Global megatrends

Shaping the future of societies, economies, and values

COPENHAGEN
INSTITUTE
FOR FUTURES
STUDIES

Megatrends are high-level drivers of change that will greatly impact societies in the decades to come. They are massive in scale and their effects are felt across the globe. In a principally unpredictable world, these trends stand out as the only relative certainty we have. This publication explores 15 megatrends that will shape the world and illustrates how megatrends can be used practically in the context of future-proofing organisational strategy.

SCENARIO reports

Global megatrends

Shaping the future of societies, economies, and values

PHOTO: RICARDO ESQUIVEL

Content

Introduction. Futurists will make a point of telling you that the future can never be predicted, that it always contains multiple plausible outcomes, and that any attempt at guesswork is misguided at best and foolish at worst.

While that is true to some extent, not all aspects of the future are equally unpredictable. There are, for instance, relatively stable forces at work that play a huge role of determining outcomes. We can anticipate them, but we can do little to affect them. Take Moore's Law, which assumes that the number of transistors in a computer chip doubles about every two years. It is often pointed to as an example of predictability in the evolution of computers, and although the law may be reaching its material limits soon, it has held true more or less since it was proposed in 1975 and has profoundly shaped technological development.

On a grander scale, 'megatrends' play a similar role. The term was first coined in 1982 by futurist John Naisbitt as a popularisation of a concept previously explored by military strategist and futurist Herman Kahn in the 1970s: high-level drivers of change that will greatly impact the future of societies globally in the decades to come. Due to their massive scale and impact, megatrends are often interconnected, and they have a lifetime stretching at least 10-15 years into the future. In a principally unpredictable world, these trends stand out as the only relative certainty we have.

Yet tracking the historical development of any megatrend will show you that they do not unfold in a linear fashion, but more often in starts and stops. Take globalisation (one of the 15 megatrends covered in this publication) as an example. When we take the long view, globalisation – the process by

which the world is becoming increasingly connected through trade, migration, technology, and culture – appears to be a stable trend existing throughout much of modern history. Yet in certain periods it has been slowed down, or even reverted, through events set in motion by powerful actors. Wars, embargoes, isolationism, and trade disputes are examples. However, despite temporary setbacks like these, the world has undoubtedly become a more globalised place over the last decades and centuries due to a range of compounding factors that single individuals, governments, or nations have no control over – including growing migration, improved global infrastructure, and innovations in communications technology.

The interplay between stable trends and the more unstable forces of change (typically ones that have to do with human decision making) determine the future. In this fluid dance between agency and structure, megatrends only tell us part of the story, but they provide an important vantage point for working with the future in an informed way. Megatrend analysis is an essential part of the futurist toolbox and integral to foresight work and scenario planning, and it has been central to how we work at the Copenhagen Institute for Futures Studies for decades. Yet knowing and understanding the trajectories of megatrends is not only essential for futurists; it is crucial for any decision maker seeking to make more future-informed decisions in an increasingly complex world.

In this publication, we explore 15 megatrends that will shape the world in the decades to come while also illustrating how megatrends can be used practically in the context of future-proofing organisational strategy.

We hope you will enjoy reading it.

Trend ecosystems – a holistic approach

The trends that shape the future are all interconnected and interdependent, with different time horizons and level of impact. They form a complex weave, where pulling one thread may change the details of the overall tapestry. Trends also blend into one another, making it difficult to separate one from another. These complexities, and the uncertainties contained in them, are what make foresight and strategic planning difficult.

To make working with the future practical, it is necessary to work all these complex, interwoven trends into a simpler model that is easy to grasp, at the cost of some loss of accuracy – just as a roadmap is a simplified model of the landscape, yet much easier to navigate by than a more accurate satellite photo. We call the model we work with here a trend hierarchy, with trends sorted in layers according to how broad reaching and long-term they are. Such a hierarchy is necessarily a fiction; in reality, there is no clear dividing line between the layers,

just as there is no clear definition of when a settlement on a roadmap becomes a village, a town or a city: this is just decided by arbitrary criteria.

At the top of this hierarchy, we have the 15 megatrends presented in this report, sorted into four broad groupings for the sake of clarity. Just as there are many ways to slice a cake, there are many ways to group trends into megatrends, and other futurists and organisations have chosen to do so differently; the European Commission, for instance, operates with 14 ungrouped megatrends, some like and some unlike the 15 we present here.[1] Neither approach is more correct than the other; they are just different ways to make the trend complexity manageable. The 15 megatrends are aggregate trends, in the sense that each megatrend consists of many trends that point in the same general direction while not being wholly parallel. The process of outlining and defining the 15 megatrends began with a long list of more than a hundred 'lesser' trends, which were merged and grouped into megatrends. Many such groupings were discussed and rejected during the process, until the 15 presented here were settled on.

1 European Commission: "The Megatrends Hub", bit.ly/3K0WctA.

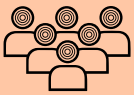
An important criterion for selection was that each megatrend should have a clear trajectory moving forward. For some megatrends, like Population Growth, this trajectory is easily quantifiable, while for others, like Individualisation & Empowerment, it is difficult to find a single objective, quantifiable measure for progress, and we have instead relied on qualified assessments based on observations of the lesser trends that make up the megatrend. We call these key trends, and we list some of them for each megatrend. Whereas megatrends must be broad enough to have global effect, for the long term, key trends have narrower scope or impact and may be shorter lived. As time passes, some key trends may end while new ones emerge, and the exact list of key trends that make up a megatrend will change accordingly without changing the overall trajectory of the megatrend. From an organisation point of view, whether you want to examine the individual key trends in your strategic planning, rather than just the megatrends, depends on the level of detail your analysis calls for.

Below key trends, there exist an uncounted range of narrower trends that only affect certain regions or industries yet remain important when considering these regions or industries. These trends may even run counter to a megatrend. For instance, while Population Growth is a strong megatrend globally at least until the middle of the century, major countries like Germany can look forward to significant population decline in this same period. We call these narrower trends *local* or *business* trends. They lie beyond the scope of this report. ■

Global megatrends

WORLD

Globalisation
The world is growing closer together. With globalisation comes both opportunities and risks, and regional issues or challenges quickly become global in scope.



Population Growth
The world population will see an explosive growth throughout the 21st century and is expected by the UN to peak at 11 billion in 2100.

Environmental Change & Sustainability
Climate change carries key risks for ecosystems and cultures. The push for sustainability seeks a mutually beneficial balance between human activity and the environment.

PEOPLE & SOCIETY

An Ageing World
A combination of improved longevity, improved health at old age, and declining birth rates is causing the world population to age. As the world grows older, societies will change, and new consumption patterns will arise.

Individualisation & Empowerment
Networks of empowered individuals form new communities in both physical and digital realms, giving rise to a pluralisation of ways of living and working.

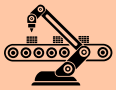
Focus on Health
With a growing understanding of how genetics and lifestyle influence health, coupled with new technologies enabling a more preventive rather than reactive approach, we may see a greater personalisation of health in the future.

Urbanisation
In the future, urban areas will be much larger, more complex, and interconnected than today. It is in cities that the global challenges of our century will need to be solved.

TECHNOLOGY & SCIENCE

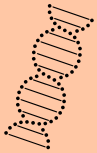
AI & Automation

Advances in artificial intelligence and robotics will change not only how we work in the future, but also how we live, how we learn, and how we entertain ourselves.



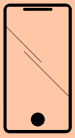
Biotech Revolution

Biotechnology will likely be as important in the next half century as computers have been in the previous half century. With biotech comes the ability to manipulate genes, create new forms of life, and connect human and machine at previously unseen levels.



Greater Interconnectedness

The number of internet-connected devices in the world far exceeds the number of people. These devices help improve the quality of the products and services we depend on while also giving rise to issues related to loss of privacy and abuse of personal data.



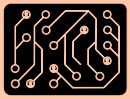
Engineering Advances

New materials, new energy sources, better production processes, and improved product designs will change our lives in the decades to come while also playing a major role in combating climate change and environmental damage.

ECONOMY

Network Economy

The ongoing digitalisation of society gives rise to new peer-to-peer processes and the creation of value in decentralised networks that rely on flat hierarchies and collaboration, and which operate both on local and global scales.

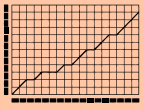


Service Economy

The evolution of the service economy gives rise of the platform business model and growing ‘servitisation’ – the erosion of old divisions between products and services in favour of a service-product continuum, where ‘solutions’ that combine the two are what’s on offer to businesses and consumers.

Economic Growth

Most individuals alive today are significantly better off than their ancestors when measured economically. While the historical benefits of economic growth are clear, its future trajectories are much less certain.



Concentration of Wealth

While global inequality between countries has declined, income and wealth inequality within countries are growing in many parts of the world, with more and more wealth being concentrated in the hands of fewer and fewer people.

PART 1

World

Globalisation

Population Growth

Environmental Change & Sustainability

GLOBALISATION

PHOTO:
NEW YORK PUBLIC LIBRARY

KEY TRENDS

- Cultural convergence
- Globalisation of conflicts
- Improved global infrastructure
- Growing migration
- Erosion of national boundaries
- Growth of developing countries
- Growth of global middle class
- Towards a multipolar world

The world is growing smaller – or so it seems. Global travel, trade, and communication is increasing in volume and speed. Events in one corner of the world can influence the rest of the world within days, even hours. Cultural trends reach across the globe, and more people feel like citizens of the world rather than one nation or state. With globalisation comes both opportunities and threats, and regional issues or challenges quickly become global in scope.

On the surface, it might seem that the world has become *less* rather than *more* globalised in recent years. The UK has left the European Union, a trade war between USA and China is ongoing, geopolitical tensions between Russia and the West are increasing, and we see an international populist backlash against free trade agreements. Most recently, a devastating global pandemic has forced the closing of borders worldwide.

Yet in spite of this short-term turbulence, it is almost unthinkable that globalisation – the process of deepening entanglement between peoples, nations and communities across regions and the world – will not continue in the future, giving rise to greater complexity and a more varied and complicated risk landscape, where existing and emerging challenges will require a unitary response. The failures to contain the Covid-19 virus geographically has shown how regional challenges can quickly become global in scope and that with greater interconnectedness also comes greater potential fragility. This is also true in the digital realm where the explosion in social media use, the rapid adoption of digital services, and the continued growth of e-commerce have become engines of global connectedness.

