Assessment of global megatrends — an update

Global megatrend 1: Diverging global population trends

European Environment Agency

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Europe is bound to the rest of the world through an enormous number of systems — environmental, economic, social, political and others. Such networks enable complex flows of materials and ideas across the globe, producing uncertain feedbacks and knock-on effects over time. Greenhouse gas emissions in Europe today can affect the climate in distant locations and far into the future. Land management choices on the other side of the world can influence food and energy prices in Europe. Global communication and trade networks fuel innovation — sometimes boosting efficiency, sometimes creating new environmental pressures.

Most of these interactions are intimately linked and set to unfold over decades. All are likely to have important implications for living standards and well-being.

The European environment's status, trends and prospects have always depended in part on events outside its borders. Yet the growing importance of global networks and flows has augmented this interdependence, creating complex challenges for traditional governance systems framed within national or regional territories. To design effective ways to manage the environmental changes ahead, societies and governments need to understand the global drivers at work and their potential implications.

With this challenge in mind, the European Environment Agency in 2010 produced its first assessment of emerging global trends as part of its five-yearly flagship report on the European environment's state and outlook (SOER 2010). The exploratory analysis summarised 11 global megatrends grouped into five clusters — social, technological, economic, environmental and governance. Introducing the issues succinctly, it sought to trigger a discussion about how Europe should monitor and assess future changes in order to better inform environmental policymaking.

In preparation for its next report on the European environment's state and outlook (SOER 2015), the EEA has initiated an update of the assessment of global megatrends, analysing each of these drivers in a little more detail than previously in terms of their impacts on the European environment and well-being. During the second half of 2013 and early-2014, the EEA is reassessing the 11 megatrends and publishing the updates separately on its website. In 2014 the chapters will be consolidated into a single EEA technical report and will provide the basis for the analysis of megatrends included in SOER 2015. The present chapter addresses megatrend 1: 'Diverging global population trends'.

Again, it needs to be emphasised that the complexity of highly interconnected human and natural systems introduces considerable uncertainty into projections and forecasts. As much as anything, the assessment of megatrends aims to encourage readers to acknowledge this interdependence and uncertainty. In so doing, it may help point the way towards systems of planning and governance better adapted to meeting the challenges ahead.

Global megatrend 1
Diverging global population trends

Across the world, the basic determinants of population size and structure — fertility, mortality and migration — have been fundamentally altered by the processes of social and economic development. As a result, the global population doubled to 7 billion in the last half century and will continue growing fast in coming decades, although regional trends differ markedly. In advanced economies, populations are ageing and in some cases reducing in size. At the other extreme, populations in the least developed countries ([1]) are expanding rapidly. Migration is also affecting the distribution and structure of populations, as people move in search of higher earnings or to escape conflict or environmental degradation.

An expanding workforce relative can create a 'demographic dividend' of greatly increased economic output. But it can also create the risk of social unrest if there are insufficient employment opportunities. Furthermore, some of the returns from the demographic dividend must be invested in areas such as health and education, and in savings for retirement, if living standards are to be sustained as the population ages.

If the world remains on its current development path, population growth and investments in human capital will continue to provide a boost to global economic output, potentially increasing the burdens on natural capital stocks. But the challenges facing regions will vary. Developing countries will need to identify ways to exploit the opportunities presented by a large economically active population and few dependents. Advanced economies will need to maintain living standards as the elderly population expands and the workforces contracts.

The world population has more than doubled since the 1960s and is projected to continue growing in coming decades. Trends in population size and structure are likely to vary greatly between countries and regions, influenced by a range of factors such as economic growth, improving public health, education and migration. This chapter will review these drivers, the resulting population trends and their implications for societies in Europe and elsewhere.

1.1 Key drivers of global population trends

Fertility and mortality rates

Among the factors that most directly shape the size and structure of populations are fertility and mortality rates ([2]), and the related issue of life expectancy. Small changes in assumptions about fertility can produce big variations in projections of population size over time. They are therefore an important source of uncertainty regarding future population trends.

Globally, fertility rates have converged since 1950, with the average rate in most regions falling below 3.0 by 2010 (Figure 1.1). In 2004, the total fertility rate in Asia and Latin America was 2.6, which was half the level in 1970. Africa remains a significant outlier but the fertility rate there is also projected to decline to below 3.0 around 2050.

Mortality rates have recorded similar decreases in recent decades. As a result, global average life expectancy has undergone the most significant increase in history, rising from 48 years in 1950–1955 to 69 years in 2005–2010 (UN, 2013b), although significant regional variations persist (Figure 1.2).

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(1) This chapter employs the United Nations categorisation of countries and regions according to their level of economic development (UN, 2013a). As of 2013, the UN defines 49 countries as 'least developed countries', and identifies seven 'developing regions' and four 'developed regions'. As such, references in this chapter to 'developing countries' and 'developed countries' thus relate to countries in those regions. 'Developed countries' are also referred to as 'advanced economies'.

(2) The fertility rate refers to the number of children born to a woman during her lifetime. The mortality rate is the number of deaths in a population or a segment of a population (e.g. infant mortality).

Figure 1.1   Total fertility rate by selected world regions, 1950–2050

Swiftly converging fertility rates

The total fertility rate is the average number of children a woman would have at the end of her reproductive life, supposing she follows the average fertlity rate at each age and supposing she does not die giving birth.
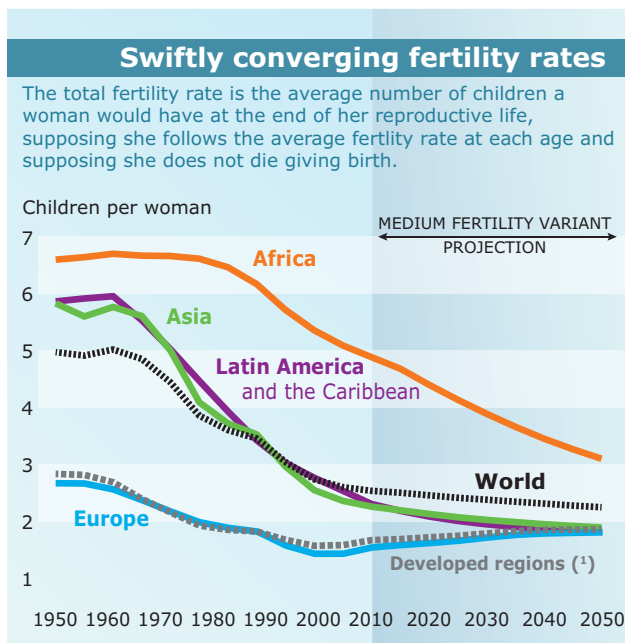
Note: (¹) Europe, Northern America, Australia, New Zealand and Japan.

Source: UN Population Division, World Population Prospects (2012 revision).

Childhood mortality (i.e. death under the age of five) fell from 203 per 1 000 live births to 60 during that period. According to United Nations projections, global life expectancy will continue rising in coming decades, reaching 75 years by 2045–2050 (UN, 2013b).

In combination, these trends in fertility and mortality rates have important implications for population growth and structure. The immediate effect of fewer births and increasing life expectancy is an increase in the average age of a population.

The interaction of fertility and mortality rates also influences population size. In particular, childhood mortality rates play a central role in determining the replacement fertility rate (³), which ranges from less than 2.1 in advanced economies to almost 3.4 in the least developed countries (Engelman and Leahy, 2006). If the fertility rate remains below the replacement rate for a sustained period then the population will decline unless net migration inflows offset the reduction.

The global total fertility rate stood at a little over 2.5 in the period 2005–2010, which was slightly higher than the global replacement rate of approximately 2.3. Both rates are projected to decline in coming decades, with global fertility falling below the replacement level in the second half of the current century (UN, 2014b).

Economic development and education

The trends in fertility and mortality rates are themselves shaped by interrelated drivers, such as economic development; advances in health care, science and governance; and related cultural and lifestyle changes.

Economic development impacts both fertility and mortality. As illustrated in Figure 1.3, fertility rates typically start to drop when a country achieves a per capita income level of USD 1 000–2 000 (2010 PPP) and declines to replacement level when the country reaches a per capita GDP of USD 4 000–10 000. After this income level, fertility continues at or below the replacement level but may increase again in some cases.

