period, as was perceived to be the case in some countries after EU enlargement in 2004, can become a major political issue. Similarly, the temporary displacement of even a large number of people from rising flood waters is an issue that governments can and do plan for; in contrast, the loss of the territory of a low-lying island state, should it occur, might have significant geopolitical ramifications in terms of the legal protection and future of the state's citizens. As with the distinction between 'migration' and 'displacement', it is likely that 'operational' and 'geopolitical' challenges exist at opposite ends of a continuum (see Figure 1.5). For example, evidence shows that certain aspects of the post-2005 tsunami disaster response were very political in their nature⁴¹.



A broad view of policy is required to understand policy problems related to *non*-migration influenced by environmental change, as well as other types of migration which occur in the context of environmental change.

There are other aspects of people migrating in circumstances of environmental change that present important policy challenges, including non-migration influenced by environmental change and migration as a form of adaptation to environmental change (see Box 1.6). Non-migration is shown in the conceptual framework in Figure 1.3 and as a 'migration outcome' arising from environmental change in Figure 1.4. It may seem perverse to categorise 'non-migration' as a 'human mobility outcome', but its relevance is acute: it is often those trapped in areas of environmental danger, and denied opportunities for diversifying their livelihood through migration, who will increasingly be the silent victims of environmental change.

This report takes a strategic approach to policies, including consideration of:

- policies that can be conceptualised as '**reducing the influence of global environmental change on migration**', which include slowing the rate of environmental change, reducing its impact and increasing resilience;
- policies that can be thought of as '**planning for and responding to migration influenced by global environmental change**', and which include addressing protection gaps, planning for urban growth and mitigating social tensions and conflict;
- policies which '**recognise migration as adaptation to environmental change**', including population resettlement, building new cities and facilitating migration as adaptation.

To provide a better understanding of responses across this range of policy areas, a number of policy reviews were commissioned from leading experts. These, along with the driver and science reviews, were subject to a full process of independent peer review and are published alongside this report (Annex D).

1.3 Scope of the report: migration, environmental change and scale

This section sets out the scope of the report, in terms of the scale and nature both of migration that it covers and of the environmental change with which it is concerned. Although much existing evidence has been concerned primarily with international migration, it has encompassed a very wide range of

⁴¹ Hyndman (2011).

'environmental changes' from the global (notably climate change) to the highly localised. This report takes a different approach in that *all* forms of migration, including international migration, internal movements and circulation, are analysed in the context of global environmental change. Three key ecological regions that are seen as being particularly vulnerable to global systemic environmental change are considered: low-elevation coastal zones, drylands and mountain regions.

1.3.1 Internal migration, international migration and circulation

This report uses a broad definition of migration that allows a more comprehensive understanding of the complex issues involved in environmental change and migration.

As noted above, the number of international migrants has grown in recent years, to approximately 210 million in 2010⁴². It is clear that international migration is a significant phenomenon; it is often a life-changing event for migrants themselves; it raises a number of questions in terms of governance and relations between states; and it has particular implications when the impact of environmental change on migration drivers is concerned, as it is likely to lead to geopolitical policy challenges.

Yet, according to figures compiled in the 2009 *Human Development Report*, international migration makes up only about one-fifth of total migration in the world, with the vast majority of movement, conservatively estimated at 740 million people⁴³, occurring within national boundaries. Internal migration is also covered in this report for a number of reasons. First, it is widely argued that the largest burden of environmental change will be felt by the poorest, in low-income countries⁴⁴. Poor people are often affected by migration, as they or a family member have moved, often to a nearby town or village or to another part of their country. Yet poor people are in general very unlikely to have access to international migration, as the cost is prohibitive.

Secondly, internal migration can often be over substantial distances, and have significant impacts. For example, migration from one Indian state to another or one Chinese province to another can take place over thousands of miles, and involve movement to a place with a different language, customs or set of rights and entitlements. In this sense, it arguably deserves attention alongside international migration as a significant issue for policy.

However, thirdly, and perhaps most important, there is some evidence to suggest that where global environmental change does act to raise levels of migration and displacement, the majority of additional migrants remain, and are likely to continue to remain, within their country of origin, owing to the prohibitive cost of international migration, as explained above. Moreover, as shown in Chapter 3, evidence also suggests that internal migration is taking people to places where they are more rather than less vulnerable to environmental change-related risk. A generally accepted definition, and the one that is used here, is that internal migration should involve the crossing of a regional, district or municipal boundary⁴⁵, the size and political significance of which will vary greatly in different countries, and involve a movement lasting at least 3 months. However, this definition draws attention to a key feature of migration, which is that migration is not necessarily permanent, but may involve multiple episodes of short-term migration, otherwise known as 'circulation'. It should also be noted that internal migration is more likely within large countries (such as China, Nigeria, Brazil, the USA), whereas international migration is more likely to affect the inhabitants of small countries (such as Jamaica, Luxembourg, and Tuvalu).

The report also includes short-term migration in its scope. Short time-span, repeated and often short-distance moves are especially significant for poorer people, as well as for groups such as women and children, who are often excluded from migration analysis. It can form a critical part of the livelihood strategy of poor households in vulnerable areas, and in that sense is particularly relevant to adaptation to environmental change. In addition, circulation is also a developing area of policy interest in terms of

42 UN DESA (2005); IOM (2010). Note, part of this increase is due to instances of reclassification. For example, between 1980 and 1990, the number of international migrants rose from 99 to 150 million. However, 27 million of these migrants were persons whose movement changed from being classified as internal to international with the disintegration of the USSR.

43 UNDP (2009).

44 IPCC (2007a).

45 UNDP (2009).

international migration: indeed, this form of mobility is encouraged within the European Union for citizens of member states, and increasingly discussed as a policy option for citizens from third countries.

1.3.2 Global systemic environmental change

A perspective is required that includes, but goes beyond, climate change

Whilst this report focuses on a wide range of types of potential migration, it is more specific in its attention to global environmental change as a matter of scientific and policy interest. A range of future environmental changes have the potential to influence the drivers of migration, with the most significant and extensive being global climate change, widespread land degradation and the degradation of coastal and marine ecosystems.

The growth in understanding of the scientific causes and consequences of climate change has been substantial in the last decade, with clear evidence for a strong link between rising greenhouse gas (GHG) emissions and past and future warming, with consequent effects on global and regional climate systems and sea level⁴⁶. There have also been many studies of the potential impact of these changes on environmental and human systems, with the most recent comprehensive overview presented in the report of Working Group 2 of the Intergovernmental Panel on Climate Change (IPCC)⁴⁷. This report concluded, for example, that drought-affected areas would likely increase in extent during the twenty-first century, that crop productivity in seasonally dry and tropical regions would reduce, and that coastal zones would be exposed to increasing flooding and erosion risks. The magnitude of impacts will depend not only on the rate of future emissions of GHGs – including any effects of climate mitigation policy – but also on rates of economic and demographic growth and the extent of adaptation.

A number of dimensions of climate change have the potential – along with non-climatic environmental changes – to influence the drivers of migration (see also Box 2.3):

Effects of climate changes

- a rise in sea level
- a change in tropical storm and cyclone frequency or intensity
- changes in rainfall regimes
- increases in temperature
- changes in atmospheric chemistry
- melting of mountain glaciers.

Non-climatic environmental changes

- land degradation
- coastal and marine ecosystem degradation⁴⁸.

In practice, these effects will vary between places, and there remains a high level of uncertainty in how changes will manifest themselves in particular places, especially to 2060 (see Box 2.4). Without significant reductions in emissions, there are other highly uncertain potential climate changes resulting from higher temperatures which could take place within the timeframes considered by this project, and which have relevance for migration, including non-linear changes such as the possible weakening of the South Asian monsoon or dieback of the Amazon rainforest⁴⁹. This project has sought to address these future uncertainties, as well as others inherent in the drivers of migration, by adopting a scenario-led approach (see Box 1.8).

⁴⁶ IPCC (2007b).

⁴⁷ IPCC (2007c); see also Smith *et al.* (2009); Gosling *et al.* (2011).

⁴⁸ See Box 2.3 for further description and evidence on how these environmental changes affect the drivers of migration.

⁴⁹ SR2 (Annex D refers); Lenton *et al.* (2008).

Box 1.8: Dealing with an uncertain future: four scenarios

An important element of the project's approach to environmental change and migration, shared with many other Foresight projects, concerns the use of 'scenarios of the future'. The extrapolation of past trends has been used where considered reasonable or illustrative. However, this approach is more limited where time horizons are longer term and when there are so many socio-political and other factors that could substantially change the migration system over the next 50 years – the fall of the Berlin Wall and accession of new Member States to the European Union fundamentally altered migration systems in Europe over the last 20 years, but were not easily predictable.

In view of this, scenarios are essential to 'explore alternative futures' and so inform the development of policies that are robust to a range of external factors. Using alternative scenarios allows for the possibility that there may be thresholds beyond which there is a 'step change' in a process or behaviour. The scenarios developed for this report, described in section 2.4, have two key dimensions which are critical drivers of migration: economic factors and political/governance factors. They differ from other scenarios currently in use in research on climate change⁵⁰ and ecosystem assessment⁵¹, although they bear some resemblance to scenarios recently suggested in the field of migration⁵². The scenarios are used quantitatively and qualitatively to analyse the drivers of migration to understand the future of migration in the context of environmental change over the 2030 and 2060 timeframes.

Following from this, and in the second part of the report, the same scenarios are used to assess the future resilience of strategic policies. If policies are likely to be effective in more than one scenario of the future – in other words they are more resilient to changes in the economic and political context – they are perhaps worthy of extra promotion. This 'policy testing' approach is known in the futures community as 'windtunnelling'.

1.3.3 Understanding global change: three vulnerable regions

The analysis of the impact of environmental change on migration drivers is of most relevance and interest in three key ecological regions.

This report considers migration and environmental change on a global scale first by identifying the existing drivers of migration and then analysing how environmental change will influence them. This has advantages over a focus on migration 'hotspots', which would entail a questionable environmentally determinist approach and limit a more sophisticated analysis of what forms of migration are taking place and what kind of policy issues they present.

However, it would be a task of impossible magnitude to review every single migration stream and investigate the environmental signal, at least in a qualitative, nuanced way. This report has therefore sought to develop a global, comprehensive assessment of the spatial characteristics of migration (and non-migration) influenced by environmental change, to use as a framework for empirical investigation. Three ecological regions are particularly important for the interplay of migration drivers and environmental change:

- *Low-elevation coastal zones:* A rise in sea level, changes in tropical storm and cyclone intensity, changes in rainfall regimes, changes in ocean chemistry and degradation of coastal/marine ecosystems will affect low-elevation coastal zones, which are home to 10% of the world's population⁵³, as well as being amongst the most dynamic places on earth in terms of urbanisation and economic change⁵⁴.
- *Global drylands:* Changes in rainfall regimes, increases in temperature, changes in crop productivity and land degradation will affect drylands. The combination of rising populations, political turmoil, land degradation and recurrent drought is a major challenge for their estimated population of two billion⁵⁵,

50 IPCC (2000a).

51 Millennium Ecosystem Assessment (2005); DR7a (Annex D refers).

52 DR8b (Annex D refers).

53 DR7a (Annex D refers).

54 DR7b (Annex D refers).

55 DR6 (Annex D refers).

at least half of whom are considered to be directly dependent on natural resources, while 250 million are already affected by land degradation⁵⁶.

- *Mountain regions:* Changes in rainfall regimes, increases in temperature, changes in crop productivity, land degradation and increased glacier melt will affect mountain regions where livelihoods still depend to a great extent on the use of natural resources. Nearly three-quarters of mountain people live in rural settings where a series of 'mountain specificities', including inaccessibility, fragility and marginality, increase vulnerability.

Low-elevation coastal zones, global drylands and mountain regions constitute the report's global spatial framework for the investigation of the influence of environmental change on migration drivers. As these ecological regions do not necessarily follow regional economic or political structures, this approach offers useful insights into the interaction of environmental change and the drivers of migration.

1.4 Structure of the report

This report is divided broadly into two parts. The first begins by identifying the drivers of migration and explaining how environmental factors interact with other drivers to influence why people move and, just as importantly, why they stay (Chapter 2). This is then used as a basis for analysis of future changes in patterns of migration and displacement, relating to the three ecological regions (drylands, low-elevation coastal zones and mountain regions) in Chapter 3. The diverse impacts and implications of people migrating under the influence of environmental change, in the absence of policy intervention, are then considered in Chapter 4. The insights from Chapters 2–4 are drawn together in Chapter 5 to set out a range of possible options for policy, which are considered in the second part of the report, in Chapters 6–8.

How policy interventions can alter the impact of environmental change on migration drivers is considered in Chapter 6. In effect, this chapter is concerned with addressing the causes of migration that might be influenced by environmental change at source. Nevertheless, it is expected that some migration influenced by environmental change will be inevitable, not least in response to increasingly frequent extreme events that may be difficult and costly to prevent. Options for responding to migration and displacement, as well as to populations who are unable to move (or choose not to) in the face of deteriorating environmental conditions, are then considered in Chapter 7. Forms of migration that might be considered as valid adaptation mechanisms in anticipation of environmental change are considered in Chapter 8, which acknowledges that preventing or constraining migration can itself result in undesirable impacts and risks.

Finally, a broad and expansive view across the entire report is taken in Chapter 9, drawing out particular themes about the future and identifying strategic choices and opportunities where the need for action is most pressing.

Box 1.9: The international scope of the Foresight report

Migration is a global issue, requiring both a global perspective and an appreciation of the particular circumstances of a multitude of localities. Whilst the project has been managed and led by Foresight in the UK Government Office for Science, it is international in its scope and has drawn upon the work and assistance of leading experts and stakeholders from across the world. More than 350 experts from over 30 countries in the world have played some part in the development of this report.

⁵⁶ DR6 (Annex D refers).



2 Why do people move and why do they stay?

Key messages

- The drivers of migration can be conceptualised into five categories; of these, economic and social factors are perceived as having the greatest effect on the volume and patterns of migration, though the interactions between these drivers are equally important in determining migration outcomes.
- Environmental drivers play a limited direct role, but *global environmental change* will influence migration outcomes through affecting various drivers of migration. This influence is most pronounced for economic, environmental and political drivers of migration.
- Interactions between environmental change, migration drivers and the personal characteristics of individuals can impel migration, but can also lead to *people choosing to or being forced to stay* in areas where they may become increasingly vulnerable to environmental and other risks. This is a particularly important conclusion, as subsequent chapters will show that future potential immobility will itself raise a range of issues for policy makers, possibly as important or more important as those associated with migration itself.
- While general trends of future environmental change are relatively well understood, uncertainties in some areas remain considerable, particularly after the 2030s, and projections of the 'non-environmental' drivers of migration are also uncertain. Yet these future conditions will have fundamental impacts on the way environmental change affects migration. To help address this uncertainty, four 'future scenarios' of the world have been developed as a tool for exploring the future throughout the report.

2.1 Introduction

A new conceptual approach was introduced in Chapter 1 to provide a framework for the analysis in this report (see Figure 1.3). The framework sets out five categories of drivers which affect population movements both within and between nation states: economic, social, political, demographic and environmental. The argument was made that the many forms of environmental change in the future will generally act through these five drivers to affect levels and patterns of migration. It follows that establishing how these drivers act and interact to affect population movement is a necessary first step before the possible effects of future environmental change can be understood. This is the subject of the first part of this chapter.

The chapter then explores from a theoretical perspective how different aspects of future environmental change will influence the five drivers to alter future volumes and patterns of migration. Finally, the chapter considers how each migration driver might change in ways that are highly uncertain and potentially very disruptive. An analysis of this uncertainty is formalised in the development of plausible future socioeconomic scenarios.

2.2 The drivers of migration

This section first describes the five drivers of migration, referencing the relevant evidence where appropriate. The relative importance of the five drivers in causing migration is then analysed, and it is noted that economic and social drivers are often cited as the most important by individuals. The section concludes by examining the interdependence and interaction between different migration drivers.

2.2.1 The five drivers of migration

Five sets of 'drivers of migration' can be conceptualised.

The pentagon in Figure 1.3 characterises five broad categories of drivers of migration and notes that it is the actual or perceived spatial and temporal variability and difference between the source and destination which influences movement. Economic drivers include employment opportunities and income differentials between places. Political drivers cover not only conflict, security, discrimination and persecution, but also the political drivers of public or corporate policy over, for example, land ownership or enforced relocation. Demographic drivers include the size and structure of populations in source areas, together with the prevalence of diseases that affect morbidity and mortality. Social drivers include familial or cultural expectations, the search for educational opportunities and cultural practices regarding, for example, inheritance or marriage. The environmental drivers of migration include exposure to hazard and availability of ecosystem services. There is a vast literature that considers these drivers of migration which is not discussed in detail in this report, but relevant work is highlighted in Table 2.1.

Table 2.1: Five key drivers of migration⁵⁷

Driver	Evidence
Economic	Imbalances in labour markets and wage differentials at the macro level ⁵⁸ , and individual cost–benefit analysis of expected wages at the micro level ⁵⁹ , have been presented as two economic models of migration ⁶⁰ . A third complementary model suggests that households engage in migration to minimise risk and overcome market failures in non-labour markets (for example, capital or crop insurance markets) ⁶¹ . Whether at the individual or the household level, and whether in relation to expected income or income volatility ⁶² , economic drivers influence migration in diverse and non-deterministic ways.
Social	Access to family, social or other networks facilitates migration by migrants, while limited family and other ties also explain a lack of migration by others ⁶³ . Tendency to migrate is established in families and communities and is often celebrated through symbols and status, hence the 'culture of migration' in many populations ⁶⁴ . Migration is, for some, a rite of passage: movement acts as a key stage in an individual's progress to becoming adult or gaining acceptance ⁶⁵ . Access to education generally increases the ability and aspiration to migrate, and significant numbers of people migrate specifically in pursuit of education ⁶⁶ . However, there are also cases in which the pursuit of education is negatively correlated with migratory aspirations ⁶⁷ . Migratory aspirations may shift as knowledge and information circulates between the 'sending' and 'receiving' ends of 'transnational communities' ⁶⁸ .

57 For further discussion of the five key drivers of migration see Black *et al.* (In press).

58 Lewis (1954); Ranis and Fei (1961); Massey *et al.* (1993); Lalonde and Topel (1997); Bjak (2006).

59 Todaro (1969); Harris and Todaro (1970).

60 MR3 (Annex D refers).

61 Mincer (1978); Stark and Levhari (1982); Stark and Bloom (1985); Stark and Lucas (1988).

62 MR3 (Annex D refers).

63 Massey and Espania (1987); DR14 (Annex D refers).

64 Massey and Kandel (2002); Ali (2007).

65 Friedman (1990); Jónsson (2008).

66 DR14 (Annex D refers).

67 Massey and Kandel (2002).

68 DR14 (Annex D refers).

Driver	Evidence
Political	Political drivers have the potential to influence migration through multiple pathways. Displacement, or forced migration, may be triggered by the breakdown of governance structures or the emergence of violent conflict ⁶⁹ . However, conflict is not only a cause of migration; in some circumstances, conflict and political repression can prevent people from leaving, leading to cases of 'involuntary immobility' ⁷⁰ . Public policies seek to increase or limit migration through schemes which encourage people to move, or through barriers that restrict mobility. These policies may be directed towards the internal migration or emigration of those within a particular state's borders, or towards the immigration (permanent or circular) of foreign nationals ⁷¹ . A range of political factors, from discrimination to marginalisation, may influence migration and migratory decisions ⁷² .
Demographic	Traditionally, theories of migration have drawn heavily from the idea that 'population pressures' are major determinants or even 'root causes' of human movement. This is based on the notion that, as populations grow, Malthusian pressures are exerted on natural and agricultural resources, ultimately leading to outmigration ⁷³ . In outlining the influence of this driver, however, it is important to avoid demographic determinism. Rather than a direct driver of migration, demographic pressures are more likely to influence migration in interaction with other drivers ⁷⁴ . Furthermore, the scale and directionality of movement is not always straightforward, with most migration related to demographic pressures occurring internally and many migrants moving from areas of relatively low population densities to areas of relatively higher population densities ⁷⁵ . Age structures of populations are also important. Young populations tend to be a source of migrants ⁷⁶ , whereas ageing populations in many European (and even Asian) countries may create a demand for migration ⁷⁷ .
Environmental	The environment affects well-being through the availability and stability of, and access to, ecosystem services, and through the occurrence of hazardous events. The availability of provisioning ecosystem services is particularly acute for economies dependent on agriculture, fisheries and forestry, which are predominant in rural parts of the developing world. Here a change in ecosystem services directly affects well-being and the demand for migration ⁷⁸ . In addition, rapid-onset extreme environmental events, such as floods, landslides and wildfires, as well as volcanic eruptions, earthquakes and tsunamis, trigger displacement: significant numbers of people are displaced in the short and long term every year ⁷⁹ . Migration is but one of several possible responses to extreme events, and displacement is usually the option of last resort ⁸⁰ . Who leaves, who returns, and when they return depends on the underlying social, economic and political circumstances. Hence, environment affects migration in combination with the other four drivers.

69 Zolberg *et al.* (1989); DR5 (Annex D refers).

70 Lubkemann (2008).

71 See, for instance, Carling (2002); Vertovec (2007); Bakewell (2008).

72 See, for instance, Van Hear (1998).

73 See discussion in De Haas (2008).

74 DR11 (Annex D refers).

75 DR11 (Annex D refers); De Haas (2008).

76 Ortega (2005); Hatton and Williamson (2009).

77 DR3 (Annex D refers).

78 DR7a (Annex D refers).

79 SR10 (Annex D refers); CR1 (Annex D refers).

80 CR1 (Annex D refers).

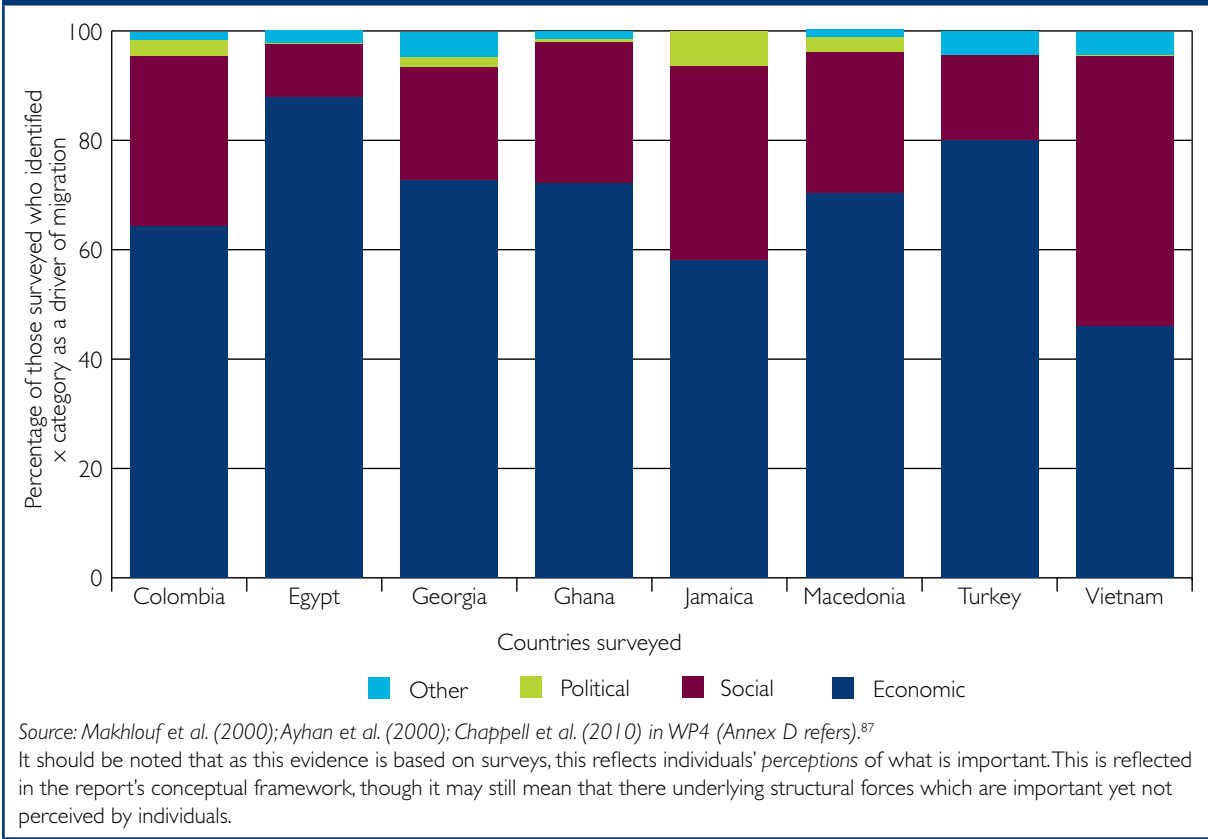
2.2.2 The relative importance of migration drivers

The relative importance of the drivers of migration differs and is context specific: however, economic drivers are often perceived as the most influential by individuals.

Evidence from national surveys on migration from eight low- to mid-income countries shows the relative importance of economic factors compared with others, at least in terms of individuals' stated reasons for leaving (Figure 2.1). Amongst these economic factors, the availability of jobs emerged as more significant than the existence of wage differentials, or the consequent ability to send remittances to family members back home. This survey analysis accords with evidence commissioned by this project to review the drivers of migration across different ecological and geographical regions of the world. As shown in the next chapter, economic factors are seen as crucial in driving migration in ecological zones as diverse as drylands⁸¹, mountain regions⁸² and low-elevation coastal zones⁸³, and in geographical regions as diverse as the Mediterranean⁸⁴ and Asian mega-deltas⁸⁵.

Survey data from the USA and the UK suggest that economic factors might be relatively less important overall as motivations for those arriving in these two high-income countries, when compared with low-income countries, although they still account for 47% and 42% of all stated motivations respectively. This makes economic drivers the leading factor in migration to the USA, and second in the UK⁸⁶ (the leading factor for the UK is social drivers, as explored next). The relative importance of different economic drivers depends in part on the nature of the wider economic circumstances. For example, research suggests that if there is fast economic growth in the destination area, then differences in income tend to dominate as the key driver of both internal and international migration. This has been the case in China, India and, increasingly, African countries.

Figure 2.1: Evidence from surveys on the relative importance of different factors in emigration from low income countries (countries chosen on the basis they contain high quality data sets)



81 DR6 (Annex D refers).
82 DR9 (Annex D refers).
83 DR7b (Annex D refers).
84 DR8b (Annex D refers).
85 DR7b (Annex D refers).
86 WP4 (Annex D refers).
87 To note the survey size varied between countries, see WP4 (Annex D refers).

Social drivers of migration are often perceived as the most dominant by individuals – especially in cases of internal migration.

Evidence from surveys suggests that, in many countries, social factors come second after economic factors as motivations for international migration, and that in some cases they come first⁸⁸. As shown in Figure 2.1, this is the case for people migrating internationally from Vietnam, who are often motivated by marriage. The role of social factors becomes even more apparent for *internal* migration (see Table 2.2); for example, marriage is a key driver of internal migration by women within India⁸⁹.

It is estimated that around 55–60% of international recruitment is organised through individual initiatives and informal recruitment, often driven by particular job openings⁹⁰. Importantly, once a migration network is established, diaspora effects can lower the costs of movement, whilst also providing a base for FDI flows, remittances, technology transfer, and also for ideas and representations. These factors can all contribute to making migration more accessible for individuals.

Table 2.2: The relative importance of different factors in internal migration as perceived by individuals: evidence from surveys⁹¹

	Percentage of survey respondents citing primary motivation for internal (and predominantly internal) migration, by country			
Motivation	India	Nepal	New Zealand	United States
Economic	9.9	15.5	13.7	28.0
Social	86.3	81.3	80.3	66.6
Environmental	0.2	n/a	2.5	0.9
Political	0.6	n/a	n/a	n/a
Other	2.9	3.2	3.4	4.5

Source: WP4 (Annex D refers)

2.2.3 The interdependence of drivers of migration

Often, the drivers of migration do not act alone. For example, political drivers are most influential when they coexist and interact with economic drivers, whilst demographic drivers cannot be understood in isolation.

It is difficult to disaggregate the effects of one set of drivers of migration entirely from those of other drivers. For example, whilst the political drivers of migration and displacement are often conceptualised as involving conflict, it is relatively rare for conflict to affect migration independently from other categories of drivers⁹². There is a strong political economy of conflict, with economic factors influencing the course of conflict, and patterns of migration responding as much to the economic destruction that is often wreaked by conflict as to the conflict itself⁹³. Moreover, development policies can, through their focus on poverty reduction and sustainable livelihoods, ameliorate the causes of conflict and enhance security, understood at both a state and human level.

In China, economic but also political transformation has led to large-scale internal movement from rural to urban areas in recent decades. Internal migration is associated with rapid economic development, but it is also intimately linked to changes in the orientation of Chinese economic policy designed to stimulate

88 As with Figure 2.1, it should be noted that as this is evidence is based on surveys, this reflects individuals' *perceptions* of what is important. This is reflected in the report's conceptual framework, though it may still mean that there underlying structural forces which are important and not perceived.

89 Bhagat (2010).

90 DRI4 (Annex D refers)

91 Data for India and the United States refer to internal migration. Data for New Zealand and Nepal refer to internal and international migration, but the vast majority of migration (80%+) in both of these countries is internal. 'n/a' = this category was not asked about specifically and is included in 'other'.

92 DR5 (Annex D refers).

93 Collinson (2003).

export growth and attract FDI. The Chinese government has created special economic zones (SEZs), where there has been rapid population growth coupled with a diversification in the economic base away from agriculture⁹⁴. In 1978, the Pearl River delta was the first area in China to be accorded SEZ status. It now has a population of more than 40 million and a population density of 7,840 per square kilometre. In both the Pearl and Yangtze River deltas, urban populations have risen from fewer than 10 million people in 1990 and are projected to reach over 65 million by 2025. This massive rural–urban shift is replicated in other Asian mega-deltas such as the Red River and Mekong deltas in Vietnam and the Chao Praya delta in Thailand.

Historically, countries experiencing the first phase of the ‘demographic transition’ (where the onset of development sees mortality decline yet fertility remains high, resulting in population growth⁹⁵) have experienced high rates of emigration⁹⁶. Whilst population booms increase migration pressure, whether this turns into actual migration depends on other factors at the receiving end. For example, the growth in emigration from low-income countries after the 1960s can be seen to be related to the appearance of sizeable young adult cohorts in such countries; however, it also relied on the USA and other countries introducing less discriminatory immigration policies. States have developed policies to encourage certain types of migration where demographic factors have combined with economic factors to mean that supply of labour is lower than demand, for example the ‘guestworker’ programmes in the 1950s in some European countries (notably Germany).

Over the next 50 years, demographic changes in many countries may make expanding migration an increasingly attractive policy option. In most high-income countries, but also in many low-income countries, populations are getting older and smaller, creating demand for migrant workers. However, these demographic drivers do not act alone, but alongside economic and political signals.

This report finds that ecosystem services can be important drivers of migration, either directly or through their interaction with other migration drivers.

The natural environment is not often considered as a dominant driver of migration, yet emerging understanding of the risks and benefits of ecosystems services shows that they play an important role. Access to fresh water, productive soil and energy production are important provisioning services that affect people’s decisions to stay or move from their settlements. In Cameroon, for example, access to forests and to extract timber and other goods (so-called ‘ecological income’) was a primary determinant of the decisions of households to stay or migrate from forest regions⁹⁷.

In addition, the natural environment and variability within it affects migration through the economics of resource availability and land productivity and resultant effects on economic opportunities and relative wages. The primary mechanisms by which livelihood and well-being are secured are through the availability, stability and access to ecosystem services; hence ecosystem services can be a factor in decisions on settlement and migration. These mechanisms are critical in rural economies dependent on agriculture, forests and fisheries. In the case of arable agricultural systems, recent evidence shows that reductions in soil quality (for example through increased erosion) increase temporary labour migration in Kenya, but that in Uganda it takes greater agricultural income to provide the income and resources to enable migration⁹⁸.

Event-driven displacements are usually short-lived and people commonly return to the source location once the event has receded, often after only a short time has elapsed. Yet, of demographic and environmental factors both affect how and whether displaced peoples return, whilst their ability to do so is also constrained by issues such as political stability and access to economic resources. An analysis of migration patterns in Honduras before and after storms in 1990s and 2000s shows that whilst the poorest households were hardest hit by the impacts of Hurricane Mitch in 1998, changes in land tenure and support meant that poorer households were less vulnerable to subsequent storms in the late 2000s

94 DR7b (Annex D refers).

95 DRI I (Annex D refers).

96 DR3 (Annex D refers).

97 Ruitenbeek (1996).

98 Gray (2011).

and less likely to be displaced⁹⁹. Hence, policy intervention to secure access to ecosystem services is critical in ameliorating the effect of environmental risk on migration patterns.

This section has shown the importance of the five types of migration driver. Through regional workshops, it has been possible to consider how drivers interact both in particular countries (Box 2.1) and across wide regions (Box 2.2). However, the focus of this report is *environmental change*; for this reason section 2.3 explores the influence of environmental change on the drivers of migration separately and together.

Box 2.1: Case study of the existence of the five drivers of migration: Turkey

Turkey is a fast-growing country experiencing rapid economic and social development, much of which is concentrated on major urban centres, such as Istanbul. Following a period of economic, social and demographic restructuring that initially led to increased emigration, Turkey has high levels of economic growth and is now an increasingly attractive destination for migrants¹⁰⁰. The five drivers of migration in the Turkish context are shown below.

Migration drivers	Examples of actual and potential effects on Turkey
Economic	Rapid economic growth drawing internal and international migrants ¹⁰¹ , particularly to major cities such as Istanbul.
Political	Conflict in neighbouring states in the Middle East and North Africa has led to increased international migration. Turkey is increasingly associated with EU migration and asylum policy ¹⁰² .
Demographic	Demographic transition means Turkey is likely to become a destination country for international migrants ¹⁰³ .
Social	Migration networks link Turkey to destination countries such as Germany ¹⁰⁴ while new networks link Turkey to sending countries in Central Asia, the Middle East and North Africa.
Environmental	Rapid urban growth poses challenges to sustainable development while also exposing migrants in urban areas to environmental hazards ¹⁰⁵ .

99 McSweeney and Coomes (2011).

100 Kirisci (2003a).

101 DR8b (Annex D refers).

102 Kirisci (2007)..

103 İçduygu and Sert (2009).

104 Avcı and Kirisci (2007).

105 Karaca and Nicholls (2008).

Box 2.2: Regional workshops: evidence of the drivers of migration in mountain regions

As part of the Foresight project, regional workshops were organised in the project's three key ecological regions as well as the Mediterranean region as a case study, bringing together local and regional experts and stakeholders to discuss the issues of migration and global environmental change. Workshop reports are included in the report's evidence base and a selection of the conclusions and discussions from these workshops are included in boxed sections in this report. These meetings were held in the following locations:

- Dhaka, Bangladesh: low-elevation coastal zones and small island states
- Kathmandu, Nepal: mountain regions
- Johannesburg, South Africa: drylands
- Istanbul, Turkey: as a case study on the Mediterranean.

The workshop on **mountain regions** included a wide-ranging discussion of the issues and evidence relating to the drivers of migration in mountain regions, including a particular focus on environmental change. Some of the key points on the main drivers of migration are summarised below:

- **Economic:** Economic need was recognised as the most influential of all migration drivers. Cyclical (rural–urban–rural) internal labour migration is the most common form of migration and is primarily fuelled by changes in livelihoods to rely less on natural resources. As a result, remittances now form a greater percentage of the household income than agriculture, in many areas.
- **Political:** Due to the rights accorded to Nepalese individuals to live and work in India there is a high rate of both short- and long-term migration from Nepal to India. In Latin America the limitations and restrictions on south–north migration has resulted in an upsurge of south–south migration or migration within Latin America.
- **Environmental:** Permanent migration due to environmental drivers is a reality. One participant provided an example from Nepal in which a whole community had moved because of a lack of water in their area.
- **Social:** Participants described how many mountain people continue to maintain links with their area of origin because of strong cultural ties. They argued that the building of roads, which increases short-term mobility, is likely to actually reduce migration in the long run as it allows individuals to both take advantage of the accessibility of urban centres and to stay within their communities¹⁰⁶.

A full report detailing the discussions from the Mountain Regions workshop can be found on the Foresight website and CD along with the full evidence base.

2.3 How global environmental change influences the drivers of migration

2.3.1 The impact of environmental change on the drivers of migration

Environmental change will play an important role into the future through influencing the environmental drivers of migration as well as other drivers of migration, by changing both 'average' conditions and patterns of variability.

This report is about environmental change, defined as changes in the physical and biogeochemical environment, over a large scale, either caused naturally or influenced by human activities. Many ecosystem services are in decline and many hazards in the environment are likely to be radically altered by climate and global environment changes in the decades ahead (see Box 2.3). Global environmental change will affect the natural world, the variability of supply of ecosystem services and exposure to hazard. Because ecosystem services and exposure to hazard are important in driving migration, as shown in section 2.2.3, it is clear that global environmental change will affect the risk calculations involved in moving and people's decisions to stay or move from their settlements.

¹⁰⁶ WRI (Annex D refers).

It is thus clear that environmental change affects the environmental drivers of migration. However, to deliver a comprehensive analysis of the impact of environmental change upon migration, it is important to examine the relationship between environmental change and *other* drivers of migration. A typology of these relationships is shown in Box 2.3.

Box 2.3: Primary environmental changes that are likely to influence the drivers of migration (for a discussion on uncertainty and the future of these changes see Box 2.4)

Climate change

1. A rise in sea level leads to a higher risk of coastal flooding, increased erosion of coastal land and ecosystems and greater salinisation of low-lying agricultural land. Erosion of ecosystems such as wetlands and mangroves through development in coastal zones over the past decades now exposes coastlines to greater risk of hazards. Salinisation of agricultural land, which is exacerbated by extraction of groundwater, lowers the productivity of such land and decreases freshwater security. These problems are likely compounded by rises in sea level¹⁰⁷. Moreover, a rise in sea level could eventually lead to issues such as loss of agricultural land through permanent inundation¹⁰⁸ and changes to marine and freshwater ecosystems with impacts on fish populations and fish-dependent livelihoods¹⁰⁹.
2. A change in *tropical storm and cyclone intensity* could increase the risk of coastal flooding and damage, increasing the exposure to hazards of coastal settlements. The overall impact of flooding of storm surges on agricultural productivity, however, is uncertain¹¹⁰. Cyclones, hurricanes and typhoons in tropical areas have historically generated more displacement than storms elsewhere. It is currently not clear whether or how cyclonic activity will be affected by climatic changes, although there are suggestions that, although the frequency of cyclones may not change (or even decrease), their intensity may increase, with resultant implications for tropical countries.
3. Changes in *rainfall regimes* would increase exposure to hazards through flooding and fire, affect the security and quality of water for domestic, municipal, industrial and agricultural uses, and also result in shifts in land productivity in all parts of the world. Soil erosion and waterlogging associated with heavy precipitation could influence agricultural income and well-being by damaging crops and increasing the frequency of failure¹¹¹. Furthermore, loss of agricultural productivity as a result of reduced precipitation could also lower rural wages¹¹² and impact crop prices¹¹³.

¹⁰⁷ Nicholls *et al.* (2007).

¹⁰⁸ Gornall *et al.* (2010).

¹⁰⁹ Badjeck *et al.* (2010); Adams and Adger (in press).

¹¹⁰ Gornall *et al.* (2010).

¹¹¹ Kundzewicz *et al.* (2007); Easterling *et al.* (2007).

¹¹² Mendelsohn *et al.* (2007).

¹¹³ Parry *et al.* (2009).

4. *Increases in temperature* raise the frequency of high-temperature extremes, which can potentially affect land productivity in warmer areas and hence food security by increasing the risk of crop failure. These losses have, in turn, been shown to affect rural wages¹¹⁴ and crop prices¹¹⁵. Increases in temperature can also increase exposure to hazards, increasing the possibility of pest outbreaks and wildfires¹¹⁶ which negatively affect agriculture and forests¹¹⁷. Furthermore, they can affect human health, for example heatwaves pose risks to vulnerable populations¹¹⁸. Although increases in temperature extremes are significant, other factors, such as the magnitude and timing of extreme temperatures, must also be taken into account in determining impacts on areas such as agricultural productivity¹¹⁹.
5. Changes in *atmospheric chemistry* would combine with changes in rainfall and temperature to affect crop productivity (higher CO₂ concentrations would be good for some, but not all, crops, whilst higher low-level ozone concentrations would be bad for most)¹²⁰. These shifts would also affect ocean chemistry and hence the productivity of coastal and marine ecosystems¹²¹.
6. *Melting of mountain glaciers* would cause an increased risk of glacial lake outburst floods, threatening settlements in certain mountain regions by increasing their exposure to hazards. The risk of rock avalanches would also increase as glacier melt destabilises slopes. In the longer term, river flows would decrease as glaciers recede, fundamentally changing mountain ecosystems and affecting water, agricultural productivity¹²² and energy security¹²³.

Non-climatic environmental changes

7. *Land degradation*, through a combination of agricultural practices, extreme weather events and climate change, leads to deteriorated soil quality and land productivity. Land degradation affects the provision of ecosystem services and affects crops, food security and agriculture. Furthermore, declining vegetation cover could lead to an increased risk of flooding in catchment areas, thus exposing populations to hazards that trigger displacement¹²⁴.
8. *Coastal and marine ecosystem degradation* has led to loss of aquatic species and habitats and the removal of physical features and ecosystems that serve as protection against coastal storms. These factors alter the exposure to hazards of coastal communities and impact the provision of ecosystem services and the productivity of fisheries that provide nutrition to large parts of the world population¹²⁵.

Environmental changes have different degrees of influence upon different drivers of migration. Environmental drivers are very susceptible to change, but the relationship with economic drivers of migration is most important.

As indicated above (Box 2.3), environmental changes have significant influence on environmental drivers. The box also shows that, in the case of economic drivers, environmental change is likely to have a significant effect on geographical patterns of agricultural productivity, influencing employment, wages and prices in this sector; with significant effects both in labour-sending and labour-receiving areas. Effects of environmental change on fish-dependent economies are particularly stark¹²⁶.

¹¹⁴ Mendelsohn *et al.* (2007).

¹¹⁵ Parry *et al.* (2009).

¹¹⁶ SRI I (Annex D refers).

¹¹⁷ Easterling *et al.* (2007).

¹¹⁸ Confalonieri *et al.* (2007).

¹¹⁹ Gornall *et al.* (2010).

¹²⁰ Easterling *et al.* (2007).

¹²¹ Nicholls *et al.* (2007).

¹²² Gornall *et al.* (2010).

¹²³ IPCC (2007a).

¹²⁴ Millennium Ecosystem Assessment (2005).

¹²⁵ Ibid.; Badjeck *et al.* (2010); Adams and Adger (in press).

¹²⁶ Badjeck *et al.* (2010); Adams and Adger (in press).

There are two important characteristics of the relationship between environmental changes and economic drivers of migration which are extremely important for the analysis of migration results in Chapter 3:

- **Whilst it is individuals who migrate, their decision-making is also based on calculations made at a household level relating to household *livelihoods***¹²⁷. This may become especially salient in conditions of low economic growth, where threats to sustainable agricultural livelihoods through future environmental changes expose households to increased risk. In such circumstances, households can insure or protect themselves against risk by using migration as part of an income diversification strategy as one or more family members moves nationally or internationally to higher-income areas¹²⁸.
- **The extent to which the economic factors that drive migration are influenced by environmental changes is at least in part sector specific.** For example, in an area where livelihoods are largely dependent on *agriculture*, adverse movements in agricultural employment, wages or prices may have a significant effect, first on those directly employed on the sector; and then more broadly on a region if there is no appreciable sectoral shift in economic activity. Such movements are very much influenced by environmental change. In contrast, in other regions that are heavily dependent on other sectors, movements in employment, wages or prices may be largely uninfluenced by environmental change.

In the case of both agriculture and fishing, however, there is a need for caution. For example, farmers' reactions to declining rainfall can range from abandonment to diversification (including the introduction of new crops with different labour demands), intensification (including irrigation and industrialisation), and a move to reduce risk in other ways (for example through insurance schemes)¹²⁹, each potentially having radically different consequences for migration patterns.

There are less pronounced effects of environmental change on political, and especially social and demographic drivers. However, the importance of these drivers in understanding migration in the context of environmental change is through their *interactions* with economic and environmental drivers.

Political drivers of migration are also susceptible to environmental change in the future. Most obviously, states may seek to directly limit or promote migration in the face of a perceived 'threat' of environmental change or the necessity to 'relocate' vulnerable populations¹³⁰. More complex are the interactions between environmental change, conflict and migration, although recent academic literature suggests that the notion of a causal link between increasing resource scarcity and interstate or armed conflict is contested (see Chapter 3)¹³¹. Environmental policies developed in anticipation or response to environmental change could also have implications for migration, and can also be understood as the influence of environmental change on political drivers of migration. However, there is only emerging evidence in this area¹³² (see Box 6.2 for further discussion of this).

It seems unlikely that social and demographic drivers of migration will be significantly affected by environmental change in the future, with the possible exception of the impact of environmental change on the regional or global distribution of diseases¹³³. A schematic diagram of the relative influence of environmental change on the different drivers of migration is shown in Figure 2.2. This shows that environmental and economic drivers of migration are most likely to be influenced by environmental change; social and demographic drivers are the least likely to be influenced, and political drivers are somewhere between these poles.

This does not imply that political, demographic and social drivers are unimportant in the analysis of migration in the context of environmental change. As was noted in section 2.2.3, there are important interactions of environmental drivers and social, demographic and political drivers. A complete analysis of migration in the context of environmental change requires an understanding of the impact of environmental change on migration drivers, and the further relationships between drivers. This is an important part of the analysis, as will be seen in Chapter 3.

¹²⁷ Stark and Bloom (1985).

¹²⁸ See a discussion on the New Economics of Labour Migration in MR3 (Annex D refers).

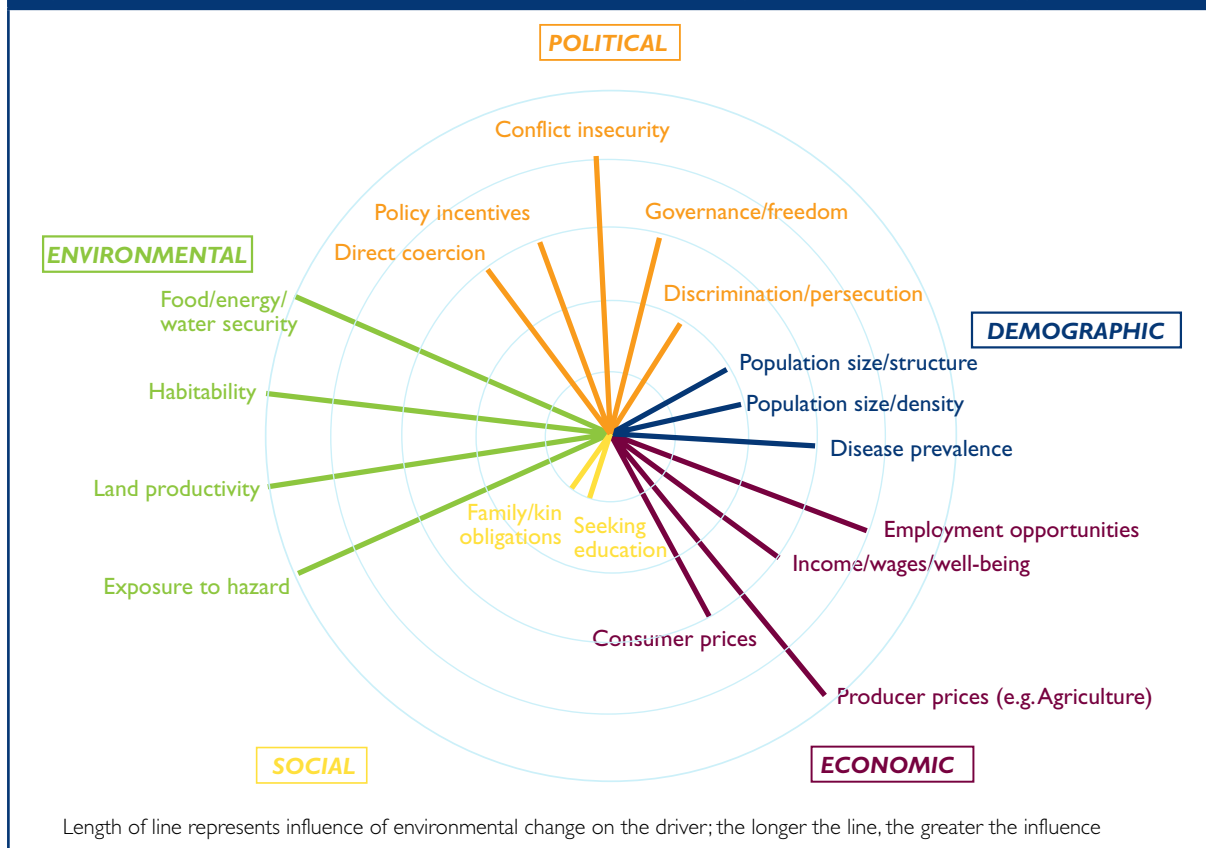
¹²⁹ Giné *et al.* (2008); Hellmuth *et al.* (2009).

¹³⁰ Dun (2011).

¹³¹ SRI2 (Annex D refers).

¹³² DRI5 (Annex D refers).

¹³³ DRI1 (Annex D refers).

Figure 2.2: The relative influences of environmental change on the drivers of migration

2.3.2 The impact of environmental change on factors that reduce migration

In addition to influencing factors that drive people to migrate, global environmental change could lead to more people choosing or being forced to stay in places where they are vulnerable to environmental risk.

One response of communities to declining rainfall or increased risk of flooding is to invest in irrigation and water management. Yet in so far as this is likely to increase the propensity of people to choose to stay in exposed areas, they are likely to remain vulnerable to extreme droughts and/or flood events, particularly if there is a lack of continuing investment in the maintenance and management of irrigation systems¹³⁴.

An equivalent process appears to have occurred in Bangladesh, where investment in storm shelters and early warning systems in the wake of a series of devastating cyclones has arguably contributed to increasing numbers of people choosing to remain in vulnerable areas¹³⁵. A key question here is whether adaptive responses to increased environmental hazard are sufficiently robust to withstand future events. In 2007, Cyclone Sidr killed around 4,000 people in Bangladesh. In comparison, an equivalent storm in 1970 killed 300,000. This suggests that these measures are effective for the time being. However, this may have as much to do with differences in the storm track of Cyclone Sidr as the increased resilience of populations living in affected regions.

The importance of personal/family characteristics: environmental change can affect these characteristics and ultimately lead to a *reduction* in migration.

As illustrated in Figure 1.2, it is clear that ability to migrate is critically dependent on personal characteristics such as age, gender, wealth or disability¹³⁶. For example, substantial social, economic and

¹³⁴ Pelling (1999).

¹³⁵ CS4 (Annex D refers).

¹³⁶ Skeldon (1997); Kothari (2002).

human resources may be required to participate in migration¹³⁷, especially internationally¹³⁸. Yet people with these different personal characteristics are also likely to be differently influenced by global environmental change. This is an important point for two reasons. First, it may mean that *any effect of global environmental change on the migration driver(s) is completely nullified*, as potential migrants do not have the personal characteristics, and in particular wealth/resources, to finance migration¹³⁹. The consequence here is that global environmental change would not have an impact on migration. It is important to analyse what the implication of this is for the individual or household. If global environmental change affects incomes, agriculture, ecosystem services and exposure to hazard, this motivates migration because aspects of well-being have deteriorated (or at least are perceived to have deteriorated, in comparison with potential destination locations). If the individual or household in question does not have the personal characteristics/resources to migrate, there are consequently *reduced opportunities for mitigating this adverse impact on well-being*. As global environmental change is likely to affect the poorest most often, the adverse impacts on well-being could well be extremely serious¹⁴⁰.

Second, because global environmental change affects those who are vulnerable and poor the most, by further limiting the resources available to them, it *may further restrict their access to migration options*. The point here is that global environmental change may have an adverse impact on factors that would have caused individuals to migrate, yet because of the simultaneous impact on wealth and resources it actually reduces their ability to migrate, and thus migration more generally.

2.4 Future change and uncertainty in the drivers of migration

This report is about the future of migration and how it is influenced by global environmental changes which are likely to become more apparent in the future. Yet making predictions of migration into the future is beset by problems: formulating a precise quantification is unlikely to be possible as even the data on recent trends are estimated with limited accuracy. Many expert predictions of migration flows have turned out to be significantly flawed¹⁴¹. There are also areas of considerable uncertainty in the future of global environmental change. The remainder of this chapter sets out how this report tackles the issue of future complexity.

There are three important features of this approach, which are further developed in sections 2.4.1–2.4.3:

- Analysing future uncertainty in global environmental change over the next 20–50 years.
- Understanding the uncertainty in the important drivers of migration. This is particularly important because, as shown above, global environmental change affects migration through the drivers of migration.
- Developing a set of future scenarios around the drivers of migration which jointly demonstrate high uncertainty and significant impact on migration. The four scenarios in section 2.4.3 are articulated around variations in economic and political drivers.

Section 2.4.3 will also show how global environmental changes are captured in the scenario analysis, as well as the drivers which are not economic or political.

2.4.1 Future global environmental change

Box 2.3 showed primary environmental changes that are likely to influence the drivers of migration. The future effects of environmental change are difficult to predict, and in some places and for some changes these effects may be highly uncertain. For non-climatic changes, this is partly because it can be difficult to project forward the human influences on land degradation, and partly due to incomplete knowledge of degradation thresholds and recovery potential.

¹³⁷ Jónsson (2010).

¹³⁸ DR8b (Annex D refers).

¹³⁹ Whilst wealth and assets are extremely important aspects of personal characteristics in this situation, other characteristics are important. For example, in rural areas of Nepal decreased access to ecosystems can threaten livelihoods and increase exposure to hazard. Yet migration is a highly gendered process in Nepal, with men frequently responding to these risks by migrating, an option that is much more difficult for women (Massey et al, 2007).

¹⁴⁰ Parry et al. (2007).

¹⁴¹ Bahna (2008).

For climate-related changes, there are three main dimensions to uncertainty in the projections of future climate¹⁴². First, there is uncertainty over the magnitude of future GHG emissions, and therefore the underlying driver of climate change, owing to uncertainty over future economic growth and the effectiveness of climate policies. Secondly, limitations in scientific understanding of some climate processes, including the interactions and feedbacks between some processes, mean that there is modelling uncertainty; although the very large-scale features of change are consistent in qualitative terms across different models (land warms more than oceans, with the greatest warming and largest increases in rainfall at high latitudes), there is considerable variation between models in the magnitude of change and, in some regions, the direction of change. Thirdly, the climate is a chaotic system, and the effects of an underlying increase in GHG concentrations are superimposed on natural variability at all timescales; this variability may swamp or exaggerate the effects of increasing GHG concentrations, and indeed also be affected by them. The relative importance of these different sources of uncertainty varies over time. By the 2030s, uncertainty in the pathway of future emissions has very little effect, because changes are largely a function of the history of GHG increases. At this time horizon, natural variability and model uncertainty are much more important. By the 2060s, the effect of different assumptions about future emissions become more apparent, and the effect of natural variability becomes relatively small. Model uncertainty remains large, particularly for regional changes in rainfall.

Box 2.4 summarises the magnitudes and dimensions of potential elements of global environmental change¹⁴³ given in Box 2.3, along with indications of the degree of uncertainty. The box distinguishes between a 'high-emissions' and a 'low-emissions' pathway¹⁴⁴, and for each pathway presents model uncertainty in terms of ranges in potential changes.

Box 2.4: Global environmental change: uncertainty and the future

Climate change

1. **Sea-level rise.** Sea levels rise as a result of two main factors: thermal expansion (whereby sea water expands as it warms up) and the activity of large ice sheets. By 2030, the global sea levels may rise by an average of between approximately 7cm and 14.5cm above 1990 levels, under both low and high emissions scenarios. By 2060, average sea-level rise above 1990 levels could be between approximately 14cm and 30cm under low emissions scenarios, but between 16.5cm and 35cm under high emissions scenarios¹⁴⁵. Sea-level rise is not consistent around the world's coastline, with above-average increases around the shores of East and South Asia.
2. **Tropical storm and cyclone frequency or intensity.** There is increasing evidence from modelling studies that the intensity and amount of rainfall in the strongest tropical cyclones is likely to increase, whilst the total number of cyclones may decrease¹⁴⁶. There is, however, less certainty about changes at the regional scale, and high year-to-year variability means that changes in the frequency or intensity of cyclones may not be detectable until the second half of the twenty-first century.

¹⁴² Foresight (2011b).

¹⁴³ For ease of reference, this report uses the term 'global environmental change' to refer to any of the future changes in the environment as described in Box 2.3, subject to the likelihoods and uncertainties as described in Box 2.4. Where appropriate, the report will describe particular manifestations of global environmental changes in particular geographical or ecological regions.

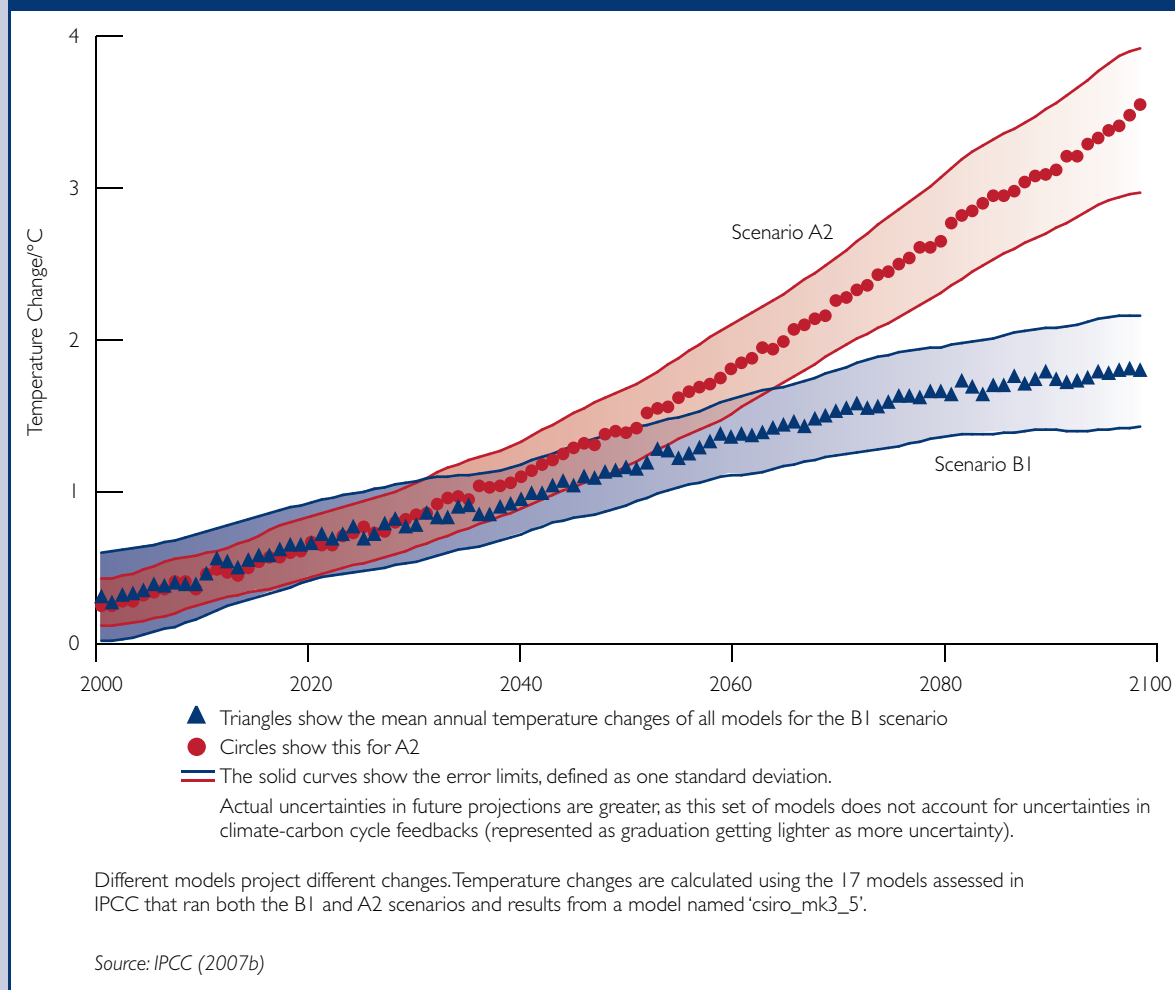
¹⁴⁴ IPCC Special Report on Emissions Scenarios (SRES), scenarios A2 and B1 respectively. IPCC (2000).

¹⁴⁵ Derived from the range in estimates produced by the models under SRES A2 and B1 emissions scenarios in IPCC (2007a).

¹⁴⁶ SRI (Annex D refers).

3. **Changes in rainfall.** Global rainfall is expected to increase as temperatures rise, as a result of increased evaporation from the oceans, but of far greater significance is the regional pattern of change in rainfall. Most climate models project an increase in rainfall at high latitudes and in the wet tropics, a decrease in summer rainfall across many mid-latitude regions and a reduction in rainfall in the seasonally dry tropics. A long-standing and robust result from climate model experiments is an increasing chance of summer drying in continental mid-latitudes, particularly in the northern hemisphere¹⁴⁷. Also, it is likely that an increasing proportion of rainfall would fall in high intensity events¹⁴⁸. However, the magnitude and regional direction of change vary between models, including uncertainty over the direction of change in rainfall associated with the South Asian monsoon.
4. **Increases in temperature.** By 2030, an increase of nearly 1°C relative to the 1980–99 global average is projected for both the high- and low-emissions scenarios¹⁴⁹. By 2060, however, projections begin to diverge, and global average temperatures increase to 1.5°C and 2°C above the 1980–99 global average for the low and high scenarios, respectively¹⁵⁰. Land warms by more than the global average, with particularly large increases – of several times the global average – at high latitudes. These increases in average temperature lead to substantial increases in the frequency of hot spells and heatwaves.

Figure 2.3: Projected changes in global mean temperature over the 21st century relative to 1980–99 from a set of 17 climate models driven by the IPCC A2 and B1 emissions scenarios



147 SR3 (Annex D refers).

148 SR3 (Annex D refers).

149 Knutti *et al.* (2008).

150 Ibid.

5. **Changes in atmospheric chemistry.** CO₂ concentrations in the atmosphere depend on future emissions. Although elevated CO₂ levels will be beneficial for some cereal crops, there is a lack of knowledge about effects on other crops, including root crops, which are important to the rural poor. Also, beneficial effects of higher CO₂ concentrations may be offset by the adverse effects of altered pests and diseases, higher temperatures and, locally, reduced water availability. Rising atmospheric CO₂ will also result in increased surface ocean acidity as more CO₂ is dissolved. Ocean acidification has the potential to harm marine ecosystems, although scientific understanding of the potential impacts is limited. By 2100, surface ocean pH is projected to decrease to 8.0 in the low-emissions scenario and to 7.8 in the high-emissions scenario, from a current baseline of 8.1. Although ocean acidification has the potential for major impacts on coastal areas, there is currently little detailed understanding¹⁵¹.
6. **Melting of mountain glaciers.** There have been considerable decadal variations in glacier trends. While in some areas glaciers have been stable or advancing, observations indicate that since the 1980s there has been a general trend for global glacier retreat¹⁵². It is not possible to firmly attribute this retreat to warming, but the IPCC considers that it is likely¹⁵³. Where observations exist, they indicate a general trend towards glacier retreat in the Himalayas and neighbouring ranges¹⁵⁴. However, there is no uniform response across the region, and characteristics of individual glaciers (such as debris cover and local topography) have been shown to be an important factor in glacier behaviour¹⁵⁵.

Non-climatic changes

7. **Land degradation.** As a slow-onset problem, often with incremental changes over time, land degradation is difficult to measure with any level of precision. Given these issues in estimating the current extent of land degradation, making predictions into the future is uncertain. Land degradation is a complex phenomenon affected by a combination of human and environmental factors including agricultural practices, extreme weather events and climate change, each of which is uncertain and likely to change in the future. There is also incomplete knowledge regarding degradation thresholds and recovery potential¹⁵⁶.
8. **Coastal and marine ecosystem degradation.** Coastal and marine ecosystems are influenced by a complex set of factors: external terrestrial influences such as river floods and inputs of sediment or pollutants; external marine influences such as storm surges and tsunamis; climate change such as sea-level rise; and the direct impact of human activities, which have had the most significant impact over the past century and are likely to continue to change in the future. The IPCC finds that, although knowledge in any aspect of the above is insufficient, uncertainty is greatest when moving from the natural subsystem to the human subsystem, with the largest uncertainties concerning their interaction. Again, thresholds add an additional level of uncertainty, with dynamic coastal systems often showing complex non-linear morphological responses to change¹⁵⁷.

2.4.2 Future uncertainty in drivers of migration

As the environment changes over the next 20–50 years, so too will the political, economic, social and demographic drivers of migration. These changes will be fundamental for our understanding of migration influenced by environmental change. In particular, economic drivers will be highly significant yet also highly unpredictable.

Because environmental change affects migration through the drivers of migration, the future uncertainty inherent in *those* drivers must also be understood. Economic and political drivers of migration, in particular, have dramatically altered in the last 50 years, leading to unexpected migration outcomes.

¹⁵¹ IPCC (2007a).

¹⁵² Zemp *et al.* (2008).

¹⁵³ Lamke *et al.* (2007); Bates *et al.* (2008).

¹⁵⁴ Zemp *et al.* (2008).

¹⁵⁵ Scherler *et al.* (2011).

¹⁵⁶ UNEP (2006).

¹⁵⁷ IPCC (2007a).

Further dramatic but largely unpredictable changes must be factored into an exploration of migration influenced by global environmental change over the next 20–50 years.

The nature of economic drivers of migration has changed in the last 50 years, and is likely to continue to be highly uncertain and variable¹⁵⁸. For example, since the 1960s the Mediterranean migration system has dramatically altered from its previous state, in which northern Mediterranean countries supplied labour to north-west European countries, to the current situation that north Mediterranean countries and Gulf Cooperation Council¹⁵⁹ (GCC) states are important destination locations for migrants from poorer south Mediterranean countries, and, recently, sub-Saharan Africa and Asian countries. This systemic change has been driven by the economic rise of northern Mediterranean countries and, more recently, the six GCC countries¹⁶⁰. Since the 1974 oil crisis, for example, there has been rapid growth in predominantly unskilled and lower-skilled labour migration to the GCC states as their regional comparative advantage has changed, fuelled by oil revenues¹⁶¹. In Qatar, 87% of the population is foreign born, while in the United Arab Emirates (UAE) and Kuwait this figure is 70% and 69% respectively¹⁶². Rapid economic development in the Gulf states has been sustained by a heavy reliance on migrant labour, largely from South, Southeast and East Asia¹⁶³.

Dramatic changes in economic drivers can cause equally dramatic changes in *internal* levels of migration. Accelerating economic growth, not least in Asia, has encouraged rapid urbanisation and growth in megacities, mainly in coastal areas and deltas¹⁶⁴. These transformations will have fundamental implications for internal migration if they occur – for example, in China, the urban population increased from 36% of the population in the 2000 Census to almost 50% in the 2010 Census, adding another 175 million people from rural areas to Chinese cities, in one of the largest migration waves seen in history. Similar migrations may well occur in other low-income Asian and African countries, as recent economic reforms continue to bear fruit¹⁶⁵. However, the crucial point is that patterns of economic growth and the emergence of new regional economies are hard to predict on a 20 to 50-year scale. For example, now that Chinese delta cities are more integrated into the global market, they are more vulnerable to system-wide changes: over 65,000 factories closed down in China during the global recession of 2008¹⁶⁶. For countries in Asia which have undertaken neoliberal reforms, the rate of growth is highly uncertain, partly because of its high correlation with FDI. Whilst FDI flows have transformed the growth of the Niger River delta, FDI flows to Southeast Asia, India and China have declined since 1998, and economists have questioned the sustainability of growth trajectories if FDI inflows plateau¹⁶⁷.

Political drivers of migration are also susceptible to dramatic change, causing fundamental changes to migration.

The dramatic economic changes seen in Asian and African mega-deltas cannot be understood in isolation of *political* factors. For example, the Pearl and Yangtze river deltas in China benefited from policies to grant them special economic status 30 years ago, while the delta regions in general have benefited from widespread neoliberal policies to reform the economy¹⁶⁸. One of the most fundamental changes in migration patterns in over the last 50 years has resulted from political decisions taken in the EU (or European Community prior to 1993), where there is now a right to freedom of movement for 502 million people in 27 member states, plus citizens in the associated states of Iceland, Liechtenstein and Norway. The concomitant of this has been an intensification of border controls in southern Europe and even the ‘externalisation’ of the EU border, causing migrants to explore new and more ‘risky’ routes¹⁶⁹,

158 DR8b (Annex D refers).

159 The Gulf Cooperation Council comprises Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE.

160 DR8b (Annex D refers).

161 PD13 (Annex D refers).

162 World Bank (2011).

163 DR8b (Annex D refers).

164 DR7b (Annex D refers); For example, between 1970 and 2010 the populations of Manila, Shanghai and Cairo grew from around 3.5 million to around 11.5 million, around 6 million to just over 16.5 million, and from 5.5 million to around 11 million respectively (UN DESA Population Division (2009a). See Figure 7.1 for more examples of rapidly growing megacities.

165 DR7b (Annex D refers).

166 Chan (2010).

167 See Nagaraj (2003) and Whalley and Xin (2010) for the Chinese case; see DR7b (Annex D refers) for Asia more generally.

168 DR7b (Annex D refers).

169 CS8 (Annex D refers).

resulting in a diversification of trans-Saharan migration routes and Mediterranean crossing points which now even encapsulate the Canary Islands¹⁷⁰. It is still highly uncertain what the future holds for EU integration and governance of migration, with experts considering the possibility of a larger and more integrated EU, a larger EU which looks much like the current one, or an EU with varying degrees of integration from different countries¹⁷¹.

Dramatic changes in migration are as much likely to occur because of *political upheaval* as conscious policies. The creation of the state of Israel in 1948 and the Arab–Israeli war led to increased migration of Sephardic Jews from Muslim countries in the southern and eastern Mediterranean in the 1950s and 1960s¹⁷² and displaced over 700,000 Palestinian refugees¹⁷³. Political upheavals in 1991–2, including the Gulf War, the outbreak of the Algerian Civil War and the UN embargo in Libya, resulted in increasing reliance of GCC countries on *Asian and sub-Saharan African* immigrants rather than Arab workers¹⁷⁴. A clear example of the unpredictability and dramatic nature of political changes – both reform and instability – is seen in the ‘Arab Spring’ of 2011 and ongoing developments in Libya and Syria – though the full impact of these events on migration will not be fully understood for some time. It is important to recognise that conflict can equally cause people to be trapped in areas as be displaced, thus making conflict-related movements particularly unpredictable, dynamic and hard to analyse¹⁷⁵.

Broad trends in demography are relatively more predictable, though there is still some uncertainty.

During the twentieth century, the world's population increased from 1.8 billion to 6.1 billion people. Between 2000 and 2010 it increased to about 6.9 billion. Yet demographic factors are more predictable than other factors, especially until 2030, because demographic change in the future is heavily influenced by births which are happening now, and relatively stable ageing and mortality rates¹⁷⁶. Based on UN Population Division projections, policy makers should assume that today's population of about 7 billion is most likely to rise to around 8 billion by 2030 and to probably over 9 billion by 2050¹⁷⁷. However, population projections are uncertain and need to be kept under review. The medium variant within the 2010 UN population projections for 2050 estimates that the total global population will increase to 9.3 billion by 2050. But even these estimates have considerable uncertainty: for example, the UN uses low and high variants spanning a population range from 8.1 billion to 10.6 billion by 2050¹⁷⁸.

Most of the increases will occur in low-income countries: for example, Africa's population is projected to double from 1 billion to about 2 billion by 2050¹⁷⁹. As Figure 2.4 shows, the proportion of the world's population living in high-income countries is projected to fall from 18% at present to 13.9% by 2050. It is projected that, by 2050, 21.8% of the world population will be African, up from 8.8% in 1950. Population growth rates are determined by a series of correlated drivers including growth in gross domestic product (GDP), educational attainment and access to contraception and gender equality. More detailed analysis reveals that possibly the single most important factor is the extent of female education. For example, the Demographic and Health Survey for Ethiopia shows that women without any formal education have on average six children, whereas those with secondary education have only two¹⁸⁰. It is important to note, then, that these projections can be strongly affected by the rate of progress in health, education and economic development in parts of Africa and Asia. For this reason, this report uses scenarios which show how demographics change depending upon the level of governance and global growth, as explored in section 2.4.3.