Taking the long view, we can also expect international migration to continue growing in terms of its share of world population. With increasing migration flows comes growing ethnic and cultural pluralism in the demographic make-up of the host countries. Additionally, according to the UN, climate change could lead to a great increase in environmental migration toward 2050 – between 25 million and 1 billion worldwide. Adding to this, the continuous and growing flows of labour, knowledge, science and technology, information, languages, and travel will continue to power global integration as well, although perhaps in different ways than we have been used to in the last half century. While the past decades of globalisation have had a decidedly Western flavour, we may see this century being shaped multilaterally or possibly dominated by different cultures and value sets, giving way to growing economic, political, and cultural influence wielded by the heavyweights of the Global South. Consider, for instance, what the recent and global success of companies like Alibaba, Huawei, Tik Tok, and Samsung, or of cultural exports like *Squid Game* and K-pop might tell us about the future of globalisation.

RISE OF THE GLOBAL SOUTH – A SHIFTING WORLD ORDER?

Depending on the broadness of the definition, globalisation can be tracked as far back in history as humans have traded, migrated and exchanged knowledge,

'It has been said that arguing against globalisation is like arguing against the laws of gravity.'

– Kofi Annan, former Secretary-General of the UN

practices, and culture across regions. Some common historical focal points include the Greek Hellenistic age, the Islamic Golden Age, the Silk Road Trade, and the rise of the European maritime empires. The most recent phase in global integration began after WW2 and is characterised by a Western-led focus on economic integration, liberalisation, and free trade. The legacy of this era is all around us. The G7, some forty years after its inception, is still made up of Canada, France, Germany, Italy, Japan, the United Kingdom and the United States. By 2020s standards, this is hardly the most reflective list of the most influential economies in the world. The most glaring omissions are China and India, which are home to one in every three people in the world. Economic forecasts assess that the seven greatest economies in 2050 – the true G7 – will be (in order) China, USA, India, Indonesia, Germany, Japan and Brazil; a list dominated by the Global South.[1]

Growing South-South cooperation has the potential to reshape global development and shift the impetus of globalisation away from its Western centre of gravity. China, the most populous, wealthy, and influential member of the Global South, is contributing to this shift by forging new ties with developing nations across Eurasia, in Africa, and in Latin America in the form of loans, aid, and investments. A linchpin of these efforts is the 'Belt and Road' initiative, a cross-continental infrastructure development strategy spanning 70 countries. With this deepening economic cooperation also comes a strengthening of political ties and the eventual rise of a new, multipolar geopolitical world order, perhaps marking a break from the Western-defined model that has dominated international geopolitics and economics for 70 years. A major question for the future is if this global power shift will lead to a more stable and peaceful world, or one that is more fraught with inter-regional confrontation and international great power rivalry. In any case, we are likely to see power struggles play out institutionally in the decades to come.

1 Tom Orlik and Bjorn Van Roye: "An Economist's Guide to the World in 2050", Bloomberg (2021), bloom.bg/3L9OvlB.

2 Mejie Jiang ( ): "Chinese Relations with the Global South: evidences from Latin America", Revistaidees (2021), bit.ly/3GKmDI9.

CASE STUDY: Africa rising

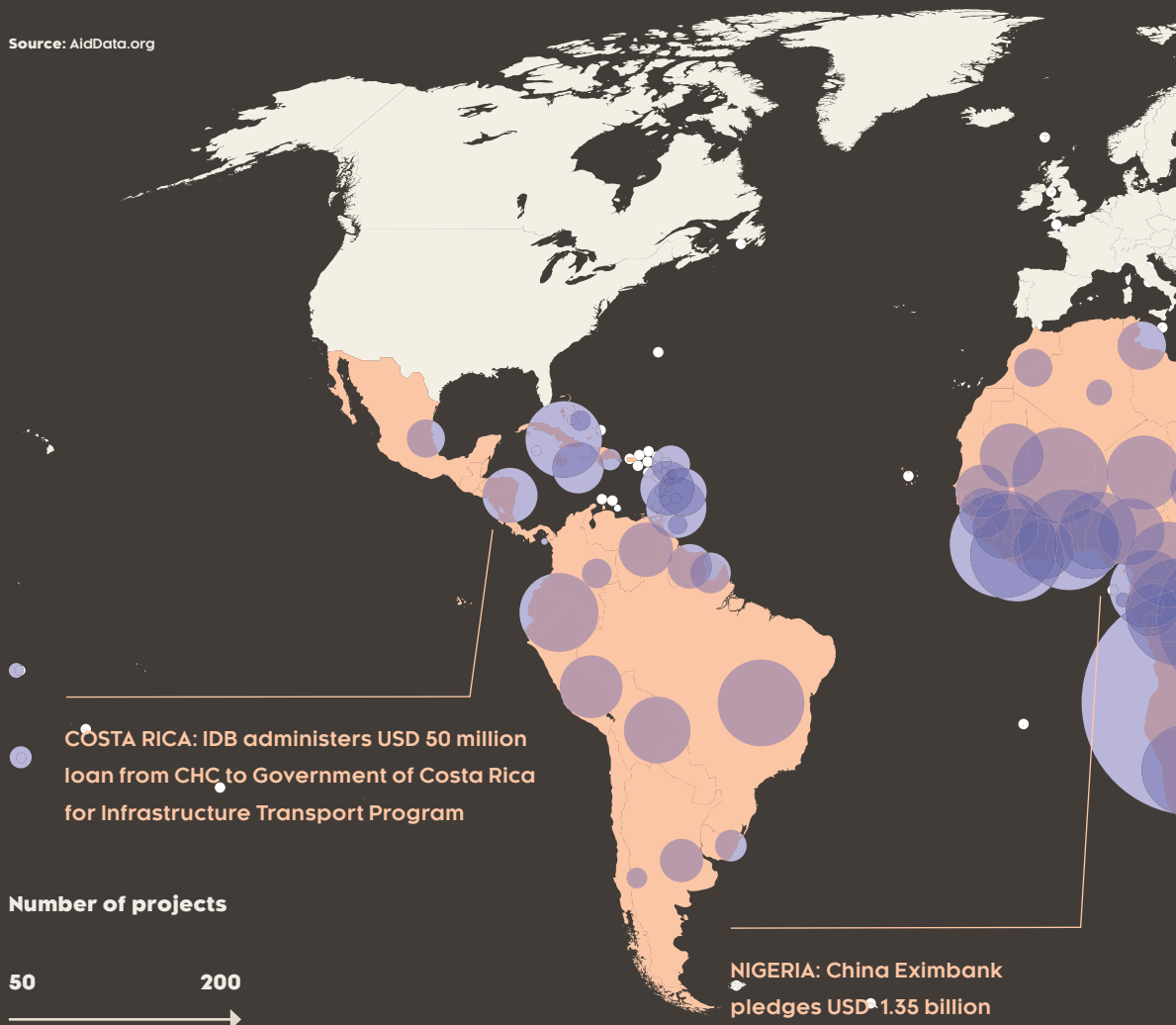
CIFS contributed to "Africa Migration Report: Challenging the Narrative" published by the International Organization for Migration (IOM) a UN organisation. The publication sought to dispel the myriad of persisting misconceptions, myths and fears around migration in Africa. CIFS's contribution to the report presented three explorative scenarios for the future of Africa by 2050. ■

PHOTO: ADEDIRE ABIODUN

Mapping China's global development footprint

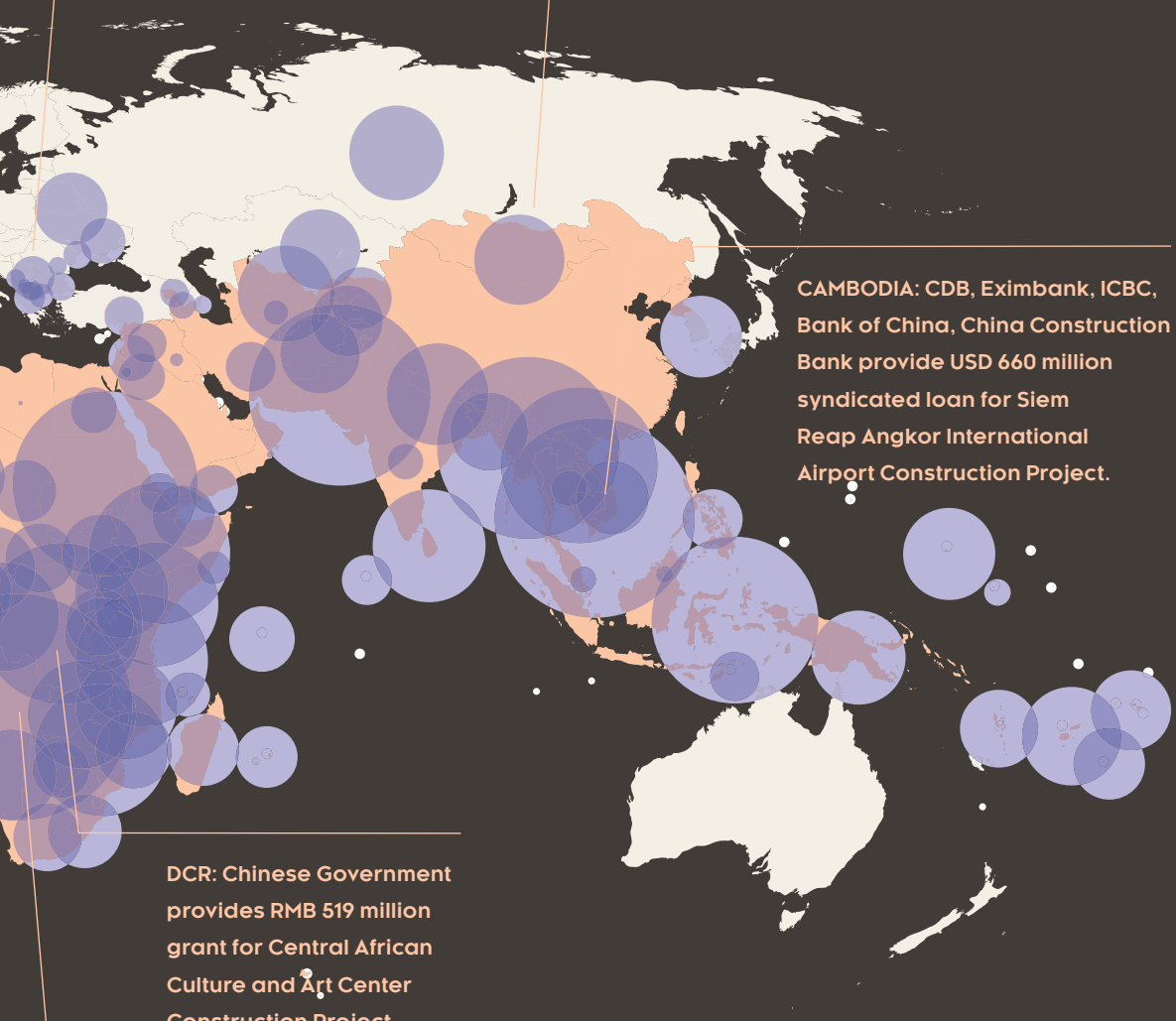
Out of the 13,427 development projects financed by Chinese government institutions and state-owned entities between 2000-2017, the vast majority are found in the Global South.

