Annex 2 GMT summary sheets

The original PowerPoint versions of the GMT pathways described below are available from the Platform for forward looking information (available from 2017 at the EEA web site).

How to interpret these pathways:

- The 'pathways' provide a visual overview of the GMTs described in the EEA SOER 2015 GMT extended background analysis EEA, 2015e (EEA, 2015d).
- The pathways are not meant to be an accurate representation of the real world, but an illustration of the megatrends, as described in the SOER 2015. (EEA, 2015c).
- They create a structured picture of the key drivers, trends and potential implications referred to in the SOER 2015 narrative (EEA, 2015c).
- However, they do not include all the detail in the narrative to enable a reader to see the key things more easily and quickly understand the 'story'.
- The pathways are intended as 'storylines' and do not attempt to illustrate direct, causal linkages between factors.
- The aim is to make the megatrends accessible and provide a basis for discussion of possible national-scale implications and priorities.
- The 'potential implications' included in the pathways are those referred to in the SOER 2015 narrative, but **these are not an exhaustive/definitive list:** other implications will exist depending on a country's characteristics and priorities.

Presented here are pathways for each of the 11 EEA SOER 2015 GMTs (EEA, 2015c):

1. Diverging global population trends
2. Living in an urban world
3. Changing disease burden and risks of pandemics
4. Accelerating technological change
5. Continued economic growth?
6. An increasingly multipolar world
7. Intensified global competition for resources
8. Growing pressures on ecosystems
9. Increasingly severe consequences of climate change
10. Increasing environmental pollution load
11. Diversifying approaches to governance.

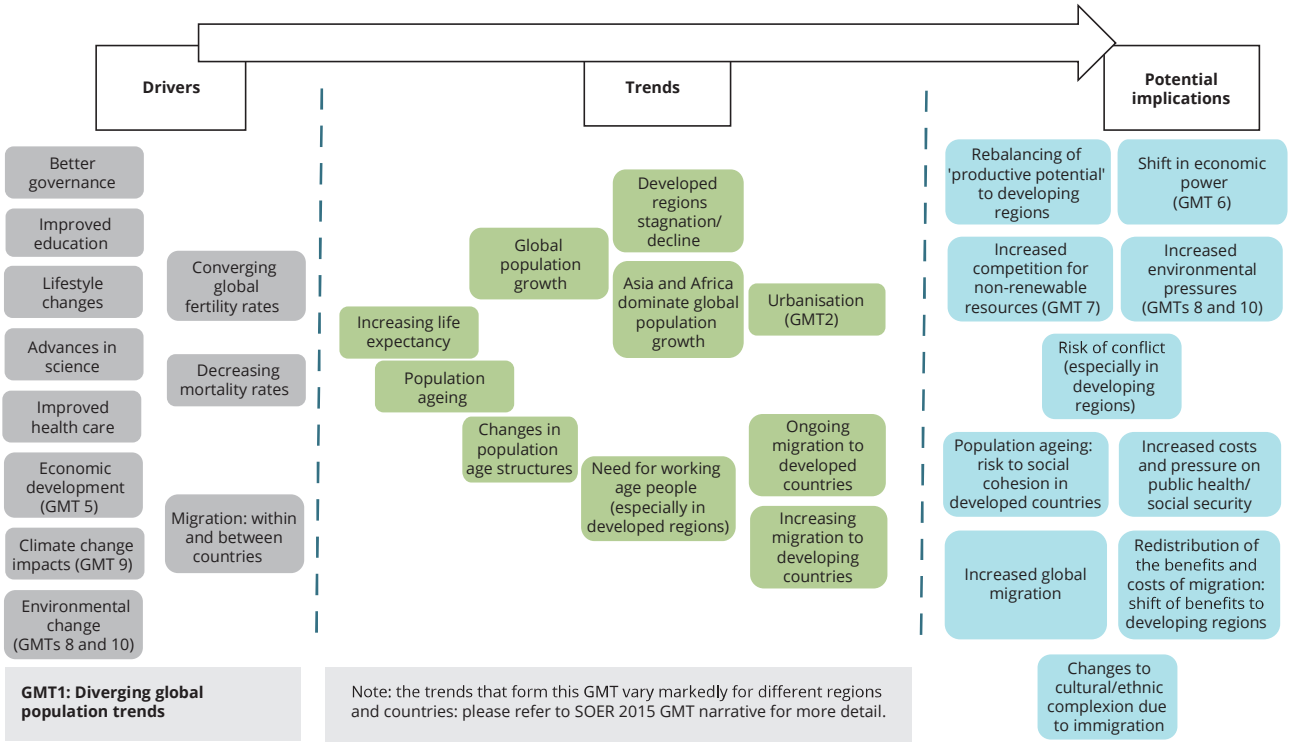
The summary text for each GMT is taken from SOER 2015 report (EEA, 2015c).

GMT 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 to grow rapidly 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 ([8]) 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 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 with few dependents. Advanced economies will need to maintain living standards as the elderly population expands and the workforce contracts.