Economic growth is both a cause and a consequence of numerous other societal changes that influence fertility and mortality. For example, increased incomes and savings, as well as the emergence of well financed social security and health systems, can reduce reliance on family assistance during old age, shifting the incentives that inform choices about family size. Economic development can also influence access to reproductive planning and to contraception (UNFPA, 2014).

As national income increases, investments in human capital — in terms of both health and education — emerge as a particularly important determinant of population trends. Improved health services can greatly reduce infant and maternal mortality, as well as influencing life expectancy for the broader population (Claeson and Waldman, 2000). Higher earnings also provide access to better nutrition. And beyond certain levels of economic development, countries tend to reduce some types of pollution (Van Alstine and Neumayer, 2010).

Education is recognised as having a particularly marked impact on fertility rates (Figure 1.4). For

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(³) 'Replacement fertility rate' refers to the average number of children that the women in a population must have during their lifetime in order to sustain a constant population size. Variations in the rate between countries reflect differences in the likelihood that female children will survive to child-bearing age, as well as differences in the ratio of female to male children born.

Figure 1.2   Global life expectancy at birth, 2011
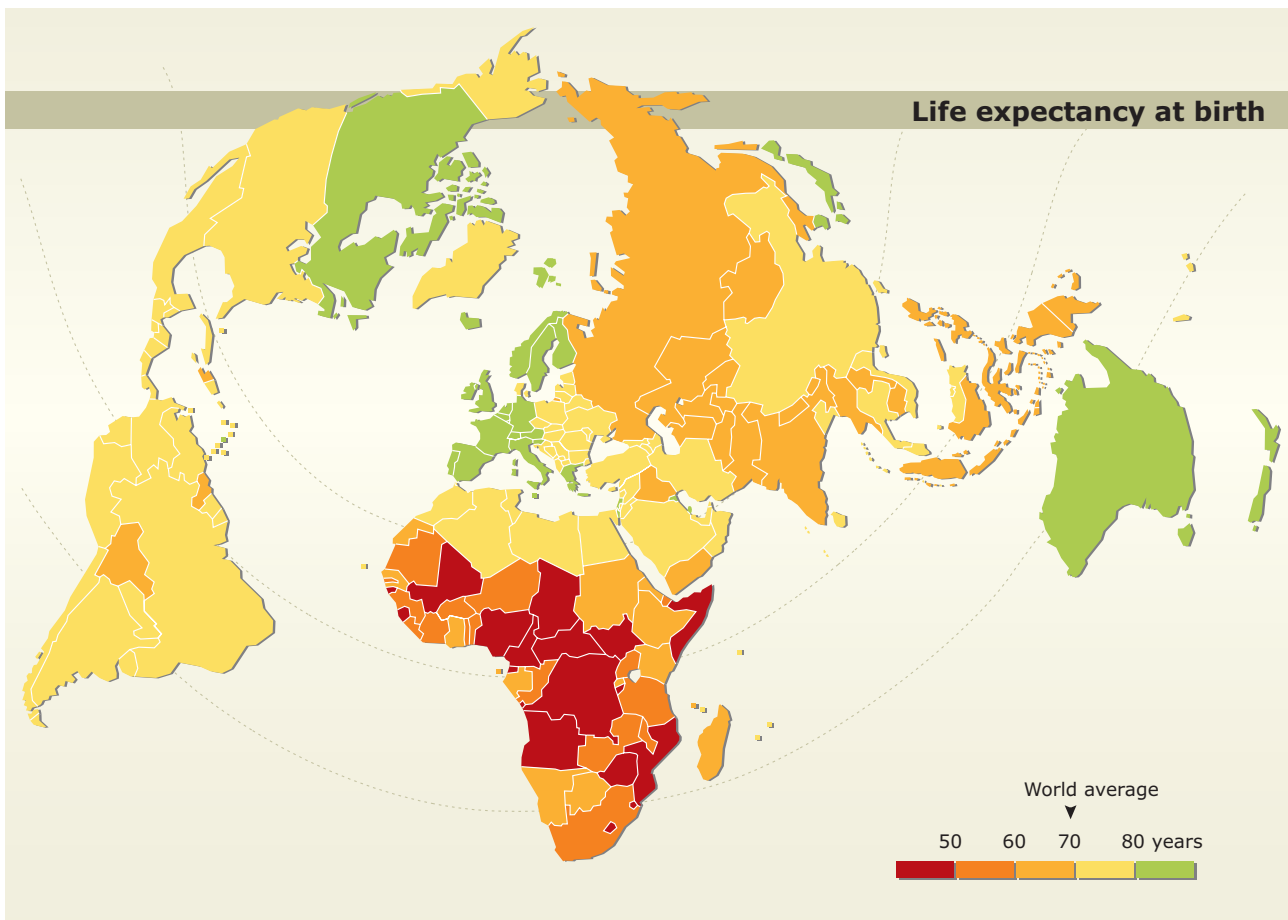
Note: Data for 2011 (or most recent data available).

Source: World Health Organization, 2014.

example, a study addressing 24 sub-Saharan countries found that birth rates were four times as high among uneducated girls aged 15–19 than among those with at least secondary schooling (UNFPA, 2012). The importance of education is also reflected in population growth projections. One study addressing the implications of different education levels for population growth projects a global population of 8.9 billion in 2050 based on its 'highest education' scenario and a population of 10.0 billion in its 'lowest education' scenario (Lutz and Samir, 2011).

Key drivers of migration

Another key determinant of the size and structure of national or local populations is migration, which is itself a manifestation of complex economic, social and environmental drivers.

Differentials between the earnings available in different locations are a powerful incentive for migration — both within countries (see GMT 2 on urbanisation) and between countries (IOM, 2013). Such movements can have implications for the population size and age structure at the source and destination locations, exacerbating or counteracting demographic trends at the national level.

Similarly, conflict, natural disasters and environmental degradation have long been recognised as catalysts for forced migration (IOM, 2013). In recent years, climate change has emerged as additional driver, potentially exacerbating existing migration pressures by threatening livelihoods and increasing exposure to natural hazards (ICMPD, 2011; Foresight, 2011).

The links between environmental change and migration are complex, however, linking to many

Figure 1.3   Correlation of fertility rates and per capita GDP, 2010

Correlation between income and fertility

Income per person
Thousand dollars a year

Gross Domestic Product by Purchasing Power Parities, in international dollars, at fixed 2005 prices.
The inflation and differences in the cost of living between countries has been taken into account.

The total fertility rate is the average number of children a woman
would have at the end of her reproductive life, supposing she follows the average
fertility rate at each age and supposing she does not die giving birth.

Number of children per woman

Note: European Union countries are represented both individually and collectively (EU-28). Data for 2012–2013.

Source: World Bank, UN Population Division, Gapminder.org.

other social and political drivers of migration. Economic migration, for example, can often be partially or wholly rooted in environmental degradation. This makes it very difficult to generate precise estimates of environmentally induced migration (IOM, 2009; Foresight, 2011).

The precise effects of climate change and environmental degradation are rendered even more complicated by the fact that in some instances they can actually deter migration. This could occur,

for example, if environmental change means that communities lack the resources to meet the costs of relocating (Foresight, 2011).

Figure 1.4   Correlation between fertility and adult female literacy rate, 2000–2009

Correlation between education and fertility

Percentage of literate women

The adult female literacy rate is the percentage of women aged 15 and above who can, with understanding, read and write a short, simple statement on their everyday life.

Asia
Africa
Europe
America
Oceania

World
Population in millions
1 360
1 000
500
200
50
5

China
Philippines
Iraq
Kenya
Egypt
Uganda
Bangladesh
Nigeria
India
Pakistan
Ethiopia

100
80
60
40
20

1   2   3   4   5   6   7   8

Number of children per woman
The total fertility rate is the average number of children a woman would have at the end of her reproductive life, supposing she follows the average fertlity rate at each age and supposing she does not die giving birth.

Percentage of literate women

Russia
France
Germany
Spain
United Kingdom
Turkey
Portugal

Europe only
Population in millions
1 40
75
20

Please note the change in scale between the two graphics

100
95
90

1.3   1.4   1.5   1.6   1.7   1.8   1.9   2.0   2.1

Number of children per woman

Note: Data for 2012 (or most recent value).

Sources: UNESCO; Gapminder.org; CIA World Factbook; 2013.

