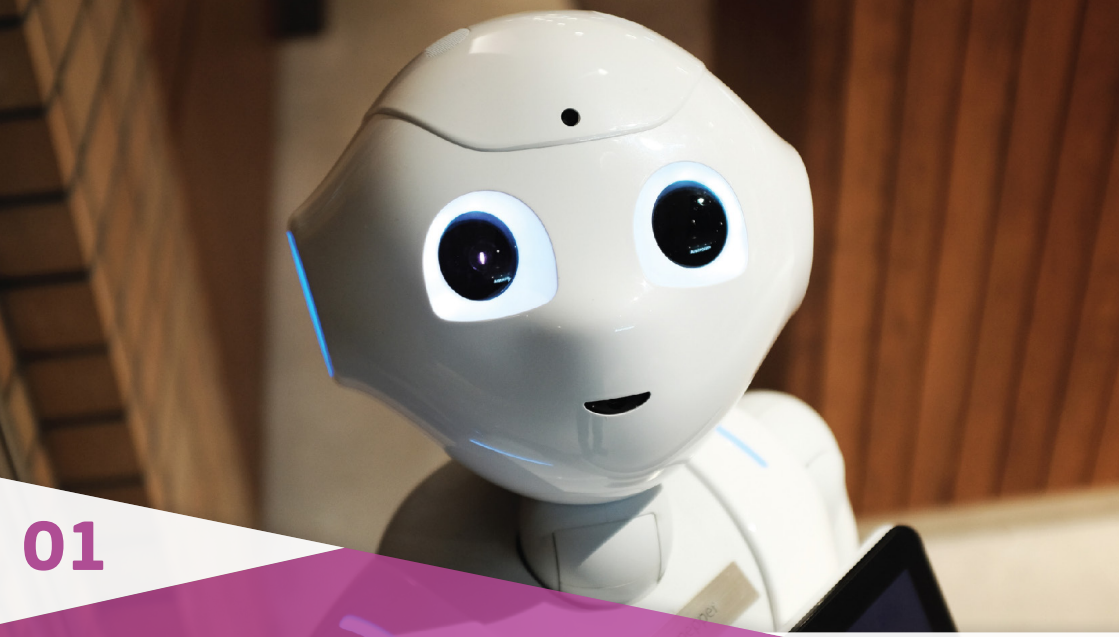

01

Accelerating technological change and hyperconnectivity

Accelerating technological change and hyperconnectivity

There is a growing impact of technology and digital connectivity on how we live, including how we communicate, socialize, work, produce and govern. 'Hyperconnectivity' refers to our interconnectedness with devices, computers and data - all connected through the internet, shaping a global society. The emergence of 'the metaverse' is presenting new realities. Rapid technological advancements, driven by artificial intelligence (AI), machine learning, robotics and the Internet of Things (IoT), is fuelling automation, productivity and economic opportunities, even in Space.

Regulation related to the development and use of technology is becoming a pressing challenge, for security, privacy and ethical reasons, especially in fields such as bioengineering and AI. Striking a balance between progress and societal well-being is crucial. Technology has become a geopolitical tool and there is a need to guarantee 'strategic autonomy' (i.e. independence) in critical technologies and materials. To achieve climate targets, technology is playing a key role in decarbonising industries, transportation and agriculture. New transportation methods and alternative fuel sources are emerging.


Alex Knight - unsplash.com

02

Aggravating resource scarcity

Aggravating resource scarcity

Population growth, industrialisation and urbanisation are driving a rising demand for food, water, energy and land, resulting in the scarcity and increased cost of natural resources. Humanity's well-being depends on healthy ecosystems that provide vital benefits, such as freshwater, pollination, climate regulation and hazard protection. Mineral resources – essential for industry, construction, and technology – are also in high demand. However, their limited availability, combined with geopolitical and environmental challenges related to their extraction, raises concern about future supply.

Humanity has reached a point where the limited resources on earth no longer meet growing demand. Planetary boundaries have been exceeded, threatening long-term human survival. Addressing resource scarcity requires effective resource management, sustainable practices and innovation. Ecosystem management and decreasing consumption in rich countries is urgently needed. Initiatives will have to ensure intergenerational fairness and global equity. The need to maintain a good quality of life and achieve a sustainable and just society in the face of the increasing pressure on resources is leading to calls for 'sufficiency' (having just enough to maintain a reasonable quality of life).

Olga Serjantu- unsplash.com

03

Changing nature of work

Changing nature of work

New generations entering the workforce and older generations working for longer are changing employment, career models and organisational structures. The transformational forces of technology and globalisation are affecting them too. Automation and technological advancements are creating challenges and opportunities, replacing routine tasks and increasing the demand for new skills. Upskilling and reskilling are becoming essential to address skills shortages. Automation can free up human workers to focus on more complex and creative tasks.

