



Migration and Global Environmental Change

Future Challenges and Opportunities

Future Scenarios

This review has been commissioned as part of the UK Government's Foresight Project, Migration and Global Environmental Change. The views expressed do not represent the policy of any Government or organisation.

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Migration and Global Environmental Change, Future Challenges and Opportunities: Future Scenarios¹

I. The objective of the paper

This paper presents the scenario narratives and data developed as part of the Foresight Migration and Global Environmental Change project. It also explains about the purpose of the scenarios and their use in the project, and the process undertaken to develop them.

Annexes A-E contain data used for the construction of the four scenarios, with some preliminary discussion of migration consequences, including those linked to environmental change.

- Annex A: Demographic factors
- Annex B: Economic factors
- Annex C: Social factors
- Annex D: Political factors
- Annex E: Environmental factors

2. Introduction

Given the 50-year timeframe of the Migration and Global Environmental Change project, it was necessary to complement traditional modelling approaches with a methodology that could represent possible future developments and states of migration drivers, in spite of the inevitable uncertainty inherent in projections over such a duration.

The scenario method was identified as the best available approach to do this. Scenarios have been used by previous Foresight projects in different ways, to provide 'internally consistent and challenging narrative descriptions of possible futures'² and as a platform for debate and a framework for the consideration of possible policy action³. This report uses scenarios of the future to understand how migration may be influenced by future global environmental change and other factors. The project scenarios are not predictions; their purpose is simply to propose

¹ The scenarios have been used in the final project report to consider policy actions that might be appropriate in the event that the future context for migration evolves in any of the ways described by the scenarios. However, it must be emphasised that these are not predictions of the future or even projections; they are plausible storylines to help policymakers think about alternative global futures.

² van der Heijden (2005).

³ See for example Evans *et al* (2004); Foresight (2005); Foresight (2008).

four contrasting but plausible ways in which political and economic factors would combine to influence migration. They are useful when considering how best to prepare for a future that is inherently uncertain. Scenarios may, for example, suggest the need for preventive action to ‘ward off’ potential futures, or alternatively, the need for the timely preparation of contingency plans that might be put into effect in the event that elements of a scenario do come to pass.

For the Migration and Global Environmental Change project, scenarios provide a means to consider, simultaneously, a number of different factors that will influence migration, and to represent the impact of environmental change on migration *through* these factors. They also make it possible to represent the impact of macro-economic, social and geopolitical factors, which are clearly very important determinants of migration, but difficult to analyse in a satisfactory way using traditional data modelling approaches⁴.

3. The scenarios process

The scenario construction process used was the ‘deductive’ (as opposed to ‘inductive’) method⁵. Two major ‘dimensions of uncertainty’ were identified in the future of migration related to environmental change, and then used to define axes, which created four scenario spaces (see **Figure 1** below). Four scenarios were then developed within these spaces by the experts, drawing on data forecasts for demographic, economic, social, political and environment factors (as described in Annexes A to E)⁶. The scenarios are presented in this document in two formats:

A table containing a summary of relevant data for to each scenario (see the annexes for the full data)

A narrative for each scenario, which are (a) consistent with the data, and (b) plausible, in that they are internally consistent, and no objective reason can be found why the particular future described could not happen.

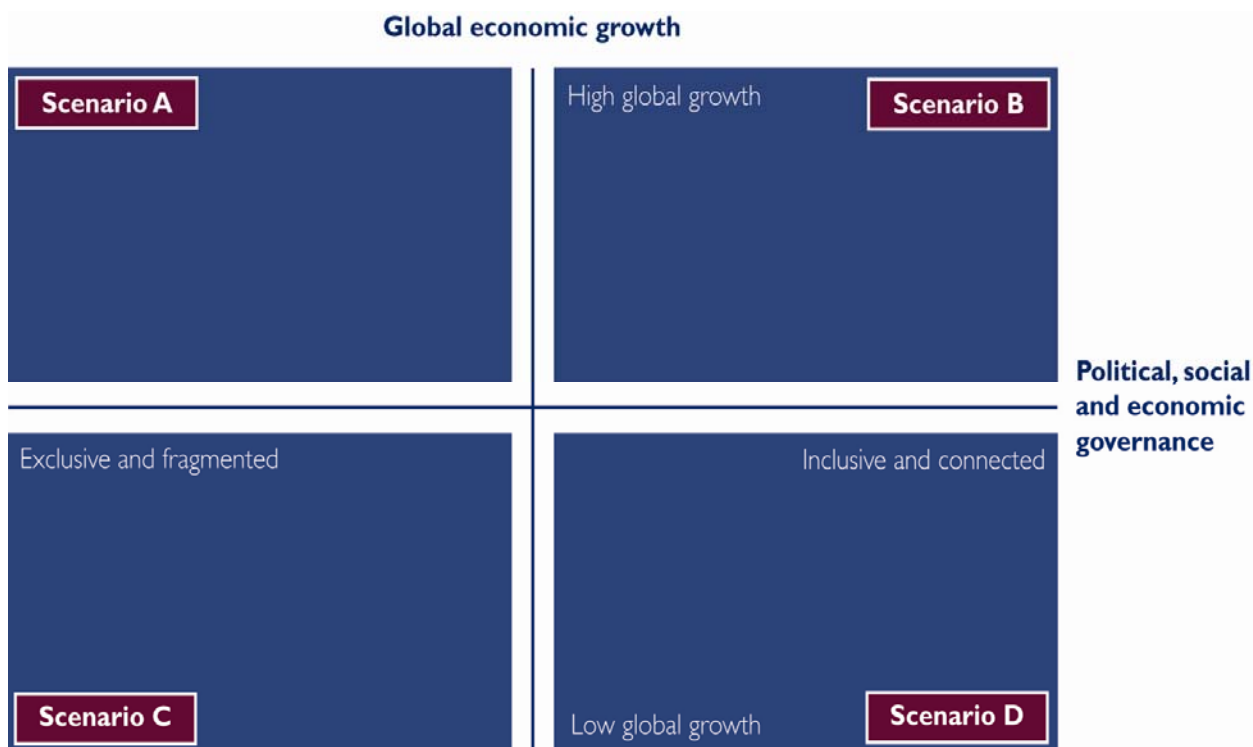
These scenarios have been tested by a number of international stakeholders and experts in the project’s four international workshops (which took place in Bangladesh, Turkey, Nepal and South Africa).

⁴ For a discussion of the use of scenarios as a complement to modelling to represent the interplay of heterogeneous factors over long timescales, see Reilly Willenbockel (2010).

⁵ For a discussion of these methods see van der Heijden (2005).

⁶ For a discussion of the scenario development process see Foresight Horizon Scanning Centre (2009)

4. The Scenarios



The axes build on one of the key insights of the project’s conceptual framework - that it is relative rather than absolute opportunities and constraints that matter most. Migration is a response to relative opportunities and constraints in one location relative to another.

As outlined in the definition of the two axes below, the same axes are used to consider both international and internal migration.

The Y-axis describes global migration opportunities linked to high global economic growth versus low global economic growth: to what extent will the world economy continue to expand? Key resulting factors are levels of labour demand (jobs) for migrants and wage levels for various skill levels affecting the economic incentives to migrate, with important interactions with political, social and demographic variables (such as attitudes towards migration and population age structures). When focusing on internal migration, this translates into the overall growth opportunities in urban centres and specific growth poles in the domestic economies.

The X-axis reflects what is happening at a more local level – the potential ‘sending’ area of migration. When focusing on international migration, it reflects the *local opportunities and constraints*. The axes could be called local political, social and economic governance: how well the local economy is governed (in terms of growth or management of natural resources) but also the extent of equitable governance of the distribution of wealth and income in the country (income inequality, access to health, education, land, etc), and more in general, the social and political contract (such as connectivity in society and political accountability, conflict/violence, rule of law, and government effectiveness). When looking at internal migration, it would reflect how particular local areas are offered local opportunities and are included in the overall economic and social processes in the country; local political, social and economic inclusion is what matters here. Inclusion or exclusion are considered the two possible extremes.

5. Details on each scenario A-D

SCENARIO A: high global growth, and exclusive local social, political and economic governance

Demographic

- High growth (with rising education and health) limits population growth, but exclusive governance sustains population growth in some of the poorest settings. World population 2030: 8.1 billion and 9.1 billion in 2060. Share of Africa plus South and Central Asia: 59% by 2060
- Very fast ageing of population in richer economies plus China, which reaches dependency ratios at levels of Europe; continuing young population in poorest parts of the world, especially Sub-Saharan Africa.