170 DR8b (Annex D refers).

171 PD19 (Annex D refers).

172 DR8b (Annex D refers).

173 UNISPAL (1950).

174 DR8b (Annex D refers).

175 DR5 (Annex D refers); Zolberg *et al.* (1989).

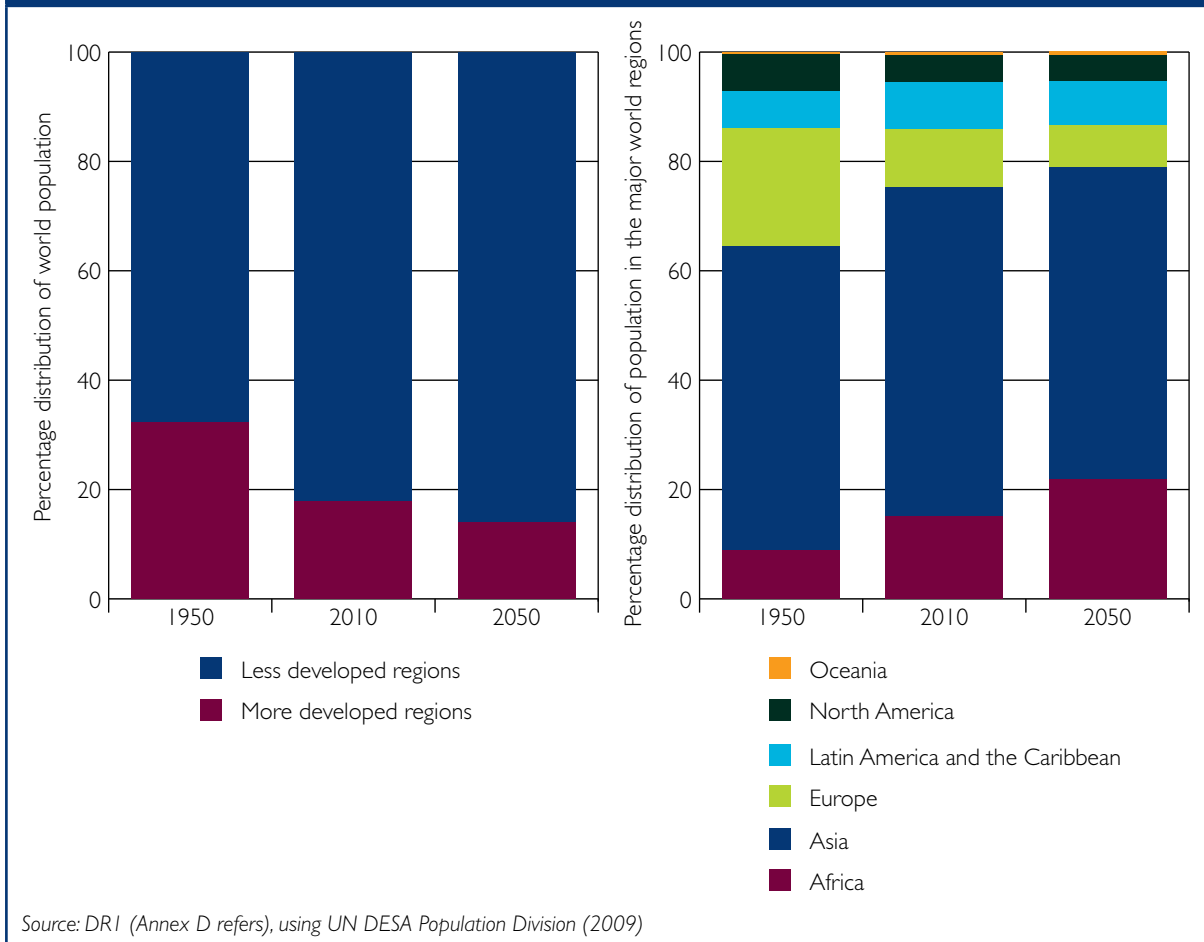
176 DR8b (Annex D refers).

177 See UN medium variant in UN DESA Population Division (2009b).

178 UN DESA Population Division (2010).

179 Lutz and Samir (2010).

180 Central Statistical Agency and ORC Macro (2006).

Figure 2.4: Population of the Major World Regions, 1950, 2010, 2050 (percentage distribution)

An important implication of these demographic trends is that ageing populations in high-income countries will present major challenges for policy makers over the next four decades. Within the EU there are projected falls in the population of Italy (from 60 million to 57 million between 2009 and 2050) and Germany (from 82 million to 71 million between 2009 and 2050)¹⁸¹. In Europe, the current fertility rate is around 1.5¹⁸², and Japan, Korea and many countries in Eastern Europe have fertility rates below 1.3. The UN projects that the populations of Japan and Russia will each shrink by about 25 million people between 2009 and 2050¹⁸³. These numbers indicate a medium-term trend of population decline in these countries. Overall, the EU's share of the global working-age population fell from 25% in 1950 to 14% in 1995, and is projected to be 9% by 2025 and to have fallen to 6% by 2050¹⁸⁴. These trends are likely to put pressure on labour costs and skill shortages, and potentially could lead to an increased demand for migrants.

It is also possible to identify trends in social drivers of migration.

In an increasingly globalised world, access to new information and communication technologies can reduce the social and psychological costs of migration, provide images and representations of destination countries and facilitate the transmission of resources and ideas within migration networks¹⁸⁵. There have been rapid developments in information and communication technologies. By 2009, an estimated 1.5 billion people were regular users of the internet, while UN estimates suggested that subscriptions had increased from 20% of the world's population in 2002 to 60% in 2009¹⁸⁶. Trends in social attitudes to

¹⁸¹ UN DESA Population Division (2009b).

¹⁸² This is the average fertility rate for the EU, and masks significant regional variation. For example, for 2005–10, UK, Sweden and France had fertility rates between 1.84–1.89, whilst Slovakia, Germany and Romania had fertility rates between 1.28–1.32.

¹⁸³ UN DESA Population Division (2009b).

¹⁸⁴ PD7 (Annex D refers).

¹⁸⁵ DR14 (Annex D refers).

¹⁸⁶ DR3 (Annex D refers).

migrants and political imperatives will affect the implications of these pressures for actual migration flows into Europe and other parts of the world faced with ageing populations.

Coverage of, and access to, communications technology is increasing in all low-income and middle-income countries¹⁸⁷. Gaps in literacy rates and education levels between south Mediterranean and north Mediterranean countries have been falling over the past decades, and are expected to continue to do so¹⁸⁸. Social drivers and attitudes are most likely to be influenced by inequalities in resources: inequalities in the distribution of resources are likely to result in inequalities in access to communications technology and education, and more pronounced tensions between migrant and non-migrant communities.

In summary, changes to political and economic drivers of migration have largely been unpredictable and dramatic in the past, they are likely to continue to be extremely unpredictable and dramatic in the future, and they have significant impacts on migration outcomes for individuals, households and populations alike. For this reason, rather than attempting to predict how these changes will occur, we have chosen to describe four potential outcomes associated with different combinations of the most significant external factors influencing migration.

2.4.3 Using scenarios to explore how migration will be influenced by future environmental change

This report uses scenarios of the future to understand how migration may be influenced by future global environmental change and other factors. The four scenarios that were developed as part of the project have been constructed to illustrate outcomes associated with different political and economic drivers, while recognising uncertainty in other areas. These scenarios are not predictions; their purpose is simply to propose four contrasting but plausible ways in which political and economic factors would combine to influence migration. These migration scenarios can then serve to explore possible policy options.

To tackle problems inherent in the consideration of future migration and environmental change, this report develops a number of scenarios to portray stylised representations of reasonable and possible futures, even if precise likelihoods cannot be ascribed to each narrative. Among all drivers, the evidence discussed above suggests that two are crucial to scenario building as they have a significant impact on migration, have significant influences on *other* migration drivers, and are subject to dramatic and unpredictable changes:

- **the economic drivers of migration**, specifically the evolution of the world economy, driving the opportunities for migration, both nationally and internationally; and
- **the political drivers of migration**, specifically how they impact on the local governance of social and economic circumstances, and of migration.

The four scenarios, with either high and low global economic growth, and connected and inclusive governance or fragmented and exclusive governance, at a local, national and international level, are shown in Figure 2.5.

¹⁸⁷ DR8b (Annex D refers); DR14 (Annex D refers); Bakewell (2009).

¹⁸⁸ DR8b (Annex D refers).

Figure 2.5: Scenarios to show plausible future states of migration drivers

Higher global economic growth will increase demand for labour, including migrants, in fast-growing economies; it will also affect growth of urban centres and regional growth poles such as coastal areas. **Governance** will affect local opportunities and constraints, via factors such as political accountability, sources of conflict and violence, the rule of law, and government effectiveness, but also social factors such as income inequalities, access to health or education, social cohesion and integration of societies. As indicated above, future demographic and social changes are also important and, although they may be less unpredictable than political or economic changes, there is still some uncertainty. Moreover, these drivers are at least partly endogenous to the four scenarios: together, economic growth and governance also affect demographic and social drivers, affecting population growth in poorer settings (via income growth and improved health and education), age structures and attitudes to migration and migrants.

Global growth will also affect the extent of **environmental change**. The coupling between economic development and GHG emissions is reflected in climate change projections described in the scenarios in the IPCC Special Report on Emission Scenarios (SRES), which projects higher average temperatures (and consequently more significant impacts) under scenarios which have a more economic than environmental focus. For the purposes of this report, high global growth scenarios, A and B, are associated with high emissions, as represented by the A2 climate scenario from SRES¹⁸⁹ (as described in Box 2.4), whereas low global growth scenarios, C and D, are associated with low emissions, as represented by the B1 scenario. Owing to inertia in the climate system, emissions scenarios will have little impact on environmental change until 2030, so there is little variance in environmental change between the scenarios for this time period, with moderate change across all. However, emissions policy can have more of an impact by 2060. Thus, in the high-growth/high-emissions Scenarios A and B, '*substantial increases*' in environmental changes are seen by 2060; in contrast, the low-growth/low-emissions Scenarios C and D see just '*increases*'.

The nature of governance will affect how problematic the resulting consequences are for populations, with more inclusive governance worlds likely to manage the impacts better than fragmented governance worlds. Below, in Figure 2.6, the main trends in the drivers are described for the four scenarios. The combination of differences in global economic growth, and political, social and economic governance, and their impact on the different economic, political, demographic, social and environmental drivers of migration will result in different migration flows and consequences. Chapter 3 uses the scenarios to show how environmental change may affect the drivers of migration.

¹⁸⁹ IPCC (2007b).

Figure 2.6: The main trends in the five drivers of migration implied in the different scenarios of the future

2.5 Conclusion

This chapter has introduced important concepts and principles which will be utilised further in Chapter 3. These include:

- There are five categories of drivers of migration.
- Economic and social drivers are seen by respondents in national surveys as the most important, although political, demographic and environmental drivers are also important – not least in the way they interact and coexist with other drivers.
- Environmental change will have different degrees of influence on different drivers. Economic, environmental and, to a lesser extent, political drivers are the most susceptible, yet the interaction between all drivers is important in the influence of environmental change.
- Environmental change may in fact lead to a reduction in migration. This may result either from a particular impact of environmental change on drivers, or from the impact of environmental change on personal characteristics, such as wealth and household/personal resources.

- An appreciation of uncertainty is important in a consideration of future global environmental change. This report addresses this uncertainty through incorporating SRES climate scenarios into the report's broader scenarios.
- An analysis of the future impact of environmental change on migration must recognise that there may be important future changes in all drivers of migration. These are encapsulated in the report's scenarios, which recognise that economic and political drivers are the most unpredictable and high impact, yet all drivers will vary.

This chapter has *not* discussed the human mobility outcomes that can be expected as a result of the impact of environmental change on migration drivers (or personal characteristics), but has laid the foundation for this further discussion in Chapter 3.



3 Future migration and immobility in the context of global environmental change

Key messages

This chapter examines the relationship between global environmental change and the drivers of migration in the three key ecological regions identified as the most vulnerable in Chapter 1: drylands, low-elevation coastal zones and mountain regions. It uses a broad range of evidence, from specially commissioned comprehensive reviews of the three regions to existing micro-level case studies, and assesses likely outcomes in different future scenarios. The findings are:

- Environmental change *does* influence the drivers of migration, with economic and environmental drivers most susceptible: migration influenced by environmental change can take different forms, including rural–urban migration, short-term migration, illegal/irregular migration and displacement.
- Vulnerability will be increased if migration occurs in unplanned ways, or migrants end up in areas of high environmental risk, such as low-lying urban areas in mega-deltas or slums in water-insecure expanding cities.
- Environmental change is equally likely to increase migration as it is to prevent it. Inability to migrate is particularly problematic for households or communities who depend on migration as a form of income diversification, and could, in the long run, lead to whole communities having to abandon their livelihoods and locations.
- An important finding is that poorer households are likely to be ‘trapped’ in circumstances where they are at once more vulnerable to environmental change and less able to move away from it.
- Outcomes vary depending upon the future scenario. In general, there are more opportunities for migration in high-growth scenarios than in low-growth scenarios. When combined with fragmented governance, this can mean large numbers migrating in irregular/illegal and unmanaged ways (high growth, low governance) or large numbers trapped and vulnerable to environmental change (low growth, low governance). There are issues for policy makers to consider in all scenarios of the future.

3.1 Introduction

Assessing the nature and scale of migration that is directly attributable to environmental change in the decades ahead is far from straightforward. The interconnectedness of the various drivers of migration, and the complex interactions of environmental change with those drivers, make it difficult to attribute specific environmental impacts. This report has identified a framework for developing this analysis in which environmental change is conceptualised as a factor influencing the five categories of migration drivers (Figure 1.3). The purpose of this chapter is to use this framework to interpret the evidence from three key ecological regions at risk: drylands, low-elevation coastal zones and mountain regions¹⁹⁰.

The evidence reviewed in this chapter includes specially commissioned reviews of the drivers of migration in three key ecological regions, as well as important case studies. Long-term changes that might affect the direct environmental drivers of migration are also considered. Because future trends in migration drivers, especially those which are political and socioeconomic, are so inherently

¹⁹⁰ Future environmental change may open up new areas for migration through its effect on the distribution of economic opportunities. For example, a reduction in summer sea ice in the Arctic could open new trade routes and infrastructure and may increase a flow of migrants to northern settlements. Evidence suggests that such adjustments may come from within the northern countries of Europe and Canada and may be fairly small in number (DRI; Annex D refers) and they are therefore not considered in detail here.

uncertain, different socioeconomic and political scenarios are used in this chapter to frame the discussion (see Chapter 2). These scenarios have been developed to be coherent with the project's conceptual framework, and are considered for each of the three ecological regions.

Overall, it will be seen that the effects of environmental change are potentially significant and could lead to migration decreasing in some scenarios, and increasing in others. It is important to be precise about what forms of migration are being considered because certain types of migration may increase and other types decrease in the *same* scenario. Indeed, an important distinction is drawn here between two categories of 'migration': more routine migration and displacement. Taking this more nuanced view allows insights to be developed; for example, lower levels of routine migration could leave greater numbers of people vulnerable to displacement.

3.2 Migration and environmental change in drylands

3.2.1 The environment and migration context in drylands

The first of the ecological regions considered here are 'drylands' or 'desert margins' (arid, semiarid and dry subhumid areas). Drylands are characterised by limited soil moisture, the result of low rainfall and high evaporation, cover over 40% of the earth's land surface and are home to over 2 billion people¹⁹¹. Although significant areas of high-income countries are in drylands, including in North America, southern Europe and Australia, they dominate many of the world's poorest countries, including in Africa and Central Asia. One estimate places 90% of dryland populations in low-income countries¹⁹². Drylands are frequently at the margins of states, and often experience lower government investment.

Box 3.1: The specifics of environmental change in drylands

The world's drylands are exposed to the effects of both land degradation and climate change, and the two are frequently closely linked. Land degradation is a reduction in the suitability of land for agriculture as a result of erosion, salinisation or a decline in soil nutrients. These may be initiated by human activities such as farming, grazing and clearance for firewood, and may be exaggerated by periods of drought or flood. According to the Millennium Ecosystem Assessment, between 10% and 20% of drylands suffer from land degradation¹⁹³. Most climate models simulate an increase in drought frequency across most of the dryland parts of sub-Saharan Africa, Central Asia and around the Mediterranean, with the exception of parts of eastern Africa, where models consistently show an increase in rainfall and parts of the Sahel where models do not agree. Such an increase in the frequency of droughts reduces the productivity and reliability of agricultural and pastoral systems¹⁹⁴.

The figures below show changes in average temperature and rainfall by 2030 and 2060 (relative to the 1961–90 mean) for four regions, each approximately 400 x 400 km. The 'high' variant is from SRES Scenario A2 and applies to Scenarios A and B, which have high growth and thus high emissions; the 'low' variant is from SRES Scenario B1, and applies to Scenarios C and D, which have low growth and low emissions. The example regions are in southern Africa (actually around Zimbabwe), western Africa (around Burkina Faso), North Africa (in Algeria) and Mexico (northern Mexico), and the changes are indicative of changes over a larger area. Note that the magnitudes of change (especially in rainfall) differ between the regions, and the amount of uncertainty is different – the direction of change is particularly uncertain in West Africa¹⁹⁵.

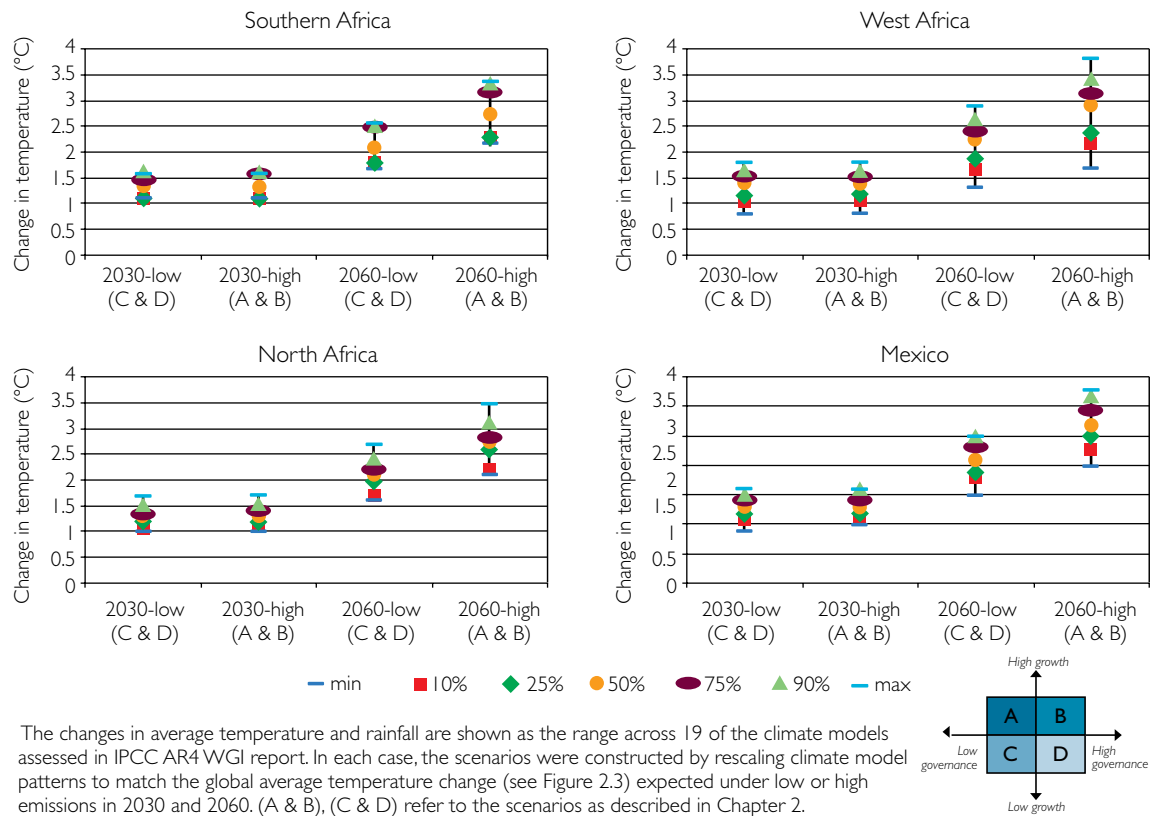
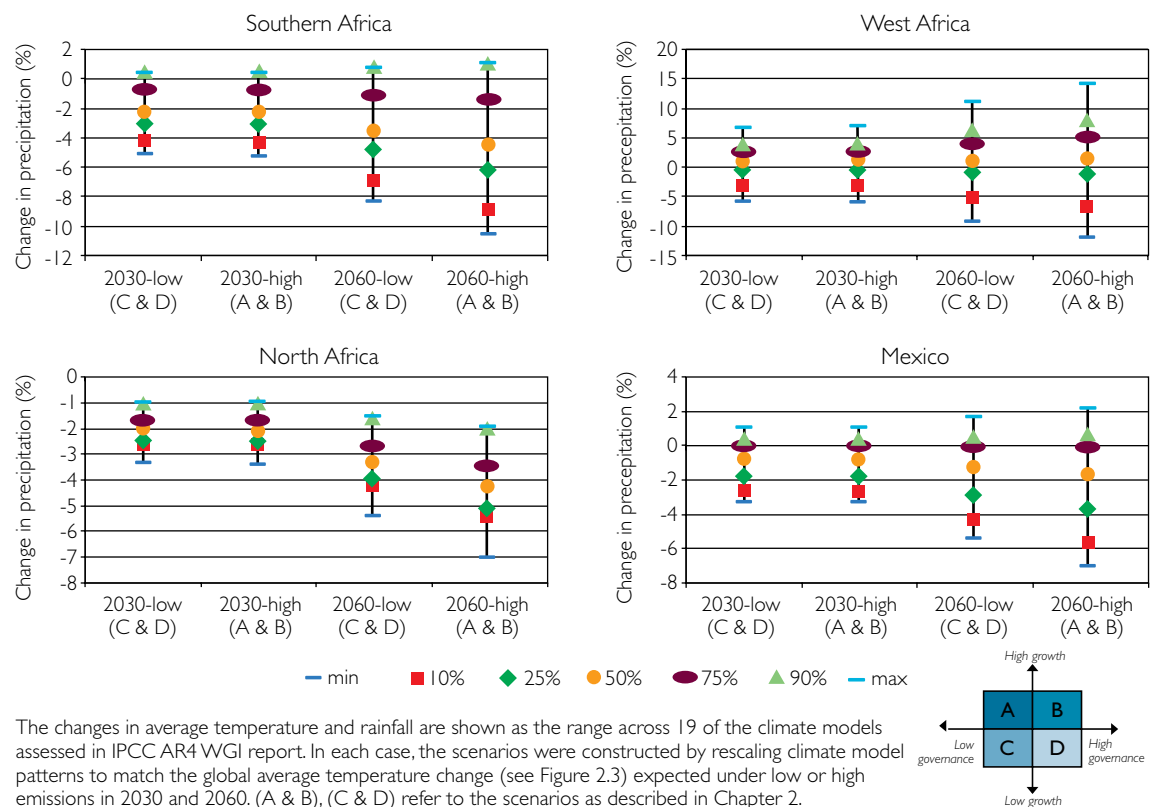
191 Safriel *et al.* (2005); UNDP (2010); Thomas (2011).

192 Safriel *et al.* (2005).

193 Safriel *et al.* (2005).

194 DR6 (Annex D refers).

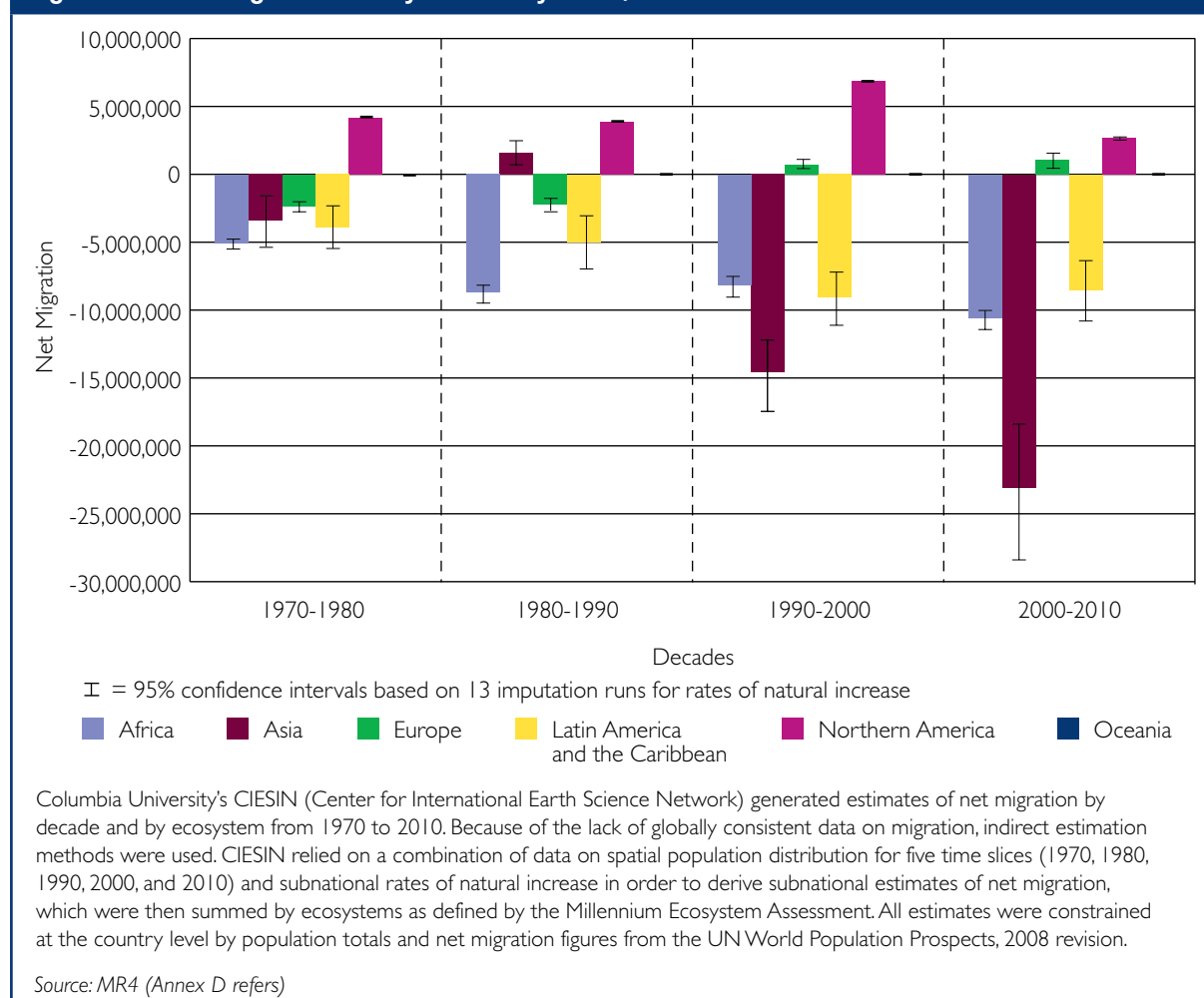
195 The changes in average temperature and rainfall are shown as the range across 19 climate models (the figures show the minimum, 10th percentile, 25th percentile, median, 75th percentile, 90th percentile and the maximum). In each case, the scenarios were constructed by rescaling climate model patterns to match the global average temperature change (see Figure 2.3) expected under low or high emissions in 2030 and 2060.

Figure 3.1: Change in temperatures in four regions important for the study of 'dryland' migration**Figure 3.2: Change in rainfall in four regions important for the study of 'dryland' migration**

Drylands are always at risk from drought, because of the climate systems which give them their very characteristics. Recent modelling studies propose a significant likelihood of net increases in moisture deficits and droughts in the twenty-first century, notably in Africa. For example, Figure 3.1 shows that median temperature increases for four representative regions in Africa and Central America are between 1.3°C and 1.5°C by 2030 and between 2°C and 2.9°C by 2060, depending on the scenario. Figure 3.2 shows median rainfall projections for the same period: North and southern Africa have similar median projections of 2% decreases in precipitation by 2030 and then 4–4.5% decreases by 2060; Mexico's projected reductions are much more moderate; there is great uncertainty regarding not just the boundaries of the change in West Africa (as there are with all the rainfall projections) but the direction as well. These environmental changes have significant implications for ecosystem services and water availability in drylands¹⁹⁶.

Analysis commissioned for this project shows that drylands in low-income countries also frequently experience net outmigration (see Figure 3.3). However, simply identifying populations that are 'vulnerable' to migration is not the same as identifying a population that will migrate, particularly if a significant number of household members of those who are vulnerable have already moved. For this reason, there is a need to analyse how environmental change interacts with the drivers of migration in dryland regions: how incomes are earned and livelihoods maintained, and the role of political and social structures.

Figure 3.3: Net migration to dryland ecosystems, 1970-2010



¹⁹⁶ Thomas *et al.* (2005); De Wit and Stankiewicz (2006).

3.2.2 Influence of environmental change on migration drivers and outcomes

Environmental change can affect household wealth and income. This is likely to lead to an increase in short term, rural–rural migration as households look to diversify incomes and secure livelihoods. It is also likely to reduce longer-distance migration, which requires economic assets.

Migration can clearly be conceptualised as a traditional strategy that has been used to cope with temporal and geographical variability in dryland ecosystem services over millennia. Far from becoming more common, it can be argued that the capacity to circulate has been increasingly compromised through the 20th century by processes of agricultural sedentarisation associated with economic change, population growth, and political change including the establishment of state borders. Nonetheless, short distance as well as longer-range migration remains a vital livelihood strategy, especially in rural drylands in Africa.

As shown in Chapter 2, it is the variability in key drivers of migration, or at least the perception of variability by individuals, which are likely to influence the decision to move (see Figure 1.3). Burkina Faso exemplifies many environmental and social issues that occur in the Sahel region: a propensity for drought to occur and rural populations heavily dependent on rain-fed agriculture and pastoralism. One study assessed the migration of 4,000 individuals during the onset of major drought in the early 1970s¹⁹⁷. It found that a common and widespread early response was short-term rural–rural migration to seek income diversification. A study of the 1983–5 drought in Mali shows a significant increase in short-cycle circulatory migration, and that in this period the majority of families depended on migration to get them through the drought¹⁹⁸.

However, the overall level of migration during the 1983–5 droughts in Mali actually stayed constant. This was due to a *reduction* in the amount of migration from Mali to international destinations (mainly other African countries and France). Males with better levels of education tended to participate most in rural–urban moves and for longer periods than those migrations that were a direct response to drought events. Environmental conditions had a similar effect on longer-distance migration in Burkina Faso, with both longer-term and rural–urban migrations favoured following periods of *higher* rainfall, as this generated the capital to enable travel to occur.

Analysis of these issues is often based upon high-quality but local-level case studies, as in the Mali and Burkina Faso examples referred to above. In a study commissioned for this project, a meta-analysis was conducted of 34 such case studies in dryland regions (including these two examples) which are part of other important projects (such as EACH-FOR¹⁹⁹), cross-referencing the analysis with databases for drought, migration and net primary productivity (a proxy for provisioning ecosystem services²⁰⁰). This systematic appraisal of the evidence confirms that a chronic deterioration of the environment can affect drivers of migration such as household security and the ability of households to meet their needs and aspirations. The study also confirms that migration options are much more available to those households that have accumulated capital over the longer term, giving them a greater adaptive capacity to migrate²⁰¹. This raises an important policy issue which is addressed later in this section: what happens to those households who experience reductions in employment opportunities or income, affected by key drivers of migration, but who *do not* have the capital to migrate?

Migration influenced by environmental change in dryland areas can take the form of displacement or more routine migration.

It is useful to take a nuanced view of different types of migration which may occur in situations of environmental change. A distinction could be drawn between ‘routine’ economic migration that involves household members (often male) seeking employment in non-rural contexts such as urban or mining areas, and movements associated with the impacts of intense environmental disturbances, such as droughts, which tend to be relatively short term, over short distances, and involve whole families²⁰².

197 Henry et al. (2004).

198 Findley (1994).

199 Jäger et al. (2009).

200 DR6 (Annex D refers).

201 DR6 (Annex D refers).

202 DR6 (Annex D refers).

However, there are exceptions. For example, in the late 1980s and early 1990s, as a result of loss of livelihoods related to the desiccation of the Aral Sea, around 100,000 people moved out of Karakalpakstan, representing 1 in 16 of the population²⁰³.

There are strong linkages between the two types of migration identified above, and indeed sometimes the distinction is blurred. Temporary displacement caused by sudden-onset events may, through experience, mean that households accumulate over time a motivation for a longer-term or permanent move. Chronic, long-term adverse effects on the provision of environmental and non-environmental services may also mean that a household has reduced capital and is more vulnerable to the impacts of environmental change though not necessarily able to adapt through planned 'routine' migration. In Northeast Ethiopia, for instance, during the droughts of the mid to late 1980s, people were initially able to employ a variety of in-place coping strategies. However, as the droughts persisted and increased in intensity, these strategies began to fail, eventually leading to displacement²⁰⁴. Persistent declines in ecosystem services, involving progressive and severe land degradation, or deep and durable drought, may give rise to longer-distance, longer-term, whole-family migration. Yet this is likely to follow channels carved out by earlier 'economic' migrations and indicates the importance of social aspects.

Environmental change interacts with political and social drivers to lead to different migration outcomes.

Adverse environmental change was a major influence in the migration of approximately 300,000 individuals out of Oklahoma in the 1930s 'dust bowl' migration. Drought in 1934 and 1936, coupled with flooding in 1935, led to the failure of the leading agricultural crop, which was cotton. Economic drivers were also important, with the Depression having an effect on the ability to earn wages. But most fundamental was the interaction of environmental change with the legal-political basis for land tenure. The right of tenant farmers to reside on their farm was contingent upon the production of sufficient crops or money to pay the landowner²⁰⁵. Repeated crop failures simply meant that the tenants were evicted from their land by landowners, who had other financial motivations to move existing tenants from the land as a result of the prevailing political situation²⁰⁶.

In general, once people decide to migrate, social drivers play an important role in determining where they go²⁰⁷. Social capital such as pre-existing family or community contacts was a highly common asset for individuals who migrated from Oklahoma to California in the dust bowl migrations, with social networks providing information about employment opportunities and accommodation, and support in terms of integration into the host population. It is also important to focus on those individuals who were forced out of their residencies in the Oklahoma drought but did not have social networks to rely on, and who also had low economic capital. The outcomes were large congregations of destitute people living in shack settlements in vulnerable areas such as railways, highways and rivers²⁰⁸. This is an important issue which is developed later: what happens to those people who suffer because of the impact of environmental change on economic and political drivers, but have little social capital to fall back on?

Where possible, people in rural drylands often prefer to stay where they are²⁰⁹ or, if displaced, to return as soon as they can, particularly if household livelihoods are already supplemented by remittances from family members employed elsewhere. However, these trends are mediated by the interaction of environmental change with other drivers. For example, data from Africa and South America suggest that, as education increases, so opportunities outside rural drylands increase and movement becomes more likely²¹⁰. When people move more permanently, they are likely to do so to places that are different from their place of origin, as this is considered to be where better environmental and economic circumstances are likely to occur.

203 CRI (Annex D refers).

204 Rahmato (1991).

205 McLeman (2006).

206 McLeman and Smit (2006).

207 DRI4 (Annex D refers).

208 McLeman and Smit (2006).

209 Mertz *et al.* (2010).

210 CR2 (Annex D refers).

The interaction of environmental change with conflict and poverty means that planned, safe migration may not be an option and consequently people can become extremely vulnerable and ‘trapped’ in dangerous circumstances.

Whilst both resource shortages and conflict in drylands may lead to migration, these two drivers clearly interact. Conflict can be associated with seasonal or drought-induced grazing shortages in parts of Africa, or where new land use practices disrupt traditional patterns of migration and access to resources. Yet relationships among social and political differences, competition for resources and conflict are not straightforward. Conflict can occur between groups within states (e.g. in Sudan and Somalia) or across international borders in remote areas that are not well connected to national security systems (e.g. across the Uganda–Kenya border).

Conflict and poverty are two contributors to vulnerability within ‘poor and high-risk environments’, which include drylands²¹¹. Although there is disagreement as to whether environmental change leads to conflict²¹², it is clear that communities which are subject to increasing environmental variability and disruption are likely to become poorer. The important point is that poverty lessens their ability to respond in a planned and controlled way to threats, whether they be ecological, conflict related, economic or demographic (prevalence of disease). This includes planned migration, which is often an appropriate response to these threats, but likely to be curtailed by low capital (social, political or economic) and conflict. The result is that ‘absolute numbers’ of migrants are unlikely to be affected, but such a figure does not include the bulk of conflict-affected persons, who are forced to stay in situations where they are vulnerable to environmental change or conflict and social tension²¹³.

An example of this vulnerability and displacement can be found in Zimbabwe. In line with the conceptual framework used throughout this report, environmental change cannot be seen as the cause of migration in this case, but there are complex interactions between environmental change and political and economic drivers. In the Zimbabwean case study, droughts during the 1997–2010 crisis period were less severe than those in earlier decades, but ‘were experienced as extreme and contributed to food insecurity because they occurred in the context of the rapidly deepening vulnerability produced by the broader political conflict and economic contraction’. Hundreds of thousands of individuals have been displaced in this political–economic–environmental crisis, either internally or externally, and those with low human or financial capital have suffered appalling living conditions (slums, shanties) and are particularly vulnerable to xenophobia and extortion²¹⁴. However, there may also be hidden thousands who are *unable* to migrate in Zimbabwe. The droughts in Ghana in the late 1970s and early 1980s are an example of a situation in which deteriorating environmental conditions affected drivers of migration such as agricultural production, but a worsening political situation (coupled with changing economic drivers) meant that migration often did *not* take place²¹⁵.

Water resources and water scarcity are important features of conflict in the eastern Mediterranean²¹⁶. However, there is no evidence of water problems causing local conflict and this in turn leading to migration²¹⁷. Indeed, the most pertinent question is why there has been so little migration as a result of water stresses in locations such as the divided territories of Cyprus and Israel–West Bank and Gaza. Possible reasons relate to the adoption of alternative techniques, such as reduced water allocations to agriculture; increasing groundwater abstraction; household-level demand/supply management techniques; increasing consumption of bottled water; and the fact that water shortages are now ‘considered sufficiently normal and routine that they are integrated into everyday life and experiences’. For Palestinians, a further reason why water stress and conflict has not led to migration is ‘the fear of losing the right to return to the West Bank and Gaza ... and the political importance of maintaining a physical presence within the homeland’²¹⁸. This is another example of how, for various cultural and political reasons, a group of people is unable or unwilling to leave their homes despite environmental vulnerability.

211 DR5 (Annex D refers).

212 DR5 (Annex D refers); SR12b (Annex D refers); Castles (2002); Barnett and Adger (2007).

213 DR5 (Annex D refers).

214 CS6 (Annex D refers).

215 Van der Geest (2011).

216 CS12 (Annex D refers).

217 CS12 (Annex D refers).

218 CS12 (Annex D refers).

Urbanisation in certain locations will mean that people become more vulnerable to environmental change, regardless of the extent to which rural–urban migration is caused by environmental change.

The evidence on the impact of environmental change on rural–urban migration is mixed. The survey evidence provided for the Burkina Faso case study discussed above indicates that both men and women seem to be more likely to move to urban areas in normal environmental conditions than in unfavourable ones²¹⁹, whilst a recent cross-country analysis of the determinants of urbanisation suggest that environmental change, as proxied by rainfall, has acted to *increase* urbanisation in developing countries in sub-Saharan Africa (but not elsewhere in the developing world)²²⁰.

Yet perhaps the main focus of researchers and policy makers alike should be, not the process of *how* people arrive in cities (whether from drylands, whether or not influenced by environmental change), but the fact that populations in African cities are growing for a number of reasons and are therefore *specifically vulnerable to future environmental change* as a result of weak infrastructure in the fast-growing cities where they live. The specific issue of the vulnerability of cities to environmental change in drylands, and especially the plight of people migrating to them, is covered in Chapter 7.

3.2.3 The implications of migration influenced by environmental change

A ‘double dilemma’ exists for people who are most vulnerable to the impact of global environmental change on their livelihoods as they are also least likely to be able to secure their livelihoods through planned migration: this ‘trapped’ population should be a focus for policy makers.

Interactions between environmental change and the drivers of migration, along with the roles of personal characteristics and forms of capital, influence the nature and scale of migration and also lead to socially differentiated migration outcomes. Broadly speaking, groups that are most reliant on ecosystem services for their income, and which display the least livelihood diversification, are most likely to be affected when global environmental change leads to natural resource scarcity. Better-educated and wealthier groups are least affected by environmental factors, because household livelihood portfolios are less dependent on natural resource use. Poorer, less educated groups are therefore more vulnerable to environmental changes that affect ecosystem services in rural areas. This situation is often exaggerated in dryland areas, which are sometimes seen by the state as remote and marginal places, and thus have less access to centrally allocated resources to help those more vulnerable²²¹.

Yet it is precisely the more educated and wealthier groups who are also likely to have better access to migration. In contrast, the poor are faced with a double dilemma: they are more reliant on ecosystem services, but also less able to diversify their incomes in advance of an environmental shock either through migration or through the pursuit of other strategies. This is shown in Figure 1.2. As a result, there is often a significant residual population that is unable to leave places which are vulnerable to environmental change, and more likely in the end to be forcibly displaced at relatively short notice and in challenging circumstances if conditions become intolerable. This, coupled with the trend of continuing African urbanisation, highlights that attention should be focused on the dangers experienced by populations who are moving to vulnerable areas, trapped in vulnerable areas or displaced, a theme further explored in the next section, which considers ‘low-elevation coastal zones’.

Gender differences are also observed in many dryland migration studies. For example, migration from the countryside to urban areas is dominated by males, both because men have higher education levels and because demand in destination areas is for male workers, notably in mining. In contrast, women (and children) participate more in short-distance movements, and are more likely to be displaced by drought events²²². Thus, women are more likely to be more vulnerable to environmental risk, as they are excluded from adaptive migration.

219 Henry *et al.* (2004).

220 Barrios *et al.* (2006) perform a regression on 78 sub-Saharan and non-sub-Saharan developing countries spanning a 30-year period (1960–1990).

221 DR6 (Annex D refers).

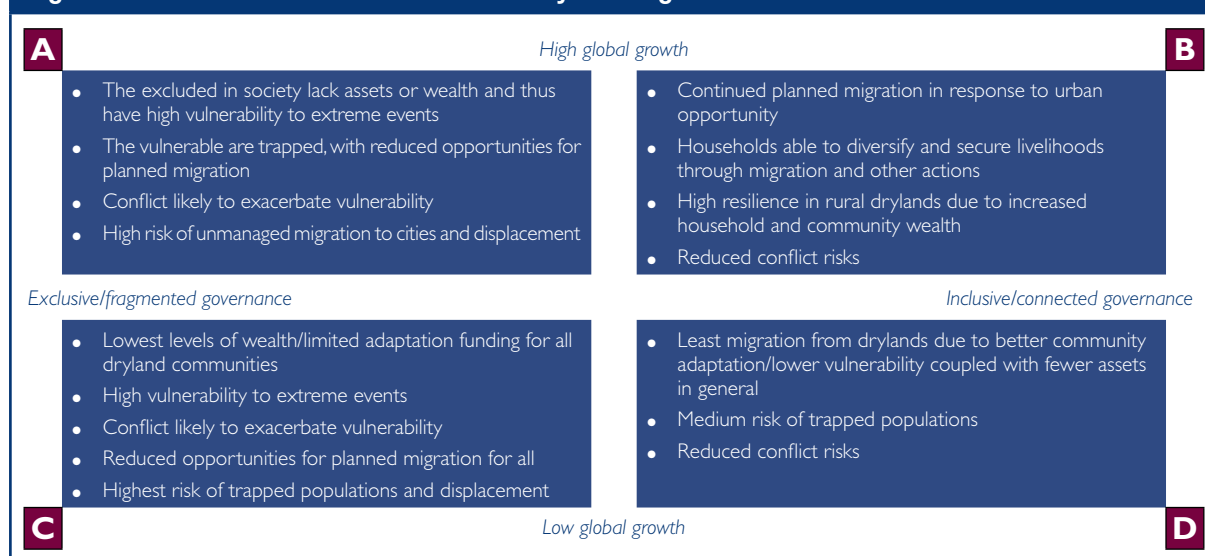
222 Findley (1994); Henry *et al.* (2004).

3.2.4 Uncertainty and importance of future scenarios

Plausible future scenarios for dryland regions suggest that different kinds of environmental change will interact with different drivers of migration in the future, leading to a variety of outcomes. Policy makers will need to weigh up the risks inherent in each scenario.

There are already some analyses of the influence of environmental change on migration in the future, with one study predicting that the impact of environmental change on economic drivers of migration in the rural, dry north-eastern part of Brazil is likely to lead to depopulation in the long run, even with relatively modest rates of warming²²³. This report uses the scenarios introduced in Chapter 2 to produce a number of plausible assessments of how the interaction between environmental change and drivers of migration might play out over the next 20–50 years.

Figure 3.4: Plausible future scenarios in dryland regions



In terms of environmental change, there is little difference between scenarios by 2030, with moderate increases in temperature expected in both high- and low-emissions scenarios (see, for example, Figure 3.1), and changes in rainfall equally similar (Figure 3.2). By 2060 there are greater variations: Scenarios A and B are 'high growth/high emissions' and thus experience more substantial environmental changes. Under Scenarios A and B, temperature is between 2.5°C and 3°C higher in 2060 than now (about 0.75°C higher than in the low-growth Scenarios C and D). The level of *uncertainty* in future rainfall is more pronounced for certain regions in the high-emission Scenarios A and B (notably West Africa), whilst there is predicted to be a more substantial reduction in rainfall in southern and North Africa in those scenarios. Because of this, under Scenarios A and B, there are substantial decreases in crop productivity in many dry regions.

These environmental changes will interact with changing socioeconomic drivers. In **Scenario A**, the most prominent of these drivers includes the fact that there are limited opportunities for income diversification, and that drylands in low-income countries, and especially marginalised regions or communities, are unlikely to benefit from high global growth. Also important is the fact that only limited segments of populations have opportunities for planned migration, and those who are most vulnerable are likely to have fewer opportunities. This confluence of drivers is likely to leave populations vulnerable to the impacts of environmental events and of more frequent episodes of conflict. They may be trapped in areas of humanitarian concern, or there may be a more regular occurrence of displacements in the face of drought and competition for natural resources, exacerbated by progressive land degradation, which is in turn caused by pressures on ecosystem services resulting from limited livelihood diversification and higher population growth. Given these growing rural resource shortages, migration and displacement pressures could focus on urban areas, either internal or international, where there will be significant demand for migrant labour; yet not a political willingness to recognise migrants legally.

223 Barbieri *et al.* (2010); see also Feng *et al.* (2010) for an analysis of the impact of environmental change on future Mexican–US migration.

Environmental changes are likely to be equally as significant in **Scenario B**, yet the impact on migration outcomes will be different owing to a different set of socioeconomic drivers. In particular, low-income dryland countries will benefit from a wider distribution of global economic development benefits (including adaptation funds) and reduced conflict risks. There will be more opportunities for livelihood diversification, including opportunities for planned migration, which are especially likely to increase in line with systematic urban growth, and are increasingly likely to be afforded by increasingly capital-rich households (including social and economic capital). These drivers are likely to mitigate the fact that environmental change may cause declining rural productivity and droughts, which may not have the same impact as in Scenario A because of lower population growth and a resultant reduction in pressures on natural resources.

Whilst global environmental changes are likely to be less pronounced in **Scenario C**, the interaction with socioeconomic drivers is likely to present the greatest challenges to drylands in low-income countries. The key trends are likely to be similar to Scenario A, and include weak ability in communities to adapt to environmental change, reduced planned migration possibilities and increased conflict. However, these pressures could be compounded by a reduced flow of development aid to low-income countries and vulnerable regions because of lower levels of global growth. With reduced opportunities for any form of 'routine' migration, the most likely outcomes include high levels of displacement and significant incidence of trapped populations.

Whilst planned migration opportunities may be fewest under Scenario C, there is the least migration (including displacement) from drylands in **Scenario D**. This is partly due to an increased ability of national and local social, economic and political institutions to provide livelihood security and for households, which reduces vulnerability. However, this is also due to the fact that, in this low-growth scenario, households will have a limited ability to accumulate the economic/social capital required to migrate. Thus, with conflict reduced, households are less vulnerable and there is a reduced likelihood of displacement yet there may still be a residual trapped population who are unable to move to improve their livelihoods when they are affected by environmental changes (which will be less severe but still important).

There is a 'difficult to imagine' climate scenario relevant to drylands which may have an impact on the relationship between global environmental change and migration.

Whilst most projections of future climate change in dryland ecosystems agree on trends of change, if not scale, Figure 3.2 shows that for one key region, the Sahel belt, climate models diverge not just in the scale of predicted changes but in the *direction* of change, in terms of whether net moisture will increase or decrease²²⁴ – this is particularly the case after 2030. In effect, there is uncertainty as to whether the Sahel belt will get drier or will experience a 'greening', with environmental change *improving* ecosystem services. The implications of drying have been discussed above, but it is important to also consider the implications of increased agricultural incomes and livelihood security. This eventuality would be likely to have divergent effects on migration: improved income would mean less need for rural–rural short-term migration (as a form of risk diversification). However, greater levels of household wealth would lead to increases in longer-term migration. The major implications could relate to security and conflict: there is considerable literature showing that resource *abundance*, as well as resource scarcity, can be a driver of conflict²²⁵.

Conclusion: trapped populations are an issue in drylands under most future scenarios.

In conclusion, migration in the context of environmental change in drylands will be determined by how environmental changes influence and interact with future drivers of migration. As the nature and effect of these drivers would be quite different in plausible future scenarios, the implications of this relationship will differ. There are key themes in the future scenarios, specifically the likely existence of populations who are unable to move out of vulnerable situations. However, other important outcomes, including the extent to which displacement will occur, the extent of planned migration versus unplanned, unmanaged migration and the vulnerability of populations, will vary. Policy makers will need to weigh and address the most important risks, and identify policies which can be effective in each of the future scenarios. Options for policy are discussed in Chapters 4 and 6–8.

224 See also Science and Development Network (2006).

225 See, for instance, Collier and Hoeffler (2002); Collier *et al.* (2009).

3.3 Migration and environmental change in low-elevation coastal zones

3.3.1 The environment and migration context in low-elevation coastal zones

Whilst the issue in regards to drylands can be seen as 'too little water', the next ecological region can be characterised as having 'too much' in the future. Low-elevation coastal zones are defined as coastal areas 0–10 m above sea level²²⁶ and are particularly vulnerable to environmental change in the future whilst supporting large numbers of people.

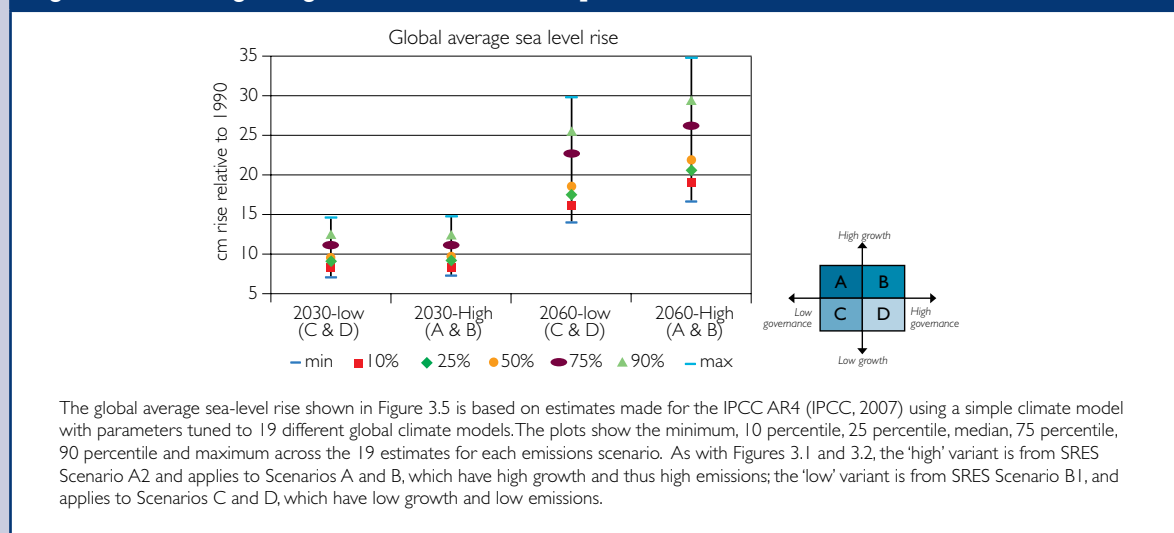
Box 3.2: The specifics of environmental change in low-elevation coastal zones

The coastal zone is exposed to climate change and the degradation of marine and coastal ecosystems. The **degradation** of coastal and marine ecosystems includes the loss of species and habitats and the removal of protection against coastal storms, triggered not only by agricultural and fisheries practices, but also by encroachment or urban and mineral developments into the coastal zone and interventions and land use changes in catchments upstream. Approximately 35% of global mangroves have been destroyed, along with around 20% of global coral reefs²²⁷.

The most obvious consequence of climate change for the coastal zone is a **rise in sea level**, leading to increased erosion of coastal habitats, salinisation of low-lying soils, and an increasing frequency of flooding from coastal storms. Even with no change in the frequency of storms, a rise in sea level has a substantial effect on the frequency of events that cause flooding²²⁸. In many highly urbanised deltas this is exacerbated by subsidence caused primarily by overabstraction of groundwater. Although there is currently no evidence for a general increase in the frequency of **tropical storms** in the future (although this may mask regional variations), there is modelling evidence for an increase in the intensity of the largest tropical storms; when combined with a higher sea level, the likelihood of extremely disruptive tropical storms affecting highly populated deltas is therefore substantially increased. Such changes would be of particular concern to low-elevation coastal zones and mega-deltas in Asia and Africa, and to small island states²²⁹. See Box 2.4 for further details on the report's approach to climate more generally.

Figure 3.5 below shows the change in global average sea level by 2030 and 2060 (relative to 1990). Changes in sea level for a specific low elevation coastal zone will differ from the global value because sea level rise will not be uniform and may be compounded by local land subsidence.

Figure 3.5: Change in global mean sea level plot



226 McGranahan *et al.* (2007).

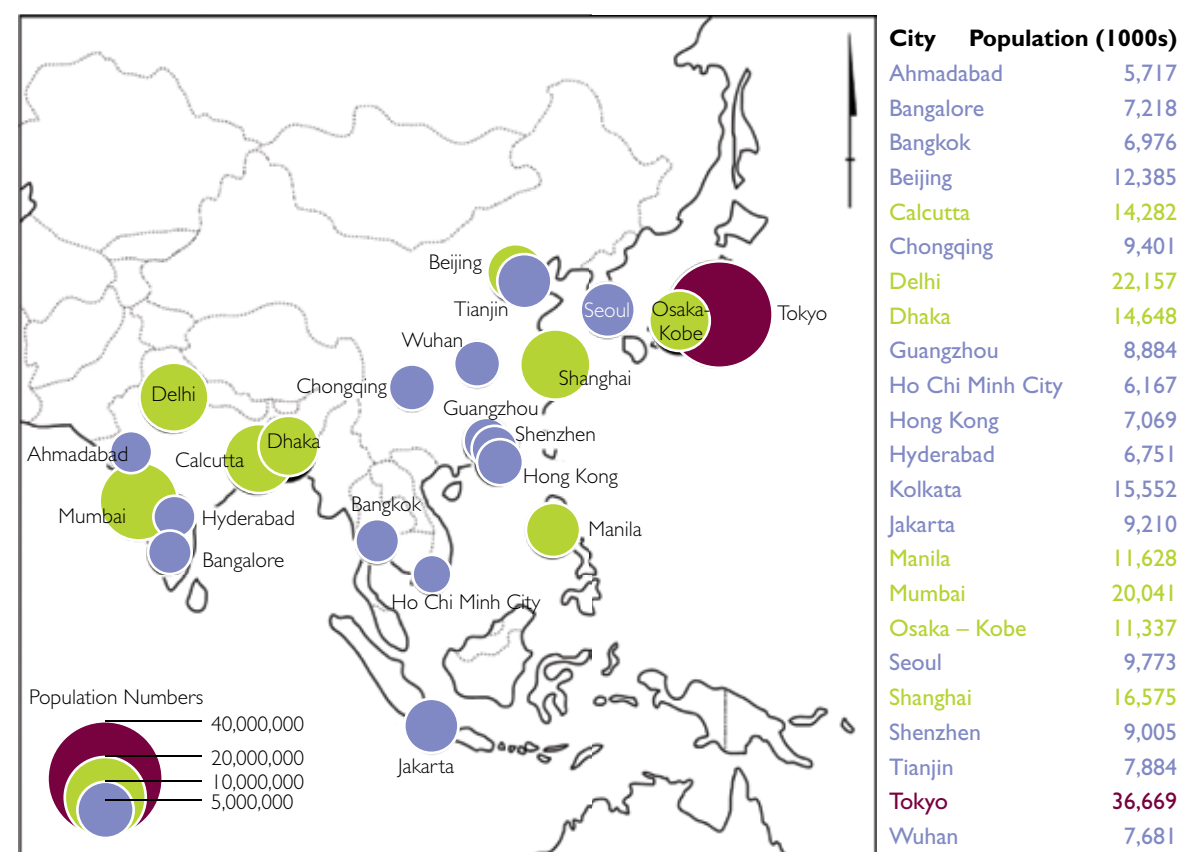
227 Agardi *et al.* (2005).

228 Yohe *et al.* (2011).

229 IPCC (2007a).

In low-elevation coastal zones, environmental events like floods can affect whole communities, directly and indirectly impacting the lives and livelihoods of people who reside there²³⁰. Two-thirds of the world's cities with populations over 5 million are at least partially located in coastal zones, including the rapidly growing urban centres of Asian and African mega-deltas (for example see Figure 3.6)²³¹. There are currently over 220 million people living in the low-elevation coastal zones of the world's 11 largest river deltas²³². Some of these populations have national significance, illustrated by the fact that approximately 30% of Egypt's population lives in the low-elevation coastal zones of the Nile delta²³³, while Bangkok is home to 24% of the population of Thailand. More broadly, it is estimated that 520 million each year, globally, are currently affected by flooding in coastal zones, and 1 billion people per year are potentially exposed to these risks, whilst 120 million are exposed to tropical cyclone hazards²³⁴. Nearly 73 million people of the 62,860 km² Ganges–Brahmaputra delta are exposed to environmental events such as cyclones and tidal surges²³⁵. Whilst the numbers of people at risk from these events in small islands and small island states are relatively small in global terms, they constitute a high proportion of their populations: over 3 million islanders from small islands and small island states, such as those in the Caribbean, Micronesia and Polynesia, reside in low-elevation coastal zones²³⁶.

Figure 3.6: Asia and the Pacific: location of cities with a population of five million and over, 2010



Source: UNDESA Population Division (2009a)

230 McGranahan *et al.* (2007); Nicholls *et al.* (2007).

231 McGranahan *et al.* (2007).

232 MR9 (Annex D refers).

233 MR9 (Annex D refers).

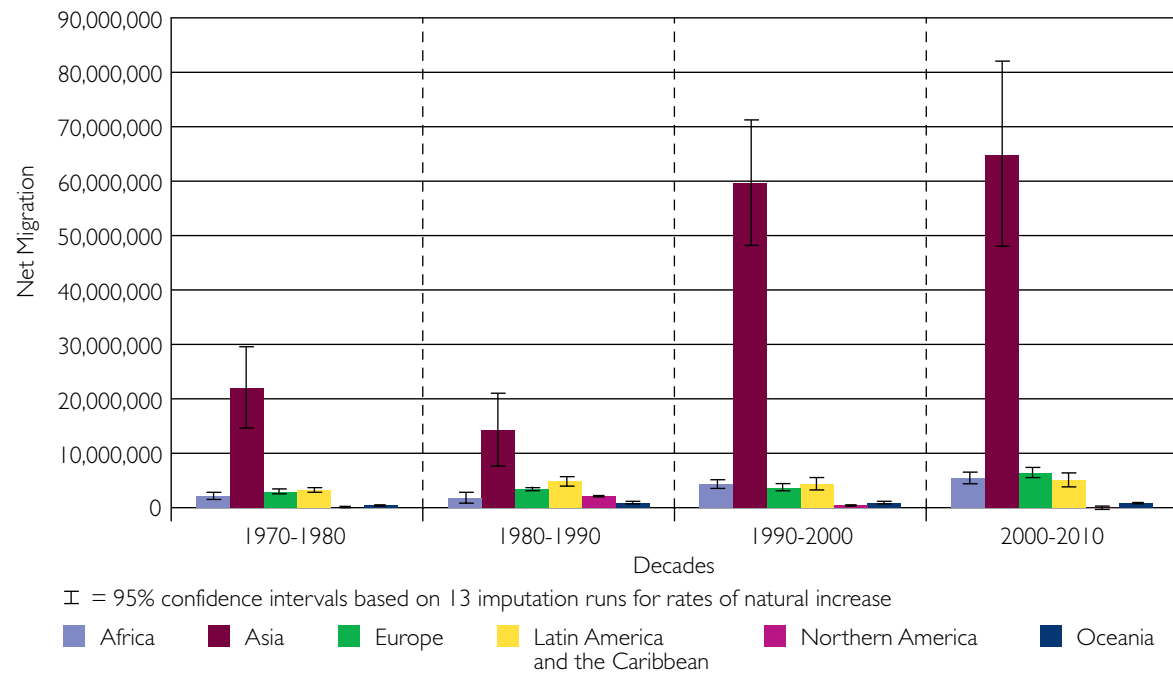
234 Nicholls *et al.* (2007).

235 MR9 (Annex D refers).

236 MR9 (Annex D refers).

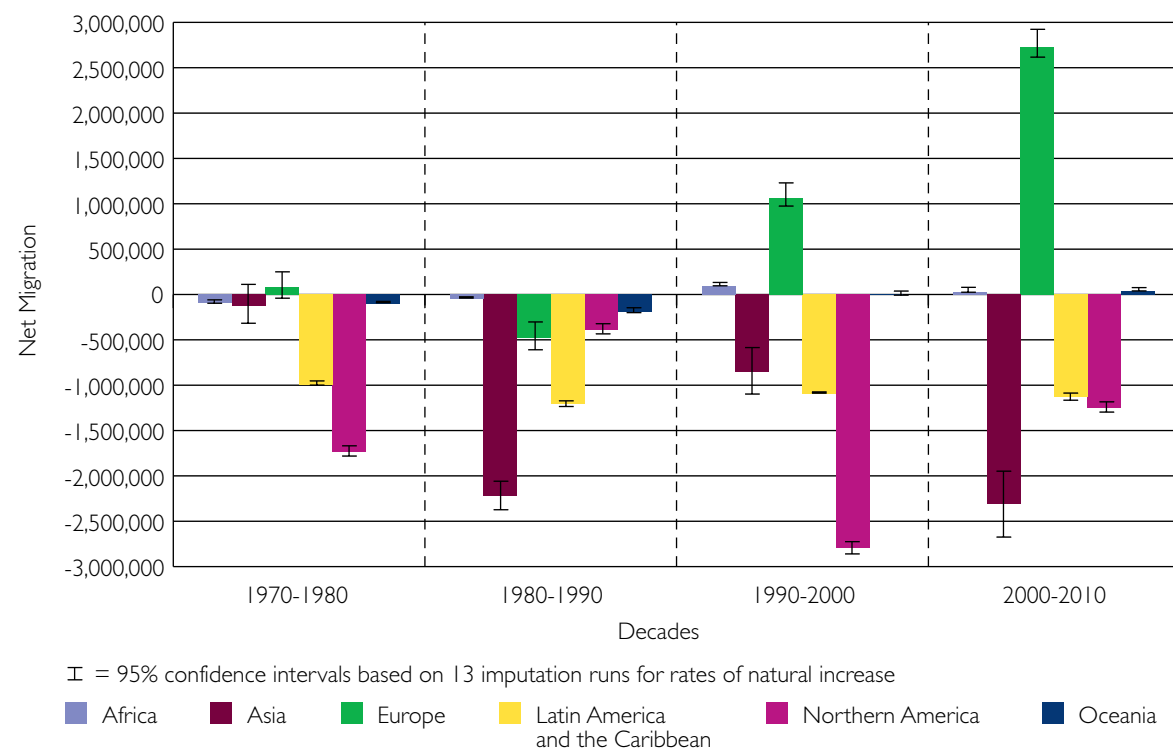
It is clear, then, that large numbers of people who currently reside in low-elevation coastal zones are potentially exposed to environmental change. But this does not automatically translate into migration influenced by environmental change. In fact, and in contrast to dryland regions, there is an historic preference for *moving* to the coastal regions likely to experience environmental change. Figure 3.7 shows increasing migration rates to coastal areas, on a global scale, for the decades 1970–2010, dominated by growth in movement to coastal regions in Asia. Hence the next section examines evidence as to the circumstances in which environmental change may affect the drivers of migration in coastal areas.

Figure 3.7: Net migration for coastal areas, within each decade, 1970–2010



Source: MR4 (Annex D refers)

Figure 3.8: Net migration for islands, within each decade, 1970–2010



Source: MR4 (Annex D refers)

3.3.2 Influence of environmental change on migration drivers and outcomes

There are major existing economic and sociopolitical structural drivers of migration in low-elevation coastal zones. Environmental change is likely to influence these drivers, affecting the economic and spatial growth of cities in these zones over the next 50 years.

Work commissioned for this report has provided a wide-ranging analysis of the drivers of migration in eleven African and Asian mega-deltas and explains why there has been accelerating migration to coastal cities. For these mega-deltas, regardless of size or other context, the underlying driver of migration to cities has been identified as uneven spatial economic development, specifically inequalities in job opportunities, wages and education. In turn, this has frequently been driven by national economic reforms which have restructured economies and increased international and domestic capital inflows to delta areas. The result has been, since 1990, an environmental and economic transformation of developing world coastal zones: while direct dependence on ecosystem services in rural contexts remains extremely important for many people, significant urban growth and the development of manufacturing and trade economies has occurred²³⁷. Political drivers have also been significant, with national economic policies tending to favour deltas for special economic zones and export processing zones. Social drivers such as migration networks, which provide migrants with information and support in destination locations, have complemented economic drivers in delta regions and islands alike²³⁸.

Environmental change in low-elevation coastal zones, as described in Box 3.2, will affect these migration drivers as sea levels rise and an increase in extreme events leads to the increased loss of infrastructure, housing and productive capital and human capital in delta areas²³⁹. Projected sea-level change over the upcoming decades will in itself change the frequency of coastal flooding, putting a strain on urban infrastructure. As Figure 3.5 shows, sea level rise is more pronounced for all scenarios in 2060; however, even a more modest rise in sea levels, as is predicted for 2030, can greatly increase the frequency of high-impact 1 in 100 year events, with exponential rises in land loss and property damage in low-lying urban areas²⁴⁰. In addition, the perception of the risk of extreme events and natural events occurring can lead to overestimation of risk by investors, reducing domestic and foreign investment in a coastal regions. Loss of confidence by investors further reduces local economic growth, which in turn can affect the drivers which lead to migration²⁴¹. Ecosystem services themselves are vital for human settlement, as they provide food, water, shelter and clothing, yet are particularly vulnerable to environmental change²⁴². The combination of their loss and the effects of environmental change on economic drivers is likely to affect the spatial growth of coastal cities in the next 50 years.

Migration in low-elevation coastal zones, including islands and delta regions, is often a strategy to secure incomes in response to economic circumstances. Environmental change is likely to influence environmental and economic drivers to increase the desire for this form of migration.

A systematic review of the drivers of migration in small island states and other islands reveals that migration decisions are usually taken at the household level and shaped by a desire to secure household incomes through diversifying risk. Figure 3.8 shows the prevalence of outmigration in Asia and Latin America and the Caribbean, the location of many low-income islands. Migration, either internal or international, is often in these circumstances developed with the purpose of improving the living standards both of those who migrate and those who stay at home²⁴³. There is evidence that cyclones, floods and coral bleaching affect household incomes through reducing agricultural production or revenues from fishing or tourism. In other words, environmental phenomena, which are likely to become more prevalent or more intense (to greater or lesser degrees) in 2030 and 2060²⁴⁴, affect economic drivers of migration. For example, in Tikopia in the Solomon Islands, following Cyclone Zoe, members of households moved to Honiara to help diversify household livelihoods and to generate income opportunities²⁴⁵.

237 DR7b (Annex D refers).

238 DR7b (Annex D refers); DRI6 (Annex D refers).

239 SRI7 (Annex D refers).

240 Nicholls *et al.* (2011); Yohe *et al.* (2011).

241 SRI7 (Annex D refers).

242 See DR7a (Annex D refers).

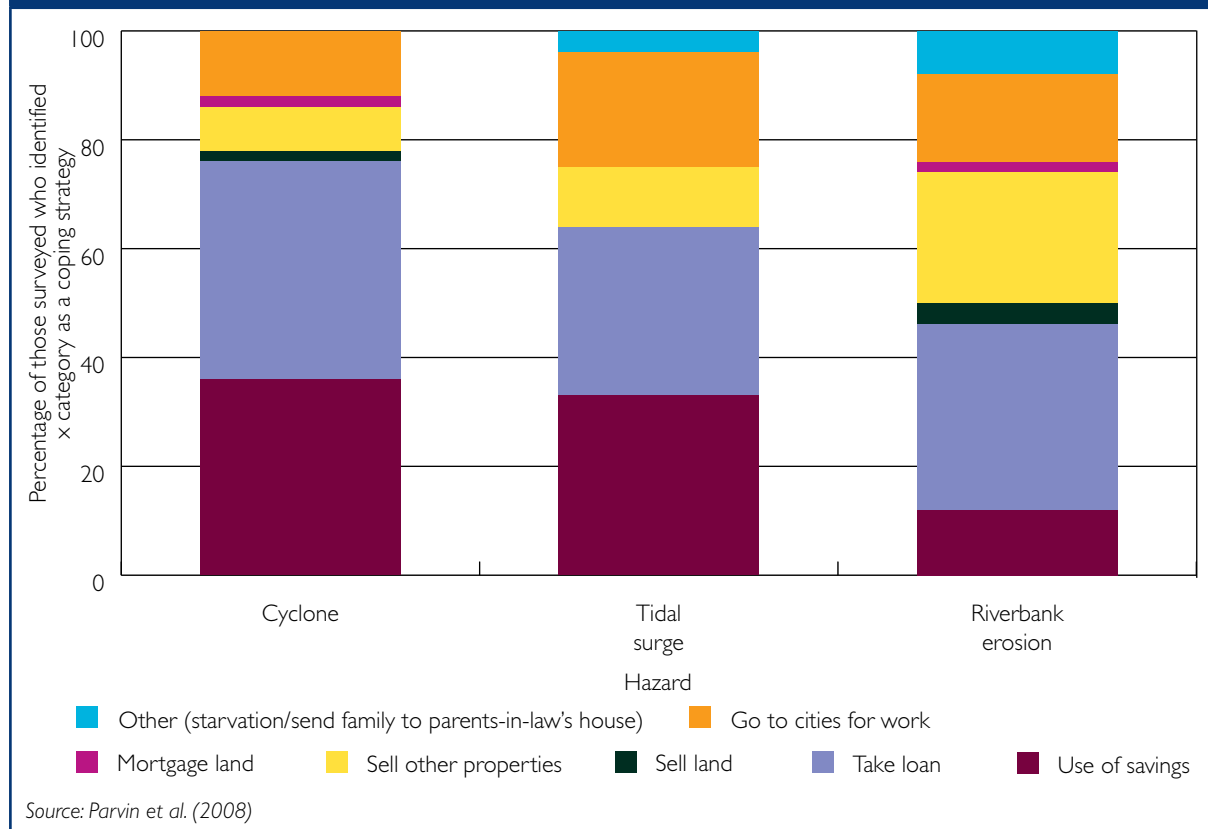
243 DRI6 (Annex D refers).

244 See Box 2.4.

245 Rasmussen *et al.* (2009).

Evidence from Vietnam suggests that environmental change can negatively impact livelihoods, as flooding can destroy crops and this acts as a trigger to livelihood stress, which is the direct cause of migration²⁴⁶. This analysis is corroborated by evidence from the case study of Bangladesh, which suggests that after exposure to an environmental hazard a majority of households will send a member to work temporarily in towns because of a lack of opportunities in their home areas. This type of migration could be in response to destruction caused by cyclones or floods, or a decrease in agricultural productivity caused by riverbank erosion or increased salinity due to encroaching sea levels²⁴⁷. Approximately 500,000 Bangladeshis move in this way each year, mainly to urban centres, because of flooding and loss of important ecosystem services²⁴⁸. Figure 3.9 shows that migration is an important economic coping strategy for households which are affected by environmental events, including tidal surges, cyclones and riverbank erosion. Such events are likely to increase in frequency and/or intensity in the next 50 years (see Box 3.2). This could, therefore, be expected to lead to increasing desires for migration to urban locations to provide better opportunities for livelihood security.

Figure 3.9: Analysis of the coping strategies of 150 households affected by different hazards on the island of Hatia, coastal Bangladesh



The effect of environmental change on the drivers of migration in low-elevation coastal zones can lead to both migration and displacement.

As indicated in Figure 3.9, different environmental phenomena can lead to different human responses, of migration which may be one. Evidence from Bangladesh suggests that riverbank erosion and increasing salinisation of low-level land, as a result of coastal flooding, is likely to lead to longer-term migration, as these have long-term impacts on the ability of individuals to earn an income from their land; in other words there are relatively lower opportunities for income generation compared with potential destination areas. In contrast, freshwater floods and cyclones generally do not have permanent impacts, so long as they do not lead to loss of land or loss of land productivity. They are more likely to lead to short-term movements (including displacement)²⁴⁹.

246 Dun (2011).

247 CS4 (Annex D refers).

248 DR7a (Annex D refers).

249 CS4 (Annex D refers).

On small islands and in small island states, the relative importance of environmental drivers on migration differs considerably. Although exposure to hazard and ecosystem services are likely to be severely affected by global environmental change (see Chapter 2), migration is unlikely to be linked directly to the deterioration of ecosystem services. However, in its various forms, migration from small islands and small island states is very obviously a response to exposure to hazards such as coastal erosion, tsunamis or cyclones²⁵⁰. For example, in Fiji²⁵¹ and Lateu²⁵², localised migration followed localised erosion or other forms of environmental change. In Samoa, villages moved inland and upwards following tsunamis²⁵³, and in Montserrat in the 1990s²⁵⁴ and in the outer Tongan islands²⁵⁵, volcanic activity induced displacement.