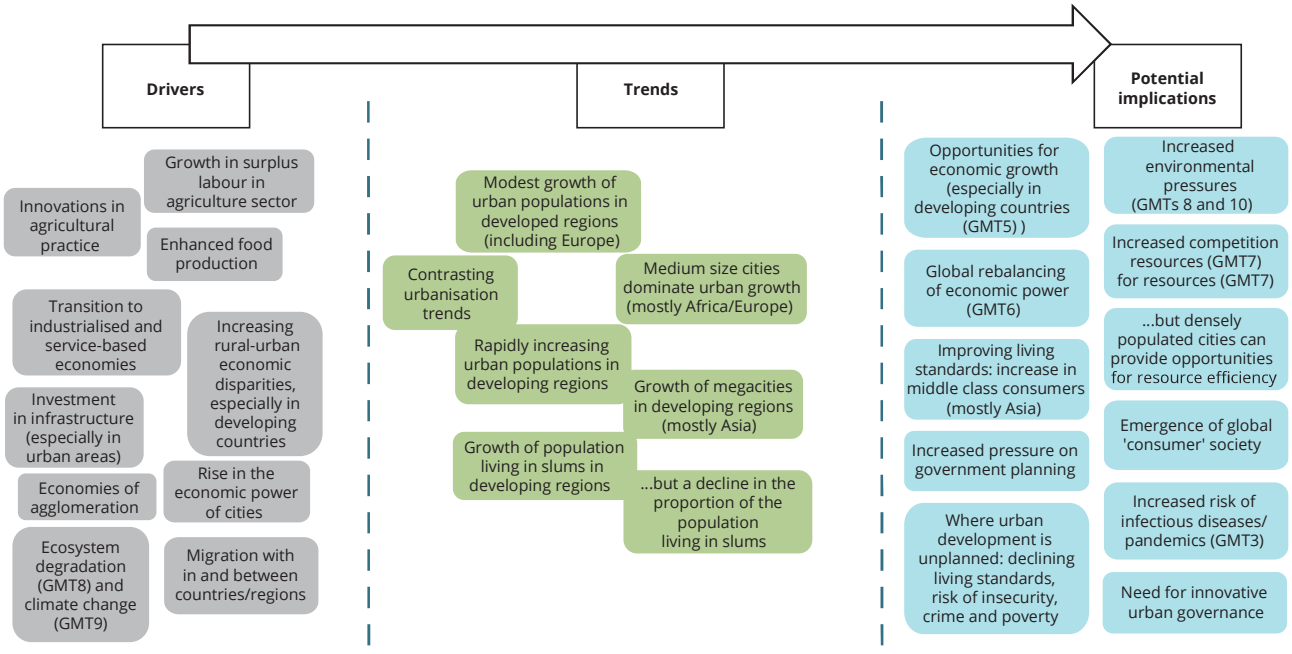
([8]) The GMT report employs the United Nations categorisation of countries and regions according to their level of economic development (see http://unstats.un.org/unsd/methods/m49/m49regin.htm). As of 2013, the UN defines 49 countries as 'least developed countries', and identifies seven 'developing regions' and four 'developed regions'. As such, references in this annex to 'developing countries' and 'developed countries' thus relate to countries in those regions. 'Developed countries' are also referred to as 'advanced economies'.

GMT 2: Living in an urban world

Urbanisation is an integral aspect of development. As countries transition from primarily agricultural economies, the shift to cities offers substantial productivity gains. Jobs and earnings in urban settings create strong incentives for internal migration, often reinforced by government policies and environmental degradation. Only later in economic development do urban-rural disparities begin to dissipate, easing the pressure for further urbanisation.

Together, these drivers have brought extraordinary changes to the geographical distribution of humanity during the last century. Whereas just 10–15 % of the global population lived in urban areas in the early 20th century, that figure had risen to 50 % by 2010 and is projected to reach 67 % by 2050 (UN, 2012). Almost all of that growth is expected to occur in today's developing regions, with urban populations in these regions expected to increase from 2.6 billion in 2010 to 5.1 billion in 2050.

At the individual level, urbanisation can boost opportunities and living standards. At the macroeconomic level, cities drive innovation and productivity. But although the associated growth of the middle class is welcome, it also carries risks in terms of a rapidly growing burden of resource use and pollution. Dense urban settlements can provide for comparatively resource-efficient ways of living, but exploiting this potential and creating a healthy, secure living environment requires effective urban planning. Indeed, the consequences of ill-managed urbanisation are apparent in the vast slums that today accommodate a quarter of the world's urban inhabitants — more than 850 million people.



GMT 3: Changing disease burden and risks of pandemics

The world is currently experiencing a major shift in health problems related to economic development and changing lifestyles. Since 2000, the global burden of disease from communicable diseases (such as human immunodeficiency virus (HIV), tuberculosis, and measles) has been outweighed by non-communicable diseases (such as cardiovascular diseases, cancers, chronic respiratory diseases and diabetes). Non-communicable diseases are also the most important cause of death in the world and are typically associated with developed-world lifestyles. But although communicable diseases are in decline globally, they still pose a significant health burden, especially in the developing world. A third factor in changing health conditions is the persistent threat of pandemics.