Economic

- Fast world economic growth, threefold increase of GNI per capita in rich economies by 2060, high growth and considerable (but incomplete) convergence of other economies, mainly China.
- Some real GDP improvements on average in poorest economies but progress very variable.
- Gaps with poorest economies stagnant (e.g. Sub-Saharan Africa: still only 3% of GNI per capita of rich economies in 2060, South Asia only 1/7th of GNI per capita of rich economies)

Political

- Limited accountability, poor regulatory quality and limited government effectiveness
- Questionable rule of law and high corruption
- Risks to stability and risks of violence

Social

- Cost of networking and social connectivity relatively high with high inequality in access to means of communication between countries and within poor countries
- High pressures linked to social inequalities
- High tensions between migrant and non-migrant communities

Environmental

- Increase in global temperature of 2.4°C by 2060
- Substantial decrease in crop productivity in dry regions, but increase in high latitudes
- Substantial increase in frequency of river flooding in south and east Asia, and west Africa
- Substantial increase in frequency of flooding for coastal cities
- Substantial increase in water resource stress in North Africa, Middle East, and Europe
- Substantial increase in changes in mountain ecosystems

Narrative for Scenario A

High global growth, and exclusive local social, political and economic governance

The world economy is growing fast and the demand for labour in richer economies is booming for various skill levels. The population in richer economies is ageing fast, leading to high demand for low skilled (migrant) labour. Weak political and social governance limits progress in many parts of the world, such as in sub-Saharan Africa. Gradual global warming results in higher frequency of disasters, especially linked to flooding. Gaps in earnings between some of the poorest and richest economies are narrowing but remain high and highly variable.

Migration to richer economies is largely 'gradual' or 'routine', yet will have considerable political challenges, as local political and social governance remains problematic. Much of this migration is towards regional economic growth poles. Environmental pressures and disasters increase, occasionally and locally creating significant numbers of displaced people, posing operational and often geopolitical challenges.

High global economic growth helps to build connectivity between communities and to reduce urban-rural divides. There is uneven distribution of economic growth because of uncertain regulatory and compliance frameworks and weak anti-corruption norms. Uncertainties impose restrictions on mobility and circulation, lead to unplanned/irregular flows and to uneven and insecure channels for transmission of remittances. Remittances remain a significant flow; but diaspora involvement in economic, social and political development is significantly curtailed.

A strong focus on security and control places limits on political and social participation and on enforcement of human rights such as freedoms of association and expression. This heightens tendencies to repression of migrant and minority groups represented as a threat to order and stability. Migrant and minority groups are largely excluded from governance structures. Emphasis on security and control lead to increased irregular migration by those with assets and capitals, and increased risk for the most vulnerable such as the elderly, women and children. Irregular flows and unplanned movements sustain grey/informal economies in destination states while upholding networks (sometimes criminal) that facilitate such movement.

Resources are devoted to control and security, which means reduced scope for effective planning to sustain rural communities and to offset the effects of urban growth. Low levels of social cohesion mean that migrants and minority groups moving from rural to urban areas are exposed to increased risk and danger and may be targeted as threats to order and stability.

Emphasis on security and control leads to a strong domestic policy focus in countries, and that diminishes the scope for regional and international co-operation and for international planning to offset the medium- to long- effects of population movements associated with increased exposure to environmental risks. International migrants are more likely to be those with many assets and capitals but will be exposed to significant dangers when they move and to exploitation when they arrive.

SCENARIO B: high global growth, and inclusive local social, political and economic governance

Demographic

- High growth (with rising education and health levels) limits population growth, further assisted by more inclusive governance in some of the poorest settings. World population 2030: 7.5 billion, peaking near 2045 at 7.7 and reaching 7.4 billion in 2060. Share of Africa plus South and Central Asia: 50% by 2060
- Very fast ageing of population in richer economies plus China and increasingly in South Asia, with more countries reaching dependency ratios at levels of Europe; continuing young population in poorest parts of the world, especially Sub-Saharan Africa.

Economic

- Fast world economic growth, threefold increase of GNI per capita in rich economies by 2060, high growth and considerable (even if still incomplete) convergence of other economies, mainly China.
- Strong improvements in GNI per capita across the world, sustained even in poorest economies.
- Gaps with poorest economies reducing although still large with poorest countries (e.g. Sub-Saharan Africa still only 1/7th of GNI per capita of rich economies in 2060, but convergence of China and increasingly south Asian countries)

Political

- High degree of accountability, functional regulatory frameworks and government effectiveness
- Broad presence of rule of law and reduced corruption
- Limited risks to stability and of violence, even in poorer countries

Social

- Convergence in access to communication capabilities, both between countries and within poor countries
- Low or managed pressures linked to social inequalities
- Limited tensions between migrants and non-migrant communities

Environmental

- Increase in global temperature of 2.4°C by 2060
- Substantial decrease in crop productivity in dry regions, but increase in high latitudes
- Substantial increase in frequency of river flooding in south and east Asia, west Africa
- Substantial increase in frequency of flooding for coastal cities
- Substantial increase in water resources stress in North Africa, Middle East, Europe
- Substantial increase in changes in mountain ecosystems

Narrative for Scenario B

High global growth, and inclusive local social, political and economic governance

The world economy is growing fast and the demand for labour in richer economies is booming for various skills. However, stable social, political and economic governance in poorer countries result in a relatively equal distribution of *growth* in economic activity across the world, implying substantial job creation in the urban areas of poorer economies. High growth and continuing rising living standards in richer economies result in a fast ageing of population in many parts of the world, and not just in pockets of Europe, increasing demand for labour further, not least of low skilled workers. Gaps between earnings in the poorest and richest economies are narrow but remain high.

Migration to richer economies is largely voluntary, with mainly 'operational' challenges, although political challenges will remain. Much of this migration is towards regional economic growth poles presenting serious managerial challenges. Environmental pressures, such as those linked to flooding, will increasingly but occasionally and locally create significant numbers of displaced people posing operational and potentially geopolitical challenges.

High economic growth helps to build connectivity between communities and to reduce urban-rural divides. Credible regulatory frameworks backed by strong compliance mechanisms facilitate circulation of migrant populations, help to maintain secure channels for transmission of remittances and facilitate diaspora involvement in economic and political development. Participatory politics with respect for human rights such as freedoms of association and expression help to sustain inclusive and connected governance. Respect for the rule of law reduces the risks of violent conflict and instability while promoting the development of cohesive societies and governance structures that are inclusive of migrant and minority groups.

Effective governance structures facilitate planning to support rural communities, develop effective urban planning and thus help to offset the risks posed by environmental degradation and to make movement from rural to urban areas less risky. Stable and secure national governance of countries provides an effective foundation for regional and international co-operation on migration that improves planning capacity and offsets the medium- to long-term effects of population movements associated with increased exposure to environmental risks, while also ensuring protection for more vulnerable groups such as the elderly, women and children.

SCENARIO C: low global growth, and exclusive local social, political and economic governance

Demographic

- Low economic growth limits population growth only partly, despite rising education and health levels, while exclusive governance sustains population growth in some of the poorest settings. World population 2030: 8.4 billion and 9.8 billion in 2060. Share of Africa plus South and Central Asia: 55% by 2060
- Relatively fast ageing of population in richer economies plus China; continuing young population in poorest parts of the world, especially Sub-Saharan Africa and some parts of South Asia.

Economic

- Stagnant world economic growth, although still somewhat faster growth in some areas, such as China. No increase in GNI per capita in rich economies by 2060, with convergence by a limited number of other economies, mainly China.
- No or very limited GNI per capita improvements in the poorest economies; any progress very variable.
- Gaps with poorest economies high and stagnant (e.g. Sub-Saharan Africa: still only 5% of GNI per capita of rich economies in 2060, South Asia only 1/8th of GNI per capita of rich economies)

Political

- Limited accountability, poor regulatory quality and limited government effectiveness
- Questionable rule of law and high corruption
- Risk of instability and violence

Social

- Cost of networking and social connectivity relatively high with high inequality in access to means of communication between countries and within poor countries
- High pressures linked to social inequalities
- High tensions between migrant and non-migrant communities

Environmental

- Increase in global temperature of 2°C by 2060
- Decrease in crop productivity in dry regions, but increase in high latitudes
- Increase in frequency of river flooding in south and east Asia, west Africa
- Increase in frequency of flooding for coastal cities
- Increase in water resources stress in North Africa, Middle East, Europe
- Increase in changes in mountain ecosystems

Narrative for Scenario C

Low global growth, and exclusive local social, political and economic governance

The world economy is stagnating while in many poorer countries social, economic and political disintegration is common, and marginalisation of their populations persists. In richer economies, the age structure puts further pressure on retirement ages or the need for new labour sources. Wage growth in richer economies is limited, but gaps with the poorest economies remain large.