There is other evidence that exposure to hazards such as floods and storm surges is a major source of displacement of populations, both temporary and permanent, in coastal areas. For example, in New Orleans and its surroundings in 2005, Hurricane Katrina caused storm surges in excess of 8m on the Mississippi coastline, levee failures flooded 80% of New Orleans, and the storm and consequent flooding displaced north Gulf Coast residents for months, and in some cases years²⁵⁶. Table 3.1 shows that by 2010 (using 2005 as a base year) the region's population had declined, with Orleans parish (which cover New Orleans city) declining by 24.5%, and the population in one part of Louisiana falling by as much as 45.6%. Figure 3.10 shows the dispersion of those who left Mississippi because of Katrina and, although there were many host communities, the largest recipient was Houston, Texas, which received over 250,000 Katrina migrants²⁵⁷.

An individual hurricane event cannot be attributed to climate change²⁵⁸. However, the events surrounding Katrina are common in many parts of the world's coasts: significant migration and adaptive responses are often triggered by extreme events²⁵⁹. As noted in Box 3.2, evidence suggests that hurricane and storm events such as these may become more severe in the future, but it is uncertain whether or not they will become more frequent²⁶⁰.

250 DRI 6 (Annex D refers).

251 Campbell (2010).

252 Bohane (2006).

253 DRI 6 (Annex D refers).

254 CRI (Annex D refers).

255 Rogers (1981).

256 CSI (Annex D refers).

257 CSI (Annex D refers).

258 Nicholls *et al.* (2007).

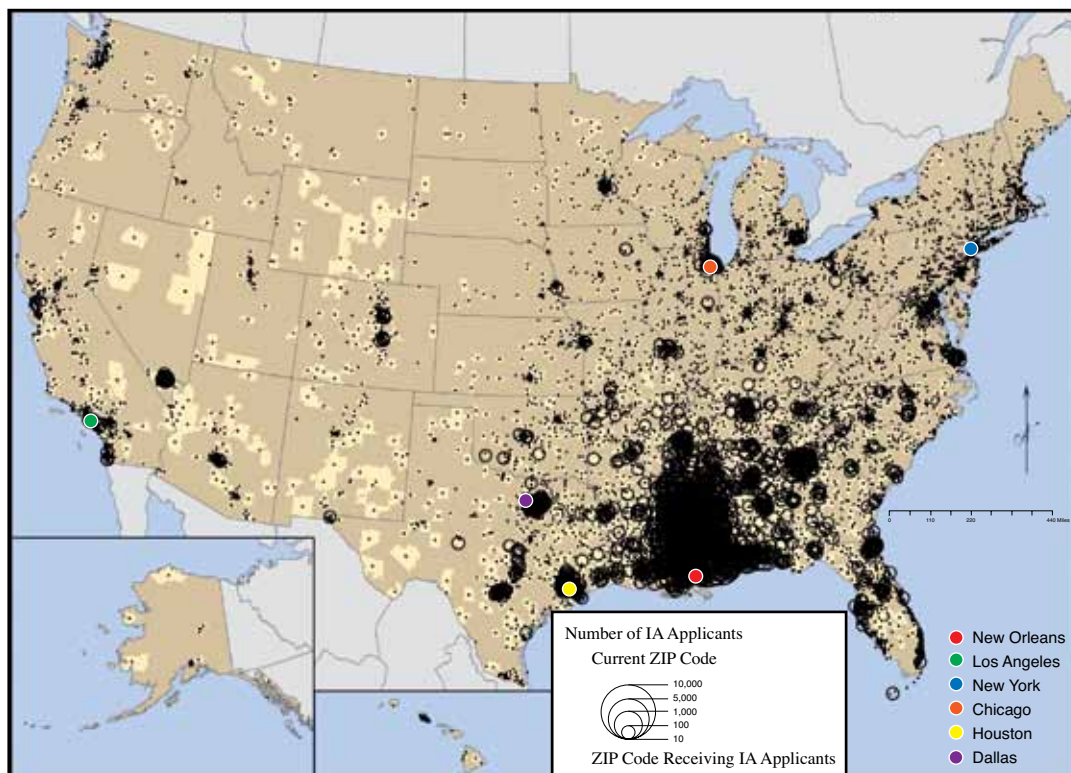
259 Adger *et al.* (2005).

260 See Box 2.4.

Table 3.1: Population estimates pre-and post Hurricane Katrina

Parish/county	2000	2005	2010	Per cent change 2005 to 2010
<i>Mississippi</i>				
Harrison	189,606	194,621	187,105	-3.9
Hancock	42,969	45,451	43,929	-3.3
Jackson	131,420	134,474	139,668	+3.9
<i>Louisiana</i>				
Orleans	484,674	455,188	343,829	-24.5
Jefferson	455,466	451,652	432,552	-4.2
Plaquemines	26,757	28,549	23,042	-19.3
St. Bernard	67,229	65,951	35,897	-45.6
St. Charles	48,072	50,116	52,780	+5.3
St. John	43,044	45,597	45,924	+0.7
St. Tammany	191,268	217,407	233,740	+7.5
Total	1,680,505	1,689,006	1,538,466	-8.9

Source: US Census Bureau (2010) in CSI (Annex D refers)

Figure 3.10: Map showing the dispersion of evacuees from Mississippi following Hurricane Katrina

Source: CSI (Annex D refers)

3.3.3 The implications of migration influenced by environmental change

Migration is a key strategy for households to diversify their incomes and secure livelihoods. It is likely to be even more important where environmental change affects incomes, and in many situations can allow more people to remain where they are.

As shown above, migration is often a decision taken at the household level, with one member migrating to secure the income, and indeed future, of the rest of the household. Often it is a 'reluctant necessity', which allows migrants to provide remittances back to their households. The additional income from remittances enables greater resilience and stability in source communities, and makes remaining behind possible²⁶¹. Incomes will be under greater threat when environmental phenomena such as flooding occur more frequently in the future. For example, islands in particular are often not generally well placed financially, geographically or politically to defend themselves against potential environmental threats²⁶². A synthesis of the evidence for low-elevation coastal zones as a whole suggests that proactive migration, alongside other adaptation measures and climate change mitigation²⁶³, is likely to become an increasingly important strategy by which populations in these areas increase their resilience to environmental change and ultimately remain *in situ*, rather than be displaced.

Environmental change in the future may mean there are fewer opportunities for planned migration, which will mean that migrants are likely to be placed in ever more vulnerable situations, and an important option for maintaining the existence of rural coastal communities is eliminated.

Whilst migration is likely to become an increasingly important option in the context of future environmental change, the evidence provided above suggests that environmental change may in fact *limit* future economic and spatial expansion of coastal cities, especially (but not exclusively) in Asian and African coastal areas. This may have two impacts on migration:

1. If people do continue to migrate to coastal cities, there may be fewer income opportunities, and people are likely to move to increasingly vulnerable locations. Migration to urban living increases vulnerability during major and minor events, as much of the population lives in high-density urban areas. Also, in Asia, many of the world's largest cities are in floodplains or cyclone-prone coastal areas. The risk of flooding, and the intensity of the most disruptive cyclones, is likely to increase with future environmental change²⁶⁴.
2. A future slowdown in the growth of cities is likely to lead to a slowdown in the opportunities for migration, unless new urban centres are built (a possibility explored further in Chapter 8). As much of the analysis above has shown, migration, and the remittances and livelihood enhancement it provides, is often essential for maintaining the very existence of a variety of coastal communities.

Those with fewer assets and low wealth are most likely to be vulnerable to environmental change, yet are also least likely to migrate away from it in a planned way. This group could become trapped in vulnerable circumstances. This is a humanitarian concern in itself, and may ultimately also lead to greater displacement.

In the dryland context those with low financial, social and/or political capital tend to be those most vulnerable to environmental change yet also least able to move out of their vulnerable circumstances. Likewise, in small island states and other islands, the people most likely to be affected live in marginal areas that are flood prone or close to exposed coasts, are already relatively poor and are unable to respond to hazard by moving, as migration (especially international migration) is selective by economic status²⁶⁵. In New Orleans, the wealthy were able to migrate proactively, whereas it was the lower-income and less educated population group that remained in their homes or sought shelter in makeshift and potentially dangerous emergency shelters, such as the Superdome and Convention Centre in the aftermath of Hurricane Katrina, and were disproportionately affected²⁶⁶. Studies in Bangladesh also show

261 DRI6 (Annex D refers).

262 DRI6 (Annex D refers).

263 Mordreux and Barnett (2009).

264 See Box 3.2 and DR7a (Annex D refers).

265 DRI6 (Annex D refers).

266 CSI (Annex D refers).

that the less poor and better educated have a higher propensity to migrate in the face of environmental threats²⁶⁷.

By staying in hazardous locations, people, especially the poor, are likely to suffer repeatedly from the effects of the environmental events that may increasingly occur there²⁶⁸. The situation is not static, as environmental changes, such as sea-level rise, are likely to impact on natural, physical, human and social capital. Indeed, there is circularity to this situation. Disasters can destroy savings, pushing households into 'poverty traps', which can affect entire regions²⁶⁹. Evidence from Bangladesh highlights the complex circularity which can be at play: erosion of land and increased salinity from coastal flooding can result in households being forced to move to embankments (which are public lands), losing permanent assets or running down savings, all of which increase vulnerability.

When those with low capital are faced with a fast-onset, life-threatening event, they may experience displacement in highly vulnerable circumstances. Among evacuees from New Orleans East, a neighbourhood of both Vietnamese and African-American residents, nearly 40% of the Vietnamese and 80% of the African-Americans relocated multiple times during the month after the storm. In Bangladesh, loss of agricultural land through riverbank erosion and following flooding (from monsoon floods or cyclones) displaced approximately 64,000 people each year between 1981 and 1993²⁷⁰, to urban areas, other agricultural areas or to highly vulnerable newly deposited land (chars).

3.3.4 Uncertainty and importance of future scenarios

Plausible future scenarios for low-elevation coastal zones suggest that different kinds of environmental change will interact with plausible drivers of migration in the future, leading to a variety of outcomes. Policy makers will need to weigh up the risks inherent in each scenario.

This section uses the scenarios introduced in Chapter 2 to produce a number of plausible assessments of how the interaction between environmental change and drivers of migration might develop over the next 20–50 years in this ecological region. The first important feature to note is that demographic projections for 2030 and 2060 show that under every scenario more people will reside in low-elevation coastal zones, and thus more people will experience the direct and indirect impacts of flooding. However, it is clear that fewer will reside in them in the two 'better-governed' B and D Scenarios and there is a higher population in them in the 'high-growth' (more environmental change) A and B Scenarios than in the 'low-growth' (less environmental change) C and D Scenarios (see Figure 3.11). The most striking increases are shown for Africa and Asia.

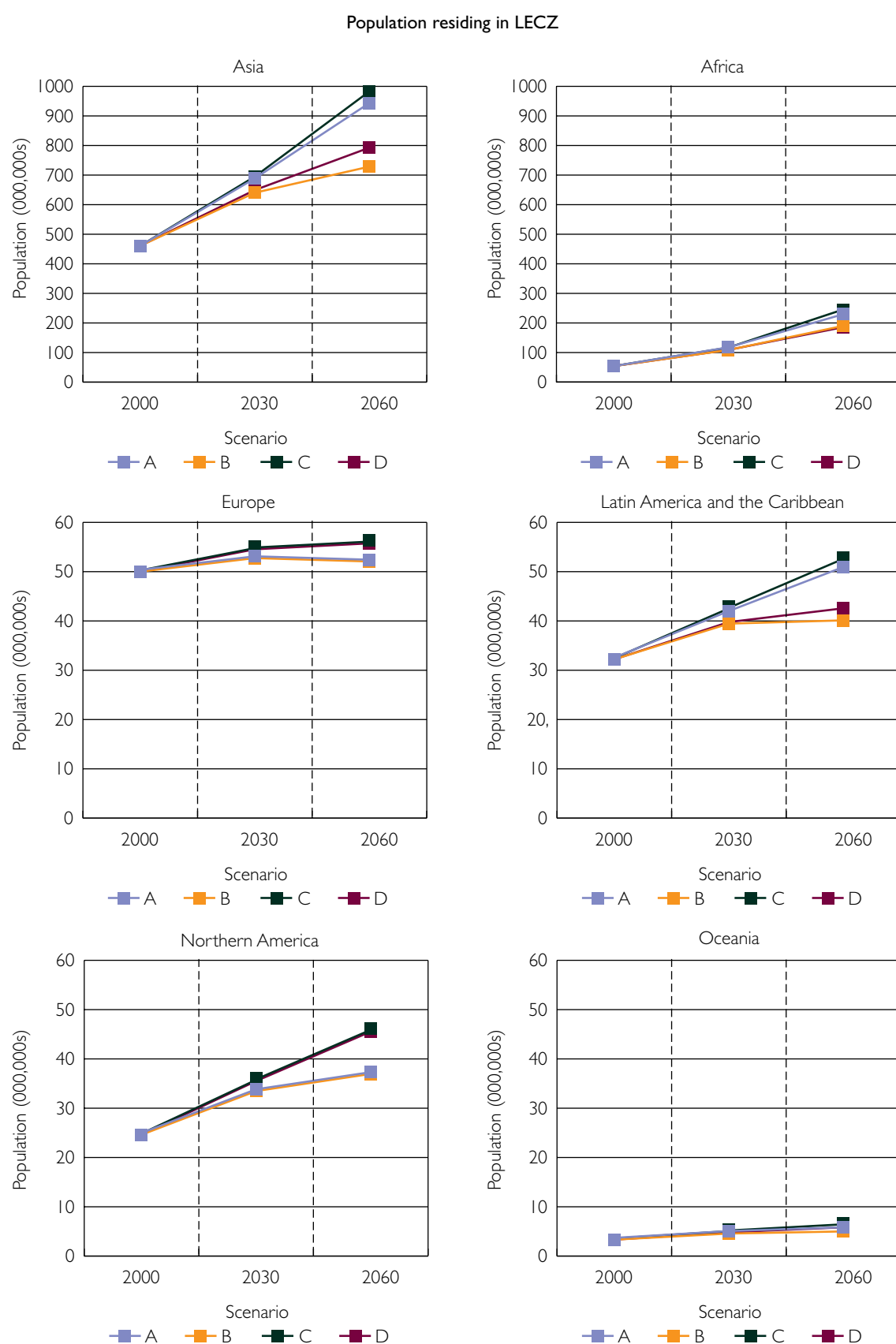
267 Paul and Routray (2010).

268 CS4 (Annex D refers).

269 SRI 7 (Annex D refers).

270 Abrar and Azad (2004).

Figure 3.11: Projections of those residing in low-elevation coastal zones in 2030-60 in Foresight Scenarios A-D (Scenarios as defined in Chapter 2)



Explanatory Note: Please note the difference in scale of the 'y' axis for Asia and Africa. Lines do not represent trajectories between points.
Source: MR9 (Annex D refers)

Scenarios A and C show the highest concentration of people living in coastal zones; for example, in Scenario C, by 2060, nearly a billion people reside in coastal zones in Asia, and 245 million in Africa, and nearly 1.4 billion globally. Scenarios B and D show between just under and just over 1.1 billion, respectively, living in coastal zones globally. This information provides insights about the potential scale of the future policy challenges discussed above. The above analysis has shown that a key policy concern is populations migrating to and residing in vulnerable urban settlements, or indeed living in vulnerable rural areas. Tables 3.2 and 3.3 shows the extraordinary increases in populations living in floodplains in urban, and to a lesser extent, rural areas in Asia, Africa and Latin America and the Caribbean in 2030 and 2060, broken down by scenario.

Table 3.2: Population increases in urban areas in floodplains in selected regions in scenarios A–D, 2030–60²⁷¹ (000,000s)

Urban Floodplains	2000 Baseline	2030		2060	
		Scenario A	Scenario B	Scenario A	Scenario B
		Scenario C	Scenario D	Scenario C	Scenario D
Eastern Asia	18	43.6	42.4	62.6	45.2
		46.2	40.9	67.4	48.2
South Central Asia	4.1	16.1	16	51.7	35.3
		17.3	14.6	58.6	37.4
Southeastern Asia	6.8	22	20.5	46.5	30
		23	20.2	49.5	35.2
Western Asia	1.1	4.1	4.3	10.6	9
		4.5	3.8	12.2	8.2
Northern Africa	1.5	4.4	4.1	10.7	7
		4.6	4	11.6	8
Sub-Saharan Africa	0.7	4.2	4.7	20.4	19.6
		4.7	3.9	24.6	15.9
Latin America and the Caribbean	2.5	5	4.5	7.5	4.9
		5.2	4.5	7.9	5.4

Source: MR9 (Annex D refers)

²⁷¹ Because of the underlying assumptions used in MR9, it is important to note that the figures presented in Tables 3.2 and 3.3 constitute a preliminary first order estimate of the urban–rural population proportion in the coastal floodplain. To some degree these figures are likely to *overestimate* the rural population and *underestimate* the urban population as settlements of all sizes are found to be preferentially concentrated at the coast; please note, based on UN groupings there is some overlap between the populations.

Table 3.3: population increases in rural areas in floodplains in selected regions in the Scenarios A-D, 2030-60

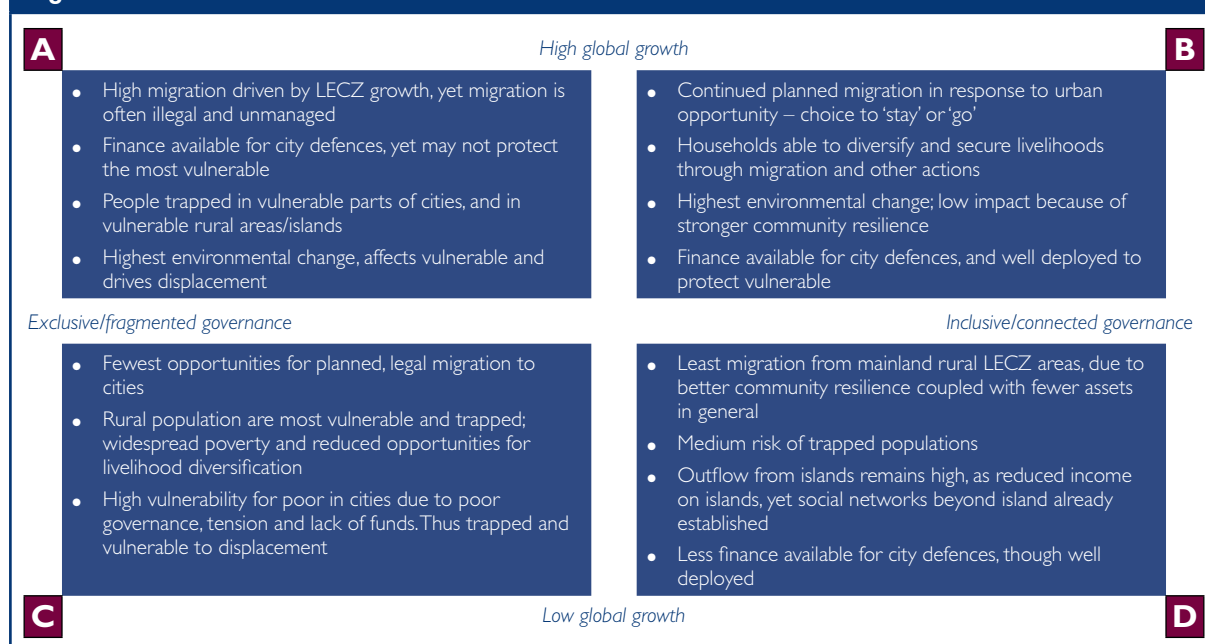
Rural Floodplains	2000 Baseline	2030		2060	
		Scenario A	Scenario B	Scenario A	Scenario B
		Scenario C	Scenario D	Scenario C	Scenario D
Eastern Asia	53.9	55.8	55.7	57.8	57.8
		55.8	55.7	57.8	57.8
South Central Asia	25.5	39.2	32.2	41.5	33.2
		37.4	35.6	39.6	37.7
Southeastern Asia	34.8	38.4	36.6	39.5	31.4
		38.1	37.3	39.2	36.3
Western Asia	3.2	7	6.2	8.7	6.3
		6.5	6.6	8	7.3
Northern Africa	8	12.5	10.9	12.9	11.2
		12.3	11.7	12.6	12
Sub-Saharan Africa	4	8.9	7.5	12	8.1
		8.1	8.2	10.4	9.6
Latin America and the Caribbean	5.9	6	6	6.1	5.9
		6	6	6.1	6

Source: MR9 (Annex D refers)

For environmental change, as was the case in dryland regions, there is little difference between the scenarios in 2030, with median projections indicating a rise in sea level of about 10cm across high- and low-emissions scenarios (see Figure 3.5). By 2060 there are greater variations. Under the high-growth/high-emissions Scenarios, A and B, median projections of sea level rise are 22cm, whilst they are 18cm in the low growth Scenarios, C and D.

Under **Scenario A**, rapid economic growth and limited regulation is likely to see coastal cities continue as poles of attraction experiencing considerable formal and informal growth. Migrants may relocate both from within the country to the city, but also immigrate legally, or illegally, via sea routes from other states. Rising sea levels, a substantial increase in frequency of river flooding in South and East Asia and West Africa, and a substantial increase in frequency of flooding for coastal cities will affect populations in cities and coastal areas (including islands) alike. By 2060 there are 175 million more people living in urban floodplains in Asia, Africa and Latin America and the Caribbean than there were in 2000 (65 million more by 2030). Informal growth means that many people living in cities are trapped in particularly vulnerable areas, such as low-lying slums, which are less likely to have benefited from city defence funds (see Box 3.3 for further discussion of city defences). This is especially the case for those who have migrated to cities in an unplanned way. This population will experience event-driven displacement, as will those who have been left behind in predominantly rural regions which are cyclone and hurricane prone – in this scenario there are 178 million living in rural floodplains in Asia, Africa and Latin America and the Caribbean, whilst there are 552 million people directly or indirectly affected by floods, living in the coastal zone in rural areas in these continents by 2060²⁷². The vulnerability of these people will increase because, under this scenario of unmanaged migration, there are fewer channels for rural–urban linkages and remittance transfers. Urban or rural populations in delta areas such as the Brahmaputra–Ganges may be especially vulnerable to repeated displacement owing to a combination of environmental factors and the risks emanating from poorly governed economic expansion.

272 MR9 (Annex D refers).

Figure 3.12: Plausible future scenarios for low-elevation coastal zones

Scenario B is similar to A in that economic growth in cities continues to drive opportunities for migration, yet differs in that migration is planned, well regulated and facilitates strengthening of rural–urban linkages. These linkages and remittances, in turn, secure rural livelihoods, which are also helped by better local governance and a more dispersed economic growth. There is in general much greater choice about whether or not to migrate and, if the decision is made to migrate, opportunities to maintain connections to rural areas and return freely are readily available. As under Scenario A, high economic growth is likely to provide the capital for building and maintaining defences to protect low-lying areas, or even for city relocation. In contrast to Scenario A, however, capital is likely to be deployed more effectively to protect the poor and vulnerable. Despite the fact that the same difficult environmental circumstances as in Scenario A will be experienced, Scenario B shows increased resilience at a city, community or individual level.

Under **Scenario C**, low growth means that there are few opportunities for planned, legal migration to cities. This is particularly problematic for those in rural coastal areas, as exclusive governance and low growth means that scope to diversify livelihoods is reduced, leading to widespread poverty. Although environmental risks are *less substantial* than in Scenarios A and B, there is still *increased risk* of river flooding in South and East Asia and West Africa, and an increased risk of coastal flooding due to sea-level rise, compared to now. Those who do migrate to cities, together with the existing urban population (which is still increasing), will have very low protection against environmental hazards: the lack of funds for flood protection means that money is spent only on the privileged. By 2060 there are 232 million people living in floodplains in urban areas in Asia, Africa and Latin America and the Caribbean (126 million more than in 2030), and a significant proportion of this group are likely to be trapped in vulnerable living conditions, such as low-lying slums and squatter settlements next to water hazards. A serious environmental event will lead to a humanitarian catastrophe, loss of life and displacement.

Generally, migration in coastal zones is likely to be lowest under **Scenario D**, as there are fewer opportunities for migration (due to lower economic growth), less need for migration (due to greater community resilience) and fewer assets at a household level to finance it. As a result, there are still risks of trapped populations in rural areas who could be vulnerable to the increased occurrence of environmental events, although this risk is not as substantial as in Scenarios A and B. This situation will be slightly different for islands, where reduced environmental change and lack of growth will reduce opportunities for income generation, and people will use established social networks to migrate, either internally, to capital cities, or internationally. There will be few opportunities for those in cities to migrate but they will be better protected, by well-deployed funds. Yet those funds will be lower than in Scenario B, and thus protection will be less.

Box 3.3: The importance of coastal defences

Coastal defences are a key intervention for reducing exposure to extreme events and sea-level rise in low-elevation coastal zones. There are, however, economic and environmental limits to what can be achieved, especially where other factors such as subsidence are implicated. As noted in the text, future scenarios of regional, national and local governance will imply different levels of protection, and different outcomes for migration. Rapidly growing, low-lying urban centres, especially those built through significant economic development (e.g. in China, Singapore), have the greatest potential to build defences against sea-level rise. The costs of adaptation to sea-level rise may be lower than options such as city relocation. In Bangladesh, the United Nations Development Programme (UNDP) has been building thousands of disaster-resilient houses for the most vulnerable families, and the World Bank has provided a total support of USD 187 million for the development of hundreds of cyclone shelters and more resilient agricultural practices in cyclone-prone areas, in partnership with the government of Bangladesh²⁷³. The success of projects like these will be influential in determining the extent to which migration and displacement occur because of future environmental change, an issue further discussed in Chapter 6.

Conclusion: similar issues are likely to be experienced in low-elevation coastal zones as in dryland regions; they include the importance of trapped populations, the links between proactive migration and vulnerability, and the resultant impacts on humanitarian issues and displacement,

In conclusion, migration in the context of environmental change in low-elevation coastal zones, like that in drylands, will be determined by how environmental changes influence and interact with future drivers of migration. Although many of the drivers are very different in drylands, certain key themes are similar. For example, in both ecological regions there is a risk of trapped populations in most scenarios. In low-elevation coastal zones in particular they are likely to reside in *both* rural and urban areas. Migration is likely to continue to urban areas in most scenarios in coastal areas, yet the types of migration (for example planned, unmanaged or displacement), and thus the vulnerability of *both* migrants and those left behind, may differ. Once again it is clear that policy makers will need to weigh up risks, address the most important, and identify for policies that can be relevant in each of the future scenarios (see Chapters 4 and 6–8).

273 CS4 (Annex D refers).

3.4 Migration and environmental change in mountain regions

3.4.1 The environment and migration context in mountain regions

As in drylands, mountain populations have long adapted to living in fragile environments subject to environmental stresses. The challenging climate in mountains, such as low temperatures and snow, and extreme climate events such as floods and droughts, interact with terrain characteristics (especially steep slopes and in some regions tectonic movements). In 2003 more than 700 million people, or about 12% of the world's population, lived in mountain regions (see Table 3.4). More than 600 million (90%) of those lived in low-income countries and emerging economies²⁷⁴. Box 3.4 describes the recent, current and possible future environmental changes in mountain regions. There is evidence that, over the period 1970–2010, there was considerable migration from mountains at a global level, and especially in Asia (Figure 3.14). However, as the relationship between migration and environmental change is not always intuitive and linear, a range of evidence is assessed in the next section to further understand potential links.

Table 3.4: Global population of mountain regions, 2003

Mountain terrain class, based on elevation and steepness criteria	Global population (000s)	Developing countries population (000s)	% of global total for 'class' residing in urban areas
Class 6: elevation > 4,500m	4,137	4,137	1
Class 5: elevation 3,500–4,500m	13,325	13,320	24
Class 4: elevation 2,500–3,500m	45,865	45,602	31
Class 3: elevation 1,500–2,500m, slope > 2°	141,468	138,388	24
Class 2: elevation 1,000–1,500m, slope > 5°	145,183	136,461	28
Class 1: elevation 300–1,000m and elevation range > 300m/5 km	368,812	324,884	27
Total	718,790	662,792	27

Source: Adapted from Huddleston et al. (2003)

274 DR9 (Annex D refers).

Box 3.4: The specifics of environmental change in mountain ecosystems

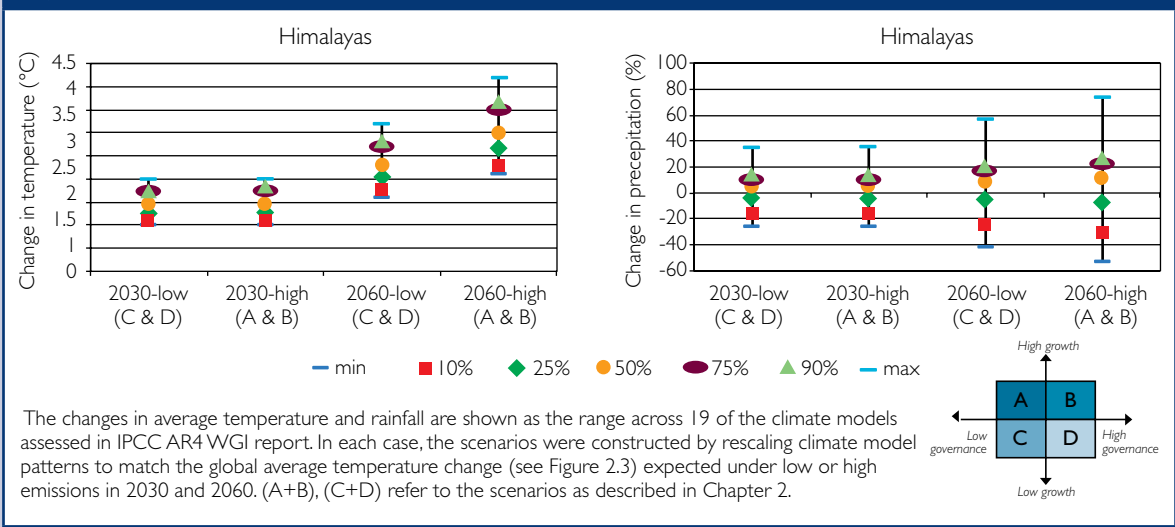
Mountain ecosystems experienced above average warming in the twentieth century. This rate of change has significant implications for mountain ecosystems. Progressive warming at higher altitudes in the Himalayas, for example, has been three times greater than the global average²⁷⁵. Predictions for the twenty-first century are that temperatures will continue to increase disproportionately in mountain ecosystems²⁷⁶.

With such warming, it is likely that the hydrological cycle in mountain areas will intensify, changing the frequency and intensity of floods and droughts. Expected shifts in species composition of mountain ecosystems may also affect this hydrological cycle. More intensive precipitation events could trigger flash floods and landslides in mountainous terrain²⁷⁷.

As discussed in Box 2.4, while there have been considerable decadal variations in glacier trends, observations indicate that since the 1980s there has been a general trend for global glacial retreat²⁷⁸. The melting of snow, ice cover and glaciers means that the supply of water to vast land masses and billions of people may not be guaranteed in the future²⁷⁹. In the near term glacial melt in mountainous areas increases the danger of outburst floods from glacial lakes, threatening settlements in some mountain areas by increasing exposure to hazards²⁸⁰. In the longer term, as glaciers recede, river flows may decrease fundamentally, changing mountain ecosystems and affecting water, food and energy security²⁸¹.

Figure 3.13 below shows changes in average temperature and rainfall by 2030 and 2060 (relative to the 1961–90 mean), for a representative area in the Himalayas, using the same methodology as outlined in Box 3.1. Similar to the South Asia example, there is relative certainty in terms of anticipated increases in temperature, but huge unpredictability, including in direction of change, in rainfall projections towards 2060.

Figure 3.13: Variants in temperatures and rainfall in representative Himalayan area



275 DR9 (Annex D refers).

276 DR9 (Annex D refers).

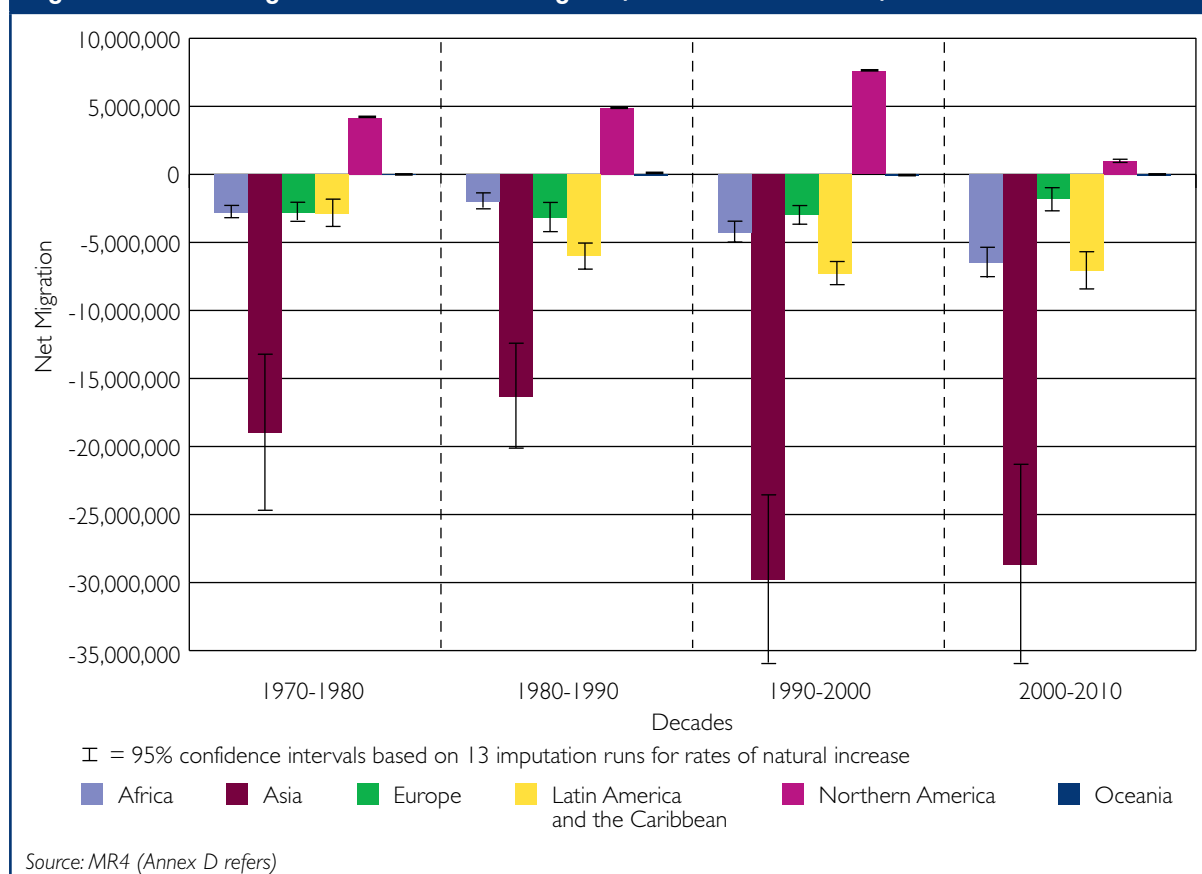
277 DR9 (Annex D refers).

278 Zemp *et al.* (2008).

279 DR9 (Annex D refers).

280 IPCC (2007a).

281 IPCC (2007a).

Figure 3.14: Net migration for mountain regions, within each decade, 1970–2010

3.4.2 Influence of environmental change on migration drivers and outcomes

The specificities of mountain ecosystems mean that communities are highly reliant on ecosystem services and agricultural incomes, yet these environmental and economic drivers of migration are likely to be affected by future environmental change.

Some 73% of the global mountain population lives in rural conditions and their livelihood is highly dependent on natural resources. Evidence from a cross-country analysis of migration drivers in mountainous regions shows that many mountain households pursue a mixed agriculture based on cereal grains, horticulture crops, and animal husbandry. In the Hindu Kush–Himalayas, agriculture is the primary source of income for a majority of the households. In general, livelihood options are restricted to agriculture, including livestock farming, or daily wage labour. This can be explained by the fact that mountain areas are fragile, inaccessible, comparatively less developed, diverse and marginal in national policies. Production and exchange options available to the mountain people are therefore limited, and mountainous areas are not often prioritised for national economic development policies. This is in sharp contrast to the growing economic vibrancy that is increasingly a feature of adjacent lowlands, foothills and urban areas in mountain regions²⁸².

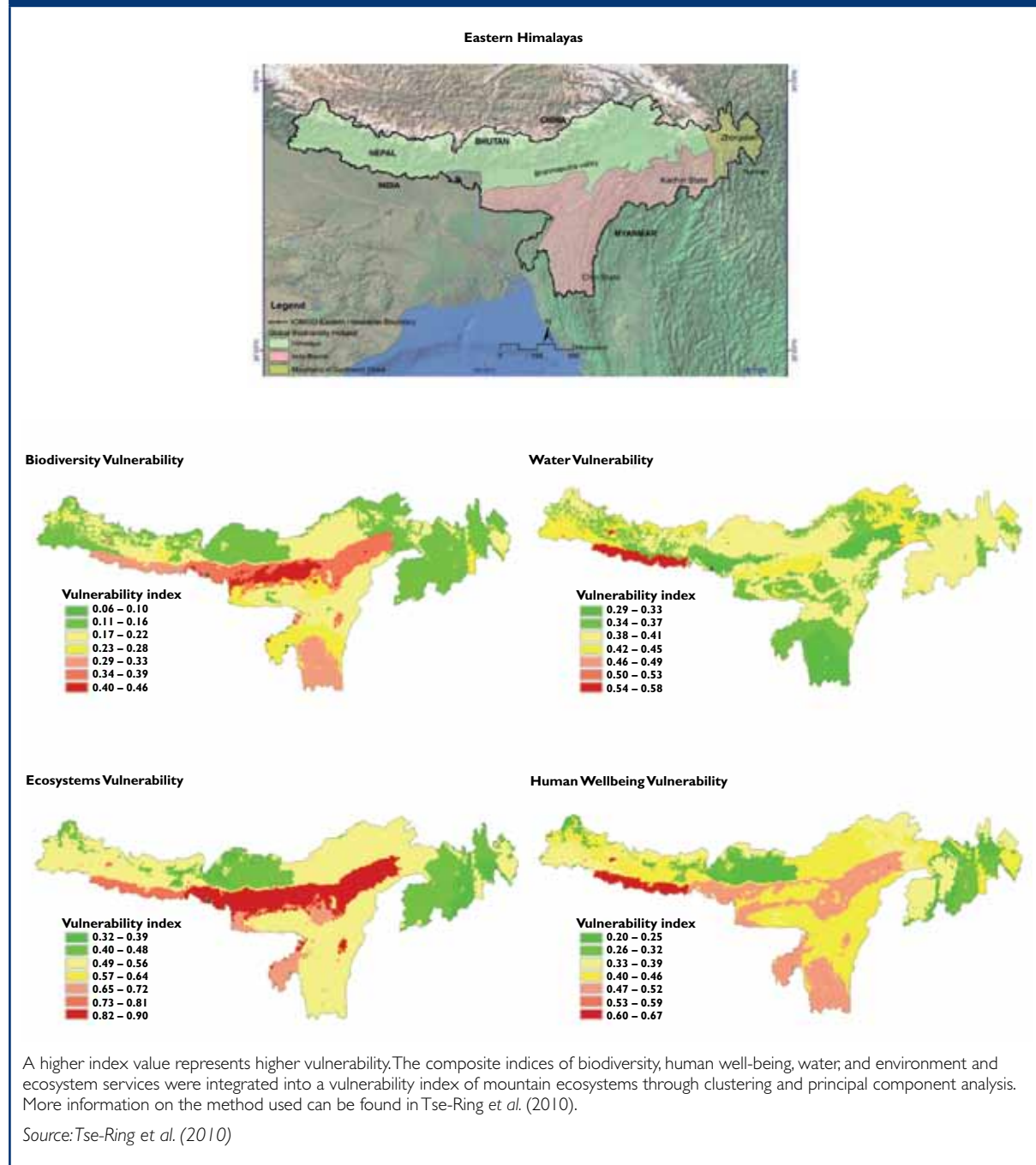
The largest number of rural mountain dwellers is in East Asia (over 223 million), yet here ecosystem services and water are particularly vulnerable to environmental change²⁸³. This is particularly the case in the eastern Himalayas, where water, biodiversity and ecosystems are markedly vulnerable (see Figure 3.15). Figure 3.15 also shows general human well-being, which is closely linked to the availability of ecosystem services and water: Ecosystem services related to water play an overriding role in local livelihoods (drinking water, irrigation, farming, biomass growth)²⁸⁴.

282 DR9 (Annex D refers).

283 Huddleston *et al.* (2003).

284 DR9 (Annex D refers).

Figure 3.15: Relative magnitude and spatial characteristics of vulnerability to climate change impacts in the Eastern Himalayas



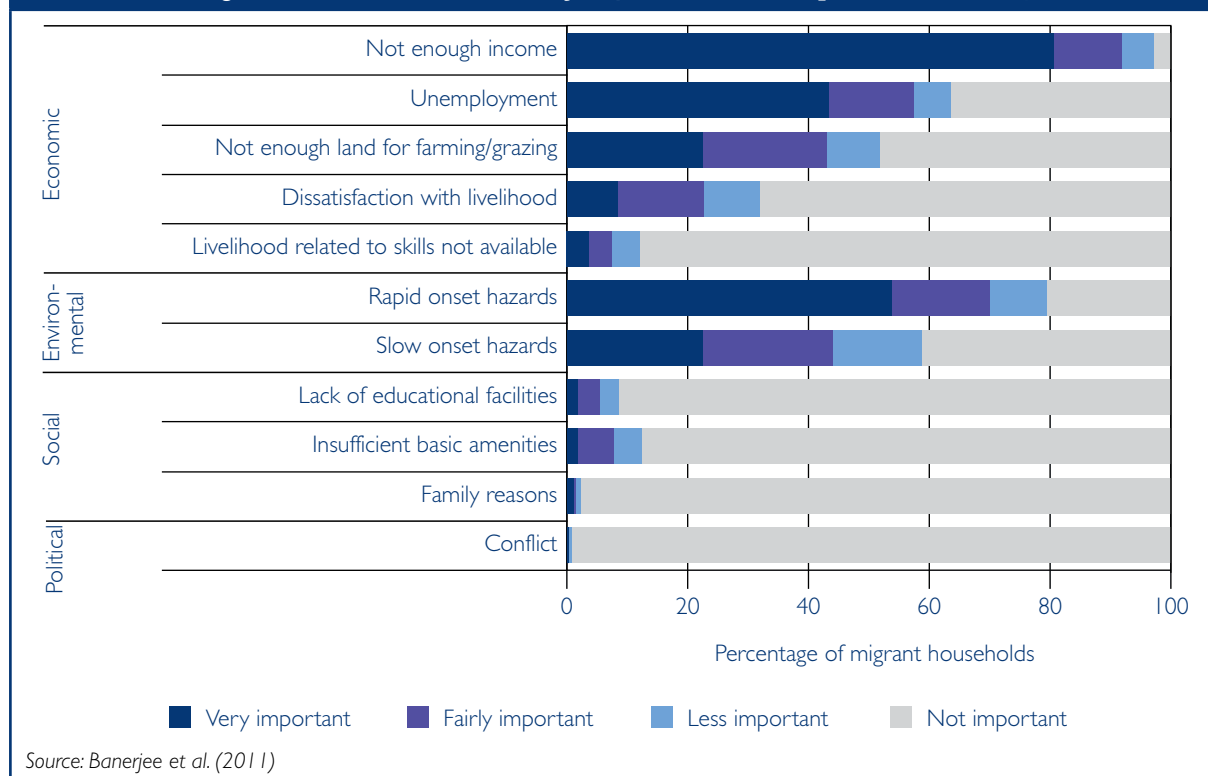
In summary, the dependence of mountain communities on agriculture, which in turn is dependent on ecosystem services and can be affected by environmental change, makes them comparatively more hazard prone than secondary- or tertiary-sector occupations in the manufacturing or services industries. For example, in the Hindu Kush–Himalayas region, there is evidence to show that the production of horticultural crops has already either stagnated or declined due, at least in part, to environmental changes²⁸⁵.

In mountain regions, migration is a common response to threats to incomes. These threats include those caused by environmental variability of the kind that is expected to occur more frequently in the future.

285 DR9 (Annex D refers).

Many mountain areas have a history of large-scale migration, both between rural areas and to urban and even foreign destinations²⁸⁶. Migration for work is a significant household strategy to diversify the sources of income. For example, in Nepal and Pakistan farmers look for seasonal non-farm work in urban centres, while many Nepali farmers migrate to India to seek employment during the off-farm season between November and January every year. Similar seasonal migration is also prevalent in Peru²⁸⁷. Environmental change exacerbates existing economic drivers to trigger migration in combination with many other factors. Analysis from four case studies in mountain and hill communities in the Hindu Kush–Himalaya regions of China, India, Nepal and Pakistan shows that one factor in household migration decisions is the effect of environmental hazards. Figure 3.16 shows that 80% of migrant households surveyed considered these hazards an influence on the decision to migrate for work. As discussed in Box 3.4, rapid-onset events such as flash floods and landslides are expected to increase in mountain regions as a result of more intensive precipitation events and enhanced glacial melt increasing the danger of glacial lake outburst floods²⁸⁸. Over the longer term, as glaciers recede, river flows may decrease, fundamentally changing mountain ecosystems and affecting water, food and energy security²⁸⁹. Figure 3.16 also shows the importance of *non-environmental* factors in this decision, amongst which income and unemployment are prominent.

Figure 3.16: Determinants of labour migration and their perceived importance in migration decision-making in the Hindu Kush–Himalayas (China, India, Nepal and Pakistan)



There is case study evidence that migration, as part of livelihood diversification strategies, increases as environmental conditions reduce incomes:

- Evidence from the Kenyan highlands suggests that temporary migration is a form of livelihood diversification for households in circumstances of poor soil quality (which reduces agricultural yields)²⁹⁰.
- In the Ecuadorian Andes, both local and internal migration increase significantly when there are fluctuations in agricultural harvests²⁹¹.

286 Gray (2009).

287 DR9 (Annex D refers).

288 DR9 (Annex D refers).

289 IPCC (2007a).

290 Gray (2011).

291 Gray (2009).

- In the Ethiopian highlands, drought increases labour-related migration; migration represents a key coping strategy following drought, with the poorest most likely to migrate²⁹².

Drought, leading to reduction in soil quality and in agricultural harvests, is a likely characteristic of future environmental change in mountain regions, and thus certain forms of migration seem likely to be an inevitable outcome of this environmental change.

The relationship between global environmental change and migration in mountain regions is extremely complex: whilst global environmental change can be linked with increases in migration as a form of income diversification, it can also reduce the socioeconomic asset base required to migrate.

The studies mentioned above, along with another study of Uganda (parts of the country with an elevation of +1,000 m), are summarised in Table 3.5. They show that environmental change can have different *directional* affects on migration and in some cases can *reduce* migration. Migration is a response to a reduction in soil quality in Kenya, yet the opposite relationship was found in Uganda. Whereas Kenya is a country with a history of migration and income diversification, Uganda is not, and thus has high 'barriers to entry' or initial costs of migration (such as housing, school fees or bride wealth). The Ugandan study showed that, as the environment improved (through improved soil quality), so did a family's assets and therefore its ability to finance costly migration²⁹³.

Table 3.5: The impact of environmental change on different types of migration in mountainous locations: dark grey represents an inverse relationship, light grey a positive relationship and white no relationship²⁹⁴

Location	Environmental situation	Impact on migration	Explanation
Kenya	Environment WORSENS (soil quality decreases)	INCREASE in temporary migration	Migration as form of income diversification Low barriers to entry, migration is easy to achieve
Uganda	Environment IMPROVES (soil quality increases)	INCREASE in permanent migration	Soil quality acts as capital to facilitate migration
Ethiopia	Environment WORSENS (more occurrence of drought)	INCREASE in male labour migration	Migration as form of income diversification
Ethiopia	Environment WORSENS (more occurrence of drought)	REDUCTION in female marriage migration	Reduction in capital required for marriage and household formation
Ecuador	Environment WORSENS (fluctuations in harvests)	INCREASE in local and internal migration	Migration as a form of income diversification for the poor who are more dependent on environment
Ecuador	Environment WORSENS (environmental degradation)	NO EFFECT on international migration	International migration more likely to be undertaken by wealthier individuals, who are less dependent on environment

Similarly variable relationships are seen in the Ethiopian case study in Table 3.5. When the environment worsened, male labour migration increased, as a means of income diversification, whereas female marriage migration fell. This latter result is likely to be because environmental change reduces the assets of poor households, resulting in a reduced ability to finance wedding expenses and new household formation²⁹⁵. In Ecuador, whereas environmental degradation leads to an increase in local and internal migration, it has no effect on international migration. This is because local migration is likely to be a

²⁹² Gray and Mueller (in press).

²⁹³ Gray (2011).

²⁹⁴ See Ecuador case study in Gray (2009); Kenya and Uganda case studies in Gray (2011); Ethiopia case study in Gray and Mueller (in press).

²⁹⁵ Gray and Mueller (in press).

short-term, household response to the impact of environmental change on incomes; however, costly, long-distance migration is generally the preserve of the wealthier, asset-rich households, whose livelihoods are less dependent on the environment²⁹⁶.

This complex series of different relationships can be summarised as follows:

- Worsening environmental conditions, likely under scenarios of global environmental change, increase the desire to migrate amongst asset-poor households, as form of income diversification.
- Worsening environmental conditions will mean that poorer households are less able to finance migration, which requires significant capital.

3.4.3 The implications of migration influenced by environmental change

Migration is likely to be an essential strategy for income diversification in the context of future environmental change in mountain regions, yet environmental change may make migration less possible for poorer households, if it requires wealth or assets.

Migration, in general, can have powerful benefits for mountain source communities. Figure 3.17 shows the significant increases in migrant remittances accompanying equally significant increases in Nepalese migration between 2001 and 2009. It has been estimated that remittances accounted for 22% of Nepalese GDP in 2009²⁹⁷, and could have been as high as 30% if remittances through informal channels are taken into account. Figure 3.18 shows that remittances are perceived as important in the mountain context in meeting not only basic consumption and food needs, but also for expenditure on housing, health and education, investments which are essential for reducing vulnerability to environmental change²⁹⁸. Remittances from distant destinations are not undermined by local disasters, which are more likely to have adverse effects on localised income streams.

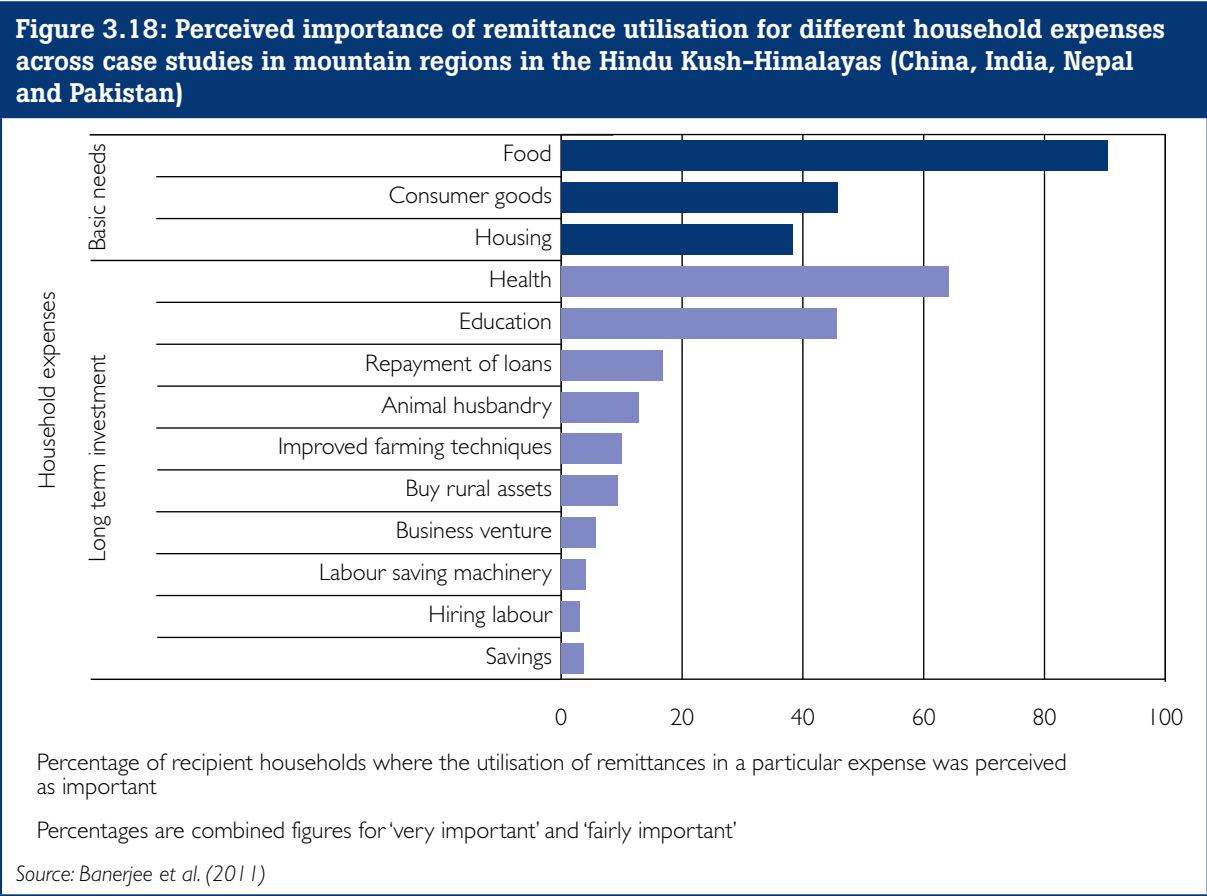
Figure 3.17: Migrant remittances and departures in Nepal (2001-09)



296 Gray (2009).

297 World Bank (2009a).

298 Banerjee et al. (2011).



A key concern in the mountain context is that those who are most reliant on migration as a form of income diversification have the fewest options for migration.

The case studies referred to above found that, although many individuals in Ecuador, Ethiopia and Kenya are able to migrate, there is considerable variation. For example, in Ecuador, although opportunities for internal migration are readily and widely available, it is the well educated and those well endowed with land who have the most options for migrating internationally. Whilst people in Kenya are able to migrate relatively easily, those in Uganda are less likely to migrate in detrimental environmental conditions because of high migration 'entry costs'. In Ethiopia, men migrate, whereas women typically do not, as they are reliant on migrating on marriage. The Ecuador case study shows that international migration is dominated by men, as is labour migration from most mountain regions, and there is no reason to suggest that this will change in the future without specific interventions²⁹⁹. For example, a recent study showed females made just 8% of total Nepali migrants³⁰⁰.

In summary, increased exposure to environmental hazards and reductions in ecosystem services in mountain regions are most likely to affect women, the poor and the least educated³⁰¹. Although women, the least educated and those with a low asset base are able to migrate, they have fewer options than asset-rich, educated males, and in some cases are not able to migrate at all.

External political circumstances, particularly conflict, can cause populations to become trapped in environmentally vulnerable locations in mountains.

Mountain regions are particularly susceptible to types of conflict (including intra-country conflict, insurgencies, political instability and discriminatory violence) for a number of reasons. They are often at the fringes of states, they harbour important resources (for example minerals), they have high ethnic and cultural diversity, and their economic development is slower³⁰². Some international borders in mountain regions have been sites of political tension and conflict (e.g. India and Pakistan, Pakistan and Afghanistan,

299 DR9 (Annex D refers).

300 CS10 (Annex D refers)

301 ICIMOD (2010).

302 DR9 (Annex D refers).

China and the Tibetan frontier), affecting rural livelihoods, cross-border movements and trade in rural goods. Populations in these border areas, when exposed to environmental risks, may experience more limited movement options than those living further away. Conflicts and border closures can create significant vulnerabilities. For example, closure of Tibet's border in the 1950s led to the closure of traditional mountain trade routes, affecting rural livelihoods in India, Bhutan, Nepal and Pakistan³⁰³. Another example is that a reorganisation of provinces based on ethnicity has reduced the opportunities for north–south migration in Ethiopia, previously an important route for labour migration to provide alternative sources of income when land productivity and agricultural incomes declined³⁰⁴. Section 3.4.4 explores more fully how external drivers in future scenarios can affect migration in mountain regions.

Where migration influenced by environmental change does take place from mountain regions, it will add to existing urbanisation trends, and thus add to existing urban challenges.

Figure 3.16 highlights that income is an extremely important driver of migration in the Himalayas. Social networks and recruitment agencies provide information back to source communities about the opportunities for employment in urban areas, whilst attainment of education and other facets of the 'urban lifestyle' mean that individuals often migrate to urban areas to diversify their livelihoods and reduce their household's vulnerability to environmental (and non-environmental) changes³⁰⁵. Table 3.6 shows how surveyed labour migrants from Himalayan mountains (of whom at least 80% cited environmental change as a motivation to move) migrated to urban areas. This will add to existing urban planning issues in destination communities.

Table 3.6: Urban–rural differences for migration episodes in the destination of surveyed labour migrants from the Himalayan mountains (of whom at least 80% cited environmental change as a motivation to move; see Figure 3.16)

Migration episode	Urban-rural differential in the destination of surveyed labour migrants					Number of labour migrants surveyed
	Village (%)	Town (%)	City (%)	Rural total (%)	Urban total (%)	
First migration	8	37	55	8	92	994*
Second migration	11	30	59	11	89	234
Third migration	17	25	58	17	83	65

*Exact destination not known for a further seven migrants.

Source: Banerjee et al. (2011)

3.4.4 Uncertainty and importance of future scenarios

Mountain livelihoods are often affected by external forces.

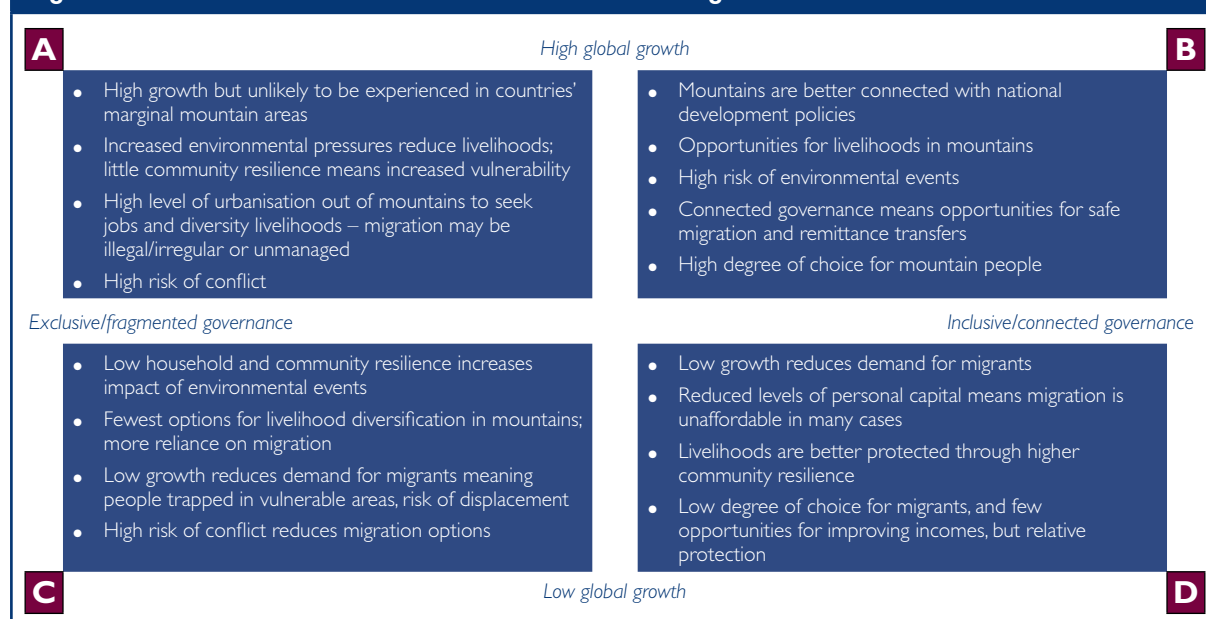
The above analysis shows that environmental conditions have been a factor in the decision of mountain people to migrate internationally, but external forces have been influential. For example, the 2008–09 recession following the global financial crash coincided with a 13% decline in Nepali emigration. Migration to Qatar and the UAE fell, although migration to Saudi Arabia increased³⁰⁶. The global financial crash illustrates how migration, whether or not it has been influenced by environmental change, is in turn highly susceptible to the influence of external factors. Other factors and trends that may have an equally fundamental effect on future mountain livelihoods include the relationships between environmental change and migration drivers and migration outcomes, which are explored below. This section uses the scenarios introduced in Chapter 2 to produce a number of plausible assessments of how the interaction between environmental change and drivers of migration might develop over the next 20–50 years in this ecological region. Policy makers will need to weigh up the risks inherent in each scenario.

303 See, for instance, Bergmann et al. (2008).

304 Ezra (2001).

305 DR9 (Annex D refers).

306 CS10 (Annex D refers).

Figure 3.19: Plausible future scenarios for mountain regions

As was the case in drylands and low-elevation coastal zones, environmental change results in little difference between the scenarios in 2030, with, for example, moderate increases in temperature of about 1.5°C expected in the Himalayan region across high- and low-emissions scenarios (see Figure 3.13).

By 2060 there are greater variations. Scenarios A and B are 'high growth/high emissions' and thus experience more substantial changes. For example, the median projection for temperature in the Himalayas in the high-growth scenario is 3°C compared with the median projection in the low-growth scenario of 2.3°C. Although *global* temperatures are predicted to increase by 1.5–2°C, mountain ecosystems are predicted to experience disproportionately high temperatures, so this pattern is likely to be seen more widely across other mountain areas in the high-emission A and B Scenarios.

Such warming is likely to intensify the hydrological cycle in mountain regions, changing the frequency and intensity of floods and droughts. In particular, more intensive precipitation events *could* trigger flash floods and landslides in mountainous terrain³⁰⁷. However, there is great uncertainty over future precipitation in mountain regions, and this is even more pronounced in 2060. For example, the median projection for precipitation in the Himalayas in the high-emission/high-growth Scenarios, A and B, is an increase in rainfall of approximately 17%, yet its maximum and minimum bounds are a 78% *increase* or a 56% *decrease*. The low-emission/low-growth Scenarios, C and D, show less divergence, but there is still substantial unpredictability.

These environmental changes will interact with changing socioeconomic drivers. In **Scenario A**, high global growth continues to drive job creation in (usually urban) areas, which offers opportunities for migration from mountain regions. Exclusive national governance means that job opportunities are unlikely to be generated in the same way in mountain regions. This combines with the fact that environmental changes, driven in part by high GHG emissions resulting from high global growth, are most severe, and livelihoods are under threat. High demand and supply of migration ensues, meaning that migration is inevitable. However, the impact of exclusive governance, which may encourage conflict or communal tension, means that migration is not recognised, creating difficulties and putting migrants in vulnerable situations. Most serious for sending communities is that fragmented governance means that there are fewer opportunities for maintaining linkages with migrants, and a lower possibility of regular remittances flows. This reduces the potential for remittances to be used to secure incomes in sending areas.

As noted above, environmental change may not be as severe in **Scenario C** as low global growth constrains GHG emissions, but the vulnerability of populations to environmental change is most pronounced. This is because an exclusive governance system is unlikely to protect the livelihoods of people in the mountain margins of states or facilitate local migration. Low global growth also means that there are

307 DR9 (Annex D refers).

fewer opportunities for jobs and income generation in the mountains. In this scenario, migration is relatively unavailable as an option as there is low demand for migrants from traditional destination areas, and potential migrants are unable to avoid potentially high migration 'entry costs'. A further barrier to migration is the increased likelihood of conflict in mountain regions where previous migration routes are closed in an unpredictable manner. In general, there are large groups of people trapped in mountain regions, with dwindling incomes, increased vulnerability and increased risk of displacement.

The contrast with **Scenario B** is clear: in this scenario, mountains are better incorporated into national development plans, no matter how geographically marginal or peripheral to states they are. As a result, there are many opportunities for livelihood diversification *in situ*, enhanced by the benefits brought more equally by high global growth. Simultaneously, connected governance regimes and strong growth in destination areas means there are many opportunities for migration. As a result, there is a high degree of *choice* for mountain people in Scenario B, which will help populations stay resilient to increased threats posed by environmental events.

People are also generally well protected in **Scenario D**, in which inclusive governance ensures that environmental change causes few humanitarian problems. The main difference from Scenario B is that individuals have very little *choice* in regard to migration or their livelihoods. This is because low global growth means a reduced demand for migrants in destination areas and, for individuals, a lower asset base with which to finance possible migration. This, coupled with the protection provided by local and national institutions, means that there is the lowest probability of migration influenced by environmental change.

Conclusion: the analysis of mountain regions reveals many of the same features of the dryland system.

Perhaps unsurprisingly, migration influenced by environmental change in mountain regions shares many of the features found in dryland regions. This can be explained by the fact that both mountain regions and dryland regions are often considered 'marginal' parts of states and thus do not feature prominently in national development plans, with the result that there are fewer opportunities for diversifying livelihoods *in situ*. In addition, conflict is more likely in these marginal locations. An important difference from both drylands and low-elevation coastal zones is that there are *relatively* fewer urban locations in the mountains, so the main concerns of 'non-migration' are around being trapped in vulnerable *rural* locations. The analysis of remittance flows has provided a useful insight into some of the *opportunities* of well-managed migration, a theme which is picked up again in Chapter 4.

Box 3.5: Case study: the Mediterranean

A complex region.

The Mediterranean is a complex region comprising drylands, coastal zones and mountains. It represents a microcosm of the influence of environmental change on migration drivers in geographically proximate ecological regions which have *discordant* political and economic systems. It encompasses southern European countries, predominantly within the EU, as well as North African countries. The EU has been a powerful political and social influence in the region and provides a legally binding framework for free movement which applies (primarily) to citizens of its member states.

Across the Mediterranean there is exposure to the effects of both rapid- and slow-onset environmental change. Future climate change is expected to lead to an extension of arid land and increased desertification³⁰⁸. There are a variety of different migration trends and patterns in the region. Contemporary political economy is an important driver, along with the 'migration transition' under way in key Mediterranean states, which may lead to Turkey and other North African countries evolving into destination countries for international migrants³⁰⁹. Turkey is an increasingly attractive destination as it is experiencing rapid economic and social development, particularly in its cities³¹⁰. Internal migration in the Mediterranean has taken the form of large scale rural–urban migration to fast-growing cities such as Istanbul and Cairo.

308 DR8a (Annex D refers).

309 DR8b (Annex D refers).

310 DR8b (Annex D refers); Kirisci (2003); İçduygu (2006).

Southern Europe is most likely to be affected by future environmental change, but this may not necessarily have much significance for international migration.

Most scenarios of climate change for Europe suggest an increase in agricultural productivity in northern Europe with decline in southern Europe linked to water scarcity. For example, Ciscar *et al.* (2011)³¹¹ found that northern Europe would benefit from positive yield changes under a full range of scenarios to 2080 (i.e. a temperature rise of 2.5–5.4°C), whereas southern Europe would experience yield losses that could reach 25% under a 5.4°C rise scenario. Estimates of the economic costs of such impacts show a decline of up to 1% in the total economy in southern European countries as a result of agricultural decline by 2080 (caused primarily by a loss in precipitation of 7–28% depending on the climate scenario). Such costs would reduce the demand for labour, with offsetting increases in aggregate welfare in northern Europe.

Free movement of labour within the EU already attracts migrants from eastern and southern Europe to the agricultural and food processing sectors in northern Europe³¹². Will environmental change, through its impact on agricultural productivity, lead to further migration of this nature? The evidence suggests not. Agricultural practices may be able to overcome water scarcity or changes in weather patterns: there is some evidence that agriculture, for example in Britain, has coped better with extreme weather over time³¹³. Increased drought, famine or threats to agrarian livelihoods may cause outmigration in the Mediterranean, but this outmigration is more likely to represent an acceleration of existing short distance, internal, rural–urban migration³¹⁴.

Opportunities to migrate are generally reduced for those who suffer the impact of environmental change, meaning that longer-distance, international migration in this context within the Mediterranean may well decline in the future.

Migration influenced by environmental change in the Mediterranean is likely to be internal rather than international because the people whose livelihoods will be affected by environmental change generally lack the resources to migrate internationally. International migration is relatively costly and requires substantial resources. People with subsistence-based livelihoods who have been adversely affected by drought or famine are less likely to possess the social, economic and human resources to engage in this form of migration³¹⁵.

Trends interact: the externalisation of the EU border may have implications for migration and environmental change in the Southern Mediterranean.

The EU is a unique form of regionalised, supranational governance with powerful effects on members and non-members. The 'externalisation of the EU border' devolves aspects of the EU's migration control policies to non-member states. Coupled with provisions to facilitate the return of asylum seekers and irregular migrants to third countries, potential migrants to the EU are increasingly likely to encounter enhanced border controls in southern Mediterranean countries designed to inhibit movement towards the EU³¹⁶.

This development may interact with future trends in migration influenced by environmental change. People in non-EU states in the southern Mediterranean who increasingly engage in 'routine' internal migration to help diversify their livelihoods, may, in certain scenarios, find themselves competing for jobs with migrants who have been diverted to the southern Mediterranean by EU policies. This interaction may lead to mismatches in labour markets and concentrations of migrant populations, with implications for economic integration and social cohesion³¹⁷.

311 Ciscar *et al.* (2011).

312 DRI (Annex D refers).

313 Moriondo *et al.* (2010); Wreford and Adger (2010).

314 DR8b (Annex D refers).

315 DR8b (Annex D refers).

316 Geddes (2008).

317 CS8 (Annex D refers).

Uncertainty and the future: feedback from the Istanbul workshop.

Alongside the climate uncertainties noted above, there are also real uncertainties as to how the countries in the region will react to a changing environment. These issues were explored at a workshop with Mediterranean experts and stakeholders in Turkey. Workshop participants felt that technology and some economic indicators (e.g. foreign direct investment and trade), in particular, were unknown parameters whose direction is likely to shape the future course of migration. Participants also raised some interesting ideas about how *different governance scenarios* could affect future migration.

A particularly important issue at the time of the workshop was developments in regard to the 'Arab Spring'. Attendees noted that if the ongoing changes moved the region towards the direction of democracy, and political and economic adjustment, then the region as a whole would be more likely to enter a 'connected and inclusive' style of governance (Scenarios B and D). Such a move would have broad implications on the whole region. For example, a more connected approach to governance may result in the reduction of political barriers to movement in the region. This could have tangible benefits for many, which could include increased *ability to adapt to environmental change*. An example of this is where Turkey and Syria relaxed border restrictions, leading to an increase in civil society collaboration, business and sharing of know-how, which ultimately resulted in joint projects to improve water management³¹⁸.

A full report detailing the discussions from the Mediterranean workshop can be found on the Foresight website and CD along with the full evidence base.

3.5 Conclusions

Environmental change does influence the drivers of migration, with economic and environmental drivers most susceptible: there will be different migration patterns in the future because of environmental change.

Evidence presented in this chapter, from global assessments of ecological regions through to data-rich local case studies, shows that environmental change over the coming decades represents a significant potential influence on migration drivers, leading to patterns and levels of migration that are different from those that would otherwise be expected. This is congruent with the conceptual framework developed by the project and presented in Figure 1.3, though it is important to note that there are differential impacts of environmental change on drivers, as shown in Figure 2.2. Environmental change has the most powerful influence on the environmental drivers of migration, ecosystem services and exposure to hazard. Perhaps more important, given their role in influencing migration decisions, is the impact that environmental change has on the economic drivers of migration, specifically incomes and agriculture, and indeed the interaction between ecosystem services and these drivers.

This chapter has shown that these relationships exist because migration is an important element of how people manage risk in areas of the world where there is increasing scarcity or uncertainty in ecosystem services, increasing threats to livelihoods and incomes and/or a rising frequency or impact of environmental hazards. Indeed, well-managed migration may actually secure livelihoods to the extent that populations are better able to remain *in situ*.

Migration influenced by environmental change can take different forms, including urbanisation, short-term migration, illegal/irregular migration and displacement. This is often a function of the socioeconomic context, which will vary significantly in different future scenarios.

It has been shown in this chapter that environmental change can influence the migration decision to lead to different 'human mobility' outcomes. There is evidence that in some circumstances environmental change, especially abrupt, sudden-onset events which are predicted to increase in the future, have led to internal or international displacement. In other situations environmental change, of the types which are predicted to increase in the future, can affect migration drivers to lead to short-term, short-distance migration as a form of income diversification. The social, economic and political context may mean that

318 WR4 (Annex D refers).

this migration takes a variety of different forms: it can be to urban areas, other rural areas, across borders, legal, illegal, routine, unpredictable, or an intensification of existing migration routes. Accordingly, the levels of vulnerability of those who migrate or are displaced can differ. The likelihood of these different outcomes occurring in the future varies. Generally, unplanned, unmanaged migration and displacement is likely to occur in scenarios in which there are more fragmented and exclusive forms of governance. Migration is still likely to occur in other scenarios, though it may be more of a 'routine' and 'planned' nature.

Environmental change is as equally likely to prevent migration as it is to increase it.

Table 3.3 showed that although environmental change (and specifically deterioration) could lead to increases in migration in mountain regions, it could also lead to *reductions* in migration. This situation was also observed in the drylands context, with case studies finding that in Mali worsening environmental conditions led to a reduction in international migration, and in Burkina Faso rainfall was inversely related to longer-term migration. The important findings are that:

- Environmental change can increase the desire to migrate because of a need to diversify incomes (especially where there is high dependence on the environment), yet
- Environmental change can reduce the ability to migrate, as it erodes the financial or physical assets and capital required to finance migration.

Complexity arises because there is a relationship between these two phenomena: at any one point, in any situation, one may be more powerful than the other. On a *generalised* level, however, the implication of this relationship is that migration of a type which is 'expensive', and requires significant capital to finance, is *less* likely to occur when there is environmental change, whereas 'cheaper' and easier migration is *more* likely to occur when there is environmental change. The former category is likely to include longer-distance, longer-term, international migration, which is generally costly; and the latter category to include short-distance, internal migration. It must be stressed that there are many important social, political and economic contexts that may mean that this general relationship does not occur in a given situation. For example, social networks have been developed through previous migration between Mexico and the USA, and this form of capital is likely to make this kind of international migration more accessible to those with lower incomes. The same applies to migration within Europe (low political barriers) and migration between Southeast Asian countries and the Gulf states (strong recruitment agencies and high economic returns for migrants).