1.2 Trends in population size and structure

Global population growth

Driven in part by the economic and social forces described above, the world population has more than doubled since the 1960s. Today, it exceeds seven billion people (UNFPA, 2011) and continues to grow by approximately 1.1 % annually (UN, 2013b). In the decades ahead the rate of global population growth appears likely to slow, although the interaction of the different drivers creates many uncertainties — a fact reflected in large differences between projections.

As illustrated in Figure 1.5, according to UN estimates (UN, 2013b) the world population will be between 8.3 billion and 10.9 billion in 2050, with a medium variant of 9.6 billion ([4]). Thereafter the population is expected to keep rising, exceeding 10 billion at the end of the century.

Figure 1.5   IIASA and UN world population projections
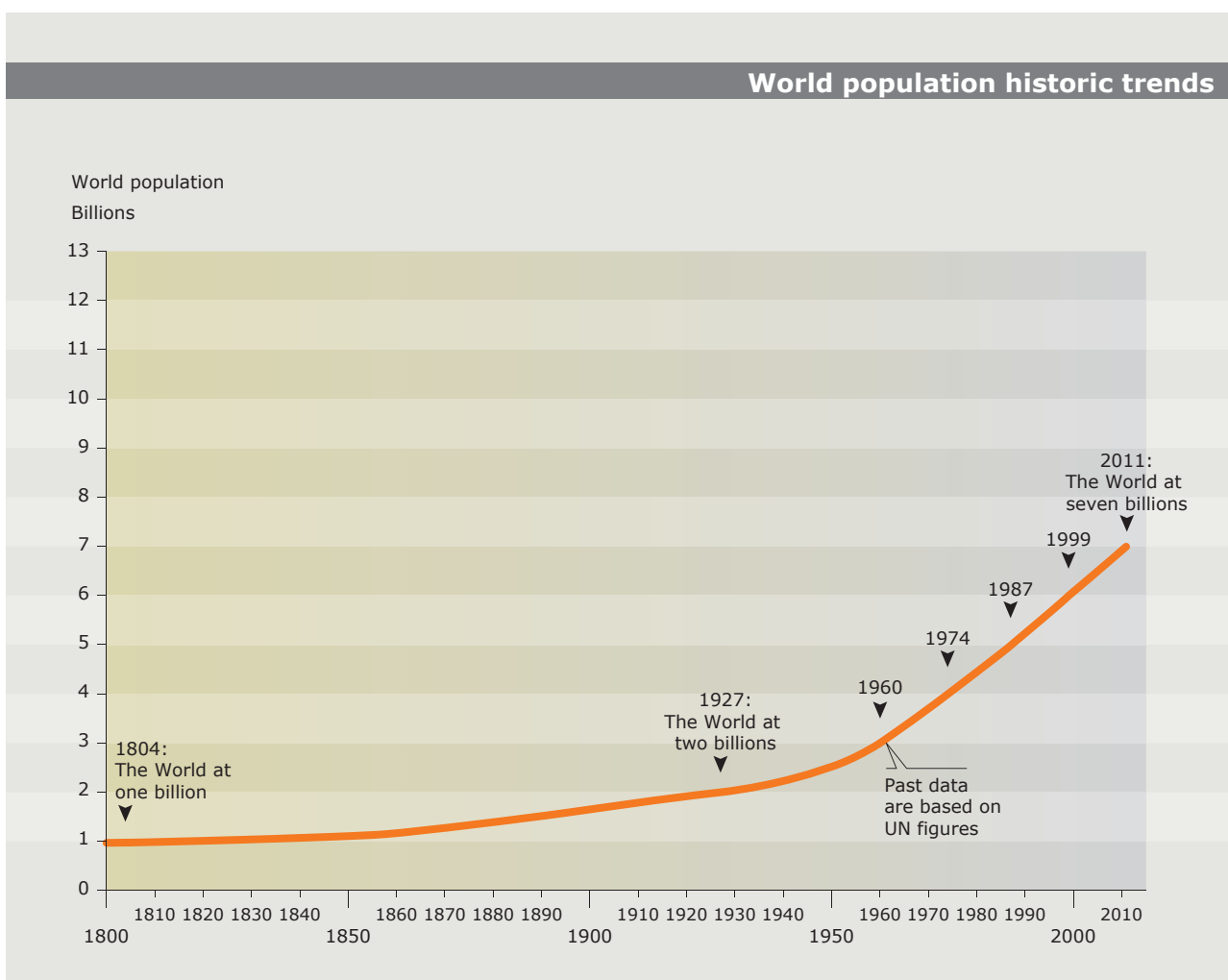
Sources: UN Department of Economic and Social Affairs, The World at Six Billion, 1999.

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[4]   The medium variant is defined by certain assumptions about future fertility trends in developed and developing countries. It is not a 'mean' growth estimate.
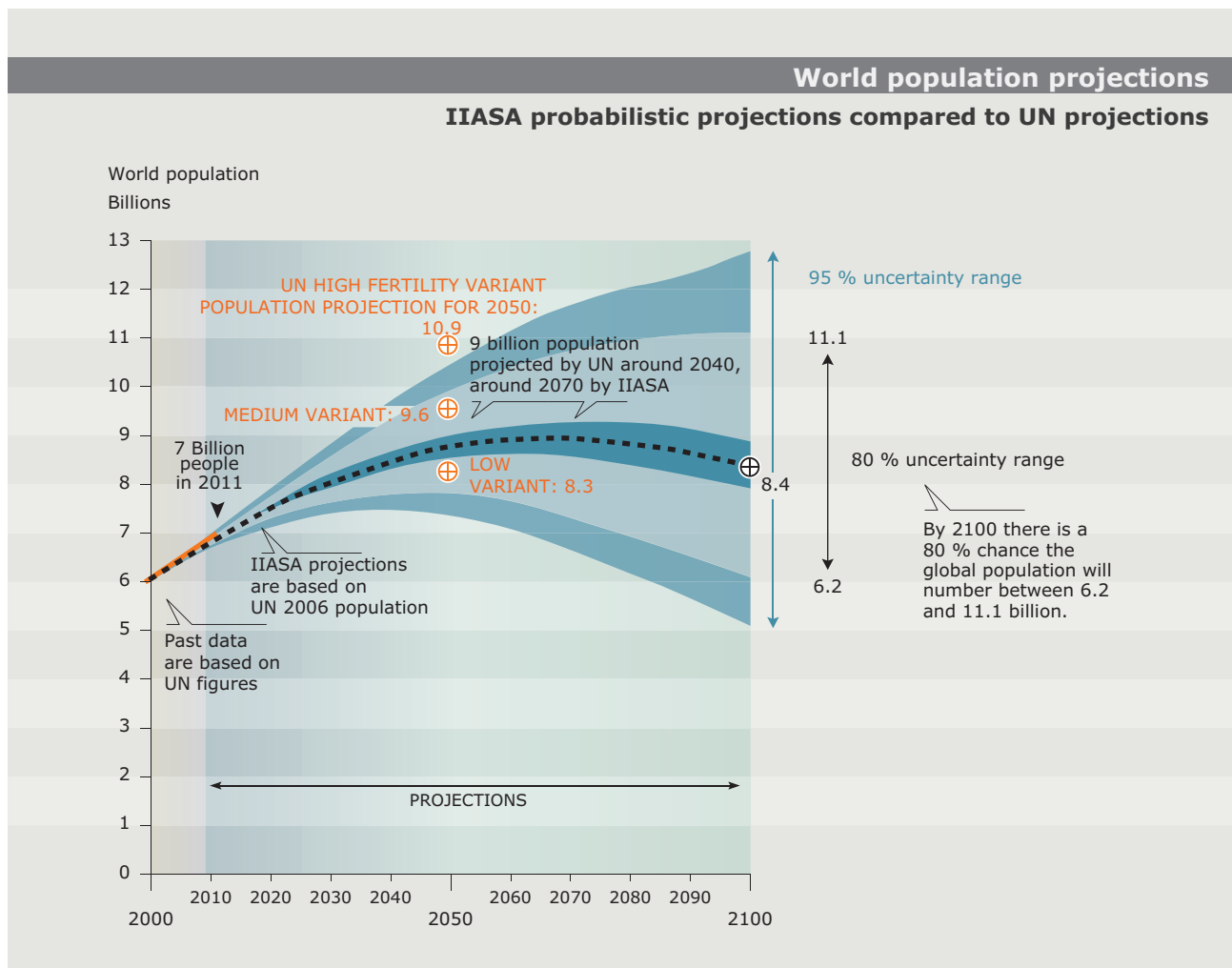
In contrast, IIASA (2007) projects a medium-variant population of 8.75 billion in 2050, with a range from 7.8 to 9.9 billion. It foresees the global population peaking at 9.45 billion around 2070 and then starting to decline.