There is more willingness to migrate, internally and internationally, as local opportunities are limited and economic and other transformation remains limited in the poorer countries. More skilled populations from poorer countries continue to relocate to richer economies, including by filling in jobs for low skilled workers in richer economies and accelerating the brain drain, although the number of people wanting to move it well outstripping opportunities. Internal migration opportunities are relatively limited; few opportunities for skilled workers in urban centres of poorer economies, contribute to further political and social pressures.

Low growth and exclusive governance lead to policies that are strongly focused on security and control. Ineffective regulatory and compliance frameworks and weak-anti-corruption norms lead to restrictions on mobility and circulation, increased unplanned/irregular flows and to uneven and insecure channels for transmission of remittances. Vulnerable groups such as women, children and the elderly are less able to move and more likely to be exposed to the effects of risk, including environmental risk. Diaspora involvement in economic, social and political development is significantly curtailed.

Emphasis on security and control places limits on political and social participation and on enforcement of human rights such as freedoms of association and expression. This creates increased scope for social and political conflict, heightens tendencies to repression of migrant and minority groups represented as a threat to order and stability. Migrant and minority groups are largely excluded from governance structures.

Emphasis on security and control leads to increased irregular migration by those with assets and capitals and increased risk for the most vulnerable, such as the elderly, women and children. Irregular flows and unplanned movement sustains grey/informal economies in destination states while sustaining networks (sometimes criminal) that facilitate such movement.

Resources are devoted to control and security which reduces the scope for effective planning to sustain rural communities and to offset the effects of urban growth. Low levels of social cohesion mean that migrants and minority groups moving from rural to urban areas are exposed to increased risk and danger.

Emphasis on security and control leads to a strong domestic policy focus that diminishes the scope for regional and international co-operation and for international planning to offset the medium- to long- effects of population movements associated with increased exposure to environmental risks. International migrants are more likely those with many assets and capitals but will be exposed to significant dangers when they move and to exploitation when they arrive.

SCENARIO D: low global growth, and inclusive local social, political and economic governance

Demographic

- Rising education and health levels across the world limit population growth, further assisted by more inclusive governance in some of the poorest settings, even though tempered by relatively low economic growth in poorest settings. World population 2030: 8.1 billion and 8.9 billion in 2060. Share of Africa plus South and Central Asia: 51% by 2060
- Fast ageing of population in richer economies plus China; continuing young population in poorest parts of the world, especially Sub-Saharan Africa.

Economic

- Slow world economic growth, but high growth in particular areas, such as China and South Asia. Considerable convergence to rich economy levels of GNI per capita by 2060 by specific countries, such as China.
- Highly variable improvements in GNI per capita across the world, with several countries lagging behind.
- Gaps with poorest economies reducing although still large with poorest countries (e.g. Sub-Saharan Africa still only less than 10% of GNI per capita of rich economies in 2060, and South Asia only 1/5th, but convergence of China)

Political

- High degree of accountability, functional regulatory frameworks and government effectiveness
- Broad presence of rule of law and contained corruption
- Limited risks to stability and of violence, even in poorer countries

Social

- Convergence in access to means of communication between countries and within poor countries
- Low or managed pressures linked to social inequalities
- Limited tensions between migrant and non-migrant communities

Environmental

- Increase in global temperature of 2°C by 2060
- Decrease in crop productivity in dry regions, but increase in high latitudes
- Increase in frequency of river flooding in south and east Asia, west Africa
- Increase in frequency of flooding for coastal cities
- Increase in water resources stress in North Africa, Middle East, Europe
- Increase in changes in mountain ecosystems

Narrative for Scenario D

Low global growth, and inclusive local social, political and economic governance

The world economy is stagnating and the demand for labour in richer economies is relatively limited. Changing population structures (ageing of the population) in these economies is resulting in an increased labour demand for low skilled jobs but also forces retirement ages to rise. Wage growth is limited in the richer economies, but gaps with the poorest countries remain very large.

The demand for migrants is relatively low although still rising due to the ageing population structure in richer economies. Relatively low wage growth in these economies is interpreted by many (even if wrongly) as resulting from the immigration pressure, resulting in continuing tensions towards immigration despite the obvious need given the age structure. Potential sending countries are handling growth reasonably well and are gradually transforming, with substantial internal migration to areas of higher growth, such as regional growth poles and coastal areas.

Low economic growth leads to increased reliance in less economically developed countries on public and private resources from developed countries to develop connectivity between communities and reduce rural-urban divides. Transmission of public and private flows is facilitated by effective regulatory and compliance frameworks and by strong anti-corruption norms that facilitate circulation of migrant populations, maintain secure channels for transmission of remittances and facilitate diaspora involvement in economic and political development.

Participatory politics and respect for human rights such as freedoms of association and expression sustain inclusive and connected governance. Respect for the rule of law reduces the risks of violent conflict and instability while promoting the development of cohesive societies and governance structures that are inclusive of migrant and minority groups.

Transmission of public and private flows from more to less economically developed countries facilitates planning to support rural communities, develop effective urban planning and thus help to offset the risks posed by environmental degradation and to make less risky movement from rural to urban areas

Stable and secure national governance provides an effective foundation for regional and international co-operation on migration that improves planning capacity and offsets the medium- to long-term effects of population movements associated with increased exposure to environmental risks while also ensuring protection for more vulnerable groups such as the elderly, women and children.

6. Annexes

Annex A: Demographic Factors

A first driver of migration considered to define the basic data for the scenarios are demographic factors. Population growth is influenced by a variety of factors, including the level of income in particular societies but also crucially various factors related to social, political and economic governance, leading to various levels of access to health and education, different income distribution and inclusive social policies. As a result, we allow for different population scenarios for each quadrant. While many specific demographic factors could be considered, we focus here on the population levels and the population structure as two key factors influencing migration incentives⁷. Inter alia, these models take into account population structure, and education interactions in projecting the level and uncertainty in population projections. The result is a careful calibration of population forecasts, sensitive to progress in health, education and economic factors, but also with careful modeling of the population backlog resulting from particular age structures at any point in time.

The scenarios provide predictions under low growth and problematic (exclusive) social and political governance population levels of close to 10 billion in 2060, with lower levels (in high economic growth and inclusive governance scenarios) to about 7.4 billion, having peaked around 7.7 near 2045 (in line with the 10th percentile forecast in population forecast models).

These population scenarios therefore provide world populations with more than two billion difference (between scenario B and C), with a difference in population estimates for South and Central Asia, and for Sub-Saharan Africa of about 0.8 billion each, by 2060. All scenarios imply a considerable increase in the share in the world population of the poorer areas of the world relative to the richer parts.

These scenarios suggest rapid rise in elderly dependency ratios in richer economies, with China converging fast to the high dependency ratios of Europe, while Sub-Saharan Africa remaining at considerably lower levels (young populations) even at relatively low population growth scenarios, simply due to the consequences of current population structures.

These scenarios predict a rapid ageing of the population in richer economies, but also in China. For the poorest areas in the world, such as in Sub-Saharan Africa, the population will remain considerably younger – and not much different from today according to these population models, due to the consequences of current population structures and only slow decline in fertility rates. South Asia will look increasingly like Europe today, especially in high growth scenarios.