Environmental change may prevent migration, and this can lead to equally serious, and potentially even more problematic, situations of vulnerability.

Perhaps the most salient point from this analysis of the evidence is that environmental change will reduce the options for poor households to migrate, yet in general these households are the ones most needing to diversify their incomes *because* of environmental change. This puts people and populations in very vulnerable circumstances, for the following reasons:

- Reduced options for migration, combined with incomes threatened by environmental change, means that people are likely to migrate in illegal, irregular, unsafe, exploited or unplanned ways.
- If this occurs, people are likely to end up migrating to areas of high environmental risk, such as low-lying urban areas in mega-deltas or slums in water-insecure expanding cities.
- Many populations will be at risk because safe migration channels from small island environments and marginal agricultural lands in the world's drylands and mountain regions are *unavailable* to them. This means they may become trapped in poor areas where they are likely to be more vulnerable to increasingly worse environmental conditions. This is particularly likely in scenarios with 'exclusive governance'.

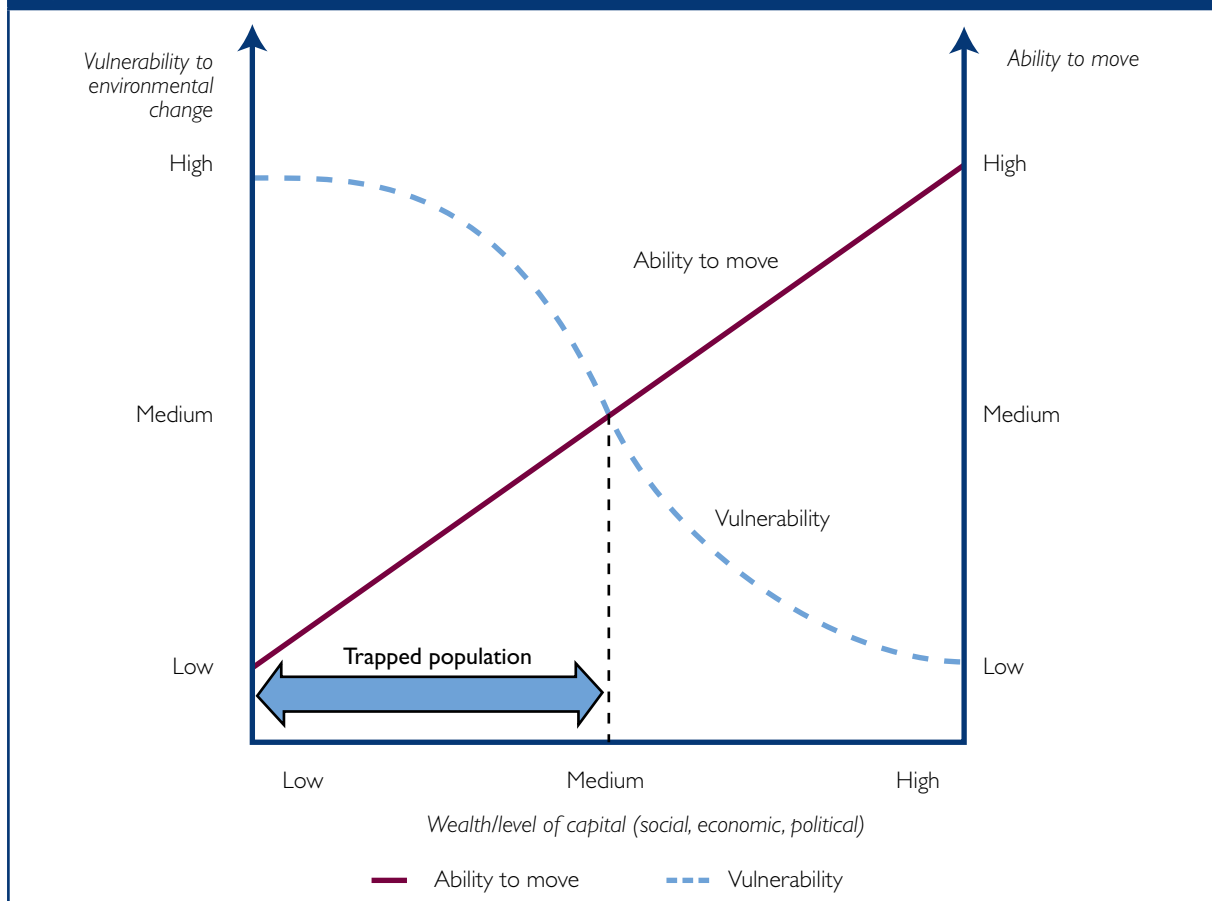
Many studies in a wide range of countries have shown that migration is positively associated with wealth and social capital³¹⁹, whereas vulnerability to environmental change is negatively correlated with wealth and social capital, as shown in Figure 3.20³²⁰. In general, better-educated and wealthier social groups are

319 See DR3 (Annex D refers).

320 Smit and Wandel (2006).

likely to have better access to migration. In contrast, those with lower wealth or capital face a double dilemma in future environmental change: on the one hand, their reduced level of capital makes them unable to move away from situation where they may experience increasing environmental threats; yet at the same time, this very lack of capital makes them even more vulnerable to environmental change. It is well established that the capacity to adapt is made up of physical, social and human capital. Hence vulnerability has the negative association with wealth portrayed in Figure 3.20. As a result, there may be significant residual populations that are trapped in places where they are vulnerable to environmental change. This trapped population is shown in Figure 3.20 as those who have a higher vulnerability to environmental change and a lower ability to move away from those circumstances.

Figure 3.20: Schematic representation of 'trapped populations'



There are two further relationships to consider: first, migration can be a form of livelihood diversification which enables communities to remain in sending areas, in the long run. Reduced options for migration may, in the long run, lead to a larger migration of whole households or communities, in an unplanned and unmanageable way. The second is that where populations are trapped in vulnerable situations this is likely to lead to an increased chance of widespread displacement in the long run. This is especially the case with extreme environmental events, such as floods, cyclones and tidal surges, which are predicted to become more frequent or intense, notably in the tropics, over the next 50 years (see Box 2.4).

The final conclusion is that future economic and political scenarios of the world are likely to be hugely influential as to whether people migrate or not, what that form of migration may take if it occurs, and whether migration happens in planned and managed ways or in irregular and unsafe ways.

For example, migration to vulnerable areas, in vulnerable circumstances, is especially likely to occur in scenarios where there is exclusive governance yet many migration opportunities. The likelihood of being trapped in areas highly vulnerable to environmental change is greater under scenarios of low growth and/or exclusive or fragmented governance. The lesson for policy making is that strategies for intervention need to be resilient to the range of future scenarios, as will be shown in Chapters 6–9 of this report.



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4 Migration in the context of environmental change: the implications of inaction

Key messages

This chapter takes as a starting point the insights from the last, specifically around the different migration and non-migration outcomes that can be expected in the future as a result of the influence of environmental change on migration drivers. This chapter conceptualises these outcomes into six 'human mobility outcomes' which have implications for policy makers:

- Environmental change, in combination with other factors, may amplify or significantly change existing patterns of migration where people have the resources and freedom to make choices concerning whether they move and to where. However, this migration, depending on various characteristics such as duration, distance and whether borders are crossed, can have *vastly different policy implications*. It can either pose 'operational' challenges or more 'geopolitical' challenges.
- Environmental change may also affect migration drivers to lead to *displacement*. Again, this movement can pose different challenges to policy makers, depending on whether the displacement is, for example, long term, concentrated on one area, or of a particular socioeconomic grouping. Displacement can in turn pose 'operational' challenges or 'geopolitical' challenges.
- As identified in Chapter 2, environmental change may also lead to *reduced* options for migration, or interact with populations who have *limited* migration opportunities. A relevant 'human mobility' option to consider in the context of environmental change is, therefore, where individuals or populations are *trapped*. A further important 'non-migration' outcome to consider is those who *choose to stay* despite worsening environmental conditions.

This chapter also shows that there are powerful linkages between these different human mobility outcomes. In particular:

- Migration which has operational challenges has a positive relationship with those who choose to stay, as the income diversification provided by migration can enable wider households or communities to stay *in situ*.
- Where populations are trapped in vulnerable areas there is a higher risk of eventual displacement and humanitarian risk.
- Opportunities for well-managed migration can facilitate people escaping a situation in which they are trapped in a vulnerable location.

4.1 Introduction

No scenario of the future represents a 'no risk' situation for policy makers.

This chapter returns to the question of why policy makers across the world should be concerned about the relationship between global environmental change and migration. Much current policy debate is focused on the notion that if nothing new is done to mitigate or promote adaptation to global environmental change, then millions of people will be forced to migrate, possibly in extreme circumstances where they will require some form of international protection. In contrast, this report argues that the consequences of continuing with existing policies will be somewhat different. The weight of evidence presented in Chapters 2 and 3 suggests that migration in the context of environmental change is inevitable through to both 2030 and 2060, though its nature and type will vary depending on the socioeconomic scenario and environmental future. Migration could either continue in existing patterns or could be unpredictable and unplanned. The extent to which global

environmental change leads to displacement, the forcible movement of people in more extreme circumstances, remains a much more open question. In addition, although migration and displacement raise a number of policy challenges, so does the fact that many people are likely to stay, or be ‘trapped’ in places that will become increasingly vulnerable to global environmental change.

This chapter explores the policy implications of these different future patterns, bearing in mind that they pose rather different policy challenges. It reviews a range of evidence to show that the risk of having to manage large displaced populations will be greater if more people are living in places that are vulnerable to environmental disasters. Moreover, policy challenges will be more severe if people move in an uncontrolled or unplanned way to places that are vulnerable to environmental hazards, or indeed if they are prevented from moving away from such places. These two outcomes are likely if current policies remain unchanged. Migration, displacement and immobility can occur in ways that pose largely operational challenges. However, in the absence of policy change, the likelihood is that they will become more geopolitical in nature, with significant consequences for the well-being of millions of potentially affected people in the future.

4.1.1 Six ‘human mobility outcomes’

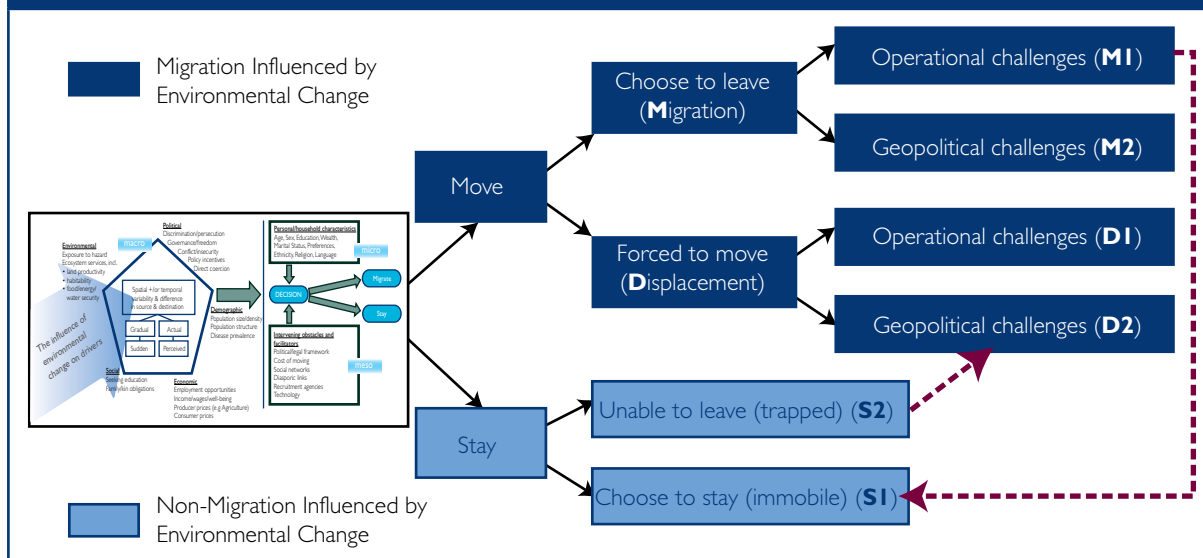
There are six broad outcomes, where environmental change influences migration, of interest to policy makers. These outcomes include migration and displacement but also *non-migration*, and hence are termed ‘mobility outcomes’. These all represent challenges to policy makers, though there is not a presumption that migration should be reduced in all instances.

Individuals make decisions on their location and movements on the basis of their quality of life and the livelihoods of themselves and their families. These myriad decisions become important to society and to policy where it is necessary to manage the collective consequences. Relevant issues, for example the public delivery of services, risks to human security and human rights and the sustainability of resource use, may be challenged by the scale, nature and speed of migration.

This chapter reviews evidence on six potential outcomes for ‘human mobility’ (see Figure 4.1):

- Environmental change, in combination with other factors, can influence existing patterns of migration (i.e. where people have the resources and freedom to make choices concerning whether they move and to where)³²¹. The consequences might pose relatively routine operational challenges (**M1**) if they require relatively small or slow adjustments to the status quo. However, they may sometimes raise more overtly geopolitical challenges (**M2**), for example where movement is large, rapid and/or crosses sensitive international boundaries.
- Decreased availability of ecosystem services beyond a certain minimum threshold, or catastrophic changes in the local environment, for example due to extreme climate events, may lead to human displacement, i.e. where individuals have little or no option to remain where they are, in either the short or the long term. Again such displacement might pose only operational challenges (**D1**) if it falls within the remit of routine emergency planning, but it may well pose geopolitical challenges (**D2**) that require a more complex response.
- People may remain in places that are increasingly vulnerable to global environmental change. The policy challenges in this case are considered more operational (**S1**) if people have chosen to stay voluntarily. They are arguably more geopolitical in nature (**S2**) if people are effectively trapped in vulnerable locations against their will.

³²¹ See Chapter 1 and Figure 1.3.

Figure 4.1: Six human mobility outcomes arising from environmental change and the links between them

An important point about these different human mobility outcomes is that they are not mutually exclusive, but potentially connected in complex ways. In particular, if people are effectively trapped in a place that is vulnerable to environmental shocks (S2), this is likely to increase the chance that they will subsequently be forcibly displaced, probably in circumstances that pose 'geopolitical' (D2) rather than merely 'operational' challenges (Figure 4.1). The ability of some people to leave voluntarily (M1) may also be critical to the ability of others within a family or community to choose to stay (S1). These complex interactions also reinforce the need for a broad policy perspective.

4.2 Operational challenges and opportunities arising from migration in the context of environmental change

Migration influenced by environmental change is not just relevant to 'migration policy' but presents challenges and opportunities for many other important policy areas.

Migration influenced by environmental change will present 'operational challenges' where the migration is largely internal, relatively predictable and an extension of existing flows. Many governments routinely develop policies that are specifically directed at managing migration. But they also administer a broad range of other policies which are relevant and which need to take account of immigration, emigration and also the redistribution of populations within a country. In general, national and local governments need to know not only how many people currently live in an area, but also how many are likely to reside in the area in the future when planning for a wide range of government services. Chapter 3 has shown that environmental change may amplify or change volume and patterns of human movement in the future, particularly in the context of high rates of global growth and inclusive governance (Scenario B). These changes may create significant challenges for policy even if they are short in distance or happen at a relatively gradual rate within states. However, it is important to emphasise that there are many opportunities that result from migration, for a range of communities and for the individual themselves.

4.2.1 Operational challenges from migration

Migration in the context of environmental change is likely to lead to increased rural–urban migration and city expansion. Cities will face a 'double jeopardy' future, where this challenge is multiplied by the challenge of *increasing* threats from environmental change. Yet the third challenge is perhaps the most

critical, the fate of the new migrant arrival to the city, who will often be in the most vulnerable situation.

The majority of migration is legal and part of the process of economic and social development³²². Many African cities, for example, have extremely fluid populations with seasonal and longer-term circular migration linking rural and urban areas³²³. The rate of rural–urban migration is likely to increase in Africa. This increase in internal migration would occur in a context in which the dynamics of urbanisation are already sensitive to drought in rural areas surrounding the main cities³²⁴.

There are three particular policy challenges that result from migration influenced by environmental change where it leads to rural–urban migration. The gravity of the situation is highlighted by the fact that even before these future challenges hit cities, the starting point for many countries is also not very promising: in much of the developing world, there is *already* a massive shortage of adequate urban housing³²⁵ and weak land-use planning systems³²⁶, and social cohesion is threatened by unemployment, rising living costs and the widespread influence of criminal gangs and other forms of organised crime that prey on ethnic rivalries³²⁷. For example, already the number of African urban poor is expected to exceed 400 million by 2015, compared with 240 million in 1990³²⁸.

From this baseline, cities will face three further challenges, which, on top of each other, will reinforce each other or ‘multiply’ the consequences. **First, cities will experience growing populations**, through rural–urban migration (much of which would occur even without the influence of the environment) or natural population growth. This will lead to major operational challenges including housing provision, land-use planning, and social cohesion in both sending and receiving areas. Changing levels and patterns of migration also have the potential to exacerbate localised environmental impacts such as air pollution in large cities, waste creation and pressure on transport. These policy challenges are already well established, but population increases in destination countries amplify the requirements for sustainable urban growth. For example, the population of Lagos grew from 1.4 to 10.6 million between 1970 and 2010, that of Dhaka grew from 1.4 to 14.6 million over the same time period, whilst the population of Mexico City increased from 8.8 to 19.5 million between those years³²⁹.

The second challenge is that cities will face challenges from future environmental change. This is particularly acute for cities which are in drylands, low-elevation coastal zones or mountain regions³³⁰. For example, as climate change manifests itself in the form of sea-level rise³³¹ and inundation of land in coastal cities, there are likely to be direct impacts on the availability of water resources and environmental health, as well as secondary impacts of provision of energy and transport³³². Indeed, the prospect of amplified rural–urban migration in the decades ahead in low-income countries, coupled with the direct effects of environmental change, means that the issues of environmental change and population growth will be felt as multiple challenges which reinforce each other. For example:

- The populations living in urban floodplains in Asia rises from 30 million in 2000 to between 83 and 91 million in 2030 and then 119–188 million in 2060 (see Figure 4.2)³³³ in different scenarios of the future.
- 150 million people are already living in cities with significant water shortages³³⁴.

322 Internal migration involves about five times as many people globally as international migration (see Chapter 1), and is legal in almost all countries.

323 DR2 (Annex D refers).

324 Barrios *et al.* (2006); see Chapter 3 for broader discussion of urban growth in the context of environmental change.

325 UN-Habitat (2006).

326 Jeppesen *et al.* (2006).

327 PD4 (Annex D refers).

328 Auclair (2005).

329 United Nations (2010). See also Figure 7.1 of this report.

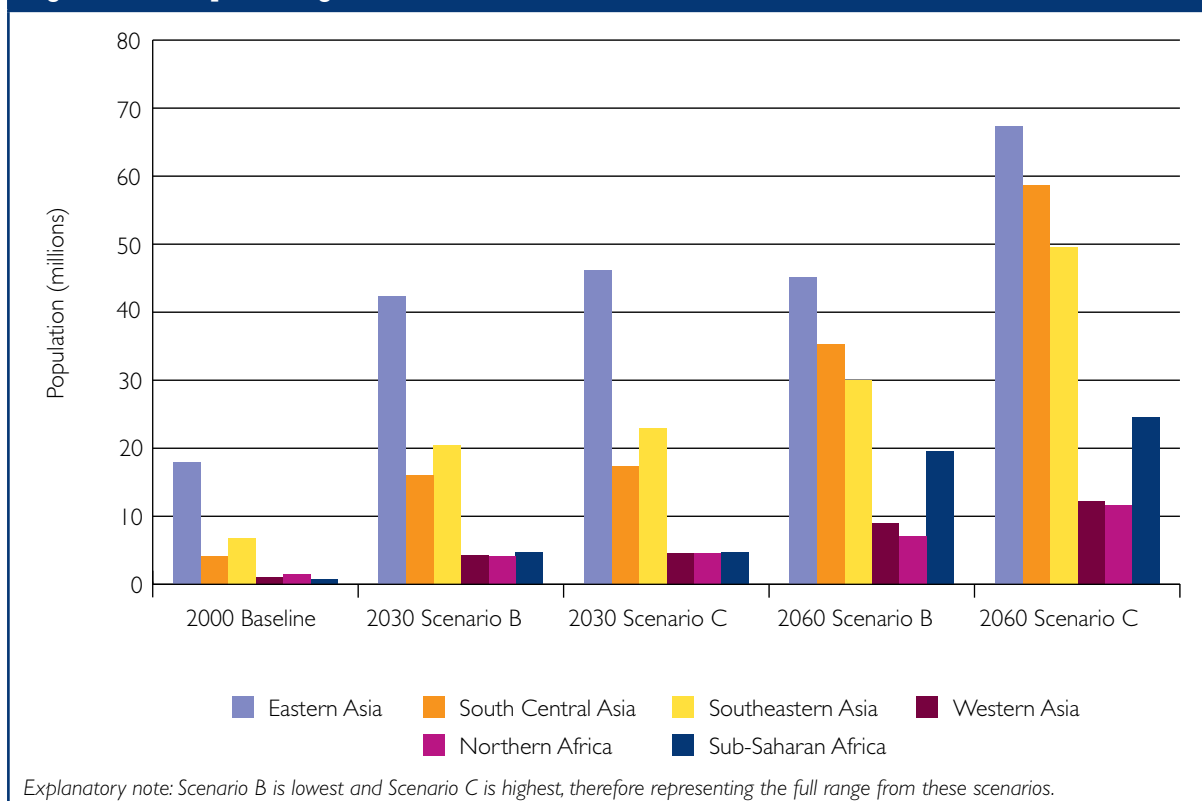
330 Adamo (2010).

331 By 2030, the global sea levels may rise by an average of between approximately 7cm and 14.5cm above 1990 levels, under both low and high emissions scenarios. By 2060, average sea level rise above 1990 levels could be between approximately 14cm and 30cm under low emissions scenarios, but between 16.5cm and 35cm under high emission scenarios.

332 See Rosenzweig *et al.* (2010); Hunt and Watkiss (2011).

333 MR9 (Annex D refers).

334 McDonald *et al.* (2011).

Figure 4.2: People Living in Urban Flood Zones in 2060

This brings the third challenge, which sits atop the previous two: **new city migrants tend to concentrate in hazardous districts of cities**, as they often have no option but to live in the worst locations and thus are the most vulnerable to environmental change. The World Bank reports that 40% of new migrants arriving in Dakar, Senegal, between 1998–2008 have moved to zones with high flood potential³³⁵. Dakar's growth is symptomatic of countries where growth in the agricultural economy has fallen and urbanisation rates are increasing. In general, new populations are also less attuned to environmental risks and less likely to take time to learn the norms of collective action and response to environmental hazards. High rates of migration could reduce social cohesion in destination regions in the short term as new populations take time to learn the rules and risks³³⁶. For example, new migrants to the Cayman Islands have been shown to have a low awareness of hurricane risks and safety precautions, which indigenous residents perceive as placing everyone at greater risk³³⁷. Providing information and services to new populations presents significant operational challenges.

Despite these challenges, policy makers should not focus on preventing rural–urban migration as doing so is likely to be unsuccessful, to eliminate potential benefits from migration, and to have problematic consequences.

Given these challenges, some policy makers may focus on trying to stop rural–urban migration. However, there are three powerful reasons why this would be an unstrategic and maladaptive response. First, attempts to reduce the rural–urban flow are likely to be ineffective. Simply investing in employment and social infrastructure in rural areas does not necessarily reduce the overall rate of migration. Data from Nepal³³⁸ show that, although providing infrastructure and services in rural areas reduces outmigration in the short term, increasing the overall wealth and human capital in rural areas actually increased the tendency of young mobile people to migrate to cities in the longer run. This result may only hold in specific situations in low-income countries³³⁹. However, evidence also shows that policies of rural development intended to curb rural–urban migration in the African context either had no effect on

335 World Bank (2010).

336 Putnam (2007).

337 Tompkins *et al.* (2009).

338 Massey *et al.* (2010).

339 Massey *et al.* (2010).

migration or have encouraged it³⁴⁰. This finding does demonstrate that migration patterns are not easily malleable and the challenges of rapid urbanisation in the developing world need to be faced head-on by policy makers.

Second, migration may bring benefits to individuals and communities, as explored in the next section. The third reason is a development upon the second: these 'benefits' may actually be vital for individuals or households to survive, and denying people these opportunities may lead to further problems. As shown in Chapter 3, migration is often an important method for households to diversify their incomes, and may be even more important if environmental change affects their other income streams. The consequence of preventing these migration opportunities may be that more people are trapped in situations where they have no alternative to sustain their livelihood³⁴¹ and are thus vulnerable to a range of risks including environmental change, the full implications of which are explored later in this chapter.

4.2.2 Opportunities and benefits arising from migration

Migration can present significant benefits, including in terms of adapting to environmental change.

Notwithstanding the operational challenges above, it is important to be clear that migration can also present significant opportunities in different parts of the world, not only for development and economic growth in general, but also specifically for the process of adaptation to climate and other environmental change. For example, the linkages between rural and urban areas that arise from rural–urban migration can promote the flow of remittances from destination areas, effectively enhancing and smoothing incomes in areas of origin, and providing resources for investment in education and capital³⁴². Evidence presented in Chapter 3 showed that migrants from mountain areas in Nepal, China, Pakistan and India generated remittances which were often used to increase the resilience and incomes of households in source areas³⁴³. Migration, either internally or internationally, in Burkina Faso, India and Mexico has been shown to benefit rural areas through the investment of remittance income in agricultural intensification and improved farming methods. In the case of Burkina Faso in particular this has also included investment in techniques for soil and water conservation³⁴⁴.

Turning to international migration, the challenges are likely to be more 'geopolitical' in nature, and these are covered in section 4.3. However, it is worth noting that international migration can also create benefits and opportunities, as was noted, for example, in the case of Nepal and other mountain countries in Figure 3.18. Table 4.1 shows the world's top 10 low income and emerging economy countries whose populations received remittances in 2010. Remittance flows have been resilient in the face of the global financial crisis. They fell by 5.5% in 2009, but recovered in 2010³⁴⁵. This compares with a 40% decline FDI flows between 2008 and 2010³⁴⁶. Remittance income far exceeds overseas development assistance (ODA) as an international income flow. In 2010, there were US\$307 billion of remittance flows compared with US\$120 billion of ODA³⁴⁷.

340 Beauchemin and Schoumaker (2005); Bakewell (2008).

341 Losch (2008).

342 DR2 (Annex D refers).

343 Banerjee *et al.* (2011).

344 SRI3 (Annex D refers).

345 World Bank (2011).

346 Ibid.

347 Ibid.

Table 4.1: Top 10 countries (low-income and emerging economies) receiving remittances (US\$bn 2010)

Top 10 countries by remittance volume	Total volume of remittances (USD billion, 2010)	Top 10 countries by proportion of GDP	Percentage of GDP (2009)
India	55.0	Tajikistan	35.1
China	51.0	Tonga	27.7
Mexico	22.6	Lesotho	24.8
Philippines	21.3	Moldova	23.1
Bangladesh	11.1	Nepal	22.9
Nigeria	10.0	Lebanon	22.4
Pakistan	9.4	Samoa	22.3
Lebanon	8.2	Honduras	19.3
The Arab Republic of Egypt	7.7	Guyana	17.3
Vietnam	7.2	El Salvador	15.7

Source: World Bank (2011)

In small Pacific Island states, remittances are important components of national income. This has led to the designation of Kiribati, Tokelau, the Cook Islands and Tuvalu as 'MIRAB' states, where **m**igration, **r**emittances, **a**id and the urban **b**ureaucracy are central to the socioeconomic system³⁴⁸. The MIRAB perspective has since been extended to cover Samoa, Tonga and Cape Verde.

4.3 Geopolitical challenges associated with migration

New migration flows, as well as substantial increases in existing flows, can pose particular policy challenges in both sending and destination countries; this is especially determined by the speed, volume and/or novelty of new migration patterns.

As a result of migration influenced by environmental change, countries and regions may lose cohorts of skilled workers in key sectors, whilst destination areas may face challenges relating to economic integration and social cohesion as a result of concentrated populations of migrants. Analysis in Chapter 3 suggests that such large-scale, unplanned and/or international movements are particularly likely in a future world characterised by high global growth, but exclusive social, political and economic governance (Scenario A).

Research commissioned for this project shows that host populations across the world generally acknowledge the positive cultural and economic contribution migrants can make, especially in the context of ageing populations in migrant-receiving areas. Yet there remain concerns about job security, wages and impacts on the provision of state services for new populations³⁴⁹. These attitudes vary across Europe³⁵⁰; however, in most public opinion surveys, concerns about the fiscal burden of new migrants' use of public services (e.g. health, housing) outweigh concerns about labour market effects, even among lower-income residents.

348 DRI6 (Annex D refers).

349 MR5 (Annex D refers).

350 MR5 (Annex D refers).

For example, flows of migration from North Africa to Italy, France and Spain are particularly sensitive at present. This sensitivity relates to fears about the size of potential influxes, and a perception that in the current economic context migrants from North African countries present an inflow of people who are in general 'not well matched to the labour market needs of European host countries'³⁵¹. Thus, in spite of moves towards international cooperation in the field of migration management, for example through the creation of the Schengen area in Europe, or global institutions such as the UN High Level Dialogue and Global Forum on Migration and Development, there remains a lack of international consensus on how to respond to migration, and significant tensions between states.

Increased migration also raises significant challenges for social cohesion. Overt conflict between migrants and established residents remains the exception rather than the rule. However, urban growth, especially if rapid, inadequately planned and involving population groups from distant locations, clearly contributes to conflicts and disputes. In Africa, rapid late twentieth- and early twentieth-first century urban growth has occurred at a time of limited economic opportunities and poor governance, fuelling the potential for conflict³⁵². Even when migration is not the primary contributor to urban growth (as noted in Chapter 3)³⁵³, its occurrence in already pressurised urban environments can raise the context for disorder and conflict.

One way in which the integration of migrants can be accelerated is through their engagement with diaspora or hometown associations, comprising existing migrants³⁵⁴. However, for arrivals that are *en masse*, rapid or ethnically different, risks of conflict and disputes with existing urban populations can be relatively high, not because of *migration per se*, but as a result of changing demographics³⁵⁵. In the case of urbanisation in Africa, as much as of immigration to Europe, access to physical space and essential resources including water, housing pressures, rapid growth of the labour force in constrained markets and aspirations to elite positions when they are of limited availability are all areas where there is evidence of inflow leading to a rise in urban tensions³⁵⁶.

Underlying urban associations with conflict are poverty, inequality and fragile governance³⁵⁷. Slum growth is expected to dominate future African urban expansion³⁵⁸, and, as noted above, the African urban poor are expected to exceed 400 million by 2015³⁵⁹. Where there are substantial economic inequalities, self-interested state elites and weak urban governance, violence is a likely outcome. There are also a number of instances where violence is manifested as a political tactic³⁶⁰ or is a consequence of lack of control³⁶¹, and in such situations ethnic diversity, contributed by migration, can further fuel situations for conflict to arise³⁶², even if it is not the primary cause of conflict. A case study of the complex links between environmental change, migration and social tensions in the Zimbabwe–South Africa context is shown in Box 4.1.

351 DRI (Annex D refers).

352 Rodgers (2010).

353 Migration accounts for 40% of urban growth in developing economy in recent decades. See Montgomery (2008). It may account for less in Africa, as discussed in Chapter 3 (see also Potts, 2009).

354 Gray (2006).

355 Raleigh *et al.* (2008).

356 Goldstone (2002); Urdal (2005).

357 PD4 (Annex D refers); Fox and Hoelscher (in press).

358 Pieterse (2011).

359 Auclair (2005).

360 Fox and Hoelscher (in press).

361 Baker (2008).

362 Pratt and Cullen (2005).

Box 4.1: Case Study: Zimbabweans in South Africa

The potential for urban conflict is well illustrated by recent experiences of Zimbabwean migrants in South Africa. Zimbabwe's political and economic crisis since 2000, enhanced in rural areas by drought impacts, for example in 2001–02, 2000–08 and 2010, has led to significant emigration. It has been estimated that 25% (3 million out of a population of 10–12 million) have emigrated since 2000³⁶³, of whom 1.5–2 million are resident in South Africa, with up to another 1 million making regular movements between the two states³⁶⁴. Although farm employment attracts some of the poorest and least skilled migrants, two groups have made a significant impact on South African urban centres, especially the major cities: well-educated migrants, who have entered top and middle sectors of the employment market, and large numbers working in the urban informal sector and living in shanties or inner-city squats³⁶⁵.

In 2008, linked to a widening poverty gap in South Africa (with 41% of citizens living below the poverty line and 40% lacking formal employment³⁶⁶), a spate of attacks occurred against urban Zimbabwean migrants, who were viewed as competitors for formal and informal income generation. In May 2008, 150,000 urban migrants were displaced, and 60 killed, with only limited protection afforded by state authorities, and most assistance coming from churches and charities. Attacks have continued sporadically, and have in some instances spread to rural areas. Lack of formal state recognition in South Africa of the Zimbabwean crisis may have contributed to the lack of speed and scale in dealing with the attacks³⁶⁷. For example, attempts to allow migrant registration up to a December 2010 deadline proved problematic as many migrants lacked official forms of identity, having obtained fraudulent documents on arrival in the country.

Meanwhile, in places of origin, although remittance flows from migrants are an important resource, there are concerns that migration can diminish the stock of human capital in low-income countries as a result of a 'brain drain' as skilled workers move from low- to high-income countries. A shortage of skilled healthcare practitioners has been identified in almost all Pacific Island and Caribbean states because of movement to, in particular, the USA, Canada, New Zealand and the Gulf states³⁶⁸. Fiji has had to recruit doctors from the Philippines and Indian subcontinent to fill the gap left by emigrating doctors. However, balanced against this must be an assessment of the increased remittance and FDI flows that offset this loss of human capital. This issue is further addressed in Chapter 8.

Effective responses to migration flows that raise geopolitical challenges also require consensus about the nature of these challenges and effective remedies. There is little evidence of a powerful global consensus on migration that could prompt the emergence of a comprehensive, integrated structure for the global governance of migration. This is because of a divergence of interests within the generalised international governance system. Interests are influenced by different beliefs, access to information and weighted by power³⁶⁹, and can mean that the interests of receiving countries are different from those of sending countries.

4.4 Operational challenges associated with displacement

There are specific operational challenges associated with displacement, especially if the displacement is temporary, for short time periods and internal.

As shown in Chapter 1, over the next 50 years levels of migration are highly likely to increase globally, almost regardless of whether there is global environmental change. However, population displacement is likely to grow specifically in response to the expected rising incidence of extreme climate events, whether in the form of floods, storm surges or droughts (see Box 2.3 for details), and become more likely, particularly in a future world characterised by low global growth, and inclusive local social, political

363 CS6 (Annex D refers).

364 Polzer (2009); Solidarity Peace Trust (2010).

365 Morreira (2010); Worby (2010).

366 Solidarity Peace Trust (2010).

367 CS6 (Annex D refers).

368 DRI6 (Annex D refers).

369 Keohane and Victor (2011).

and economic governance (Scenario D). According to the Internal Displacement Monitoring Centre and Norwegian Refugee Council:

- 17 million were displaced by natural hazards in 2009;
- 42 million were displaced by natural hazards in 2010³⁷⁰ (for both years, this definition of natural disasters includes events related to geophysical hazards).

Broadly speaking, displacement is frequently rapid onset, unforeseen and an option of last resort for those affected. Yet the dynamics of displacement are well understood³⁷¹. Moreover, even when people are displaced, the challenges that are posed for public policy may well, as with migration, often remain operational, such as the demand for emergency and humanitarian relief such as food, water, health care and shelter, rather than geopolitical in character. For example, although some labelled the populations displaced from the city of New Orleans before, during and after Hurricane Katrina in August 2005 as 'environmental refugees', this label was robustly rejected by public figures from across the political spectrum³⁷².

Elsewhere, the toleration of informal expansion of cities in Africa has allowed major population displacements to be absorbed, preventing political crises³⁷³. Yet such displacements have nonetheless contributed to other socioeconomic problems, notably the growth of abject poverty in African cities. A specific concern is that many large-scale displacements occur in conjunction with environmental stress, and with conflict. Clearly, the causality of conflict and the role of environmental stress remains contested. Resource scarcity associated with climate variability may not be a direct cause of conflict. Yet much case study research confirms that environmental stress and conflict are correlated³⁷⁴, and shows that drought and resource scarcity interact with displacement and migration in complex chains of causation³⁷⁵. In terms of outcome, whether populations are displaced by conflict is conditional on both assets and impacts on those populations³⁷⁶. As shown in Chapter 3, poor populations who are most vulnerable to conflict tend to be trapped in conflict areas, whereas those forced to leave have a limited choice of destinations.

As a result, the policy challenges of displacement are highly significant, especially where states have limited resources. In places where states are unstable and subject to natural disasters, those most likely to be severely affected are also those whose governments are least likely to assist³⁷⁷. Often governments in these countries either do not have the means to provide security or, in some cases, are themselves the main source of insecurity.

Like migration, displacement can also have impacts on the places that people leave. For example, displacement tends to narrow the demographic and human capital, often more dramatically than continuing migration. Where displacement is combined with non-return, it may make it difficult or impossible to maintain sustainable economies, as in the example of the decline of irrigated agriculture in the Kurdish areas of Iraq³⁷⁸.

In summary, displacement associated with environmental change can have major and long-term impacts beyond the immediate displacement events, impinging on economic growth, the legitimacy of government and the social contract for protection of citizens. Indeed, as shown in Chapter 3, in some cases displacement can in turn lead to increased vulnerability to environmental change, as displaced populations will often end up living in even more vulnerable conditions.

370 Yenotani (2011) in MR7 (Annex D refers).

371 Oliver-Smith (2006).

372 Noveck (2005).

373 DR2 (Annex D refers).

374 CR1 (Annex D refers).

375 Benjaminsen (2008).

376 DR5 (Annex D refers).

377 DR5 (Annex D refers).

378 CR1 (Annex D refers).

4.5 Geopolitical challenges associated with displacement

Some impacts of environmental change outlined in Chapter 3 may give rise to significant permanent displacement of whole populations as a result of existing settlements being, in effect, uninhabitable. This movement may be long term and sometimes across international borders, and thus presents geopolitical challenges.

Described as 'D2' in Figure 4.1, this mobility outcome may have significant political implications for the sovereignty and citizenship of those displaced, and for the responsibility of international governance to manage the issues³⁷⁹. The types of human mobility outcome that constitute a major political or geopolitical challenge include large-scale displacements of populations from low-elevation coastal zones, marginal drylands or mountain regions representing a significant proportion of a country's population or populations compelled to move to neighbouring countries. In addition, if the whole population of island states were forced to migrate, this could represent a crisis for those states and even for the global climate regime. Even smaller-scale displacement events can represent significant political challenges if they are unforeseen and rapid.

Challenges can arise in countries that may not possess either the willingness or capacity to deal with the problems while international resolve in this area has been relatively weak. Policy responses have often been reactive while commitments made by states to international human rights do not always translate into implementation on the ground. The circumstances of displacement also mean that migrants do not have a powerful political voice, while their advocates in NGOs and civil society also tend to be weak.

Although the challenges of internal and international displacement are real and pressing, there are still only limited governance mechanisms, raising the prospect that people are at risk both of impoverishment at destination and/or being forced to return to places where their very survival may be under threat. The existing constellation of international frameworks and laws, including the Guiding Principles on Internal Displacement and the 1951 Geneva Refugee Convention and its 1967 protocol, do leave gaps in protection for individuals displaced by environmental change, because of either gaps in coverage or gaps in implementation³⁸⁰.

The situation of small island states faced with global environmental change throws issues of global governance into stark relief³⁸¹. Potential displacement from island nations raises specific governance dilemmas, ranging from the future of their Exclusive Economic Zones, through to the risk that some islands, or even nations, could become completely uninhabitable³⁸². Whilst there is perhaps one precedent for a nation state that lacks a territory³⁸³, the possibility that one or more island states could become submerged clearly raises significant issues for sovereignty and citizenship which are not addressed by existing legal instruments. Meanwhile, the economies of many tropical island states are heavily dependent on marine ecosystem services, which are under threat. For example, 89% of GDP and 98% of exports in the Maldives come from either fishing or tourism or other biodiversity-based sectors, and hence the country is almost entirely reliant on the sustainability of these activities³⁸⁴.

The geopolitical challenges associated with displacement revolve partly around issues of legal status and protection, but also issues of human security, social protection, health and development, especially for those displaced internationally. For example, in low-income countries, large-scale displacement can place significant strain on public services and risk the spread of both disease and conflict, as appears to have occurred in the case of the displacement to Zaire³⁸⁵ following the Rwandan genocide in the mid-1990s, or the apparently continuing spread of conflict around countries in West Africa, which encompasses Liberia, Sierra Leone, Guinea and Côte d'Ivoire. In high-income countries, if relatively rapid or unexpected displacement occurs it can also pose geopolitical challenges. Analysis suggests that the key to successful

379 PD16 (Annex D refers).

380 Koser (2011); DRI3 (Annex D refers).

381 Humphreys (2010).

382 PD15 (Annex D refers).

383 The Sovereign Military Order of Malta, based in Rome, which issues passports and has diplomatic relations with 104 states, although its claim to sovereign status is disputed (PD15, Annex D refers).

384 IUCN (2009).

385 Now the Democratic Republic of the Congo.

management of 'mass' displacements to the UK over the last three decades has depended more on political leadership from government than on operational preparedness³⁸⁶.

Yet, overall, a lack of a global consensus on the nature of both challenges and remedies is as apparent in the case of displacement as it is in the case of migration. For example, whilst international organisations are edging towards a shared understanding of the protection gaps associated with migration influenced by global environmental change, and new approaches are being discussed in fora facilitated by the International Organisation for Migration (IOM)³⁸⁷ and more recently at the UNFCCC Conference of the Parties in Cancun³⁸⁸, much attention remains focused on the search for a definition of 'environmental' or 'climate migrants', a search that evidence presented in Chapter 1 suggests will be fruitless.

4.6 Operational opportunities and challenges associated with those who choose to stay

The opportunity to stay in a location represents a positive outcome in many respects, but there are important nuances surrounding the provision of services and protection to potentially vulnerable populations, and whether people want to stay because of certain obligations. Furthermore, communities' ability to stay may depend on voluntary migration opportunities.

In contrast to migration and displacement, choosing to stay (S1) is more obviously a desirable human mobility outcome, in that it represents the exercise of free choice by affected populations. The ability of people to choose to stay where they are living, in spite of global environmental change, arguably simplifies urban planning and land-use policies, where populations are more stable and the longevity of population groups in particular places facilitates the process of community engagement and active citizenship. Stable populations are also arguably less prone to conflict, and easier for state and non-governmental authorities to provide with a range of social protection benefits and services.

However, choosing to stay nonetheless represents a policy challenge, for a number of reasons. First, whether or not people are able to choose to stay is likely to depend at least in part on whether policy has adequately responded to the operational challenges of migration (section 4.2.1) or, more importantly, whether it has enabled people to build on the opportunities which migration provides (section 4.2.2). For example, if some family members are able to move legally to find employment, and can send home remittances and travel freely back to their place of origin, this will probably enhance the ability of other family members to choose to stay in conditions where they are resilient to future environmental shocks. In this sense, the operational challenges associated with promoting the right of some people to stay may well lie in the area of well-regulated and managed safe migration of others, or policy action to facilitate remittances or circular mobility.

Secondly, even where people are able to stay, perhaps partly because family members have migrated, they remain vulnerable to environmental change and may have expectations of state intervention which are difficult to meet. For example, a study of communities in Mexico affected by Hurricane Stan in 2005 revealed frustration with state authorities at their perceived failure to contribute to reconstruction³⁸⁹.

Thirdly, people may also seek to exercise their 'right to stay' even where this is effectively foolhardy, and creates additional public health, security or other challenges for the state. Those who have strong cultural affiliations with places at risk distinguish themselves as being very likely to resist movement at all costs, yet in ways that are highly challenging for public policy. For example, part of the population of Montserrat, the 'belongers', resisted all evacuation orders during the volcanic eruption of the 1990s. In doing so, they placed themselves in physical danger, but beyond the immediate reach of public authorities charged with their protection. Displaced Iraqi Kurds sought to return and resettle as soon as possible despite drought and repression in the 1990s and 2000s, again creating significant operational challenges for humanitarian and other organisations to reach them to provide protection and assistance³⁹⁰.

386 PD6 (Annex D refers).

387 PD17 (Annex D refers).

388 PD23 (Annex D refers).

389 Alscher (2010).

390 UNHCR (1993); CRI (Annex D refers).

At the same time, as with the distinction between (voluntary) migration and (involuntary) displacement, the distinction between populations that choose to stay and those who are trapped (section 4.7) is also at least partly blurred. For example, whilst populations at risk of displacement, and even populations who have been displaced, often do all they can to maintain their livelihood through the exercise of free choice, locally specific economic interests, such as the ownership of property and land, or the obligations associated with social networks, are examples of factors that may act as a significant disincentive to abandon settlements under stress³⁹¹.

4.7 The challenges of 'trapped' populations unable to leave

A focus from policy makers upon those who migrate neglects a focus on those who are potentially the most vulnerable – those who are unable to migrate from environmentally prone locations and will become even more threatened by environmental change.

Whether populations are trapped through direct force, or through implied constraint, the policy implications (S2) in such cases are likely to be more severe than in situations where the decision to stay is more clearly voluntary. These implications include challenges in the provision of human security and social protection, in extending adequate health and other services and more broadly in promoting 'development' in affected areas. The material losses associated with extreme events may also exacerbate the reality of being 'trapped' for affected populations, as they become even less able to move.

For example, in the case of Hurricane Katrina in New Orleans, it could be argued that the group that posed the most significant policy challenges was not those who were displaced but those who became trapped amid a complete breakdown of public services, severe damage to property and contamination of land and water supplies as a result of the release of large quantities of oil. Broadly speaking, whether New Orleans residents were 'trapped' or not depended on race and class, as these factors influenced access to private transport and social networks that could facilitate evacuation. However, it is also clear that some chose to stay simply because they underestimated the severity of the storm³⁹².

Another example of a population trapped in a place vulnerable to an event projected to become more frequent in the context of global environmental change is that of the Burmese, who experienced the devastation of Cyclone Nargis in April 2008. Not only did Nargis leave at least 130,000 people dead³⁹³, but the inaccessibility of affected people to international humanitarian assistance threatened a separate wave of death from lack of food and water and the spread of disease in the aftermath of the disaster³⁹⁴. In Somalia, armed conflict hinders both the movement of pastoralists who would otherwise relocate in the face of drought and the access of humanitarian organisations to those who are drought affected³⁹⁵.

Whilst much policy attention is directed to the notion of 'adaptation' of vulnerable populations to climate and other environmental change, strategies for adaptation are unlikely to be successful in circumstances in which populations are not committed to remaining in the place where they are living, and see greater opportunities for adaptation and resilience elsewhere. This is important, as migration often is seen as the most sensible 'spontaneous' adaptation strategy by vulnerable people, as acknowledged by, for example, the National Adaptation Programme of Action (NAPA³⁹⁶) for the Republic of Mali, which highlights the extreme vulnerability of those who are unable to migrate for work to neighbouring regions and countries during drought periods³⁹⁷. As context, there are likely to be between 472 and 552 million people directly or indirectly affected by floods in rural areas in Africa, Asia and Latin America by 2060³⁹⁸ depending on the future scenarios.

391 CRI (Annex D refers).

392 Adeola (2009).

393 Webster (2008).

394 Stover and Vinck (2008).

395 Kolmannskog (2009).

396 National Adaptation Programmes of Action (NAPAs) are the process by which least developed countries (LDCs) identify priority activities that respond to their urgent and immediate needs to adapt to climate change.

397 Republique du Mali: Ministere de l'Equipment et des Transports (2007).

398 MR9 (Annex D refers).

But perhaps the most important policy implication of people staying where they are in the context of global environmental change, whether that is because they have chosen to stay or because they are trapped, is that they may become *more* rather than less vulnerable to displacement in the face of extreme events. In turn, that displacement is arguably much more likely to throw up 'geopolitical' (D2) rather than mere 'operational' (D1) challenges. For example, whilst the example of Hurricane Katrina in New Orleans is partly one of vulnerable people being trapped in the face of the storm, more broadly it is arguably one of a much larger population having a false sense of security that it could remain in New Orleans, with many hundreds of thousands being displaced when the flood defences broke.

4.8 Conclusion: the risks of no policy action and the case for action

Policy makers must take a strategic look at the different human mobility outcomes which are likely to result from environmental change. It must be understood that there are deep connections between migration, the lack of migration and displacement. Specifically, preventing migration may lead to more problematic outcomes.

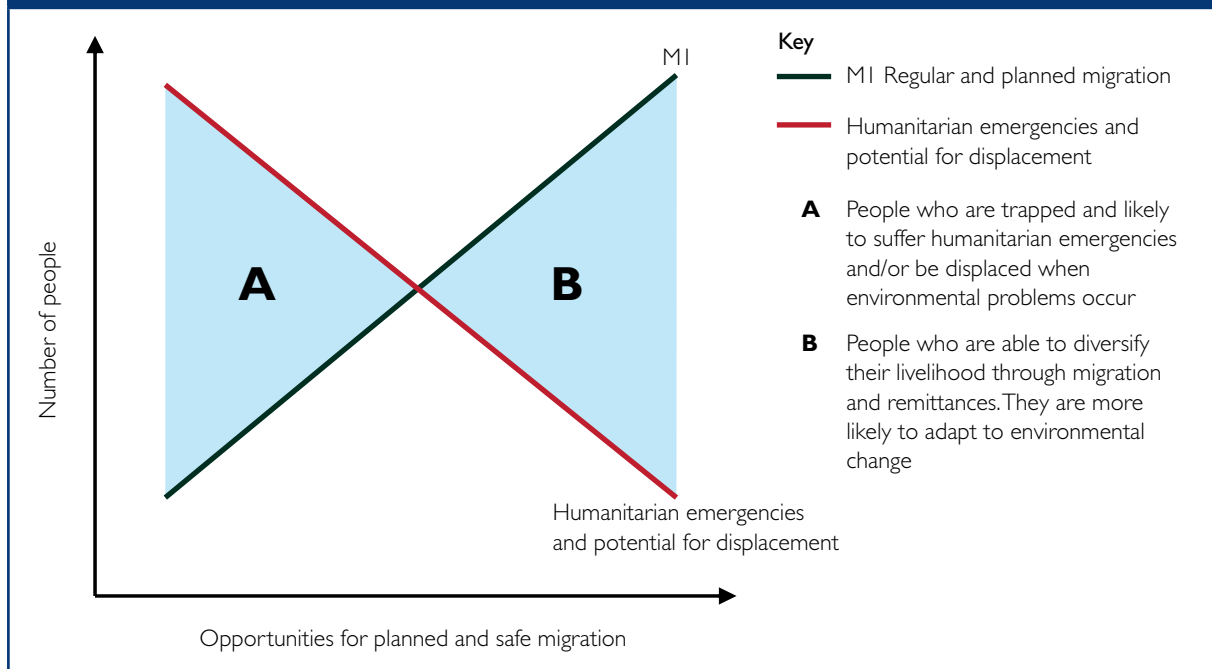
The human mobility outcomes described in this chapter as M1, D1 and S1³⁹⁹ might seem largely unproblematic, or even in some cases desirable. Both M1 and D1 represent areas where there are existing government policies in most countries, designed to regulate and manage migration, and to respond to displacement associated with disasters. They fall primarily within the jurisdiction of specific states, rather than being areas for international negotiation and/or regulation. Meanwhile, the mobility outcome of S1 might appear to require no policy intervention at all.

Yet it is important to stress that significant gaps remain in policies to address these human mobility outcomes in the face of global environmental change, reflecting, in different parts of the world, a lack of funds or political will, or incoherent policy making. Unless government policies are strengthened so that people can proactively and safely use migration as one of a range of adaptation strategies (M1), or take refuge safely in a time of crisis before returning to their home (D1), more negative outcomes will occur. Depending upon the scenario, people may be trapped in vulnerable areas (S2) or lose their choice to stay in certain areas (S1), displacement with geopolitical consequences may occur (D2) or migration may be unpredictable and unexpected and concentrated on particular locations (M2).

Figure 4.3 is a schematic diagram which shows this relationship. Chapter 3 has shown that migration is a key form of enhancing livelihoods and diversifying income, for example through remittances. As migration of the form M1 increases (regular migration which proceeds along existing and expected lines), individuals and households increase their resilience and make themselves less vulnerable to environmental change, therefore reducing the likelihood of humanitarian issues and displacement, as represented by the 'B' population. However, as migration opportunities are reduced, there are reduced opportunities for populations to secure livelihoods and build resilience, and populations are likely to become trapped in vulnerable locations (indicated by A). These populations are more likely to suffer humanitarian emergencies and/or displacement. Chapter 5 develops a strategic approach to policy which addresses the challenges of migration highlighted in this chapter, whilst enabling the benefits of migration to be harnessed to increase resilience and reduce vulnerability to humanitarian emergencies and displacement.

³⁹⁹ Migration with geopolitical consequences (M1), displacement with geopolitical consequences (D1) and choosing to stay (S1).

Figure 4.3: Schematic representation of the relationship between well-managed migration and those who are trapped and more likely to suffer humanitarian emergencies and problematic displacement





5 A strategic framework for policy

Key messages

- To develop effective policy for migration and non-migration influenced by environmental change, a focus on the underlying causes or drivers of migration is important.
- Migration and non-migration in the context of environmental change will be relevant for *policy areas beyond just 'migration' or 'environment'*; a narrow focus is unlikely to address the challenges identified in Chapter 4.
- Policy makers need to focus on addressing a broader range of outcomes and impacts, rather than taking a narrower view of merely seeking to control (i.e. restrict, manage or facilitate) numbers of people who move or remain at a given location. A much more comprehensive perspective on policy objectives is required.
- The policy framework set out in this report encompasses three distinct approaches to the challenges of migration and non-migration influenced by global environmental change:
 - reducing the influence of global environmental change on migration;
 - planning for and responding to migration influenced by global environmental change and non-migration influenced by global environmental change;
 - recognising the opportunities of migration as adaptation to global environmental change.

5.1 Introduction

The previous chapter has highlighted that migration influenced by environmental change over the next five decades is likely to raise a number of policy challenges, in terms of both migration and displacement, as well as for those who do not migrate (either because they choose to stay or because they are trapped in vulnerable locations). Moreover, these challenges will be both operational and geopolitical in nature. This chapter identifies a broad range of policy areas that affect migration (and non-migration) influenced by environmental change and offers a policy framework within which potential interventions might be considered. In doing so, the chapter sets the scene for a discussion of a strategic approach to policy options in the remainder of the report, highlighting the different levels at which change might be required.

A starting point for this chapter is that the effectiveness of policies related to migration can vary considerably. For example, a gap has been observed between the principal policy objective of controlling immigration and the rising numbers of immigrants in some of the world's major destination countries⁴⁰⁰. The same variability in effectiveness also applies to policies relating to internal migrants and major destination cities⁴⁰¹. Yet, while some migration policies may not be wholly effective, they are not without impact. For example, they have had substantial influence on the legal channels, geographical itineraries and methods that people have used to move⁴⁰². There are also examples of migrants being increasingly forced into irregular/illegal migration routes or strategies⁴⁰³. Some migration policies are also effective on some measures but have significant unintended consequences; for example, European countries and the USA are able to exercise considerable power to exclude immigrants⁴⁰⁴.

400 Boswell (2007).

401 Chan and Zhang (1999).

402 DR8b (Annex D refers).

403 Broeders and Engbersen (2007).

404 See Carling (2007); Nevins (2007).

Understanding why some migration policies appear not to work is necessary to identify policies which have the best chance of success in addressing future challenges. Three particular issues are:

- Policies may be ineffective if they are responding to the *symptoms* rather than to the *causes or drivers* of migration.
- The consequences of migration, and especially migration in the context of environmental change, will be relevant for *policy areas beyond 'migration' or 'environment'*; a narrow focus misses important causal relationships and implications.
- Policies may be ineffective if they focus on short-term or intermediate targets rather than genuine *strategic objectives*. Clear identification of the strategic objective of a policy relevant to migration in the context of environmental change is essential for the benefits to be realised and for problems to be addressed effectively.

A key message for policy makers is that, to stand the best chance of being effective, policies to address migration influenced by environmental change need to address these limitations. In particular, they need to draw upon a broad perspective and be cross-sectoral; they should focus on root causes of phenomena; and they should be expansive in outlining policy goals. The following sections explore these three key criteria further before setting out a framework that is used in subsequent chapters for considering policy options.

5.2 Focusing on the underlying causes rather than symptoms

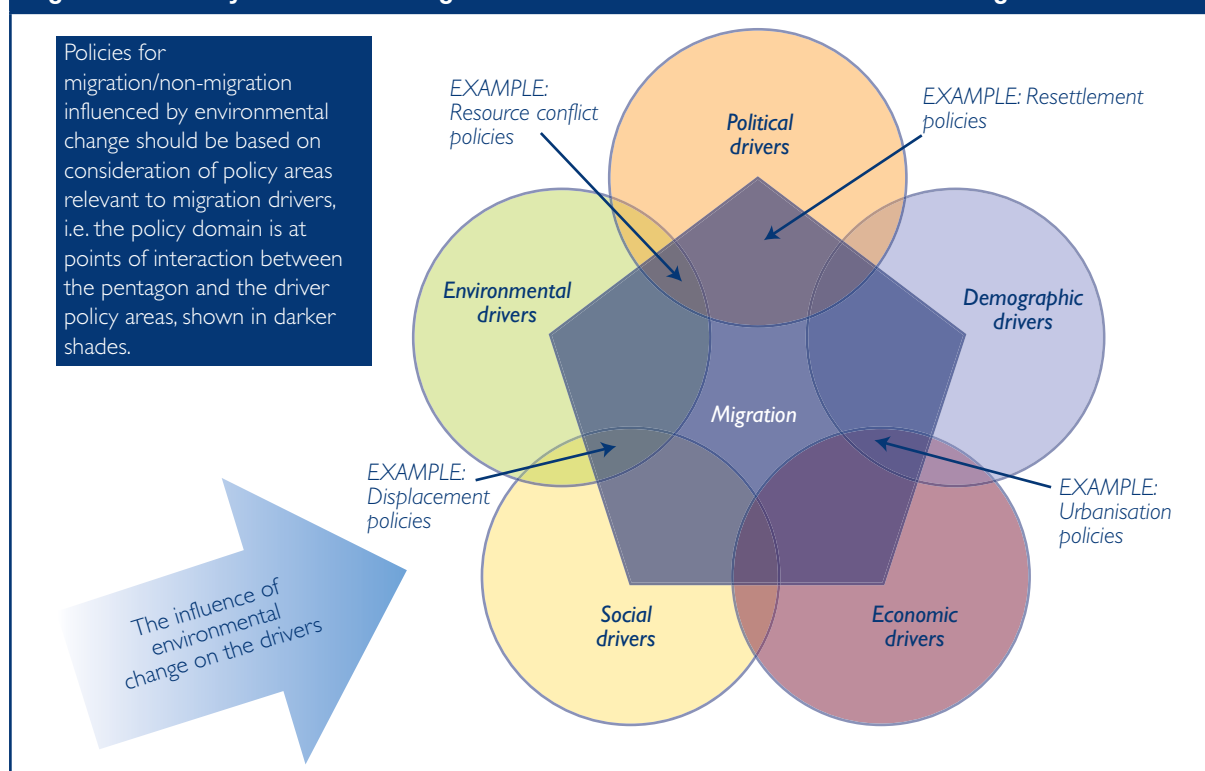
Policies are most likely to be more effective and arguably more resilient to future uncertainty if they are focused on the causes or drivers of migration and non-migration in the context of environmental change, rather than just the symptoms.

One reason why policies related to migration are not always effective is that they may respond to the symptoms rather than to the causes or drivers of migration. For example, it has been argued that migration policies have been unsuccessful in certain parts of the world because migrants and employers have a shared interest in circumventing some or all aspects of immigration control⁴⁰⁵. In this instance the underlying structural, economic and demographic drivers of migration are not aligned with the objective of migration policy. The implication is that any interventions to address issues involving migration (involving whatever policy areas) will face an uphill task unless the fundamental causes are first identified and, if appropriate, addressed.

Addressing the root causes of migration (including people becoming trapped) is considered in detail in Chapters 6–8. The first half of this report has provided substantial evidence that migration *and non-migration* can be the outcome of complex interactions between migration drivers and environmental change, and that this interaction will increase in the future. Challenges for policy related to migration in the context of environmental change require a 'policy domain' which reflects the broad drivers of migration, shown schematically in Figure 5.1.

An implication of the need to address the root causes of migration is that a successful approach to policy also requires clarity of the institutions and organisations responsible for managing these interventions and securing agreed objectives. There is recognition that, inevitably, making and implementing policy is always an imperfect endeavour because policies are made at one place, at one point in time, but then subsequently implemented elsewhere. This issue becomes more acute when states have significant constraints on their governance capacity and where there is need for assistance from other states, NGOs or international organisations.

⁴⁰⁵ Ruhs and Anderson (2009).

Figure 5.1: Policy domains for migration in the context of environmental change

5.3 Connecting migration policies with other areas of policy

Migration is caused by the interaction of economic, political, social, demographic and environmental factors. It is therefore critical that policy makers look for solutions beyond just ‘migration’ or ‘environment’ policy areas.

Figure 5.1 also shows that policies relevant to both migration and non-migration influenced by environmental change lie at the intersection of migration policy and social, economic, political⁴⁰⁶, environmental and demographic policy. As shown in the first half of this report, migration, whether it occurs within or between states, is generally a strategy based on decisions made primarily at household level. But these decisions do not take place in isolation. In part, they respond to substantial regional, national and global variabilities and inequalities. If policy options towards migration are drawn from only a narrow range of policies, particularly if restricted to options specifically in the field of migration policy, there is a risk that interventions will not address the root causes of migration flows, and be limited in effectiveness.

It is therefore important to consider not only future policy interventions that are concerned with migration, but also their coherence with policies that might *affect* migration but which are only indirectly concerned with it. A specific example concerns emerging policies relating to credit, insurance and agriculture, which may influence migration but are clearly outside of the area of migration policy.

Migration outcomes caused by the interaction of environmental change and migration drivers have implications for a wide range of policy areas.

At the same time, migration has powerful effects both on the individuals who move and on communities, societies and economies in the places they move from and to. It is also important for policy makers to consider the implications of migration and migration interventions on wider areas of policy. For example, policies relating to urban planning and adaptation to climate change are not migration policies *per se*, yet could be substantially affected by future migration flows. Migration networks connect sending and destination places and become transmission mechanisms for resources, including remittance flows, which can have tangible benefits for a range of sectors in source locations. A *strategic* assessment of possible

406 ‘Political’ policy can usefully be thought of as policy relevant to conflict, governance, discrimination and freedom.

future interventions requires a long-term and comprehensive understanding of the *implications* of migration outcomes, rather than a more narrow focus on the migration itself. This applies as much for migration influenced by environmental change, the subject of this report, as for migration in general.

The creation of effective connections between diverse areas of policy is a substantial challenge for policy makers, but should be a key aim. If successful, it could create scope for much more effective interventions which involve inter-agency collaboration. Establishing such connections is important as the range of possible interventions is very wide, and there is therefore a risk that policies affecting migration can become fragmented and incoherent. At the same time, it has proven difficult in the past to secure agreement between states on stronger international governance structures that address these incoherencies and are capable of protecting migrants. Nevertheless, the 'cluster approach' of the UN's Inter-Agency Standing Group provides an example that progress could be made in this difficult area, given sufficient political will (the cluster approach is further discussed in Chapter 7)⁴⁰⁷.

5.4 The need for a more comprehensive view of policy objectives

A strategic approach to policy, as developed in this report, entails a focus on addressing the broader range of *outcomes and impacts*, rather than the narrower view of merely seeking to control (i.e. restrict, manage or facilitate) numbers of people who move or remain at a given location. This requires a broad perspective on policy objectives.

For policies that deal with migration, it is clear that there is a continuum, ranging from those that are highly positive towards movement, seeing it either as a positive end result or, at least, as a part of the solution to an underlying problem, through to those who are highly negative towards movement, seeing a principal aim of policy as either limiting migration or limiting the need for migration.

This report argues that responding to migration in the context of environmental change, including the six human mobility outcomes (see Chapter 4), requires a strategy which goes beyond this, and:

- addresses the broad range of potential implications and impacts of potential human mobility outcomes, rather than merely managing or restricting the size of population movements;
- uses a range of strategic policy responses to manage those outcomes.

The evidence reviewed in the first half of this report shows that the human mobility outcomes in Figure 4.1 are those that demand most urgent attention, and include different forms of migration (M2), displacement (D2) and trapped populations (S2). Table 5.1, in turn, shows that a broad range of policy areas are affected by these outcomes, and that the relationship between the migration outcome and the policy area can be negative or in certain circumstances can be positive and can deliver important benefits. For example, if environmental change influences internal migration in African countries, this can lead to operational challenges (M1) for urban planning, provision of education and services and health; yet this migration can provide remittances which are sent back to destination areas to build resilience to environmental change⁴⁰⁸. As another example, if environmental change causes a reduction in financial capital, which leads to households being trapped in vulnerable locations in mega-deltas, this has implications for human security, vulnerability, economic development and health.

It is for policy makers to judge which of the implications and impacts of migration outcomes are the most important priorities for action. This report does not attempt to prejudge those decisions. Rather, it aims to clearly state these impacts and implications for different policy sectors and to provide insights into how they might be addressed. At a strategic level, appropriate implied policy responses are outlined in Table 5.1.

407 McNamara (2006).

408 SRI 3 (Annex D refers).

Table 5.1: Human mobility outcomes, their impact on different sectors, and the strategic policy response

Type of movement	Impacts of movement for different sectors	Strategic policy response
Migration with operational challenges (M1)	If managed badly can have negative effects on: ● urban planning and land use ● provision of health and education ● human security and social protection ● vulnerability to environmental change	Reduce the need for migration influenced by environmental change
		However, accept that some will still occur: plan for and respond to this
	Can be a positive force for ● building resilience ● development ● adaptation	Recognise the opportunities provided by migration in the context of environmental change
Migration with geopolitical challenges (M2)	Likely to be negative for: ● community relations and tensions ● conflict ● human security and social protection	Reduce the need for migration
		However, accept that some migration will still occur: Plan for and respond to it
		Recognise that planned, managed migration (M1) provides an opportunity to reduce M2 migration
Displacement with operational challenges (D1)	Likely to be negative for: ● economic growth ● the legitimacy of government ● human security and social protection ● health	Reduce the need for migration
		Accept that some migration will still occur: plan for and respond to it
Displacement with geopolitical challenges (D2)	Likely to be negative for: ● human security and social protection ● development, health ● legal status of nations and citizens, and subsequent protection ● conflict	Reduce the need for migration
		However, accept that some migration will still occur: plan for and respond to it
		Recognise that opportunities in migration may make communities more resilient in the context of environmental change
Unable to leave (trapped – S2)	Likely to be negative for: ● human security and social protection ● health ● development ● adaptation ● vulnerability to environmental change and displacement	Recognise the opportunities provided by migration in the context of environmental change
		Plan for and respond to non-migration influenced by environmental change (trapped populations)
Choose to stay (immobile – S1)	Likely to be positive for: ● human choice ● urban planning and land use ● human security and social protection	Reduce the need for migration
		Recognise the opportunities provided by migration to allow people to stay, in the context of environmental change
	Likely to be negative in certain contexts for: ● provision of services, including health and education ● conflict	Plan for and respond to non-migration

5.5 Towards a policy framework for migration and non-migration influenced by environmental change

This report calls for a new strategic policy approach to migration in the context of environmental change, which is based on the need to reduce the influence of environmental change on migration yet *simultaneously* plan for its likely occurrence and also capture the opportunities in migration to adapt to environmental change.

Drawing together the points from the previous three sections, the remainder of this chapter, and the ensuing chapters of this report, are based on a policy framework that has three attributes:

- (a) recognition that the root causes of the future policy challenges must be addressed, including the interaction between environmental change and the drivers of migration, where appropriate;
- (b) recognition that multiple policy fields interact with migration influenced by global environmental change, because they affect the migration or are affected by resultant outcomes (e.g. conflict, mobility of skills, humanitarian requirements);
- (c) recognition that policy goals may be diverse but should ultimately relate to addressing the broader impacts of movement on a variety of sectors (middle column of Table 5.1).

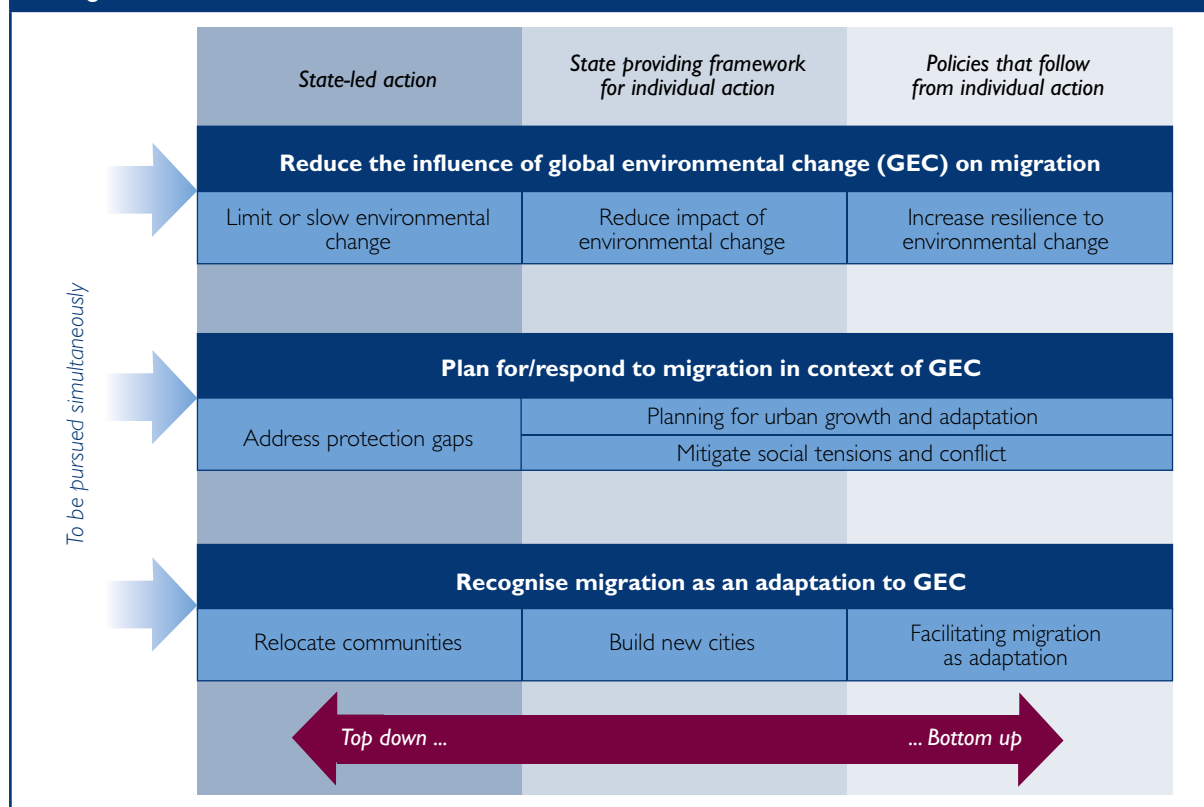
The policy framework is depicted in Figure 5.2, and essentially encompasses three distinct approaches to the challenges of migration and non-migration influenced by environmental change:

- reducing the influence of global environmental change on migration (and reducing the need for it) (discussed in Chapter 6);
- planning for and responding to migration influenced by environmental change (and non-migration, as appropriate) (Chapter 7);
- recognising the opportunities of migration as adaptation to global environmental change (Chapter 8).

The framework also encompasses the notion that policies can vary from state-led 'top-down' policies, in which states seek to affect the nature of environmental change and/or human migration directly, through to policies that follow from individual actions. This represents a continuum of actions, spanning:

- the use of force, law, incentive or persuasion to directly shape human behaviour to meet an objective identified by the state ('state-led action');
- an approach in which the state provides a framework or structure which encourages individuals to do certain things, but does not compel them to do so ('state providing framework for individual action');
- a responsive approach that accepts the strength of forces outside direct state control, where the state anticipates what bottom-up actions will occur and ensures that it delivers as many positive outcomes, and as few negative outcomes, as possible ('policies that follow from individual action').

This categorisation of policies from 'top down' to 'bottom up' cuts across the three broad approaches, and is further discussed, as appropriate, in Chapters 6-9.

Figure 5.2: A policy framework for migration and non-migration influenced by environmental change

5.5.1 Reducing the influence of global environmental change on migration (Chapter 6)

The first strategic policy approach in the framework concerns the diverse areas of policy that would reduce the need for migration influenced by environmental change. Three areas are discussed in Chapter 6:

- (i) *Policies that seek to slow the rate of environmental change by curbing climate change or preventing environmental degradation.* Climate change mitigation policies are likely to have more of an impact on climate change and migration towards the 2060 time period in this project, as inertia in the climate system mean there is less scope to influence outcomes by 2030. However, measures to mitigate non-climatic environmental change, for example relating to land use, could have more immediate effects on migration.
- (ii) *Reducing the impacts of environmental change.* These policies include forecasting, warning and humanitarian emergency actions, infrastructure measures to protect against events (such as flood planning) and non-structural measures to reduce exposure, such as better spatial planning.
- (iii) *Increasing resilience to environmental change.* Policies in this area are focused on enhancing livelihoods for individuals, providing forms of insurance and social protection so that people and communities are able to absorb shocks, regenerate and resist environmental change.