The projected global trends mask significant variance in the population growth in different areas of the world. The UN estimates that the population of today's developed regions will grow marginally from 1.25 billion in 2013 to 1.3 billion by 2050.

This increase is due to a projected annual inflow of 2.4 million immigrants in the period 2013–2050. After 2050 inward migration is projected to decrease, resulting in a slight reduction in the population in these regions. Europe's population is expected to begin its decline sooner, falling from 739 million in 2011 to 709 million in 2050 in the medium variant scenario.

With the population in more developed regions growing only very slightly, almost all of the

Figure 1.5   IIASA and UN world population projections (cont.)

World population projections

IIASA probabilistic projections compared to UN projections

World population
Billions

UN HIGH FERTILITY VARIANT
POPULATION PROJECTION FOR 2050:
10.9

95 % uncertainty range

9 billion population projected by UN around 2040, around 2070 by IIASA

MEDIUM VARIANT: 9.6

11.1

7 Billion people in 2011

LOW VARIANT: 8.3

8.4

80 % uncertainty range

IIASA projections are based on UN 2006 population

6.2

By 2100 there is a 80 % chance the global population will number between 6.2 and 11.1 billion.

Past data are based on UN figures

PROJECTIONS

Note: The UN Population Division studies fertility-evolution scenarios to produce high, medium and low variant figures, whereas the IIASA bases its calculations on assumptions for fertility, mortality and migration (the latter only affecting regional projections).

Sources: Lutz W., Sanderson W. and Scherbov S., 2007 Probabilistic World Population Projections, International Institute for Applied Systems Analysis (IIASA); UN Population Division, World Population Prospects (2012 Revision).

projected increase in the global population in coming decades is concentrated in countries currently categorised as less developed. The UN foresees the population of these countries rising from 5.9 billion in 2013 to 8.2 billion in 2050. As illustrated in Figure 1.6, this implies that today's developed regions will account for just 12 % of the world population in 2050, down from 16 % in 2010 and 27 % in 1950 (UN, 2013b).

Among the less developed regions, Asia and Africa are projected to dominate population growth in coming decades, with particularly robust increases expected in the 49 'least developed countries' (LDCs). The UN estimates that the population of the LDCs will double from 898 in 2013 to 1.8 billion in 2050, which would represent almost a fifth of the global population (UN, 2013b).

In today's developing regions, population trends are expected to shift towards the stagnation and decline that have already commenced in developed regions. Despite continuing population growth in much of the developing world, in the future, some developing nations will begin to experience population ageing, stagnation and decline in coming years. For example, the populations of Russia, Ukraine and several Caribbean countries will decline in the period 2010–2030. Indeed, Russia's population is projected to decline by 10 million over that period, and a further 10 million by 2050 (UN, 2013b).

One effect of these uneven growth trends will be a significant adjustment in the geographical distribution of the world population (Figure 1.6). The contribution of Asia, Europe and South America to the global total is expected to decline during the remainder of the century. In contrast, Africa's contribution is expected to expand significantly, from less than 15 % of the world total in 2010 to more than 35 % in 2100.

Changes in population age structure

Changes in population age structure are an inevitable consequence of the adjustments in fertility and mortality rates associated with socio-economic development. As socio-economic conditions improve, structural changes in the population tend to occur in three phases (NTA, 2011a; Figure 1.7):

- In the least developed economies, high fertility rates are balanced by high infant and child morality rates. As infant and child mortality rates decline, the proportion of children in the total population increases.

**Figure 1.6   Distribution of the world population by major area, medium variant, 1950, 2010, 2050 and 2100**
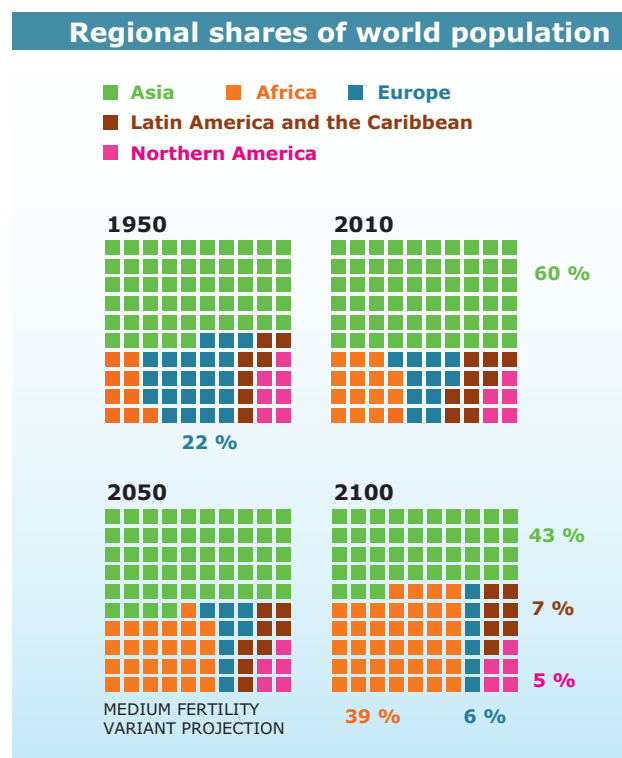
Source: UN Population Division, World Population Prospects (2012 revision).

- Fertility rates decline and the many young people born during the era of high fertility enter adulthood. As a result, the working-age population expands relative to the populations of young and old dependents.

- The large workforce enters retirement and the smaller generations that follow imply a reduced working age population. At the same time, increased life expectancy means a further increase in the population of elderly dependents relative to workers.

While this sequence of structural changes appears to occur globally, populations vary greatly in how far they have progressed through the transition. As illustrated in Figure 1.8, in 2010 just 4 % of Africa's population was aged 65 or more, while 51 % were under 20 years old. In Europe, the figures were 16 % and 21 % respectively. Looking ahead, it is projected that children will still account for more than 40 % of the population in Africa in 2050.

Figure 1.7   Population pyramids for the least developed economies, developing economies and developed economies

| Least developed economies | Emerging economies | Developed economies |

100 years

50 years

0 years

Male   Female
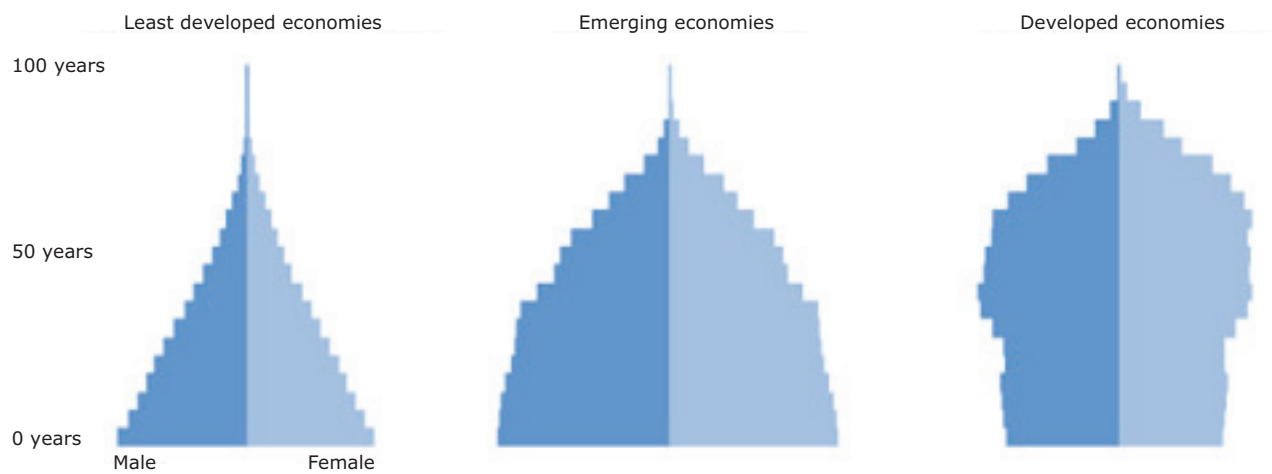
Source: NTA, 2011a.