Source: AidData.org



BOSNIA AND HERZEGOVINA: China Eximbank provides EUR 613.99 million buyer's credit loan for 450MW Tuzla Thermal Power Plant Unit 7 Project.

KAZAKHSTAN: Chinese Government provides USD 17.2 million for the Chukurbulak Dam Construction Project on the Khorgos River.



CAMBODIA: CDB, Eximbank, ICBC, Bank of China, China Construction Bank provide USD 660 million syndicated loan for Siem Reap Angkor International Airport Construction Project.

DCR: Chinese Government provides RMB 519 million grant for Central African Culture and Art Center Construction Project

ANGOLA: CDB provides 28 million loan for Malanje River Dredging Project

IDB: Inter-American Development Bank
CDB: China Development Bank
ICBC: Industrial and Commercial Bank of China
RMB: Renminbi
CHC: China Co-Financing Fund for Latin America and the Caribbean

POPULATION GROWTH

A megatrend with an expiration date, global population growth has been on an explosive rise since the early 1900s and is expected to continue for at least five decades before plateauing sometime in the late 21st century. Almost all future population growth will take place in the Global South, especially Africa, which means that the global population distribution will fundamentally shift in the coming decades.

PHOTO:
MUHAMMADTAHA IBRAHIM

KEY TRENDS

- Growing global population
- Growing urban population
- Food security issues
- Population pressure on borders

'Let's just take a simple fact that between the birth of Christ and the landing of the Mayflower, the population of the Earth doubled. It rose from 250 million to probably 500 million. Today, the population of the Earth is rising at such a rate that it will double in half a century.'

– Aldous Huxley, writer

In the early 20th century, the world population began an unprecedented, rapid, and seemingly unstoppable growth, which has continued to this day. Although the annual growth rate peaked at 2.1% in 1968 and has since declined, the combination of high fertility, rising life expectancy, and declining child/infant mortality – especially in the Global South – continues to push the world population up. The world population is expected to peak at around 11 billion by 2100, after which it will flatten or even decline; this makes population growth one of the few megatrends with an expected expiration date.[1]

Although the fact that we will see sustained population growth throughout the 21st century is undisputed, it should be noted that projections are fraught with uncertainty. Several research groups have forecast population growth trajectories that vary significantly from those of the UN. Some forecasts assess that global population will peak at 9.7 billion as soon as 2070, after which it will start declining.[2] Many of the inconsistencies stem from the fact that it is difficult to project future changes in fertility, which may be impacted by political action to limit or boost national population growth, as seen in the past in countries like China and Singapore – not to mention disagreements over the current size of the world population. Nonetheless, sustained population growth over the next half century is almost certain and the global population distribution will change fundamentally.

Almost the entire net population increase is expected to take place in Africa, with a population forecast to grow from 1.3 billion today to around 2.5 billion in 2050 and 4.3 billion by 2100, with the continent's largest cities growing to above 80 million residents. India's population is expected to grow by a quarter billion towards 2060, after which it is expected to decline as rapidly as it has grown. The Chinese population is expected to peak as soon as 2035 and then decline to a little over 1 billion by 2100 while the European population is forecast to decline from 750 million today to 715 million by 2050 and 630 million by 2100. This will shift the global population heavily towards the Global South, excluding China. The only major Western country with a significant expected population growth is the United States, which is forecast to grow from 330 million in 2020 to 430 million by 2100.[3]

A major question is if global food resources can keep up with the growth in world population and – if it can – whether the food will be distributed to where it is needed. In combination with crop and farmland damage from environmental change, a worst-case scenario of global population growth is that it may lead to major famine disasters in countries with rapid growth, with populations

1 Max Roser et al.: "World Population Growth", Our World in Data (2019), bit.ly/3FW6M2l.

2 David Adam: "How Far Will Global Population Rise? Researchers Can't Agree", Nature (2021), go.nature.com/3eTUPys.

3 UN: "World Population Prospects" (2019), population.un.org/wpp/.

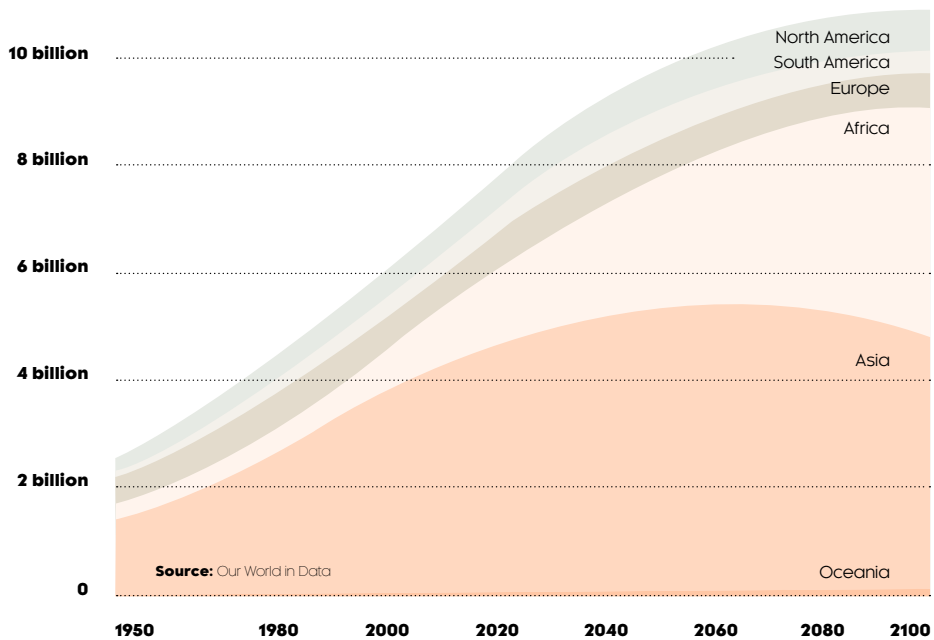
putting pressure on the borders of neighbouring regions that experience population decline. A growing world population also means growing pressure on other resources, including energy and fresh water; pressures that may in turn exacerbate environmental change.

CASE STUDY: Megatrend-driven investment

Population growth and the growth of the global middle class is pushing up demand for food. However, productivity growth is not following suit. This might pose a significant problem in the future. High increase in food prices may spill over, creating social unrest as we saw during the Arab Spring and many other countries that did not get similar headlines. Lack of stability will likewise spill over into the financial market, increasing risk and reducing foreign direct investment. CIFS worked for an investment firm looking at how trends like population growth could affect their market. The purpose of the collaboration, which included megatrend analysis and workshop facilitation, was to prompt a structured discussion at the advisory board level of the trends, drivers and enablers relevant for the organisation. ■

World population by Region

Projected population size in 2100, based on the UN's medium population scenario



ENVIRONMENTAL CHANGE & SUSTAINABILITY

KEY TRENDS

- More extreme weather
- Rising sea levels
- Shifting climate zones
- Declining biodiversity
- Climate refugees
- Growing environmental consciousness
- Growing climate measures
- Energy transition
- Regenerative agriculture

We are rapidly changing the environment of Earth by destroying ecosystems, polluting air and water, and emitting more CO_2 than nature can break down. The consequences are a heating world, more extreme weather, the destruction of farmland, and rising sea levels. Climate change carries key risks for ecosystems and cultures, as well as for crop yields, water availability, biodiversity, and land use on local, regional, and global levels. The push for sustainability is a reaction to environmental change, which includes seeking economic growth without the degradation of natural resources.

PHOTO: RICARDO ESQUIVEL

'If you really think the economy is more important than the environment, try holding your breath while counting your money.'

– Dr. Guy McPherson, professor of natural resources and ecology

Mankind's effect on the natural habitats has been tremendous. Today, livestock outweigh wild mammals and birds tenfold. The natural environment is deteriorated by pollution of water, air, and soil as well as depletion of resources through overfishing, deforestation, and the extinction of wildlife. Between 1970 and 2016, the world lost over half of its animal species population.[1] If the current trend line is extended into the future, approximately 90% of the wildlife that existed in 1970 will be gone by 2040. All these effects and others are amplified by climate change.

1 World Wild Life: "68% Average Decline in Species Population Sizes Since 1970, Says New WWF Report" (2020) wwf.to/3G1FkAw.