The three approaches above address the effects of 'negative' environmental changes, which include flooding, tropical storm events, droughts, land erosion and changes in coastal zone ecosystems (see Box 2.3). Although policies to address these effects are only rarely directed at reducing migration, they influence the frequency of rapid- or slow-onset hazards, and influence changes in ecosystem services and livelihoods, and are therefore considered here. However, a key implementation challenge arises from uncertainty surrounding the anticipated effects of global environmental change in a particular place.

5.5.2 Planning for and responding to migration (and non-migration) influenced by global environmental change (Chapter 7)

Seeking to minimise the extent to which global environmental change contributes to increased migration is an entirely legitimate public policy goal, especially where this is framed in terms of reducing the extent to which people are forced to migrate. However, it is clear from Chapter 3 that increased migration, of various forms, remains likely over the next half a century⁴⁰⁹. Consideration of measures for dealing with migration influenced by environmental change also needs to include analysis of relevant national and international policy and governance frameworks which are in place. Three key areas of policy are discussed in Chapter 7:

- (i) *Addressing and closing protection gaps for those displaced.* This includes identifying and filling gaps in national and international protection for migrants and those who are displaced, and understanding what existing or new approaches will best address these gaps.
- (ii) *Planning for urban growth and adaptation.* There is urgent need for policies to address the growing populations in urban centres in the context of increasing environmental change. Furthermore, new migrants to cities are particularly vulnerable and require extra consideration. A more strategic approach to the long-term future of cities is required.
- (iii) *Dealing with tensions and conflicts associated with migration and non-migration influenced by environmental change.* Here it is important for policy makers to recognise that tensions and conflicts can arise in situations in which populations are effectively trapped in environmentally vulnerable areas.

5.5.3 Recognising the opportunities of migration as adaptation to global environmental change (Chapter 8)

Policy interventions may reduce the need for migration but it is likely to remain an attractive option for many people over the next five decades. Migration will continue with or without global environmental change, but environmental change will affect pressures to move. In Chapter 8, three areas of policy are discussed in which significant action is needed now; all three can be seen as proactive approaches to migration, as they recognise that migration is used by individuals and communities as a way of improving living conditions. They entail facilitating adaptation strategies in the face of environmental change, and realising the benefits of migration as well as dealing effectively with costs.

- (i) *Relocation as adaptation.* This recognises that relocation has been utilised or is being considered in a range of contexts, including the aftermath of drought and famine (e.g. Ethiopia), movement from environmentally degraded dryland and mountain areas to urban areas (e.g. China) and in the face of sea-level rises in the case of low-lying islands and low-elevation coastal zones (e.g. the Maldives). However, relocation within and beyond states does pose social and political challenges.
- (ii) *Building new cities.* This recognises that new urban development could benefit migrants and local populations. In particular, if implemented in a sustainable way, it could help deal with congestion problems in existing urban centres, as well as allowing for a form of spatial planning which limits the exposure of communities to continuing environmental change and hazards.
- (iii) *Facilitating migration as adaptation: making migration work.* This approach requires a rethink of current development and migration policies, which often focus on keeping people where they are. In particular, migration is a key way for individuals to increase their long-term resilience to environmental change and offers scope for 'transformational' adaptation.

Similar sets of policies were discussed in the Johannesburg workshop, with a particular focus on what was applicable to dryland regions. Box 5.1 provides more information on the discussions at this workshop.

⁴⁰⁹ See also Box 1.5, 'Projecting migration trends', in Chapter 1, in which it is observed that a simple extrapolation of current proportions of migrants to a UN variant population project would result in an extra 71 million international migrants by 2060 without accounting for environmental change.

Box 5.1: Regional workshops: the range of policies that can have an effect on migration in drylands

At the workshop in Johannesburg, participants discussed how different policies could be applicable to migration in the context of environmental change in dryland areas. Discussion focused in particular on *policies in destination areas*, *policies in source areas* and *policies important for the process of migration*:

- **Policies in destination areas** included measures to improve *conditions* in destination areas, to ensure that migrants are protected and that they receive access to infrastructure and services. In Oshakati, in Namibia, squatting on low-lying areas has been stopped and a concerted effort is also being made to mitigate flood risks in general, to reduce the risks to migrants from exposure to environmental hazards. Other measures included *transport policy*, which can also play a role in determining where new migrants settle. A good transport network can improve access to employment, and can therefore increase options for where migrants settle. During the xenophobic violence in South Africa in 2008 (see Box 4.1), temporary safety sites were established in areas which were acceptable travel distances from where people needed to continue in their jobs.
- **Policies in source areas** included local measures to reduce the inequalities between urban and rural areas, thereby enabling individuals to have greater choice in where they reside. In particular, this involved *improving conditions in source areas*, for example, in the case of drylands, through livestock management (diseases/health for animals) and natural resource management. The example of Kenya's Arid and Semi-Arid Lands policy (ASAL) was mentioned as an example of this kind of policy. *Remittances*, which are a function of migration, provide another route to addressing inequalities between urban and rural areas.
- **Policies orientated towards the process of migration** were focused on *international migration and regional cooperation*. Migrants typically pass through many countries before they reach their destinations using migration pathways in African drylands. There is a need for regional cooperation to ensure legal documentation for nationals and foreigners, and to improve the access to the legal structures designed to protect them. The border between Zimbabwe and Mozambique has recently been opened, meaning that citizens of both countries are free to cross, and are recognised and afforded citizens' rights.

The different approaches to policy taken by participants in the drylands workshop were interesting, and, although not identical, have much in common with the policy approach taken by this report. Indeed, the contribution and subsequent report from the drylands workshop have provided inspiring ideas for this report⁴¹⁰.

A full report detailing the discussions from the Drylands workshop can be found on the Foresight website and CD along with the full evidence base.

5.6 Conclusion

An essential point about the policy framework presented here is that the three approaches to policy for migration influenced by environmental change (seeking to reduce it, planning for it, recognising the opportunities in it) are not mutually exclusive. Rather, all three should be pursued simultaneously. These three approaches are considered in detail in subsequent chapters.

The ordering of the different types of response (and indeed the ordering of the next three chapters) should not be taken to suggest that policy related to migration influenced by environmental change should first be tackled by seeking to reduce it, and then, in the event of failure, planning for it, and then embracing it if that fails. This is not the case. Not only are all three potentially as important as each other for addressing the challenges identified in Chapter 4, but a sequential approach would delay action in the last two categories. Indeed, in many cases, the resulting delay could mean that it would be too late to effectively address key issues raised in the first half of this report.

410 WR2 (Annex D refers).



6 Reducing the influence of global environmental change on migration

Key messages

The evidence reviewed so far shows that future environmental change is likely to interact with future migration drivers to lead to certain kinds of human mobility outcomes. This chapter considers measures (within the realms of development, disaster risk reduction or climate change adaptation, for example) which might be expected to have the effect of reducing the impact of environmental change on drivers of migration, reducing in turn the pressures on migration, and potentially mitigating policy challenges. This chapter finds that:

- Policies that aim to limit or slow the rate of environmental change are likely to have limited, or unpredictable, impacts on migration.
- Policies focused on forecasting and reducing the impact of environmental events can be effective at reducing the impact of environmental change on drivers of migration in some circumstances, but can never address all migration influenced by environmental change.
- Equal priority should be given to policies that promote the long-term resilience of communities to environmental change, such as enhancing livelihoods and promoting insurance. These policies are also likely to be more robust to future uncertainty. However, evidence shows that an important component of both livelihood and insurance strategies is migration itself, which has high potential to be a *transformational* adaptation strategy.

This chapter concludes that, as policies are unlikely to reduce entirely the need for migration influenced by environmental change, policies that plan for and respond to it should also be considered. Furthermore, as migration may be an effective way to build resilience, policies that recognise migration as an adaptation to global environmental change should be considered. These are discussed in Chapters 7 and 8 respectively.

6.1 Introduction

Chapter 4 showed that migration influenced by environmental change in the future is likely to pose a range of challenges for diverse areas of policy. One way for policy makers and others to manage these challenges proactively is to address the influence of global environmental change on the drivers of migration (see Chapter 2 and Figure 2.2 for discussion of the most important relationships). Three groups of policies are broadly distinguished in Chapter 5 in the policy framework. All three can be seen as changing the way that environmental change influences the drivers of migration. This chapter considers policies that seek to reduce the need for migration and highlights the particular importance of addressing the way environmental change influences especially ecosystem services, exposure to hazard and economic drivers.

These policies fall into three categories:

- The first seek to slow the rate of environmental change, for example by reducing the human forcing of climate change (i.e. climate change mitigation) or measures to reduce the degradation of ecosystem services.
- The second focuses on adapting to any environmental change through improved capability to respond to hazardous events and the consequences of degrading ecosystem services, for example by improving prediction and preparedness, implementing physical protection measures for a changing climate or reducing exposure to loss.
- The third group consists of measures to increase resilience to loss, through enhancing livelihoods and providing insurance and social protection.

The approach of reducing the need for migration influenced by environmental change can be seen as a strategic response to certain human mobility outcomes and their impacts. These outcomes have been identified in Chapter 4 and are recorded in Table 6.1 below.

Table 6.1: Reducing the influence of global environmental change on migration as a strategic policy response to important human mobility outcomes

Mobility outcome (as identified in Chapter 4)	Impacts of movement for different sectors	Strategic policy response
Migration with operational challenges (M1)	If managed badly, can have negative results for urban planning and land use, provision of health and education, human security and social protection and vulnerability to environmental change	Reduce the influence of environmental change on drivers of migration
Migration with geopolitical challenges (M2)	Likely to be negative for community relations and tension, conflict, human security and social protection	
Displacement with operational challenges (D1)	Likely to be negative for economic growth, the legitimacy of government, human security and social protection and health.	
Displacement with geopolitical challenges (D2)	Likely to be negative for human security and social protection, development, health, legal status of nation and citizens, and subsequent protection and conflict.	

A wide range of existing policy measures are designed to address global environmental change, and are sometimes alluded to as important in reducing migration or displacement⁴¹¹. Whether they will be effective is unclear. However, given that their main focus is not reducing migration *per se*, but rather to reduce disaster risk, enhance development and alleviate poverty, manage rural land, and adapt to and mitigate climate change, these diverse sets of policies are clearly necessary for the implementation of sustainable development in their own right. Most measures are top down and 'state led' or rely on the state providing a framework for individual action, but others, particularly in the third group (measures to increase resilience to loss), can be 'bottom up' and respond to the actions of individuals. In this chapter it is argued that these environmental and development policies are unlikely to have significant *additional* outcomes in reducing migration, at least in the short term, although they may reduce risks to populations exposed to short-term displacement, and have impacts on migration levels in the long term.

A key challenge for their implementation is the uncertainty surrounding the likelihood and scale of anticipated environmental change in particular places. Table 6.2 provides examples of policy measures in all three groups which are applicable to the three ecological regions used in the project: drylands, low-elevation coastal zones and mountain regions. It demonstrates how a strategic mix of different policies can be deployed to achieve resilience to uncertainty in different environmental contexts. How these policies will be affected by the uncertainty of different future scenarios is considered in the final section of this chapter.

411 Some NAPAs include measures to reduce the impacts of environmental change in order to lessen pressures on migration – see DRI3 (Annex D refers); Martin (2010).

Table 6.2: Examples of policy responses to reduce the need for migration influenced by environmental change relevant to the three study ecological regions

	Ecological region		
Type of policy	Low-elevation coastal zones	Drylands	Mountain regions
<i>Slowing the rate of change</i>			
Climate mitigation policy	Reduce emissions of greenhouse gases		
Land degradation	Reduce loss of coastal wetlands and forests through conservation laws	Reduce or reverse deforestation through land management practices Management of soil erosion through structural measures and planting	Reduce or reverse deforestation through land management practices
<i>Reducing the impacts of environmental change</i>			
Managing the impacts of events	Tropical cyclone forecasting	Drought forecasting	Flood warning
Structural measures to protect against events	Coastal flood protection Erosion management	Flood protection Provision of rural water supplies	Flood protection
Non-structural measures to reducing exposure	Land-use planning Introduction of saline-resistant crops	Land-use planning Introduction of drought-resistant crops and agricultural practices	Land-use planning
<i>Promoting long-term resilience to environmental change</i>			
Enhancing livelihoods	Developing sustainable fisheries Provision of infrastructure and services	Agricultural development Provision of infrastructure and services	Agricultural development Provision of infrastructure and services
Insurance	Community-level insurance	Micro-insurance	Micro-insurance
Social protection	Cash transfers Government-subsidised index insurance	Cash transfers Government-subsidised index insurance	Cash transfers Government-subsidised index insurance

6.2 Slowing the rate of change: curbing climate change and reducing environmental degradation

Climate mitigation is a high and urgent policy priority globally and for all countries (see Box 6.1). Climate mitigation policies are unlikely to have a significant effect on how environmental change influences the drivers of migration before 2030. However, early implementation is necessary to reduce climate impacts in the longer term, and thereby avoid potential large-scale disruption of economies and settlements, and consequent implications for migration patterns and flows.

This first group of measures seeks to slow the rate and impact of global environmental change by reducing the magnitude of future climate change through limiting future emissions of GHGs (climate change mitigation) or by slowing the rate of degradation of ecosystems and their provisioning, regulating, cultural and supporting services (see Table 6.2 for examples).

A growing number of studies have assessed the potential effect of climate mitigation policies on future climate change, by considering the reduction in emissions necessary to achieve a defined climate policy target or, conversely, the effects of specific emissions policies on the extent of future climate change

which can be expected⁴¹². These studies suggest that, unless the emission gap can be reduced by 2020, and strong mitigation achieved afterwards, the chance that the global average temperature increase can be limited to less than 2°C falls. This is shown in Figure 6.1, in which the Case 1 scenario assumes that nations meet only their lowest stated ambitions whereas the Case 2 scenario assumes that nations meet their highest stated ambitions. More significantly for considering the 2030 time period, owing to inertia in the climate system, the effects of mitigation policy on climate change will become more pronounced after the 2050s.

Box 6.1: Climate mitigation policy and the UN Framework Convention on Climate Change

International climate change mitigation policy is steered by the UN Framework Convention on Climate Change (UNFCCC), which entered into force in 1994. This requires signatories to stabilise GHG concentrations 'in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner'⁴¹³. The Kyoto Protocol, signed in 1997, commits signatories to reduce emissions, and the Copenhagen Accord, agreed in 2009, aims to keep global emissions within levels to limit global average temperature increase to within 2°C above pre-industrial levels⁴¹⁴. Migration is not considered explicitly in the Convention text as an element of sustainable development, although it is recognised in the Cancun Accord as a potential adaptation measure in the face of climate change (see Chapter 9).

Although there have been many impact studies using different 'business as usual' emissions futures, only very few studies have examined explicitly the implications of climate policy for the impacts of climate change. Estimates of 'avoided impacts' depend to a certain extent on assumptions about future growth and unmitigated change, and exactly how climate change is manifested. What evidence there is shows that, by the middle of the twenty-first century, an aggressive mitigation policy (with a high likelihood of limiting the global temperature increase to 2°C) may reduce the numbers of people exposed to increased coastal flooding by around 20%⁴¹⁵, reduce the area with a decline in suitability for growing crops by around 17%⁴¹⁶, and reduce the numbers of people living in adversely affected water-stressed areas by approximately 17%⁴¹⁷. However, there is likely to be considerable regional variability in avoided impacts. Climate mitigation policy is therefore unlikely to slow the rate of climate change sufficiently to affect the drivers of migration over the next 20 years, but may begin to have an effect by the 2060s. The earlier action is taken to reduce emissions, the greater will be the avoided impacts of climate change over the longer term and the greater the effect on the drivers of migration in the second half of the twenty-first century.

412 See Washington *et al.* (2009); Rogelj *et al.* (2010); den Elzen *et al.* (2011).

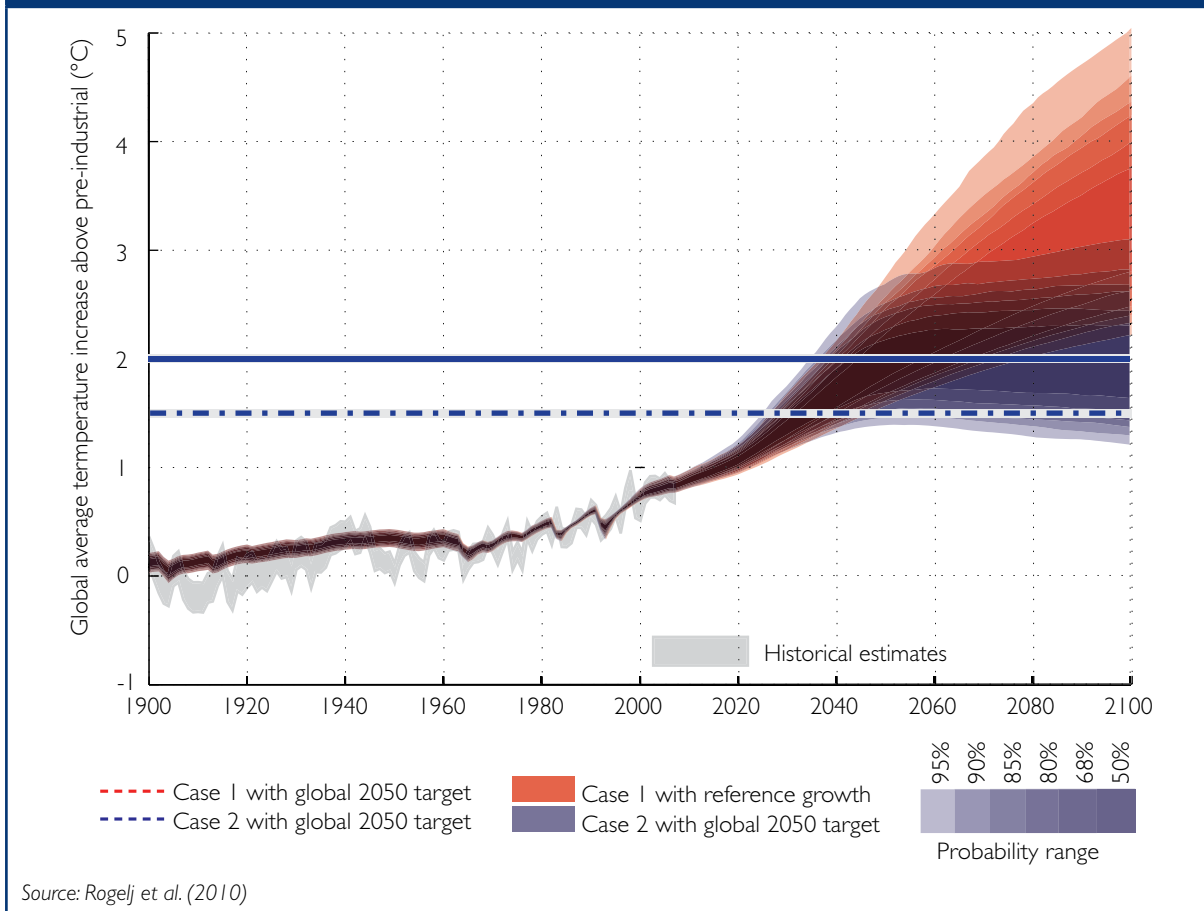
413 UNFCCC (1992).

414 UNFCCC (1998, 2009).

415 See MR9 (Annex D refers).

416 Warren *et al.* (2010).

417 Arnell *et al.* (2011).

Figure 6.1: The effect of the Copenhagen Accord on global average temperature through the 21st century

Slowing the rate of land degradation is likely to have a more immediate effect on the drivers of migration, though the benefits in terms of migration are uncertain and will vary from place to place.

There is a long history of land management projects designed to slow or reverse the effects of land degradation and to maintain ecosystem services. In poorer regions, these policies are primarily aimed at sustaining livelihoods, although they may be targeted at preventing adverse downstream consequences, for example flooding. A range of soil conservation measures have been implemented, for example within the Loess Plateau area of China, under a series of programmes⁴¹⁸ to reduce soil erosion. The UN Convention to Combat Desertification⁴¹⁹ provides a global context for land degradation policies focused on dryland regions, although the way in which this Convention is implemented locally has a significant impact on its effectiveness⁴²⁰.

However, although there have been many studies examining the environmental effects of land management policies, there is less evidence on their impacts on rural livelihoods, and therefore on the drivers of migration. What empirical evidence does exist suggests that the actual benefits for livelihoods are variable and dependent on local context and, often, the characteristics of individual participants and households.⁴²¹ Data from China's Sloping Land Conversion Program in the Loess Plateau area, for example, showed that political leadership and extent of participation had significant impacts on households⁴²², whereas in the Jos Plateau in Nigeria, the extent of agricultural extension services was an important determinant of impact⁴²³. Policies to reduce land degradation or mitigate climate change may have unintended consequences for migration and displacement (Box 6.2), stressing the need for good planning and decision-making around resettlement (see section 8.2).

418 Chen et al. (2007).

419 See, for instance, <http://www.unccd.int/>.

420 Stringer et al. (2007).

421 See Yila and Thapa (2008); Yao et al. (2010).

422 Yao et al. (2010).

423 Yila and Thapa (2008).

Box 6.2: Potential unintended impacts of land degradation policy and climate mitigation policy on migration and displacement

It is possible that climate change mitigation could have unexpected consequences which affect migration. Large-scale hydropower and biomass production, undertaken as part of a policy to increase the use of renewable energy sources, could result in the forced displacement and resettlement of vulnerable populations in certain contexts⁴²⁴. In addition, ambitious targets for biofuel production could directly influence migration by providing opportunities for employment and the diversification of smallholder income, and also indirectly by restricting livelihoods and increasing food insecurity⁴²⁵. REDD+ refers to activities that reduce emissions from deforestation and degradation, plus the sustainable management of forests and carbon stocks, and is a key component of global climate policy developed in the 2010 Cancun Agreement. The nature and scale of REDD+ projects will vary from case to case and the potential for either displacement out of project areas or, conversely, improvement in security of livelihood is difficult to generalise. There is also limited robust empirical evidence on likely impacts⁴²⁶. The Cancun Agreement includes text safeguarding the rights of indigenous communities, so in principle measures taken should produce minimal involuntary displacement. However, there may be increased risks if governance is weak or if the concept of livelihood displacement is not sufficiently respected⁴²⁷.

Just as migration resulting from environmental change is multi-causal and complex, so is migration resulting from policies to mitigate environmental change. Mitigation policies could influence migration, for example by changing the net expected income differentials between areas of origin and destination, disrupting the livelihoods of households reliant on natural resources, modifying direct transport costs and altering returns to human capital⁴²⁸. A more sophisticated approach that mirrors the conceptual framework of this project is, therefore, one that looks at the effect of low-carbon policies on the *existing* drivers of migration.

On the one hand, the sheer size of the developing world population dependent on agriculture and forestry raises concerns that poorly designed and implemented policies to increase low-carbon energy supply and improve carbon sequestration could, paradoxically, displace the livelihoods that mitigation policy is intended to protect. On the other hand, low-carbon policies have the potential to improve the access of rural areas in the developing world to energy, which could have a significant influence on future migration by modifying pathways to development. The precise influence of mitigation policy on migration is therefore difficult to determine.

6.3 Reducing the impacts of environmental change, including through adaptation policies

Many measures to reduce the impacts of environmental change through disaster risk reduction, humanitarian response and adaptation to climate change could have additional implications in terms of reducing displacement and migration.

This second group of measures focuses on reducing the impacts of a changing environment on life and livelihood (see Table 6.2 for examples). These impacts may arise from changes in rapid-onset events, the slow evolution of longer-term events or the deterioration of ecosystem services. These measures are typically framed within the context of disaster risk reduction, humanitarian response, drought management and adaptation to climate change. Many, particularly those focused on disaster risk reduction, include benefits of reduction of short-term displacement of populations as a result of extreme events. Investments aimed at avoiding and minimising risks are often more effective than structural

424 WP3 (Annex D refers).

425 DRI15 (Annex D refers).

426 Caplow *et al.* (2011).

427 Cernea (2006); Sutter and Parreno (2007).

428 DRI15 (Annex D refers).

measures, including being effective in minimising disruptive migration. The actions can broadly be allocated to three categories.

- actions that concentrate on the event itself, for example floods or drought, and including such measures as forecasting, dissemination of warnings and emergency response (see section 6.3.2);
- actions that seek to reduce the physical impacts of anticipated environmental change, through for example structural flood protection works or the provision of systems to supply water during drought conditions;
- actions that aim to reduce exposure to the event, through measures such as spatial planning, building controls and the use of agricultural practices that are less vulnerable to drought (these latter two bullets are covered in section 6.3.3).

Existing policies are becoming more attuned to future global environmental change, but this is currently not the case for migration and displacement.

The existing situation is that these policies currently have wide application in the management of environmental events, such as flooding or droughts, which occur as part of 'normal' climate variability. Considerable investment and effort is currently under way, for example in the areas of disaster risk reduction⁴²⁹ and drought management⁴³⁰. However, global environmental change complicates existing policies in a number of ways. First, it creates additional threats, most specifically due to rising sea levels, particularly in low-elevation coastal zones, and thus potentially introduces new threats to an area. Secondly, it changes the level of risk to which an area is exposed, and hence the justification for action. Thirdly, it adds *additional* uncertainty to the assessment of threat, challenging the planning and implementation of policies. Explicit planning for reducing impacts under changing environmental conditions does occur, but is currently the exception⁴³¹.

The literature on disaster risk reduction, drought management and adaptation to climate change is large and increasing. There are numerous examples of both actual and potential policies, a number of frameworks for assessing options and policies, and an increasing awareness of the factors which influence success and effectiveness. As with climate and land degradation policy, these efforts are rarely explicitly based on a policy objective of affecting migration, although, as noted above, some NAPAs do. The discussion here focuses on measures that address major and widespread environmental events that are likely to have the greatest potential effect on migration and displacement, and which are more likely to occur under future scenarios of environmental changes (see Chapter 2).

6.3.1 Forecasting, warning and humanitarian emergency actions

Forecasting, warning and humanitarian emergency actions will become increasingly important in reducing threats to livelihoods and the risk of displacement in future environmental change, especially for climate-related changes. However, although forecasting is improving, there are inherent limitations which mean that it will not always be possible to avoid all impacts, especially in those low-income countries that are vulnerable to climate change, and where investment in forecasting skills and infrastructure may be problematic.

The first type of policy focuses on forecasting, warning and humanitarian emergency actions taken before, during and after an event, whether rapid onset or slow onset. The aim of such forecasting is to improve security, lessen threats to livelihoods and reduce the risk of displacement. Indeed, both Tuvalu and Mozambique include measures to enhance forecasting and disaster response within their NAPAs, with the aim of reducing pressures on displacement⁴³². Forecasting operates at different timescales, ranging from hourly to seasonal and, in principle, decadal. Thus:

Short-term forecasting (i.e. over hours or days) is currently widely used to predict the onset of floods and storms, with varying degrees of success depending largely on the availability of data and models for the interpretation of data and the inherent short-term predictability of weather. Skills in forecasting are

429 See, for example, <http://www.unisdr.org/>.

430 See, for example, <http://www.unep.org/>.

431 Corfee-Morlot et al. (2011).

432 DRI3 (Annex D refers).

increasing; for example, there is evidence that the 2010 Pakistan floods were predictable with a lead time of 6–8 days⁴³³, but inherent predictability varies between regions.

Seasonal climate forecasting has a lead time of several months, and is used to predict both the development of slow-onset events (such as droughts) and the likelihood of experiencing rapid-onset events in the future (for example, the number of tropical cyclones during an upcoming cyclone season). Seasonal forecasting relies on the identification of the atmospheric and, particularly, oceanic conditions which precede anomalous climatic events, and does not work where events are driven by short-term phenomena. Seasonal forecasting is currently most effective when used to consider events associated with ENSO (El Niño/Southern Oscillation), an atmospheric and oceanic anomaly in the Pacific with wide-reaching global consequences⁴³⁴. Forecasts of ENSO conditions can now be made with a 2-month lead time, based on sea surface temperatures in the eastern Pacific Ocean, and contingent forecasts for rainfall anomalies in South Asia, Australia, South America and parts of Africa are based on the forecast ENSO. The skill of these forecasts linking ENSO with regional rainfall is improving, but there are major scientific challenges in increasing the lead time for ENSO forecasts⁴³⁵. Seasonal forecasts of the strength and characteristics of the South Asian monsoon, a major driver of floods and droughts, are also improving, but the monsoon is influenced by a variety of factors (including ENSO) operating together⁴³⁶.

Decadal forecasting has a longer time horizon, and is based on understanding the slowly operating drivers of weather and climate. At present, the greatest scope for decadal forecasting appears to be based on the prediction of Atlantic Multidecadal Variability (AMV), which manifests itself in anomalous sea surface temperatures in the Atlantic and is linked with seasonal weather in Europe, West Africa and, in conjunction with other modes of climatic variability, North America⁴³⁷. Future improvements in event, seasonal and decadal forecasting will depend partly on improvements in the collection of data, partly on advances in the understanding of the drivers of anomalous events and partly on improvements in the ability to represent data and processes within models. Significantly, the inherent degree of predictability varies from place to place (for example, forecasting is easier in the tropics) and it is not appropriate to assume that it will ever be possible to predict accurately the onset of all types of events in all places.

Irrespective of improvements in the technical aspects of forecasting and warnings, their success depends on a conducive and efficient sociopolitical context which may not always be in place in countries most vulnerable to climate change.

The ability to forecast is only one component of the mix of policies used to reduce impacts, and indeed may have very little effect unless it is complemented by 'softer' measures. Forecasting and warning systems as well as associated humanitarian responses currently tend to be top down, expert driven and hazard focused, and more advanced for rapid-onset events than for slow-onset events such as droughts⁴³⁸. However, evidence suggests that the existence of a process and network for the dissemination of warnings, the availability of knowledge and skills within communities and organisations to react to warnings, and the mobilisation of emergency responses are vitally important⁴³⁹. For example, some seasonal forecasts for the Horn of Africa provided early warning of drought in 2011, but do not appear to have triggered a sufficiently early response from a wide enough group of humanitarian actors⁴⁴⁰.

Evidence from existing warning systems demonstrates the necessity of taking a multi-sectoral and interdisciplinary approach, recognising that much action occurs outside of formalised organisational frameworks, and the need for political commitment to implementation once warnings are issued⁴⁴¹. New frameworks being developed under the UN International Strategy for Disaster Reduction (ISDR) are focused on how people use and interpret warnings rather than simply the technologies of hazard prediction, and therefore offer greater potential for leading to actual benefits in terms of reduced impacts

433 Webster et al. (2011).

434 SR4a (Annex D refers); SR6 (Annex D refers); See C6 of Foresight (2011a).

435 SR4a (Annex D refers).

436 SR6 (Annex D refers).

437 DR6 (Annex D refers).

438 SR4b (Annex D refers).

439 DFID (2011).

440 The Economist (2011).

441 SR5 (Annex D refers).

on security and livelihoods. For example, clear warning systems backed up by rehearsed evacuations and prepared response plans that involve wide public participation are more likely to be effective than systems based on warning alone.

6.3.2 Policies that seek to protect places at risk through infrastructure or through reducing exposure to the event

Measures to reduce loss through providing protection or by reducing exposure have the potential to lessen the impact of environmental change on the drivers of migration. However, they cannot eliminate the effect completely; it is neither possible nor practical to remove all loss.

Important policy measures are aimed at reducing the impacts of environmental change by altering the physical impact of events. They include structural flood protection works, for example along coastal areas or along rivers, measures to prevent riverbank erosion and measures to alleviate the effects of drought through the provision of dry-season water supplies. Structural measures include infrastructure and planning and are typically implemented where there are significant populations and economic assets at risk, for example in urban areas.

There are a series of problems with such measures. First, there may be significant technical challenges, limiting the options which are available. Second, it may be difficult to attract funding or produce cost-effective designs: this applies not only to public works but also to actions implemented by individuals or small groups (for example small farmers in Ethiopia and South Africa)⁴⁴². Third, structural options tend to benefit specific sections of a community and may have 'downstream' consequences that challenge the livelihoods of others. Fourth, flood protection measures may encourage communities to remain, and indeed further develop, in hazardous places. This may in the longer term lead to increased losses as events increasingly exceed design standards. Finally, and most pertinently here, uncertainty surrounding climate and environmental change makes it more difficult to plan efficiently, evaluate structural measures and guarantee that they will provide the desired level of protection; methodologies need to be developed to incorporate uncertainty in planning and design more effectively.

Policy measures can also lessen the impact of events and changes in ecosystem services by reducing the exposure to loss ('non-structural' measures). For floods and storms, this takes the form of reducing development in hazard-prone locations, improving the resistance of structures to loss and providing refuge sites. Different combinations of measures are suitable in different circumstances. In Bangladesh, for example, it is impractical to restrict development in flood-prone locations, and so a network of refuge sites has been constructed to help reduce the impacts of flooding⁴⁴³. Measures to reduce the exposure of farmers to loss of production due to floods, water shortage or salinity include changes to cultivation practices, soil improvement measures and the use of different crop varieties⁴⁴⁴, supported through agricultural extension activities. Bangladesh and Guinea Bissau both include in their NAPAs measures to combat salinisation impacts and practices to reduce migration pressures⁴⁴⁵.

Inevitably, however, there are challenges with implementing 'non-structural' approaches. For example, many of the actual decisions and actions are taken at the individual or household level. Outcomes may be difficult to predict, and decisions will be driven by a range of context-specific circumstances; the policy levers can therefore be difficult to identify. Avoidance of development in hazardous locations can be very difficult to manage and sustain. For example, Mozambican farmers perceived the risk of inhabiting highly productive farmland in high-risk floodplains to be lower than the risk estimated by those formulating the relevant policy, leading the farmers to ignore warnings of threats⁴⁴⁶. In many expanding urban areas, illegal development frequently occurs in areas set aside because of high risk of environmental hazard⁴⁴⁷. Land access, tenure rights and inheritance practices influence significantly the ability of individuals and households to make land-use and property decisions⁴⁴⁸. In general, measures to reduce the impact of

442 Bryan *et al.* (2009).

443 CS4 (Annex D refers).

444 See SR10 of Foresight (2011a) for an overview of measures to improve yield in water-limited areas.

445 DRI3 (Annex D refers); Government of the People's Republic of Bangladesh (2005); Government of Guinea-Bissau (2006).

446 Patt and Schröter (2008).

447 Bull-Kamanga *et al.* (2003).

448 Foresight (2011a).

environmental risks through planning and risk avoidance are typically more robust to uncertainty than measures that aim to alter the environment through infrastructure (planning and avoidance measures, for example, do not require precise estimates of future hazard for design purposes or evaluation of performance). However, it is clear that there are inevitably limits to the effectiveness of both classes of policy, meaning that it is also important to build the resilience of communities to environmental change to enable long term adaptation.

6.4 Promoting long-term resilience to environmental change

Policies that focus on reducing the impacts of environmental events must be complemented by strategies to build the long-term resilience of communities.

The third group of policies identified here seek to address the effects of environmental change by increasing the resilience of individuals, households and communities to changing conditions to reduce pressures on them to move. Resilience is defined in terms of the ability of a system to absorb shocks and regenerate after a disturbance⁴⁴⁹, and was identified by, for example, the Ashdown Review of UK humanitarian response as a key component of a proactive approach effective at minimising the impact of environmental events⁴⁵⁰. Policies to promote resilience can be considered climate ‘adaptation’ policies in the broader sense in that increased resilience is likely to mean that the impacts of future environmental change can be better withstood. Policies to support resilience tend to originate from strategic goals relating to development and poverty alleviation (often related to the achievement of Millennium Development Goals), but there is a growing interest in their potential for disaster risk reduction. There are two specific areas of policy which have most relevance to migration: enhancement of livelihoods and insurance. These policies typically do not have a specific objective of *reducing* migration⁴⁵¹, and although some may well achieve this, others will not.

6.4.1 Enhancement of livelihoods

Measures to enhance livelihoods are likely to lead to long-term resilience of communities. However, this may not necessarily result in less migration because *migration is often the most effective approach to enhancing livelihoods and securing resilience.*

It was shown in Chapter 3 that livelihoods are fundamental to migration decisions. If environmental change affects livelihoods, then migration may result as it can represent alternative means of securing income. The broad area of livelihood enhancements has a strong focus on the rural environment. Policies include measures to support farmers not just by changes to agricultural practices, but also by improving access to markets and income diversification⁴⁵². An expanding literature is assessing the effectiveness of policies on enhancing livelihoods⁴⁵³ (but not specifically on effects on migration), mostly in dryland environments. As always, the detailed options and conclusions are dependent on the local context. In one study in Botswana, different parts of the community adopted different approaches; some diversified, whilst others specialised and accumulated assets, and yet others relied on providing labour⁴⁵⁴. Many of these initiatives can be triggered by ‘bottom-up’ community-based initiatives⁴⁵⁵. The provision of small amounts of credit in the form of micro-finance is playing an increasingly important role in interventions to support and enhance livelihoods, aimed at allowing farmers to invest in agricultural development and diversification. There is some evidence that micro-finance does alleviate rural poverty in particular settings⁴⁵⁶, but the overall evidence is at best weak and highly disputed⁴⁵⁷. In any case, the effect of micro-finance varies between members of a community⁴⁵⁸.

449 See, for example, Miller *et al.* (2010); Turner (2010).

450 DFID (2011).

451 There are examples, however, such as Mali’s NAPA, which proposes to diversify activities of fishing communities to reduce migration pressures (DR13 (Annex D refers)).

452 See C5 of Foresight (2011a).

453 Davis *et al.* (2010); Mertz *et al.* (2011).

454 Sallu *et al.* (2010).

455 See C5 of Foresight (2011a).

456 See Swain *et al.* (2008); Berhane and Gardebroek (2011); Mertz *et al.* (2011).

457 Armendáriz de Aghion and Morduch (2005); Duvendack *et al.* (2011); Morduch (2011).

458 Young (2010).

Taken together, the limited research on the effectiveness of measures to enhance livelihoods implies that their effectiveness will be difficult to predict, and that policies will need to be tailored to local circumstances. There is, moreover, little evidence on the impact of such measures and policies on migration, and the evidence that does exist suggests that effects will be complex. In the Chitwan area of Nepal, for example, improvements to local infrastructure and services to support local livelihoods initially reduced outmigration, but in the longer term led to increased migration away from the area⁴⁵⁹. Furthermore, there is evidence to suggest that migration is often a very important component of the package of responses to enhance livelihoods and build local resilience in communities⁴⁶⁰. For example, a study in Ghana found that income diversification through non-farm activities such as trading and handicrafts was the most widely used measure for enhancing livelihoods after outmigration⁴⁶¹. Indeed, migration – and in particular the tools, such as training and skills, to make migration successful – can be considered a ‘transformational’ adaptation strategy, as opposed to just ‘improving’ the coping of a community in particular vulnerable areas⁴⁶². The role of migration in enhancing livelihoods and building resilience in light of environmental change is explored in Chapter 8.

6.4.2 Provision of insurance and social protection

The wider provision and uptake of insurance is a potential strategy for building the resilience of individuals, households and communities, but it faces major implementation challenges. This means that effective social protection schemes are required to offer livelihood protection but also that migration and remittances remain an important alternative to insurance provision.

Insurance is widely used in high-income countries to support individual and organisational recovery from events, although perils covered, insurance penetration and degree of government involvement vary from country to country. Insurance is also increasingly used in low-income environments, particularly for protection against agricultural losses⁴⁶³. This often takes the form of index insurance, in which payouts are based on the value of some weather-related index (for example rainfall deficit) at a defined location, rather than indemnity insurance, which is based on the actual value of loss. This is administratively much simpler, although there is the risk for policy holders that they do not necessarily receive payments in the event of loss. Several nations, including Ethiopia and the Caribbean Island states, have recognised the need for catastrophe insurance at the national or regional level⁴⁶⁴. Index insurance schemes directly targeting farmers are in operation in India and are being piloted in many more countries⁴⁶⁵.

For the provider, a major challenge is the estimation of the risk premium to be charged to customers, particularly in the face of uncertainty over the changing likelihood of an event occurring⁴⁶⁶. Index insurance premiums tend to be set on an annual basis (although for commercial reasons are unlikely to vary much from year to year), so whilst climate change, for example, may not be directly relevant in rate setting, technical improvements in seasonal forecasting in some places (see section 6.3) may lead to increasingly sophisticated pricing structures. Index insurance is also potentially valuable at the local community or municipality scale, to cover the costs of recovery from rapid-onset extreme events⁴⁶⁷. Access to micro-finance also has the potential to help recovery from disaster loss, as for example in Bangladesh⁴⁶⁸, and it has been recommended that recapitalisation of micro-finance institutions is a good use of disaster relief funds after an event⁴⁶⁹.

There are a number of challenges with implementing index-insurance in ways that sustain livelihoods. A key issue lies in translating the need for the product into an actual demand, given a range of factors such as perceptions of risk, affordability of premiums for poor people, the presence of basis risk and trust

459 Massey *et al.* (2010).

460 Ellis (1998); Adger *et al.* (2002); see also Chapter 3.

461 Assan *et al.* (2009).

462 PD23 (Annex D refers).

463 SR14 (Annex D refers); Hazell and Hess (2010); see C5 of Foresight (2011a).

464 Foresight (2011b); PD21 (Annex D refers).

465 SR14 (Annex D refers).

466 Hochrainer *et al.* (2010).

467 PD21 (Annex D refers).

468 Khandker (2007)

469 Poston (2010); PD21 (Annex D refers)

in financial institutions⁴⁷⁰. Most careful impact evaluation studies have shown that uptake of these products is low at present, and the poorest do not buy these products, and the evidence points to a poor understanding of insurance, basis risk, high cost and trust as key constraints⁴⁷¹. Thus, the development of a private insurance market tailored to the poor to deal with climatic risk in agriculture still seems far off. Even if insurance against risk is pursued, support from relevant governments may be necessary to encourage uptake, and to support the providers of index insurance through, for example, the provision of reinsurance⁴⁷².

For this reason, the alternative approach of providing insurance as part of a social protection system perhaps holds more promise. One route could be government-supported and -subsidised index insurance, such as the scheme undergoing a large-scale trial in India as a promising alternative to the highly costly National Agricultural Insurance Scheme⁴⁷³. Alternatives could be cash transfers for the poorest populations at times of stress. This approach has gained support amongst many development and humanitarian policy makers⁴⁷⁴. Nevertheless, to offer livelihood protection it needs to be embedded in well-designed and -implemented social protection systems that offer guaranteed support in times of crisis rather than haphazard disaster responses⁴⁷⁵.

Finally, many poor households engage in migration of some family members as part of an income diversification and insurance strategy, with remittances flowing in response to shocks. For example, the insurance motive has been found to be relevant for international migration from Mexico to the USA⁴⁷⁶ and from Nigeria to the USA⁴⁷⁷ and for internal migration in Botswana⁴⁷⁸ and Thailand⁴⁷⁹. It is also reflected in the growth of international remittances in the aftermath of major climate-induced disasters, such as hurricanes or serious droughts. For example, it has been found that international remittances increased after Hurricane Gilbert in Jamaica⁴⁸⁰, and also following weather-related income losses in the Philippines⁴⁸¹. Facilitating the flow of remittances and the use of migration as an insurance strategy offers a useful complement to insurance and social protection provision. This is discussed further in Chapter 8.

6.5 The future resilience of policy: effectiveness in each future scenario

When considering policies for the next 50 years, it is essential to assess them for their resilience across the range of scenarios.

This chapter has reviewed a range of policies which, while designed to deal directly or indirectly with environmental change or its consequences, bear on migration and displacement. Some have the potential to slow the onset of the event, potentially giving people the choice to stay; others focus on forecasting events which are likely to lead to significant displacement; and some are focused on enabling communities to achieve resilience. It has set out the rationale for these policies and explained how they address the challenges identified in Table 6.1 and in Chapter 4. However, throughout this report there is recognition that the influence of environmental change on migration and non-migration is highly contextual, and is likely to have very different outcomes depending on the future socioeconomic and political scenario. This section explores how resilient each policy is to the future, using the scenarios presented in Chapter 2. In particular, Table 6.3, provides an indication of the effectiveness of each broad class of policy for each of the four scenarios. The colours range from dark red, indicating high effectiveness, through white, indicating neutral effectiveness, to shaded grey, which indicates that policies

470 Basis risk is a central design feature in index-based insurance. Payouts are made not on the basis of actual losses sustained by the policy holder; but if the index reaches a particular value, for example if measured rainfall in the local rainfall station falls below a particular level. Basis risk reflects the difference between the actual loss and the loss implied by the index. If a farmer's losses are only poorly correlated with payouts as implied by the index, then the basis risk is high, and the policy is less useful for the farmer. Farmers may sometimes not get payouts even though serious losses are experienced.

471 SRI 4 (Annex D refers).

472 SRI 4 (Annex D refers).

473 SRI 4 (Annex D refers); Clarke *et al.* (2011).

474 Mattinen and Ogden (2006).

475 European Report on Development (2010).

476 Amuedo-Dorantes and Pozo (2006).

477 Osili (2004).

478 Lucas and Stark (1985).

479 Paulson (2003).

480 Wallsten (2004).

481 Yang and Choi (2007).

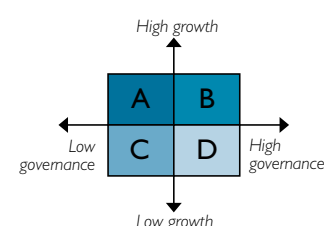
may well be counterproductive. 'Effectiveness' for each scenario is measured against its ability to address the policy challenges highlighted in Table 6.1. The future resilience of each policy is indicated by their effectiveness across the range of scenarios.

Table 6.3: Resilience of policies in affecting migration influenced by environmental change

Type of policy (below)/Scenario (right)	A	B	C	D
<i>Slowing the rate of change</i>				
Climate mitigation policy (2030 timeframe)				
Climate mitigation policy (2060 timeframe)				
Addressing land degradation (2030 and 2060)				
<i>Reducing the impact of environmental change through adaptation (2030 & 2060)</i>				
Forecasting, warning and emergency actions – Short-term forecasting – Seasonal climate forecasting – Decadal forecasting – Warnings and emergency actions				
Protection against events – structural measures				
Reducing exposure – non-structural measures				
<i>Increasing resilience to environmental change (2030 & 2060)</i>				
Measures to enhance livelihoods – (excluding micro-finance, for which there is limited evidence per se)				
Insurance schemes				
Social protection schemes				

Key

	High effectiveness
	Moderate effectiveness
	Neutral effectiveness
	Moderately counter productive
	Highly counter productive



In general, policy approaches which empower the individual are likely to be more effective in different future scenarios, and are thus more resilient.

The effectiveness of **climate mitigation policies** in reducing the migration outcomes identified in Table 6.1⁴⁸² is considered over two time periods, as mitigation policies will begin to affect the impact of environmental change on the drivers of migration only in the second half of the century. Hence there is potential for them to have some effectiveness on the migration outcomes by 2060, in contrast to the situation in 2030. For both time periods, large-scale projects such as hydroelectric dams or deforestation projects (which are more 'top down') that do not involve indigenous populations may cause those populations to be displaced from the land, resulting in negative effects on the migration outcomes in Table 6.1. It must be emphasised that if proper safeguards are taken in terms of protecting the rights of indigenous populations, then these negative effects will be reduced, but these safeguards are less likely to be taken in the fragmented/exclusive governance future scenarios, A and C. **Land degradation** policies exhibit a similar pattern, though their positive impact on the migration outcomes in Table 6.1 can be achieved in a much shorter time frame in Scenarios B and D.

This is a pattern which is also seen with policies orientated towards **forecasting, warning and emergency actions**. Whilst the technical aspects of forecasting appear set to improve in most scenarios, their

482 It is important to emphasise that this report is not considering the general effectiveness of climate policies in meeting other objectives such as GHG targets, sea-level rise or vulnerability of communities. This section is only looking at their impact on the migration outcomes listed in Table 6.1.

implementation and effectiveness is highly reliant on a conducive sociopolitical context – trust in technocrats and political leaders and a sufficient level of preparedness and engagement of the public in the responses to warnings. **Structural measures**, requiring intervention and coordination from the state, are similarly dependent on a strong and inclusive governance context. In poor-governance scenarios, the substantial resources at stake may be subject to corruption and misallocation. Because of the need for these substantial resources, structural measures are also more likely to be successful in scenarios of high growth and thus high availability of funds.

Non-structural measures to reduce exposure are more resilient to a range of scenarios, as they do not rely on heavy state intervention, and, in general, empower individuals and households to take many of the actual decisions and actions involved. Many of the policies aimed at 'increasing resilience to environmental change' display similar patterns of effectiveness in future scenarios as they are equally orientated towards empowering the individual. This is especially the case with measures to **enhance livelihoods** (micro-finance excluded, owing to the disputed evidence on its effectiveness *per se*). Of course, all policies rely on governance to some degree, and **social protection** perhaps more so, as they are regarded as more effective in high-governance worlds. **Insurance measures** also place responsibility with the individual, but are likely to be more effective in the high-growth context, given the difficulties encountered in getting people to purchase these products in very poor settings.

Looking across the range of policies, it is clear that most policies are likely to be effective in addressing the human mobility outcomes identified in Table 6.1 in the 'high-governance' worlds of Scenarios B and D, and especially where that governance is complemented by high growth (Scenario B). The real test of future resilience is provided by the poor-governance scenarios, A and C, and it is clear that policies that rely on heavy state intervention are less likely to be effective in these scenarios. Policies that focus on empowering the individual, including non-structural measures and measures to enhance livelihoods, and to a lesser degree insurance and social protection, are most effective in a range of scenarios and are most future resilient by these measures.

6.6 Conclusion

Policies to address the impact of environmental change on the drivers of migration are extremely unlikely to eliminate all migration influenced by environmental change. Policies will also be required to plan for and respond to migration influenced by environmental change, which is inevitable.

This chapter has reviewed a range of measures that may reduce migration and displacement influenced by environmental change. Different strategic approaches may be effective in different circumstances, for example well-rehearsed evacuation plans are more appropriate for rapid-onset events such as storms and floods, whereas measures to enhance resilience will empower communities in the face of slow-onset events, such as droughts, but will also strengthen the ability of communities in the face of rapid-onset events.

However, regardless of the future state of the world, measures which have the effect of reducing the impact of environmental change on the drivers of migration will not prevent all environmentally influenced displacement and migration.

- Over the time period considered in this report, climate change policy will have limited effects on the way environmental change affects the drivers of migration, and then only towards the end of the period.
- Policies focused on land degradation may be effective but, depending on nature of future scenarios for local regional and global governance, could also result in additional migration and displacement if not implemented correctly.
- Technical improvements in environmental forecasting have been achieved, although this is variable across countries and ecologies. However, the effectiveness of forecasting is also highly dependent on the sociopolitical context, which is much more variable.

- Infrastructure and non-structural measures are important, but can never eliminate all physical or social impact of disasters. In particular, institutions, particularly those in low-income countries, may have limited capacity in terms of financial and human capital to implement measures. In addition, uncertainty in changes in environmental drivers in the future can make it difficult to plan and evaluate certain types of policy measures. This is a particular problem for structural measures to reduce the impacts of environmental change, and less of a problem for measures which seek to increase household and community resilience and alleviate poverty.

Policies which recognise that migration influenced by environmental change is inevitable, and must be planned for (and responded to), are considered in the next chapter.

As the impact of environmental events can never be totally eliminated, it is just as important to build the resilience of future communities through measures to enhance rural livelihoods and provide insurance and social protection. Migration can actually be a very effective part of this strategy, and policy makers should consider migration as a future adaptation to environmental change.

As reports such as the Ashdown Review have recently argued, an effective way to reduce the impact of future environmental change is to build the resilience of households and communities at the outset⁴⁸³. This chapter has considered two particularly promising approaches to doing this: measures to enhance livelihoods and to provide insurance. However, an exploration of the evidence shows that, in fact, migration is often a very effective strategy to both enhance livelihoods and provide insurance. The potential for migration to be adaptation to environmental change is considered in Chapter 8.

483 DFID (2011).



7 Planning for and responding to migration influenced by global environmental change

Key messages

This chapter is based on the premise that policies to reduce the influence of environmental change on the drivers of migration can, ultimately, never entirely eradicate migration, and thus there is a need for policy makers to consider approaches that can be taken to plan for the relevant human mobility outcomes. Different mobility outcomes require different approaches. In particular:

- There are protection gaps for populations who experience displacement influenced by global environmental change. Yet a global governance framework for 'environmental migrants' is highly unlikely to be a 'silver bullet'. Rather there should be a focus on what existing international processes and fora can deliver; and specific protection gaps should be addressed in these places.
- Cities are faced with a 'double jeopardy' future: they must respond to swelling populations, whilst also experiencing increased threats from future environmental change. Migrants, in particular, are likely to be vulnerable, yet the focus of policy makers should *not* be on stopping rural–urban migration. City planning needs to be much more strategic in its appreciation of future environmental hazards and population size, whilst a particular focus is required on the vulnerability of new migrants.
- The environmental change–migration–conflict nexus is complex, non-linear and context specific. However, it is clear that strategic priorities must include a focus on urban tension and conflict, which will largely occur in cities, and a focus on populations which are trapped in circumstances of poverty, conflict and environmental change.

7.1 Introduction

Chapter 6 examined a range of policy options that might contribute to reducing the extent to which future environmental change leads to migration, by slowing environmental change, reducing its impact or enhancing resilience. However, despite the value of policies in each of these areas, a significant likelihood remains that migration influenced by environmental change will grow as a policy issue in both the medium and long term. The challenges that it will raise demand serious attention in terms of public policy. These policy challenges cannot wait for further precision on the numbers that might be involved, or the precise directions that migrants might move. This chapter explores the range of potential responses to migration and displacement influenced by environmental change, and considers ways of mitigating its impact.

The first two columns of Table 7.1 below highlight the human mobility outcomes of relevance and their implications for policy makers. The third column shows how planning for and responding to these challenges is an appropriate strategic policy response (in parallel with strategies to reduce the impact of environmental change on the drivers of migration, outlined in Chapter 6, and policies to promote migration as adaptation, described in Chapter 8).

Table 7.1: Planning for and responding to migration influenced by environmental change as a strategic policy response to important human mobility outcomes

Mobility outcome (as identified in Chapter 4)	Impacts of movement for different sectors	Strategic policy response
Migration with operational challenges (M1)	Can have negative results for urban planning and land use, provision of health and education, human security and social protection and vulnerability to environmental change, if not managed appropriately	Accept that this migration will occur: plan for and respond to urbanisation and increased routine migration
Migration with geopolitical challenges (M2)	Likely to be negative for community relations and tension, conflict, human security and social protection	Accept that this migration will occur: plan for and respond to conflict and tensions in rural and urban areas likely to receive migrants
Displacement with operational challenges (D1)	Could be negative for community relations and tensions, conflict, human security and social protection	Plan for and respond to displacement by addressing assistance needs
Displacement with geopolitical challenges (D2)	Likely to be negative for human security and social protection, development, health, legal status of nation and citizens and subsequent protection and conflict	Plan for and respond to displacement by addressing protection gaps
Unable to leave (trapped – S2)	Likely to be negative for human security, health, development, adaptation and vulnerability to environmental change and displacement	Plan for and respond to <i>immobility</i> , including possible humanitarian needs

This chapter is organised into three principal sections. The first considers governance issues that are likely to be raised if environmental change contributes to increasing levels of displacement, either internally within countries or across national boundaries. This report has suggested that displacement of a kind that raises 'geopolitical' policy challenges (termed 'D2' in Chapter 4) is particularly likely to grow if legal channels for migration and circulation are shut off, and populations effectively remain trapped in places which are vulnerable to global environmental change. This section therefore focuses on the protection gaps that are likely to emerge as such D2 displacement occurs, and which will need to be addressed by state action, although even displacement which raises 'operational' policy challenges (termed 'D1' type displacement in Chapter 4) may raise significant issues of emergency preparedness and response. It also briefly considers emerging global governance in the fields of international migration and climate change, and highlights the links between the governance of displacement and more routine migration, an issue which is discussed in more detail in Chapter 8.

The second section considers challenges relating to continued and accelerating urban growth, an outcome in which global environmental change will be an important factor. In particular, it discusses the actions that will offer means of mitigating the consequences of increased migration and displacement to urban settings through making cities sustainable and liveable for growing populations. Finally, this chapter considers policy responses required to address tensions and conflicts that may emerge and develop in relation to migration influenced by environmental change, including both urban conflict in destination areas and wider geopolitical conflict. However, it is important to emphasise here that conflict is not simply a potential consequence of migration, but a phenomenon that interacts with migration and environmental change in a way that may substantively change the nature of necessary and effective policy responses.

7.2 Addressing humanitarian needs and protection gaps for displaced populations

There are protection gaps for populations who experience displacement influenced by global environmental change. Yet this report argues that a global framework for ‘environmental migrants’ is highly unlikely to be a ‘silver bullet’, and moreover would neglect key populations at risk.

This section focuses on the humanitarian needs and protection gaps which exist for displaced people whose movement has been influenced by global environmental change. It has been argued extensively that existing human rights and humanitarian law fails to protect those displaced by global environmental change. Yet efforts to protect ‘environmental refugees’ or ‘environmental migrants’ face arguably insuperable definitional challenges. Moreover, there are significant gaps in protection for displaced people more generally. Any approach to protection needs to acknowledge these two issues.

There have been recent arguments⁴⁸⁴ made by academics and advocates for the creation of a new category of ‘climate refugee’⁴⁸⁵. The coverage of such a category could be based on, for example, the following definition:

‘People who have to leave their habitats, immediately or in the near future, because of sudden or gradual alterations in their natural environment related to at least one of three impacts of climate change: sea-level rise, extreme weather events, and drought and water scarcity’⁴⁸⁶.

It has also been proposed by some academics and advocates that this definition could be the basis for a new legal instrument on the recognition, protection and resettlement of people affected by climate change, even to be considered as part of the UNFCCC⁴⁸⁷. It follows that it would relate to planned and voluntary resettlement, and support permanent movement. In contrast to the 1951 Geneva Refugee Convention and its 1967 protocol, which focuses on the individual, some advocates envisage it being organised around groups, for example villages, cities, regions or even entire populations in the case of small island states. The argument put forward is that this approach would see high-income countries bearing the costs as they have been the main cause of the problem while decision-making would give greater weight to low-income countries. There have also been suggestions that the UNDP and the World Bank, which have not hitherto played a role in protection, could implement this instrument⁴⁸⁸.

However, others have argued that the quest for definition of migration linked to climate change or environmental factors is too narrow⁴⁸⁹, an argument endorsed by this report. Chapters 1 and 2 described in detail how migration is a multi-causal phenomenon, how environmental change will affect migration through its effects on other drivers, and how a multitude of drivers and motivations are likely to underlie migration, some of which may be influenced by environmental change and some of which may not. Consequently, any attempt to assess which proportion of a migration ‘decision’ is influenced by environmental change is unlikely to be scientifically credible.

These scientific concerns seem insuperable. However, there are further concerns about gaps in policy for the protection of people who are displaced. Whilst the current set of classification systems for migrants has certain advantages, for example in raising the visibility of groups of migrants who had been ignored, or for determining responsibilities for migrants with different protection and assistance needs, in many cases there also are limitations⁴⁹⁰. In particular, and as the UNHCR has stated, ‘there are protection gaps in mixed flows, especially as regards migrants deemed “irregular” by the authorities who fall outside established protection frameworks, but who otherwise need humanitarian assistance or other kinds of

484 See, for instance, Conisbee and Simms (2005); Williams (2008).

485 The notion of renegotiating the 1951 Geneva Refugee Convention and its 1967 protocol to include ‘climate refugees’ has been mooted by some (see LiSER initiative cited in Boano *et al.*, 2008) though many experts have argued against this idea, as, amongst other reasons, renegotiation may in fact result in the loss of important safeguards (Suhrke, 1994; Castles, 2002). The weight of evidence behind this last perspective is persuasive, and renegotiating the Geneva Convention is given no further consideration in this report.

486 PD16 (Annex D refers).

487 Biermann and Boas (2010).

488 PD16 (Annex D refers).

489 Suhrke (1994); Lonergan (1998); Castles (2002).

490 DR13 (Annex D refers).

protection⁴⁹¹. Agencies may avoid protection responsibilities too easily, or indeed may be denied the opportunity, because of a lack of explicit mandate. Displaced people in territories where the government is unable or unwilling to provide protection may face serious deprivation of their human rights, irrespective of whether they are refugees or internally displaced, whether fleeing conflict, environmental factors, natural disasters or other causes⁴⁹².

To address these gaps, if a global approach to protection of refugees or displaced people is to be put forward, then it should be based on the need of refugees or displaced persons, rather than what has caused them to migrate. Indeed, the project's conceptual framework (Figure 1.3) and the discussion on interactions between the drivers of migration (Chapter 2) show the importance of *not* placing too much emphasis on the role of one particular driver.

A broader focus on 'survival migration' in response to a wide range of factors, including environmental and climate change as well as state fragility, may be one way to capture the complexities of contemporary forced migration and prompt more effective governance responses⁴⁹³. As Chapter 3 showed, the nexus of conflict, migration and the environment in states such as Pakistan and Zimbabwe can lead to increased vulnerability to environmental change magnified by political-economic crises⁴⁹⁴. 'Survival migration' can focus attention on the existential threats that can drive migration and give a sense of the policy challenges linked to such movement. Yet if such a category is to inform laws and institutions, then it needs to place less emphasis on the driver of migration, that is survival, than on the potential harm to the migrant⁴⁹⁵.

There is a multitude of existing international relationships, legal agreements and institutions involved in governance of both migration and environment. The best thing to do is build on these.

An alternative approach could be to seek effective action through the array of *existing* partially overlapping and non-hierarchical institutions⁴⁹⁶. At the international level, the governance systems for climate change, for migration and for displacement are characterised by overlapping legal agreements; distinct fora within which they are discussed; participation by different sets of institutions; rules that can overlap because there is no agreed hierarchy for resolving conflicts; and disaggregated decision making, with agreements made in one forum not necessarily extending to others. This can lead to fragmentation and incoherence. Yet there are also potential advantages, related to flexibility and adaptability⁴⁹⁷.

The Guiding Principles on Internal Displacement are a case in point. Senior decision makers predicted that ostensibly trying to create 'hard law' at a global level to protect IDPs would be, at best, a long and drawn-out process and, at worst, actively counterproductive. Instead they took an innovative approach of developing a set of 'soft' principles through an expert-led consultative process, thereby avoiding the need for negotiation and agreement at state level⁴⁹⁸. The Principles were presented to the UN Commission for Human Rights⁴⁹⁹ in 1998, and have been endorsed by the UN General Assembly⁵⁰⁰. They seek to provide protection from forced displacement, assistance during forced displacement and return, and resettlement and reintegration assistance to:

*'persons or groups of persons who have been forced or obliged to flee or to leave their homes or place of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalised violence, violations of human rights or **natural** or human-made **disasters**, and who have not crossed an internationally recognised State border'*⁵⁰¹.

These Principles offer some scope for development of enhanced protection and assistance to those whose displacement is influenced by global environmental change, in particular displacement with

491 UNHCR (2008).

492 DRI3 (Annex D refers).

493 Betts (2010).

494 DR5 (Annex D refers); CS6 (Annex D refers).

495 McAdam (2010).

496 Raustiala and Victor (2004).

497 Keohane and Victor (2011).

498 Koser (2011).

499 Now the UN Human Rights Council.

500 UN General Assembly (1999).

501 UN Economic and Social Council (1998) (emphasis added).

'operational' challenges, which will usually be internal and for a relatively short duration (referred to as 'DI' in Chapter 4). The appeal of this approach is that the Principles work on the basis that there is *not* a 'clean slate' upon which to build a brand-new framework, and that existing mechanisms offer more potential than ambitious plans for new structures⁵⁰². So, for example, now the Principles exist, a promising avenue is the scope for incorporation of the Guiding Principles into national law, a process that has started to occur in at least 20 countries worldwide, including several countries in drylands, low-elevation coastal zones and mountain regions, where environmental change is likely to have the most impact on drivers of migration⁵⁰³ (as originally shown in Chapter 3). Another promising approach is one taken by the African Union (AU), which, in Kampala in 2009, adopted the AU Convention for the Protection and Assistance of IDPs in Africa. The Kampala Convention, as it is known, is based on the Guiding Principles on Internal Displacement and is an important example of the translation of 'soft law' into 'hard law' at a regional level. Article 4 of the Convention states that 'State parties shall take measures to protect and assist persons who have been internally displaced due to natural or human made disasters, including climate change', and again this represents an important tool in the protection of those displaced because of environmental change, especially those in the DI category.

As with the Kampala Convention, there may be scope for action at regional level in other regions where geographical proximity leads to a heightened sense of interdependence and shared interests. For example, the EU has developed extensive migration and asylum provisions. These include the Temporary Protection Directive (2001), which establishes temporary protection in the event of 'mass influxes' arising from sudden displacement⁵⁰⁴. In addition, as noted in Chapter 3, the EU has also sought to externalise its migration policies to countries in its 'neighbourhood', including the southern Mediterranean⁵⁰⁵. Nonetheless, in the face of an influx of migrants in spring 2011 from Libya and Tunisia, and despite calls from the UNHCR, the EU did not invoke the Temporary Protection Directive and its provisions for solidarity between member states. Indeed, EU action to externalise controls may make it more difficult for forced migrants to secure access to an EU member state and to seek protection⁵⁰⁶.

As this last example demonstrates, although the more piecemeal and disaggregated approaches to governance may provide a real solution to displacement influenced by environmental change, there are still substantial limitations. Indeed, whilst the Kampala Convention holds a lot of promise, it has been ratified by only seven of the African Union's 53 members (as of May 2011) and requires ratification from a total of 15 to enter into force. Furthermore, there are limitations in the Guiding Principles, which include, *inter alia*, the fact that they are non-binding and their diffusion into national legal systems is not, as yet widespread. There are also extensive shortcomings in the institutions charged with implementing them and the exclusion of certain groups, for example non-citizens who are displaced within their host country (for example the tens of thousands of immigrants who were subject to a wave of xenophobic violence and displaced in South Africa in 2008)⁵⁰⁷. The provisions of the Guiding Principles, Kampala Convention and EU Temporary Protection Directive include reference to fast-onset environmental (or similar) but not to slow-onset change. As Chapter 3 showed, there can be situations where populations are displaced by slow-onset changes.

Another particular challenge relates to small island states. Here, there is the clearest case for reassessing the scope for new definitions and structures within the framework for international climate governance.

Scientific projections on sea-level change and related environmental changes (for example floods, storm surges and erosion) show that a number of small island states are threatened by the impacts of future environmental change (see Chapter 3). In particular, these impacts are likely to lead some islands to lose land or may even make them incapable of supporting populations through saltwater intrusion or inundation, or through the impact of ocean acidification on fish stocks⁵⁰⁸.

502 Zetter (2011).

503 These countries include Angola, Armenia, Azerbaijan, Bosnia and Herzegovina, Burundi, Columbia, Georgia, Guatemala, India, Iraq, Liberia, Nepal, Peru, the Russian Federation, Serbia, Sierra Leone, Sri Lanka, the Sudan, Tajikistan, Turkey, Uganda and the USA (Koser; 2011).

504 DRI3 (Annex D refers).

505 CS8 (Annex D refers).

506 PD12 (Annex D refers); CS8 (Annex D refers); DR8b (Annex D refers).

507 CS6 (Annex D refers); Koser (2008, 2011).

508 PD15 (Annex D refers); DRI6 (Annex D refers).

A first step is to consider existing provisions. All island states have Exclusive Economic Zone status, designated under the UN Convention of the Law of the Sea (UNCLOS). Island nations can be more secure in their future trajectories if they can legally secure their marine resources, either through global agreement or through agreements with neighbouring countries, and reduce the uncertainties on rights of abode in the circumstances of 'climate-induced statelessness'⁵⁰⁹. In other words, the governance challenges of displacement and long-term sustainability are already recognised for small island states, and actions can be taken to minimise the political effect of accelerating impacts on these regions.

Ultimately, if many significant populations are displaced within their own country or internationally, or even whole nations are displaced as a result of climate and related environmental stresses, a global solution will be required⁵¹⁰. It is important to consider how these protection gaps can be closed.

Conclusion: the array of existing governance fora and processes should be utilised to address the humanitarian needs relating to those displaced by environmental change. Where protection gaps are identified, these are the appropriate places to address them, and ultimately the discussion should be widened to migration more generally.

To conclude, there is currently no comprehensive, integrated international framework to deal with displacement that is partially or wholly influenced by global environmental change. However, a bespoke framework may not be necessary or even possible. Moreover, even if such a framework does not develop over the medium and long term, this does not mean that there will be no 'global governance' of migration and displacement. There is substantial institutional density and complexity already, as well as important linkages with policies on the global governance of migration, climate change and other areas. Scope exists for building on such developments. This section concludes by highlighting three important developments which offer perhaps the greatest scope for addressing the humanitarian needs, and, where appropriate, protection gaps, for those subject to displacement influenced by environmental change.

First, it is clear from this analysis, and from the evidence presented in Chapter 5 (see Figure 5.1), that effective humanitarian assistance and protection would benefit from stronger inter-agency linkages between policy areas. The UN's Inter Agency Standing Committee (IASC) has developed a 'cluster approach' to humanitarian intervention to coordinate UN and non-UN humanitarian organisations in cases where there is not a clear leadership and accountability chain already established (for example cross-border refugees are already the responsibility of the UNHCR). The UNHCR is a full member, whilst the IOM is a standing invitee, as is the Office of the Special Rapporteur on the Human Rights of IDPs within the Office of the High Commissioner for Human Rights (OHCHR). The cluster approach designates sector leads. The UNHCR takes the lead for 'conflict-induced' IDPs whereas the IOM and the International Federation of Red Cross and Red Crescent Societies (IFRC) lead on internal displacement due to natural disasters⁵¹¹. The cluster approach thus far has focused mainly on providing guidance on risk management in the face of climate change, and the integration of climate risk management in the work of agencies and organisations. This has entailed consideration of preparedness, disaster risk reduction, disaster management and response⁵¹².

Second, a development that could offer scope to enhance the global governance of migration in the context of climate change is the Cancun Adaptation Framework adopted as part of the Cancun Agreements at the 2010 Climate Change Conference in Cancun, Mexico. In particular, Paragraph 14(f) calls upon states to enhance their action on adaptation by pursuing a range of measures, including 'to enhance understanding, coordination and cooperation with regard to climate change induced displacement, migration and planned relocation, where appropriate, at the national, regional and international levels'⁵¹³. The fact that this paragraph includes reference to 'planned relocation' indicates recognition that the issue that policy needs to address might not be migration or displacement *per se*, but those who are unable or unwilling to move without assistance.

509 PD15 (Annex D refers).

510 PD15 (Annex D refers).

511 See One Response (2010).

512 DRI3 (Annex D refers).

513 Full discussion of Paragraph 14(f), and the wider implications of the Cancun Adaptation Framework for migration, can be found in Chapter 9.

Third, since 2007, the Global Forum on Migration and Development has provided a global platform for dialogue and debate on international migration policy and governance, and in 2010 included discussion about the links between migration and climate change. Although such dialogue is unlikely to develop into a global rule-based system to govern international migration, such as exists for trade in the form of the World Trade Organization (WTO), it does nonetheless open a flexible space that embraces both governments and civil society, in which practical solutions to regional and global challenges on migration and global environmental change can be debated, tested and refined.

This section has specifically focused on displacement, in particular the form that has geopolitical challenges (but also including that which has more operational challenges). The progress made by fora such as the Global Forum on Migration and Development and processes such as the Cancun Adaptation Framework indicate progress towards a longer-term governance solution to all forms of migration that are influenced by environmental change, including displacement. These institutions can promote more dialogue and cooperation between countries on migration *more broadly* and potentially facilitate migration opportunities. As shown in the previous chapters, this is likely to provide individuals with a greater chance of building resilience in the longer term and thus minimising the threat of humanitarian events and, ultimately, displacement itself. The governance of migration more broadly is analysed in Chapter 8.

7.3 Planning for urban growth and adaptation

Cities are faced with a 'double jeopardy' future, whereby urban populations swell and future environmental change presents an increasing threat. Migrants, in particular, are likely to be vulnerable. Yet the focus of policy makers should not be on stopping rural–urban migration, but rather on improving the urban environment and increasing urban resilience.

This section highlights policies to address operational challenges associated with migration to cities (termed 'MI' in Chapter 4). As discussed in Chapter 3, rapid city growth is expected to continue in many parts of the world in the future. Under certain scenarios in which there is high growth and/or exclusive governance (for example, if rural areas do not benefit from national policies), rural–urban migration influenced by global environmental change is likely to accelerate this urban expansion. Chapter 4 showed that these trends are likely to lead, in particular, to three policy challenges. These challenges can be seen to reinforce each other, or 'amplify' the consequences:

- The populations of cities are growing as a result of natural population growth and/or increased rural–urban migration. In a 'business as usual' scenario, this expansion alone would represent a huge operational challenge for cities, particularly those in low-income countries.
- However, the issue is further complicated by the fact that many cities are extremely vulnerable to future environmental change. Many cities are located in vulnerable areas, for example in drylands or low-lying coastal areas. The future expansion of cities needs to be considered in the face of this increasing threat.
- Migrants are particularly vulnerable, as they tend to live in high-density settlements in areas prone to environmental hazards, and they may not have the human, social or financial capital to protect themselves from environmental risks.

Whilst a policy approach focused on preventing rural–urban migration would address certain policy challenges, it would risk worse outcomes in other areas and this report strongly argues against such a stance. Rural–urban migration movements are driven by powerful economic, social and political forces. Indeed, in certain scenarios of the future, environmental change will influence these drivers to *increase* rural–urban migration. Trying to prevent such powerful forces would be futile, and would only increase irregular movements and associated negative outcomes, including increases in informal settlements and huge swathes of cities falling out of reach of the state⁵¹⁴. Many governments, particularly in Africa, have engaged in policies to decrease urban tensions by disincentivising rural–urban migration, and diverting movements away from strategic urban centres⁵¹⁵. In general, these policies have had no discernible effects

⁵¹⁴ Informal settlements are covered in more detail in section 7.4.