Figure 1.8   Percentage of total population under age 20 versus age 65 and above in major regions of the world, 2010 and projected for 2030 and 2050
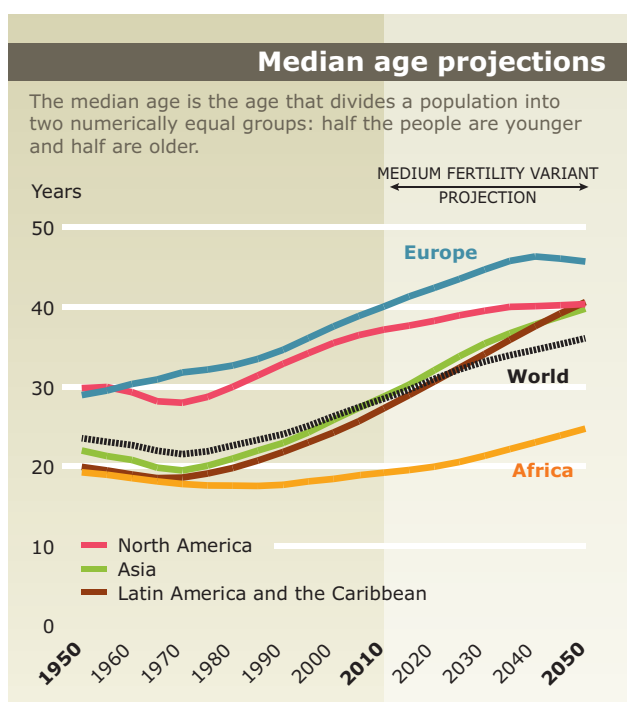

Ageing world

Age class share
of regional population

UNDER 20   65 AND OVER

60   50   40   30   20   10   0   0   10   20   30 %

Africa
2010
2030
2050

In 2010, 52 % of the African population is under 20.

Latin America and the Caribbean

Asia

Northern America

Europe
2010
2030
2050

In 2050, 27 % of the European population is projected to age 65 and over.
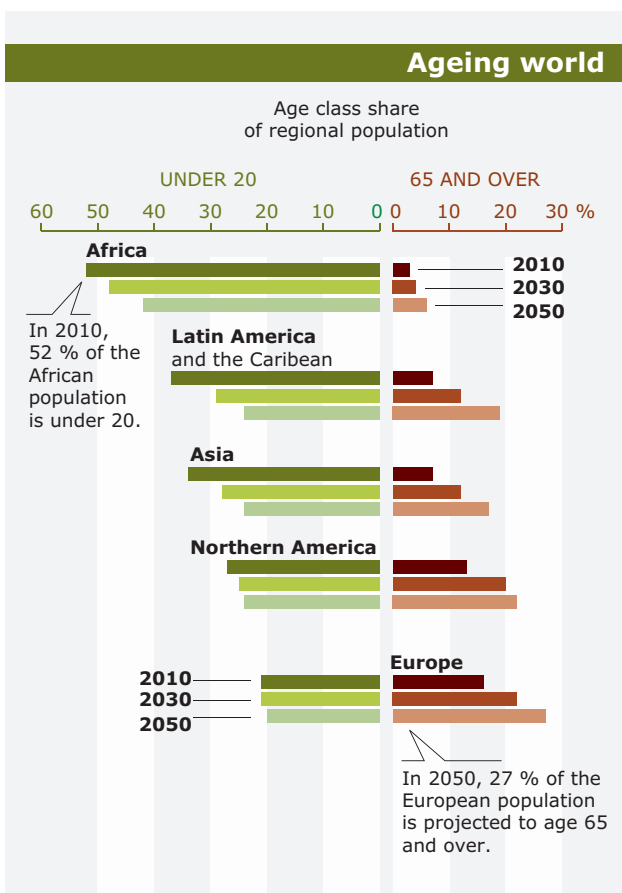
Source: UN Population Division, World Population Prospects (2012 revision).

Notwithstanding the variance in global population change, population ageing is an increasingly important trend in both developed and developing nations. The median age declined in most world regions in the first two decades after 1950 as child populations expanded but has since increased markedly (Figure 1.9). Again, the trends vary between regions. In Africa, the increase did not commence until the 1990s. In Europe, the process of demographic transition is more advanced, resulting in a steady rise in the median age since 1950.

Globally, the population aged 60 or over is expected to rise from 841 million people in 2013 to two billion in 2050. In developing regions, the population aged 60 or over is expected to grow at an annual rate of over 3 % in the next three decades, rising from just 9 % of the population today to 20 % in 2050 (UN, 2013b). In developed regions, the percentage aged 60 or over is projected to increase from 22 % to 32 % in the same period (UN, 2013b).

Alongside these changes in the size and structure of populations, coming decades are expected to see substantial shifts in the distribution of populations. Half of the world's population today inhabits cities and this figure is likely to reach 67 % by 2050 (UN, 2012). This would imply an increase in the global urban population from 2.6 billion in 2010 to 5.2 billion, meaning that cities would account for all of the population growth up to 2050.

Figure 1.9   Median age projections, 1950–2050

Median age projections

The median age is the age that divides a population into two numerically equal groups: half the people are younger and half are older.

Years

MEDIUM FERTILITY VARIANT PROJECTION

Europe

World

Africa

North America
Asia
Latin America and the Caribbean

1950 1960 1970 1980 1990 2000 **2010** 2020 2030 2040 **2050**

Source: UN Population Division, World Population Prospects (2012 revision).

Shifting migration trends

Since the 1960s, migration patterns have been marked by an increase in the share of migrants from developing countries, with developed countries receiving the majority of international migrants. Between 1960–1970 and 2000–2010, the average annual net number of migrants to Europe grew from 95 000 to nearly 1.9 million (UN, 2013b), steadily increasing in significance as a component of the European population (Figure 1.10). Indeed, 20 of the 30 countries that experienced population growth in 2000–2010 primarily due to net migration (rather than natural increase) are European (UN, 2011a).

By 2010, nearly 70 % of international migrants were from developing regions, with half of these migrating to developed regions (OECD, 2012). Overall, 59 % of global international migrants in 2013 were living in developed regions and accounted for 11 % of the population there (Table 1.1).

At present, the trend of migration from developing to developed regions appears to be continuing. The UN (2011b) estimates that 32 of 45 developed countries were net receivers of migrants over the period 2000–2010. And although migration into the OECD countries and Russia saw a modest slowdown in 2008–2010, largely due to the global economic crisis, it began to increase again in most of these countries in 2011 (OECD, 2012).

Looking further ahead, however, the direction of migration flows is likely to evolve as the economic incentives shift. Already, several countries in developing regions (e.g. Kuwait, South Africa and Thailand) have been attracting significant numbers of migrants, including refugees from neighbouring countries (UN, 2011b). China and India, for example, could attract more labour migrants as their working-age population slows whereas wages rise. Equally, labour migration into the United States is projected to decrease as certain areas of South America are expected to attract labour migrants that would traditionally have gone to the United States (NIC, 2008).
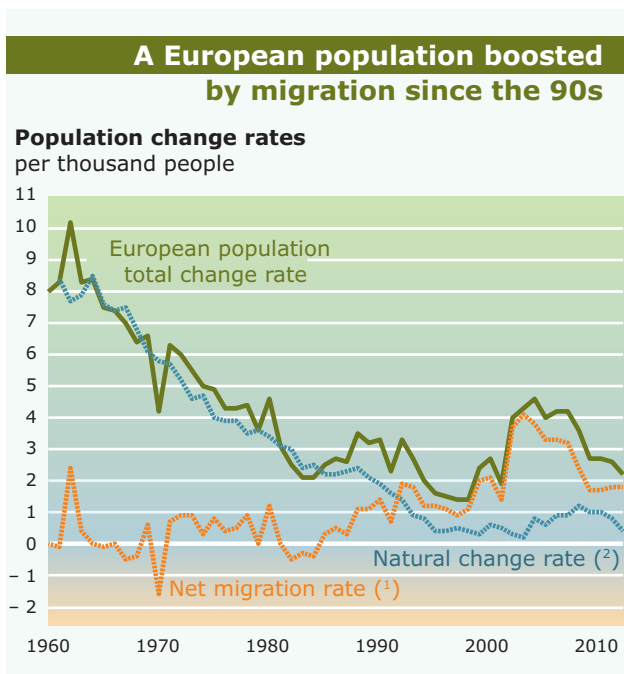
Table 1.1   Estimated number of international migrants and their percentage distribution by major area, 2013

Geographic region	Number of migrants (million)	As a % of total migrants in the world	As % of regional population
World	231.5	100	3.2
Developed regions	135.6	58.6	10.8
Developing regions	95.9	41.4	1.6
Africa	18.6	8.1	1.7
Asia	70.8	30.6	1.6
Europe	72.4	31.3	9.8
Latin America and the Caribbean	8.5	3.7	1.4
Northern America	53.1	22.9	14.8
Oceania	7.9	3.4	20.7

Source: UN, 2014a.