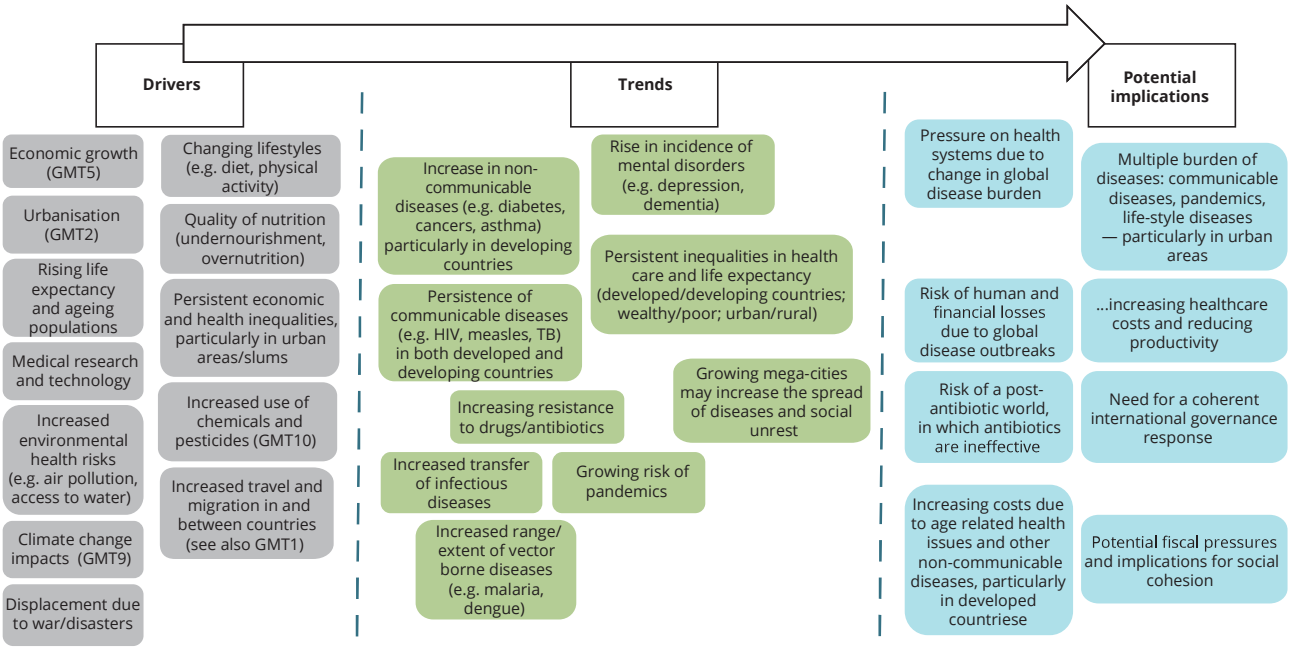
Many developing countries will find this shift challenging, as they will have to deal with the multiple burdens of persistent communicable diseases and the risk of pandemics, combined with the increasing burden of non-communicable diseases.

In addition, significant health disparities still exist between and within countries, particularly between urban and rural areas. Consequently, some vulnerable population groups (e.g. children and people living in poverty) are still at greater risk of poor health, although life expectancy and general health have been continually improving around the world.

A broad range of economic and social trends will influence the future of global public health. Although some global environment-related drivers (e.g. access to drinking water) are improving, others — such as urban air pollution and lack of access to basic sanitation — continue to pose a serious risk to human health. In addition, the incremental effects of climate change are contributing to the global burden of disease (by, for example, increasing the risk of spreading vector-borne diseases). Another driver is related to accelerating technological innovations, which are bringing many health benefits but also unknown health risks. Additionally, the pharmaceutical industry is slowing down its development of new drugs for the treatment of 'non-profitable' diseases (mostly communicable diseases in developing countries) and diseases resistant to traditional antibiotics.

Action at the global and national levels is needed to greatly reduce the risks posed by these trends. Increased investment in health and infrastructure, improved education and better governance are key factors in realising sustained improvements in human health.

The Millennium Ecosystem Assessment underlined that human health depends on healthy ecosystems, and so there are synergies between efforts to address health issues and those to protect the environment, both in Europe and worldwide.



GMT3: Changing disease burdens and risks of pandemics

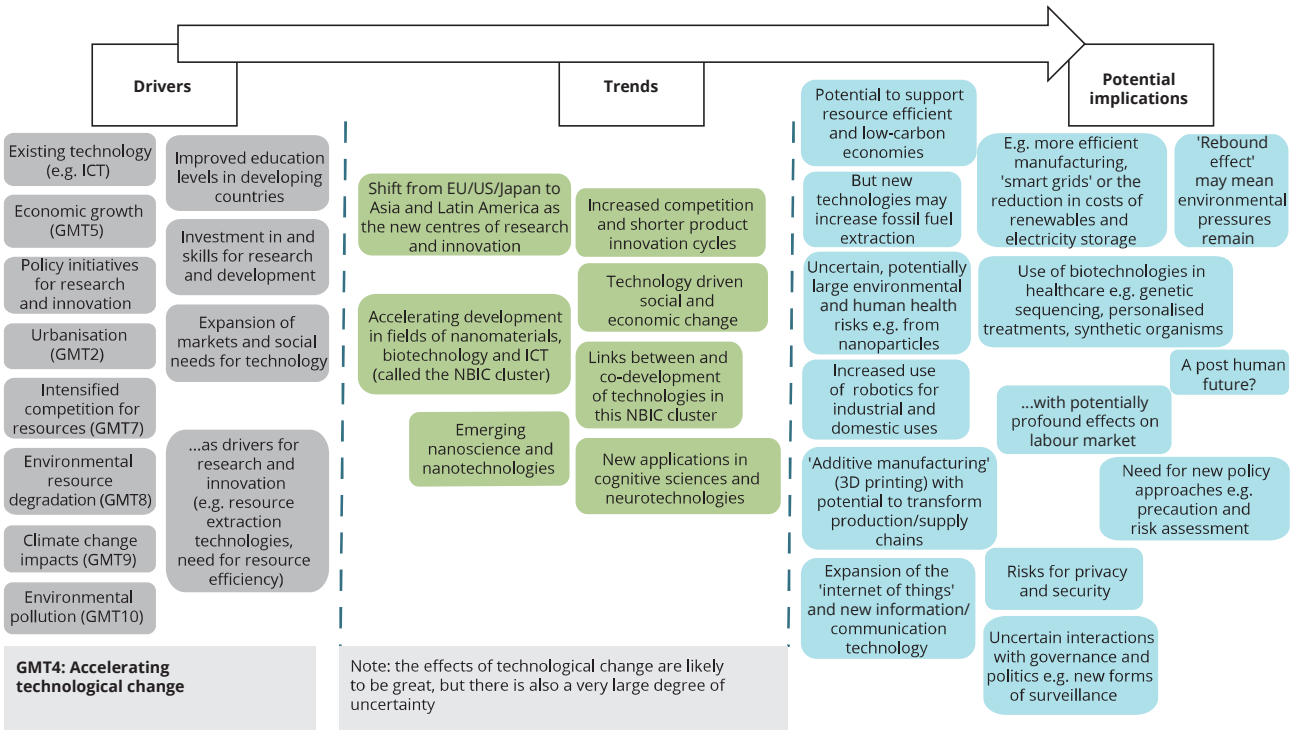
Note: Europe faces uncertain but increased exposure to possible future pandemics