⁵¹⁵ UN DESA Population Division (2009a).

on urban growth⁵¹⁶. In Burkina Faso, for instance, policies of rural development intended to curb rural–urban migration have either had no effect on migration or have encouraged it⁵¹⁷ – this argument has also been made more generally about the continent as a whole⁵¹⁸.

Furthermore, such a negative policy stance would forfeit many of the important benefits of migration, including opportunities for communities and households to improve their resilience to environmental change. These opportunities and benefits from migration are fully explored in Chapter 8. Starting with the premise that policy should not aim explicitly to prevent rural–urban migration, this chapter covers three sets of policy measures to address the challenges articulated in Chapter 4:

- measures for expanding cities to respond to increasing threats from environmental change, including those focused on water scarcity, hazards, the threat of land loss and the environmental footprint;
- measures that focus specifically on reducing the vulnerability of migrants and new arrivals in cities;
- strategic planning and decision making about the long-term location and protection of cities.

This section concludes by noting that, in some situations, cities can become unsustainable and extremely vulnerable to environmental change. In these situations there may be a requirement for the development of new cities in less exposed regions, an issue which is further developed in Chapter 8.

7.3.1 Policy for cities in the context of increasing environmental threats and growing populations

Urban centres are growing fast, as a result of both natural growth and rural–urban migration, and are particularly vulnerable to environmental change. There are particular challenges related to increased water scarcity, increased threat from hazards, a threat of land loss and the need to reduce the environmental impact of cities.

As discussed in Chapter 4, urban centres around the world are growing fast, either as a result of rural–urban migration or natural population growth. Currently, over half of the world's population lives in urban areas⁵¹⁹. By 2030, this is expected to rise to about 59%, with over 90% of the increase in the next two decades occurring in cities in the developing world⁵²⁰. The fastest growing cities in the past five decades or so included Tokyo and Mexico City, but emerging cities of Asia, such as Mumbai and Karachi, have experienced spectacular growth rates in recent years (see Figure 7.1). For example, Mumbai's population grew from 5.8 million in 1970 to 20 million in 2010 and is projected to be 25.8 million in 2025; whilst Karachi's was 3.1 million in 1970, 13.1 million in 2010 and is projected to increase to 18.7 million by 2025. As shown in Figure 7.1, other cities in drylands, low elevation coastal zones or in / near mountainous regions are expected to see substantial growth rates.

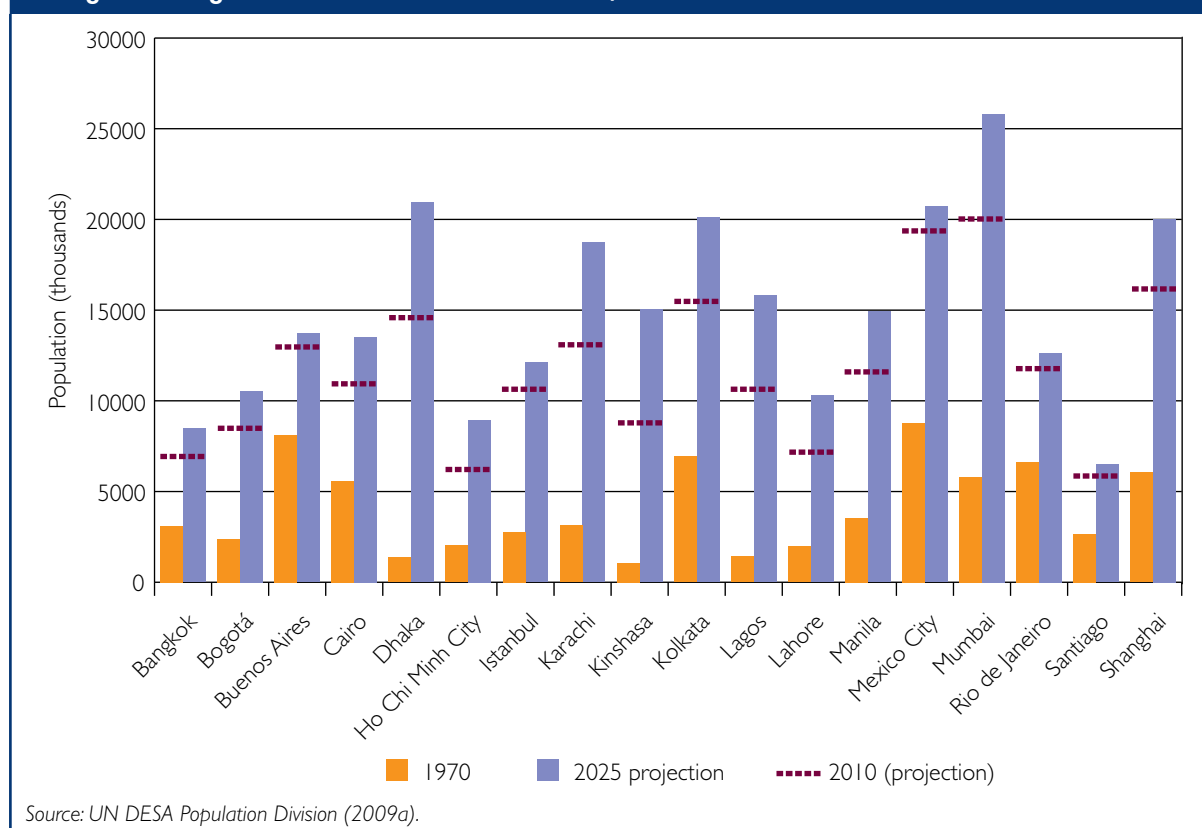
516 PD4 (Annex D refers).

517 Beauchemin and Schoumaker (2005).

518 Bakewell (2008).

519 UN DESA Population Division (2008).

520 UN-Habitat (2011).

Figure 7.1: Growth in populations of urban agglomerations of relevance to environmental change and migration between 1970 and 2025, with 2010 shown for reference

Given these growing populations, and the fact that a significant amount of existing migration is from rural to urban areas, there is clearly a need for greater emphasis to be directed at the development of urbanisation policy. This is particularly important in African countries, which to date have seen relatively low levels of urbanisation and suffer as a result from massively underdeveloped urban infrastructure. Yet there are also issues in Asian cities, where the challenge of sustainable urbanisation is reinforced by the likely combination of continued rural–urban migration and growing environmental vulnerability within large cities.

Environmental change over the next 50 years will potentially compromise development and growth trajectories of economies around the world. The impacts of climate change on cities include, for example, pressure on infrastructure, urban heat island effects and extreme events such as heatwaves, which are exacerbated in dense urban environments. The European heatwave of 2003, which resulted in an estimated excess mortality of 70,000, was largely an urban disaster, with mortality rates in Paris during the height of the heatwave being three times normal for the time of year⁵²¹. Water availability and problems with the distribution of potable water and provision of sanitation are likely to become more critical as a result of the projected decreased precipitation in dryland areas of the world by 2060. In the coastal cities of Asia, which play a primary role in the economies of Asian countries, the loss of land due to sea-level change presents particular and specific policy and planning challenges⁵²². The scenarios used in this report estimate that by 2060 sea level could rise by 14–35cm; however, a sea-level rise of 0.5 m would displace 1.86 million residents in Lagos⁵²³. On top of this, growing urban centres, particularly in high-income countries, have been the major location of the observed expansion of the global environmental footprint, for example in the growth of energy use and carbon dioxide emissions, over the past 20 years. The challenge of sustainability involves recognising that urban centres are hotspots that

521 Kovats and Hajat (2008).

522 DR9 (Annex D refers).

523 Rosenzweig et al. (2011); relatively severe scenarios of climate change indicate that sea level could rise by between 0.50 and 0.65m by 2060. This is the sea-level range associated with the IPCC Representative Concentration Profile 8.5 scenario (i.e. a 'high end' emissions scenario) at the 5th and 95th percentile in the range of projected sea level, SR8 (Annex D refers).

drive environmental change, both in their regions and globally⁵²⁴, and to factor the role of growth through migration into this equation.

Much greater emphasis needs to be given now to planning for long-term environmental change in expanding cities.

In general, this has not been the norm, although some cities have engaged in developing long term plans for adaptation, with best practice being found in cities such as New York, Durban and London⁵²⁵. The great majority of cities face the challenges of fragmentation of planning services and administrations, a feature which may be due to a lack of institutional arrangements to allow cities to translate plans into action. Currently, only a small number are engaged in planning for the economic and environmental impacts of climate change as their populations grow. Furthermore, levels of investment to address increasing future exposure to hazards and risks are currently well below levels that account for growing exposure to risk⁵²⁶. Only a few major cities, such as London, New York and Mumbai, have developed detailed plans for incorporating future climate change impacts. All cities face significant hurdles to implementing more targeted policies⁵²⁷. The report of the Urban Climate Change Research network suggests that the main factors that have limited future-oriented climate planning in cities include the limited monitoring and evaluation of policies, as well as a lack of leadership and cooperation among relevant agencies. Of course, the costs of adaptation actions are disputed⁵²⁸.

Nevertheless, adaptation to future environmental risks will never have perfect foresight. With this in mind, city planners are increasingly realising that adaptation planning urgently needs to be given greater priority using current knowledge of future risks to ensure resilience against future uncertainty. Planning for sustainability and making cities resilient to environmental change requires addressing the critical issues of water availability and quality, potential land loss, more frequent hazards such as heatwaves, waste, mobility and congestion. Chapter 4 has shown that many cities may become major attractors of migrants from surrounding regions at risk, notably cities on dryland margins, on the margins of mountain regions experiencing depopulation, and in urban centres on islands and low-lying coastal zones. Cities in all these situations face the risks of resource availability and hazard, some with problems amplified as available land comes under ever greater pressure.

An urgent issue is water availability in the context of growing cities. Policies that address water availability and quality in cities should be prioritised.

Constraints on water availability are a key environmental issue faced by cities. This issue is also potentially, in some circumstances, likely to limit economic growth, although it is unlikely to limit population growth. Already, 150 million people live in cities with significant water shortages, a figure that is likely to rise in the future⁵²⁹. Yet water availability is only one of the issues for water management in urban environments. Water quality, access to clean water and delivery to all urban residents complicates the overall availability position. From a perspective of public health, the provision of sanitation in cities within the developing world will remain a critical issue given that around half the population in low-income countries, in both rural and urban areas, do not currently have access to improved sanitation⁵³⁰. This situation is likely to be exacerbated by the scarcity and security of water supply anticipated in a changing climate.

In addition, hydrological changes mean that flooding and more intense events are also possible even in cities where per capita water availability declines. Water stress may be exacerbated by rural–urban migration with the consequent concentration of water demand in urban centres, in contrast to the previously more dispersed demands of individuals in their original rural areas.

It is therefore crucial that planning for adaptation to environmental change in cities with new migrants focuses on water. There are two options for ensuring water availability in growing cities. First, cities need to secure supplies of water for growing populations. Many are actively doing so through engineering

524 Grimm *et al.* (2008).

525 Corfee-Morlot *et al.* (2011).

526 Gasper *et al.* (2011).

527 Moser and Ekstrom (2010).

528 McCarney *et al.* (2011).

529 McDonald *et al.* (2011).

530 Costello *et al.* (2009).

solutions, for example building reservoirs, transporting water over longer distances, and even building desalination plants, given the likely decline in water availability and growing populations in dryland regions. Expanding water supply infrastructure has its own environmental limits: large-scale desalination of water in coastal areas is considered a maladaptive response because of its intensive energy use and the resulting pollution. In Victoria, Australia, for example, critics argue that a new desalinisation plant at Wonthaggi to supply water to Melbourne increases energy-related pollution, has high opportunity costs and reduces incentives for individual action to use water sustainably⁵³¹. Thus, population pressures allied to global environmental change pose major challenges to urban sustainability.

The second solution to the water challenge facing many cities over the coming decades, particularly those in low-income countries, concerns effective management of the demand for water. Agricultural production in the hinterland of large urban centres is one of the most intense water uses, but diverting water to cities can undermine the viability of local agriculture, particularly in dry climates. In Santiago de Chile, for example, it is projected that increased migration will result in a population of 6.5 million by 2025; at the same time a 40% reduction in precipitation and reduced glacial flows in the rivers servicing the city is predicted by 2060. The city has instigated a water abstraction market, but this is based on current minimum streamflow, and analysis suggest that the markets are not adequate for dealing with decreased availability and multiple demands on water resulting from growing populations⁵³². It is likely that all available supply and demand solutions will be required to enable cities to adapt population increases and climate change to 2060, but each contribution requires significant governance and carries significant environmental and other risks.

A long-term risk to cities is loss of land, and the associated hazards that follow from this. Cities must plan for this future environmental change.

Although short-term hazards are an important element of environmental change and risks, long-term trends, in particular the threat of land loss, create further policy challenges that need to be addressed. The scenarios used in this report estimate that by 2060 sea level could rise by 14–35 cm, whilst more severe scenarios of climate change suggest that sea level could rise by between 0.50 and 0.65 m by this date⁵³³. Protecting large cities in the mega-deltas of Asia from land loss may always be worth the cost and effort⁵³⁴. Nonetheless, protecting cities from rising sea levels presents a number of policy challenges. First, even if the economic argument is accepted, design and construction takes time, and city and national planning is often slow in implementation, leaving cities with decades of exposure to risk. The case of New Orleans flooding in 2005 has been extensively debated as a controversial example of a known flood risk, a known engineering solution, and a long-term planning failure to implement the infrastructure required⁵³⁵.

A further part of city adaptation concerns reducing the exposure of new and growing populations to natural hazards. But with growing populations, land scarcity and significant gaps in infrastructure, many cities in low-income countries are instigating development and settlement in more and more marginalised high-risk land⁵³⁶. Around 20% of the population of Rio de Janeiro, for example, live in *favelas*, which are susceptible to landslides and floods, with a significant proportion of the migrant populations coming from dryland areas in north-eastern Brazil. In response, Rio de Janeiro has invested USD 600 million in the past years to attempt to avoid further expansion into hazardous slope and floodplain areas and provide secure tenure for residents of the *favelas*⁵³⁷. Such initiatives need to be supported and lessons learned from them as cities plan for expansion of migrant populations clustered in hazardous landscapes and informal settlements within growing cities.

Planned adaptation to future environmental change within cities should be led by regulation and planning. Central planning is necessary for a number of reasons. The economic cost of anticipating future risks and acting on those risks has been shown to be less than simply reacting to impacts. Property, capital assets

531 Barnett and O'Neill (2010).

532 Barton and Heinrichs (2011).

533 See above; see also SR8 (Annex D refers).

534 DR9 (Annex D refers).

535 Repetto (2011).

536 SR17 (Annex D refers).

537 Blake *et al.* (2011).

and infrastructure all depreciate at different rates, and losing areas to encroaching inundation creates significant losses⁵³⁸. Coordinated strategic planning may be able to reduce such costs significantly. In addition, the social consequences of environmental risks in cities are externalities which are often unaccounted for.

7.3.2 Policies to focus on migrants moving to cities

Migrants moving to cities present particular policy challenges, as they are often the most vulnerable yet also have inadequate voice and representation. There needs to be strong urban planning and policies specifically focused on the welfare of new city migrants.

As indicated in the example on Rio de Janeiro above, a key factor in urban planning to reduce exposure to environmental change is that migrants often reside in areas particularly vulnerable to environmental change. Migrants are often low-skilled, and, especially in cities in low-income countries, are often concentrated in dense housing, and often in informal settlements with low levels of health, water and other services. Migrant populations often take time to learn the norms of collective action and response to environmental hazards in a community⁵³⁹, and are thus more vulnerable to environmental risks such as hurricanes⁵⁴⁰.

Thus, immigrant populations are often susceptible to negative impacts of public health risks and exposed to floods, landslides and other hazards. Evidence for Buenos Aires, Lagos and Dakar shows that migrants are more likely to be exposed than longer-term residents: in Dakar, for example, 40% of new migrants to the city over the period 1998–2008 reside in areas designated as being at high flood risk⁵⁴¹. A World Bank study of poor urban households in cities in Kenya and Nicaragua documents how immigrant populations in Mombasa and Esteli suffer disproportionate impacts from localised hazards such as flooding and winds⁵⁴². Furthermore, evidence suggests that high levels of impact from climate change are not likely to have a dampening effect on migration rates to cities in the developing world over the next five decades. However, as indicated in Chapter 3, there are many indications that when locations are perceived to be at risk, there is a reduced willingness to invest, affecting economic growth in cities, and reducing income opportunities for migrants and existing inhabitants alike, further increasing their vulnerability. In addition, small impacts on capital assets, particularly for new migrants to cities, may have very significant impacts on welfare, pushing households into persistent poverty or negative equity and making it impossible for households to rebuild their savings and assets. Conditions experienced by lower-income migrants can lead to health inequalities and exposure to physical and mental health risks. Informal settlements and slums present physical health risks as a result of overcrowding and lack of infrastructure, particularly lack of access to clean water and means of sewage disposal⁵⁴³. Mental health disorders have also been shown to be associated with poor living conditions⁵⁴⁴ (see also Box 7.2).

Policy imperatives to address these issues should focus on sustainable urban growth, the protection of vulnerable populations and the promotion of food security. Local community-based actions to deal with these hazards abound and do promote capital accumulation, but are largely outside the control of formal governance structures in many cities. The World Bank study identifies weak and unclear tenure rights in both formal and informal settlements as the most critical mechanism for city planners and governments to address in reducing the vulnerability of urban populations, including new migrants⁵⁴⁵.

A further major policy challenge in planning for growing new populations in cities is that of social cohesion within planning processes. Disasters often widen inequality and, consequently, the social impacts of hazards in cities also include psychological impacts and fear of crime following large-scale disruption. Improving urban governance, planning and service delivery in developing world cities is critical in the

538 SRI 7 (Annex D refers).

539 Putnam (2007).

540 Tompkins *et al.* (2009).

541 World Bank (2010).

542 Moser *et al.* (2010).

543 UN-Habitat (2011).

544 Patel and Kleinman (2003).

545 Moser *et al.* (2010).

context of mitigating conflict that arises from poverty and economic stagnation in cities⁵⁴⁶, an issue further considered in section 7.4.1.

7.3.3 A more strategic approach to the long-term future of cities

Environmental change and urban population growth require national and subnational planners to take a much more strategic and long-term approach to city planning.

When urban areas are protected they have to be ‘protected forever’ as development occurs and populations grow in protected areas⁵⁴⁷. Agglomeration effects, moral hazard and path dependency effects will make it ever more difficult to abandon or shift urban developments, partly because protection in the short run induces new migrants into these areas. The implications of the irreversible nature of protecting cities against sea-level change, for example, may not be properly incorporated in planning processes, with potential disastrous future funding gaps and planning failures⁵⁴⁸. If sea levels rise by more than 1 m by 2100 or beyond, policy makers risk getting locked in to long-term and costly protection of marginal areas.

Thus, an efficient adaptation strategy for cities planning for environmental change should *not* be based on the assumption that an increased population and continuing economic growth will provide the resources and capacity to adapt⁵⁴⁹. As was shown in Chapter 3, there are other possible future scenarios, which include populations expanding but in the context of curtailed economic growth. Rather, urban planning should take into account future changes in climate risks (and sea level for coastal cities) and the likelihood of continuing rural–urban migration, and recognise in particular the irreversibility of defending areas as well as the indirect and social costs. The costs of protecting the world’s coastline may well keep increasing over time once the decision to protect coastal cities has been made. Some estimate that this rising cost could increase to levels that potentially affect the world economy. This may imply the need to plan for new cities in other areas, an issue dealt with in section 8.4.

7.4 Managing social tensions and conflicts associated with migration influenced by environmental change

The environmental change–migration–conflict nexus is complex, non-linear and context specific. Policies must be equally as fluid and tailored to the appropriate situation. However, clear strategic priorities include a focus on urban tension and conflict, which will largely occur in cities, and where populations are trapped in circumstances of poverty, conflict and environmental change.

As shown in Chapters 3 and 4, there is little evidence available to support the theoretical notion that environmentally induced conflict will in turn cause migration. However, the following is clear:

- Environmental change, in combination with other factors, may amplify or significantly change existing patterns of migration where people have the resources and freedom to make choices concerning whether to move and to where. Much of this migration will present operational challenges (as covered in the previous section). However, this form of migration can exacerbate political or geopolitical problems, and in particular can raise tensions and interact in problematic ways with conflict in destination areas. This is *more likely* to be the case if the migration is long term, extends across international borders, is concentrated in particular source destinations, is illegal/irregular and is unexpected. In low-income countries, the majority of this form of M2-type migration⁵⁵⁰ in the future is expected to be to cities, but in some circumstances may be rural–rural. Displacement influenced by environmental change may also pose geopolitical problems in terms of tensions if it results in large numbers of people arriving in specific locations over a short period (classified as D2 in Chapter 4).
- Global environmental change can contribute to impoverishment, and can raise the exposure and vulnerability of individuals to conflict, ecological disasters and economic hardship. An associated reduction in financial assets can reduce the ability of individuals to move in a planned, safe way and lead to them, effectively, becoming trapped. In the context of high levels of vulnerability, this means that

546 PD4 (Annex D refers).

547 SR17 (Annex D refers).

548 SR17 (Annex D refers).

549 See SR17 (Annex D refers) for economic arguments on adaptive capacity and its limits.

550 Using nomenclature from Chapter 4.

there is a greater chance of humanitarian emergencies and potentially even unmanaged and dangerous displacement (this, again, is D2 displacement).

Possible responses to these issues are discussed in this section. Given the significance of future urban growth, discussion starts with measures that need to be implemented in urban environments.

7.4.1 Policies and plans to reduce tension and avoid conflict in growing cities

Growing populations and the increased threats from environmental change are problems in themselves, but may also lead to tension and interact with conflict in urban areas. This reinforces the high priority for governments to improve the living conditions in urban environments as often these are, in fact, the most effective polices to address tension and conflict.

As noted in section 7.2, urban growth is likely to continue over the next five decades, driven in part by natural population growth and in part by rural–urban migration, which may be influenced by environmental change. Policies in urban settings will need to address the material deprivation and social and economic inequality associated with urban growth and rural–urban migration, which can lead to social unrest and conflict⁵⁵¹. Future environmental change will, other things being equal, increase material deprivation in urban settings, especially for the poor⁵⁵². The position of migrants within labour markets in growing urban centres needs to be secured to ensure that the well-being of migrants is not further compromised. This includes positive planning and regulation of informal sectors in the economy where new migrants may concentrate. Further measures involve planning for inclusion of migrants and civil society in the urban transition to reduce conflict and increase social cohesion.

Improvements in infrastructure and public services can have very direct impacts on the reduction of conflict and violence reduction⁵⁵³. Investment in the water supply and sanitation, affordable transport networks, and affordable housing will help reduce material deprivation, and social and economic inequality as well as exposure to hazards such as flood risk. For example, in Bogota, Colombia, urban tax policies targeting wealthier groups have funded transport developments, education programmes and community centres, which has led to a marked reduction in street crime and other forms of violence⁵⁵⁴. Initiatives to improve connectivity of poorer areas and achieve inclusiveness for all city residents are exemplified by the construction of the Mandela Bridge in Johannesburg, which aims reduce the potential for ghetto development and avoid the creation of ‘no-go’ zones where violence can thrive⁵⁵⁵. The experience of Curitiba, the fastest growing city in Brazil between 1950 and 1990, offers further insights (see Box 7.1). In general, it is clear that key factors include enhancing basic infrastructure, improving public services, reducing exposure to hazards, which disproportionately affect the urban poor,⁵⁵⁶ and improving access to housing and informal settlements.

551 Rodgers (2010).

552 UN-Habitat (2011).

553 PD4 (Annex D refers).

554 Gutiérrez Sanín *et al.* (2009).

555 Mlangeni (2008).

556 Ibarra *et al.* (2009).

Box 7.1: Personal testimony from the former Mayor of Curitiba, Jaime Lerner

'An influx of migrants constitutes both an opportunity and a challenge for cities. Increasing diversity, expertise, motivation, and creativity; but creating a challenge for city planners to plan and execute for a population that keeps on increasing sharply. There are three imperative issues that need to be addressed when establishing the priorities of a city: mobility, sustainability and identity.

'In Curitiba, the capital city of the State of Paraná, southern Brazil, these concepts were translated into several initiatives and policies that helped the city to become a positive example in terms of urban planning. Curitiba's population rose from 300,000 in 1950 to a metropolis of 1.5 million in 1990, making it Brazil's fastest growing city. Economic opportunities attracted waves of migrants from rural areas and problems of flooding threatened some areas of the city. Strong city planning has meant that Curitiba has been able to accommodate large increases of migrants and to increase its resilience to a challenging environmental issue.

'Creative urban drainage policies transformed critical areas of the city into parks whose dual role was the containment of floods. This solution to the city's flooding was much cheaper than the traditional engineering solutions and brought great dividends in terms of environmental protection and education, tax revenues, image, environmental education and quality of life, transforming the identity of the city. The parks created hubs for cultural, sportive and leisure activities and environment education. They also helped solve problems of illegal occupation of fragile areas and preservation of forest remnants.

'An Integrated Transit Network was set up, a mobility solution that is the origin of Bus Rapid Transit Systems (as they became known) worldwide. Bus transit was chosen because it presented the initial advantages of being economically viable, more adaptable and flexible over time – allowing incremental implementation of the system in pace with Curitiba's fast growth. The network consists of Express Buses operating along exclusive lanes in the city centre with concentric bus loops connecting the lower density areas of the city at 'integration terminals'. Key to the design and sustainability of this system was ensuring co-responsibility between the public and private sectors and the population. Interaction with the system's private operators and with the buses and equipment manufacturers has stimulated design improvements to achieve greater comfort and economy as well as seeking more efficient and less pollutant fuel alternatives. The Integrated Transit Network of Curitiba has inspired proposals at over 80 cities around the world⁵⁵⁷.

Reducing poverty and improving the well-being of inhabitants of informal urban settlements may not only have significant benefits for residents, but also lead to lower levels of poverty-induced conflict⁵⁵⁸. For example, a South African project tackled the problems associated with low-quality formal housing in Kuyasa, built since 1994 as part of the Reconstruction and Development Programme (RDP) (see Box 7.2). It is intended that the lessons learned from this project will be incorporated into further RDP housing projects. This existing housing shares many of the limitations of informal squatter settlements: high-density, energy-inefficient houses with no heating occupied by large households and built in an area at risk of environmental hazards (flooding) and on the city margins, at a long distance from employment⁵⁵⁹. Residents living in such settlements generally have little, if any, disposable income, a high propensity to be victims of crime and conflict, high unemployment, high levels of sickness, and a high incidence of mental health disorders: all factors associated with poverty⁵⁶⁰. The position of migrants within labour markets in growing urban centres needs to be secured to ensure that the well-being of migrants is not further compromised. This includes positive planning and regulation of informal sectors in the economy where new migrants may concentrate. Further measures involve planning for inclusion of migrants and civil society in the urban transition to reduce conflict and increase social cohesion.

In some instances, comprehensive top-down policies for urban development can create effective and safe cities, reducing the potential for social tensions to develop. For example in Kigali, Rwanda, a 'modernisation master plan' to reconstruct the city, and which is linked to engagement of the informal

557 WP2 (Annex D refers).

558 PD4 (Annex D refers).

559 PD1 (Annex D refers).

560 PD1 (Annex D refers).

sector through the creation of cooperative associations and training of an accountable police force, has been conceived as a model for urban transformation⁵⁶¹.

Whether, as in Kigali, the state is providing the framework for the approach, or there are more 'community-led' processes, such as in Kuyasa, the important point is that these are all 'normal' and 'regular' aspects of urban development policy, some of which have already been identified in section 7.3, and all of which have been extensively studied (though not necessarily adequately funded). Yet the drivers of future environmental change and continuing urbanisation indicate that greater priority needs to be given to them in many vulnerable cities in drylands, low-elevation coastal zones and mountains, and indeed more generally across low-income countries.

Box 7.2: Improving well-being and sustainable energy use in rapid-growth urban housing: the case study of Kuyasa

Kuyasa, in Cape Town's main area of formal and informal marginal settlement, had characteristics typical of informal squatter settlements. The Kuyasa community Clean Development Mechanism (CDM) project sought to raise well-being through improvements to housing stock, while at the same time reducing energy consumption through linking improvements with a growth in renewable energy use. Low-cost solar panels, ceilings and insulation were installed in 2,300 basic Reconstruction and Development Programme (RDP) houses in a scheme employing and training residents. Following completion, a survey of 30% of all households reported substantial improvements in health in over 80% of households, a 50% reduction in energy expenditure and a substantial reduction in the use of paraffin in heaters and lights, which in itself causes health problems when used in enclosed spaces⁵⁶². Overall, the project has led to a reduction in poverty and improvement in well-being, such that overall tensions within households and the settlement have been reduced.

In some circumstances tailored and bespoke policies are required to address the particular challenges of tension and conflict in growing and vulnerable urban locations.

The capacity to achieve effective urban planning and management is often absent in cities in low-income countries. 'Urbanisation without growth'⁵⁶³, the expansion of cities without parallel development of the urban economy, has in recent decades been accompanied by the withdrawal of the state from parts of urban centres in many African, South American and Asian cities, and even in some cities in North America and Europe. Informal sectors have emerged to fill gaps in service provision, regulation and especially the rule of law. Informal policing and customary law in urban management can in itself be partisan and violent⁵⁶⁴, for example in Pakistan,⁵⁶⁵ South America⁵⁶⁶ and South Africa⁵⁶⁷, even if these practices become unofficially endorsed by the state⁵⁶⁸.

Where the informal sector has filled gaps left by the state, future policies and practices need to capture the benefits of such systems while improving accountability. The importance of the informal sector in building cohesion between communities can be seen in Nigeria, where informal enterprise developments has fostered inter-ethnic and inter-regional links between Igbo, Hausa, Yoruba and non-Nigerian groups⁵⁶⁹. The UN-Habitat Safer Cities Programme⁵⁷⁰ has been operationalised in urban centres in Africa, Latin America and Papua New Guinea. It provides a framework to strengthen the capacity of local bodies to address violence and conflict by fostering collaboration between local agencies, criminal justice systems and civil society, to build partnerships that address the roots of crime, including poverty and limited livelihood opportunities⁵⁷¹. A successful example is in Durban (eThekweni municipality), South Africa, where urban violence between ethnic groups led to 20,000 deaths ahead of elections in 1994. In 2003,

561 Goodfellow and Smith (forthcoming 2011).

562 PDI (Annex D refers).

563 Beall and Fox (2009).

564 Baker (2008).

565 Budhani *et al.* (2010).

566 Gutiérrez Sanín *et al.* (2009).

567 Nina (2000).

568 Schärf (2005).

569 Meagher (2009).

570 UN-Habitat (2007).

571 Baker (2008).

traditional Amakhosi Zulu chiefs in the urban area were encouraged to gain the right to represent Zulu interests in city affairs through participation in the democratic system. As a result of this more inclusive approach to governance, Amakhosi now cooperate in planning and infrastructure programmes, and are introducing and accept responsibility for development programmes, in their areas of responsibility. Local security has increased through this participation, and ethnic conflicts have declined, because all groups are inclusively represented within the urban management system⁵⁷².

7.4.2 Policies to avoid conflict that may result in populations being trapped

The existence of conflict will, in many situations, mean that populations are trapped in vulnerable situations, where deterioration in environmental conditions may lead to humanitarian emergencies and unplanned displacement. Approaches to conflict must take account of this particularly vulnerable population.

This report argues in Chapter 4 that an impending future problem is where populations are trapped in increasingly dangerous environmental areas, and in Chapter 8 that an important policy in this context is the availability of migration options to facilitate individuals removing themselves from this vulnerability. However, the presence of conflict may render these options unavailable for a given period of time. There is a wide literature on conflict resolution and avoidance that is beyond the scope of this report, but a key message is that approaches to conflict must recognise the needs and particular vulnerabilities of these populations who are trapped in environmentally prone circumstances.

In particular, environmental change can put specific strain on resources, further deepening the poverty–conflict nexus, and increasing the likelihood of populations being trapped or displaced. Effective strategies to resolve conflict over resource allocation are essential.

Conflict reduces the ability for people to move from vulnerable areas, reduces their assets and reduces their resilience to environmental change. Conflict is especially likely to befall people who are already poor and vulnerable, and those dependent on the physical environment for their livelihoods⁵⁷³. As Table 7.2 shows, certain types of conflict are particularly associated with resource issues. There is evidence from Africa that disputes and conflicts can be a traditional component of the management of resources which are dynamic in terms of location and time⁵⁷⁴.

There is an endogenous and cyclical relationship between poverty, resources, conflict and the inability for people to move voluntarily. Likely consequences will be humanitarian emergencies, and there will potentially be tipping points for large-scale displacement with geopolitical consequences (D2). As shown in Chapters 2 and 3, in many parts of the world environmental change is likely to have a negative effect on resources, such as water, land and vegetation, and, partly because of this, will affect poverty and vulnerability. The impact of environmental change is thus to deepen this endogenous cycle, and there is therefore a clear requirement for policies to address the impact of environmental change on the resource–conflict relationship.

572 Beall and Ngonyama (2009).

573 DR5 (Annex D refers).

574 Hussein (1998).

Table 7.2: A typology of conflicts associated with resource issues

Conflict	Reason, nature and consequence
(i) <i>Conflicts between pastoralists and farmers</i>	Land degradation leads farmers to encroach onto pastoral lands ⁵⁷⁵ . May be drought-enhanced ⁵⁷⁶ .
(ii) <i>Conflicts amongst pastoral groups</i>	Competition for pasture and water access in drylands, exacerbated by drought. May involve arms and cross-border raids. Can result in marginalisation and displacement.
(iii) <i>Conflicts over resource use from encroachment onto indigenous lands</i>	Commercial access to mineral or forest resources displaces traditional land users. May be state driven as countries seek new resource overseas ⁵⁷⁷ . Leads to displacement.
(iv) <i>Disputes associated with water resources</i>	Water resource extraction diminishes downstream supplies ⁵⁷⁸ . Or water use diminishes food sources associated with lakes, rivers, wetlands ⁵⁷⁹ .

Some dryland pastoralist communities have developed elaborate institutions and practices that serve to manage resources, address social security issues and resolve conflicts⁵⁸⁰. Where competition grows, the goal should be not simply to reduce conflict, but to increase cooperation (sometimes called 'productive conflict'⁵⁸¹), such that situations of tension are turned around to generate positive outcomes so that more than a zero-sum game is achieved. Traditional governance mechanisms that are successful in diluting conflicts in specific contexts offer scope for wider adaptation⁵⁸² and provide lessons for managing conflicts associated with migration. Social and political changes at the state level have reduced the effectiveness of some rights-based systems in rural Africa, but initiatives built on shared interests and cooperation, for example the Fadama project in northern Nigeria⁵⁸³, or on improved resource use, for example in the Sahel⁵⁸⁴, have nonetheless achieved some success. This is particularly the case when women play a significant role in negotiations, exemplified by studies in southern Ethiopia and Kenya⁵⁸⁵. Where there is an international dimension to resource access disputes, NGOs have demonstrated an important capacity to successfully represent the rights of minority groups, including in the International Court of Justice. There is also evidence of innovation in resource management institutions to resolve or avoid conflicts at local level associated with forced displacement, even in the absence of policy intervention⁵⁸⁶. There may be scope to learn from such local adaptations in policy development.

High demand for water, including for agriculture and for hydroelectric dams, in upstream sectors of rivers such as the Omo and Nile have the potential to impact downstream water supply in neighbouring states, raising the risk of confrontation between upstream and downstream communities⁵⁸⁷. All of Africa's shared major river basins have international river basin initiatives⁵⁸⁸ which already function through quiet diplomacy to mediate risks and potential disputes. They can involve cooperative agreements that often extend beyond the issue of the actual water resource itself. The Nile Basin Initiative (Box 7.3) is an example of a framework in which collaboration can develop ahead of the time when actual water availability is known and vested interests have developed. A similar proposal has been made for addressing potential water use issues in the Zambezi basin during the next 50 years⁵⁸⁹, but the prospects for such an approach are more limited in other water-scarce areas, such as Cyprus and Israel–Palestine,

575 Thébaud and Batterby (2001).

576 Hussein (1998).

577 Friis and Reenberg (2010).

578 PD II (Annex D refers).

579 Aginam and Notaras (2009).

580 Temesgen (2010).

581 Martin (2005).

582 PD II (Annex D refers).

583 World Bank (2007); Ruckstuhl (2009).

584 Castro and Engel (2007).

585 Tadesse *et al.* (2010).

586 Black and Sessay (1998).

587 PD II (Annex D refers).

588 PD II (Annex D refers).

589 Beck and Bernauer (2011).

because of inter-state disputes based on other political factors⁵⁹⁰. However in these (and other) areas, technical developments, including greater water use efficiencies, may offer a double-win situation: water becomes less scarce, and the potential for water demand to contribute to confrontation is decreased.

Box 7.3: Case Study on the Nile basin

Ten states share the Nile basin, with downstream states vulnerable to changes in upstream water management policies. Uncertainty over future precipitation in the basin makes planning future resource sharing problematic, but also provides an opportunity, now, for developing plans whilst interests are unclear. The issues are wider than simply addressing future water availability, which is the major concern of Egypt and Sudan, the principal downstream states. They also include drought and flood risks in headwater countries such as Ethiopia and Uganda. The Nile Basin Initiative (NBI), formed in 1999, provides an inter-state mechanism to address these complex issues, with the Nile Basin Cooperative Framework presently under negotiation 'to achieve sustainable socio-economic development through the equitable utilisation of, and benefits from, the common Nile Basin water resources'. However, this explicitly avoids confronting the issue of the many unilateral water resource developments that have been developing at the level of individual states.

An additional key requirement for the future is to anticipate where conflicts might occur which may trap populations in situations of vulnerability to environmental change.

In West Africa a conflict early-warning system has been developed by the Economic Community of West African States (ECOWAS) to mitigate and dissipate cross-border resource disputes before conflict occurs⁵⁹¹. A similar system has been developed in the Horn of Africa by the Inter-Governmental Authority on Development⁵⁹². Warning systems are especially pertinent in the context of water resources, as growing demands, especially in drainage systems where climate change may markedly reduce effective rainfall, for example in the eastern Mediterranean⁵⁹³, Nile⁵⁹⁴ and Zambezi⁵⁹⁵ river basins, will exacerbate the scale and magnitude of future shortages. Given the increasing likelihood of environmental change, and the impact of conflict on the ability of populations to remove themselves from vulnerability, consideration should be given to the social aspects of these warning systems, and in particular whether there are populations who are likely to be trapped in environmentally vulnerable situations as a result of the conflict.

7.5 Robustness of policy areas to future uncertainties

When considering policies for the next 50 years, it is essential to assess them for their resilience across the range of scenarios.

This chapter has reviewed a range of policies which are important in the context that migration is highly likely to continue over the next 50 years, and that it will be influenced by global environmental change. In this chapter, the major policy areas considered have been those relating to protection gaps for populations whose displacement has been influenced by environmental change; the sustainability of cities in the context of future environmental change and future migration; and types of conflict which may be important for migration and non-migration outcomes as defined in Table 7.1. The chapter has set out the rationale for these policies and explained how they address the challenges identified in Table 7.1 and in Chapter 4. However, throughout this report there is recognition that migration and non-migration influenced by environmental change is highly contextual, and is likely to have very different outcomes depending on the future socioeconomic and political scenario. This section explores how resilient each policy is to the future, using the scenarios presented in Chapter 2. In particular, Table 7.3, below, provides an indication of the effectiveness of each broad class of policy for each of the four scenarios. Again, the colours range from dark red, indicating high effectiveness, through white, indicating neutral effectiveness,

590 CS12 (Annex D refers); Comiteau (1999).

591 Wulf and Deibel (2009).

592 Mwaura and Schmeidl (2002).

593 CS12 (Annex D refers).

594 Conway (2005).

595 Beck and Bernauer (2011).

to shaded grey, which indicates that policies may well be counterproductive. 'Effectiveness' for each scenario is measured against its ability to address the policy challenges highlighted in Table 7.1. The future resilience of each policy is indicated by its effectiveness across the range of scenarios.

In general, approaches to policy which follow from the behaviour of individuals or empower communities are likely to be more resilient across future scenarios than those which rely on the state.

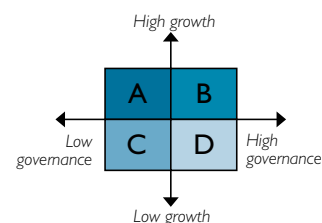
All of the measures which fall into the first approach discussed in the chapter, of 'addressing humanitarian needs and protection gaps for displaced populations' are, due to their very nature, likely to be less effective and successful in scenarios of the future which are characterised by exclusive and fragmented global governance. However, there are nuances to this. State-led approaches which propose redesigns of existing international frameworks for the protection of migrants/refugees risk, in a fragmented world, opening up these existing frameworks for review, which could result in the loss of important safeguards. This applies to an **approach which addresses 'survival migration'** and a **bespoke framework for environmental migrants**, although the former approach could make important strides in inclusive and connected future scenarios. Governance approaches that **utilise existing regional and global fora and processes** and/or **promote soft law approaches** are unlikely to have such counterproductive effects in low-governance worlds, and could have strongly positive effects on the plight of those displaced by environmental change in more inclusive future worlds.

Table 7.3: Resilience of policies that plan for migration influenced by global environmental change

Policy area (below)/Scenario (right)	A	B	C	D
<i>Addressing humanitarian needs and protection gaps for displaced populations</i>				
Bespoke global framework for 'environmental migrants/refugees'	Highly counter productive	Neutral effectiveness	Highly counter productive	Neutral effectiveness
Broader approach which addresses 'survival migration'	Highly counter productive	Moderate effectiveness	Highly counter productive	Moderate effectiveness
Promoting soft law approaches , such as the Guiding Principles on IDPs, as a basis for 'hard law'	Neutral effectiveness	Moderate effectiveness	Neutral effectiveness	Moderate effectiveness
Existing regional and global fora and processes	Neutral effectiveness	High effectiveness	Neutral effectiveness	High effectiveness
<i>Planning for urban growth and adaptation</i>				
Policies to prevent rural-urban migration	Highly counter productive	Highly counter productive	Highly counter productive	Highly counter productive
Urban policies to prepare for future environmental change and increasing populations	Moderate effectiveness	High effectiveness	Moderate effectiveness	Moderate effectiveness
Policies to make cities more inhabitable for incoming migrants	High effectiveness	High effectiveness	Moderate effectiveness	Moderate effectiveness
<i>Managing social tensions and conflicts</i>				
Improvement in living conditions in cities to enhance well being	Neutral effectiveness	Moderate effectiveness	Neutral effectiveness	Moderate effectiveness
Strengthen the capacity of local bodies to address violence and conflict in cities through collaboration	Moderate effectiveness	Moderate effectiveness	Moderate effectiveness	Moderate effectiveness
Community approaches to conflict resolution, based on traditional methods if appropriate	Moderate effectiveness	Moderate effectiveness	Moderate effectiveness	Moderate effectiveness
Early warning systems for conflict which factor in the presence of trapped populations	Neutral effectiveness	High effectiveness	Neutral effectiveness	High effectiveness

Key

	High effectiveness
	Moderate effectiveness
	Neutral effectiveness
	Moderately counter productive
	Highly counter productive



The determining factor of the effectiveness of policies for urban growth is whether they are state-led policies to meet centrally constructed objectives to **prevent rural–urban migration**, or whether they are policies which follow from the actions of individuals who migrate to cities. The former set of policies is likely to be, at best, ineffective and, at worst, actively harmful in leading to large populations becoming trapped in vulnerable rural areas. The negative effects will be exaggerated in fragmented governance worlds, where informal and dangerous temporary settlements are likely to result. However, approaches which follow from the behaviours of individuals migrating to cities are likely to be much more future proof, as it is clear that people will be moving to urban centres in most, if not all, scenarios. Policies to **prepare cities for future environmental change and increasing populations** are important in all scenarios, although they may involve complex central infrastructure projects, which are likely to be less successful in scenarios of poor governance. **Policies to make cities more inhabitable for incoming migrants** can be much more community orientated, and are thus less affected by poor governance. These last two policies may be affected by global growth if it means that there is less finance available for projects.

The situation is similar with **policies to empower communities/local bodies to resolve conflicts**, either in urban spaces and/or over natural resources; thus, these policies are likely to be more insulated from poor governance and are effective across the range of scenarios. **Policies to improve living conditions in cities to enhance well-being** follow a similar pattern as the effectiveness of the above policies to prepare for future environmental change in cities: they are likely to be harder to implement in low-governance worlds as they rely on some state coordination for success. Similarly, **early-warning systems** are an example of a 'state-framed' approach which can have very powerful benefits for trapped populations, although they do rely on connected governance arrangements to realise some of these benefits.

Looking across the range of policies, a similar pattern emerges as was evident in Chapter 6. It is clear that most policies are likely to be effective in addressing the human mobility outcomes identified in Table 7.1 in the 'high-governance' worlds of Scenarios B and D. Again, the real test of future resilience is how the policy fares in the low-governance Scenarios, A and C. Those policies that are state led are less likely to be successful in these scenarios than policies that focus on individuals and follow from their actions.

7.6 Conclusions

Policies to prepare for and respond to migration influenced by environmental change should be understood in the context of the broader policy space, which also recognises the opportunities in migration for long-term adaptation.

Chapter 6 noted that it was highly unlikely that all migration influenced by environmental change could be eliminated, and this chapter has focused on policy responses to plan and respond to migration and displacement influenced by environmental change. In parts it has also focused on trapped populations. The important policies areas relevant to migration in the context of environmental change have been highlighted as addressing humanitarian needs and protection gaps for displaced populations, policy and planning for sustainable urban growth and managing social tensions and conflicts. This chapter has highlighted that a range of different policies in these broad sets may be appropriate, and that policies that focus on the actions of the individual (as opposed to policies which are state led) are likely to be more effective in a range of future scenarios, and are thus more future resilient.

In particular, this chapter has highlighted that cities face a 'double jeopardy' future. Whilst many cities may not be adequately serving their populations now, they will be subject to even greater challenges resulting from increased threats from environmental change combined with growing populations. Indeed, some of these challenges may be so great that such cities will become unsustainable, and Chapter 8 gives serious consideration to the possibilities of building new cities in more sustainable locations. Yet this chapter has strongly argued against policy attempts to prevent rural–urban migration. This is partly because they are likely to be futile, but partly because this will result in swathes of populations being trapped in vulnerable locations in rural areas, where they may be particularly prone to humanitarian emergencies and displacement.

The earlier part of this chapter focused on protection gaps and humanitarian needs for those experiencing displacement which has been influenced by environmental change. As Chapter 8 shows, greater opportunities for migration often leads to a reduction in vulnerable populations and subsequent humanitarian emergencies and displacement, and this can be facilitated by a broader approach to the governance of migration. However, this risk can never be eradicated, and this is particularly the case where conflict interacts with environmental change, thus the need for the policies in the third part of this chapter.



8 Recognising the opportunities of migration as adaptation to global environmental change

Key messages

This chapter is predicated on the evidence reviewed in this report that migration opportunities are likely to be least available to those who live in the most vulnerable locations. Not moving is likely to increase humanitarian suffering, vulnerability and reduce livelihood security, and ultimately *increase* the likelihood of people being displaced or migrating in vulnerable circumstances. This chapter finds that:

- As migration continues in the decades ahead, in the context of global environmental change, policy should be orientated towards ensuring that it occurs in a way that maximises benefits to the individual as well as to both source and destination communities. In particular, migration is a key way for individuals to increase their long-term resilience to environmental change and offers scope for 'transformational' adaptation.
- A proactive policy towards migration influenced by environmental change that recognises that it can deliver benefits is most likely to achieve this outcome. Whilst no policy should ignore the costs of migration, equally the possibility of migration allowing people to build themselves a better life should be part of the policy assessment.
- Development policies should not be based on a presumption that people should stay where they are, especially if that involves staying in increasingly vulnerable environmental locations.
- In some cases, urban planning challenges in existing settlements may be so severe that the establishment of new urban centres is a more durable solution. Over the 50-year period this report covers, development of new secondary cities should be considered.

This chapter concludes with an assessment of the effectiveness of policies in different future scenarios. It finds that policies which build on individuals' adaption strategies, including facilitating migration, are more 'future resilient' than policies which give the state more control over people's movements, such as relocation.

8.1 Introduction

The policy responses discussed in the previous two chapters concern management of the pressures to migrate, and management of the migration which may result. Chapter 6 assessed the options that may allow vulnerable populations to remain in areas threatened by environmental change, while Chapter 7 addressed the serious urban and other management challenges of migration which does take place. Yet the policy picture is complete only if there is recognition that an absence of migration may itself entail undesirable risks and impacts, both to the potential migrants and to wider communities. For example, the increased environmental vulnerability of those who stay behind could increase demands for humanitarian assistance, and also add to local stress and conflict, which could have much wider consequences. Furthermore, as was seen in the analysis of measures to enhance livelihoods and provide insurance for vulnerable communities, migration may in itself be the most effective measure. In general, there may be circumstances in which the balance of risks and benefits mean that migration is the best option and therefore worthy of support. This chapter therefore considers policies that explicitly recognise and support migration as a potential adaptation strategy in response to environmental change, not least for those populations which are unable to move or have previously been prevented from moving.

These policies fall into three categories:

- those that seek to move people in an organised way to places that are less vulnerable to environmental change (referred to here as 'relocation');
- those that seek to create new urban spaces or patterns of settlement that by implication lead to migration from more vulnerable areas;
- those that seek to facilitate migration, broaden the opportunities and maximise the benefits of migration, thereby also allowing people to remain in their place of origin.

The human mobility outcomes that may result from increased environmental change and their impacts are set out in the first two columns of Table 8.1. The range of strategic policy responses which are covered and referred to in this chapter are in the third column.

Table 8.1: Migration as adaptation as a strategic policy response to important human mobility outcomes

Mobility outcome (as identified in Chapter 4)	Impacts of movement for different sectors	Strategic policy response
Migration with operational challenges (M1)	Can be a positive force for development and adaptation	If people are moving because of environmental change, ensure that migration contributes to development and adaptation
Migration with geopolitical challenges (M2)	Likely to be negative for community relations and tension, conflict, human security and social protection	Increased planned, managed migration likely to reduce the need for unmanaged, unplanned migration, which has political challenges
Displacement with operational challenges (D1)	Likely to be negative for economic growth, the legitimacy of government, human security, protection and health	Planned migration likely to provide more secure livelihoods and reduce vulnerability to environmental events that may cause displacement
Displacement with geopolitical challenges (D2)	Likely to be negative for human security and social protection, development, health, legal status of nation and citizens, and subsequent protection and conflict	
Unable to leave (trapped – S2)	Likely to be negative for human security, health, development, adaptation and vulnerability to environmental change and displacement	Migration is a positive route for people trapped in vulnerable circumstances
Choose to stay (immobile – S1)	Likely to be positive for human choice, human security and social protection	Migration can diversify livelihoods and secure incomes to make staying more possible

8.2 The case for migration as adaptation

Policies regarding migration as adaptation to environmental change need to be based on a comprehensive assessment of the transformational impact that migration may have on individuals' and communities' long term resilience to environmental change, as well as potential costs.

This report has identified problematic impacts of environmental change on migration drivers, which, in the future, will increasingly result in the outcomes identified in Chapter 4 (and Table 8.1). Policies that may reduce the impact of environmental change on migration were discussed in Chapter 6, although it was also seen that these policies can never fully eliminate the impact of environmental change on migration drivers. A key conclusion was thus that policies to build resilience in communities are *equally* as important as policies to reduce the impact. There is much evidence that migration is a key tool to build resilience, either through enhancing livelihoods⁵⁹⁶ or as a type of insurance strategy⁵⁹⁷, and putting people

⁵⁹⁶ Ellis (1998); Adger *et al.* (2002); DR8b (Annex D refers).

⁵⁹⁷ Amuedo-Dorantes and Pozo (2006) find this result for Mexico–USA migration; Osili (2004) for Nigeria–USA; Lucas and Stark (1985) for internal migration in Botswana; and Paulson (2003) for internal migration in Thailand.

in better positions to withstand environmental change⁵⁹⁸. Indeed, migration can be seen as a *transformational* adaptation strategy, as opposed to more static approach of trying to improve 'coping' in current locations to current climate conditions⁵⁹⁹. Resilience can be defined broadly to include social dimensions, such as the ability of communities to adapt in the face of external stresses and disturbances⁶⁰⁰. A transformational strategy to build human capital in populations and empower members of communities to obtain *different* income streams from *different* locations greatly increases the longer-term resilience of individuals and communities alike to the threats of environmental change⁶⁰¹.

However, the case for action does not stop there. It should also include the substantial economic benefits which can result from migration, not only for migrants but often also for the economies of receiving locations. For example, it can help to address skill shortages in key industries and public services, fuel entrepreneurship, and even provide scope for addressing demographic deficits linked to ageing populations⁶⁰². Moreover, as internal and international migration occurs most often in response to earnings differentials, it is associated with strong improvements in mean income levels in real term for the migrants, which may be particularly critical for the poor. For example, it has been estimated that 1 month of unskilled work by a Bangladeshi in the USA offers a greater earnings increase in real terms than a lifetime of micro-credit for a similar worker in Bangladesh⁶⁰³. Actual international migration may be less profitable but still has high average returns. Striking evidence is available from a study of a migration lottery in Tonga, whereby each year a number of work visas are allocated by New Zealand authorities to some applicants by drawing lots. 'Winners' of the migration lottery earn, on average, almost three times the net weekly wages of those who are not selected⁶⁰⁴. Internal migration is also profitable, even if less so. A study in Tanzania of the income levels of those who migrated from their original village in the last 10 years found that, after adjusting for living costs, migrant incomes were typically 30% higher than those of non-migrant but otherwise similar households. Studies in India have found similar results⁶⁰⁵.

However, such potential benefits need to be weighed against potential costs. Migration can, for example, involve substantial social costs, for migrants and receiving communities alike. The migrant experience, across or within borders, and not least in poorer low-income countries, can be difficult, with unrealistic expectations, arguably, the norm⁶⁰⁶. Standards of living in congested urban centres with stresses on water and sanitation, housing and public services are often very low (see Chapter 7). Migrant inflows in specific segments of labour markets, not least among the low-skilled groups, can put downward pressure on wages and may undermine often hard-fought labour rights protection, leading to resentment from the established population⁶⁰⁷. More generally, the negative attitudes across the world towards immigrants in the early years of their settlement are well documented⁶⁰⁸. The political costs of immigration can lead to policy where restriction is a main objective, not least in countries with tight labour markets and well-developed or emerging welfare states⁶⁰⁹.

The evidence in this report has shown that migration opportunities may be least available to those who live in the most vulnerable locations and circumstances.

Despite the considerable potential benefits of migration, and the seemingly large amount of internal migration taking place in many low-income countries⁶¹⁰ as part of a transformation from agricultural to more industrial and urban-based societies, it is often the poorest who cannot take advantage of migration possibilities. As discussed in Chapter 3, environmental change may well exacerbate the number of poor trapped in environmentally vulnerable and degraded rural settings, with little scope for moving to

598 Wallsten (2004) and Yang and Choi (2007) record that remittances increased following climate-related disasters in Jamaica and the Philippines, respectively; DR8b (Annex D refers) notes that rural-urban migration has diversified livelihoods, increased resilience and reduced vulnerability to environmental change.

599 PD23 (Annex D refers)

600 Adger (2000).

601 PD23 (Annex D refers).

602 DR3 (Annex D refers); DR11 (Annex D refers); PD7 (Annex D refers); SR18 (Annex D refers).

603 Clemens *et al.* (2008).

604 McKenzie *et al.* (2010).

605 MR3 (Annex D refers); De Brauw (2007); Beegle *et al.* (2011).

606 Tunali (2000).

607 SR18 (Annex D refers); MR5 (Annex D refers).

608 MR5 (Annex D refers).

609 DR13 (Annex D refers); DR3 (Annex D refers).

610 Chapter 1 noted that the UN made a conservative estimate that there were 740 million internal migrants in 2009.

areas with better opportunities⁶¹¹. This raises the question of the circumstances that might justify policies to support migration, including across borders, as a means of improving living conditions, and as part of an adaptation strategy when faced with environmental change.

Policy aims should focus on ensuring that migration in the context of environmental change occurs in a manageable way which allows the most benefits and fewest costs.

Assessing the case for supporting migration in the face of environmental change needs to recognise both benefits and costs. This chapter considers options to promote migration as an adaptation strategy in the face of environmental change in those specific cases where the benefits are deemed to outweigh the costs. In particular, the challenge is to foster opportunities for mutually beneficial and possibly managed migration (referred to as M1 in Table 8.1), thereby avoiding potential geopolitical impacts that characterise certain forms of migration (M2), and especially various forms of displacement, including those that are associated with geopolitical policy problems (D2)⁶¹².

8.3 Relocation as adaptation

In the face of future environmental change such as sea-level rise and other consequences of climate change, it may be an option for governments to choose to relocate large populations from rural and urban areas.

As this report has shown, environmental degradation has meant that many agriculture-based societies have faced declines in fortune while urban settlements have similarly had to be disbanded owing to water stress or other environmental factors. Examples include historic settlements of the Mayan or Ghanaian empires, as well as more recent examples such as the marsh areas of the Tigris–Euphrates delta in post-Saddam Iraq or the Aral Sea depopulation in Karakalpakstan⁶¹³. In many cases, there was gradual abandonment. In others an organised exodus of large parts of the population occurred. In general, abandonment was accelerated by political upheaval and violent conflict. At other times, events involving natural hazards have forced whole communities to relocate to other areas, for example volcanic eruptions (e.g. Montserrat) or flooding and landslides linked to extreme weather (e.g. the ancient Indus Valley and Pattonsburg, Missouri, in the twentieth century)⁶¹⁴.

The discussion of migration has only recently entered the UNFCCC climate negotiations process⁶¹⁵, and part of its focus is on planned relocation⁶¹⁶. Planned relocations can be defined as the movement of people, typically in groups or whole communities, as part of process led by the state or other organisation, to a predefined location. There are a number of relevant examples, offering lessons for policy. These are examined in the next section and section 8.3.2.

8.3.1 Recent evidence on planned relocations

There is burgeoning recent evidence which provides insights into the experiences and lessons learnt from planned resettlement.

- In Papua New Guinea, the **Carteret Islands** are affected by both sea-level rises and erosion, and since 2003 the population of about 1,000 residents, with direct financial government support, has been gradually resettled in Bougainville Island. Whilst the media have depicted this as the first example of mass relocation from an island as a result of climate change, most research would suggest more complex causes linked to erosion and indeed other socio-political factors rather than climate change⁶¹⁷. Whatever the reason, the case of the Carteret Islands nevertheless illustrates the problems that may be associated with relocation, as Bougainville Island itself continues to face governance

611 See Banerjee *et al.* (2011).

612 See Chapter 4 for full discussion of migration outcomes.

613 CRI (Annex D refers).

614 CRI (Annex D refers).

615 For a detailed discussion of how migration has been discussed in various stages of climate change negotiations, see PD23 (Annex D refers).

616 See Chapter 9 for further discussion of migration and relocation in the Cancun Adaptation Agreement. For more information on the UN Framework Convention for Climate Change (UNFCCC) see Chapter 6, Box 6.1.

617 DRI6 (Annex D refers).

challenges and social tensions, partly as a result of its secession conflict⁶¹⁸. Experience from this event shows that even gradual planned resettlement with government support can lead to one set of problems being exchanged for another in the destination area.

- After increasing volcanic activity between 1995 and 1997, the UK government supported relocation of **Montserrat**'s population of about 12,000 to other parts of the island, to other Caribbean islands and to the UK. Some have since returned to specific parts of the island with active support from government, although the local economy has changed dramatically from a thriving mix of tourism, agriculture, remittances and the public sector to a society of few young wage earners and larger proportions of vulnerable groups and generally more dependence on the state⁶¹⁹. As in the Carteret Islands, the local economy has not recovered from the temporary disruption following the relocation of the island's population.
- In **Ethiopia**, a considerably poorer setting, much larger resettlements have been implemented in recent decades. Faced with drought and environmental degradation, the Ethiopian military government advocated the resettlement of about 1.5 million of the 8 million people living in the vulnerable northern highlands around the time of the onset of the large famine period of 1984–85. In practice, about 600,000 people were mostly forcibly resettled to less sparsely populated areas in the south and south-west⁶²⁰. Implemented on a shoestring, and often in areas with high risk of disease, without necessary public investments, it resulted in substantial misery and deprivation and, in some areas, conflict with pastoralist populations⁶²¹. Despite these experiences, relocation has again been promoted by the current government since the drought of 2003, with a 'Voluntary Relocation Programme' aimed at resettling 2.2 million from the drought-prone central and eastern highlands to other rural areas in the same administrative regions. In principle voluntary and with a right to return, but with local political campaigns to encourage resettlement, up to a million people have since moved. In practice, implementation quality has been variable, and the extent to which it overall resulted in positive impacts on people's well-being remains controversial⁶²².
- In **China**, population resettlement has been a central platform of policies relating to poor areas in environmentally fragile settings since 1983⁶²³. Beginning with the resettlement of the 'San-Xi Areas' (the Hexi corridor area and middle area around Dingxi in Gansu, the Xihaigu area in Ningxia), it has involved the movement of large populations from poor and especially environmentally degraded areas in various parts of the country, including drylands and mountainous areas to either rural or urban settlement. By 2002, 4.4 million people in Gansu province had been voluntarily moved with official encouragement, with several million more planned.⁶²⁴

Although evaluation of the impact of these policies in China has been limited, material living conditions appear to have improved for these groups, with considerable investment in public services but also with increased dependency⁶²⁵. Although official monitors of the process have hailed it a success, problems of movement of people into agricultural lands elsewhere have been noted. These are related to issues of land scarcity and insecurity of land tenure. The fiscal cost has also been considerable in comparison with funds available for general poverty reduction⁶²⁶.

- In the face of current and projected sea-level rises, The **Maldives** government proposed in 2009 to set up a sovereign wealth fund⁶²⁷ from tourism receipts to support population movements from its island archipelago and is reported to be considering the acquisition of land in countries such as Sri Lanka to resettle its population of a few hundred thousand permanent residents, although the speed of progress is disputed⁶²⁸. Other low-lying islands, such as **Kiribati**, already have sovereign wealth funds,

618 Alley (2003).

619 CRI (Annex D refers).

620 Tareke (2009).

621 Clay and Holcomb (1985); Woldemeskel (1989); Pankhurst (1992); Rahmato (2003).

622 Pankhurst (2006); Hammond (2008).

623 This is separate from any resettlement linked to large-scale development projects, such as the Three Gorges Dam, which has been given far larger attention in the literature and policy discourse even though in numbers affected (about 1.3 million) it is considerably smaller in scale than the 'voluntary' resettlement considered here.

624 Liu (2007).

625 Rogers and Wang (2006); Liu (2007).

626 Li *et al.* (2004); Liu (2007).

627 A sovereign wealth fund is a long-term, state-owned investment fund consisting of financial assets invested globally, focusing on maximising long-term gains.

628 PD15 (Annex D refers).

with the aim of providing long-term adaptation resources, of which large -scale relocation is one of the options considered.

When movements beyond national borders become essential, such as may be the case for the Maldives and **Tuvalu**, the sociopolitical challenges are even more serious, related to potential coexistence of the population of a nation entirely within the borders of other countries. As noted in Chapter 7, the environmental dimension of this need to relocate has led to much debate concerning the possible offer or creation of a (multilaterally accepted) status for 'environmental migrants', and active bilateral discussions with particular nations to allow populations to settle⁶²⁹. However, progress on this issue has been slow. For example, Australia has refused to agree to accept people from Tuvalu who need to be resettled for purely environmental reasons. New Zealand has offered to take in 75 people per year for the next 30 years (equivalent to about a quarter of Tuvalu's current total population), but as part of an agreement on labour migration which is not officially linked to environmental causes. Migration from Tuvalu and other islands into both Australia and New Zealand conditional on standard economic criteria and skills has nevertheless remained high⁶³⁰. Overall, the organised bilateral movement of island populations may offer a partial solution for some of the smallest island states, but it is unlikely to be sufficient for any larger-scale migration.

If the current rate of change in sea level continues unabated, relocation may have to be considered as a necessary adaptation for several low-lying islands in the Pacific and the Caribbean. For most, from Fiji and Papua New Guinea to Cuba, internal relocation is an option, as these islands rise up to several hundred metres above sea level, although current population centres are in low-lying areas. However, the challenges go beyond those relating to the provision of housing and public services, and other humanitarian support. The bigger challenges tend to be sociopolitical and economic. As the example of the Carteret Islands shows, the context of Papua New Guinea made the organised movement of large populations with direct government support to particular areas a potential source of further sociopolitical conflict, not least in settings with poor governance. The economic challenges are arguably even more difficult, as opportunities to generate income cannot easily be engineered. The relatively local movement in Montserrat still contributed to a dramatic change in livelihood patterns and increased welfare dependency⁶³¹. Although these challenges tend to be recognised, they are not easily resolved. The establishment of financial instruments such as sovereign wealth funds to deal with slow-onset environmental change may offer the financial means to support relocation, but it does not guarantee future secure livelihoods for those affected.

When the scale of movement becomes larger, as may be the case in densely populated low-lying areas, or, as was the case in Ethiopia and China, involving large populations engaged in agriculture in drought-prone or otherwise environmentally degraded areas, the challenges are more daunting still, even if migration remains within national frontiers.

8.3.2 Policy lessons from previous resettlements

Several lessons can be drawn from these cases:

1. **Given the challenges involved, a carefully planned movement is clearly superior to hastily organised, under-resourced, internal relocation.** Political imperatives encouraged the various Ethiopian governments to push ahead with poorly financed and planned relocations often to unsuitable areas, with, especially in the mid-1980s, devastating consequences.
2. **The need to plan carefully also implies that funding has to be secured well in advance, and not, for example, raised when natural disasters precipitate the need for urgent relocation.** Sovereign wealth funds with specific environmental adaptation purposes, including for migration, are one route, although they are not without governance-related risks. In practice, these funds transfer funds under the control of the current generation of politicians to a future generation of politicians. In areas with risks of poor governance and conflict, there is a substantial problem in securing commitment that funds allocated today will indeed be used for the purposes initially stipulated, suggesting the need for

629 PD16 (Annex D refers).

630 PD15 (Annex D refers).

631 CRI (Annex D refers).

monitoring and mechanisms and binding commitment devices. Insurance facilities, such as the Caribbean Catastrophe Risk Insurance Facility, which offers payouts in the case of natural disasters, could provide the liquidity needed for quick implementation of relocation, but can offer a solution only if sensible contingency plans for relocation are drawn up well in advance⁶³².

3. **Large-scale movement of agricultural populations to another agricultural area is at best high risk and unlikely to be conducive to permanent transformation of living conditions.** High-yielding agricultural land is rarely left uncultivated by local settlers unless for good reasons, such as high disease risk in lowland Ethiopia. Moreover, cultivation of existing agricultural land by newly settled populations is likely to result in conflict over land or insecure land tenure, as noted in the China and Ethiopian examples. Furthermore, to bring such land into profitable cultivation would typically require substantial investments and possibly technological change well beyond the capacities of new and relatively poor settlers⁶³³.
4. **As all examples have highlighted, the key question of economic livelihoods in destination areas is not easily resolved.** Montserrat's resettlement and supported return migration resulted in an economic transformation with more dependency on welfare payments. China's resettlement also appears to have resulted in more dependency⁶³⁴. It has been argued in the case of Ethiopia that, with 85% of the population engaged in agriculture, relocation should focus not on rural areas and agriculture, but on movement towards towns, with resources spent on job creation and urban development⁶³⁵. In general, the hasty implementation of relocation plans can mean that insufficient effort is made to ensure that populations have the appropriate skill set to be successful migrants. Attempts to ensure that that populations move to locations where there are existing social networks for the arriving population may also be inadequate⁶³⁶. Large-scale organised resettlement does tend not to exploit any existing migration links, nor does it take into proper account the relative income and labour market opportunities for migration, affecting the chances of success. However, Kiribati is currently demonstrating an interesting alternative. Rather than focusing on just relocation plans, it has launched programmes aimed at improving education precisely to create the skill mix that will allow more skill-based migration from Kiribati. In this way, it is effectively encouraging migration as an adaptation strategy⁶³⁷.
5. **Organised relocation tends to be very expensive.** Despite making it a crucial policy objective, reflected in the state budget, Ethiopia's leadership attributed the acknowledged initial failings of the 2003 resettlement to a lack of resources⁶³⁸. The high cost as a share of the budget for poverty reduction is also clear from the Chinese example. With a reported cost of about USD 1,000 per person, and with several million people still planned to be moved, the cost could come to billions of dollars⁶³⁹.
6. **Finally, all current programmes should be voluntary in that participation can in principle be refused.** A question remains about the meaning of 'voluntary', as these programmes offer only one directed area of destination, and they also operate in specific policy environments. In both China and Ethiopia, there are important restrictions on internal migration. In China, the Hukou system restricts internal migration as permission needs to be sought to move residency, and this continues to affect access to land, employment, housing, health and schooling, especially for poorer and unskilled groups. No alternative migration opportunities other than the planned 'voluntary' resettlement are being offered. In Ethiopia, a similar system of local residency and registration exists, affecting land access and access to other services. In both countries, many risk giving up these rights by moving for

632 PD21 (Annex D refers).

633 Hammond (2008) goes further, and argues that, as rural-rural relocation typically involves movement into more remote areas, it is a means of making these vulnerable groups politically and socially invisible.

634 Rogers and Wang (2006).

635 Rahmato (2003).

636 In China, for example, much of the movement from mountainous areas involved ethnic minorities, who were moved to areas where they were less well represented (Rogers and Wang, 2006). One lesson put into practice by the Ethiopian government in 2003 was to restrict resettlement to areas with a similar ethnic base, in contrast to resettlement in the 1980s, which had contributed to ethnic tensions.

637 PD15 (Annex D refers).

638 Prime Minister Meles Zenawi, quoted in Hammond (2008).

639 Liu (2007).

employment. In choosing between legal ‘voluntary’ resettlement to a particular area versus voluntary migration to destinations of choice, the incentives and official rhetoric are clearly biased towards the former.

While recognising that migration may be useful, or even essential, can alternative policy regimes be designed in which migration as adaptation can be adopted, without policy-induced relocation via directed migration? This is pursued further in the next two sections.

8.4 Urbanisation as adaptation: settlement policies and new cities

In some cases the challenges for urban planning in existing settlements may be so severe that the establishment of new urban centres is a more durable solution. Over the 50-year period this report covers, development of new secondary cities must not be ruled out.

As the analysis in earlier chapters has shown, rapid urbanisation has been a feature of development in many low-income countries in recent years, and is likely to continue over the next five decades. The likely scale of migration, and urbanisation, and the pressures of global environmental change, not least in low-lying coastal areas, where most of the largest cities are currently located, may also mean that the majority of existing cities may not be sufficiently equipped to respond effectively to new adaptation challenges while absorbing further large populations. As Chapter 7 has argued, the challenges faced by cities to absorb growing numbers of migrants while faced with the added burdens of environmental change are enormous, and in some situations may lead to an unsustainable ‘lock in’ to settlement in increasingly precarious environmental locations. Would new sustainable cities, in less vulnerable locations, offer a solution at least in some parts of the developing world?

In the past, new city development, not least when purely driven by political imperatives, such as new capital cities in Nigeria, Brazil or Tanzania, has sometimes resulted in economically unviable entities, supported only by tax receipts and administrative centralisation⁶⁴⁰. Further problems may occur in situations of weak regulatory frameworks: in India, for example, the first of six planned eco-cities has been developed in the Mumbai–Pune Highway region, yet this has resulted in local environmental damage, the displacement of indigenous populations from their land (and their replacement with elite members of urban populations) and the subsequent rural–urban migration of those displaced persons to different cities. The trend in private–public partnerships for building new cities in India also risks a loss of state accountability for environmental protection whilst the development of new eco-cities produces the need for high speed private transportation networks, which further increase GHG emissions⁶⁴¹.

In other cases, economic imperatives have dominated, for example in the special economic zone in China, where the new city of Shenzhen was built. Although such developments have absorbed large migrant populations⁶⁴², the key to their success will be adaptation to new environmental realities, particularly after 2030, and also the provision of a setting in which secure livelihoods can be guaranteed in the long-term.

Box 8.1: Inspiration for new settlement policies: ‘charter’ cities

Inspiration for new cities and settlements can be found in the concept of ‘charter cities’, introduced by Paul Romer⁶⁴³, combining ideas of special economic zones, attractive for large-scale productive investment, with free rights of safe and secure voluntary settlement and guaranteed defined social and economic rights, to be established on new land. It could involve land provided in one country but labour provided from other countries, with third countries contributing as guarantors, making it also potentially suitable for any required relocations in view of environmental change. The need for external enforcement agencies makes them unlikely to be easily feasible, although elements of these ideas could be incorporated into a strategic approach to new city development.

640 Kironde (1993); Berraud (2001).

641 CSII (Annex D refers).

642 Wu (2009).

643 See, for example, Fuller and Romer (2010).

8.5 Facilitating migration as adaptation: making migration work

Development policy in the context of environmental change should not be based on a presumption that people should stay where they are, especially if that involves staying in locations that are increasingly vulnerable environmentally. The possibility of migration allowing people to build themselves a better life should be part of the policy assessment.

Currently, much development policy and debates on international development and poverty reduction, not least in context of global environmental change, is focused on finding ways to ensure that populations are able remain in particular locations. As Chapter 6 has shown, there may be circumstances in which this is both possible and desirable. However, it is argued here that a wider set of options need to be weighed in the light of the local circumstances. The costs and benefits of policies that enable people to move to build a better life elsewhere need to be considered alongside any policies which are designed to encourage or constrain people to remain where they are, particularly in localities where they may become trapped and increasingly vulnerable to environmental effects, and where livelihoods may become less sustainable in the longer term.