Figure 1.10 **European population change by component, 1960–2009 (per 1 000 population)**

A European population boosted by migration since the 90s

Population change rates
per thousand people

European population total change rate

Natural change rate (²)

Net migration rate (¹)

Note: EU-28: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia Slovenia, Spain, Sweden and the United Kingdom.

(¹) Including statistical adjustment.

(²) Number of births minus number of deaths per thousand people.

Source: Eurostat, 2014.

Climate change will exacerbate existing pressures on migration, and could lead to changes in migration patterns (ICMD, 2011). However, the complexity and uncertainty of the associated drivers is reflected in widely diverging projections for climate change-induced migration. ESPON (2013), for example, conclude that climate change-induced migration may be slight compared to migration for other reasons. In assessing the current state of knowledge on the subject, the International Organization for Migration found that 200 million people are expected to migrate by 2050 but projections vary from 25 million to one billion (IOM, 2009).

UN analysis (taking into account the migration policy stance of developed countries) predicts that international migration flows to developed regions will decline smoothly in the coming decades. The average number of annual migrants is projected to ease from 3.4 million people in the period 2000–2010 to about 2.3 million per year in 2040–2050 (UN, 2011b).

1.3 Implications

The changing size and structure of populations across the world has wide-ranging implications, driving other global trends such as economic growth and increasing environmental burdens. At each phase of the demographic transition, the shifting population structure and related migration flows bring opportunities and difficulties.

Economic and environmental impacts of expanding workforces

Population trends directly influence economic production by shaping the size and age structure of the workforce. In many countries, strong growth in the working age population, alongside improvements in human capital (e.g. health and education) and investments in infrastructure and technology, have contributed to rapid economic growth in recent years (WEF, 2012).

The expansion in workforces and skills is likely to vary globally, however. Samir et al. (2010) project that Africa's population will grow significantly up to 2050 (Figure 1.11), with a substantial youth cohort persisting throughout, in parallel with a growing older population. Asia will experience marked population growth and significant ageing. In contrast, Europe's population is projected to contract and age. In all regions the share of the population with secondary and tertiary education is projected to increase but the expansion is very substantial in Africa and Asia. Age structure of human capital (education levels) influences future societal economic growth and democracy processes, longevity and disabilities of population, as well resilience of individuals along many dimensions of well-being (Figure 1.11).

This rebalancing of productive potential is already apparent in economic output data. While the advanced economies dominated growth during the 20th century, emerging economies are rapidly gaining prominence. The BRIICS countries accounted for 21 % of global output (in PPP terms) in 2000 but by 2010 that had already risen to 32 % (OECD, 2013). The OECD projects that their economic production will exceed the GDP of OECD members by around 2030, and will account for 56 % of global GDP by 2050 (OECD, 2013; GMT 6).

As illustrated in Figure 1.12, rapid economic growth in developing regions is projected to translate into marked reductions in the proportion of populations living in extreme poverty.

Population growth and related economic development can boost humanity's competition for non-renewable resources (GMT 7). They can also increase the burden on the environment through increased consumption of biotic resources (GMT 8) and via the production of harmful emissions and waste (GMT 10). Environmental damage may be particularly significant in regions such as sub-Saharan Africa and parts of south-east Asia, where high population growth rates coincide with a high and direct dependency on natural capital for economic development (OECD, 2012).

Employment opportunities and threats to social cohesion

While the surge in workforce numbers offers the potential of rapid economic expansion, it also generates challenges. One important issue is the need to create sufficient employment opportunities for the young and fast-growing workforce. Failing to create such opportunities is a waste of valuable human resources and potentially a source of conflict.

While the world as a whole reached a peak in its share of young people (aged 15–24) around 1985 (Figure 1.13), in the least developed countries this peak occurred in 2005 and is projected to remain high in the coming decades. By 2025, three quarters of the countries with youth bulges (particularly large cohorts in the 15–24 age bracket) will be located in sub-Saharan Africa, with the rest located in the Middle East and a few across Asia and the Pacific Islands (Ortiz and Cummins, 2012). The largest youth bulges are found in some of the world's most fragile countries, which are likely to be particularly vulnerable to civil unrest and ill-equipped to respond.

The challenges facing those countries currently experience youth bulges have been exacerbated in recent years by the global economic crisis, which has disproportionately impacted young people. Since employment itself provides an important means of developing skills and experience, the jobs crisis has serious implications for the future employability and earnings potential of a substantial group of young workers (Ortiz et al., 2012).

Increasing burdens of ageing populations

In other countries further advanced in the process of demographic transition, threats to social cohesion are more likely to arise from population ageing and decline. While these trends may alleviate some of the growth in demands on ecosystems, they can threaten the social security and public health systems established in the context of growing working-age populations. As old-age dependency ratios increase, the social contract may come under strain. Public finances could worsen as a smaller economically active population is relied upon to provide for the pensions, health care and other needs of the elderly.

Preserving living standards as populations age and avoiding a breakdown in social cohesion will require that countries use the period when they benefit from a disproportionately large workforce to prepare for subsequent population ageing and decline. This could involve two sets of measures: first, investing some of the economic returns into education, skills, health and infrastructure that can enable a relatively smaller workforce to maintain or enhance economic output (Figure 1.11); second, building up savings to finance pensions, thereby reducing the need reliance of the elderly on transfers from current workers.