⁷ To obtain data on population, we rely on the models provided by IIASA as given at <http://www.iiasa.ac.at/Research/POP/proj07/index.html?sb=6>, which is the model underlying the data in Lutz and Samir (2010)

A.1 Total World Population

World population 2010: 6.8 billion

Of which Africa (North+Sub-Saharan Africa (SSA)): 1 billion; Central+South Asia: 1.7 billion

Share in total: 40%

<p>SCENARIO A</p> <p>AT HIGH END OF CURRENT FORECASTS</p> <ul style="list-style-type: none"> - Lower end growth predictions for richer economies (10th percentile) - Higher end growth predictions for developing world, especially Africa and South Asia (90th percentile) <p>World population 2030: 8.1 billion; Africa (North+SSA): 1.6 billion; Central+South Asia: 2.3 billion; Share in total: 48%</p> <p>World population 2060: 9.1 billion; Africa (North+SSA): 2.5 billion; Central+South Asia: 2.9 billion; Share in total: 59%</p>	<p>SCENARIO B</p> <p>AT LOWEST END OF FORECASTS:</p> <ul style="list-style-type: none"> - World converging to population levels at 10th percentile of current forecasts, as population growth in developing world slowing down (especially Africa) <p>World population 2030: 7.5 billion; Africa (North+SSA): 1.3 billion; Central+South Asia: 2.0 billion Share in total: 44%</p> <p>World population 2060: 7.4 billion; Africa (North+SSA): 1.7 billion; Central+South Asia: 2.0 billion; Share in total: 50%</p>
<p>SCENARIO C</p> <p>TOWARDS HIGHEST END OF CURRENT FORECASTS:</p> <ul style="list-style-type: none"> - Median growth predictions for richer economies (50th percentile) - Higher end growth predictions for developing world, especially Africa and South Asia (90th percentile) <p>World population 2030: 8.4 billion; Africa (North+SSA): 1.6 billion; Central+South Asia: 2.3 billion; Share in total: 46%</p> <p>World population 2060: 9.8 billion; Africa (North+SSA): 2.5 billion; Central+South Asia: 2.9 billion; Share in total: 55%</p>	<p>SCENARIO D</p> <p>AT LOW END OF FORECASTS:</p> <ul style="list-style-type: none"> - Median growth predictions for richer economies (50th percentile) - Median end growth predictions for developing world, especially Africa and South Asia (50th percentile) <p>World population 2030: 8.1 billion; Africa (North+SSA): 1.5 billion; Central+South Asia: 2.1 billion; Share in total: 44%</p> <p>World population 2060: 8.9 billion; Africa (North+SSA): 2.1 billion; Central+South Asia: 2.4 billion; Share in total: 51%</p>

Annex A.2: Demographic: Elderly dependency ratio (+60/20-60) 2010

Sub-Saharan Africa: 0.11

Western Europe: 0.38

South Asia: 0.15

China: 0.20

(Note highest is currently Japan 0.52)

<p>SCENARIO A</p> <p>AT LOW END OF FORECASTS</p> <p>High dependency ratio (=fast ageing) in rich countries (90th), but still low in poorer countries (10th)</p> <p>2030</p> <p>Sub-Saharan Africa: 0.11</p> <p>South Asia: 0.20</p> <p>Western Europe: 0.67</p> <p>China: 0.47</p> <p>2060</p> <p>Sub-Saharan Africa: 0.13</p> <p>South Asia: 0.30</p> <p>Western Europe: 1.23</p> <p>China: 1.23</p>	<p>SCENARIO B</p> <p>AT HIGH END OF THE FORECASTS</p> <p>High dependency ratio (fast ageing) in both rich and poorer countries: rapid ageing, but still considerable gap between them; at 90th percentile for all</p> <p>2030</p> <p>Sub-Saharan Africa: 0.11</p> <p>South Asia: 0.22</p> <p>Western Europe: 0.67</p> <p>China: 0.47</p> <p>2060</p> <p>Sub-Saharan Africa: 0.19</p> <p>South Asia: 0.48</p> <p>Western Europe: 1.23</p> <p>China: 1.23</p>
<p>SCENARIO C</p> <p>AT LOWEST END OF FORECASTS</p> <p>Relatively high dependency ratio in rich countries (50th percentile) but still low in poorer countries (10th)</p> <p>2030</p> <p>Sub-Saharan Africa: 0.11</p> <p>South Asia: 0.20</p> <p>Western Europe: 0.60</p> <p>China: 0.43</p> <p>2060</p> <p>Sub-Saharan Africa: 0.13</p> <p>South Asia: 0.30</p> <p>Western Europe: 0.90</p> <p>China: 0.88</p>	<p>SCENARIO D</p> <p>AT MEDIAN TO HIGH END OF FORECASTS</p> <p>Relatively high dependency ratio in both rich and poorer countries: rapid ageing, but still considerable gap between them at 50th percentile for all</p> <p>2030</p> <p>Sub-Saharan Africa: 0.11</p> <p>South Asia: 0.21</p> <p>Western Europe: 0.60</p> <p>China: 0.43</p> <p>2060</p> <p>Sub-Saharan Africa: 0.16</p> <p>South Asia: 0.37</p> <p>Western Europe: 0.90</p> <p>China: 0.88</p>

Annex B: Economic Factors

The scenarios distinguish different scenarios in terms of growth in different parts of the world, as the relative earnings opportunities across the world are a key driver of migration. Sustained economic growth is not independent of social, political and economic governance, with especially important differences in poorer economies, still liable to a higher incidence of conflict, corruption and derailment linked to poor economic and political governance. We therefore allow for different growth rates in some of the current lower income areas of the world by inclusive or exclusive governance.

Contrary to general assumptions, international organisations do *not* produce growth prospects beyond 5 to 10 years. For example, the Global Economic Prospects, published yearly by the World Bank, only publish forecasts for less than 5 years ahead. The most recent report offers just 2 years ahead.

A number of initiatives have been taken over recent years to make forecasts or scenarios for the world economy up to 2050, the most recent one by the US Carnegie Foundation for International Peace⁸ largely extrapolating from recent trends and referencing a few other attempts. Some growth and GDP forecasts stem directly from complete dynamic computable general equilibrium (CGE) models, used for simulations of different policy and other scenarios. An example is the ADAGE (Applied Dynamic Analysis of the Global Economy) model.

It would be hard to argue there is a clear science to credibly underpin such long-run forecasts. Nevertheless, one could suggest indicative growth rates corresponding to our scenarios, assuming the poor 'local governance' would imply lagging growth from currently the poorest areas in the world, such as Sub-Saharan Africa and parts of South Asia.

The relevant 'growth' and 'level' of income indicator for countries as a whole is Gross National Income, in practice a measure of the total earnings of the inhabitants of a particular country. Basic numbers for 2008 are:

⁸ Dadush and Stancil (2010)

	GNI per capita (\$)	GNI per capita (PPP)	GNI per capita in PPP relative to High Income
High Income countries	39688	37193	
Sub-Saharan Africa	1070	1950	5%
South Asia	963	2697	7%
China	2940	6000	16%

(World Bank Development Indicators)

The growth figures (in per capita terms) are chosen to be suggestive of rather different worlds, of stagnation and growth in different areas of the world. Growth rates chosen are above and below those typically embedded in existing models. For example, the ADAGE model base run assumes 'rich' economies 'business as usual' growth in per capita terms (US and Europe) to be in the region of 1.8% per capita per year, Chinese growth of 4.5% per year and the 'rest' (such as Africa and South Asia) on average about 2.4% per year. Our values chosen are between 0 and 2% for rich economies, Chinese growth between 3 and 5%, and African growth rates between 0 and 4%.

The resulting four scenarios lead to rather different levels of GNI per capita and, as is relevant for migration, different gaps. In Scenario B, China is rapidly catching up (as would several countries in East and South-East Asia). India, and most of the South Asian countries would be expected to also rapidly catch up, but as starting from lower initial levels, a gap remains. High African growth rates in Scenario B, on average more than 5% (and 4% per capita) would see rapid increases to levels of \$15,000 per capita by 2060, or well above many middle-income countries today, but still leaving substantial (more than six-fold) gaps with the rest of the world. Scenario D shows that convergence is still the case but at a slower rate: here, the world economy (and the economies of richer economies) are growing considerably slower, but with good governance in the developing world, this would still imply considerable growth in these countries. GDP per capita would be generally stagnant in the rich economies; in poorer economies, considerable progress is achieved but the gaps of the currently poorest countries with the richest would remain relatively high.

Poor governance in the poorer economies in the world would lead to scenarios with considerably less progress in the poorest countries (in Scenario A and C), and large relative gaps, especially between Sub-Saharan Africa and high income countries. Gaps between Africa and the rest of the world would remain very large and similar or even higher than today.