The COVID-19 pandemic has accelerated remote work, fostering flexibility and decentralisation. The shift in occupational structures (e.g. gig economy, project work), is leading to a polarisation in employment, wage disparities and inequalities. While workers gain autonomy, job security and benefits become concerns. The types of jobs that are predicted to grow in the EU by 2030 are those that require higher education, social and digital skills. The future of work emphasizes digital, green, and purposeful aspects. Employees are demanding that employers meet specific (sustainability) values. The reliance on labour tax to fund social protection is coming into question, as the working population in the EU ages.

Viacheslav Yakobchuk - Adobestock

04

Changing security paradigm

Changing security paradigm

The diversification of threats and the people behind them are generating new challenges for the defence and security communities, and to society as a whole. The COVID-19 pandemic, climate crises and war, have shifted societal focus towards security, defence capacities and NATO's role. International relations and political power positions and plays are changing, for e.g. increasingly trying to control energy resources, raw materials, aid policies, economic tools, data and cyberspace.

Rising media access and disinformation are contributing to a 'radicalisation of opinion'. Cyber and hybrid threats are increasing (i.e. the blending of conventional with political warfare), even using migrants, fake news and election intervention tactics. Advanced technologies such as drones, autonomous systems, armed robots and exoskeletons are transforming the battlefield, and shaping the arsenals of major powers (China, Russia and the US). There is an increase in unconventional weapon use. The EU can be a stronger, safer, leading global player by pooling resources and acting together to address these issues, and reducing industrial dependency on foreign countries.

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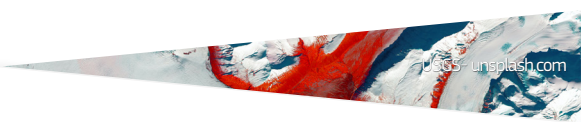
05

Climate change and environmental degradation

Climate change and environmental degradation

The climate would continue to change even if all of the emissions from human activities suddenly stopped. However without strong and immediate abatement (mitigation), greenhouse gas emissions will greatly further increase global warming and changing climate patterns, including extreme events such as heatwaves, storms, floods and fires. Pollution, consumption, resource exploitation and environmental degradation will lead to severe, pervasive and possibly irreversible changes for ecosystems, people, assets and economies around the world. That is why urgent environmental action is necessary – to reduce the harm, and to avoid the worst effects of climate change and environmental degradation.

Climate change adaptation is also necessary to reduce vulnerability to unavoidable negative impacts. Living inside 'planetary boundaries' (i.e. the environmental limits within which humanity can live safely) will require fundamental changes in the way we live, particularly in rich countries. A side effect of environmental action and increasing awareness is that established belief systems and behaviours (among citizens and businesses), are increasingly being challenging and reshaped.



06

Continuing urbanisation

Continuing urbanisation

People in search of better opportunities - such as jobs, services and education - have been moving from rural to urban areas across the world, and this accelerating trend is projected to continue. The number of people living in cities has more than doubled over the last 40 years and is projected to reach 5 billion by 2050. The COVID-19 pandemic led to an acceleration of on-going transformations in cities such as micro-mobility, online shopping and the digitalisation of (health and government) services. However, it also exacerbated social inequalities.

Urban concentration is linked to increased productivity (and 70% GDP), but it is also linked to challenges, such as environmental degradation, public health issues, housing problems and inequalities. Cities occupy approximately 2% of the total land, and are responsible for over 60% of energy consumption; they generate 70% of emissions, and 70% of global waste. Technologies are helping cities to better engage with citizens and address these challenges. Local governments are increasingly collaborating with communities and enabling platforms for them to gather and build local, 'people-based' solutions.