Further, in weighing up cost and benefits, impacts and opportunities, it is critically important that the wishes and perspectives of the people concerned are given due weight. After all, it is they, and the potential host population, who will have to live with the consequences of relocating or remaining. Indeed, the importance of this issue was demonstrated in the international workshops conducted by this project in Bangladesh, South Africa, Turkey and Nepal. These demonstrated that local views and motivations can differ substantially from those of more distant policy makers.

This section now explores policies that can make migration a more effective adaptation strategy for vulnerable populations faced with environmental change, as well as more acceptable to receiving communities⁶⁴⁴. The aim is to consider how the opportunities for migration can be broadened, and how the potential benefits that could be realised from migration could be realised for poor communities and families, and how those who are trapped in vulnerable circumstances can extricate themselves from this position. Movement within borders of countries is discussed first as this is likely to be much more significant than international migration.

8.5.1 Realising potential benefits from internal migration

Internal migration and urbanisation is a prerequisite of development. Faced with future migration influenced by environmental change, development policies must recognise the benefits of migration to economic development and individual welfare, as part of the cost–benefit analysis.

Section 7.3 noted that there are many operational challenges inherent in increased rural–urban migration. Yet it was argued that policy makers should not focus their attentions on trying to prevent this migration. One reason for this is that evidence suggests that attempts to do so are likely to be unsuccessful. However, another important reason is that, for many of world's poor, rural–urban migration, and internal migration more generally, offers important benefits and opportunities. Internal migration is an essential part of the process of increasing living standards in poor economies. Labour productivity, the output that can be produced per worker, is central to increasing incomes. The scope for labour productivity gains is generally much larger outside agriculture than inside this sector, and the absorption of labour in these alternative sectors as part of economic growth processes is at the basis of much of the gains in living standards around in the world, further feeding growth and transformation. The release of labour from agriculture also allows progress in agricultural practices and techniques to be translated into income gains in the rural sector.

Across the world, the inverse relationship between the share of the population engaged in agriculture and the level of national income as well as poverty is well established⁶⁴⁵. Owing to scale economies, cities are the locations for much of this non-agricultural activity. However, despite the potential advantages to economies as a whole and for the migrant population, this process is not smooth and as already noted, involves substantial changes in the lives of receiving communities, in terms of congestion, impacts on

⁶⁴⁴ Barnett and Webber (2010).

⁶⁴⁵ World Bank (2008).

public services and infrastructure, pressures on water, sanitation, health and educational systems and often also on local labour market opportunities. Local identities can also come under pressure. These issues were covered in Chapter 7.

Because of such sociopolitical pressures, the political leadership of many cities across a wide range of poorer countries tends to be generally hostile to large influxes of migrants whether from internal or international origin. In any case, city planning and much national policy making appears to be generally focused on restricting new populations, rather than making cities accessible for migration. Yet it has been argued that there is actually undermigration in China, with many cities too small for economic efficiency⁶⁴⁶. Evidence from earnings gaps in Tanzania shows that there may be under migration from rural to urban areas, and similar patterns have been found in India⁶⁴⁷. Making development carbon neutral has economies of scale, and is therefore easier to implement in densely populated areas rather than more sparsely populated hinterlands⁶⁴⁸. Effectively protecting concentrated populations in low-lying coastal and flood-prone areas is more cost-effective than when they are spread out across vast coastal distances.

On the one hand, migration, and an analysis of its costs and benefits, must not be absent from country-level development policies. This does not mean that migration is explicitly encouraged, but rather it must be recognised that for many people it is an important way of bringing themselves out of poverty and out of vulnerability to global environmental change. On the other, to fully achieve the goals of economic development, economic efficiency, carbon-neutral economies of scale and cost-effective adaptation, policies to encourage or facilitate migration to particular cities may need to be part of the policy suite.

Whichever the choice, the following set of factors should be considered by development planners in the context of future migration and non-migration influenced by environmental change:

- **Appropriate planning institutions for adaptation of cities is desirable⁶⁴⁹ and migration should become an integral factor in planning processes.** The migrant experience in many emerging economies is generally difficult, typically leading to a marginalised existence on the fringes of the existing city economy and society. Migrants are often excluded from some rights, including property rights, basic services or social protection⁶⁵⁰. Adopting policies to ensure that migrants' livelihoods are not more fragile than the established population could allow better integration in local society and provide migrants with opportunities to build up secure economic livelihoods, enabling transformation of the local economy.
- **Making cities in some parts of the world more attractive for in-country migrants, possibly combined with specific incentives for populations from defined areas, may also provide an alternative to costly relocations involving defined locations with limited opportunities.** The examples from the previous sections showed that relocation is generally costly and has often failed to offer clear opportunities for secure livelihoods without welfare dependency. An important shift in policy thinking is required, away from a focus on building resilience *in situ* at all costs, and relocation only if all else fails when faced with environmental change. It requires the acknowledgement that migration is bound to be a part of the livelihood transformation for many, without environmental change, and that such change may simply induce a need for more immediate migration opportunities that should be supported.
- **Particular policies for consideration relate to legal and institutional issues (guaranteeing rights to migrants, such as access to services, housing, property rights and social protection, similar to non-migrants), as well as specific investments and city planning to enable expansion.** These policies would also involve a potential shift in public spending patterns in cities, focusing on poverty alleviation for migrants, strengthening the livelihood opportunities of the current rural population in fragile settings and providing funds to facilitate adaptation to climate change. Of course, such policies will need to take careful account of sensitivities in established populations, particularly if they are perceived as positive discrimination or as prejudicial to existing residents.

646 Au and Henderson (2006).

647 Beegle et al. (2011).

648 McGranahan et al. (2004).

649 Carmin et al. (2009). See also Chapter 7.

650 Sabates-Wheeler and Macauslan (2008).

- There is evidence that migration by some can also support the local transformation and increased resilience of those remaining behind in local communities via remittances, thereby avoiding wholesale relocation⁶⁵¹. Rights to basic services and social protection and more secure property rights in both origin and destination communities would also allow more circular migration so that migrants can more easily return when opportunities decline, for example during economic downturns, thereby releasing pressure on local labour markets.

Nevertheless, successful migration leading to economic security also requires that in-country migrants can offer skills that are in demand in local labour markets. This means that, when investing in migration as an adaptation strategy, policies should also involve building up skill sets that are transferable to cities through improved education and health. This was a particular focus for discussion amongst participants at the Bangladesh workshop (see Box 8.2).

Box 8.2: Feedback from the regional workshops: migration as an adaptation in Bangladesh

Bangladesh is one of the countries in South Asia most vulnerable to environmental change. It regularly suffers from sudden events such as flooding, cyclones or riverbank erosion as well as being subject to slow-onset processes such as soil salinity and coastal erosion. The frequent inundation of farming land, destruction of crops, and loss of livelihood associated with these climatic events has influenced the displacement of people from their places of origin.

In response to growing climate change effects in Bangladesh, workshop participants discussed the idea of **migration as adaptation; transforming migration into a logical and legitimate livelihood diversification strategy**. Circular migration between urban and rural areas is already a common strategy in Bangladesh, and one that can be further increased by environmental events. Following Cyclone Aila in 2009, one survey of the cyclone-affected population found that temporary migration for work increased from 1% before the cyclone to a current level of 7%. Internal and international migration can also have substantial benefits; Bangladesh, for example, earned USD 10.7 billion in 2009–10 from its overseas migrants.

Considering the potential for labour migration and the growing need to react and adapt to environmental change, participants recommended incorporating migration into Bangladesh's national development agenda, and facilitating skilled and semiskilled, internal and international, migration. Such a process would require careful management, and policy makers will need to bear in mind migrants' access to health care, livelihood opportunities and family planning support⁶⁵².

A full report detailing the discussions from the Low-elevation coastal zones workshop can be found on the Foresight website and CD along with the full evidence base.

8.5.2 Supporting and maximising benefits from international migration

Demographic deficits in certain countries suggest that a win–win situation could occur where there are opportunities for planned, circular migration from countries that are likely to be particularly vulnerable to environmental change.

As with internal migration, investments could allow more successful international migration. In high-income countries, business leaders have long acknowledged the positive role of migration in addressing skill shortages in key sectors of the economies, especially as, other things being equal, these skill shortages are likely to grow further in many countries, exacerbated by the demographic deficit⁶⁵³. For example, as discussed in Chapter 2, with a fertility rate of below 1.3, Japan's population is due to shrink by around 25 million by 2050, whilst according to projections from the European Commission, by 2050, the EU will go from having four to only two persons of working age for each citizen aged 65 or above⁶⁵⁴.

651 SRI3 (Annex D refers). See also Chapter 3.

652 WR3 (Annex D refers).

653 DR3 (Annex D refers); DRI1 (Annex D refers); PD7 (Annex D refers); SRI8 (Annex D refers).

654 European Commission (2006).

For low-income countries to take advantage of these opportunities an investment in those skills that are in demand internationally is required. This could enable workers from these countries to migrate, but within the wider framework of the sociopolitical constraints on international migration. Increased investment in education in Kiribati, for example, has been justified in these terms⁶⁵⁵. However, such investments are transferable across borders only if qualifications and acquisition of skills can be certified.

Whilst the disadvantages of a potential 'brain drain' can be crucial to the originating country, recent work has come to the conclusion that, perhaps surprisingly, significant benefits can also result⁶⁵⁶. This is for a number of reasons, including that the opportunity for international migration by a few of the best with particular high-value skills (from engineers to health professionals) provides incentives to many more to acquire these skills, and that subsequent remittance flows by these international migrants can provide a crucial income source for food, education and health care, and can outweigh the training costs of these skilled migrants. Recent literature suggests that, by stimulating an increase in the expected returns on education, migration can lead to increased investment in human capital and a 'brain gain' that exceeds the brain drain. Some states, such as the Philippines, have sought to overtrain in areas such as nursing because of the anticipated increase in remittance flows⁶⁵⁷.

Most promising for such migrant opportunities have long been regional opportunities, with faster-growing countries in a particular geographical neighbourhood absorbing labour from countries where growth is sluggish, for example towards megacities in East and Southeast Asia⁶⁵⁸. Although demand for migration may be reduced in certain 'low-growth' scenarios, promoting legal and safe opportunities for migration and increasing human capital in expanding regions is in many respects a 'no regrets' strategic policy option, as individuals are given opportunities to do what is best for them, regardless of the prevailing socioeconomic situation.

Circular migration schemes have increasing potential to be a platform to deliver these benefits.

Particular schemes of temporary and circular migration may allay some of the sociopolitical concerns and allow international migrants with a wide variety of skills to play a role in high-income or emerging economies. Temporary migration would still offer highly valuable earnings opportunities to migrants from low-income countries as typically returns to skills in demand in high-income countries are substantially above those in sending countries. More effective movement within emerging economies, such as the creation of freedom of movement within regional free trade areas, for example between Asian countries as part of the Colombo Process, could also provide opportunities⁶⁵⁹.

A range of migration policy options can include provision for shorter- or longer-term stays. An increased focus on circular migration schemes is under way, exemplified by several initiatives in Canada⁶⁶⁰, Germany and the UK⁶⁶¹. Circular migration schemes are designed to promote greater circulation of people, but without necessarily leading to permanent settlement. Benefits for sending, destination countries and for migrants themselves have already been seen⁶⁶². Indeed, in 2004, the House of Commons International Development Select Committee specified how it thought migration could be supported as part of a poverty reduction strategy, noting 'the potential development benefits which might be gained from more circular migration', and that 'it is important to examine the different ways in which such circular migration might be encouraged'⁶⁶³. The Global Commission on International Migration saw important development opportunities arising from more fluid circular migration, with people able to move back and forth more easily because 'the old paradigm of permanent migrant settlement is progressively giving way to temporary and circular migration'⁶⁶⁴.

655 PD15 (Annex D refers).

656 Clemens and McKenzie (2009).

657 Özden and Schiff (2006).

658 DR7b (Annex D refers).

659 SR20 (Annex D refers).

660 Preibisch (2007).

661 Castles (2006).

662 Vertovec (2007).

663 House of Commons International Development Committee (2004, p. 48).

664 Global Commission on International Migration (2005, p. 31).

Within Europe, the European Commission has also highlighted the development opportunities of circular migration. In its 2005 'Policy Plan on Legal Migration', the Commission advocated provision of multi-entry visas, giving priority to former migrants when granting new residence permits for temporary employment, and setting up a database of third-country nationals who left an EU member state when their residence or work permit expired⁶⁶⁵. The EU has since agreed 'mobility partnerships' with Moldova, Cape Verde and Georgia.

Such developments are promising; however, they are frequently governed by bilateral agreements rather than any form of regional or global governance; perhaps as a consequence they remain quite small, and await systematic evaluation as to their effectiveness and potential to be 'scaled up'. It is also worth noting that it is not simply the arrangements for global or regional governance that are important in making circular or temporary migration schemes successful, but other measures are also important. In particular, to avoid institutional capture by specific groups or unplanned hardship, such schemes would also benefit from careful funding arrangements (such as credit), appropriate transport and settlement support, and schemes to certify qualifications and skills.

8.6 Resilience of policy areas to future scenarios

When considering policies for the next 50 years, it is essential to assess them for their resilience across the range of scenarios.

This chapter has highlighted three broad areas of policy that would facilitate, if not encourage, effective migration that is of potential benefit to the migrant as well as to both the originating and destination areas. In so doing it has discussed their feasibility and general desirability. The three relate to:

- relocation policies, that is state-led action to move communities to predestined locations;
- creation of new urban spaces or patterns of settlement that, by implication, lead to migration from more vulnerable areas;
- specific policies to make migration more beneficial for poorer communities, particularly in the context of adapting to environmental change.

This chapter has provided the rationale for these policies, and explained how they address the challenges identified in Table 8.1 (and Chapter 4). However, throughout this report there is recognition that migration and non-migration influenced by environmental change is highly contextual, and is likely to have very different outcomes depending on the future socioeconomic and political scenario. This section explores how resilient each policy is to the future, using the scenarios presented in Chapter 2 and used for a similar exercise in Chapters 6 and 7. In particular, Table 8.2 provides an indication of the effectiveness of each broad class of policy for each of the four scenarios. Again, the colours range from dark red indicating high effectiveness, through white, indicating neutral effectiveness, to shaded grey, which indicates that policies may well be counterproductive. The 'effectiveness' of each policy is measured against its ability to address the policy challenges highlighted in Table 8.1. The future resilience of each policy is indicated by its effectiveness across the range of scenarios.

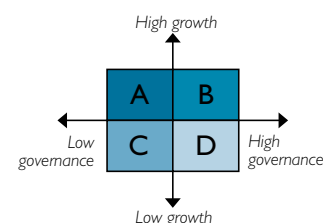
⁶⁶⁵ Commission of the European Communities (2005).

Table 8.2: Effectiveness of policies to recognise the opportunities inherent in migration influenced by environmental change

Type of policy/Scenario	A	B	C	D
<i>Relocation as adaptation</i>				
Internal relocation , after disasters, funded by disaster insurance facilities or aid, to other rural areas	Highly counter productive	Moderate effectiveness	Highly counter productive	Moderate effectiveness
Internal relocation , pre-planned, funded by long-term investment, including urban settlement and job creation	Moderate effectiveness	High effectiveness	Moderately counter productive	Moderate effectiveness
International relocation , pre-planned, funded by sovereign wealth funds or similar	Neutral effectiveness	High effectiveness	Highly counter productive	Moderate effectiveness
<i>Settlement policies</i>				
Building new cities and urban planning	Neutral effectiveness	High effectiveness	Moderately counter productive	Moderate effectiveness
<i>Facilitating migration as adaptation</i>				
Investment in migration: education and skills for potential migrants	Moderate effectiveness	High effectiveness	Moderate effectiveness	Moderate effectiveness
Investment in migration: making cities more accessible and attractive for migrants (access for migrants to property rights, social protection, public services, and cities built for expansion)	Moderate effectiveness	High effectiveness	Moderate effectiveness	Moderate effectiveness
Incentives for migration: temporary or circular; including credit, transport, protection	High effectiveness	High effectiveness	Moderate effectiveness	Moderate effectiveness

Key

	High effectiveness
	Moderate effectiveness
	Neutral effectiveness
	Moderately counter productive
	Highly counter productive



Policies that give responsibility to the individual, including facilitating migration, are more ‘future resilient’ than policies that give more control over people’s movements to the state.

A common theme of this exploration of future resilience throughout this report is that most policies are highly or moderately effective in Scenario B, in which there is high global growth and effective and connected governance. This is likely to be because, in an environment in which projects can be well financed and they are conceived and delivered in an inclusive way, all policies are much more likely to succeed. This applies as much to the policies listed in Chapter 8 as it does the policies in Chapters 6 and 7. Similarly, most policies are likely to be moderately effective in Scenario D; although funding may be reduced (which may, for example, reduce economic well-being, which would be important to large new cities), strong governance ensures the policies deliver certain benefits.

An examination of the resilience of policies to the context of Scenarios A and C is perhaps more illustrative. These scenarios are characterised by both exclusive governance and low growth. Exclusive and fragmented governance is likely to have a significant effect on the success of **relocation schemes**, as crucial lessons, as identified in section 8.3, may not be applied to influence practice: for example, the need to match livelihoods in the resettled areas, and the respect for the right of the individual not to move. As noted above, relocation is expensive, and these policy measures are even less likely to be effective in Scenario C, in which there is lower global growth and therefore reduced funding. A similar picture is seen with policies relating to **building new cities**, although the impact of poor governance is tempered somewhat by the increased ability of people affected to influence outcomes (in comparison with what may be forced resettlement).

In contrast, policies that offer scope for **migration as adaptation** are still highly or moderately successful across all scenarios. This is because, if done correctly, they have the effect of improving individual's human capital and empowering them to lead resilient lives. If 'roots' are put down and social networks established through short-term or circular migration, this further increases resilience, potentially spreading to include the wider community. Individuals will be less reliant on external parties, such as the state, to coordinate itself and deliver complex policies, meaning that these policies are more resilient to the low-governance scenarios, A and C. The fact that high global growth drives demand for migrants means that incentives for migration are most apparent in Scenarios A and B, which may also influence the effectiveness of the policy.

In summary, policies that offer scope for migration as adaption are systematically more effective in the range of scenarios: they offer opportunities for some to migrate as part of a livelihood transformation. The resultant increase in remittances and social networks is likely to strengthen livelihoods for those in source communities, providing a greater opportunity for those who stay behind. As before it is important to stress that there is no single policy approach that will fit all situations, and it will be particularly important to ensure that local circumstances and local perspectives play a central role in assessing the best policy choices.

8.7 Conclusion

It is important for policy makers to fully recognise that migration, in its different forms, is part of the general transformation of relatively poor to better-off societies. Moreover, in the face of environmental change, it is equally important to appreciate that there is a growing risk that poor communities may be unable to migrate successfully and improve their lives. This chapter has discussed three sets of policy options, involving different types of action, which can promote mobility and avoid displacement in the face of environmental change and even disaster: relocating populations, building viable new cities and encouraging and supporting (internal and to a lesser extent international) migration to maximise its potential to build long term resilience. The implications of all three policy approaches discussed in Chapters 6–8, which encompass reducing the need for, planning and responding to, and recognising the opportunities in migration influenced by environmental change, are drawn together in Chapter 9.



9 Conclusion

Key messages

This report has challenged the view that public policy needs to respond to a growing number of 'environmental migrants' or 'environmental refugees' in the future. However, the relationship between migration and global environmental change is real and important. Hundreds of millions of people, especially in poorer parts of the world, are highly vulnerable to global environmental change, and will become more so in the future. Migration and displacement are sometimes part of a complex set of problems which must be addressed, but in many cases migration is also part of the solution. In particular:

- Migration is highly likely to continue through to 2060, taking people both towards and away from areas where they will be vulnerable to global environmental change.
- Lack of ability to migrate is as important a policy issue as migration itself, as migration may form part of an appropriate adaptation to global environmental change.
- The policy responses that have the best chance of success across different future scenarios are those that respond to individual strategies of adaptation, rather than imposing top-down 'state led' solutions.
- A key priority is to develop adaptation planning in a way that builds resilience whilst recognising both the risks and benefits inherent in migration.
- Giving urgent policy attention to migration in the context of global environmental change now will prevent a worse and more costly situation in the future.

In summary, the key message of this report is that migration in the face of global environmental change may not be just part of the 'problem' but can also be part of the solution. In particular, planned and facilitated approaches to human migration can ease people out of situations of vulnerability and help build resilience.

9.1 Introduction

This report has explored the phenomenon of migration influenced by global environmental change. It has argued that, in spite of recent academic and media attention, it is neither practically nor theoretically feasible to identify a clear and unambiguous group of 'environmental migrants', still less to project the volume of 'environmental migration' into the future. Yet the relationship between global environmental change and migration is both real and important. The drivers of migration will be significantly affected by global environmental change as it unfolds over the next five decades and in many cases sooner.

To understand this relationship, and its implications for policy, a fundamentally new approach needs to be taken. To anticipate the nature of future change, it is important and necessary to start with an analysis of the drivers of migration, and then consider the likely impact of global environmental change on these drivers under different scenarios of the future. This report has set out four such scenarios, and sought to identify likely patterns of change in three key vulnerable ecological regions.

To explore the implications for policy, the report has highlighted two forms of movement, migration and displacement, which occupy distinct policy areas and therefore imply distinct policy challenges. Both pose challenges that are 'operational' and 'geopolitical' in nature. The former are primarily a concern for national governments and agencies, but the latter demand global cooperation and action.

Applying this new approach, the report has three headline conclusions:

- **First, migration is likely to increase in volume between now and both 2030 and 2060, regardless of the nature of global environmental change, under all but the most extreme socioeconomic and political scenarios.** The nature of migration, globally and locally, may also change. This implies a need for forward-thinking policies to respond to these growing volumes and changing patterns of migration, which are as likely to involve the movement of people towards places that are vulnerable to environmental change (e.g. to slums in large cities located within vulnerable coastal zones) as they are to involve movement away from vulnerable places (e.g. from rural areas in which ecosystem services and/or agricultural productivity is under threat).
- **Secondly, the critical policy issues that emerge are concerned not simply with the management of populations that are displaced by extreme events, but also with populations that become trapped in places where they are increasingly vulnerable to environmental change.** This problem of 'immobility', which particularly affects the poorer and more vulnerable groups in societies, has received limited attention to date but will become critically important in policy terms in the future.
- **Thirdly, migration can itself be a form of adaptation to environmental change, both for those who move and for those who choose not to, where their resilience to environmental change is enhanced by the migration of other household or community members.** There is significant scope for migration to increase the resilience of household members who migrate and who stay behind. Indeed, this approach can have a transformative affect on the adaptive capacity of those involved. Community- or household-level migration does imply a need for policy interventions, for example to build rural–urban linkages or facilitate migration across regional or national boundaries. The notion of 'migration as adaptation' is controversial, being viewed by some as an (unwarranted) admission of the failure of climate mitigation policies, or as necessitating the large-scale resettlement of vulnerable populations by governments. However, this view neglects some of the benefits that migration can bring to individuals, households and communities in both source and destination locations and in the face of environmental change.

The report argues that the policy actions required to address migration influenced by environmental change, as well as the consequences for those left behind, go well beyond migration policy or environmental policy, and require action across other areas, including sustainable urbanisation; climate-smart development; conflict resolution; and emergency preparedness. The next section discusses how policy makers can prepare for the challenges ahead, looking in particular at the robustness of different types of policy measure under alternative scenarios of the future.

9.2 How should policy makers prepare for a highly uncertain future?

This report has emphasised that the future of migration in the context of global environmental change is highly uncertain. Predictions of future numbers of 'environmental migrants' are at best likely to mislead, and at worst may be utilised in planning exercises, resulting in suboptimal policy making. Yet policy makers *do* need to prepare for the future, and to be proactive in addressing certain possible future challenges that may have significant consequence for many sectors, and indeed grave consequences for many people. So how should policy makers prepare for a highly uncertain future⁶⁶⁶?

⁶⁶⁶ Box 9.1 gives an overview of what is known about the numbers of people who are vulnerable to environmental change.

Box 9.1: Revisiting the numbers

Chapter 1 of this report provided projections of international migration using extrapolations of the current proportion of international migrants to the global population (3.1%) and applying that number to median projections of population growth to arrive at a projection of 283 million by 2060 (71 million more than at present). These numbers can be compared with UN estimates that there were 740 million internal migrants in 2009, a number also highly likely to grow over the next five decades. In contrast, Chapter 1 argued that early estimates of future 'environmental migrants', which range from 150 to 300 million, rely on assumptions which are not supported by the evidence presented in this report.

Subsequent chapters of this report have developed the argument that global environmental change is very likely to *reduce* the ability of many people to migrate and therefore will in some circumstances reduce migration *per se*. These 'trapped' and 'immobile' populations are hidden from high-level estimates, yet they represent a policy concern just as serious as, *if not more serious than*, migration. It follows that the numbers which truly matter are populations which are in situations of environmental vulnerability: whether they migrate or not should not be the primary concern⁶⁶⁷. These numbers include the following:

- A total of 150 million people currently live in cities with significant water shortages, a figure that is likely to rise in the future⁶⁶⁸.
- Up to an extra 100 million people may be exposed to an increased risk of hunger as a result of climate change by the 2050s⁶⁶⁹.
- The number of people living in floodplains of urban areas which is projected to rise:
 - Eastern Asia: from 18 million in 2000 to between 45 and 67 million by 2060
 - South-Central Asia: from 4 million in 2000 to between 35 and 59 million by 2060
 - Southeast Asia: from 7 million in 2000 to between 30 and 49 million by 2060
 - Africa: from 2 million in 2000 to between 26 and 36 million by 2060⁶⁷⁰

These numbers are not mutually exclusive so they cannot be added up. Their order of magnitude is similar to the estimates of 'environmental migrants' listed in Chapter 1.

9.2.1 Migration in the context of environmental change: common themes across scenarios

A starting point is to look for common themes of migration in the context of environmental change in regions across the four scenarios of the future used in the project (see Chapter 3). Figure 9.1 is a synthesis of the human mobility outcomes, as defined in Chapter 4, across the three ecological regions, discussed in Chapter 3.

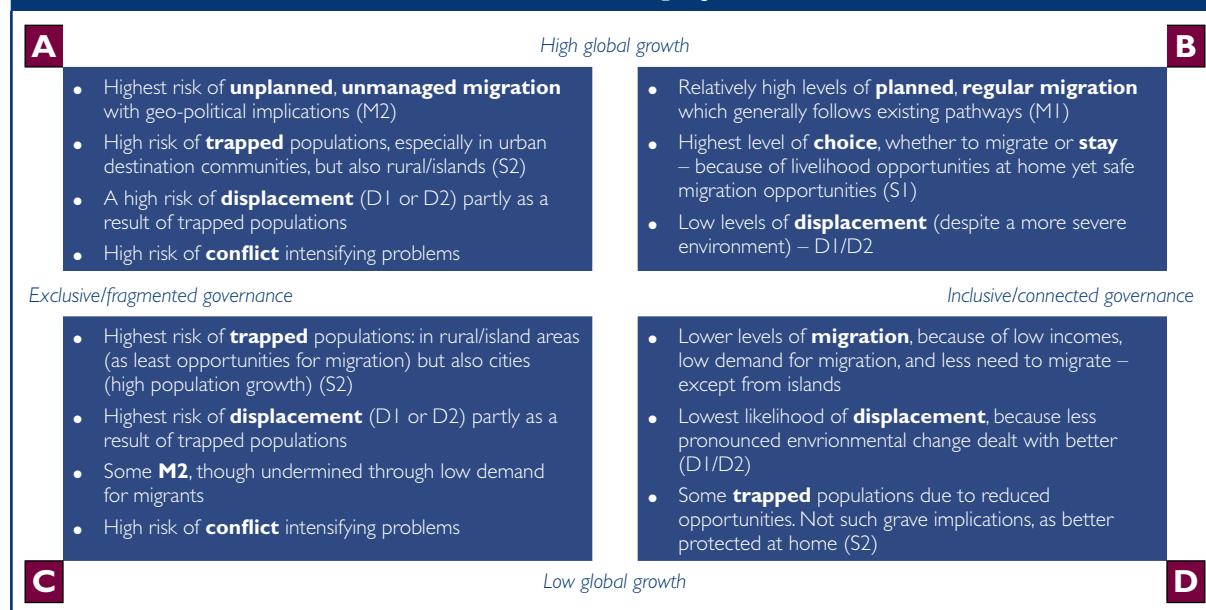
⁶⁶⁷ Their migration clearly does have policy implications, as has been explored in this report, but first and foremost should be humanitarian considerations.

⁶⁶⁸ McDonald *et al.* (2011).

⁶⁶⁹ Parry *et al.* (2001).

⁶⁷⁰ MR9 (Annex D refers).

Figure 9.1: Synthesis of the likelihood of human mobility outcomes across drylands, low-elevation coastal zones and mountains for the project's four scenarios.



Below are key themes that can be taken from this synthesis:

- **There are human mobility outcomes which pose significant challenges to policy makers in each of the four plausible scenarios.** No scenario of the future represents a 'no-risk' situation for policy makers. It must be emphasised that Figure 9.1 shows the outcomes that have the greatest likelihood of occurring for each scenario. This does not mean that other outcomes will not occur. For example, if many countries were moving towards Scenario A in the future, there may still be significant parts of the world which are not (potentially further compounding the risks).
- **The existence of trapped populations is a significant risk in three of the four scenarios.** In Scenario A these trapped populations are most likely to reside in vulnerable communities in urban destinations, as high growth will drive demand for migrants, though fragmented governance means that there is little protection for migrants upon arrival. In Scenario C, there will be a greater number of people trapped in vulnerable rural areas or islands, as low global growth means fewer migration opportunities in urban destinations. Yet in this scenario there will also be a significant number of people trapped in urban locations because of high population growth. The same low global growth will mean equally few migration opportunities in Scenario D, though this represents less of a problem because of more inclusive local governance.
- **There are high risks of displacement influenced by environmental change in two of the scenarios.** This is partly likely to be driven by the fact that, in Scenarios A and C, large trapped populations will reside in locations which are particularly vulnerable to environmental change, such as low-lying urban areas, slums with poor access to water, or isolated and environmentally prone rural locations. Unlike in Scenario D, these populations are poorly protected by local, national or regional governments, increasing their vulnerability.
- **Unplanned, unmanaged migration with geopolitical challenges is driven by a combination of high growth and exclusive governance.** As a result, this form of migration, influenced by environmental change (M2), is a key risk in Scenario A. There will also be risk of this form of migration in Scenario C, owing to exclusive governance; however, whilst there may be pressures to migrate from certain regions, low global growth will undermine demand for migrants in source locations.
- **Until about the middle of the century, the degree of environmental change between the scenarios does not differ much, and there will be increases in environmental change across all scenarios.** Environmental change related to climate change is locked in until around 2030, due to inertia in the climate system, so there is negligible difference between the scenarios in that time period. By 2060, differences will begin to appear, with Scenarios C and D experiencing some *increases* in environmental changes relevant to migration drivers, whilst Scenarios A and B will experience *substantial increases*. Until at least the middle of the century, differences in governance are most likely to drive the impact

of these changes, with populations at lower risk in better-governed scenarios and at higher risk in scenarios with exclusive governance. An important message, however, is that if the analysis were to go beyond 2060, these differences would increase significantly, and action to mitigate global environmental change (especially climate change) should be prioritised now accordingly.

- **The greatest choice for individuals occurs in the inclusive governance scenarios, in which people have the opportunity to reside *in situ* or diversify their livelihoods through migration.** Where environmental change affects livelihoods, there will be migration which is planned, and regular, building on existing patterns, most prominently in Scenario B, but also in Scenario D. This type of migration does still pose policy challenges (for example in city planning), but, importantly, it also brings opportunities. Perhaps most significant is the fact that, in the long run, it can facilitate a household or community staying *in situ* despite a substantial increase in environmental change. Whilst the level of choice is partly driven by high global growth (increasing opportunities for migration), it is also driven by more inclusive and connected governance. The implications of this key point are explored now.

Three conclusions can be drawn from this synthesis:

1. **The evidence from this report shows that some migration in the context of global environmental change is inevitable in the future, even if its nature is uncertain.**

'No migration' is not an option in the context of future environmental change: migration will continue to occur in the future and can be either well managed and regular or, if efforts are made to prevent it, unmanaged, unplanned and forced. Policies trying to inhibit migration in the context of environmental change are more likely to lead ultimately to problematic migration, trapped populations and displacement.

2. **The most future-resilient policies are those which move households and communities from situations in which they are trapped, or where they are in vulnerable circumstances and/or vulnerable to displacement. This includes facilitating migration proactively.**

Proactively facilitated and managed migration is an example of a 'no regrets' policy, which would lead to improvements in each of the future scenarios, because 'no migration' is not an option in the context of future environmental change.

A proactive approach to migration in the context of environmental change will reduce the chances of populations being trapped and/or being displaced in circumstances that raise wider geopolitical challenges; a proactive approach can also build on and maximise the benefits from migration, building resilience and transforming adaptive capacity.

As Chapters 6 and 7 showed, whilst policy approaches that tackle livelihoods/environmental issues, urban development and conflict do move households and communities out of situations where they are trapped and vulnerable, an essential component of the policy approach towards migration in the context of global environmental change is policies which facilitate planned and well-managed migration.

3. **Policies that recognise the opportunities in migration in the context of environmental change are part of an 'inclusive and connected' approach to governance.**

Scenario exercises work on the basis that all scenarios are equally plausible, and each scenario will drive significantly different outcomes for a given system⁶⁷¹. This approach has been used by this project, as explained in Chapter 2, in which it was shown that different levels of economic growth and different forms of governance would have the greatest impact on outcomes related to migration in the context of future environmental change. However, the analysis in Chapter 3 and Figure 9.1 shows that a more positive and proactive approach to migration is an important part of 'inclusive and connected governance' scenarios⁶⁷². Thus, policy makers now, presiding over policies relevant to migration in the context of global environmental change, have the opportunity to influence which of the scenarios of the future is most likely to occur, for countries, regions and the

671 van der Heijden (2005).

672 Indeed, there is an existing literature that shows that a more proactive and positive approach to migration is an ingredient of 'inclusive and connected governance'. For example, see Deshingkar (2005, 2009); Tacoli (2009).

global community. A positive approach to migration is not the only ingredient of a more inclusive and connected approach to governance. However, it will become more important in the context of future environmental change causing significant impacts on ecosystem services, exposure to hazard, incomes, livelihoods, community and individual capital, and other key factors which determine migration.

9.2.2 Robustness of policy options under different future scenarios

Having considered important common themes of migration in the context of environmental change across regions and across future scenarios, it is essential to identify commonalities in the assessment of policies in different future scenarios. Chapter 5 outlined three strategic approaches to policies, which were explored in Chapters 6–8. These were to reduce the need for migration, to plan for migration, and to recognise opportunities inherent in migration. Chapter 5 also showed that the types of policies within these three broad approaches could be classified as follows:

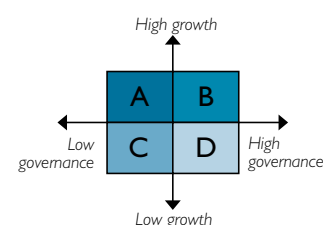
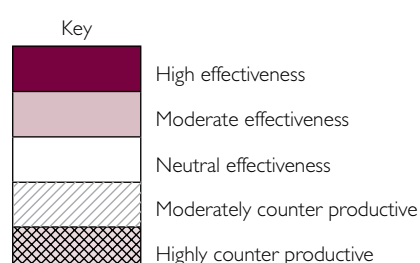
- **‘State-led’ action**, which attempts to directly shape human behaviour in order to meet an objective identified by the state, for example climate policy, planned relocation or top-down approaches to protecting displaced people through global agreements.
- **‘State providing framework for individual action’**, in which the state provides a structure that encourages individuals to do certain things, but does not compel them, for example structural measures, such as flood defences, to reduce the impact of environmental change, forecasting or building new cities.
- **‘Policies that follow from individual action’**, in which the state anticipates the strength of forces outside its control, and plans to achieve as many positive outcomes, or as few negative outcomes as possible, for example increasing resilience to environmental change, facilitating migration as adaptation, making cities more inhabitable for incoming migrants.

The level of state intervention entailed in these policies diminishes in descending order (though clearly there is a role for the state in each class in terms of initially operationalising a policy; subsequent coordination and intervention then diminishes for the second and third classes).

From Chapters 6–8, it is clear that the resilience of policies to future scenarios is, to a large extent, determined by whether the policies rely on interventions which are *state led* or *individually led*. Table 9.1 shows a synthesis of the future resilience of a range of policies discussed in Chapters 6–8, across the four future scenarios, classified here by the level of required state intervention. The same colour scheme applies as in previous tables, the darker blue indicating high effectiveness in the future scenario, white indicating neutral effectiveness and shaded grey indicating that policies may well be counterproductive. This table represents a distillation of the broad themes that were identified across the tables at the end of each of Chapters 6–8.

Table 9.1: Synthesis of typical effectiveness of policies in future scenarios where policies are classified by level of state intervention

Class of policy, according to level of required state intervention	Typical effectiveness across scenario			
	A	B	C	D
<i>State-led action</i>				
General trend shows this pattern (e.g. relocation, Geneva convention):				
Some are broadly neutral (e.g. climate policy)				
<i>State providing framework for individual action</i>				
Those requiring significant coordination from state are likely to show this (e.g. structural measures to reduce impact of environmental change on migration drivers)				
Though those requiring less coordination from state are likely to show something more like this (e.g. forecasting)				
<i>Policies that follow from individual action</i>				
General trend is that these policies are positive across scenarios (e.g. increasing resilience to environmental change, reducing vulnerability in urban areas, facilitating migration as adaptation)				



Policies that follow from individual action, or empower the individual (or indeed community) to take action are most resilient to future scenarios. Policies that require significant state action can be successful, but are likely to be ineffective in some scenarios.

Table 9.1 shows that, in general, the 'state-led' class of policies can be successful in scenarios of connected, inclusive and thus more effective governance. In contrast, they are likely to be ineffective or even counterproductive in fragmented and exclusive scenarios (for example planned resettlement). This is intuitive, as policies that require a complex and coordinated set of actions from the state are likely to be successful if there is effective governance. The general resilience of policies classified as 'state providing framework for individual action' differs depending on the level of state intervention in the policies. For example, the success of measures that require substantial state-led intervention, such as structural projects to reduce the impact of environmental change on migration, is likely to vary considerably depending on the governance scenario. Policies that require less coordination from the state are clearly likely to be less dependent on future governance, and will therefore be more resilient. Policies that are based on individual action and enable individuals and communities to take responsibility for themselves are the most resilient to future uncertainty. This is because these policies are even less dependent on complex coordination of state activities, and are thus less likely to fail in scenarios of poor governance. They include:

- policies to increase resilience to environmental change (e.g. measures to enhance livelihoods, insurance schemes, social protection);
- policies to make cities more inhabitable for incoming migrants;
- policies to facilitate migration as adaptation (e.g. investment in migration, incentives for migration).

This is not to say that policies classed as 'state led' or 'state providing framework for individual action' are not worth considering. In fact, much of Chapters 6–8 showed the benefits of these policies. A sensible approach to policies whose effectiveness varies considerably between scenarios is to make critical assessments of the nature of political, economic and social governance in the relevant situation, noting

that there may be significant temporal and spatial variations⁶⁷³. This may be an assessment of the governance situation in a particular location, or it may be an assessment of how the governance situation has changed over time.

9.3 Who needs to do what?

Given that most migration is within state boundaries, and is likely to remain so in the future, a strong case can be made that the primary demand will be for a domestic policy response, albeit with international support. This section is therefore organised by different line ministry areas of responsibility, referring in each case to areas of international policy as appropriate. However, there are some issues that especially demand international attention, and these are considered in section 9.3.6, which focuses on the Cancun Adaptation Framework.

9.3.1 Environment ministries and international organisations

A common conclusion of previous reports⁶⁷⁴ has been that the magnitude of likely future migration caused by environmental change necessitates urgent action on the part of governments and international organisations. Under such an analysis, the volume of future 'environmental migration' is frequently assumed to be related in some way to the extent of climate or other environmental change, whether this relationship is linear or non-linear. These reports argue that action is needed now, to reduce global warming, land degradation or the loss of forests or other ecosystems and habitats, to avert a major crisis in the future.

The conclusion of this report is different. First, on a timescale certainly to around the middle of the century, it seems unlikely that realistic global efforts to reduce GHG emissions could feed through to reduced levels of migration influenced by environmental change. This is not to say that there will not be an impact on likely migration levels in the long run. Indeed, over a 50- to 80-year timespan, climate mitigation policies could have a major effect. At the same time, action on other forms of global environmental change, such as land degradation, might also have an impact.

But perhaps more important, the report also questions the assumption implicit in such an analysis that migration represents the negative and unwanted consequence of a failure to mitigate or reduce environmental change. On the contrary, migration is increasingly seen, in some circumstances, as having a number of benefits both for migrants themselves and for source and destination communities. However, these benefits can be contested, spread unevenly and are sometimes ephemeral, and need to be weighed against negative effects in each situation.

What should be the focus for environment ministries, and international environmental organisations?

- First, **climate mitigation** in particular; and the reduction of negative environmental change more generally, continue to represent an important policy priority regardless of the consequences for migration.
- Second, there is a case for a greater drive to implement policies that limit the exposure of populations to environmental hazards. They include location-specific measures, such as **flood control** and **water management**, as well as the provision of more general **forecasting and warning capacity**, although extra consideration may need to be given to projects which are state-led and in exclusive governance scenarios.
- Third, there is a strong case for **building resilience** in vulnerable locations, for example by enhancing livelihoods or insurance and social protection mechanisms, to provide real choice to populations, especially in rural areas, about whether they remain there or not. But, here, evidence suggests that migrant household members in cities or other countries can be part of the process of investment in rural areas and agriculture, whilst strong rural–urban linkages or diaspora bonds can create the economic and social conditions to sustain and nurture rural growth.
- There is also a clear case for policies that focus not only on source areas for migrants, but also on destinations. The risk that, for example, **improved infrastructure to provide clean water or sanitation**

⁶⁷³ Parson *et al.* (2007).

⁶⁷⁴ See Chapter 1 for details.

or **protect against flooding in low-lying cities** might stimulate additional migration to these cities should properly be discounted in decision-making. At the same time, those areas most in need of intervention by environment ministries may be less those that are losing populations, and more those where significant populations remain trapped and vulnerable.

The **timing** for such action is urgent and immediate action is required. Critically, funding is being discussed at an international level, for example through negotiations at the UNFCCC, the operationalisation of the Adaptation Committee (see section 9.3.6) and the Green Climate Fund. It is essential that such initiatives recognise the links between environmental change and migration because an understanding of where populations are likely to be located over the next 50 years is *essential* to the success of such initiatives; and indeed many of the *objectives of these initiatives may be realised only* through harnessing the positive outcomes of migration.

Yet perhaps more significant is that every day people are *already* trapped in vulnerable situations, where there are few safe migration options yet staying also represents a danger because of the environment. This situation will only increase in its magnitude, and the earlier action is taken, the earlier human suffering will be alleviated.

9.3.2 Ministries and organisations that deal with migration

A second area of policy development that has been the focus of numerous reports concerns policies on migration and asylum. Here, the argument has been put by a range of civil society organisations that rising 'environmental migration' will create a protection gap that necessitates the development of a new category of 'environmental migrant' or 'climate refugee'. In contrast, some organisations and media outlets have suggested that tighter immigration controls are needed if high-income countries are not to be overwhelmed by 'environmental migrants'⁶⁷⁵.

Here again, the conclusion of this report is somewhat different. Whilst there are examples of situations where significant populations might move across international borders and/or a 'protection gap' might emerge, notably in the situation of residents of small island states at risk of complete abandonment owing to sea-level rise, such examples are relatively rare. In contrast, it seems likely that environmental change will act primarily to intensify migration flows that are internal to states, or at most regional in nature, rather than moving people from one part of the world to another. In this context, the most urgent areas for policy development arguably centre around improving the legal and policy frameworks for dealing with internal displacement, rather than the development of a new legal or policy category of 'environmental refugee'.

Nonetheless, there are a number of issues of relevance to immigration ministries, border agencies and international organisations concerned with migration and refugees, which are highlighted in this report. Chief amongst these is the idea that well-managed migration, under some circumstances, could represent a powerful adaptation strategy, particularly if it is individual- or community-led, and occurs through an expansion of choice rather than through state coercion. Particular areas for policy focus here include:

- first, the development of **bilateral or regional agreements on migration** that provide vulnerable individuals and households that are currently 'trapped' in vulnerable locations with increased livelihood choices in a manageable policy environment;
- second, continued efforts to **share information and good practice** between states and civil society at a global level, to promote the better governance of migration;
- third, **preparedness** on the part of key states to deal with both the operational and political aspects of a 'mass' movement in the face of a major environmental catastrophe.

In contrast, the need for a new international architecture for the governance of migration in the context of environmental change is less clear, although the development of principles that identify protection gaps, and deliver efficient and targeted protection and assistance would be valuable. Such an approach is embodied in the 'Nansen Principles' on climate change and displacement, adopted in Oslo in June 2011 at the Nansen Conference on Climate Change and Displacement in the 21st Century, and due to be

⁶⁷⁵ For discussion on this see McGregor (1994); Wood (2001).

adopted by UNHCR in late 2011⁶⁷⁶. The **timing** for such action is important. The key driver here is that such international governance approaches, whether 'soft law' or 'hard law', can take time to design, agree, ratify and implement. It is essential that such approaches are implemented in advance of serious changes in the climate, rather than when it is too late.

9.3.3 Development and planning ministries and organisations

Whilst a policy response to migration influenced by environmental change might most obviously be sought within the fields of environmental or migration policy, a much more important area for action lies in the broader area of international development policy. International development is already widely seen as a way in which poor and vulnerable populations might build their adaptation to climate change; this report argues that development policy needs to go well beyond sustainable and 'climate-smart' agriculture to strengthened land-use planning, a new emphasis on sustainable cities and the promotion of strong rural–urban linkages, within and between countries. Key measures include:

- climate-smart development, which might include the promotion of **drought- or saline-resistant crops and agricultural practices**, but also **measures to enhance livelihoods, provide insurance and social protection**, and promote agriculture and fisheries more generally;
- an appreciation that certain forms of **migration** can be part of a transformational adaptation strategy, which builds long-term resilience in communities, either through facilitating a long-term transformation in livelihoods or by providing a *de facto* form of insurance to households and generating increased capital;
- **better land-use planning**, which makes cities more habitable and less vulnerable to environmental change and extremes (especially for low-income groups such as migrants), builds urban infrastructure notably around water, sanitation, transport and access to public services, and maintains a balance between 'urban' and 'rural' development.

One of the key challenges for development policy solutions is the need for inter-ministerial cooperation within a given country. For example, whilst it is common for high-income countries to have specialised 'development' ministries to promote development cooperation, there can be advantages for these to combine their skills and expertise with other parts of government, such as energy ministries on low-carbon energy futures, or finance ministries on insurance or other financial products. In many low-income countries, meanwhile, development challenges are already distributed amongst such other 'line' ministries, making the promotion of a coordinated approach particularly challenging.

One particular 'development' intervention that has been mooted as a response to global environmental change is that of the planned relocation of populations. This strategy is referred to in a number of NAPAs on climate change. Yet it is an area fraught with pitfalls, where there are few positive experiences on which policy lessons can be built. An alternative is the development of national plans for investment in new towns and cities, which will relieve pressure on existing urban infrastructure and seek to meet high environmental standards from the outset. This area of '**spatial planning**' has a mixed but perhaps more positive history, and is one in which greater potential arguably lies.

In addition, there are a number of measures that are required to improve national and international responses to environmental disasters to ensure that associated displacement is minimised and contained, spatially and temporally. These include improved **early-warning systems, disaster preparedness and detailed emergency management plans**. Ideally, emergency response strategies should be framed within wider development policies, building resilience and ensuring the active participation of both governments and citizens so that they are implemented effectively when needed.

As noted in section 9.3.6, the **timing** for actions relating to adaptation funding is important. The urgency of the issue in respect to cities requires particular emphasis. Whilst trends of global environmental change and population growth are likely to multiply the challenges faced by cities in the future, it is important to recognise that these challenges will add to *existing* fragilities. Many cities in low-income countries are already failing in important respects, and citizens, especially low-income groups such as migrants, are

⁶⁷⁶ See UNHCR (2011).

already extremely vulnerable. Future trends are set to exacerbate these challenges, and action is required before it is too late.

9.3.4 Humanitarian ministries and organisations

In addition to development interventions, it is clear that the expected increase in frequency or intensity of extreme environmental events that are likely to occur over a 50-year timescale requires attention to the efficiency and effectiveness of humanitarian response. Here, humanitarian actions need to be more clearly tied together with development interventions, to ensure that populations build resilience in the face of humanitarian shocks. At the same time, specific issues of humanitarian concern include:

- The need to ensure that **protection gaps** in relation to displacement which is influenced by global environmental change are filled. This report has argued that this issue can be pursued incrementally, at a regional level through 'bottom-up' approaches (including the 'Nansen Principles'), and in tandem with other migration and development objectives.
- The need for efficient and effective **early-warning systems** for cyclones, floods and droughts that are not only based on effective forecasting, but are also linked to practical and policy measures that will ensure implementation and follow-up action by affected communities, organisations and states.

9.3.5 Organisations and ministries concerned with public order and security

For some, concerns about migration in the context of environmental change go beyond the fact of movement itself, to the notion that large-scale migrations in the future could contribute to regional and international security problems. This report concludes that there is a relationship between environment, migration and security, but one which is complex and multi-dimensional, and confounds efforts to frame insecurity simply as a consequence of environmental change and/or increased migration.

The report has the following clear messages from its analysis of the complex security issues that arise from migration influenced by global environmental change:

- Issues of **conflict resolution** arise both in cities to which people migrate and in rural areas where there is a changing resource base. Yet in both cases, because these conflicts are complex, solutions need to engage with the wider context in which they develop. This includes urban poverty and disenfranchisement of certain social groups, the poor quality of urban infrastructure and public services and high levels of inequality, for example promoting the involvement of the informal sector in development, rather than criminalising it.
- Just as with early-warning systems for environmental extreme events, there is value in the development of **conflict early-warning systems**, which allow governments and civil society actors to be proactive in dealing with conflict, to avoid its escalation. Consideration should be given to the location of vulnerable populations who may be trapped by conflict or other socioeconomic or political circumstances, and who may be vulnerable to environmental change and displacement.

It is unhelpful to frame the relationship between migration and global environmental change as a security issue; indeed, to do so may undermine efforts to build on migration as an adaptation strategy, or to mobilise collaborative action to address environmental change at a local, regional or international level.

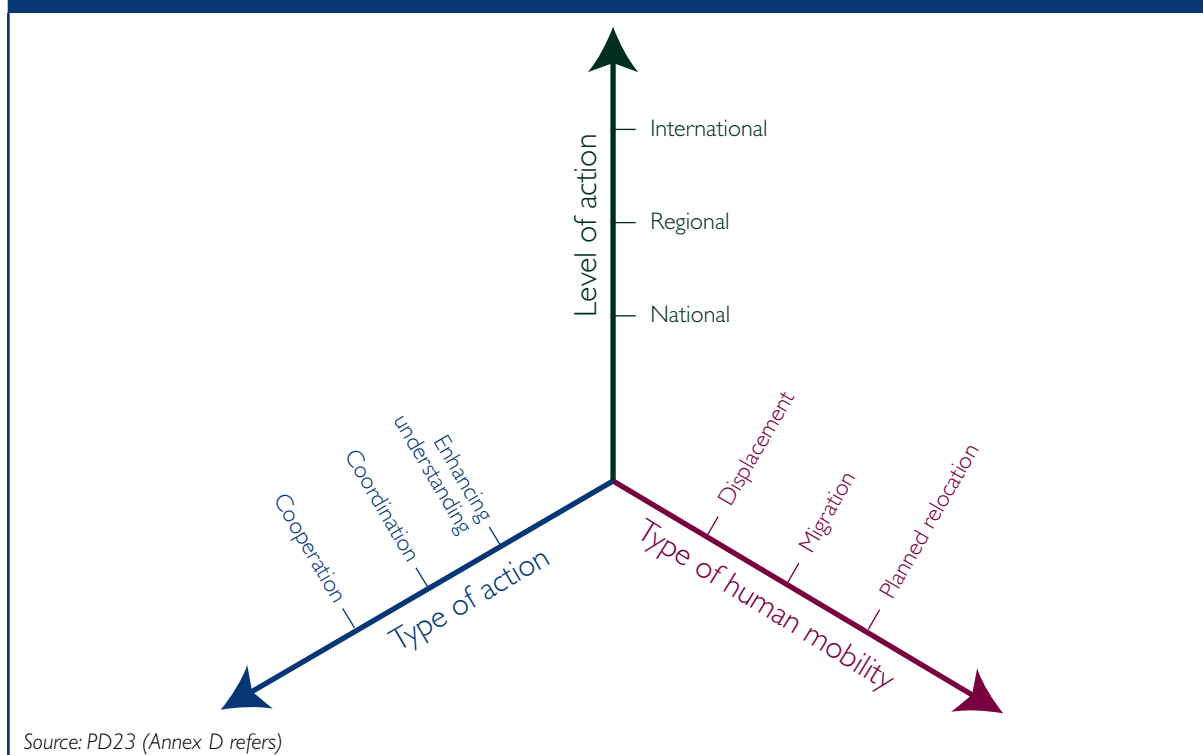
9.3.6 The Cancun Adaptation Framework

The previous sections have highlighted key policy issues in a series of sectors of government and international policy, each of which might respond to the interactions between migration and global environmental change. However, as noted in Chapters 6 and 7, the Cancun Adaptation Framework, for the first time in international climate negotiations, has focused directly on these interactions, by recognising in Paragraph 14(f) that migration can be a form of climate change adaptation, and can therefore be considered by parties to the UNFCCC as a measure eligible for climate finance support through emerging sources such as the Green Climate Fund⁶⁷⁷.

⁶⁷⁷ The Green Climate Fund, as described at the fifteenth session of the Conference of the Parties, is a financial mechanism designed to support projects, programme, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation, capacity building, technology development and transfer. See UNFCCC (2009).

In particular, by focusing on three types of action, at three different geographical scales, and in relation to three different types of migration, Paragraph 14(f) provides, in theory, for a matrix of 27 permutations of policy measure (Figure 9.2).

Figure 9.2: Three domains of measure covered in Paragraph 14(f) of the Cancun Adaptation Framework.



In practice, some combinations of actions by the international community are more likely, including:

- enhanced understanding at all levels, through enhanced monitoring and research, of the implications of migration for adaptation: such research would form the basis for greater and better-informed international dialogue;
- regional- and national-level discussion of issues such as displacement as a result of environment-related disasters, and labour arrangements in migration destination countries;
- coordination at regional and national level on relocation and guiding principles for internally and externally displaced people;
- cross-ministry national cooperation and capacity building to manage domestic migration flows associated with climate change;
- regional cooperation, and discussion of legal and spatial arrangements of relocation⁶⁷⁸.

At the same time, the presence of human mobility in one policy forum (UNFCCC) has and will continue to influence discussions in other arenas which have been identified as important in Chapter 7, including the Global Forum on Migration and Development, the high-level dialogue on migration and regional fora⁶⁷⁹. For policy makers involved in the Cancun Adaptation Framework, the wider UNFCCC and the wider international coordination of response to climate change, these recent developments represent an important opportunity for the key conclusions of this report to be taken forward, most notably the role of migration as a proactive approach to building resilience, reducing vulnerability and representing a transformational and strategic approach to adaptation. Such an approach needs to cut across the various line ministry responsibilities outlined above.

⁶⁷⁸ PD23 (Annex D refers).

⁶⁷⁹ PD23 (Annex D refers).

Box 9.2: Priorities for research

This report has shown how the interactions between migration and global environmental change are complex, and cannot be reduced to the search for a number or definition of 'environmental migrants'. Given the complexity of these interactions, three specific research priorities are suggested:

- Building on the conceptual model developed in this report, there is a need for further **grounded empirical research**, to understand how environmental change interacts with the various drivers of migration in specific locations.
- Such research needs to be underpinned by **high-quality longitudinal data on migration** – since this is the critical element of existing research that goes beyond generalised statements to detailed understanding. There is value in collecting such data both retrospectively, through quantitative life histories; and prospectively, through panel studies.
- There is an urgent need for a focus on the **resilience of populations that are moving to, or are trapped in, urban areas** that are vulnerable to global environmental change, particularly in low-income countries. Cities in such countries have been identified as a particular concern in this report, where policy innovation is urgently needed.

More broadly, it is critical that researchers in the fields of development, climate and environmental science, and climate adaptation, pay attention to the role played by migration. The aim would be to promote a better understanding of the extent to which migration influences vulnerability and resilience in the face of environmental change, and of whether policy responses will adequately address the impact of global environmental change on migrant and non-migrant communities.

9.4 Cost-effectiveness of different policy options

The cost of inaction is likely to be higher than the costs of measures discussed in this report, especially if they reduce the likelihood of problematic displacement.

The cost-effectiveness of the policy framework outlined in Chapter 5 will depend on the specific circumstances of migration influenced by environmental change. It is not within the scope of this project to conduct a thorough cost-benefit analysis of this framework in the many circumstances in which it can be applied. Nor indeed is it feasible to cost out the variety of specific policy options for different ministries or areas of policies outlined in the section above.

Nevertheless, there is broad evidence that the costs of inaction are likely to be higher than the implementation of measures suggested above, especially if the consequence is problematic displacement. For example, there is compelling economic analysis that the aggregate cost of effective policy responses to climate change including adaptation should be absorbed by future economic growth and will be much less than resulting damages⁶⁸⁰.

In turn, one of the key conclusions of this report is that there is a need to strengthen policies that limit problematic displacement of a more challenging geopolitical nature (D2 as defined in Chapter 4). Economic analysis of migration and, in particular, displacement is challenging because current methods are unable to quantify the full welfare costs and benefits to migrants, their households, and sending and receiving populations. However, despite this issue and the fact that migration influenced by environmental change can take many forms, there is evidence that policies to facilitate planned and safe migration are likely to be more cost-effective than those that lead to problematic displacement. For example, putting aside the considerable welfare costs to illegal immigrants, policing illegal migration is expensive for both sending and destination countries. The enforcement costs of reducing illegal migration for the USA and Mexico are high and increasing⁶⁸¹. In contrast, empirical evidence in developing countries suggests that there is a correlation between internal labour mobility and economic growth (Figure 9.3).

⁶⁸⁰ Stern (2007).

⁶⁸¹ Hanson (2007).

Figure 9.3: Internal labour mobility and economic growth in developing countries

A positive association is found between internal labour mobility and economic growth among a selection of developing countries (based on World Bank estimates using selected household surveys). Marker shows land area of country. Marker in the upper-left-hand corner is República Bolivariana de Venezuela in 2004.

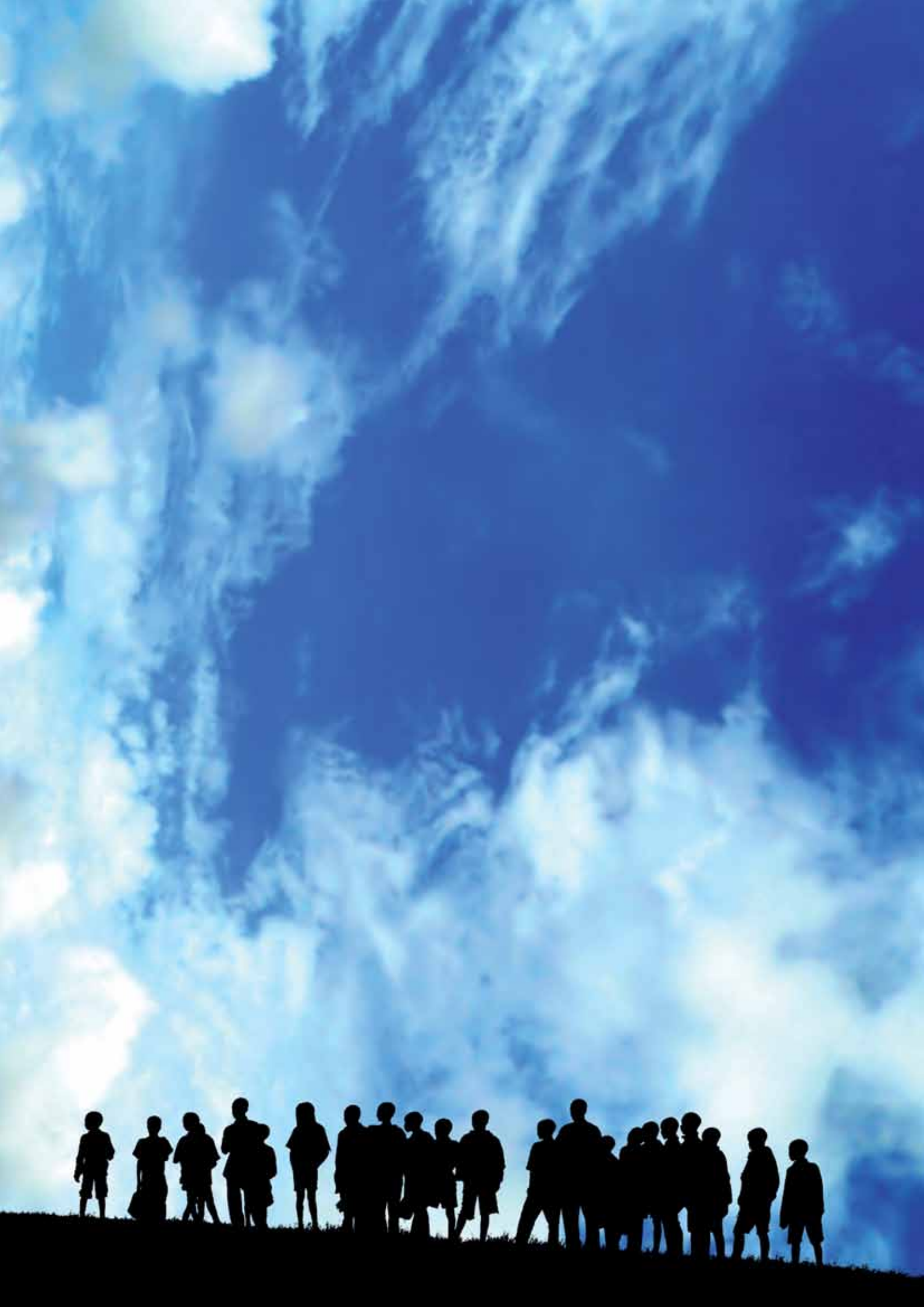
Source: World Bank (2009b).

9.5 Priority areas for action

It is not easy, in an area of complex interactions between multiple human and natural processes, which encompass multiple policy areas, to highlight a single area for urgent policy action. Moreover, the need for urgent action may not be correlated with quick and visible results. Most obviously, this report has concluded that actions to reduce GHG emissions, to mitigate human-induced climate change, remain urgent and critical, even if their effect on migration drivers will be most pronounced in the second half of the century. Nonetheless, from the wide range of evidence and policy solutions considered in this report, three key priorities for urgent action stand out:

- **First, it is critical that emerging policy to promote adaptation to climate and other global environmental change takes account of the role of migration both as a form and as a consequence of adaptation.** This is not a recommendation that individuals, communities or populations should be relocated away from vulnerable areas, although this may occasionally be appropriate. Rather, it is a call for a change in the pervasive mindset that migration represents a problem (or a solution only of 'last resort'), to be avoided by public policy rather than recognised. There is a need for this mindset to change soon, as many of the funding mechanisms for adaptation are currently under discussion (see section 9.3.6). Furthermore, as shown in the examples of Somalia and Cyclone Nargis in Burma, the phenomena of populations trapped and vulnerable to environmental events is a problem that exists even now, *before* future global environmental change makes it more prevalent.
- **Secondly, given the rapid and continuing migration of people to many areas that are highly vulnerable to global environmental change, notably poorer areas of large, coastal cities, it is critical that urban development policies, and policies to deal with urban growth, seek to reduce this vulnerability,** whilst simultaneously promoting sustainable, low-carbon economies. Again, this is an impending problem. Even now, major cities across the world are failing their citizens in terms of adequate housing, land-use planning and social cohesion. The dual impacts of environmental change and increasing populations upon this fragile starting point means that urban challenges require action now.

- **Finally, international and inter-sectoral cooperation on strategic decisions is a critical part of the solution, and these long-term approaches need to be coordinated *now*.** For example, early-warning and emergency response capacities need strengthening to deal with the increased frequency of extreme environmental events that threaten the lives and livelihoods of populations. Yet such early-warning systems should be coordinated with an assessment of whether such populations will be trapped in vulnerable areas, potentially as a result of conflict or tension. Investment will not be effective unless it is joined to a comprehensive policy aimed at enhancing resilience and ensuring the participation of citizens in facing up to the environmental and migration challenges of the future.



Annex A: Acknowledgements

The Government Office for Science would like to express its thanks to the following individuals who were involved in the detailed technical work and were involved in the Project's advisory bodies⁶⁸². Foresight would also like to thank the 350 or more other individuals from organisations across the world who peer reviewed individual papers, contributed views and advice, attended smaller workshops not listed, and provided other support.

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Annex B: References and bibliography

- ABRAR, C. & AZAD, S.N. 2004. *Coping with Displacement. Riverbank Erosion in North-West Bangladesh*. Dhaka: University Press Ltd.
- ADAMO, S.B. 2010. Environmental Migration and Cities in the Context of Global Environmental Change. *Current Opinion in Environmental Sustainability*, 2(3), 161–165.
- ADAMS, H., & ADGER, W.N. In Press. Changing Places: Migration and Adaptation to Climate Change. In O'BRIEN, K., SYNGNA, L. & WOLF, J. (eds). *The Changing Environment for Human Security: New Agendas for Research, Policy, and Action*. London: Earthscan.
- ADEOLA, F. 2009. Katrina Cataclysm: Does Duration of Residency and Prior Experience Affect Impacts, Evacuation and Adaptation Behaviour Amongst Survivors? *Environment and Behavior*, 41(4), 459–489.
- ADGER, W.N. 2000. Social and Ecological Resilience: Are they Related? *Progress in Human Geography*, 24(3), 347–364.
- ADGER, W.N., KELLY, P.M., WINKELS, A., HUY, L.Q. & LOCKE, C. 2002. Migration, Remittances, Livelihood Trajectories, and Social Resilience. *Journal of Human Environment*, 31(4), 358–366.
- ADGER, W.M., HUGHES, T.P., FOLKE, C., CARPENTER, S.R. & ROCKSTROM, J. 2005. Social–Ecological Resilience to Coastal Disasters. *Science*, 309(5737), 1036–1039.
- AGARDI, T., ALDER, J., DAYTON, P., CURRAN, S., KITCHINGMAN, A., WILSON, M., CATENAZZI, A., RESTREPO, J., BIRKELAND, C., BLABER, S., SAIFULLAH, S., BRANCH, G., BOERSMA, D., NIXON, S., DUGAN, P., DAVIDSON, N. & VOROSMARTY, C. 2005. Chapter 19: Coastal Systems. In HASSAN, R., SCHOLES, R. & ASH, N (eds). *The Millennium Ecosystem Assessment Series : Ecosystems and Human Well-Being: Current State and Trends, Volume 1*. Washington, DC: Island Press. 513–549.
- AGINAM, O. & NOTARAS, M. 2009. *Sucking Dry an African Giant: The Astounding Loss of Lake Chad*. Special Report, World Water Day. Tokyo: United Nations University.
- ALI, S. 2007. 'Go West Young Man': The Culture of Migration Among Muslims of Hyderabad, India. *Journal of Ethnic and Migration Studies*, 33(1), 37–58.
- ALSCHER, S. 2010. Environmental Factors in Mexican Migration: The Cases of Chiapas and Tlaxcala. In AFIFI, T. & JÄGER, J. (eds). *Environment, Forced Migration and Social Vulnerability*. Berlin: Springer.
- AMUEDO-DORANTES, C., & POZO, S. 2006. Remittances as Insurance: Evidence from Mexican Immigrants. *Journal of Population Economics*, 19(2), 227–254.
- ARMENDÁRIZ DE AGHION, B. & MORDUCH, J. 2005. *The Economics of Microfinance*. Cambridge, MA: MIT Press.
- ARNELL, N.W., VAN VUUREN D.P. & ISAAC M. 2011. The Implications of Climate Policy for the Impacts of Climate Change on Global Water Resources. *Global Environmental Change*, 21(2), 592–603.
- ASSAN, J.K., CAMINADE, C. & OBENG, F. 2009. Environmental Variability and Vulnerable Livelihoods: Minimising Risks and Optimising Opportunities for Poverty Alleviation. *Journal of International Development*, 21(3), 403–418.
- AU, C.-C. & HENDERSON, J.V. 2006. Are Chinese Cities Too Small? *Review of Economic Studies*, 73(3), 549–576.
- AUCLAIR, C. 2005. *Urbanization Challenges in Sub-Saharan Africa*. Nairobi: UN-Habitat.
- AVCI, G. & KIRISCI, K. 2007. Turkey's Immigration and Emigration Dilemmas at the Gate of the European Union. In CASTLES, S. & WISE, R.D. (eds). *Migration and Development: Perceptions from the South*. Geneva: IOM.
- BADJECK, M.-C., ALLISON, E.H., HALLS, A.S., & DULVY, N.K. 2010. Impacts of Climate Variability and Change on Fishery-Based Livelihoods. *Marine Policy*, 34(3), 375–383.

- BAECHLER, G. 1999. Environmental Degradation in the South as a Cause of Armed Conflict. In CARIUS, A. & LIETZMANN, K. (eds). *Environmental Change and Security: A European Perspective*. Berlin: Springer.
- BAHNA, M. 2008. Prediction of Migration from the New States after their Accession into the European Union: Successes and Failures. *International Migration Review*, 42(4), 844–860.
- BAKER, B. 2008. *Multi-choice Policing in Africa*. Uppsala: Nordiska Afrikainstitutet.
- BAKEWELL, O. 2008. 'Keeping Them in Their Place': The Ambivalent Relationship Between Development and Migration In Africa. *Third World Quarterly*, 29(7), 1341–1358.
- BAKEWELL, O. 2009. *South–South Migration and Human Development: Reflections on African Experiences*. Human Development Research Paper 2009/07. New York: UNDP.
- BANNERJEE, S., GERLITZ, J.Y. & HOERMANN, B. 2011. *Labour Migration as a Response Strategy to Water Hazards in the Hindu-Kush Himalayas*. Kathmandu: ICIMOD.
- BARBIERI, A.F., DOMINGUES, E., QUEIROZ, B.L., RUIZ, R.M., RIGOTTI, J.I., CARVALHO, J.A.M. & RESENDE, M.F. 2010. Climate Change and Population Migration in Brazil's Northeast: Scenarios for 2025–2050. *Population and Environment*, 31(5), 344–370.
- BARNETT, J. & ADGER, W. 2007. Climate Change, Human Security and Violent Conflict. *Political Geography*, 26(6), 639.
- BARNETT, J. & O'NEILL, S. 2010. Maladaptation. *Global Environmental Change*, 20(2), 211–213.
- BARNETT, J. & WEBBER, M. 2010. *Accommodating Migration to Promote Adaptation to Climate Change*. Policy Research Working Paper 5270. Washington, DC: World Bank.
- BARRIOS, S., BERTINELLI, L. & STROBL, E. 2006. Climatic Change and Rural–Urban Migration: The Case of Sub-Saharan Africa. *Journal of Urban Economics*, 60(3), 357–371.
- BARTON, J. & HEINRICHS, D. 2011. Box 5.3: Santiago de Chile: Adaptation, Water Management and the Challenges for Spatial Planning. In ROSENZWEIG, C., SOLECKI, W.D., HAMMER, S.A. & MEHROTRA, S. (eds). *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network*. Cambridge: Cambridge University Press.
- BATES, D. 2002. Environmental Refugees? Classifying Human Migrations Caused by Environmental Change. *Population and Environment*, 23(5), 465–477.
- BATES, B.C., KUNDZEWICZ, Z.W., WU, S. & PALUTIKOF, J.P. 2008. *Climate Change and Water*. Technical Paper of the Intergovernmental Panel on Climate Change. Geneva: IPCC Secretariat.
- BEALL, J. & FOX, S. 2009. *Cities and Development*. London: Routledge.
- BEALL, J. & NGONYAMA, M. 2009. *Indigenous Institutions, Traditional Leaders and Elite Coalitions for Development: The Case of Greater Durban, South Africa*. Crisis States Research Centre Working Papers Series 2, 55. London: Crisis States Research Centre, London School of Economics.
- BEAUCHEMIN, C. & SCHOUMAKER, D. 2005. Migration to Cities in Burkina Faso: Does the Level of Development in Sending Areas Matter? *World Development*, 33(7), 1129–1152.
- BECK, L. & BERNAUER, T. 2011. How Will Combined Changes in Water Demand and Climate Affect Water Availability in the Zambezi River Basin. *Global Environmental Change*, 21(3), 1061–1072.
- BEEGLE, K., DE WEERDT, J. & DERCON, S. 2011. Migration and Economic Mobility in Tanzania: Evidence from a Tracking Survey. *Review of Economics and Statistics*, 93(3), 1010–1033.
- BENJAMINSEN, T.A. 2008. Does Supply-Induced Scarcity Drive Violent Conflicts in the African Sahel? The Case of the Tuareg Rebellion in Northern Mali. *Journal of Peace Research*, 45(6), 819–836.
- BERHANE, G. & GARDEBROEK, C. 2011. Does Microfinance Reduce Rural Poverty? Evidence Based on Household Panel Data from Northern Ethiopia. *American Journal of Agricultural Economics*, 93(1), 43–55.
- BERGMANN, C., GERWIN, M., NÜSSER, M. & SAX, W.S. 2008. Living in a High Mountain Border Region: The Case of the 'Bhotiyas' of the Indo-Chinese Border Region. *Journal of Mountain Science*, 5(3), 209–217.
- BERTRAUD, A. 2001. *The Costs of Utopia: Brasilia, Johannesburg and Moscow*. Mimeo [Online]. Available: http://alain-bertaud.com/images/AB_The%20Costs%20of%20Utopia_BJM4b.pdf
- BETTS, A. 2010. Survival Migration: A New Protection Framework. *Global Governance*, 16(3), 361–382.