<p>SCENARIO A</p> <p>High Growth in rich economies, lagging growth in poorer developing countries, no convergence</p> <p>2010-2060 growth per capita</p> <p>Sub-Saharan Africa: 1% pa</p> <p>South Asia: 3% pa</p> <p>High Income: 2% pa</p> <p>China: 5% pa</p> <p>2030 (implied and rounded)</p> <p>Sub-Saharan Africa: US \$2,400 (PPP)</p> <p>South Asia: US \$ 5,200 (PPP)</p> <p>High Income: US \$ 57,500 (PPP)</p> <p>China: US \$ 17,500 (PPP)</p> <p>2060 (implied and rounded)</p> <p>Sub-Saharan Africa: US \$ 3,300 (PPP)</p> <p>South Asia: US \$ 12,500 (PPP)</p> <p>High Income: US \$ 100,000 (PPP)</p> <p>China: US \$ 76,000 (PPP)</p> <p>2060 relative to High Income Countries</p> <p>China: 76%</p> <p>Sub-Saharan Africa: 3%</p> <p>South Asia: 13%</p>	<p>SCENARIO B</p> <p>High world growth, highest in the developing world, implying partial convergence.</p> <p>2010-2060 growth per capita</p> <p>Sub-Saharan Africa: 4% pa</p> <p>South Asia: 5% pa</p> <p>High Income: 2% pa</p> <p>China: 5% pa</p> <p>2030 (implied and rounded)</p> <p>Sub-Saharan Africa: US \$4,600 (PPP)</p> <p>South Asia: US \$ 7,900 (PPP)</p> <p>High Income: US \$ 57,500 (PPP)</p> <p>China: US \$ 17,500 (PPP)</p> <p>2060 (implied and rounded)</p> <p>Sub-Saharan Africa: US \$15,000 (PPP)</p> <p>South Asia: US \$ 34,000 (PPP)</p> <p>High Income: US \$ 100,000 (PPP)</p> <p>China: US \$ 76,000 (PPP)</p> <p>2060 relative to High Income Countries</p> <p>China: 76%</p> <p>Sub-Saharan Africa: 15%</p> <p>South Asia: 34%</p>
<p>SCENARIO C</p> <p>Low world growth, low in developing world, no convergence</p> <p>2010-2060 growth per capita</p> <p>Sub-Saharan Africa: 0% pa</p> <p>South Asia: 1% pa</p> <p>High Income: 0% pa</p>	<p>SCENARIO D</p> <p>Low world growth, higher in developing world, some convergence</p> <p>2010-2060 growth per capita</p> <p>Sub-Saharan Africa: 1% pa</p> <p>South Asia: 2% pa</p> <p>High Income: 0% pa</p>

China: 3% pa 2030 (implied and rounded)	China: 3% pa 2030 (implied and rounded)
Sub-Saharan Africa: US \$ 2,000 (PPP)	Sub-Saharan Africa: US \$2,400 (PPP)
South Asia: US \$ 3,400 (PPP)	South Asia: US \$ 4,200 (PPP)
High Income: US \$ 37,000 (PPP)	High Income: US \$ 37,000 (PPP)
China: US \$ 11,500 (PPP)	China: US \$ 11,500 (PPP)
2060 (implied and rounded)	2060 (implied and rounded)
Sub-Saharan Africa: US \$ 2,000 (PPP)	Sub-Saharan Africa: US \$ 3,300 (PPP)
South Asia: US \$ 4,500 (PPP)	South Asia: US \$ 7,500 (PPP)
High Income: US \$ 37,000 (PPP)	High Income: US \$ 37,000 (PPP)
China: US \$ 28,000 (PPP)	China: US \$ 28,000 (PPP)
2060 relative to High Income Countries	2060 relative to High Income Countries
China: 76%	China: 76%
Sub-Saharan Africa: 5%	Sub-Saharan Africa: 9%
South Asia: 12%	South Asia: 20%

Annex C: Social Factors

A number of social factors, and their governance, are also explicitly considered in the development of the scenarios. Two factors are especially emphasised: first, the extent to which societies are able to make societies more inclusive, with opportunities for skill improvements in health and education, and the extent to which societies are inclusive to migrants, in terms of acceptability and allowing opportunities for further migration building on existing networks. Migration (diaspora) networks are a strong determinant of the level and patterns of migration, as key facilitators of further migration. Their ability to foster more migration is also affected by the costs of networking between communities, including via technology. Investments in health and education are strong determinants of migration patterns, largely (although not exclusively) through the resulting skill composition of the domestic labour force.

- Scenarios along the four dimensions (with high and low growth, and inclusive and exclusive governance) offer different outcomes in terms of:
- Pressures linked to social inequalities
- Tensions between migrants and non-migrant communities
- Cost of networking with diaspora communities, including via costs of communication and technology
- The skill composition of the labour force through health and education

Quantifying these factors precisely are unlikely to offer much additional insight; also, for most of these factors, high or low global economic growth is unlikely to make much difference, with the exception of demand factors for migration, linked to the skill composition of the domestic labour force. Global inequalities in economic growth, and social and political governance will matter substantially, leading to different outcomes across scenarios in these indicators.

In terms of differences between 2030 and 2060, it is likely to be a matter of degree, rather than a diverse experience, so we are not offering an *explicitly* different narrative.

C.1 Migration networks and social acceptability of migration

<p>SCENARIO A</p> <ul style="list-style-type: none"> • High inequality in access to means of communication between countries and within poor countries • High pressures linked to social inequalities • High tensions between migrants and non-migrant communities 	<p>SCENARIO B</p> <ul style="list-style-type: none"> • Convergence in access to means of communication between countries and within poor countries • Low or managed pressures linked to social inequalities • Limited tensions between migrants and non-migrant communities
<p>SCENARIO C</p> <ul style="list-style-type: none"> • High inequality in access to means of communication between countries and within poor countries • High pressures linked to social inequalities • High tensions between migrants and non-migrant communities 	<p>SCENARIO D</p> <ul style="list-style-type: none"> • Convergence in access to means of communication between countries and within poor countries • Low or managed pressures linked to social inequalities • Limited tensions between migrants and non-migrant communities

The key difference between the scenarios for the first three ‘social’ factors are largely related to the extent to which governance is inclusive, leading to lower inequalities both across and within countries, and how this translates in managed tensions between non-migrant and migrant communities. While nuances could be discussed, in the narratives for the scenarios no further distinction is made between the high and low growth scenarios.

In general, inclusive governance in social, political and economic domains are likely to create circumstances in which social inequalities are handled relatively well, in which tensions between migrant and non-migrant communities can be controlled. Inclusive governance will also allow a wide sharing in progress in communication and technology, to allow a further penetration of digital and other newly emerging technologies, linked to mobile phones and the internet. This will further allow fast information and financial flows, and thereby further reducing migration costs. These factors will be relevant for global (international) migration, as well as for the movement within countries, between rural and urban areas, and other poles of economic opportunity.

In the case of “exclusive” governance, inequalities and tensions are likely to dominate, with continuing suspicions between migrant and non-migrant communities, as well as tensions across the broader society. Community cohesion and social capital will be under pressure, affecting the scope and acceptability of migration. Penetration of technologies in the poorest areas will continue, but proceed more slowly, keeping migration costs higher.

An argument could be made that in a world of ‘low’ economic growth, the consequences of ‘exclusive’ governance may be more severe, in terms of affecting the social tensions, not least regarding migration, while the costs related to migration – both in financial and social terms – maybe higher, constraining migration and migrant communities. Policy responses, in terms of a more strict control regime, may also follow.

C.2 Education and health investment, and the skill composition of the labour force

In terms of education and health investment, there is little doubt that richer economies will continue to spend considerably, while currently poorer economies are also trying to reach increasing health and education levels. High growth will make funding these investments easier, so that there are bound to be differences between the high and low growth scenarios. They will also affect the extent to which richer countries will continue to be willing to spend considerably on aid, which has been especially relevant in these sectors in the recent decade. Investment in poorer economies will be different depending on whether governance is inclusive or not: in more inclusive settings, we can expect that gaps within and between countries will remain high, affecting the extent to which one can expect to see more systematically rising secondary and tertiary education attainment. In Scenarios B and D, one can expect by 2030 and beyond considerable progress in this respect, with the percentages of children attaining complete secondary schooling reaching close to universal levels well before 2060. In less inclusive settings, it is likely that this cannot be attained even by 2060.

<p>SCENARIO A</p> <ul style="list-style-type: none"> • High investment in education and health in richer economies. Perpetual large gaps in attainment in health and education in poorer countries relative to richer economies. • Rising secondary school attainment and rising levels of tertiary participation but with large inequalities within and between countries. 	<p>SCENARIO B</p> <ul style="list-style-type: none"> • High investment in education and health across the world, including in the developing world. • Universal secondary school attainment by 2060 and rising levels of tertiary participation.
<p>SCENARIO C</p> <ul style="list-style-type: none"> • Perpetual large gaps in attainment in health and education in poorer countries relative to richer economies. • Progress on secondary school attainment and levels of tertiary participation but with large inequalities within and between countries. 	<p>SCENARIO D</p> <ul style="list-style-type: none"> • High investment in education and health across the world, including in the developing world. • Universal secondary school attainment by 2060 and rising levels of tertiary participation.