GMT 4: Accelerating technological change

The pace of technological change is accelerating. The shifts in technological paradigms that once were separated by centuries or millennia — such as the development of agriculture or the industrial revolutions based on steam and then electric power — are now occurring within a single lifetime. Indeed, the pace at which new technologies are being adopted by the market and used in society has rocketed over the past century and a half. In the early 1900s, it took more than 30 years for a quarter of the US population to adopt telephones and radios; however, more recently, the World Wide Web reached this level in only 7 years.

Today, research and development around the world are accelerating —particularly for nanotechnologies, biotechnology, and information and computer technology. Moreover, the integration of techniques and knowledge across these three areas and closely related ones is speeding up the pace of discovery. The new products and innovations emerging from this 'NBIC cluster' could increase resource efficiency and support the shift to low-carbon economies. In this process, technological change may transform energy, manufacturing, health care and many other sectors over the coming decades.

Along with the opportunities, accelerating change will also create new risks for society, health and the environment. Institutional and policy innovations will be needed to minimise the emerging risks and promote technological change that supports public goals.

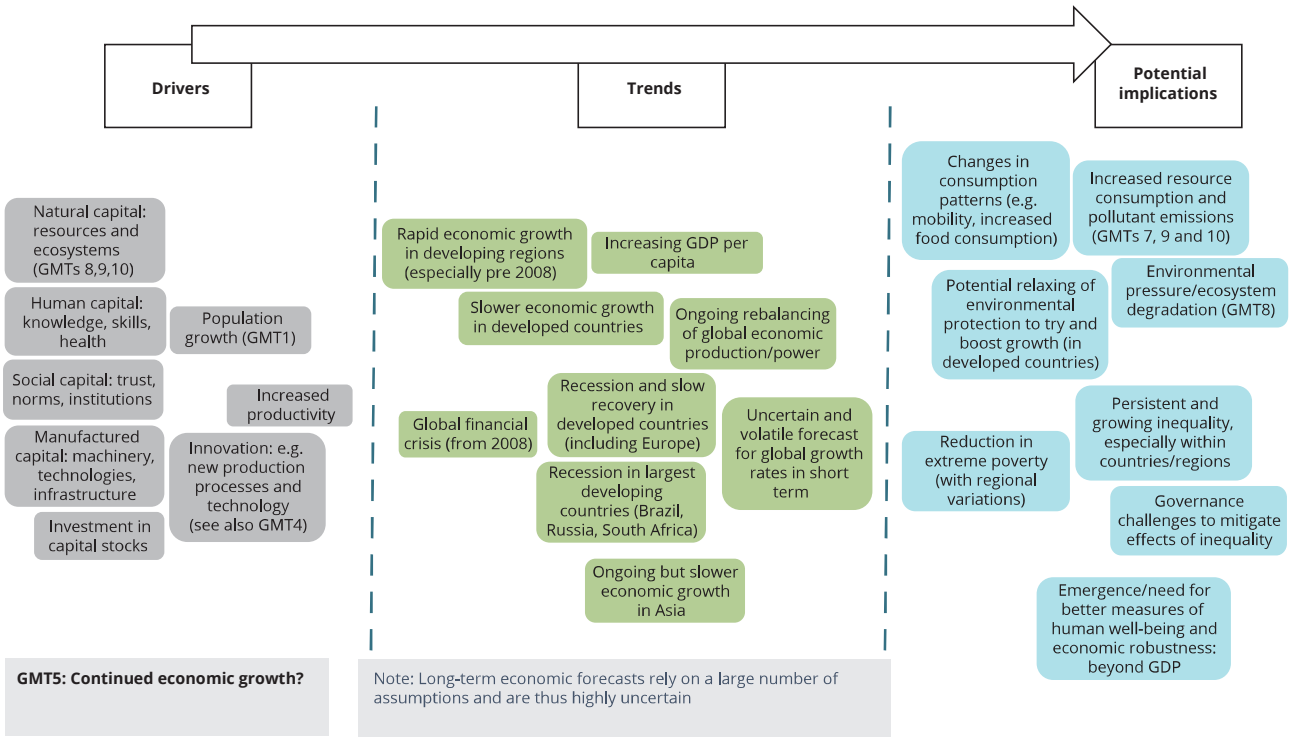


GMT 5: Continued economic growth?