Humans depend on a range of plant and animal species for our survival. Bees pollinate the plants we eat, and coral reefs provide nurseries for over the 100 million tons of fish eaten worldwide every year – yet both are threatened. Towards 2040, most the world's coral reefs could be destroyed, and wild bee (and other insect) species are in decline and threatened by extinction. Deforestation has contributed to habitat destruction and significant loss of biodiversity. Air pollution alone causes more than 7 million premature deaths yearly.[2] Climate change is already impacting food production, and it is estimated that higher temperatures and precipitation trends since 1980 have already lowered yields of wheat and maize below what they would otherwise have been, i.e. by 5.5% and 3.8% respectively. Without adaptation, global crop yields in 2050 are set to be approx. 7% below estimated yields without climate change – yet to feed the growing world population, food production needs to increase by 60% until 2050. The need to increase food yields is also related to another important resource: fresh water. Water use has been growing at more than twice the rate of population increase. If current trends continue, 33 countries face severe water stress in 2040.[3]

2 WHO: " New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution", https://bit.ly/3gdohjC

3 FAO: "The State of Food and Agriculture" (2016), bit.ly/3fizbE9.

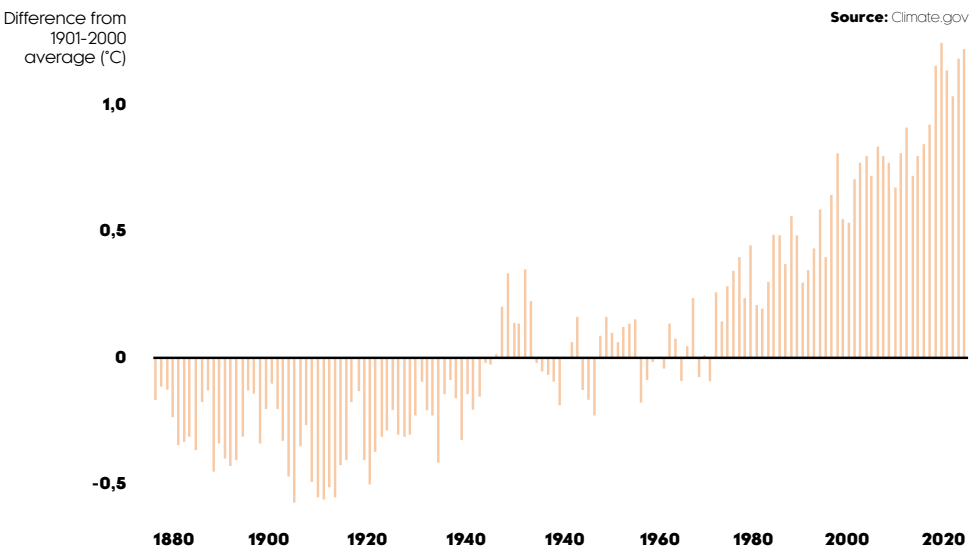
Concurrent with intensifying environmental change, the world is witnessing a shift towards sustainable energy sources, as solar and wind power are becoming increasingly competitive with fossil fuels. More broadly, to reduce the environ-

mental destruction of the planet, changes are happening that will transform economic systems as we know them. Every industry and every individual will be affected by these changes, and our lives 20 year from now will likely be very different from today. Energy will be renewable to a large extent, new vehicles will be electric, the food we eat will come from farms using smart farming technologies, and a greater share of the food will be plant based. Institutional investors and regulatory bodies will increasingly push for this green transition, increasing the risk of stranded assets and becoming uncompetitive for companies that are not agile enough to shift fast enough.

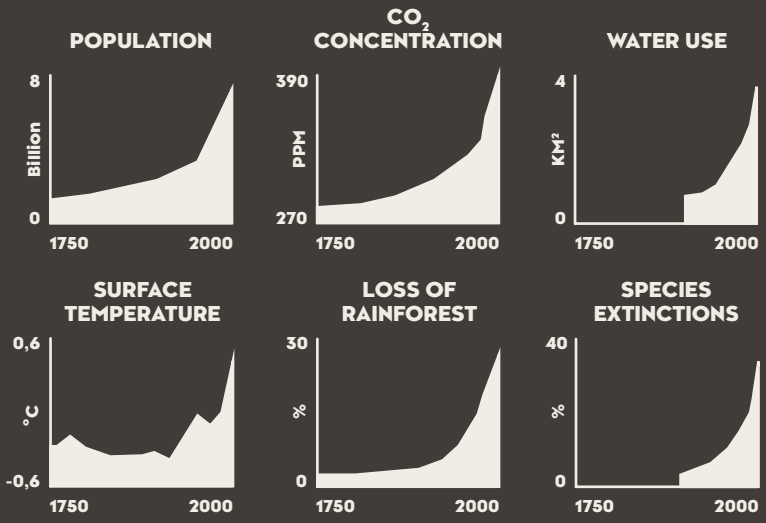
CASE STUDY: A sustainable future for Denmark

The Danish government has committed to a 70% reduction of emissions by 2030. To meet this goal, forward-thinking solutions are needed. CIFS helped Innovation Fund Denmark support and drive Danish research and innovation generated in a collaboration between science and business, considering Danish strongholds and global mitigation opportunities to ensure maximum value. An expert panel was put together consisting of leading climate scientists, top executives, interest organisations, and authorities. The outcome was a report that explored plausible solutions to mitigate climate change and identified Danish Strongholds relevant to these solutions, assessing their relevance, utility and potential for widespread adoption in the face of the climate crisis. ■

Global average surface temperature



The great acceleration



The dramatic, continuous, and roughly simultaneous surge in growth rates across a large range of measures of human activity.

Our world at

°C	FLORA AND FAUNA	WATER	FOOD	SEA LEVEL RISE
0				
1.5	9 out of 10 coral reefs at risk from severe degradation	Water shortages in the Mediterranean, Australia, Brazil and Asia	Wheat, rice, maize, and soybean production suffers	Rising sea levels displace 46 million people
2	All coral reefs disappaear	8% of the global population faces severe water shortages	Agricultural yields fall rapidly	Fewer opportunities for infrastructure adaptation
3	Marine ecosystems may collapse	Almost half of the Himalayan high mountain glaciers lost	Fish species go extinct locally	Near-complete melting of the Greenland Ice sheets
4	Half of all plant and animal species face local extinction	More frequent and severe extreme drought	High level of food insecurity	470-760 million people at risk; sea level rise nearly 9 meters

Biggest threats against Earth's biodiversity

50% Change in land and sea use

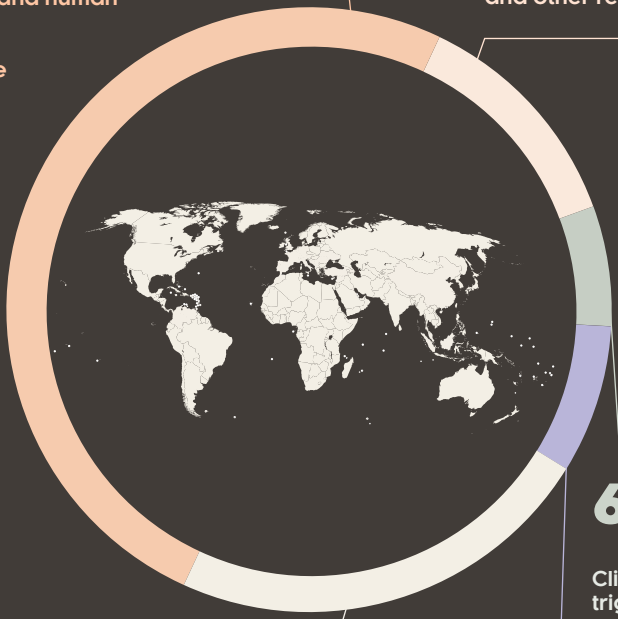
Land and sea use change encompasses any change in the species' environment, for example habitat loss and degradation caused by:

- Urbanisation and human settlements
- Unsustainable agriculture
- Deforestation
- Resource extraction

13% Invasive species and disease

Invasive species can disrupt native species by:

- Introducing disease
- Preying on native species
- Taking up space, food, and other resources



6% Climate change

Climate change trigger irregular seasonal change, which confuses the natural order of phenomena such as migration and reproduction.

24% Species overexploitation

Overexploitation can happen in two ways:

- DIRECTLY: When a specific species is targeted for sustenance or trade.
- INDIRECTLY: When a species is killed unintentionally as a by-product (i.e. bycatch in fisheries).

7% Pollution

Different forms of pollution have various effects on the environment. For instance, an oil spill has a sudden impact whereas other pollutants, like microplastics have a more gradual effect.

Source: IPCC, Climatenexus.org, Stockholm Resilience Centre, WWF "Living Planet Report" (2020).

PART 2

People & society

An Ageing World

Individualisation & Empowerment

Focus on Health

Urbanisation

AN AGEING WORLD

KEY TRENDS

- Improved longevity
- Improved health at old age
- Declining birth rates
- Inverse population pyramid
- Grey power

A combination of improved longevity, improved health at old age, and declining birth rates is causing the world population to age. As the world grows older, the balance between workers and retirees is shifting, putting pressure on healthcare systems and giving rise to new consumption patterns. In an ageing world, where more and more live healthy and active lives well into retirement, we may also be forced to reconsider where we draw the lines between tradition phases of life like youth, adulthood, and old age.

PHOTO: TSUCHIYA

'The ageing and declining population will have far-reaching impacts. Declining fertility rates will possibly increase immigration. The structure of family and society will inevitably change.'

– Toshihiko Fukui, economist

The global population today is the oldest it has ever been, and it is growing older. There are around 700 million people in the world aged 65 or above, and that number is projected to reach 1.5 billion by 2050. 1 in 6 people will be over the age 65 by 2050, up from just 1 in 11 in 2019.[1]

1 UN: "Our World is Growing Older" (2019), bit.ly/3qUq961.

High-income countries are the first to deal with the effects of an ageing population as their 'boom' generations transition towards retirement. For most developed countries, rapid increases in the elderly population are predicted for the coming decades. In low-income countries, decreasing fertility rates and reduced child and youth mortality create an opportunity to increase the living standards of the broader population by increasing the active work force.[2]

2 UN: "World Population Ageing Highlights" (2017), bit.ly/3zqFleZ.

3. UNWTO: "International tourism trends in EU-28 member states", https://bit.ly/3oi1ZBH.

AGEING IMPACTING LABOUR AND HEALTHCARE

Europe's population is rapidly ageing, causing the working population to decline by estimated 0.4% every year until 2040, when over 20% of the workforce is expected to be between 55 and 64 years old. This trend exerts a macroeconomic impact in two different ways: through a higher dependency ratio (i.e., higher proportion of retirees to workers) and through workforce aging. Higher dependency could lead to fewer workers in a fixed population producing less output, so per capita GDP would fall. Aggregate saving rates could decline, as the elderly tend to save less after retirement. Public finances could also be put under pressure in ageing economies as the level of age-related spending increases. Specifically, there will be increased pressures on the provision of healthcare and long-term care.