China has made very significant progress in improving educational enrolment. By 2030 it is expected to have more educated people of working age than Europe and Northern America together (Lutz and Goujon, 2001). Whether the large populations of young people concentrated in the world's poorest countries will benefit from such investments is unclear.
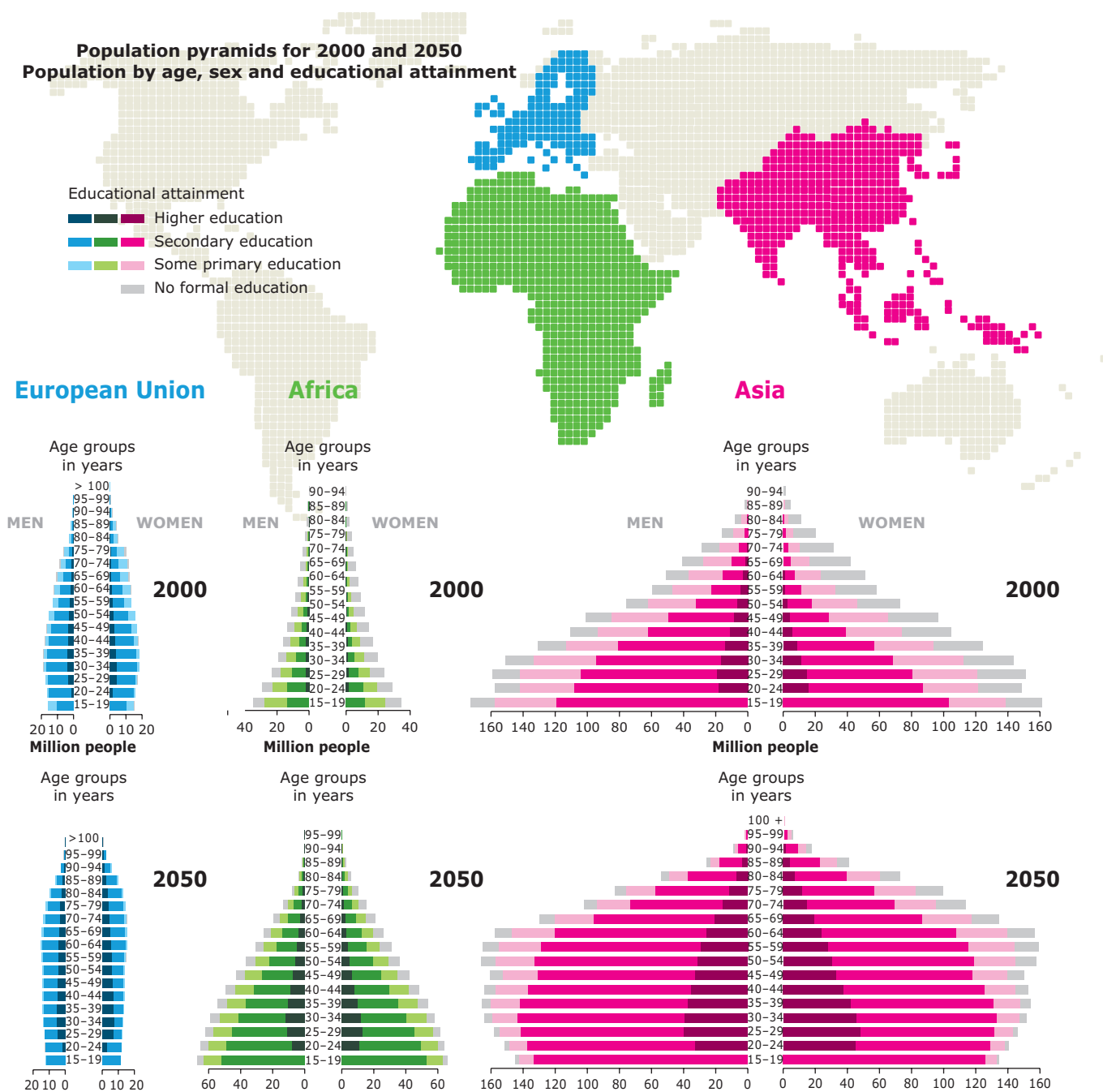
Migration and workforces in developed regions

In past decades, migration from developing regions has often delivered economic benefits to the advanced economies. In addition to mitigating population ageing (in part by affecting fertility rates), immigration can increase the working-age population and offering valuable skills to the labour market. It is estimated, for example, that 30 % of migrants in the OECD have tertiary education (OECD and UNDESA, 2013). Migration flows have also brought changes in the ethnic and cultural complexion in the recipient countries.

For developing regions, past migration flows have brought significant costs but also some benefits. The loss of highly skilled persons is one major concern, potentially undermining the productive capacity and

Figure 1.11   Population pyramids for Europe (left), Africa (centre) and Asia (right) in 2000 and 2050

Population pyramids for 2000 and 2050
Population by age, sex and educational attainment

Educational attainment
■ Higher education
■ Secondary education
■ Some primary education
■ No formal education

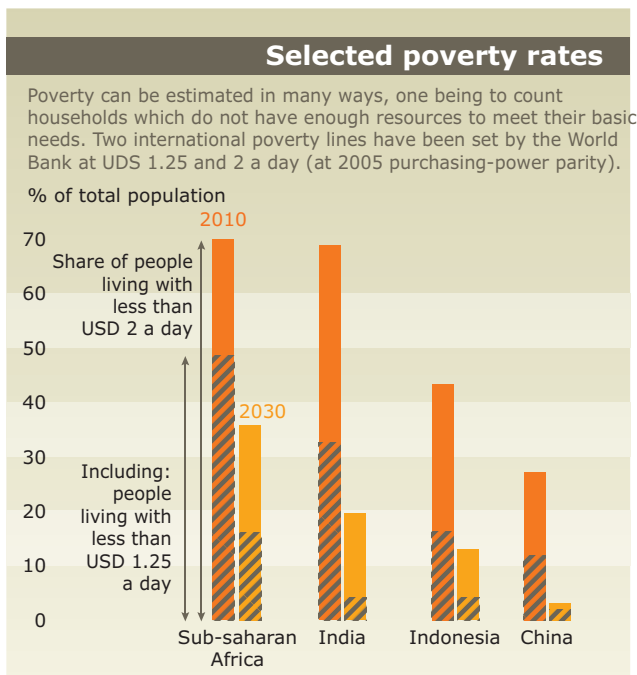**European Union**   **Africa**   **Asia**

Note: Please note that children under 15 are not represented on the age pyramids.

2050 education attainment calculated according to the Global Education Trend (GET) scenario.

The GET scenario is not derived from a simple assumption. It is based on the country's educational expansion historical trend.

Source: Samir et al., 2010.

development prospects of poor nations. According to OECD and UNDESA (2013), one in nine tertiary educated persons born in Africa resides in OECD countries. The situation is especially worrying in small countries and island states. For example, in

2010 almost 90 % of highly skilled persons born in Guyana lived in OECD countries. In contrast, large countries in developing regions, such as Brazil, China, India and the Russian Federation, had low emigration rates of the highly skilled (below 3.5 %).

Figure 1.12   Reductions in population living in extreme poverty

Selected poverty rates

Poverty can be estimated in many ways, one being to count households which do not have enough resources to meet their basic needs. Two international poverty lines have been set by the World Bank at UDS 1.25 and 2 a day (at 2005 purchasing-power parity).

% of total population

2010

Share of people living with less than USD 2 a day

2030

Including: people living with less than USD 1.25 a day

Sub-saharan Africa   India   Indonesia   China

Source: World Bank PovcalNet, 2013; Uri Dadush and Bennett Stancil, The World Order in 2050, Carnegie Endowment for International Peace, Policy outlook, April 2010.

At the same time, however, migrant workers provide a major source of revenues for the populations that they leave behind. The World Bank estimates that remittance flows to developing countries reached USD 414 billion in 2013 — nearly three times the size of official development assistance. By 2016, they are projected to increase to USD 540 billion. Transfers on this scale represent a crucial source of income to support livelihoods and finance development.

The projected changes in migration flows in coming decades are likely to bring some redistribution of the benefits and costs of migration. In developed regions, reduced immigration to some countries may imply that populations age more rapidly, increasing the ratio of dependents to workers. In relatively prosperous parts of the developing world, increasing inflows of migrants may produce the opposite effects.
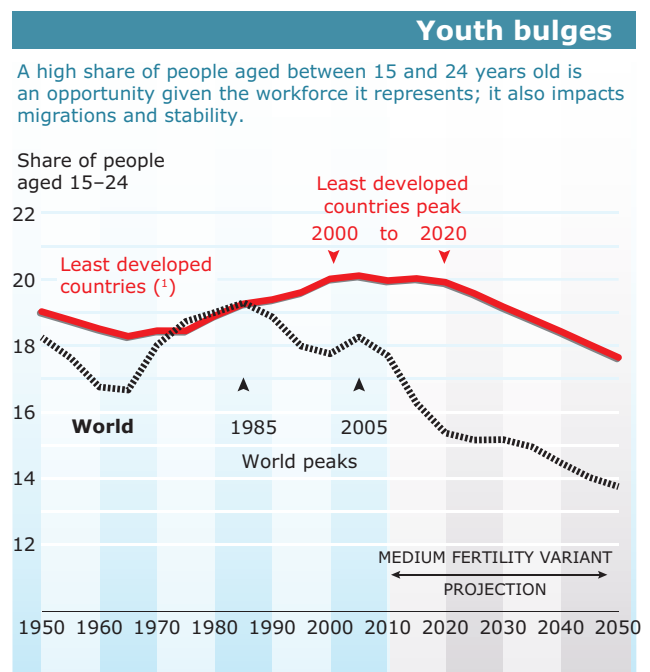
1.4   Challenges for Europe

Global environmental policy today seeks to address and mitigate the environmental effects of anticipated population growth, particularly in the most vulnerable areas (typically developing regions).

Costs related to ageing, health and education (pensions, expanded education spending, labour shortages) will increase fiscal pressures, and a drying up of migration could make things worse. Both, population age structure and the specific features of economic life-cycle in each society (including consumption and production patterns) have important economic and policy implications. The legacy of the crisis — with often large increases in public debt — unfavourable demographics, and rising spending pressures in areas like health and education all contribute to substantial fiscal pressures. In several cases, structural reforms can mitigate fiscal pressures without harming growth and equity, thus providing a way to avoid difficult trade-offs (OECD, 2014).