The financial and economic downturn of 2008 and 2009 significantly reduced economic output in many developed countries, particularly in Europe. Although the impacts of the downturn are still felt across the world, virtually all mainstream outlook studies foresee economic expansion globally in the coming decades as Asia's and Africa's huge populations continue their shift towards Western patterns of production and consumption. The Organisation for Economic Co-operation and Development (OECD) projects that economic output will treble between 2010 and 2050, although growth is expected to decelerate in many countries as they become more prosperous.

The implications of this enormous increase in global economic output are numerous. Rapid growth has brought reductions in global poverty and increases in well-being, but it is also linked to growing inequality and escalating environmental pressures (addressed in GMTs 7–10). In Europe, a decrease in growth rate may put a strain on the public finances available for environmental protection and increase social inequality.

The negative environmental and social impacts associated with western consumption patterns have called into question prevailing models of development and the indicators that societies employ to quantify progress. In particular, the limitations of gross domestic product (GDP) as a measure of human well-being and the sustainability of growth have prompted international efforts to identify better measures.

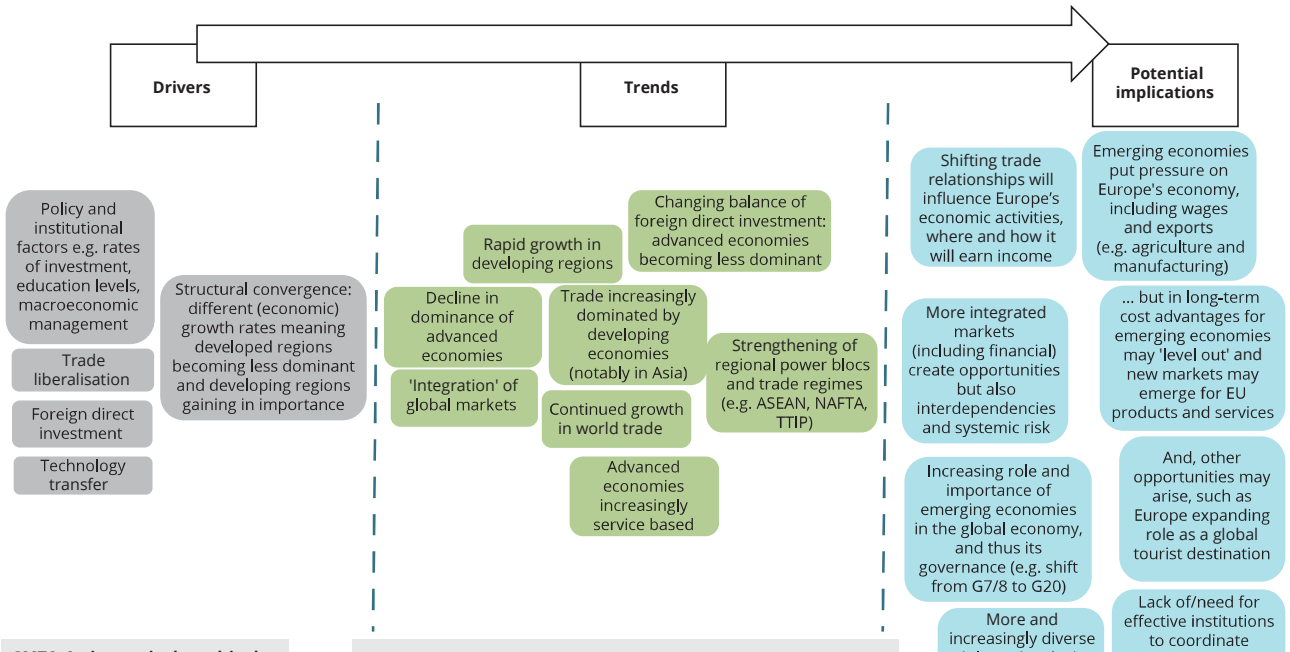


GMT 6: An increasingly multipolar world

Globally, economic power is shifting. During the 20th century, a relatively small number of countries, together accounting for about a fifth of the world population, have dominated global economic production and consumption. Today, a significant rebalancing of this power is under way.

Driven by structural change, fast-growing workforces and trade liberalisation, developing regions are rapidly increasing their share of global economic output, trade and investment. Economic and demographic projections suggest that the influence of today's wealthiest economies will continue to lessen as other countries and regional power blocs become increasingly important — economically, politically and diplomatically.

For Europe, this rebalancing presents competitive threats but also economic opportunities for meeting the demands of a fast-growing global middle class. The emergence of a larger and more diverse mixture of major economic powers may, however, complicate global efforts to coordinate governance, and growing economic interdependence will make it harder to manage the social and environmental impacts associated with globalised supply chains.