Overall, healthcare expenditures are expected to increase significantly due to ageing, and new ways of providing and improving healthcare should be considered. Ageing of the global population opens new consumption patterns, especially for medicine and medical/mobility technology. Tourist expenditure for age 60+ for a range of European countries is expected to increase by 30-40% towards 2030, while falling for young adults aged under 30.[3] Pension reform will be required in many countries.

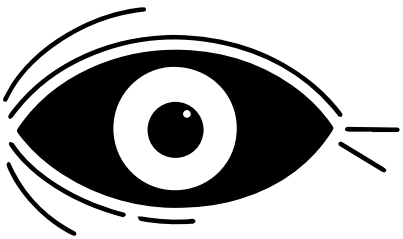
In general, as societies grow richer, the health of the elderly improves as well. This means that the world will see not just more elderly, but more *active* elderly individuals as well. Some will remain active in the labour market long after 'official' retirement age, while others will be active doing unpaid voluntary work locally, nationally, or internationally, sometimes from a distance. Even though such unpaid activity rarely is registered as economic activity, it can be of immense value to a society, especially given the elderly's many years of experience.

As a result of China's one-child policy, this country looks to be affected especially hard by ageing. Towards 2050, the share of China's population aged 65+ is forecast to more than double while the share at 25-64 years will decline by nearly one-fifth – and continue to decline for the rest of the century.[4] This could severely impact China's economic prospects in the future unless the country finds way to include more elderly in the workforce, for instance through improved health or technological aids.

4 PRB: 'Ageing and Health in China', bit.ly/3s7YgHV

CASE STUDY: The good life in the 3rd age

In 2042, no less than 25% of the Danish population will be aged over 65. In order for as many people as possible to have a good life, a high standard of living, and a good level of social welfare provision, it will be necessary to rethink how we work towards the end of our working lives and how we leave the labour market. To work towards this change, the Danish pension company PFA established a think tank named The New Third Age, to which CIFS was a central contributor. Using trends analysis and scenarios, CIFS identified seven central challenges, from which think tank participants developed 33 policy recommendations for ensuring future seniors a good life. The report containing the think tank's work and recommendations was presented at two major events, which attracted significant media attention. ■

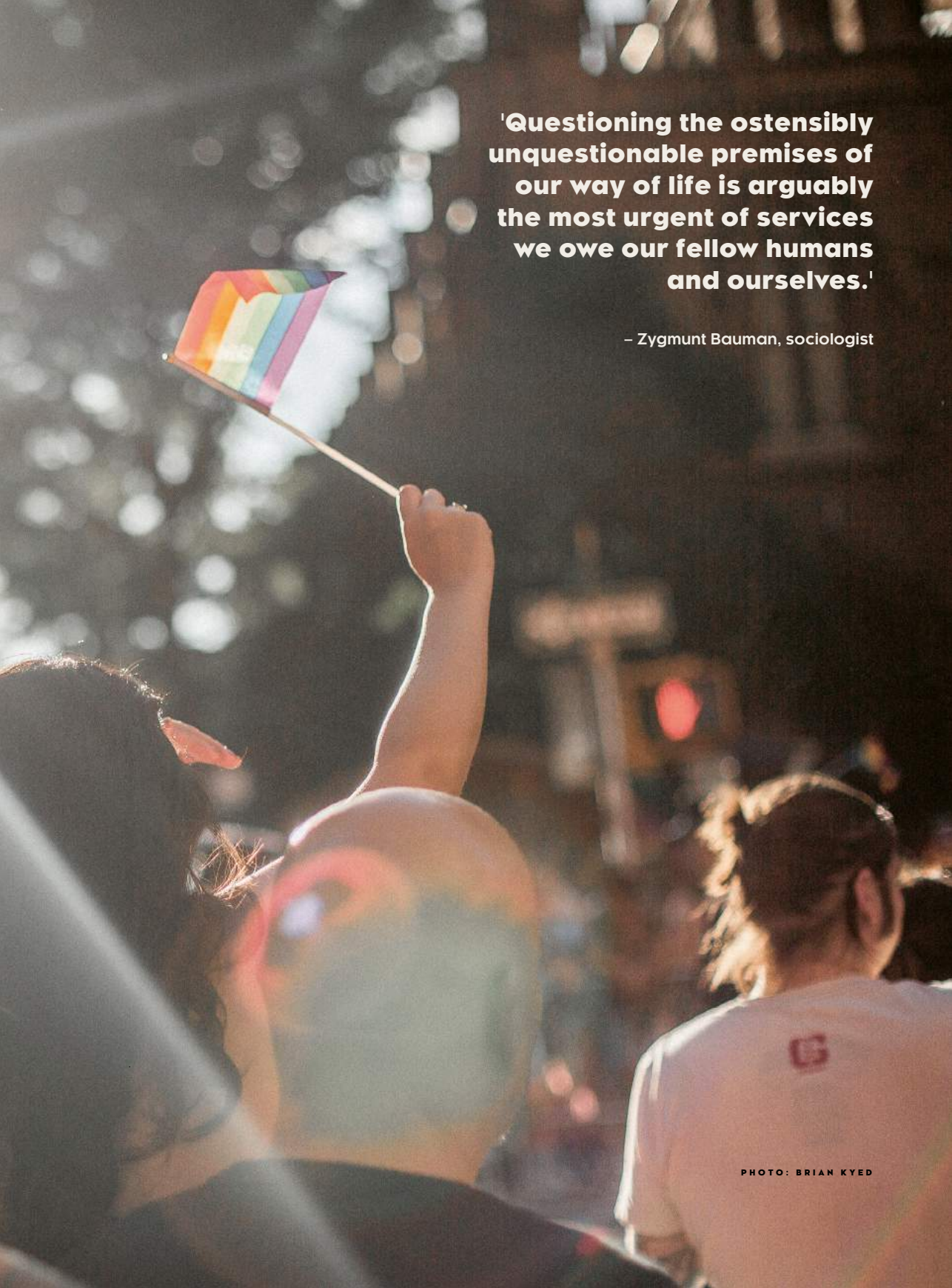


INDIVIDUALISATION & EMPOWERMENT

The social structures and identity markers that have traditionally shaped our lives are losing their grip. increasingly, empowered individuals seek and form new networks and communities in both physical and digital realms. Some key features of this individualised network society are a pluralisation of ways of living, working, and consuming, as well as a reconstitution and expansion of the various phases of life.

KEY TRENDS

- Growing individual liberty
- Sexual liberation
- Erosion of gender boundaries
- Breakdown of nuclear families
- Creative/transformative economy
- Female empowerment
- Social media
- Collective activism



'Questioning the ostensibly unquestionable premises of our way of life is arguably the most urgent of services we owe our fellow humans and ourselves.'[1]

– Zygmunt Bauman, sociologist

PHOTO: BRIAN KYED

We are experiencing a major shift in society, away from traditional behavioural patterns towards more *individualisation* and *empowerment*, following from decades of sexual liberation, erosion of gender norms and boundaries, and the advent of new kinds of digital and physical communities. Where 'fitting in' and adhering to the social codes of your class and career were important in the past, it has become more socially acceptable – even admirable – to stand out and be your own self. We also see increasing social, political, economic, and technological empowerment of communities and individuals. The trend towards empowerment of both individuals and groups of people is related to the emergence of the *network society*, which sees traditional hierarchical structures replaced by networks of empowered individuals, moving towards a hyperconnected always-on culture that exists in real time. Social media continues to grow and evolve into entirely new forms that extend the parameters of our digital existence.

SOCIAL LIFE REDEFINED

The rising empowerment of individuals and groups leads to a 'liquification' of embedded social structures and a hybridisation of lifestyles. As an example, we see a gradual re-conceptualisation of the various phases of life, which have traditionally been divided into discrete categories like childhood, adulthood, and old age. As our lifestyles become more fluid and as society ages (see *An Ageing World* on page 30), some phases of life are extended and others are shortened; more of them tend to overlap, while entirely new ones also arise.

From a market perspective, the liquification of lifestyles and life phases also means the inevitable breakup of consumers into 'micro-segments' that didn't exist or weren't very common in the past. This increasingly makes traditional segmentation of consumers moot – modern individuals, who often dip into many unrelated subcultures, aren't as easily categorised. Yet while consumers can't be easily segmented, we can still be divided according to our motives for consumption, such as shopping for enriching or rewarding experiences rather than material consumption. Motives associated with individualisation and empowerment include the urge to create (or co-create) ones own products or experiences or improve or transform oneself by acquiring skills, knowledge or growth through self-actualisation.

Naturally, the extent to which individuals (especially those belonging to younger generations) can self-actualise depends on a range of other factors, including demographic and economic ones. In a future with ageing populations and rising costs for senior welfare, larger economic responsibilities may be placed on the

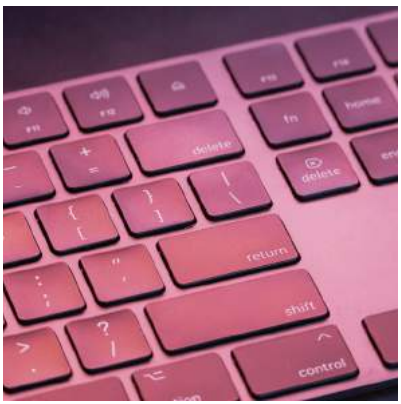
younger generations, which means that individualised ways of living and working might be more difficult to pursue. It goes without saying that self-actualisation – the top level of maslow's pyramid of needs – can only be achieved once other crucial needs are met.

Personal technology and the internet play a major role in the empowerment of individuals and groups. We can talk of both *technological empowerment* and *social empowerment*, with the two supporting each other rather than being in opposition. With technological empowerment comes opportunities like free online education, co-creation communities, peer-to-peer marketplaces, and the ability to reach millions with your content at next to no cost. You can share your interests and ideas with people across the world, creating or joining communities that best fit your personality and needs.