- BHAGAT, R.B. 2010. Internal Migration in India: Are the Under-Privileged Migrating More? *Asia-Pacific Population Journal*, 25(1), 31–49.
- BIERMANN, F. & BOAS, I. 2010. Preparing for a Warmer World: Towards a Global Governance System to Protect Climate Refugees. *Global Environmental Politics*, 10(1), 60–88.
- BIJAK, J. 2006. *Forecasting International Migration: Selected Theories, Models, and Methods*. Central European Forum for Migration Research Working Paper 4/2006. Warsaw: CEFMR.
- BLACK, R. & SESSAY, M.F. 1998. Refugees and Environmental Change in West Africa: The Role of Institutions. *Journal of International Development*, 10(6), 699–713.
- BLACK, R., ADGER, W.N., ARNELL, N.W., DERCON, S., GEDDES, A. & THOMAS, D. In Press. The Effect of Environmental Change on Human Migration. *Global Environmental Change*.
- BLAKE, R., GRIMM, A., ICHINOSE, T., HORTON, R., GAFFIN, S., JIONG, D., BADER, L. & CECIL, D. 2011. Chapter 3: Urban Climate: Processes, Trends and Projections. In ROSENZWEIG, C., SOLECKI, W.D., HAMMER, S.A. & MEHROTRA, S (eds). *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network*. Cambridge: Cambridge University Press.
- BOANO, C., ZETTER, R. & MORRIS, T. 2008. *Environmentally Displaced People: Understanding the Linkages between Environmental Change, Livelihoods and Forced Migration*. Forced Migration Policy Briefing 1. Oxford: Refugee Studies Centre.
- BOHANE, B. 2006. Surging Seas Force Islanders to Pack their Bags. *The Age*, 5 January.
- BOSWELL, C. 2007. Theorizing Migration Policy: Is There a Third Way? *International Migration Review*, 41(1), 75–100.
- BROEDERS, D. & ENGBERSEN, G. 2007. The Fight Against Illegal Migration, Identification Policies and Immigrants' Counterstrategies. *American Behavioural Scientist*, 50(12), 1592–1609.
- BROWN, L. 1976. *World Population Trends: Signs of Hope, Signs of Stress*. Worldwatch Paper 8. Washington, DC: Worldwatch Institute.
- BRYAN, E., DERESSA, T.T., GBETIBOUO, G.A. & RINGLER, C. 2009. Adaptation to Climate Change in Ethiopia and South Africa: Options and Constraints. *Environmental Science and Policy*, 12(4), 413–426.
- BUDHANI, A.A., GAZDER, H., KAKER, S.A. & MALLAH, H.B. 2010. *The Open City: Social Networks and Violence in Karachi*. Crisis States Research Centre Working Paper Series 2 Working Paper No. 70. London: Crisis States Research Centre, London School of Economics.
- BULL-KAMANGA, L., DIAGNE, K., LAVELL, A., LEON, E., LERISE, F., MACGREGOR, H., MASKREY, A., MESHACK, M., PELLING, M., REID, H., SATTERTHWAITE, D., SONGSORE, J., WESTGATE, K. & YITAMBE, A. 2003. From Everyday Hazards to Disasters: The Accumulation of Risk in Urban Areas. *Environment and Urbanization*, 15(1), 193–203.
- CAMPBELL, J. 2010. Climate-Induced Community Relocation in the Pacific: The Meaning and Importance of Land. In MCADAM, J. (ed.). *Climate Change and Displacement. Multidisciplinary Perspectives*. Oxford: Hart Publishing.
- CAPLOW, S., JAGGER, P., LAWLOR, K. & SILLS, E. 2011. Evaluating Land Use and Livelihood Impacts of Early Forest Carbon Projects: Lessons for Learning About REDD+. *Environmental Science and Policy*, 14(2), 152–167.
- CARLING, J. 2002. Migration in the Age of Involuntary Immobility: Theoretical Reflections and Cape Verdean Experiences. *Journal of Ethnic and Migration Studies*, 28(1), 5–42.
- CARLING, J. 2007. Migration Control and Migrant Fatalities at the Spanish–African Borders. *International Migration Review*, 41(2), 316–343.
- CARMIN, J., ROBERTS, D. & ANGUELOVSKI, I. 2009. *Planning Climate Resilient Cities: Lessons for Early Adopters*. Paper prepared for the World Bank, 5th Urban Research Symposium, Cities and Climate Change. Marseille: World Bank.
- CASTLES, S. 2002. *Environmental Change and Forced Migration: Making Sense of the Debate*. Geneva: Evaluation and Policy Analysis Unit, United Nations High Commissioner for Refugees.
- CASTLES, S. 2003. Towards a Sociology of Forced Migration and Social Transformation. *Sociology*, 39(1), 13–34.

- CASTLES, S. 2006. Back to the Future: Can Europe Meet its Labour Needs through Temporary Migration. IMI Working Paper No. 1. Oxford: IMI.
- CASTLES, S. 2011. Concluding Remarks on the Climate Change-Migration Nexus. In PIGUET, É., PÉCOUD, A. & DE GUCHTENEIRE, P. (eds). *Migration and Climate Change*. Cambridge: Cambridge University Press.
- CASTRO, P. & ENGEL, A. (eds). 2007. *Negotiation and Mediation Techniques for Natural Resource Management: Case Studies and Lessons Learned*. Rome: Food and Agricultural Organization.
- CENTRAL STATISTICAL AGENCY AND ORC MACRO. 2006. *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia, and Calverton, MD: Central Statistical Agency and ORC Macro.
- CERNEA, M. 2006. Re-examining 'Displacement': A Redefinition of Concepts in Development and Conservation Policies. *Social Change*, 36(1), 8–35.
- CHAN, K.W. 2010. The Global Financial Crisis and Migrant Workers in China: 'There is No Future as a Labourer; Returning to the Village has No Meaning'. *International Journal of Urban and Regional Research*, 34(3), 659–677.
- CHAN, K.W. & ZHANG, L. 1999. The Hukou System and Rural–Urban Migration in China: Processes and Changes. *The China Quarterly*, 160, 818–855.
- CHEN, L.D., WEI, W., FU, B. & LÜ, Y. 2007. Soil and Water Conservation on the Loess Plateau in China: Review and Perspective. *Progress in Physical Geography*, 31(4), 389–403.
- CHRISTIAN AID. 2007. *Human Tide: The Real Migration Crisis* [Online]. Available: <http://www.christianaid.org.uk/Images/human-tide.pdf>.
- CISCAR, J.C., IGLASIAS, A., FEYEN, L., SZABÓ, L., VAN REGEMORTER, D., AMELUNG, B., NICHOLLS, R., WATKISS, P., CHRISTENSEN, O.B., DANKERS, R., GARROTE, L., GOODESS, C.M., HUNT, A., MORENO, A., RICHARDS, J. & SORIA, A. 2011. Physical and Economic Consequences of Climate Change in Europe. *Proceedings of the National Academy of Sciences of the United States of America*, EARLY EDITION [Online]. Available: www.pnas.org/cgi/doi/10.1073/pnas.1011612108.
- CLARKE, D., MAHUL, O. & VERMA, N. 2011. *Weather Crop Insurance in India*. Washington, DC: World Bank.
- CLAY, J.W. & HOLCOMB, B.K. 1985. *Politics and the Ethiopian Famine 1984–1985*. Cambridge, MA: Cultural Survival Inc.
- CLEMENS, M. & MCKENZIE, D. 2009. Think Again: Brain Drain. *Foreign Policy*, 22 October.
- CLEMENS, M.A., MONTENEGRO, C.E. & PRITCHETT, L. 2008. *The Place Premium: Wage Differences for Identical Workers Across the US Border*. World Bank Policy Research Working Paper 4671. Washington, DC: World Bank.
- COLLIER, P. & HOEFFLER, A. 2002. Greed and Grievance in Civil War: The Centre for the Study of African Economies Working Paper No. 160. Oxford: CSAE.
- COLLIER, P., HOEFFLER, A. & ROHNER, D. 2009. Beyond Greed and Grievance: Feasibility and Civil War. *Oxford Economic Papers*, 61(1), 1–27.
- COLLINSON, S. 2003. Chapter 1: Introduction. *Power, Livelihoods and Conflict: Case Studies in Political Economy Analysis for Humanitarian Action*. London: Overseas Development Institute, Humanitarian Policy Group.
- COMITEAU, L. 1999. WORLD COURT/NAMIBIA/BOTSWANA (L-O) [Online]. Available: <http://www.globalsecurity.org/military/library/news/1999/12/991213-namibia1.htm>.
- COMMISSION OF THE EUROPEAN COMMUNITIES. 2005. *Policy Plan on Legal Migration*. Brussels: Communication from the Commission, COM(2005) 669 Final.
- CONFALONIERI, U., MENNE, B., AKHTAR, R., EBI, K.L., HAUENGUE, M., KOVATS, R.S., REVICH, B. & WOODWARD, A. 2007. Chapter 8: Human Health. In: PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., VAN DER LINDEN, P.J. & HANSON, C.E. (eds). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

- CONISBEE, M. & SIMMS, A. 2005. *Environmental Refugees: The Case for Recognition*. London: New Economics Foundation.
- CONWAY, D. 2005. From Headwater Tributaries to International River: Observing and Adapting to Climate Variability and Change in the Nile Basin. *Global Environmental Change*, 15(2), 99–114.
- CORFEE-MORLOT, J., COCHRAN, I., HALLEGATTE, S. & TEASDALE, P.J. 2011. Multilevel Risk Governance and Urban Adaptation Policy. *Climatic Change*, 104(1), 169–197.
- COSTELLO, A., ABBAS, M., ALLEN, A., BALL, S., BELL, S., BELLAMY, R., FRIEL, S., GROCE, N., JOHNSON, A., KETT, M., LEE, M., LEVY, C., MASLIN, M., MCCOY, D., MCGUIRE, B., MONTGOMERY, H., NAPIER, D., PAGEL, C., PASTEL, J., DE OLIVEIRA, J.A.P., REDCLIFT, N., REES, H., ROGGER, D., SCOTT, J., STEPHENSON, J., TWIGG, J., WOLFF, J. & PATTERSON, C. 2009. Managing the Health Effects of Climate Change. *Lancet*, 373(9676), 1693–1733.
- DAVIS, B., WINTERS, P., CARLETTO, G., COVARRUBIAS, K., QUIÑONES, E.J., ZEZZA, A., STAMOULIS, K., AZZARRI, C. & DIGIUSEPPE, S. 2010. A Cross-Country Comparison of Rural Income Generating Activities. *World Development*, 38(1), 48–63.
- DE BRAUW, A. 2007. Chapter 15: International Migration: Can it Improve Living Standards Among Poor and Vulnerable Populations? In VAN BRAUN, J., VARGAS-HILL, R. & PANDYA-LORCH, R. *The Poorest and Hungry: Assessments, Analysis, and Actions*. Washington, DC: IFPRI.
- DE HAAS, H. 2005. International Migration, Remittances and Development: Myths and Facts. *Third World Quarterly*, 26(8), 1269–1284.
- DE HAAS, H. 2008. *Migration and Development: A Theoretical Perspective*. IMI Working Paper Series. Oxford: International Migration Institute.
- DEN ELZEN, M.G.J., HOF, A.F. & ROELFSEMA, M. 2011. The Emissions Gap Between the Copenhagen Pledges and the 2°C Climate Goal: Options for Closing and Risks that Could Widen the Gap. *Global Environmental Change*, 21(2), 733–743.
- DESHINGKAR, P. 2005. Maximising the Benefits of Internal Migration for Development. In LACZKO, F. (ed.). *Migration and Poverty Reduction in Asia*. London: DFID.
- DESHINGKAR, P. 2009. Internal Migration, Poverty and Development in Asia: Including the Excluded. *IDS Bulletin*, 37(3), 99–100.
- DE WIT, M. & J STANKIEWICZ. 2006. Changes in Surface Water Supply Across Africa with Predicted Climate Change. *Science*, 311(5769), 1917–1921.
- DFID. 2011. *Humanitarian Emergency Response Review* [Online]. Available: <http://www.dfid.gov.uk/Documents/publications1/HERR.pdf>.
- DUN, O. 2011. Migration and Displacement Triggered by Floods in the Mekong Delta. *International Migration*, 49(s1), e200–e223.
- DUVENDACK, M., PALMER-JONES, R., COPESTAKE, J.G., HOOPER, L., LOKE, Y. & RAO, N. 2011. *What is the Evidence of the Impact of Microfinance on the Well-Being of Poor People?* London: EPPI-CENTRE, Social Science Research Unit, Institute of Education, University of London.
- EASTERLING, W.E., AGGARWAL, P.K., BATIMA, P., BRANDER, K.M., ERDA, L., HOWDEN, S.M., KIRILENKO, A., MORTON, J., SOUSSANA, J.-F., SCHMIDHUBER, J. & TUBIELLO, F.N. 2007. Chapter 5: Food, Fibre and Forest Products. In PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., VAN DER LINDEN, P.J. & HANSON, C.E. (eds). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- THE ECONOMIST. 2011. Once More unto the Abyss: A Terrible Drought Has Brought the Shadow of Famine Back to Africa. *The Economist*, 7 July.
- EL-HINNAWI, E. 1985. *Environmental Refugees*. Nairobi: United Nations Environment Programme.
- ELLIS, F. 1998. Household Strategies and Rural Livelihood Diversification. *Journal of Development Studies*, 35(1), 1–38.
- EUROPEAN COMMISSION. 2006. *The Demographic Future of Europe – From Challenge to Opportunity*. Luxembourg: European Commission.

- EUROPEAN REPORT ON DEVELOPMENT. 2010. *Social Protection for Inclusive Development. A New Perspective in EU Cooperation with Africa*. Florence: Robert Schuman Centre for Advanced Studies, European University Institute.
- EZRA, M. 2001. Demographic Responses to Environmental Stress in the Drought- and Famine-Prone Areas of Northern Ethiopia. *International Journal of Population Geography*, 7(4), 259–279.
- FENG, S., KRUGER, A. & OPPENHEIMER, M. 2010. Linkages Among Climate Change Yields and Mexico–US Cross-Border Migration. *Proceedings of the National Academy of Sciences of the United States of America*, 107(32), 14257–14262.
- FINDLAY, A. & GEDDES, A. 2011. Critical Views on the Relationship Between Climate Change and Migration: Some Insights from the Experience of Bangladesh. In PIGUET, É., PÉCOUD, A. & DE GUCHTENEIRE, P. (eds). *Migration and Climate Change*. Cambridge: Cambridge University Press.
- FINDLEY, S.E. 1994. Does Drought Increase Migration? A Study of Migration from Rural Mali during the 1983–1985 Drought. *International Migration Review*, 28(3), 539–553.
- FORESIGHT. 2011a. *The Future of Food and Farming: Challenges and Choices for Global Sustainability*. London: Government Office for Science. Department for Business, Skills and Innovation.
- FORESIGHT. 2011b. *International Dimensions of Climate Change*. London: Government Office for Science. Department for Business, Skills and Innovation.
- FOX, S. & HOELSCHER, K. In Press. Political Order, Development and Social Violence. *Journal of Peace Research*.
- FRIEDMAN, J. 1990. Being in the World: Globalization and Localization. In FEATHERSTONE, M. (ed.). *Global Culture: Nationalism, Globalization and Modernity*. London: Sage Publications.
- FRIENDS OF THE EARTH. 2007. *A Citizen's Guide to Climate Refugees* [Online]. Available: http://www.safecom.org.au/pdfs/FOE_climate_citizens-guide.pdf.
- FRIIS, C. & REENBERG, A. 2010. *Land Grabs in Africa: Emerging Land System Drivers in a Teleconnected World*. Copenhagen: Global Land Project.
- FULLER, B. & ROMER, P. 2010. Cities from Scratch: A New Path for Development. *City Journal*, 20(4) [Online]. Available: http://www.city-journal.org/2010/20_4_charter-cities.html.
- GASPER, R., BLOHM, A. & RUTH, M. 2011. Social and Economic Impacts of Climate Change on the Urban Environment. *Current Opinion in Environmental Sustainability*, 3(3), 150–157.
- GEDDES, A. 2008. *Immigration and European Integration: Beyond Fortress Europe?*, 2nd edition. Manchester: Manchester University Press.
- GEMENNE, F. 2011. How they Became the Human Face of Climate Change. Research and Policy Interactions in the Birth of the 'Environmental Migration' Concept. In PIGUET, É., PÉCOUD, A. & DE GUCHTENEIRE, P. (eds). *Migration and Climate Change*. Cambridge: Cambridge University Press.
- GINÉ, X., TOWNSEND, R. & VICKERY, J. 2008. Patterns of Rainfall Insurance Participation in Rural India. *World Bank Economic Review*, 22(3), 539–566.
- GLOBAL COMMISSION ON INTERNATIONAL MIGRATION. 2005. *Migration in an Interconnected World: New Directions for Action*. Geneva: GCIM.
- GLOBAL HUMANITARIAN FORUM. 2009. *The Anatomy of a Silent Crisis*. Geneva: Global Humanitarian Forum.
- GOLDSTONE, J. 2002. Population and Security: How Demographic Change Can Lead to Violent Conflict. *Journal of International Affairs*, 56(1), 3–21.
- GOODFELLOW, T. & SMITH, A. Forthcoming 2011. *From Urban Catastrophe to 'Model' City? Politics, Security and Development in Post-Conflict Kigali*. Crisis States Research Centre Working Paper Series 2. London: Crisis States Research Centre, London School of Economics.
- GORNALL, J., BETTS, R., BURKE, E., CLARK, R., CAMP, J., WILLETT, K. & WILTSHIRE, A. 2010. Implications of Climate Change for Agricultural Productivity in the Early Twenty-First Century. *Philosophical Transactions of the Royal Society B*, 365(1554), 2973–2989.

- GOSLING, S.N., WARREN, R., ARNELL, W.N., GOOD, P., CAESER, J., BERNIE, D., LOWE, J.A., VAN DER LINDEN, P., O'HANLEY, J.R. & SMITH, S.M. 2011. A Review of Recent Development in Climate Change Science. Part II: The Global-Scale Impacts of Climate Change. *Progress in Physical Geography*, 35(4), 443–464.
- GRAY, B. 2006. Migrant Integration Policy: A Nationalist Fantasy of Management and Control? *Translocations*, 1(1), 118–138.
- GRAY, C.L. 2009. Environment Land and Rural Out-Migration in the Southern Ecuadorian Andes. *World Development*, 37(2), 457–468.
- GRAY, C. 2011. Soil Quality and Human Migration in Kenya and Uganda. *Global Environmental Change*, 21(2), 421–430.
- GRAY, C. & MUELLER, V. In Press. Drought and Population Mobility in Rural Ethiopia. *World Development*.
- GRIMM, N.B., FAETH, S.H., GOLUBIEWSKI, N.E., REDMAN, C.L., WU, J., BAI, X. & BRIGGS, J. 2008. Global Change and Ecology of Cities. *Science*, 319(5864), 756–760.
- GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH. 2005. *National Adaptation Programme of Action (NAPA)* [Online]. Available: <http://unfccc.int/resource/docs/napa/ban01.pdf>.
- GOVERNMENT OF GUINEA-BISSAU. 2006. National Programme of Action of Adaptation to Climate Changes [Online]. Available: <http://unfccc.int/resource/docs/napa/gnb01.pdf>.
- GUTIÉRREZ SANÍN, F., PINTO, M.T., ARENAS, J.C. GUZMÁN, T. & GUTIÉRREZ, M.T. 2009. *Politics and Security in Three Colombian Cities*. Crisis States Working Paper No. 44 (Series 2). London: London School of Economics.
- HAMMOND, L. 2008. Strategies of Invisibilization: How Ethiopia's Resettlement Programme Hides the Poorest of the Poor. *Journal of Refugee Studies*, 21(4), 517–536.
- HANSON, G.H. 2007. *The Economic Logic of Illegal Immigration*. Council on Foreign Relations CSR No. 26. New York: Council on Foreign Relations.
- HARRIS, J.R. & TODARO, M.P. 1970. Migration, Unemployment and Development: A Two-Sector Analysis. *American Economic Review*, 60(1), 126–142.
- HATTON, T.J. & WILLIAMSON, J.G. 2009. *Vanishing Third World Emigrants?* National Bureau of Economic Research Working Paper 14785. Cambridge, MA: NBER.
- HAZELL, P.B.P. & HESS, U. 2010. Drought Insurance for Agricultural Development and Food Security in Drylands Areas. *Food Security*, 2(4), 395–405.
- HELLMUTH, M.E., OSGOOD, D.E., HESS, U., MOORHEAD, A. & BHOJWANI, E. (eds). 2009. *Index Insurance and Climate Risk: Prospects for Development and Disaster Management*. Climate and Society No. 2. New York: International Research Institute for Climate and Society (IRI), Columbia University.
- HENRY, S., SCHOUMAKER, B. & BEAUCHEMIN, C. 2004. The Impact of Rainfall on the First Out-Migration: A Multi-Level Event-History Analysis in Burkina Faso. *Population and Environment*, 25(5), 423–460.
- HOCHRAINER, S., MECHLER, R. & KULL, D. 2010. Micro-Insurance Against Drought Risk in a Changing Climate: Assessing Demand and Supply Considerations. *International Journal of Climate Change and Management*, 2(2), 148–166.
- HOMER-DIXON, T.F. 1991. On The Threshold: Environmental Changes as Causes of Acute Conflict. *International Security*, 16(2), 76–116.
- HOMER-DIXON, T.F. 1999. *Environment, Scarcity and Violence*. Princeton, NJ: Princeton University Press.
- HOUSE OF COMMONS INTERNATIONAL DEVELOPMENT COMMITTEE. 2004. *Migration and Development: How to Make Migration Work for Poverty Reduction*, Sixth Report of Session 2003–04. London: The Stationery Office.
- HUDDLESTON, B., ATAMAN, E., DE SALVO, P., ZANETTI, M., BLOISE, M., BEL, J., FRANCESCHINI, G. & D'OSTIANI, L. 2003. *Towards a GIS-Based Analysis of Mountain Environments and Populations*. Environment and Natural Resources Working Paper No. 10. Rome: Food and Agriculture Organization of the United Nations.

- HUGO G. 1996. Environmental Concerns and International Migration. *International Migration Review*, 30(1), 105–131.
- HUMPHREYS, S. (ed.). 2010. *Climate Change and Human Rights*. Cambridge: Cambridge University Press.
- HUNT, A. & WATKISS, P. 2011. Climate Change Impacts and Adaptation in Cities: A Review of the Literature. *Climatic Change*, 104(1), 13–49.
- HUSSEIN, K. 1998. *Conflict Between Sedentary Farmers and Herders in the Semi-Arid Sahel and East Africa: A Review*. IIED Pastoral Land Tenure Series No. 10. London: International Institute for Environment and Development.
- HYNDMAN, J. 2011. *Dual Disasters: Humanitarian Aid After the 2004 Tsunami*. Sterling, VA: Kumarian Press.
- IBARRARAN, M.E., RUTH, M., AHMAD, S. & LONDON, M. 2009. Climate Change and Natural Disasters: Macroeconomic Performance and Distributional Impacts. *Environment, Development and Sustainability*, 11(3), 549–569.
- İÇDUYGU, A. 2006. *The Labour Dimensions of Irregular Migration in Turkey*. Florence: CARIM, Institute Universitaire Européen.
- İÇDUYGU, A. & SERT, D. 2009. *Turkey*. Focus Migration Country Profile No. 5. Hamburg: HWWI.
- ICIMOD. 2010. *Climate Change Vulnerability of Mountain Ecosystems in the Eastern Himalayas* [Online]. Available: http://books.icimod.org/uploads/tmp/icimod-climate_change_vulnerability_of_mountain_ecosystems_in_the_eastern_himalayas.pdf.
- IOM. 2010. *World Migration Report*. Geneva: IOM.
- IPCC. 2000. *IPCC Special Report Emissions Scenarios*. Cambridge: Cambridge University Press.
- IPCC. 2007a. Summary for Policymakers. In PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., VAN DER LINDEN, P.J. & HANSON, C.E. (eds). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- IPCC. 2007b. Climate Change 2007: The Science of Climate Change. In SOLOMON, S., QIN, D., MANNING M., CHEN, Z., MARQUIS, M., AVERYT, K.B., TIGNOR, M. & MILLER, H.L. (eds). *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- IPCC. 2007c. Climate Change 2007: Impacts Adaptation and Vulnerability. In PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., VAN DER LINDEN, P.J. & HANSON, C.E. (eds). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- IUCN. 2009. *The Economic Value of Marine and Coastal Biodiversity to the Maldives Economy*. Report Produced for the Atoll Ecosystem Conservation Project. Gland: IUCN.
- JACOBSON, J.L. 1988. *Environmental Refugees: A Yardstick of Habitability*. Worldwatch Paper 86. Washington, DC : Worldwatch Institute.
- JÄGER, J., FRÜMANN, J., GRÜNBERGER, S. & VAG, A. 2009. *EACH-FOR: Environmental Change and Forced Migration Scenarios – D.3.4. Synthesis Report* [Online]. Available: http://www.each-for.eu/documents/EACH-FOR_Synthesis_Report_090515.pdf.
- JEPPESEN, S., ANDERSEN, J.E. & MADSEN, P.V. 2006. *Urban Environmental Management in Developing Countries – Land Use, Environmental Health and Pollution Management – A Review*. Mimeo. Copenhagen: University of Copenhagen, Department of Geography.
- JÓNSSON, G. 2008. *Migration Aspirations and Immobility in a Malian Soninke Village*. IMI Working Paper Series. Oxford: International Migration Institute.
- JÓNSSON, G. 2010. *The Environmental Factor in Migration Dynamics – A Review of African Case Studies*. IMI Working Paper No. 21. Oxford: IMI.
- KAPLAN, R.D. 1994. The Coming Anarchy: How Scarcity, Crime, Overpopulation, Tribalism and Disease are Rapidly Destroying the Social Fabric of Our Planet. *The Atlantic Monthly*, February.

- KARACA, M. and NICHOLLS, R.J. 2008 Potential Implications of Accelerated Sea-Level Rise for Turkey. *Journal of Coastal Research*, 24(2), 288–298.
- KEOHANE, R.O. & VICTOR, D.G. 2011. The Regime Complex for Climate Change. *Perspectives on Politics*, 9(1), 7–23.
- KHANDKER, S.R. 2007. Coping with Flood: Role of Institutions in Bangladesh. *Agricultural Economics*, 36(2), 169–180.
- KIRISCI, K. 2003. Turkey: A Transformation from Emigration to Immigration. *Migration Information Source* [Online]. Available: <http://www.migrationinformation.org/Profiles/display.cfm?id=176>.
- KIRISCI, K. 2007. Turkey: A Country of Transition from Emigration to Immigration. *Mediterranean Politics*, 12(1), 91–97.
- KIRONDE, J.M. 1993. Will Dodoma Ever be the New Capital of Tanzania? *Geoforum*, 24(4), 435–453.
- KNUTTI, R., ALLEN, M.R., FRIEDLINGSTEIN, P., GREGORY, J.M., HEGERL, G.C., MEEHL, G.A., MEINSHAUSEN, M., MURPHY, J.M., PLATTNER, G.K., RAPER, S.C.B., STOCKER, T.F., STOTT, P.A., TENG, H. & WIGLEY, T.M.L. 2008. A Review of Uncertainties in Global Temperature Projections over the Twenty-First Century. *Journal of Climate*, 21(11), 2651–2663.
- KOLMANNSKOG, V. 2009. *Climate Change, Disaster, Displacement and Migration: Initial Evidence From Africa*. New Issues in Refugee Research Research Paper No. 180 [Online]. Available: <http://www.unhcr.org/4b18e3599.html>.
- KOSER, K. 2008. *Protecting Displaced Migrants in South Africa*. Brookings Institute [Online]. Available: http://brookings.edu/opinions/2008/0617_south_africa_koser.aspx.
- KOSER, K. 2011. Climate Change and Internal Displacement: Challenges to the Normative Framework. In PIGUET, É., PÉCOUD, A. & DE GUCHTENEIRE, P. (eds). *Migration and Climate Change*. Cambridge: Cambridge University Press.
- KOSER, K. & MARTIN, S. 2011. Chapter 1: Introduction. In KOSER, K. & MARTIN, S. (eds). *The Migration–Displacement Nexus: Patterns, Processes, and Policies*. Oxford: Berghahn Books.
- KOTHARI, U. 2002. *Migration and Chronic Poverty*. Working Paper No. 16. Manchester: Institute for Development Policy and Management University of Manchester.
- KOVATS, S. & HAJAT, S. 2008. Heat Stress and Public Health: A Critical Review. *Annual Review of Public Health*, 29, 41–55.
- KUNDZEWICZ, Z.W., MATA, L.J., ARNELL, N.W., DÖLL, P., KABAT, P., JIMENÉZ, B., MILLER, K.A., OKI, T., SEN, Z. & SHIKLOMANOV, I.A. 2007. Chapter 3: Freshwater resources and their management. In PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., VAN DER LINDEN, P.J. & HANSON, C.E. (eds). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- LACZKO, F. & AGHAZARM, C. 2009. *Migration, Environment and Climate Change: Assessing the Evidence*. Geneva: IOM.
- LALONDE, R. & TOPEL, R.H. 1997. Economic Impact of International Migration and the Economic Performance of Migrants. In ROSENZWEIG, M.R. and STARK, O. (eds). *Handbook of Population and Family Economics*. London: Elsevier Science.
- LAMKE, P., REN, J., ALLEY, B., ALLISON, I., CARRASCO, J., FLATO, G., FUJI, Y., KASER, G., MOTE, P., THOMAS, R.H. & ZHANG, T. 2007. Observations: Changes in Snow, Ice and Frozen Ground. In SOLOMON, S., QIN, D., MANNING, M., CHEN, Z., MARQUIS, M., AVERYT, K.B., TIGNOR, M. & MILLER, H.L. (eds). *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- LENTON, T.M., HELD, H., KRIEGLER, E., HALL, J.W., LUCHT, W., RAHMSDORF, S. & SCHELLNHUBER, H.J. 2008. Tipping points in the Earth's Climate System. *Proceedings of the National Academy of Sciences of the United States of America*, 105(6), 1786–1793.
- LEWIS, A.W. 1954. Economic Development with Unlimited Supplies of Labour. *The Manchester School of Economic and Social Studies*, 22(2), 139–191.

- LI, X., CHEN, Z., YE, L., DENG, H., LIU, M., ZHANG, J. & NE, F. 2004. A Critical Consideration of Environmental Resettlement: The Case of Hunshandake Desert, Inner Mongolia. *Translated by QING-JIE WANG* (August 17, 2005). *Journal of Inner Mongolia University*, 36(5), 34–38.
- LIU, M. 2007. The Case Study on China's Resettlement Poverty Reduction. *IFPRI Vision 2020 Conference: Taking Action for the World's Poor and Hungry People*. Beijing, 17–19 October 2007. Washington: IFPRI.
- LONERGAN, S. 1998. *The Role of Environmental Degradation in Population Displacement*. Environmental Change and Security Program Report Issue No. 4. Washington, DC: Woodrow Wilson International Center for Scholars.
- LOSCH, B. 2008. Migrations and the Challenge of Demographic and Economic Transitions in the New Globalization Era. Migration and Development: Future Directions for Research and Policy. Panel 4: Migration and Economic Globalization. New York, February 29–March 1 2008. New York: Social Sciences Research Council.
- LUBKEMANN, S.C. 2008. Involuntary Immobility: On a Theoretical Invisibility in Forced Migration Studies. *Journal of Refugee Studies*, 21 (4), 454–475.
- LUCAS, R. & STARK, O. 1985. Motivations to Remit: Evidence from Botswana. *Journal of Political Economy*, 93(5), 901–918.
- LUTZ, W. & SAMIR, K.C. 2010. Dimensions of Global Population Projections: What Do We Know About Future Population Trends and Structures? *Philosophical Transactions of the Royal Society B*, 365(1554), 2779–2791.
- MCADAM, J. 2010. 'Disappearing States', Statelessness and the Boundaries of International Law. UNSW Law Research Paper No. 2010-2. Sydney: University of New South Wales.
- MCCARNEY, P., BLANCO, H., CARMIN, J. & COLLEY, M. 2011. Chapter 9: Cities and Climate Change: The Challenges for Governance. In ROSENZWEIG, C., SOLECKI, W.D., HAMMER, S.A. & MEHROTRA, S. (eds). *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network*. Cambridge: Cambridge University Press.
- MCDONALD, R.I., GREEN, P., BALK, D., FEKETE, B.M., REVENGA, C., TODD, M. & MONTGOMERY, M. 2011. Urban Growth, Climate Change, and Freshwater Availability. *Proceedings of the National Academy of Sciences of the United States of America*, 108(15), 6312–6317.
- MCGRANAHAN, G., SATTERTHWAIT, D. & TACOLI, C. 2004. Rural-Urban Change, Boundary Problems and Environmental Burdens. Working Paper Series on Rural-Urban Interactions and Livelihood Strategies. Working Paper No. 10. London: IIED.
- MCGRANAHAN, G., BALK, D. & ANDERSON. 2007. The Rising Tide: Assessing the Risks of Climate Change and Human Settlements in Low Elevation Coastal Zones. *Environment and Urbanization*, 19(1), 17–37.
- MCGREGOR, J. 1994. Climate Change and Involuntary Migration: Implications for Food Security. *Food Policy*, 19(2), 120–132.
- MCKENZIE, D., GIBSON, J. & STILLMAN, S. 2010. How Important is Selection? Experimental vs. Non-Experimental Measures of the Income Gains from Migration. *Journal of European Economic Association*, 8(4), 913–945.
- MCLEMAN, R. 2006. Migration Out of 1930s Rural Eastern Oklahoma: Insights for Climate Change Research. *Great Plains Quarterly*, 26(1), 27–40.
- MCLEMAN, R. & SMIT, B. 2006. Migration and Adaptation to Climate Change. *Climatic Change*, 76(1–2), 31–53.
- MCNAMARA, D. 2006. Humanitarian Reform and New Institutional Responses. *Forced Migration Review/ Brookings-Bern Special Issue*, 9–11 December.
- MCSWEENEY, K. & COOMES, O.T. 2011. Climate-Related Disaster Opens a Window of Opportunity for Rural Poor in Northeastern Honduras. *Proceedings of the National Academy of Sciences of the United States of America*, 108(13), 5203–5208.
- MARTIN, A. 2005. Environmental Conflict Between Refugee and Host Communities. *Journal of Peace Research*, 42(3), 329–346.

- MARTIN, S. 2010. *Climate Change, Migration and Adaptation. Study Team on Climate-Induced Migration*. Washington, DC: The German Marshall Fund of the United States.
- MASSEY, D.S. & ESPANIA, F.G. 1987. The Social Process of International Migration. *Science*, 237, 733–738.
- MASSEY, D.S. & KANDEL, W. 2002. The Culture of Mexican Migration: A Theoretical and Empirical Analysis. *Social Forces*, 80(3), 981–1004.
- MASSEY, D.S., ARANGO, J., HUGO, G., KOUAOUCCI, A., PELLEGRINO, A. & TAYLOR, J.E. 1993. Theories of International Migration: A Review and Appraisal. *Population and Development Review*, 19(3), 431–466.
- MASSEY, D.S., AXINN, W. & GHIMIRE, D. 2007. Environmental Change and Out-Migration: Evidence from Nepal. PSC Research Report No. 07-615. Ann Arbor: PSC.
- MASSEY, D.S., WILLIAMS, N., AXINN, W.G. & GHIMIRE, D.J. 2010. Community Services and Out-Migration. *International Migration*, 48(3), 1–41.
- MATTINEN, H. & OGDEN, K. 2006. Cash-based Interventions: Lessons from Southern Somalia. *Disasters*, 30(3), 297–315.
- MEAGHER, K. 2009. The Informalization of Belonging: Igbo Informal Enterprise and National Cohesion from Below. *Africa Development*, 34(1), 31–46.
- MENDELSON, R., BASIST, A., KURUKULASURIYA, P. & DINAR, A. 2007. Climate and Rural Income. *Climatic Change*, 81(1), 101–118.
- MERTZ, O., MBOW, C., NIELSEN, J. Ø., MAIGA, A., DIALLO, D., REENBERG, A., DIOUF, A., BARBIER, MOUSSA, I. B., ZOROM, M., OUATTARA, I. & DABI, D. 2010. Climate Factors Play a Limited Role for Past Adaptation Strategies in West Africa. *Ecology and Society*, 15(4), 25.
- MERTZ, O., MBOW, C., REENBERG, A., GENESIO, L., LAMBIN, E.R., D'HAEN, S., ZOROM, M., RASMUSSEN, K., DIALLO, D., BARBIER, B., MOUSSA, I.B., DIOUF, A., NIELSEN, J. Ø. & SANDHOLT, I. 2011. Adaptation Strategies and Climate Vulnerability in the Sudano-Sahelian Region of West Africa. *Atmospheric Science Letters*, 12(1), 104–108.
- MILLENNIUM ECOSYSTEM ASSESSMENT. 2005. *Ecosystems and Human Well-Being: Synthesis*. Washington, DC: Island Press.
- MILLER, F., OSBAHR, H., BOYD, E., THOMALLA, F., BHARWANI, S., ZIERVOGEL, G., WALKER, B., BIRKMANN, J., VAN DER LEEUW, S., ROCKSTRÖM, J., HINKEL, J., DOWNING, T., FOLKE, C. & NELSON, D. 2010. Resilience and Vulnerability: Complementary or Competing Concepts? *Ecology and Society*, 15(3), 11–36.
- MINCER, J. 1978. Family Migration Decisions. *Journal of Political Economy*, 86(5), 749–773.
- MLANGENI, P.V. 2008. *Implications of Urban Branding to Local Economic Development in the Inner City of Johannesburg*. Mimeo. Masters of Science in Development Planning, University of the Witwatersrand, South Africa.
- MONTGOMERY, M.R. 2008. The Urban Transformation of the Developing World. *Science*, 319(5864), 761–764.
- MORDUCH, J. 2011. Why Finance Matters. *Science*, 332(6035), 1271–1272.
- MORIONDO, M., BINDI, M., KUNDZEWICZ, Z.W., SZEWD, M., CHORYNSKI, A., MATCZAK, P., RADZIEJEWSKI, M., MCEVOY, D. & WREFORD, A. 2010. Impact and Adaptation Opportunities for European Agriculture in Response to Climatic Change and Variability. *Mitigation and Adaptation Strategies for Global Change*, 15(7), 657–679.
- MORREIRA, S. 2010. Seeking Solidarity: Zimbabwean Undocumented Migrants in Cape Town. *Journal of South African Studies*, 36(2), 433–449.
- MORRISSEY, J. 2009. *Environmental Change and Forced Migration: A State of the Art Review*. Refugee Studies Centre Background Paper. Oxford: Refugee Studies Centre.
- MORTREUX, C. & BARNETT, J. 2009. Climate Change, Migration and Adaptation in Funafuti, Tuvalu. *Global Environmental Change*, 19(1), 105–112.
- MOSER, S.C. & EKSTROM, J.A. 2010. A Framework to Diagnose Barriers to Climate Change Adaptation. *Proceedings of the National Academy of Sciences of the United States of America*, 107(51), 22026–22031.

- MOSER, C., NORTON, A., STEIN, A. & GEORGIEVA, S. 2010. *Pro-Poor Adaptation to Climate Change in Urban Centres: Case Studies of Vulnerability and Resilience in Kenya and Nicaragua*. Social Development Department Report 54947-GLB. Washington, DC: World Bank.
- MWAURA, C. & SCHMEIDL, S. (eds). 2002. *Early Warming and Conflict Management in the Horn of Africa*. Lawrenceville, NJ: The Red Sea Press.
- MYERS, N. 2002. Environmental Refugees: A Growing Phenomenon of the 21st century. *Philosophical Transactions of the Royal Society B*, 357(1420), 609–613.
- MYERS, N. & KENT, J. 1995. *Environmental Exodus: An Emergent Crisis in the Global Arena*. Washington, DC: The Climate Institute.
- NAGARAJ, R. 2003. Foreign Direct Investment in India in the 1990s: Trends and Issues. *Economic and Political Weekly*, 38(17), 1701–1712.
- NEVINS, J. 2007. Dying for a Cup of Coffee? Migrant Deaths in the US–Mexico Border Region in a Neoliberal Age. *Geopolitics*, 12(2), 228–247.
- NICHOLLS, R.J., WONG, P.P., BURKETT, V.R., CODIGNOTTO, J.O., HAY, J.E., MCLEAN, R.F., RAGOONADEN, S. & WOODROFFE, C.D. 2007. Chapter 6: Coastal Systems and Low-Lying Areas. In PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., VAN DER LINDEN, P.J. & HANSON, C.E. (eds). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- NICHOLLS, R.J., MARINOVA, N., LOWE, J.A., BROWN, S., VELLINGA, P., DE GUSMÃO D., HINKEL, J. & TOL R.S.J. 2011. Sea-Level Rise and its Possible Impacts Given a 'Beyond 4°C World' in the Twenty-First Century. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 369, 161–181.
- NINA, D. 2000. Dirty Harry is Back: Vigilantism in South Africa – The (Re)Emergence of 'Good' and 'Bad' Community. *African Security Review*, 9(1), 18–28.
- NOVECK, J. 2005. Use of the Word 'Refugee' Stirs Race Debate. *Associated Press Online*, 7 September.
- OLIVER-SMITH, A. 2006. *Disasters and Forced Migration in the 21st Century*. Social Sciences Research Council [Online]. Available: http://understandingkatrina.ssrc.org/Oliver-Smith/#E*.
- ONE RESPONSE. 2010. *Cluster Approach Implementation by Country* [Online]. Available: <http://oneresponse.info/Coordination/ClusterApproach/Pages/Cluster%20Approach.aspx>.
- ORTEGA, J.A. 2005. What Are the Implications of the Demographic Transitions Process for 21st Century European Population? *Eurostat/UNECE Work Session on Demographic Projection*. Vienna, September 2005. Vienna: Eurostat/UNECE.
- OSILI, U. 2004. Migrants and Housing Investments: Theory and Evidence from Nigeria. *Economic Development and Cultural Change*, 52(4): 821–849.
- ÖZDEN, C. & SCHIFF, M. 2006. *International Migration, Remittances and the Brain Drain*. London: World Bank/Palgrave Macmillan.
- PANKHURST, A. 1992. *Resettlement and Famine in Ethiopia: The Villagers' Experience*. Manchester: Manchester University Press.
- PANKHURST, A. 2006. *Resettlement Planning Lessons from Success and Failure Cases: Experience from Eleven Sites in Four Regions*. Addis Ababa: FFSS.
- PARRY, M., ARNELL, N., MCMICHAEL, T., NICHOLLS, R., MARTENS, P., KOVATS, S., LIVERMORE, M., ROSENZWEIG, C., IGLESIAS, A. & FISCHER, G. 2001. Viewpoint: Millions at Risk: Defining Critical Climate Change Threats and Targets. *Global Environmental Change*, 11, 181–183.
- PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P. and Co-Authors. 2007. Technical Summary. In PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., HANSON, C.E. & VAN DER LINDEN, P.J. (eds). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate*. Cambridge: Cambridge University Press.
- PARRY, M., EVANS, A., ROSEGRANT, M.W. & WHEELER, T. 2009. *Climate Change and Hunger: Responding to the Challenge*. Rome: World Food Programme.

- PARSON, E.A., BURKETT, V., FISHER-VANDEN, K., KEITH, D., MEARN, L., PITCHER, H., ROSENZWEIG, C. & WEBSTER, M. 2007. *Global Change Scenarios: Their Development and Use*. Washington, DC: US Climate Change Science Program.
- PARVIN, G.A., TAKAHASHI, F. & SHAW, R. 2008. Coastal Hazards and Community-Coping Methods in Bangladesh. *Journal of Coastal Conservation*, 12(4), 181–193.
- PATEL, V. & KLEINMAN, A. 2003. Poverty and Common Mental Disorders in Developing Countries. *Bulletin of the World Health Organization*, 81(8), 609–615.
- PATT, A. & SCHRÖTER, D. 2008. Perceptions of Climate Risk in Mozambique: Implications for the Success of Adaptation Strategies. *Global Environmental Change*, 18(3), 458–467.
- PAUL, S.K. & ROUTHAY, J.K. 2010. Household Response to Cyclone and Induced Surge in Coastal Bangladesh: Coping Strategies and Explanatory Variables. *Natural Hazards*, 57(2), 477–499.
- PAULSON, A. 2003. *Insurance Motives for Migration: Evidence from Thailand*. Mimeo. Evanston, IL: Kellogg School of Management, Northwestern University.
- PELLING, M. 1999. The Political Ecology of Flood Hazard in Urban Guyana. *Geoforum*, 30(3), 249–261.
- PIETERSE, E. 2011. Grasping the Unknowable: Coming to Grips with African Urbanisms. *Social Dynamics*, 37(1), 5–23.
- PIGUET, É., PÉCOUD, A. & DE GUCHTENEIRE, P. 2011. *Migration and Climate Change*. Cambridge: Cambridge University Press.
- POLZER, T. 2009. *Regularizing Zimbabwe Migration to South Africa*. Migration Policy Brief, Consortium for Refugees and Migrants and University of Witwatersrand Forced Migration Programme [Online]. Available: <http://www.cormsa.org.za/wp-content/uploads/MigrationPolicyBrief/Migration%20Policy%20Brief%201%20-%20Zim%20Special%20Permits.pdf>.
- POSTON, A. 2010. Lessons from a Microfinance Recapitalisation Programme. *Disasters*, 34(2), 328–336.
- POTTS, D. 2009. The Slowing of Sub-Saharan Africa's Urbanization: Evidence and Implications for Urban Livelihoods. *Environment and Urbanization*, 21(1), 253–259.
- PRATT, T. & CULLEN, F.T. 2005. Assessing Macro-Level Predictors and Theories of Crime: A Meta-Analysis. *Crime and Justice*, 32, 373–449.
- PREIBISCH, K. 2007. Local Produce, Foreign Labor: Labor Mobility Programs and Global Trade Competitiveness in Canada. *Rural Sociology*, 72(3), 418–449. OR BASOK, T. (2003) 'Mexican seasonal migration to Canada and development: A community-based comparison,' *International Migration*, 41(2), 3–26.
- PUTNAM, R.D. 2007. E Pluribus Unum: Diversity and Community in the Twenty-First Century. *Scandinavian Political Studies*, 30(2), 137–174.
- RAHMATO, D. 1991. *Famine and Survival Strategies*. Uppsala: Nordiska Afrikainstitutet.
- RAHMATO, D. 2003. *Resettlements in Ethiopia: The Tragedy of Population Relocation in the 1980s*. Forum for Social Studies Discussion Paper 11. Addis Ababa: FFSS.
- RALEIGH, C., JORDAN, L. & SALEHYAN, I. 2008. Assessing the Impact of Climate Change on Migration and Conflict. World Bank Working Paper [Online]. Available: http://siteresources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/SDCCWorkingPaper_MigrationandConflict.pdf.
- RANIS, G. & FEI, J. 1961. A Theory of Economic Development. *American Economic Review*, 51(4), 533–565.
- RASMUSSEN, K., MAY, W., BIRK, T., MATAKI, M., MERTZ, O. & YEE, D. (2009) Climate Change on Three Polynesian Outliers in the Solomon Islands: Impacts, Vulnerability and Adaptation. *Geografisk Tidsskrift – Danish Journal of Geography*, 109(1), 1–13.
- RATHA, D. 2005. Workers' Remittances: An Important and Stable Source of External Development Finance. In MAIMBO, S.M. & RATHA, D. (eds). *Remittances: Development Impact and Future Prospects*. Washington, DC: World Bank.
- RAUSTIALA, K. & VICTOR, D. 2004. The Regime Complex for Genetic Resources. *International Organization*, 58(2), 277–309.
- REPETTO, R. 2011. *America's Climate Problem: The Way Forward*. London: Earthscan.

- REPUBLIQUE DU MALI: MINISTERE DE L'EQUIPMENT ET DES TRANSPORTS. 2007. *Programme d'Action National d'Adaptation aux Changements Climatiques* [Online]. Available: <http://unfccc.int/resource/docs/napa/mli01f.pdf>.
- RODGERS, D. 2010. Urban Violence Is Not (Necessarily) a Way of Life: Towards a Political Economy of Conflict in Cities. In BEALL, J., BASUDEB, G.-K. & KANUBUR, R. (eds). *Urbanization and Development*. Oxford: Oxford University Press.
- ROGELJ, J., CHEN, C., NABEL, J., MACEY, K., HARE, W., SCHAEFFER, M., MARKMANN, K., HÖHNE, N., ANDERSON, K.K. & MEINSHAUSEN M. 2010. Analysis of the Copenhagen Accord Pledges and its Global Climatic Impact – a Snapshot of Dissonant Ambitions. *Environmental Research Letters*, 5(3), 034013.
- ROGERS, G. 1981. The Evacuation of Niuafo'ou: An Outlier in the Kingdom of Tonga. *Journal of Pacific History*, 16(3), 149–163.
- ROGERS, S. & WANG, M. 2006. Environmental Resettlement and Social Dis/Rearticulation in Inner Mongolia, China. *Population and Environment*, 28(1), 41–68.
- ROSENZWEIG, C., SOLECKI, W., HAMMER, S.A. & MEHROTRA, S. 2010. Cities Lead the Way in Climate-Change Action. *Nature*, 467, 909–911.
- ROSENZWEIG, C., SOLECKI, W.D., HAMMER, S.A. & MEHROTRA, S (eds). 2011. *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network*. Cambridge: Cambridge University Press.
- RUCKSTUHL, S. 2009. Renewable Natural Resources: Practical Lessons for Conflict-sensitive Development. Conflict, Crime and Violence Issue Note. Washington, DC: The World Bank Group, Social Development Department.
- RUHS, M. & ANDERSON, B. 2009. Semi-Compliance and Illegality in Migrant Labour Markets: An Analysis of Migrants, Employers and the State in the UK. *Population, Space and Place*, 16(3), 195–211.
- RUITENBEEK, H.J. 1996. Distribution of Ecological Entitlements: Implications for Economic Security and Population Movement. *Ecological Economics*, 17(1), 49–64.
- SABATES-WHEELER, R. & MACAUSLAN, I. 2008. Migration and Social Protection: Exposing Problem of Access. *Development*, 50(4), 26–32.
- SAFRIEL, U., ADEEL, Z., NIEMEIJER, D., PUIGDEFABREGAS, J., WHITE, R., LAL, R., WINSLOW, M., ZIEDLER, J., PRINCE, S., ARCHER, E., KING, C., SHAPIRO, B., WESSELS, K., NIELSEN, T., PORTNOV, B., RESHEF, I., THONELL, J., LACHMAN, E. & MCNAB, D. 2005. Chapter 22: Dryland Systems. In HASSAN, R., SCHOLES, R. & ASH, N. (eds). *The Millennium Ecosystem Assessment Series : Ecosystems and Human Well-Being: Current State and Trends, Volume 1*. Washington, DC: Island Press.
- SALLU, S.M., TWYMAN, C. & STRINGER, 2010. Resilient or Vulnerable Livelihoods? Assessing Livelihood Dynamics and Trajectories in Rural Botswana. *Ecology and Society*, 15(4), 3.
- SAUNDERS, P. 2000. Environmental Refugees: Origins of a Construct. In STOTT, P. & SULLIVAN, S. (eds). *Political Ecology: Science, Myth and Power*.
- SCHÄRF, W. 2005. *Non-State Justice Systems in Southern Africa: How do and should Governments Respond?* Conference Paper. Available: <http://www.csvr.org.za/wits/confpaps/scharf.htm>.
- SCHERLER, D., BOOKHAGEN, B. & STRECKER, M.R. 2011. Spatially Variable Response of Himalayan Glaciers to Climate Change Affected by Debris Cover. *Nature Geoscience*, 4, 156–159.
- SCIENCE AND DEVELOPMENT NETWORK. 2006. *Wet or Dry? Sahel's Uncertain Future* [Online]. Available: <http://www.scidev.net/en/features/wet-or-dry-sahels-uncertain-future.html>.
- SHEARS, R. 2007. The World's First Climate Change Refugees to Leave Island Due to Rising Sea Levels. *Daily Mail*, 18 December.
- SKELDON, R. 1997. *Migration and Development: A Global Perspective*. Harlow: Longman.
- SKELDON, R. 2008. International Migration as a Tool in Development Policy: A Passing Phase? *Population and Development Review*, 34(1), 1–18.
- SMIT, B. & WANDEL, J. 2006. Adaptation, Adaptive Capacity and Vulnerability. *Global Environmental Change*, 16(3), 282–292.

- SMITH, J.B., SCHNEIDER, S.H., OPPENHEIMER, M., YOHE, G.W., HARE, W., MASTRANDEA, M.D., PATWARDHAN, A., BURTON, I., CORFEE-MORLOT, J., MAGADZA, C.H.D., FÜSSEL, H.-M., PITTOCK, A.B., RAHMAN, A., SUAREZ, A. & VANYPERSELE, J.-P. 2009. Assessing Dangerous Climate Change Through an Update of the Intergovernmental Panel on Climate Change (IPCC) 'Reasons for Concern'. *Proceedings of the National Academy of Sciences of the United States of America*, 106(11), 4133–4137.
- SOLIDARITY PEACE TRUST. 2010. *Desperate Lives: How Zimbabweans Survive Without Official Sanction in South Africa*. Port Shepstone: SPT.
- STARK, O. & BLOOM, D. 1985. The New Economics of Labour Migration. *American Economic Review*, 75(2), 173–178.
- STARK, O. & LUCAS, R.E.B. 1988. Migration, Remittances, and the Family. *Economic Development and Cultural Change*, 36(3), 465–481.
- STARK, O. & LEVHARI, D. 1982. On Migration and Risk in LDCs. *Economic Development and Cultural Change*, 31(1), 191–196.
- STERN, N.H. 2007. *The Stern Review of the Economics of Climate Change*. Cambridge: Cambridge University Press.
- STOVER, E. & VINCK, P. 2008. Cyclone Nargis and the Politics of Relief and Reconstruction Aid in Burma (Myanmar). *Journal of the American Medical Association*, 300(6), 729–731.
- STRINGER, L., THOMAS, D.S.G. & TWYMAN, C. 2007. From Global Politics to Local Land Users : Applying the United Nations Convention to Combat Desertification in Swaziland. *The Geographical Journal*, 173(2), 129–142.
- SUHRKE, A. 1994. Environmental Degradation and Population Flows. *Journal of International Affairs*, 47(2), 473–496.
- SUTTER, C., & PARRENO, J.C. 2007. Does the Current Clean Development Mechanism (CDM) Deliver its Sustainable Development Claim? An Analysis of Officially Registered CDM Projects. *Climatic Change*, 84(1), 75–90.
- SWAIN, R.B., VAN SANH, N. and VAN TUAN, V. 2008. Microfinance and Poverty Reduction in the Mekong Delta in Vietnam. *African and Asian Studies*, 7(2–3), 191–215.
- TACOLI, C. 2009. Crisis or Adaptation? Migration and Climate Change in a Context of High Mobility. *Environment and Urbanization*, 21(2), 513–525.
- TAREKE, G. 2009. *The Ethiopian Revolution: War in the Horn of Africa*. New Haven, CT: Yale University Press.
- TEMESGEN, A.K. 2010. *The Impact of Environmental and Political Influences on Pastoral Conflicts in Southern Ethiopia*. Draft Paper Presented at the Conference on Climate Change and Security in Trondheim, 21–24 June 2010 [Online]. Available: <http://climsec.prio.no/papers/Environmental%20and%20political%20influences%20on%20pastoral%20conflict%20in%20Southern%20Ethiopia.pdf>.
- THÉBAUD, B. & BATTERBY, S. 2001. Sahel Pastoralists: Opportunism, Struggle, Conflict, and Negotiations: A Case Study from Eastern Niger. *Global Environmental Change*, 11(1), 69–78.
- THOMAS, D.S.G. 2011 (ed.). *Arid Zone Geomorphology*, 3rd edition. Chichester: Wiley-Blackwell.
- THOMAS, D.S.G., KNIGHT, M. & WIGGS, G.F.S. 2005. Remobilization of Southern African Desert Dune Systems by Twenty-First Century Global Warming. *Nature*, 435, 1218–1221.
- TODARO, M.P. 1969. A Model of Labor Migration and Urban Unemployment in Less Developed Countries. *American Economic Review*, 59(1), 138–148.
- TOMPKINS, E.L., HURLSTON, L.A. & POORTINGA, W. 2009. Foreignness as a Constraint on Learning: The Impact of Migrants on Disaster Resilience in Small Islands. *Environmental Hazards*, 8(4), 263–277.
- TSE-RING, K., SHARMA, E., CHETTRI, N. & SHRESTHA, A. 2010. Climate Change Vulnerability of Mountain Ecosystems in the Eastern Himalayas: Climate Change Impact and Vulnerability in the Eastern Himalayas – Synthesis Report. Kathmandu: ICIMOD.
- TUNALI, I. 2000. Rationality of Migration. *International Economic Review*, 41(4), 893–920.
- TURNER, B.L. 2010. Vulnerability and Resilience: Coalescing or Paralleling Approaches for Sustainability Science? *Global Environmental Change*, 20(4), 570–576.

- UNDP. 2009. *Human Development Report 2009: Overcoming Barriers: Human Mobility and Development*. New York: UNDP.
- UNDP. 2010. *The Forgotten Billion* [Online]. Available: <http://www.unccd.int/media/docs/ForgottenBillion.pdf>.
- UN DESA. 2005. *Trends in Total Migration Stock: The 2005 Revision* [Online]. Available: http://www.un.org/esa/population/publications/migration/UN_Migrant_Stock_Documentation_2005.pdf.
- UN DESA POPULATION DIVISION. 2008. *World Urbanization Prospects: The 2007 Revision*. New York: UN DESA.
- UN DESA POPULATION DIVISION. 2009a. *World Urbanization Prospects: The 2009 Revision*. New York: UN DESA.
- UN DESA POPULATION DIVISION. 2009b. *World Population Prospects: The 2008 Revision* [Online]. Available: http://www.un.org/esa/population/publications/wpp2008/wpp2008_text_tables.pdf.
- UN DESA POPULATION DIVISION. 2010. *World Population Prospects: The 2010 Revision* [Online]. Available: <http://esa.un.org/unpd/wpp/index.htm>.
- UN ECONOMIC AND SOCIAL COUNCIL. 1998. *Guiding Principles on Internal Displacement* (E/CN.4/1998/53/Add.2) [Online]. Available: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G98/104/93/PDF/G9810493.pdf?OpenElement>.
- UNEP. 2005. *Pacific Island Villagers First Climate Change 'Refugees'* [Online]. 6 December. Available: <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=459&ArticleID=5066&I=en>.
- UNEP. 2006. *Global Desert Outlook*. Nairobi: Division of Early Warning and Assessment.
- UN FCCC. 1992. *United Nations Framework Convention on Climate Change, Article 2* [Online]. Available: <http://unfccc.int/resource/docs/convkp/conveng.pdf>.
- UN FCCC. 1998. *Kyoto Protocol to the United Nations Framework Convention on Climate Change* [Online]. Available: <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.
- UNFCCC. 2009. Copenhagen Accord: Draft Decision –/CP.15. *Conference of the Parties Fifteenth Session*. Copenhagen, 7–18 December. Bonn: UNFCCC [Online]. Available: <http://unfccc.int/resource/docs/2009/cop15/eng/107.pdf>.
- UN GENERAL ASSEMBLY. 1999. 53rd Session. Resolution 125 on the Report of the Third Committee (A/53/620). 12 February.
- UN-HABITAT. 2006. *State of the World's Cities 2006/7: The Millennium Development Goals and Urban Sustainability*. London: Earthscan.
- UN-HABITAT. 2007. *Global Report on Human Settlements 2007: Enhancing Urban Safety and Security*. London: Earthscan.
- UN-HABITAT. 2011. *Global Report on Human Settlements 2011: Cities and Climate Change*. Nairobi: UN Human Settlements Program.
- UNHCR. 1993. Chapter 5: Responding to Refugee Emergencies. In *The State of the World's Refugees 1993* [Online]. Available: <http://www.unhcr.org/3eecedeba.html>.
- UNHCR. 2008. *Protection Gaps Framework for Analysis: Enhancing Protection of Refugees*, 2nd edition [Online]. Available: <http://www.unhcr.org/41fe3ab92.html>.
- UNHCR. 2011. *UNHCR Urges States to Redefine Response to Climate-Induced Displacement*. The UN Refugee Agency [Online]. Available: <http://www.unhcr.org.uk/news-and-views/news-list/news-detail/article/unhcr-urges-states-to-redefine-response-to-climate-induced-displacement.html>.
- UNISPAL. 1950. *General Progress Report and Supplementary Report of the United Nations Conciliation Commission for Palestine: Covering the Period from 11 December 1949 to 23 October 1950* [Online]. Available: <http://domino.un.org/unispal.nsf/9a798adbf322aff38525617b006d88d7/93037e3b939746de8525610200567883>.
- URDAL, H. 2005. *Defusing the Population Bomb: Is Security a Rationale for Reducing Global Population Growth?* Environmental Change and Security Program Report No. 11, 5–11. Washington, DC: Woodrow Wilson Center.

- US CENSUS BUREAU. 2010. *2010 Census Data* [Online]. Available: <http://2010.census.gov/2010census/data/>.
- VAN DER GEEST, 2011. North-South Migration in Ghana: What Role for the Environment. *International Migration*, 49(s1), e69-e94.
- VAN DER HEIJDEN, K. 2005. *Scenarios: The Art of Strategic Conversation*, 2nd edition. Chichester: John Wiley & Sons.
- VAN HEAR, N. 1998. *New Diasporas: The Mass Exodus, Dispersal and Regrouping of Migrant Communities*. London: UCL Press.
- VERTOVEC, S. 2007. *Circular Migration: The Way Forward in Global Policy?* Oxford University International Migration Institute Working Paper 4. Oxford: IMI.
- WALLSTEN, S. 2004. Migration Can Help Stabilize Poor Countries. SIEPR Policy Brief [Online]. Available: http://www-siepr.stanford.edu/papers/briefs/policybrief_apr04.pdf.
- WARREN, R., ARNELL, N., BERRY, P., BROWN, S., DICKS, L., GOSLING, S., HANKIN, R., HOPE, C., LOWE, J., MATSUMOTO, K., MASUI, T., NICHOLLS, R., O'HANLEY, J., OSBORN, T. & SCRIEUCRU, S. 2010. *The Economics and Climate Change Impacts of Various Greenhouse Gas Emission Pathways: A Comparison Between Baseline and Policy Emissions Scenarios. Technical Report*. DEFRA Report No. AV/WS1/D3/R01.
- WASHINGTON, W.M., KNUTTI, R., MEEHL, G.A., TENG, H., TEBALDI, C., LAWRENCE, D., BUJA, L. & STRAND, W.G. 2009. How Much Climate Change Can Be Avoided by Mitigation? *Geographical Research Letters*, 36, L08703.
- WAX, E. 2007. In Flood-Prone Bangladesh, A Future that Floats. *Washington Post*, 27 September.
- WEBSTER, P.J. 2008. Myanmar's Deadly Daffodil. *Nature Geoscience*, 1, 488–490.
- WEBSTER, P.J., TOMA, E. & KIM, H.M. 2011. Were the 2010 Pakistan Floods Predictable? *Geographical Research Letters*, 38, L04806.
- WHALLEY, J. & XIN, X. 2010. China's FDI and Non-FDI Economies and the Sustainability of Future High Chinese Growth. *China Economic Review*, 21(1), 123–135.
- WILLIAMS, A. 2008. Turning the Tide: Recognizing Climate Change Refugees in International Law. *Law and Policy*, 30(4), 502–529.
- WOLDEMESKEL, G. 1989. The Consequences of Resettlement in Ethiopia. *African Affairs*, 352, 359–374.
- WOOD, W.B. 2001. Ecomigration: Linkages between Environmental Change and Migration. In: ZOLBERG, A.R. & BENDA, P.M. (eds). *Global Migrants, Global Refugees*. Oxford: Berghahn.
- WORBY, E. 2010. Address Unknown: The Temporality of Displacement and the Ethics of Disconnection Among Zimbabwean Migrants in Johannesburg. *Journal of South African Studies*, 36(2), 417–433.
- WORLD BANK. 2007. *Status of Projects in Execution – FY07 SOPE Nigeria*. Nairobi: World Bank.
- WORLD BANK. 2008. *World Bank Development Report 2008: Agriculture for Development*. Washington, DC: World Bank.
- WORLD BANK. 2009a. *Nepal Migration Survey*. Kathmandu: World Bank.
- WORLD BANK. 2009b. Chapter 5: Factor Mobility and Migration. In *World Development Report 2009*. Washington, DC: World Bank.
- WORLD BANK. 2010. *World Development Report 2010: Development and Climate Change*. Washington, DC: World Bank.
- WORLD BANK. 2011. *Migration and Remittances Factbook 2011*, 2nd edition [Online]. Available: <http://siteresources.worldbank.org/INTLAC/Resources/Factbook2011-Ebook.pdf>.
- WREFORD, A. & ADGER, W.N. 2010. Adaptation in Agriculture: Historic Effects of Heat Waves and Droughts on UK Agriculture. *International Journal of Agricultural Sustainability*, 18(4), 278–289.
- WU, H.J. 2009. *The Way Toward Green City The Case of Shenzhen*. 45th ISOCARP Congress 2009, Porto, 18–22 October. The Hague: ISOCARP.

- WULF, H. & DEBIEL, T. 2009. Conflict Early Warning and Response Mechanisms: Tools for Enhancing the Effectiveness of Regional Organizations? A Comparative Study of the AU, ECOWAS, IGAD, ASEAN/ARF and PIF. Crisis States Working Paper Series No. 2 [Online]. London: LSE. Available: <http://eprints.lse.ac.uk/28495/1/WP49.2.pdf>.
- YANG, D. & CHOI, H.-J. 2007. Are Remittances Insurance? Evidence from Rainfall Shocks in the Philippines. *World Bank Economic Review*, 21(2), 219–248.
- YAO, S., GUO, Y. & HUO, X. 2010. An Empirical Analysis of the Effects of China's Land Conversion Program on Farmer's Income Growth and Labor Transfer. *Environmental Management*, 45(2), 502–512.
- YENOTANI, M. 2011. *Displacement Due to Natural Hazard-Induced Disasters: Global Estimates for 2009 and 2010*. Oslo: IDMC & NRC.
- YILA, O.M. & THAPA, G.B. 2008. Adoption of Agricultural Land Management Technologies by Smallholder Farmers in the Jos Plateau, Nigeria. *International Journal of Agricultural Sustainability*, 6(4), 277–288.
- YOHE, G., KNEE, K. & KIRSHEN, P. 2011. On the Economics of Coastal Adaptation Solutions in an Uncertain World. *Climatic Change*, 106(1), 71–92.
- YOUNG, S. 2010. Gender, Mobility and the Financialisation of Development. *Geopolitics*, 15(3), 606–627.
- ZEMP, M., ROER, I., KAAB, A., HOELZLE, M., PAUL, F. & HAEBERLI, W. 2008. *Global Glacier Changes: Facts and Figures*. Zurich: UNEP/World Glacier Monitoring Service.
- ZETTER, R. 1991. Labelling Refugees: Forming and Transforming a Bureaucratic Identity. *Journal of Refugee Studies*, 4(1), 39–62.
- ZETTER, R. 2007. More Labels, Fewer Refugees: Remaking the Refugee Label in an Era of Globalization. *Journal of Refugee Studies*, 20(2), 172–192.
- ZETTER, R. 2011. *Protecting Environmentally Displaced People: Developing the Capacity of Legal and Normative Frameworks*. Research Report. Oxford: Refugee Studies Centre.
- ZOLBERG, A., SUHRKE, A. & AGUAYO, S. 1989. *Escape from Violence*. Oxford: Oxford University Press.

Annex C: Glossary and acronyms

The terms and acronyms listed here cover the Project Final Report

Biodiversity: The amount of biological variation within and between species of living organisms and whole ecosystems in terrestrial and aquatic environments.

Climate Change: The change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Cumulative Causation: A self-reinforcing process during which an impulse to a system triggers further changes in the same direction as the original impulse, i.e. migration generating its own internal momentum.

Displacement: A particular form of migration, in which individuals are forced to move against their will. Where people are forced to move within their country of origin this is referred to as **internal displacement**.

Drivers of Migration: A range of factors, the spatial and temporal variability of which can create the conditions for migration. The Foresight report groups migration drivers into five categories: social, political, economic, environmental and demographic.

Drylands: Arid, semiarid, and dry subhumid areas. Drylands are characterised by limited soil moisture, the result of low rainfall and high evaporation.

Ecosystem Services: Any and all benefits that are delivered to human societies from natural or managed ecosystems such as food (a provisioning service), attractive landscapes (a cultural service), biological pest control (a regulating service) or fertile soil (a supporting service).

Environmental Change: Changes in the physical and biogeochemical (chemical, geological, and biological) environment, over a large scale, either caused naturally or influenced by human activities.

'Future Scenarios': A portrait of plausible future worlds. Not a specific forecast of the future, but a plausible description of what might happen.

Governance: The exercise of political, economic and administrative authority comprising the complex mechanisms, processes, relationships and institutions both public and private and across subnational, national and international levels through which citizens and groups articulate their interests, exercise their rights and obligations and mediate their differences.

Green Climate Fund: A multi-billion-dollar fund, agreed at the Cancun climate change talks, to support projects, programmes, policies and other activities in developing countries related to mitigation including REDD+, adaptation, capacity building and technology development and transfer.

Human Mobility: The ability of individuals, families or groups of people to choose their place of residence.

Internally Displaced Persons⁶⁸³: Persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalised violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognised state border.

683 As defined in the UN Commission on Human Rights, Report of the Representative of the Secretary-General, Mr Francis M. Deng, submitted pursuant to Commission resolution 1997/39.

Livelihoods: A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gaining by the individual or household.

Low-elevation Coastal Zones: Coastal areas located between 0 m and 10 m above sea level.

Migration: The process of an individual or group changing their place of residence either by crossing an international border (international migration) or by moving within their country of origin to another region, district or municipality (internal migration). People are normally considered to be 'migrants' if they remain outside their original place of residence for a period of at least 3 months.

Mixed Flows: Migration flows that includes both migrants who fall within established protection frameworks and migrants deemed 'irregular' by authorities, who fall outside established protection frameworks.

Modelling: A theoretical method that represents (economic) processes by a set of variables and a set of quantitative relationships between them. The model is a simplified framework designed to illustrate complex processes.

Mountain Regions: See mountain classification in Table 3.4 of the main report.

National Adaptation Programmes of Action (NAPAs): A process for least developed countries (LDCs) to identify priority activities that respond to their urgent and immediate needs to adapt to climate change – those for which further delay would increase vulnerability and/or costs at a later stage.

Non-structural Policies: Policies that aim to lessen the impact of events and changes in ecosystem services by reducing the exposure to loss, through, for example, use of agricultural practices that are less vulnerable to drought or spatial planning.

Planned Relocation: The movement of people, typically in groups or whole communities, as part of a process led by the state or other organisation, to a predefined location.

REDD+: The UN-REDD Programme was launched in September 2008 to assist developing countries prepare and implement national REDD+ strategies. REDD+ aims to reduce emissions from deforestation and forest degradation in developing countries.

Refugee⁶⁸⁴: 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 and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it.

Remittance Incomes/Flows: The portion of migrant income that, in the form of either funds or goods, flows back into the country of origin, primarily to support families back home.

Resilience: The ability of people, communities or systems to absorb shocks and regenerate after a disturbance

Rural–urban Migration: Migration of people from rural areas (characterised by a dispersed population, agricultural or other extensive land use and distance from major urban centres) to urban areas (characterised by high population size, population density and service provision).

Structural Policies: Policies that seek to reduce the physical impacts of anticipated environmental change, through, for example, structural flood protection works or the provision of systems to supply water during drought conditions. Structural measures include infrastructure and planning and are typically implemented where there are significant populations and economic assets at risk, for example in urban areas.

684 As defined in Article 1A of the 1951 United Nations Convention on the Status of Refugees and Stateless Persons.

Sustainable/Sustainability: A system or state where the needs of the present and local population can be met without diminishing the ability of future generations or populations in other locations to meet their needs without causing harm to the environment and natural assets.

Urbanisation: The rapid physical growth of urban areas due to a number of factors including rural–urban migration (as defined above).

Vulnerability: The state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt.

Windtunnelling: Using future scenarios to assess the future resilience of strategic policies.

Acronyms

AU: African Union

CDM: clean development mechanism

EU: European Union

FDI: foreign direct investment

GCC: Gulf Cooperation Council

GHG: greenhouse gas

IASC: Inter Agency Standing Committee (UN)

IOM: International Organization for Migration

IPCC: Intergovernmental Panel on Climate Change

LECZ: low-elevation coastal zone

NAPA: National Adaptation Programmes of Action

NGO: non-governmental organisation

ODA: Overseas Development Assistance

OHCHR: Office of the High Commissioner for Human Rights

REDD+: Reducing Emissions from Deforestation and Forest Degradation

UNCLOS: UN Convention of the Law of the Sea

UN DESA: United Nations Department of Economic and Social Affairs

UNFCCC: United Nations Framework Convention on Climate Change

UNHCR: United Nations High Commissioner for Refugees

USD: United States dollars

WTO: World Trade Organization

Annex D: Project reports and papers