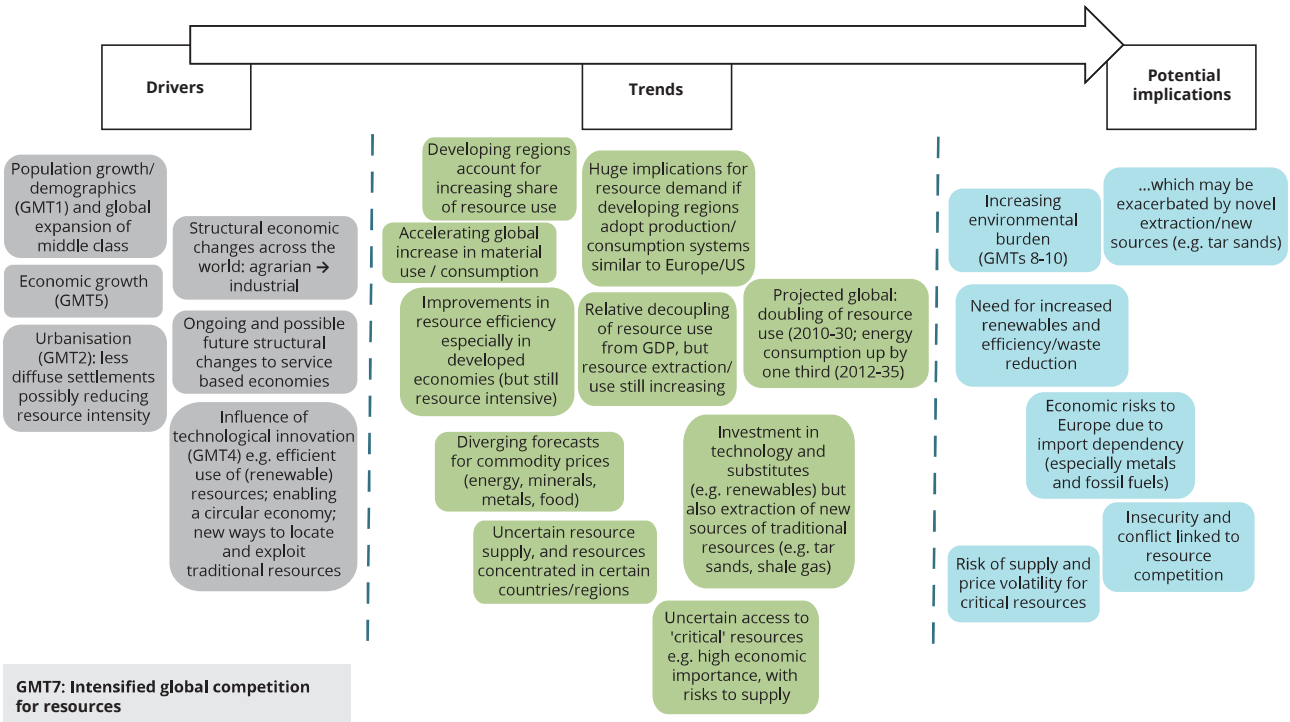
GMT6: An increasingly multipolar world

Note: There are many uncertainties in the shift to a more geographically balanced global economy e.g.: macroeconomic factors; changes in policy priorities; the impact of technological advances; socio-political development in developing countries

GMT 7: Intensified global competition for resources

As they grow, economies tend to use more resources — both renewable biological resources (see GMT 8) and non-renewable stocks of minerals, metals and fossil fuels. Industrial and technological developments, and changing consumption patterns associated with growing prosperity all contribute to this increase in demand. New technologies can create novel uses for resources and new ways to locate and exploit deposits, potentially increasing the burden on the environment. But innovations can also enable societies to reduce their use of finite and polluting resources and shift towards more sustainable alternatives.

The global use of material resources has increased 10-fold since 1900 and is set to double again by 2030, creating obvious risks. In addition to the environmental harm associated with resource extraction and exploitation, the world is a closed material system, and there are finite limits on the amounts of resources available. Even if resources are not scarce in absolute terms, they may be unevenly distributed globally, making access uncertain, increasing price volatility and potentially fostering conflict. Such concerns are particularly apparent with respect to a range of resources designated as 'critical raw materials'. For Europe, this is a major concern as its economy is structurally dependent on imports.



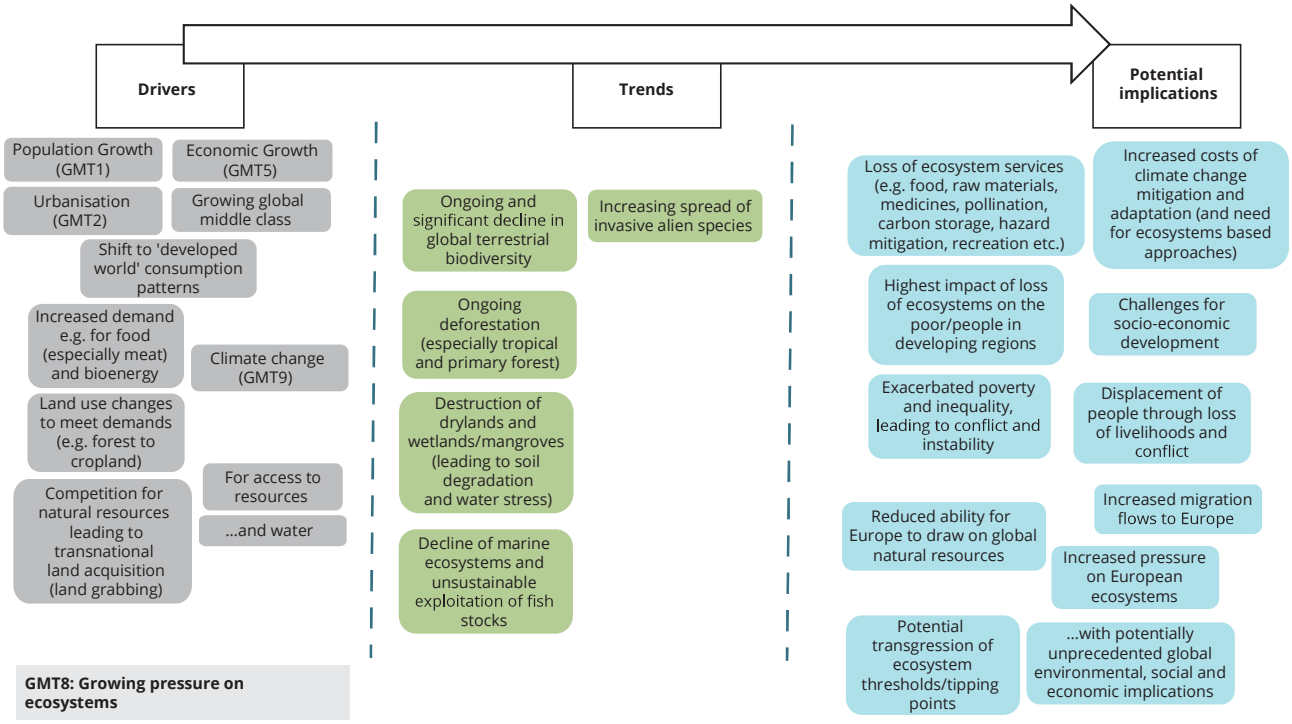
GMT7: Intensified global competition for resources