CASE STUDY: Future of media & public service

NRK, the Norwegian public service media institution, was facing challenges related to providing public service media in a new reality with a more fragmented population and growing individualisation as well as increased global competition for the attention of media audiences. In collaboration with NRK's top management, CIFS carried out a four-part scenario process, enabling the organisation to devise a robust strategy that could future-proof Norwegian public service. Subsequently, CIFS has worked with NRK on additional projects of strategic relevance. ■

PHOTO: THIAGO JAPYASSU



FOCUS ON HEALTH

KEY TRENDS

- Health expenditure as rising share of GDP
- Commercialisation of personal health
- Health as a public responsibility
- Expansion of the concept of health
- Advances in health technology

PHOTO: REFARGOTOHP

We are witnessing a growing public and personal focus on health as well as a general shift in the idea of what it means to be healthy. This evolution is supported by a better understanding of how genetics and lifestyle influence health along with new technologies enabling a more preventive rather than reactive approach to health. Coupled with demographic developments like ageing that put health systems under pressure, we may see a greater share of the responsibility for personal (and hence public) health being shifted to the individual in the future.

The notion that our health is the sum of both nature and nurture rather than nature or nurture alone is gaining wide acceptance. Rapid advancements in genomics and related fields have been instrumental in this development, paving the way for a new understanding of systems biology. We now possess gene sequencing technologies that enable granular exploration of human and environmental health and how they interact. Improved access to personal health technology, health-relevant data, and behavioural data is making it possible to predict health risks and health outcomes, needs, and trajectories more accurately. Additionally, we are beginning to see how deeply intertwined our own health is with that of our communities.

Future health systems are also facing significant pressures deriving from a range of demographic developments. The populations of developed economies are ageing and their lifespans are lengthening, which present issues like increased susceptibility to non-communicable diseases (NCDs), a shrinking workforce, and increasing long-term care costs. Economic development has led to high levels of wealth and a shift from production to service and knowledge-oriented economies, resulting in more sedentary lifestyles and often unhealthy diets which in turn lead to more NCDs and lifestyle diseases. We also see an increased awareness and measurement of mental health disorders as public discourse continues to expand and normalise open discussions. The World Health Organisation estimates that anxiety and depression disorders alone contribute to over USD 1 trillion in annual productivity losses, highlighting the fact that the health of individuals, societies, and economies are closely interlinked.

FROM TREATMENT TO PREVENTION

With a better and more holistic understanding of human mental and physical health, coupled with the many pressures facing healthcare systems, comes a realisation of the need to address the many determinants of health, including ones that are typically outside the focus of healthcare. These include socioeconomic conditions, genetic predisposition, and lifestyle aspects that are believed to contribute to incidences of chronic diseases.

One key difference separating the future of health from the past – and in large part enabling this shift – is the general public's access to better medical technologies, health-promoting services and, perhaps more importantly, data. From 2013 to 2020, the amount of health data generated worldwide increased exponentially from 153 exabytes to 2314 exabytes, providing a truly massive trove of information. Such information could, when structured and 'unsiloed', be used

'The goal of getting your genome done is not to tell you what you will die from, but to learn how to take action to prevent disease.'

– George M. Church, geneticist, molecular engineer, and chemist

to better identify and target health needs, improve health outcomes, and make delivery and administration of care more efficient on a large scale.[1] This massive amount of data provides a much better picture of the health of both individuals and populations, and it is a crucial ingredient in the shift from one-size-fits-all treatment to individually tailored evidence-based care.

Two thirds of the people in the world today own mobile devices, and forecasts suggest that by 2025, 72% of internet users worldwide will solely use smartphones to access the web.[2] Before long, 5G and satellite networks will be serving this global ecosystem of digital health by enabling remote consultation and monitoring the treatment of patients remotely via internet-connected sensors and medical devices. Telemedicine (and increasingly telesurgery) will prove especially valuable in the treatment of chronic conditions.

Indeed, immediacy and personalisation in nearly all our interactions, both inside and outside the healthcare system, are fast becoming the new standard. It is therefore unsurprising that there is a high demand for health services to conform to individual preferences and to untether us from physical points of care. A transition towards preventive health can enable well-informed citizens, supported by access to tools, data, and relevant information, to remain healthy for longer, allowing more time, care, and resources for those who need it. However, such a development could also lead to greater polarisation of health between well-informed and less well-informed citizens. As has been made apparent during the coronavirus pandemic, public information campaigns may not be sufficient to combat the spread of misinformation and dubious health advice.

A future shift towards greater personal responsibility for health may imply greater commercialisation of health services and products as tech corporations provide health services as an integrated part of their general services, with little oversight from health authorities. This carries the risk of having competing health systems with closed or incompatible data ecosystems, impeding the overall collection, sharing, and analysis of health data that forms the basis for public pre-

1 Marcus A. Banks: "Sizing Up Big Data", Nature (2020), go.nature.com/3nfrKSl.

2 James McDonald: "Almost three quarters of internet users will be mobile-only by 2025", warc.com (2020), bit.ly/3GnqSmu.

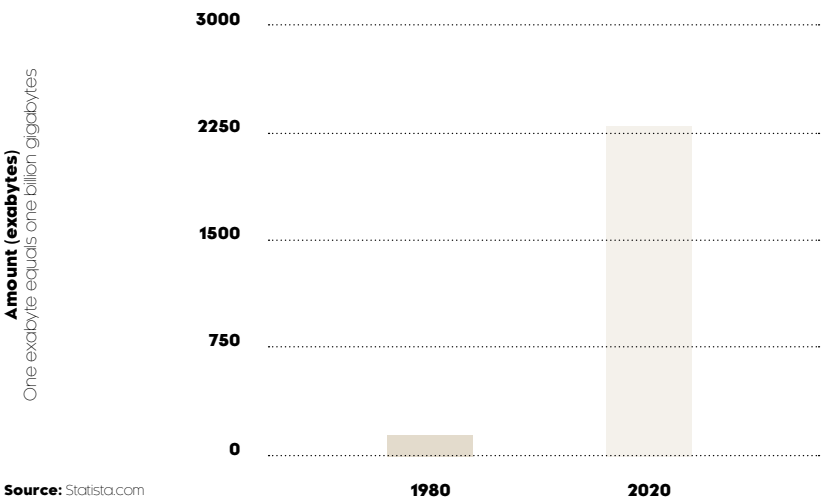
ventive healthcare and rapid response to medical crises. A related issue has to do with ownership, control, and transparency of use of personal health data. Another issue is the politicisation of health advice, with political (and sometimes commercial) agendas overshadowing the greater public good.

CASE STUDY: FutureProofing Healthcare

The Personalised Health Index is a free, publicly available tool for gathering and organising information about the next paradigm in health. The Index, which is in continuous development by CIFS, is the keystone of an emerging personalised healthcare information ecosystem that will bring together currently disparate stakeholders. The Index is part of the FutureProofing Healthcare initiative, set up and funded by Roche, and independently driven by an international team of health experts. In addition to being a publicly available resource, the Index is an asset that helps decision makers identify the best practices and focus areas of today to improve health in the future. A central aim is to generate fact-based discussions about what is needed to realise personalised healthcare as well as obstacles to this process. ■

Amount of health data

Generated worldwide



Source: Statista.com

URBANISATION

PHOTO: CHARLES MAGNUSON

KEY TRENDS

- Rise of megacities
- Concentration of population in cities
- Growing urban and inter-urban infrastructure
- Growing power of cities vs. nations
- Cities as crucibles for innovation

We will see explosive growth in urban populations throughout the 21st century. Urbanisation is a global phenomenon but will occur most rapidly in the Global South, which will be home to a majority of the world's biggest cities in 2100. Urban areas will be larger, more complex, and interconnected, and it is in cities that the global challenges of our century will need to be solved.

'Whenever and wherever societies have flourished and prospered rather than stagnated and decayed, creative and workable cities have been at the core of the phenomenon.'

– Jane Jacobs, urban theorist

Urbanisation is one of the most important social transformations in human history, with urban areas playing an increasingly important role in global change through a multiplicity of social, economic, and ecological processes across diverse spatial and temporal scales. Since the dawn of industrialisation, urbanisation has transformed into a global phenomenon accelerating a rural-to-urban migration. The world's urban population is set to explode in the 21st century and we will witness the rapid rise of megacities, mega-regions, and mega-corridors that concentrate commercial, social, and cultural activities into a compressed geographical area.

While this megatrend is global in scope, a projection of current trends reveals the majority of urbanisation in the decades to come will take place in the Global South. In fact, it is estimated that 90 percent of urban expansion towards 2050 will happen in developing countries in Africa and Asia.[1] By the year 2100, it is estimated that 13 of the world's 20 largest megacities will be located in Africa. Meanwhile, India will hold three of them – and none of them will be found in the Americas, China, or Europe.[2] Although projections over such a long timeframe are obviously very uncertain – their accuracy depending on how well the fastest growing urban areas can accomodate the swelling population – they reveal that global human geography by the end of the century will likely look fundamentally different than it does today.

1 UN: "Sustainable Cities and Communities" bit.ly/3zzLVQ9.

2 Daniel Hoornweg & Kevin Pope: "Socioeconomic Pathways and Regional Distribution of the World's 101 Largest Cities", Global Cities Institute (2014), bit.ly/3q291vC.

A CULPRIT OR OUR SALVATION?

The anthropic lifestyle is predominantly urban, and the urban areas of the future will be larger, more complex, and interconnected, resulting in a number of both positive and negative economic, environmental, social, and health-related effects. To put the challenges of urban growth in perspective, consider the future of Lagos. Today, the Nigerian metropolis is home to 21 million people. Towards 2050, the city's population is expected to double, and some forecasts predict that

3 Ibid.

Lagos will have a population of almost 90 million in 2100.[3] Compare this to Tokyo, the world's largest city today, which has 38 million residents. This massive population growth in urban areas engenders opportunities within the coming decades, but also challenges. Indeed, rapid urbanisation brings new risks relating to economic polarisation, overcrowding, the development of slums (and 'mega-slums'), logistics, sustainable infrastructure, crime, pollution and the loss of biodiversity or ecosystem devastation. Still, it is not all bad. The potential benefits of urbanisation include increased productivity, the emergence of economies of density and economies of scale, positive externalities derived from greater access to medical and educational services, and diversity. Large cities and urban corridors often contribute significant amounts to national GDP figures – it's estimated that 60% of GDP growth occurs in just the top 600 urban centres, making them large drivers of economic growth.[4]

4 Raconteur.net: "8 Ways Urban Demographics are Changing", bit.ly/3G5bcnX.

Although the world's cities occupy just around three percent of the world's total landmass, cities have a massive impact on our planet, consuming more than two-thirds of the world's energy while accounting for more than 70 percent of global CO_2 emissions.[5] The environmental strain that urban areas put on natural environments will only become more evident as cities grow in size and number, and as their energy and resource use intensifies. Over the next 40 years, the world is expected to build 230 billion square metres in new construction – adding the equivalent of Paris to the planet every single week.[6] Suffice to say that the global challenges of the 21st century will be urban challenges as well. Although cities are still, in large part, designed to respond to local needs defined in the past, urban areas have always been the place to prototype technological innovation and novel approaches to governance. Crucial to addressing some of the world's most important challenges, cities represent an emergent global governance power.