In Europe as a whole, population decline later in the current century may help ease environmental

Figure 1.13   Share of youth in world population and in least developed countries, 1950–2050

Youth bulges

A high share of people aged between 15 and 24 years old is an opportunity given the workforce it represents; it also impacts migrations and stability.

Share of people aged 15–24

Least developed countries peak
2000   to   2020

Least developed countries (¹)

World   1985   2005

World peaks

MEDIUM FERTILITY VARIANT
PROJECTION

1950 1960 1970 1980 1990 2000 2010 2020 2030 2040 2050

Note: (¹) Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, D.R. Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, São Tomé and Príncipe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, Tanzania, Vanuatu, Yemen and Zambia.

Source: UN Population Division, World Population Prospects: (2012 revision).

pressures, although it will need to be coupled with sound environmental policy in order to achieve substantial reductions in resource use and pollution. Moreover, demographic trends create some difficult challenges for European policymakers. The expanded workforce during recent decades has underpinned substantial improvements in living standards and the development of the welfare state. Sustaining these systems will present significant challenges in the light of population dynamics.

It is important to stress, however, that projected demographic trends vary markedly across Europe. According to Eurostat (Eurostat, 2011a), the EU-27 population will remain fairly static in the period 2010–2060, increasing by 5 % between 2010 and 2040 and then declining slightly. Some Member States are projected to grow substantially, however, for example Ireland (46 %), Luxembourg (45 %), Cyprus (41 %), the United Kingdom (27 %) and Belgium (24 %). Others are expected to contract significantly, such as Bulgaria (27 %), Latvia (26 %), Lithuania (20 %), Romania and Germany (19 %).

These trends would have important implications for the distribution of Europe's population, and for the related distribution of economic output, resource use and environmental pressures. For example, according to the Eurostat projections, Germany's population would decline from 82 million to 66 million, whereas the United Kingdom would become the EU-27's largest population, growing from 62 million to 79 million.

The contrasting population dynamics would also result in variance in the burden of ageing populations. Although the proportion of the population aged over 65 is expected to increase in all European countries up to 2060, the projected rates range from 22 % in Ireland and 25 % in the United Kingdom, Belgium and Denmark to 36 % in Latvia, 35 % in Romania and Poland and 33 % in Bulgaria, Germany and Slovakia (2011c).

Understanding and anticipating Europe's demographic trends will allow the EU to reach out to its population, to promote awareness, and to invest in its human capital, in order to help manage risks and drive a more sustainable economy. EU Member States may be able to pre-empt certain associated challenges, for example via smart urban design or effective support structures for older populations. Such measures could help tackle some of Europe's environmental and sustainability issues more quickly and effectively.

References

Van Alstine, J. and Neumayer, E., 2010, 'The environmental Kuznets curve', in: Gallagher, K.P. (ed), *Handbook on trade and the environment*, Edward Elgar, Cheltenham, United Kingdom.

BIO Intelligence Service, 2013, *Increasing divergence in global population trends: Analysis for update and improved assessment of this megatrend*, (http://www.eea.europa.eu/publications/global-megatrend-update-1/increasing-divergence-in-global-population-trends) accessed 7 March 2014.

Claeson, M. and Waldman, R.J., 2000, 'The evolution of child health programmes in developing countries: from targeting diseases to targeting people', *Bulletin of the World Health Organization* (78), pp. 1 234–1 245.

Engelman, R. and Leahy, E., 2006, *How many children does it take to replace their parents? Variation in replacement fertility as an indicator of child survival and gender status*, Population Action International, Washington DC.

ESPON, 2013, *Demographic and migratory flows affecting European regions and cities*, Applied research 2013/1/3, final report, European Observation Network for Territorial Development and Cohesion.

Eurostat, 2011a, *EU27 population is expected to peak by around 2040*, News release 80/2011, Eurostat.

Eurostat, 2011b, *Migrants in Europe — A statistical portrait of the first and second generation*, 2011 edition, European Commission.

Eurostat, 2011c, *The greying of the baby boomers: A century-long view of ageing in European populations*, Statistics in focus, 23/2011, European Commission.

Foresight, 2011, *Migration and global environmental change — Future challenges and opportunities*, Government Office for Science, London, United Kingdom.

ICMPD, 2011, *'Climate refugees' — Legal and policy responses to environmentally induced migration*, report for the European Parliament's Committee on Civil Liberties, Justice and Home Affairs, International Centre for Migration Policy Development.

IIASA, 2007, 'The 2007 Update of the Probabilistic World Population Projections', (http://www.iiasa.ac.at/web/home/research/researchPrograms/WorldPopulation/Research/2007_update_prob_world_pop_proj.html) accessed 13 January 2014.

IOM, 2009, *Migration, environment and climate change: assessing the evidence*, International Organization for Migration, Geneva, Switzerland.

IOM, 2013, *World migration report 2013*, International Organization for Migration, Geneva, Switzerland.

Lutz, W. and Goujon, A., 2001, 'The world's changing human capital stock: multi-state population projections by educational attainment', *Population and development review* 27(2), pp. 323–339.

Lutz, W. and Samir, K.C., 2011, 'Global human capital: integrating education and population', *Science* 333(6042), pp. 587–592.

NIC, 2008, *Global trends 2025: a transformed world*, National Intelligence Council.

NTA, 2011, *Lower-income countries and the demographic dividend*, National Transfer Accounts Bulletin, 5, East-West Center and UNFPA.

OECD, 2012, *International migration outlook 2012*, Organisation for Economic Co-operation and Development.

OECD, 2013, 'All Statistics - OECD iLibrary', (http://www.oecd-ilibrary.org/statistics) accessed 17 July 2013.

OECD, 2014, OECD@100: *Policies for a shifting world*.

OECD and UNDESA, 2013, *World migration in figures*, A joint contribution by UN-DESA and the OECD to the United Nations High-Level Dialogue on Migration and Development, 3-4 October 2013, Organisation for Economic Co-operation and Development, United Nations Department of Economic and Social Affairs.

Ortiz, I. and Cummins, M., 2012, *When the global crisis and youth bulge collide — Double the jobs trouble for youth*, Social and economic policy working paper, United Nations Children's Fund (UNICEF), New York.

Samir, K.C., Barakat, B., Goujon, A., Skirbekk, V., Sanderson, W. and Lutz, W., 2010, 'Projection of populations by level of educational attainment, age, and sex for 120 countries for 2005–2050', *Demographic Research* 22(15), pp. 383–472.

UN, 1999, *The World at Six Billion*, UN Department of Economic and Social Affairs, New York, US.

UN, 2011a, *International migration report 2009: a global assessment*, United Nations, New York.

UN, 2011b, *World population prospects: the 2010 revision*, United Nations Department of Economic and Social Affairs, New York, US.

UN, 2012, *World urbanization prospects — The 2011 revision*, ESA/P/WP/224, United Nations Department of Economic and Social Affairs.

UN, 2013a, 'United Nations Statistics Division-Standard Country and Area Codes Classifications (M49)', (http://unstats.un.org/unsd/methods/m49/m49regin.htm) accessed 10 January 2014.

UN, 2013b, *World population prospects: the 2012 revision*, United Nations Department of Economic and Social Affairs, New York, US.

UN, 2014a, 'Total international migrant stock', (http://esa.un.org/unmigration/TIMSA2013/migrantstocks2013.htm?mtotals) accessed 10 January 2014.

UN, 2014b, 'UNdata | record view | Total fertility rate', (http://data.un.org/Data.aspx?d=PopDiv&f=variableID:54) accessed 10 January 2014.

UNFPA, 2011, *Delivering results in a world of 7 billion*, Annual report 2011, United Nations Population Fund.

UNFPA, 2012, *By choice, not by chance — Family planning, human rights and development*, State of world population 2012, United Nations Population Fund.

UNFPA, 2014, 'Contraception', (http://www.unfpa.org/public/home/mothers/pid/4382) accessed 13 January 2014.

WEF, 2012, *Global risks 2012 — seventh edition*, An initiative of the Risk Response Network, World Economic Forum.

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