Annex D: Political Factors

Each of the four global scenarios could sustain different political factors relevant for migration. Six factors appear to be particularly relevant.

1. **Accountability** - including social and political participation & freedoms of expression, association and media.
2. **Stability/violence** - including likelihood that government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism.
3. **Government effectiveness/'public' governance** - including quality of public services, civil service, policy formulation and implementation, and credibility of government commitment to such policies.
4. **Regulatory quality/'private' governance** - ability of government to formulate and implement policies and regulations that permit and promote private sector development.
5. **Rule of law** - confidence in and compliance with the rules of society, including contract enforcement, property rights, police, courts and likelihood of crime and violence.
6. **Corruption** - the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests.

Different levels of economic growth may have feedback effects on these factors. However, it seems most plausible to consider that the role of these political factors maps into 'inclusive' and 'exclusive' governance. Participatory politics with respect for human rights such as freedoms of association and expression help to sustain inclusive and connected governance. Respect for the rule of law reduces the risks of violent conflict and instability while promoting the development of cohesive societies and governance structures that are inclusive of migrant and minority groups. Stable and secure national governance provides an effective foundation for regional and international co-operation on migration that improves planning capacity and offsets the medium- to long-term effects of population movements.

In contrast, 'exclusive' governance would be reflected in uncertain regulatory and compliance frameworks and weak anti-corruption norms, affecting how growth is shared between groups. Strong focus on security and control places limits on political and social participation and on enforcement of human rights such as freedoms of association and expression. This heightens tendencies to repression of migrant and minority groups represented as a threat to order and stability. Migrant and minority groups are largely excluded from governance structures. Emphasis on security and control lead to increased irregular migration by the fittest and strongest and increased risk for the most vulnerable such as the elderly, women and children. Irregular flows and unplanned movement will sustain grey/informal economies in destination states while sustaining networks (sometimes criminal) that facilitate such movement. Emphasis on security and control leads to a strong domestic policy focus that diminishes the scope for regional and international co-operation and for international planning to offset the medium- to long-effects of population movements associated with increased exposure to environmental

risks. International migrants more likely to be fittest and strongest but will be exposed to significant dangers when they move and to exploitation when they arrive.

Annex E: Environmental data

This Annex provides storylines representing a number of indicators of the environment, resources and hazards under the migration futures scenarios. These indicators are:

- Change in mean annual temperature
- Change in December-February and June-July rainfall
- Change in water scarcity
- Change in exposure to river flood hazard
- Change in crop suitability
- Numbers of people affected by coastal flooding

The global climate change story for each migration scenario

Future emissions of greenhouse gases are a function of future population, economic growth and, crucially, energy mix and technologies. The IPCC's Special Report on Emissions Scenarios (SRES) describes potential global emissions trajectories for four scenario 'families' which represent alternative futures with different economic, demographic and technological pathways. These scenarios are widely used in assessments of possible future climate change, and are the basis for the climate storylines used in this report.

The four migration scenarios have different combinations of population change and economic growth and SRES scenarios with similar demographic and economic characteristics have been used to consider the climate change impacts which might be expected for each migration scenario. Unmitigated emissions of greenhouse gases under the high global growth Scenarios A and B are represented by the SRES A2 scenario and emissions under Scenarios C and D (slower growth) are represented by SRES B1.

Mid-range predictions from the MAGICC climate model suggest a change in global mean temperature by 2050 of 2.4°C above pre-industrial for Scenarios A and B, and 2.0°C above pre-industrial for Scenarios C and D. These projections are non-interventionist and do not take account of any concerted policy to curb greenhouse gas emissions. Global average sea level change is projected to be 10 cm higher than in 1980-1999 by 2030 under all scenarios, and 17 cm higher by 2050. Sea level changes are not expected to be uniform across the globe and in some lowlying coastal areas there may be a combination of sea level rise and sinking land surface. By the middle of the 21st century there is little difference in projections for global average sea level change between the scenarios, because of the slow response of the ocean to climate change, but sea level projections diverge more towards the end of the 21st century.

The effects of climate policy are represented for all four migration scenarios by the AVOID emissions pathway A1b-2016-5-L. This assumes emissions peak in 2016, and decline at 5% per year thereafter. This pathway is considered to have a good chance of keeping the global mean temperature increase below 2°C. By 2050, the (median) projected increase in global mean temperature is 1.8°C. For the timeframes considered by this report global sea level rise under this policy scenario is assumed to be the same as under the no-policy scenarios.

Climate scenarios and impact indicators

The climate scenarios used to estimate the migration-relevant impact indicators are constructed by scaling output from a number of climate models to match the global average temperature changes under the overall climate change stories outlined above. The indicators presented here were constructed for the NERC-funded QUEST-GSI project (unmitigated emissions) and the DECC-funded AVOID project (mitigation pathway emissions).

Projected impacts for the 2020s and 2050s from three different climate models⁹ are presented (representing the uncertainty in how a given emissions pathway translates into projected changes in local rainfall and temperature).

The four impact indicators are:

- (i) change in suitability of land for crop growth, due to climate change.

The indicator is based on the index of land suitability for cultivation developed by Ramankutty *et al.* (2002), which is a function of climate suitability (temperature degree-day index and the ratio of rainfall to potential evaporation) and soil suitability (a function of soil organic carbon content and pH). In this application, a “decrease” (“increase”) in suitability occurs in grid cells where the suitability index decreases (increases) by more than 5%. In this application, suitability is only calculated for grid cells defined as being “cropland”. The indicator does not incorporate change in suitability due to progressive land degradation.

- (ii) proportion of water-stressed population exposed to a reduction in water availability

A water-stressed watershed has an average annual runoff less than 1000 m³/capita/year. This indicator sums the number of people living in such watersheds where climate change is expected to produce a “significant” reduction in runoff (adding those who live in watersheds that become water-stressed due to climate change). The indicator is expressed in terms of the proportion of total regional population.

- (iii) proportion of (river) flood-prone people living in catchments with a significant increase in the frequency of (river) flooding

A significant increase in the frequency of flooding is deemed to occur where climate change means that the current 20-year return period flood is expected to occur at least twice as often. The indicator sums the number of people living in catchments (grid cells) within a region with a significant increase in the frequency of flooding, and expresses this as a proportion of total regional population. Note that there are no consistent estimates of the proportion of a country’s population which is exposed to river flooding.

⁹ HadCM3, ECHAM5 and IPSL

Note that these measures are indicators of exposure to impact, not a prediction of actual impact; the actual impact will depend on existing and future adaptation actions.

(iv) **average annual number of people flooded in coastal floods**

This indicator sums the average annual number of people flooded in coastal floods within a region – note that it does not represent the number of people flooded in individual flood events. The version of the indicator used here assumes an increase in the standard of protection against coastal floods over time. The numbers are presented only for the AB worlds, but can be assumed in the first instance to apply also to the CD worlds. The indicator is based on the results analysis undertaken by Prof. Robert Nicholls (University of Southampton) for the QUEST-GSI project. *The numbers will be revised by Prof. Nicholls, to match the population and GDP scenarios assumed here, in a new analysis for the Foresight project, so must be treated as indicative only.*

Regional values of impact indicators

Indicators are summarised by region in **Annex E1**. **Figure 1** shows the regional indicators for the **A and B scenarios** ('worlds'), from the three climate model projections. **Figure 2** shows the indicators from the HadCM3 projection, for the **A/B scenarios, C/D scenarios** and assuming climate policy.