5 UN: "Sustainable Cities and Communities", bit.ly/3zzLVQ9.

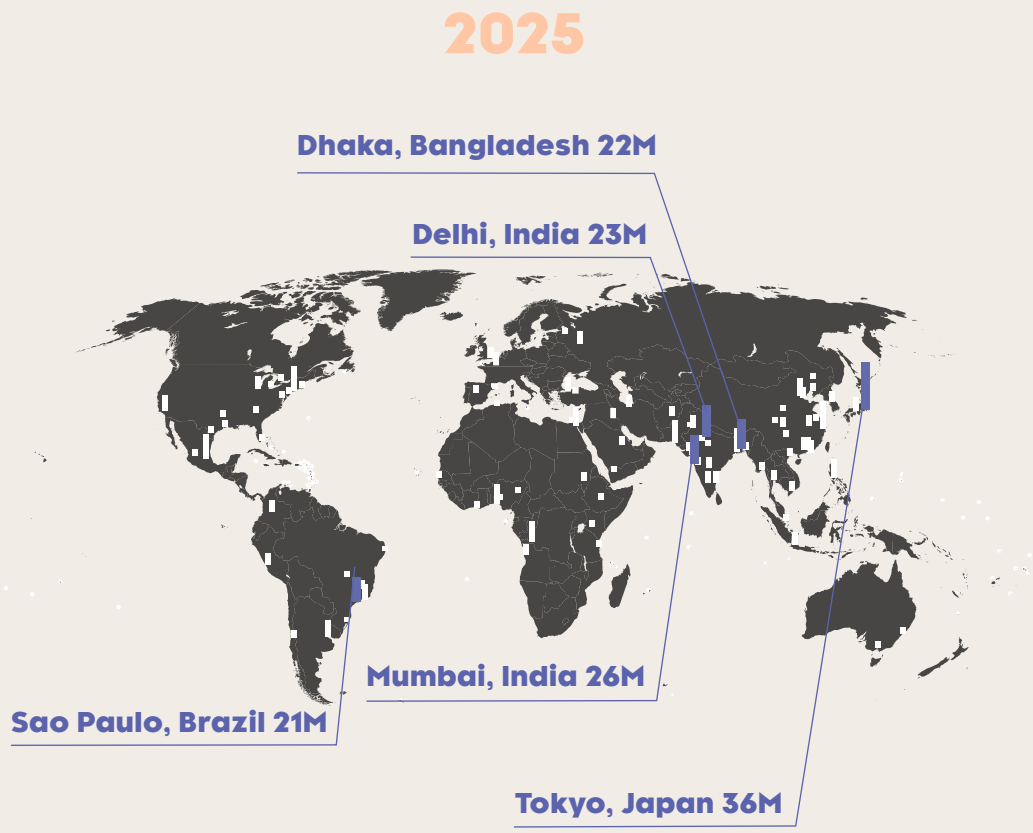
6 UN: "Global Status Report 2017", bit.ly/3pZZ2qO.

CASE STUDY: Investment strategy for danish residential properties

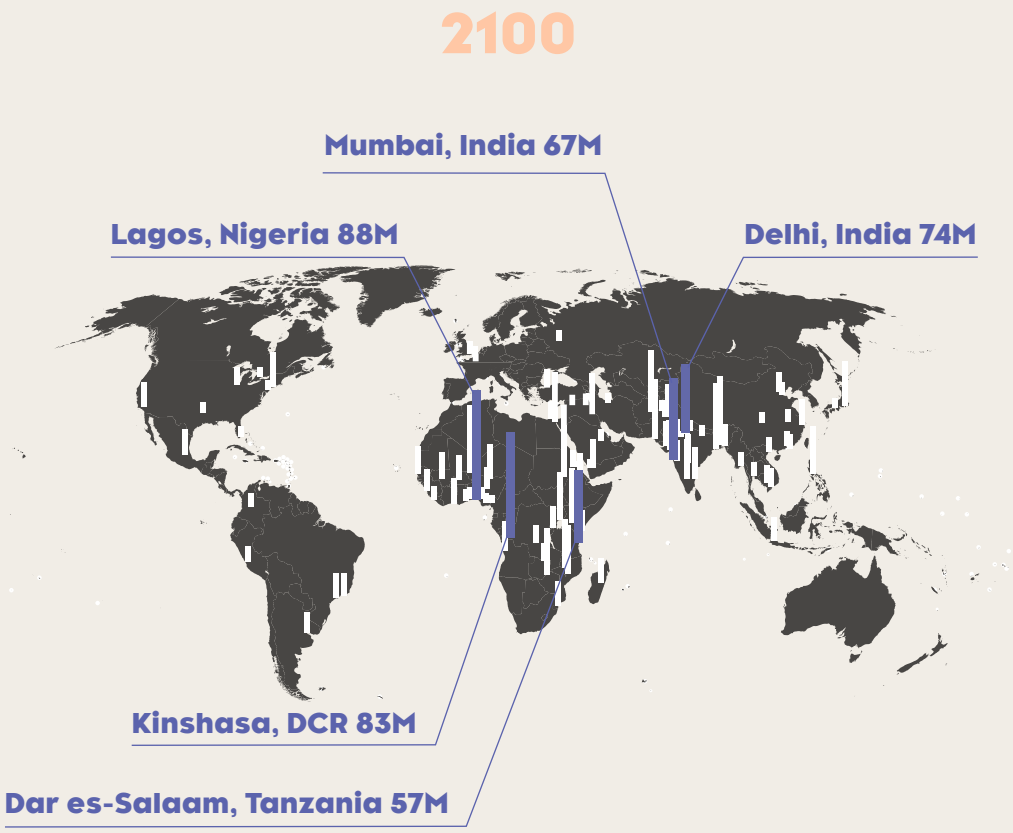
Urban population growth is pushing up housing prices in Danish cities, especially in the capital city Copenhagen. CIFS assisted Thylander Gruppen in the development of the Danish Residential Properties fund backed by the three investors PFA, AP Pension and Industriens Pension. Focusing on residential real estate, CIFS developed a model used to identify Danish urban growth centres outside the two largest cities, Copenhagen and Aarhus. Based on this analysis, Thylander Gruppen identified residential real estate that qualified for further projects and investments, and these recommendations were then carried on to Industriens Pension and PFA. ■

Link in Danish

Emerging megacities



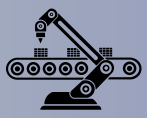
Projections by Global Cities Institute estimate that the world's biggest cities in 2100 will all be home to more than 50 million people, with Lagos possibly exceeding 88 million residents. While population projections stretching 75+ years into the future are fraught with uncertainty, we can be certain that managing the megacities of the 21st century will put significant demands on urban planners and populations and will call for new solutions to how we organise urban space.



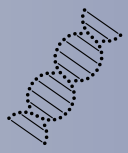
Source: Daniel Hoornweg & Kevin Pope: "Socioeconomic Pathways and Regional Distribution of the World's 101 Largest Cities", Global Cities Institute (2014), bit.ly/34pESnG.

PART 3

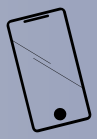
Technology & science



AI & Automation



Biotech Revolution



Greater Interconnectedness

Engineering Advances

AI & AUTOMATION

'If a typical person can do a mental task with less than one second of thought, we can probably automate it using AI either now or in the near future.'

– Andrew Ng, computer scientist and co-founder of Google Brain

PHOTO: KINDEL MEDIA

Machines are doing more and more work for us – both work that we used to do ourselves, like assembling and transporting goods, and work that we have never been able to do, like analysing billions of bits of information in seconds. Advances in artificial intelligence (AI) and robotics will change not only how we work in the future, but also how we live, how we learn, and how we entertain ourselves.

KEY TRENDS

- Big data analysis
- Immersive technology
- Growth of knowledge
- Machine intelligence
- Robotics
- Automated education
- Declining annual work hours

AI and robotics will liberate humans from an increasing number of tedious or dangerous tasks. Routine tasks are already being automated to a high degree, leaving the more interesting (often more difficult) tasks for humans. Automation can make our societies richer, as products and services produced wholly or partly by automation can be made cheaply and reliably. Products and services that used to be restricted to a small elite become accessible to the masses, in the way that books were with the printing press. One current example is online education, where university-quality courses are offered for free or at low cost.[1]

1 Julia Pugachevsky: "The 18 most popular online courses you can take from each of the top schools in the US", Business Insider (2021), bit.ly/3D2S0Vm.

AI is increasingly used to solve tasks that no human could come close to. This includes analysing gigabytes of constantly updated information in real time, with examples being search engines and reliable weather forecasts, and exploring huge amounts of data for difficult-to-find patterns (big data analysis). Virtual models and environments can be created by AI and explored through immersive technology such as virtual or augmented reality. Remote-controlled or autonomous drones can enter and study hostile environments, from burning buildings and radioactive sites to ocean depths and the surface of Mars.

Autonomous transport is becoming a reality, with many promising prototypes being used even today. This development will allow commuters to spend the time commuting for other things than driving and will allow transporting goods 24/7 with unmanned trucks, ships, and planes. On the flip side, automated vehicles may also increase overall transport, which may be detrimental to the environment.