GMT 8: Growing pressure on ecosystems

Driven by global population growth and associated demands for food and energy, as well as evolving consumption patterns, the pressure on the Earth's ecosystems is continuously increasing. Despite some positive developments, such as a recent reduction in the rates of tropical deforestation, global biodiversity loss and ecosystem degradation are projected to increase.

Climate change is expected to exacerbate this trend by altering the environmental conditions to which species are adapted. In addition, the need to shift to alternative energy sources may create challenges for global land and freshwater resources, most notably related to increased bioenergy production.

Poor people in developing countries are expected to be those most strongly affected by the projected degradation of ecosystems and their life-supporting services. The sustainable management of ecosystems and socio-economic development are thus intertwined challenges. Continuing depletion of natural capital globally would not only increase pressure on European ecosystems, but also produce significant indirect effects, such as environment-induced migration.



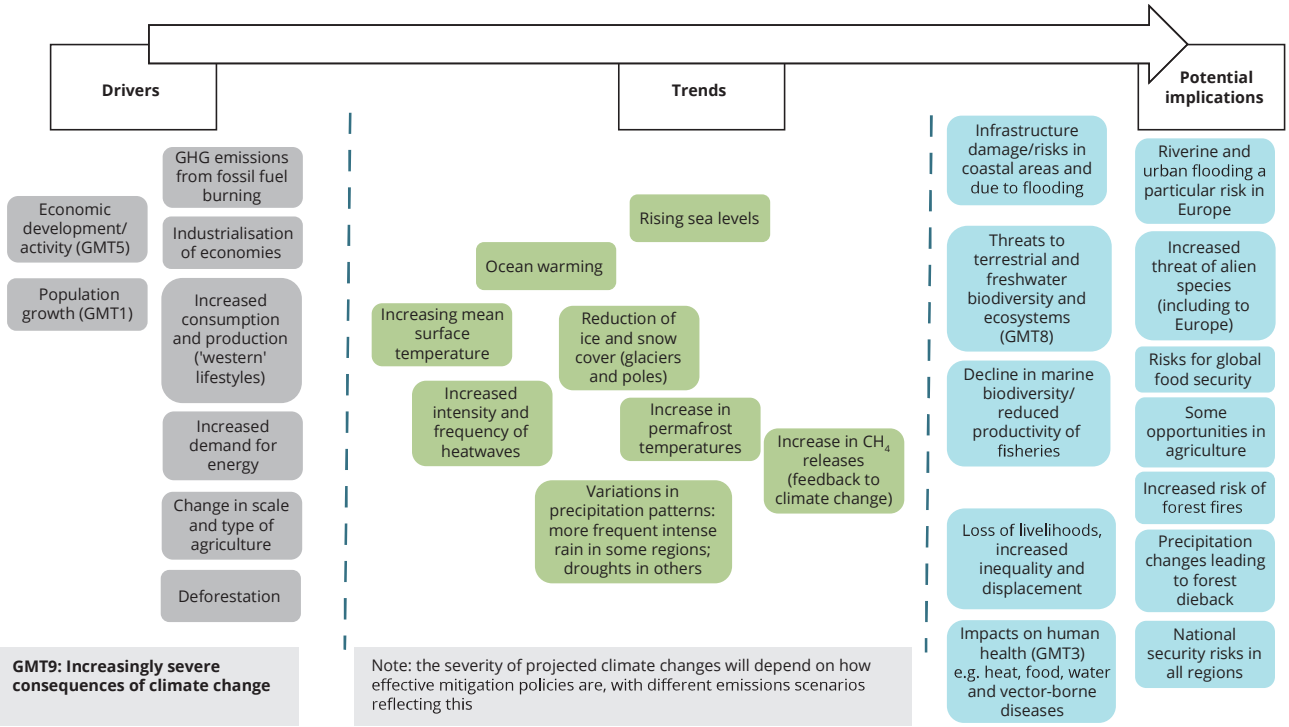
GMT 9: Increasingly severe consequences of climate change

In the past 150 years, the atmosphere and the oceans have warmed, snow and ice cover has decreased, sea levels have risen, and many extreme weather and climate events have become more frequent. This global warming and climate change are unprecedented over millennia.

The global mean temperature has increased by 0.85 °C since reliable measurements began in 1880 and is projected to increase further by the end of the 21st century — by between 1.0 °C, assuming strong emissions abatement, and 3.7 °C, assuming high emissions. This warming is expected to be accompanied by a global mean sea-level rise of up to 1 m, an increase of up to 2 °C in global upper-ocean temperature, a reduction of glaciers, ice sheets and sea ice, and an increase in the frequency of extreme weather events, such as droughts and floods, in many regions of the world.