Figure 1: Impact indicators (A and B scenarios or 'worlds', 2050) from three climate model projections

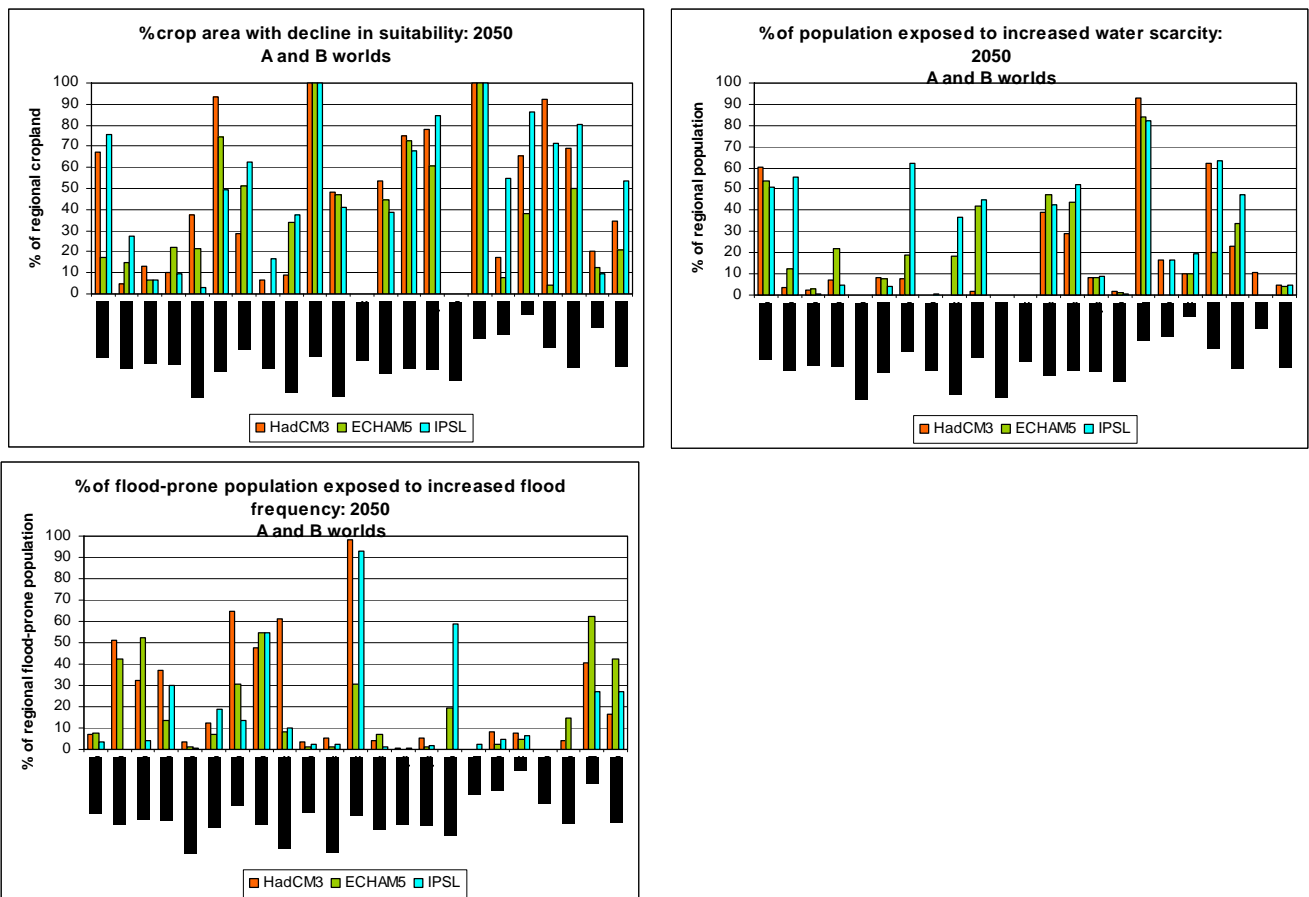
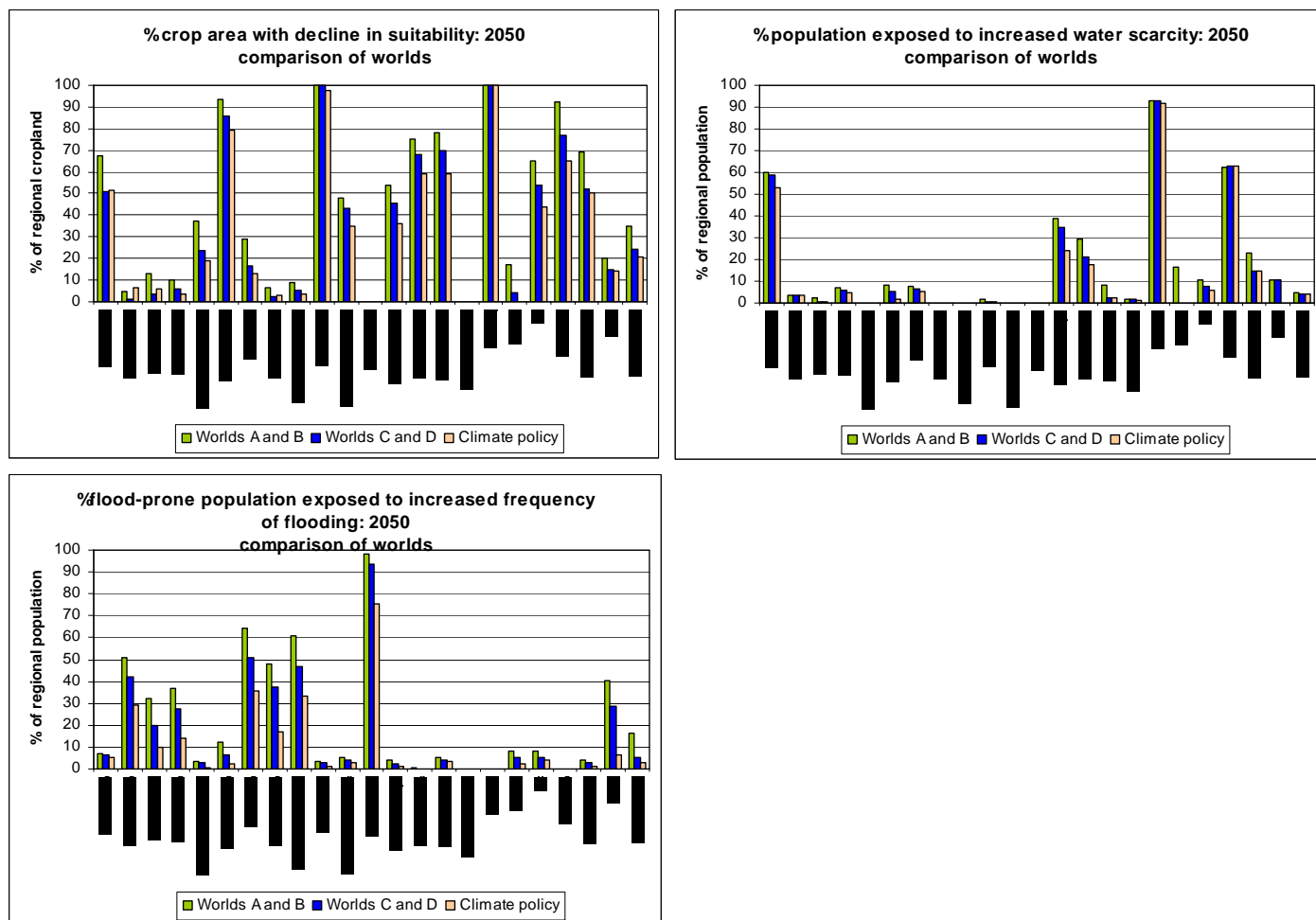


Figure 2: Impact indicators (HadCM3 projection, 2050) under A and B scenarios ('worlds') C and D scenarios and a world with climate policy



Maps

Figure 3 below shows (as an example) the spatial pattern of climate change and its impacts, from the HadCM3 climate model projection.