Thor Alvis - unsplash.com

07

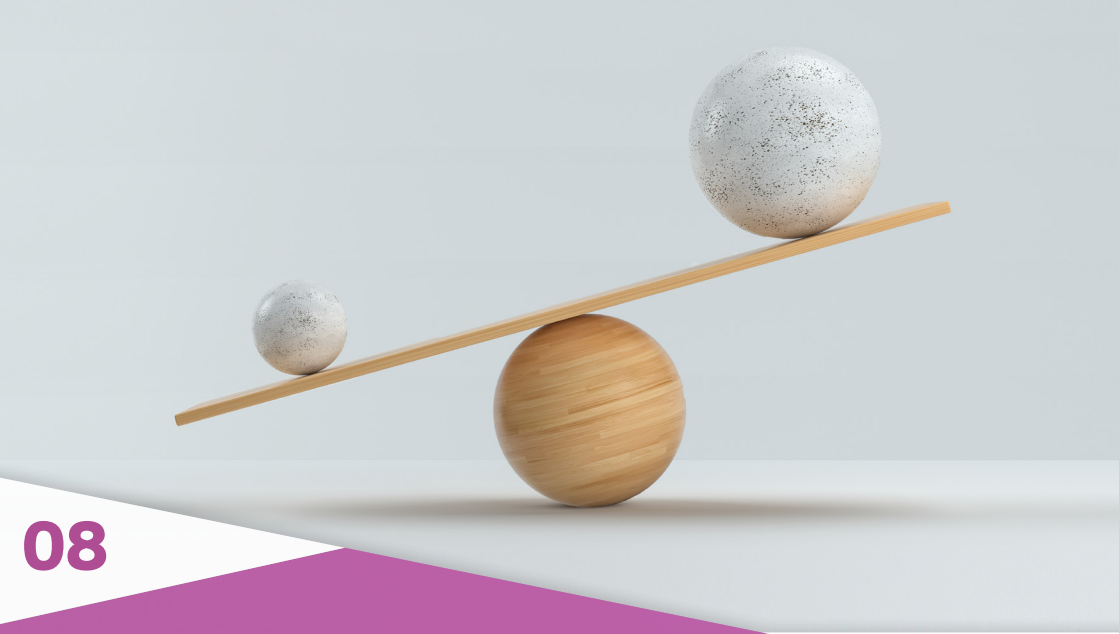
Diversification of education and learning

Diversification of education and learning

New generations, technology and hyperconnectivity are rapidly changing educational needs and the way education is delivered, for e.g. with digital tools and online platforms. New pedagogical (teaching) approaches, advances in cognitive sciences, the availability of information and an emphasis on lifelong and continuous learning are diversifying interests and ways of learning, as well as access to education. There is an emphasis on learner-centred and experiential learning, collaboration and critical thinking, the promotion of inclusivity and diversity, and the recognition of socio-emotional learning and well-being.

Teachers are increasingly doing different types of activities in their daily work. The historical link between education and school-based learning could weaken in the future, with informal and unstructured learning gaining more recognition. This could have revolutionary effects on the global education landscape (and future generations). New mind-sets will be needed to face a future shaped by escalating change, ecological and social challenges and accelerating innovation.

Matthieu Joannon - unsplash.com



08

Widening inequalities

Widening inequalities

Different types of inequalities in society are persistent and widening, despite efforts to address them and despite the progress in some areas. The number of people living in extreme poverty has decreased, but the gap between the wealthiest and poorest is expanding. Inequalities in education, the labour market and health are widening, and gender and territorial inequalities persist. Crucial for a prosperous society, outcomes are still being shaped by gender, age, ethnicity, social class, migration status and location. The pandemic exposed and exacerbated many inequalities too.

Alongside the uneven distribution of wealth and income, an inequality among the adverse effects of climate change is growing around the world. While urgent sustainability solutions are delivered, the 'green' transition will need to improve everyone's situation. Inequality is holding economic growth back and can threaten democracy and social cohesion if there is an unequal influence on setting the 'rules of the game'. More than ever before, there is a growing consensus that inequality is an urgent issue that should be at the top of policymakers' agenda.

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09

Expanding influence of East and South

Expanding influence of East and South

The shift of economic power from the established Western economies and Japan towards the emerging economies in the East and South is set to continue. China has already surpassed the USA as the largest economy, and Asia (China and India) are set to dominate the global economy, accounting for over 50% of its output by 2050. Indonesia and Brazil will be further 'winners' from the shrinking of Western economies. Africa is a continent in transformation and will become a larger player in the future global economy, with a huge free trade area and economic diversification.

Western economic sanctions against Russia, due to its invasion of Ukraine, are weakening its macroeconomic balance. Strategic autonomy (i.e. independence and freedom to act), populist nationalism and systemic failures of interdependent supply chains have led to a slowdown in the speed of globalisation, and its fragmentation. Globalisation will continue to be important, but will be more fragmented, based on strengthened trade within regional trade blocks and between like-minded partners – 'a multipolar world'.

10

Growing consumption

Growing consumption

Increasing consumer demand for goods and services is driven by factors such as population growth, rising incomes and changing lifestyles, but it brings sustainability challenges. By 2030, the global middle class, also termed the consumer class, is expected to reach 4.8 billion people - that is 1.3 billion more people with increased purchasing power than today. The rise of the middle class in emerging economies and the increase in business models targeting people at the 'bottom of the income pyramid', are collectively making consumption patterns an increasingly important force shaping global production systems, evident in various sectors (e.g. retail and entertainment).