Increasingly severe impacts of climate change are anticipated for the Earth's natural ecosystems, including substantial losses of biodiversity and increased rates of extinction. Of particular concern are ecosystems such as coral reefs, the Amazon forest and the boreal-tundra Arctic. Furthermore, climate change is likely to slow economic growth, erode global food security, increase global inequalities and adversely affect human health. These societal impacts are anticipated to be most severe in low-income countries and low-lying coastal areas.

Projected impacts directly affecting Europe include increased frequency of drought and water restrictions, increased damage as a result of flooding and increased impacts on human health from extreme temperatures.



GMT9: Increasingly severe consequences of climate change

Note: the severity of projected climate changes will depend on how effective mitigation policies are, with different emissions scenarios reflecting this

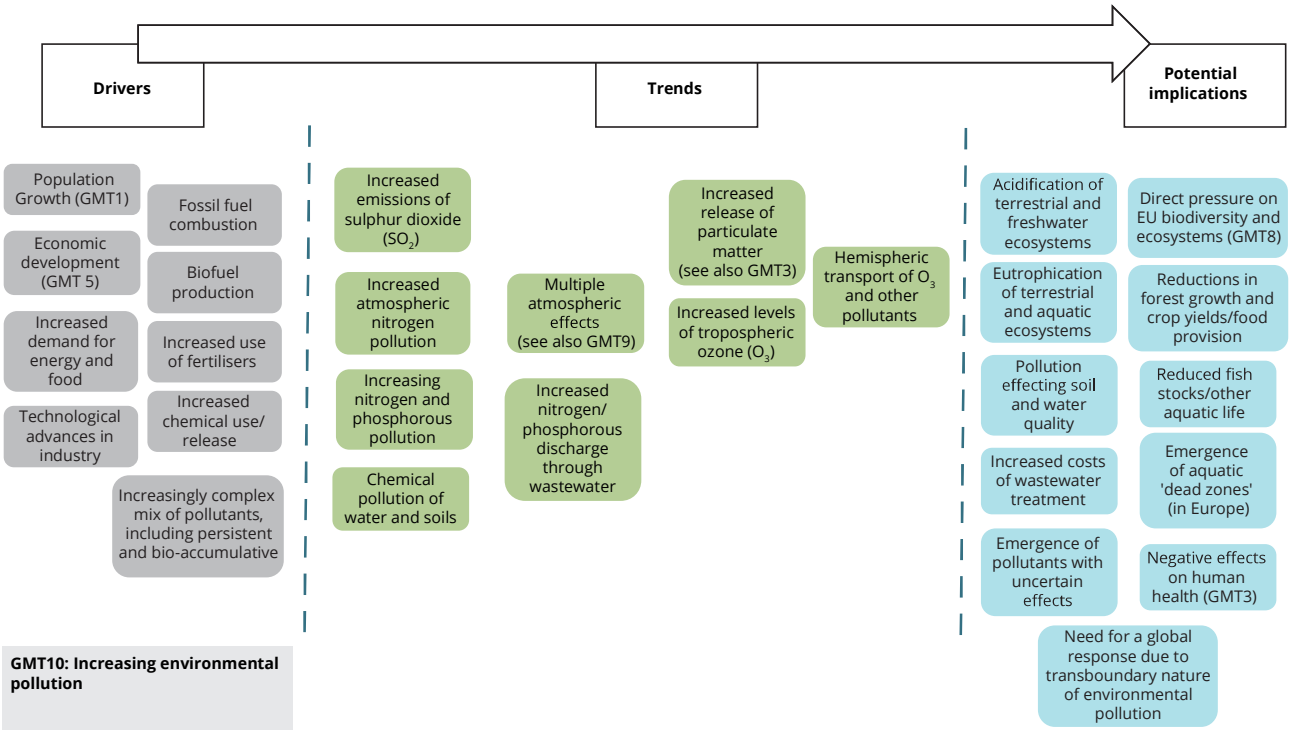
GMT 10: Increasing environmental pollution load

Across the world, ecosystems are exposed to critical levels of pollution in increasingly complex mixtures. Human activities (such as energy generation and agriculture), global population growth and changing consumption patterns are the key drivers behind this growing environmental burden.

Historic trends and business-as-usual projections suggest that, in the coming decades, pollution may reduce in some regions but could increase markedly in others. For example, emissions to air of nitrogen oxides, sulphur and tropospheric ozone are projected to decrease in Europe and North America but may increase significantly in Asia. The trends in Asia could, however, impact other world regions — including Europe — via the long-range transport of pollutants.

Nutrient effluents from agriculture and wastewater into the soil and oceans are projected to increase in most world regions, driven in part by the demand for increased agricultural production. The increasing complexity of chemical mixtures released into the environment is also a concern globally.

There is clear evidence of the detrimental effects of pollution on the natural environment, ecosystem services and biodiversity, for example through processes such as eutrophication and acidification. The number of marine dead zones due to eutrophication has increased markedly in recent years. Modelling suggests that, depending on crop type, between 3 % and 12 % of annual crop production is lost because of elevated ozone levels. Moreover, these rates may increase, particularly in Asia.



GMT 11: Diversifying approaches to governance

In the context of rapid globalisation, governments are facing a mismatch between the increasingly long-term, global, systemic challenges facing society and their more national and short-term focus and powers.

The need for more coordinated governance at the global scale has been reflected in the proliferation of international environmental agreements, particularly during the 1990s. More recently, businesses and civil society have also taken an increasing role in governance. This broadening of approaches is welcome but it gives rise to concerns about coordination and effectiveness, as well as accountability and transparency.