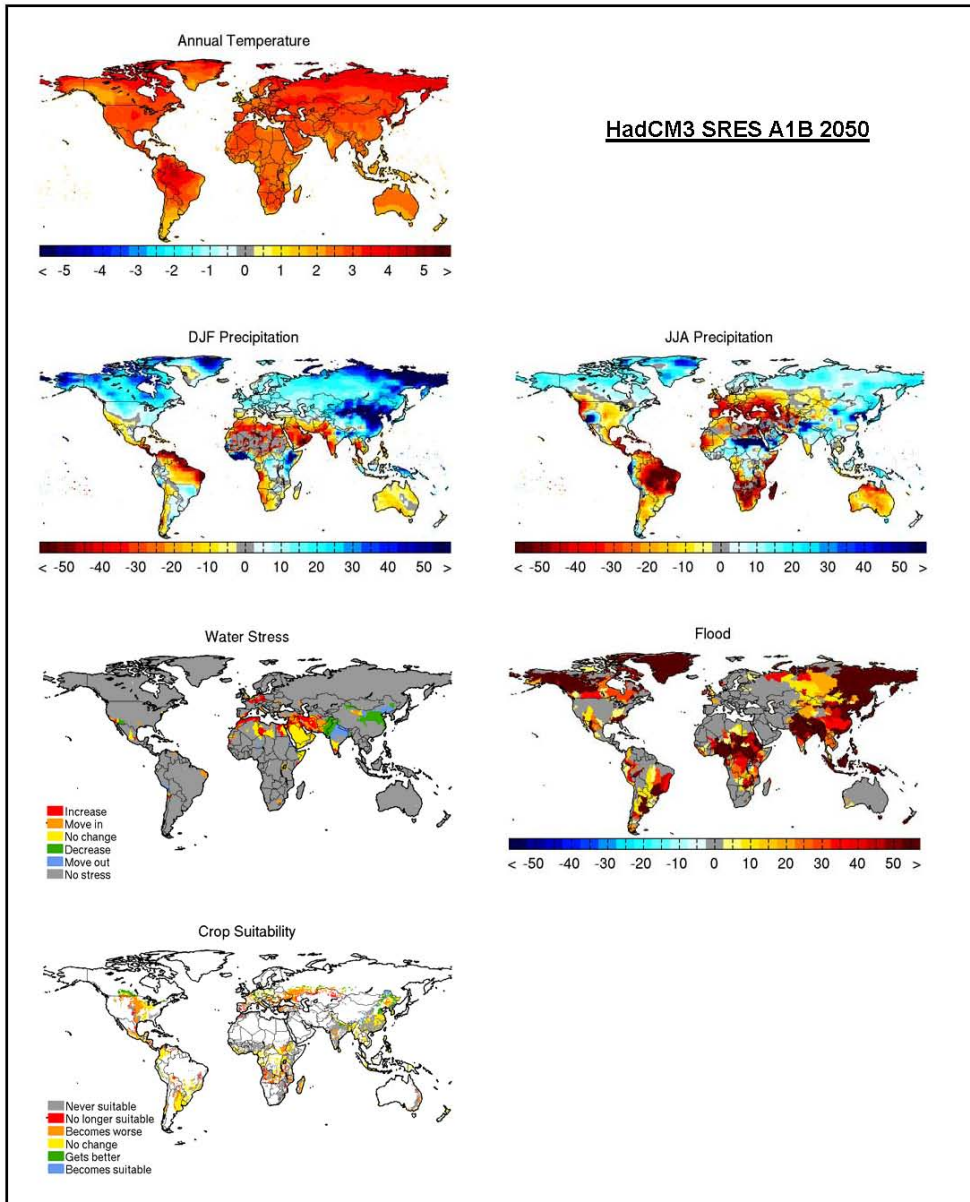


Figure X. Change in annual temperature ($^{\circ}\text{C}$) from baseline, change in DJF and JJA precipitation from baseline (%). Change in watershed water stress class. Change in crop suitability index. Percentage of flood-prone population with significant increase in flood frequency

Annex E1: Regional indicator tables

Impact indicators: 2050, HadCM3 climate model projections

	Scenarios A and B				Coastal	Scenarios C and D			Policy		
	Crop	Water	Flood	Crop		Water	Flood	Crop	Water	Flood	
North Africa	67	60	7	14	51	59	6	51	53	5	
Western Africa	5	4	51	10	1	3	42	7	3	30	
Central Africa	13	2	32	3	4	1	20	6	0	10	
Eastern Africa	10	7	37	3	6	6	27	3	5	14	
Western Indian Ocean	38	0	4	4	24	0	3	19	0	1	
Southern Africa	93	8	13	210	86	5	6	79	2	2	
South Asia	29	8	65	980	17	6	51	13	5	36	
Southeast Asia	7	0	48	870	2	0	38	3	0	17	
NW Pacific and East	9	0	61	160	6	0	47	3	0	34	
Central Asia	100	2	3	0	100	0	3	98	0	1	
Australia and New Zealand	48	0	5	7	43	0	4	35	0	3	
South Pacific	0	0	98	16	0	0	94	0	0	75	
Western Europe	54	39	4	9	46	35	2	36	24	1	
Central Europe	75	29	0	1	68	21	0	59	18	0	
Eastern Europe	78	8	5	39	70	3	4	59	3	4	
Arabian Peninsula	0	2	0	2	0	2	0	0	1	0	
Mashriq	100	93	0	6	100	93	0	100	92	0	
Canada	17	17	8	24	4	0	5	0	0	2	
US	65	10	8	17	54	8	5	44	6	4	

Caribbean	92	62	0	1	77	63	0	65	63	0
Meso-America	69	23	4	4	52	15	3	50	15	1
Brasil	20	11	40	19	15	11	29	14	0	7
South America	35	5	17	29	24	4	5	21	4	3

Crop: % of cropland with a decrease in crop suitability

Water: % of regional population exposed to increased water scarcity

Flood: % of regional flood-prone population exposed to increased frequency of flooding

Coastal: average annual number of people flooded in coastal floods, relative to the average annual number flooded in the 1990s (thousands), assuming increases in flood protection. Based on data provided by Prof. Robert Nicholls as part of the QUEST_GSI project: note that the data presented here are provisional, as they have been calculated under different population and economic assumptions than used elsewhere, and results are sensitive to these assumptions.

Impact indicators: 2050, ECHAM5 climate model projections

	Scenarios A and B			Scenarios C and D			Policy		
	Crop	Water	Flood	Crop	Water	Flood	Crop	Water	Flood
North Africa	17	54	7	15	54	7	13	36	2
Western Africa	15	12	43	9	1	35	13	0	14
Central Africa	7	3	53	3	1	41	2	1	16
Eastern Africa	22	22	14	12	4	8	8	3	6
Western Indian Ocean	22	0	1	11	0	0	7	0	1
Southern Africa	75	8	7	62	0	3	54	0	1
South Asia	51	19	31	43	20	21	38	20	6
Southeast Asia	0	0	55	0	0	41	0	0	20
NW Pacific and East	34	18	8	27	17	3	19	7	1
Central Asia	100	42	1	99	4	1	97	3	0
Australia and New Ze	47	0	1	39	0	1	34	0	1
South Pacific	0	0	31	0	0	25	0	0	9
Western Europe	45	47	7	36	36	5	26	31	1
Central Europe	73	44	0	65	31	0	54	23	0
Eastern Europe	61	8	1	54	3	1	45	3	0
Arabian Peninsula	0	1	19	0	0	14	0	0	4
Mashriq	100	84	0	100	84	0	100	83	0
Canada	8	0	2	2	0	2	0	0	1
US	38	10	5	29	9	2	19	1	1
Caribbean	4	20	0	0	21	0	0	19	0
Meso-	50	34	15	41	31	6	38	15	1

America									
Brasil	13	0	63	11	0	52	10	0	20
South America	21	4	42	13	0	22	12	0	6

Impact indicators: 2050, IPSL climate model projections

	Scenarios A and B			Scenarios C and D			Policy		
	Crop	Water	Flood	Crop	Water	Flood	Crop	Water	Flood
North Africa	75	51	4	69	51	2	67	52	1
Western Africa	27	56	0	24	19	0	20	11	0
Central Africa	7	1	4	6	0	3	8	0	1
Eastern Africa	10	5	30	8	5	17	8	5	8
Western Indian Ocean	3	0	1	0	0	0	0	0	0
Southern Africa	50	4	19	38	0	15	38	0	9
South Asia	62	62	13	56	54	11	54	45	8
Southeast Asia	17	1	55	10	1	43	11	1	20
NW Pacific and East	38	36	10	29	11	6	22	8	2
Central Asia	100	45	2	100	1	1	100	1	0
Australia and New Ze	41	0	2	36	0	2	37	0	1
South Pacific	0	0	93	0	0	86	0	0	66
Western Europe	39	43	1	30	43	1	22	42	1
Central Europe	68	52	0	60	31	0	49	23	0
Eastern Europe	85	9	2	74	1	1	61	1	1
Arabian Peninsula	0	1	59	0	1	48	0	1	38
Mashriq	100	82	2	100	82	2	100	82	0
Canada	55	17	5	44	17	1	29	17	1
US	86	19	7	70	19	6	55	18	2
Caribbean	72	63	0	46	64	0	35	19	0
Meso-	81	47	0	76	42	0	68	42	0

America									
Brasil	9	0	27	6	0	25	7	0	17
South America	54	5	27	47	4	23	41	0	11

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