Consumers are seeking convenience, personalization and unique experiences, leading to a surge in online shopping, subscription services and experiential offerings. Behaviour and choices matter and are changing, with trends towards sustainability, wellbeing and civic brands. Efforts to promote conscious consumption, such as minimalism and sufficiency, ethical sourcing, and eco-friendly products are gaining traction. Balancing consumption with sustainability and responsible choices is becoming increasingly important.

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11

Increasing demographic imbalances

Increasing demographic imbalances

Increasing demographic imbalances refer to the disparities and shifts in population distribution that are occurring globally and within regions. The world's population will reach 9.7 billion by 2050. It is projected to reach 10.9 billion by 2100, all in the context of decreasing fertility and mortality. The population is getting older and more urban. The ageing demographic shift presents challenges such as a shrinking workforce, increased healthcare and pension costs, and the need for age-friendly policies. Globally, demographic changes will be uneven across regions, with rapid growth concentrated mainly in Sub-Saharan Africa and a few other low-income countries. Stalled or even shrinking population numbers are projected for the majority of high-income countries beyond 2030.

Countries with a growing youth population have advantages to harness, but are challenged to make adequate human capital investment. They face pressure to provide education, to prevent poverty and unemployment, and face potential discontent and social unrest if they fail. Societal inequalities can translate to health risks or disparities on where to live. These factors influence birth and mortality rates and quality of life - which in turn can contribute to changes in demography.


Janko Ferlič + Curology - unsplash.com

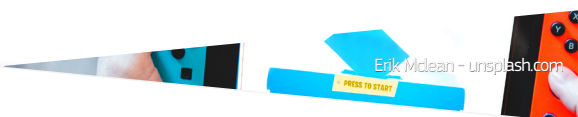
12

Increasing influence of new governing systems

Increasing influence of new governing systems

Governing systems around the world are multiplying and diversifying. Non-state actors, global conscientiousness, social media and the internationalisation of decision-making are forming new, multi-layered governing systems. The expanding influence of non-state actors, the rising interest in more participatory forms of governance, the decline of traditional media and the prominence of digital media platforms are forming new, multi-layered governing systems. They are reshaping traditional decision-making structures.

Despite increasingly innovative practices in governments, the digital transformation of governments, and the modernisation of public administration, a global decline of democracy is occurring worldwide. The use of digital technologies is altering the ways in which democracy functions. The pervasiveness of digital technologies is leading to an increase in automated decision-making, with in-built fairness, accountability, transparency and ethical biases, thereby impacting human rights. The appeal to emotions and personal beliefs is becoming more influential than objective facts. Increasing polarisation in society poses a risk for democratic systems and institutions.



Erik Mclean - unsplash.com

13

Increasing significance of migration

Increasing significance of migration

The societal and political significance of migration has increased, and its dynamics have become more complex in an interconnected world. Governing migration remains a pressing global and EU challenge. Reasons for migration include differences in opportunities between countries, levels of security, and existing networks, i.e. other migrants from the same origin country. Migrants often send needed financial support to their countries of origin.

In 2020, an estimated 281 million people were living outside their country of birth, i.e. 3.6 % of the world. This number is almost twice as high as it was in 1990. This reflects that the global population has increased and that the share of people who migrate remains a small minority, although it is increasing - up from 2.8% in 1990. The global stock of international migrants includes not only migrants who move voluntarily, but also 34 million people displaced across borders, such as refugees and asylum-seekers. More recently, the Russian invasion in Ukraine has provoked the largest and fastest displacement of people in post-war Europe, with over 6 million people displaced in the EU by June 2023.

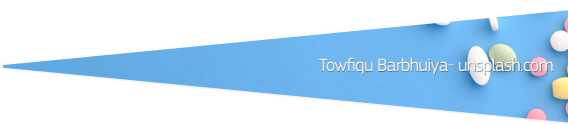
14

Shifting health challenges

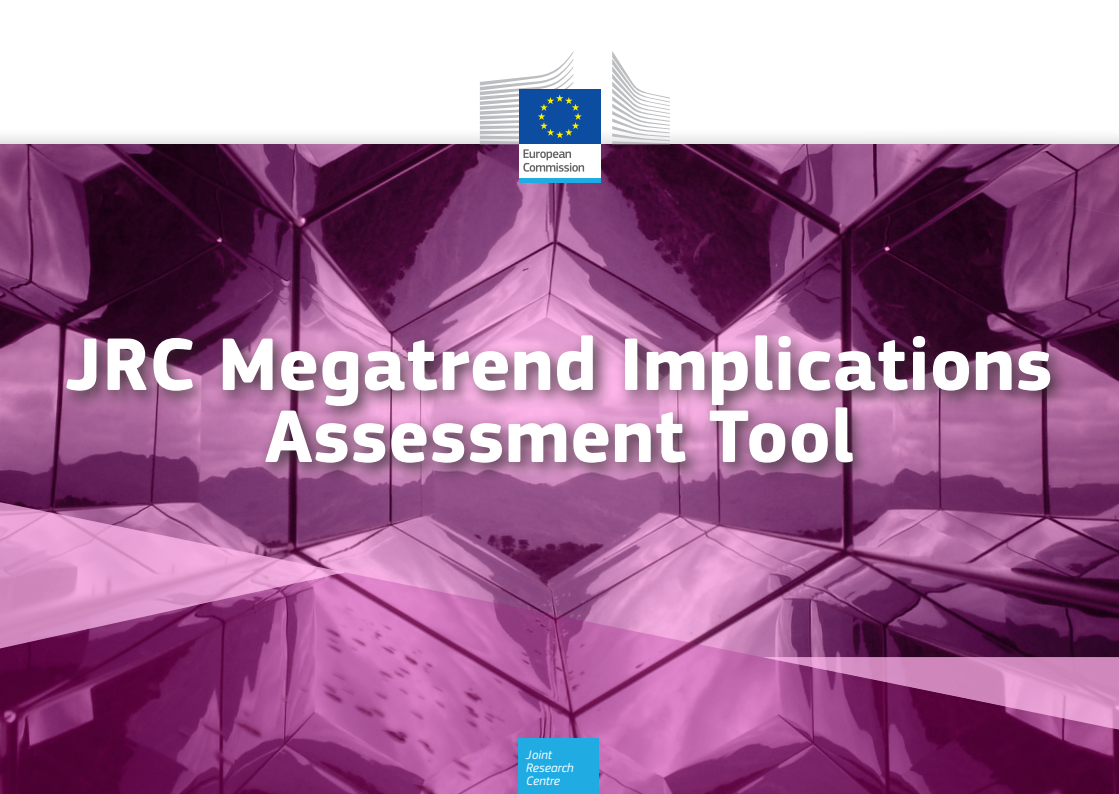
Shifting health challenges

There is increasing realisation that health is a multifactorial outcome with strong causal links to the environment in which humans and animals live. Factors in nature and society that support health, include food and water, a clean and healthy environment, behaviour, access to art and access to health-supporting systems. Science and better living standards have reduced infectious diseases, and advancements in technology, medicine, genetics and microbiomes are transforming health outcomes, but unhealthy lifestyles, pollution, age and anthropogenic causes are turning into health burdens.

In developed countries in particular, non-communicable diseases (NCDs) (e.g. cardiovascular disease and cancer) are major morbidity and mortality causes. Obesity is becoming a global health issue, while the challenge of malnutrition remains. Antimicrobial resistance is one of the top health threats, mental health challenges are rising and new 'zoonoses' (i.e. infections that jump to humans from an animal) are an ever-present risk to global health. At the same time, 'lessons learned' from the COVID-19 pandemic, biotechnology advances, personalised medicine and e-health approaches, all bring opportunities.



Towfiqu Barbhuiya- unsplash.com


European Commission
JRC Megatrend Implications Assessment Tool
Joint Research Centre

Megatrends are key drivers of change that significantly affect all policy areas. They are 'long-term driving forces' that we can see and that will have a significant influence on the long term future. The JRC monitors the development of 14 megatrends relevant for the future of the EU. These are: 'Accelerating technological change and hyperconnectivity'; 'Aggravating resource scarcity'; Changing nature of work'; 'Changing security paradigm'; 'Climate change and environmental degradation'; 'Continuing urbanisation'; 'Diversification of education and learning'; 'Widening inequalities'; 'Expanding influence of East and South'; 'Growing consumption'; 'Increasing demographic imbalances'; 'Increasing influence of new governing systems'; 'Increasing significance of migration'; 'Shifting health challenges'.

Megatrends analysis is Foresight work. The Competence Centre on Foresight has developed a tailored workshop for megatrend analysis: we call it the 'Policy Implications Assessment Tool'. It is used in Better Regulation (tool #20 Foresight). Megatrends should not be examined in isolation, because of the interdependencies between them. The set of 14 megatrends provides a framework to look at trend developments and analyse potential future implications in a systemic way.

Steps: 1) Mapping of megatrends; 2) Long-term developments and consequences for issue at stake; 3) Implications for policy; 4) New policy options.

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