AUTOMATION CAUSING SHIFTS IN LABOUR MARKETS

Automation can lead to unemployment and economic polarisation. A 2020 MIT study found that in the United States, jobs lost to automation have stopped being replaced by an equal number of similar workplace opportunities since 1987. The study also finds that low-skilled workers who lose jobs to automation tend to 'fall backwards' into even lower-skilled and lower-paying jobs while high-skilled workers are able to use automation to increase their productivity and hence their income, thereby widening the income gap.[2]

2 Peter Dizikes: "Study finds stronger links between automation and inequality", MIT News (2020), bit.ly/3hlZJRK.

Automation may very well make a growing share of people unemployable – meaning that whatever work they are qualified to do (or could upskill to become qualified to do) could be done cheaper, faster, and/or more reliably by robots or computers in the future. In such a scenario, lower-skilled workers will increasingly fall backwards into permanent unemployment, while paying work will only be available for the higher-skilled. This will present a global challenge,

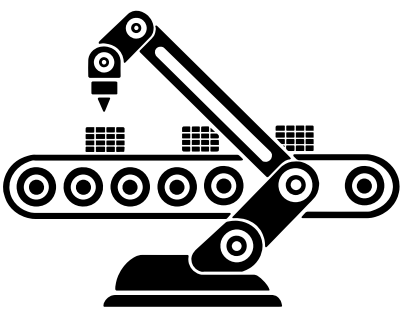
but solutions will no-doubt vary locally. The idea of a Universal Basic Income (UBI) is one proposal for how to respond. Proponents of the idea believe that because automation boosts productivity and generates wealth, societies will easily be able to afford a UBI to reduce income inequality. Opponents, however, argue that it will be too costly – equivalent to 20-30% of GDP in most countries according to the International Labour Office[3] – and will remove the incentive to work, even for those in the labour force with in-demand skills, adversely affecting the economy.

3 Isabel Ortiz, Christina Behrendt et al: "Universal Basic Income proposals in light of ILO standards: Key issues and global costing", International Labour Office (2018), bit.ly/3uYPyLC.

CASE STUDY: Data-driven exploration of oil & gas

CIFS analysed the current status and future trends in supercomputing and artificial intelligence to provide input and recommendations to the data-driven strategy process of the Norwegian Petroleum Directorate (NPD).

Supercomputing technologies, together with artificial intelligence (AI) and machine learning, have become key enablers in increasing exploration success rates and reducing time, costs and risks. In light of the analysis, considerations and options were explored. CIFS presented and discussed the results during a seminar at NPD's headquarters and provided a report along with a whitepaper on supercomputers, which including a range of recommendations for how NPD could proceed. ■



BIOTECH REVOLUTION

Biotechnology will likely be as important in the next half century as computers have been in the previous half century. We can manipulate genes in minor or major ways, even creating new forms of life to help us handle challenges like pollution, climate change, and food security, while neural science will link human and machine at previously unseen levels.

KEY TRENDS

- Genetic technology
- Synthetic biology
- Bioinformatics
- Towards the perfect human
- Medical technology
- Neural science

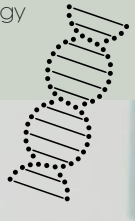


PHOTO: TESTALIZE ME

'Biotechnology is creating a new industrial revolution based on biology instead of petroleum. As biotech processes replace old rust-belt technologies, they are enabling a transformation from a petroleum-based to a bio-based economy.'

– Brent Erickson, President at BioInsights Consulting LLC

Biotechnology is set to revolutionise the world over the next half century. We are becoming increasingly adept at understanding and manipulating genetic codes of plants and animals, creating modified crops that require less fertiliser or better withstand diseases and insect attacks, or cattle that emit less methane. We are becoming masters of nature and of our own bodies, transcending natural limitations and boundaries.

A promising subfield of biotechnology is synthetic biology, where long sections of DNA are stitched together and into the DNA of another organism. The difference between genome editing and synthetic biology is mainly one of magnitude, but synthetic biology can also imply creating entirely new organisms from scratch (which has been done).[1] More often, synthetic biology is used to dramatically change the function of an organism, such as creating a yeast that produces cheese.

Another major future field of study is neural science, which is paving the way for new ways for humans and machines to interact, including brain-computer interfaces. Even today, experimental prosthetics allow not only controlling a prosthetic arm by neural link but also allow haptic feedback, enabling a sense of touch.[2] Elon Musk's company Neuralink plans to go even further by implanting chips in human brains, spreading very thin threads over the inside surface of the skull and allowing complex control of machines by thought alone.[3] Neural interfaces of this sort are initially intended mainly for disabled people but could eventually find more general use.

1 National Human Genome Research Institute: "Synthetic Biology", bit.ly/3p8SHrm.

2 Leslie Mertz: "Restoring the Sense of Touch: From 'Sci-Fi Dream' to Reality", EMB (2020), bit.ly/3CXwi5e.

3 Elizabeth Lopatto: "Elon Musk unveils Neuralink's plans for brain-reading 'threads' and a robot to insert them", The Verge (2019), bit.ly/2LrOYDN.

BIOTECH SOLVING FUTURE CHALLENGES

The great challenges that humanity faces in the 21st century will very likely require biotechnology to solve. To feed ten or eleven billion people in the face of climate change, we may need genetically modified crops and entirely new way

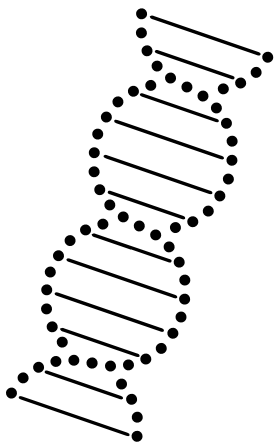
of making food. Satisfying our future energy needs in a sustainable way will almost certainly require using biological processes to turn biowaste and algae into biofuel while genetically modified plants can better absorb CO_2 and store it in the soil.[4] Bacterial enzymes can break down plastic waste for recycling, and much of today's plastic may be replaced by degradable bioplastics. Healthcare expenses, currently at 8.8 percent in OECD,[5] can feasibly be reduced through bioinformatics and a better understanding of the relationship between health, genes, and intestinal flora (see also the megatrend *Focus on Health*).

4 Peter Horton et al: "Technologies to deliver food and climate security through agriculture", Nature (2021), go.nature.com/3lhuzBP.

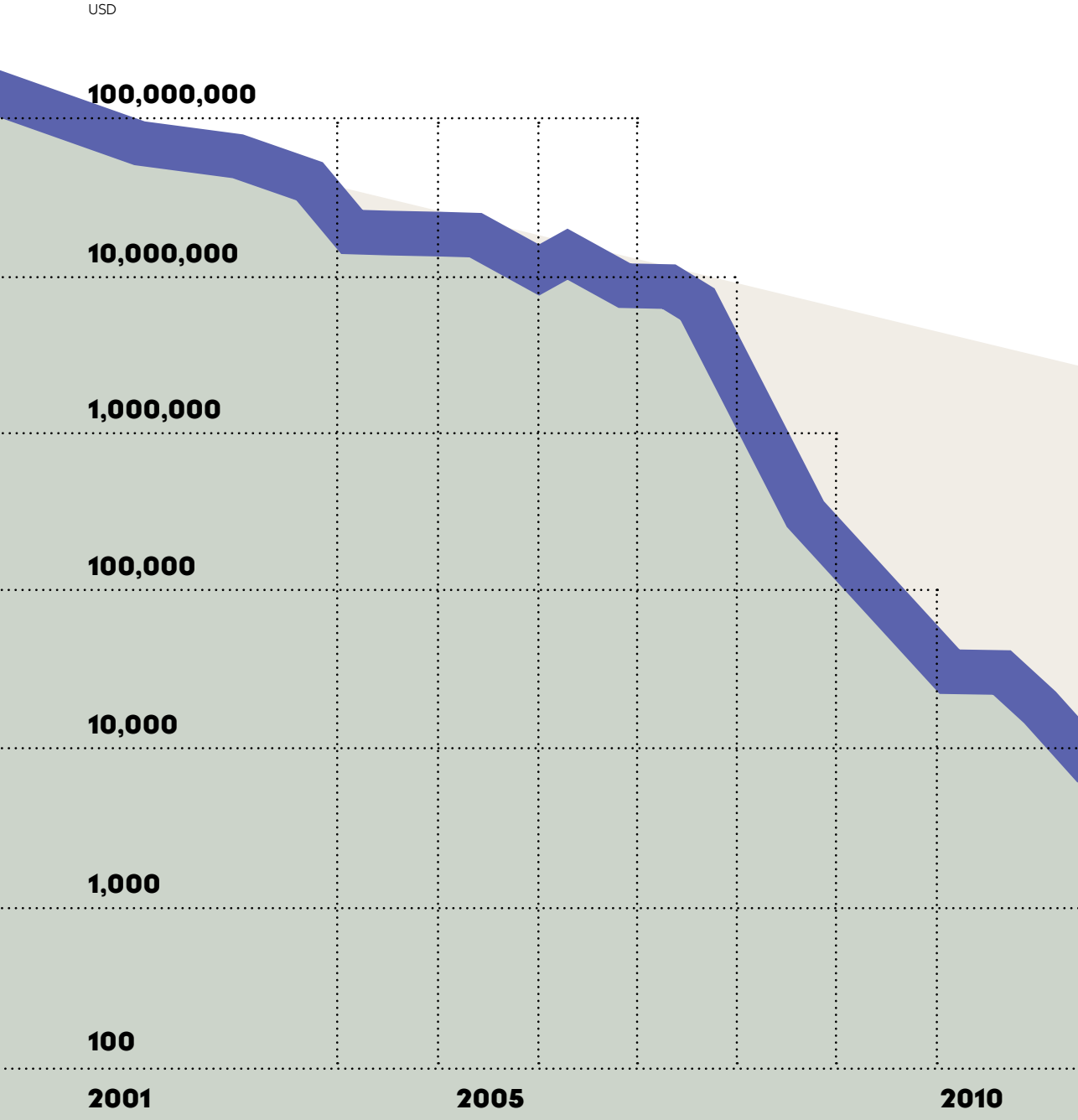
5 OECD: "Health Expenditure", (2021), bit.ly/3Ebn0nO.

CASE STUDY: Genomics & future health

CIFS brought together 27 health professionals from across the Danish healthcare system to develop a vision for the future of healthcare in Denmark. The project focused on three challenges: increasing healthcare costs, global and cross-border technology development, and increasing health polarisation. The project aimed to develop a thought leadership platform and a collaborative network built on Nordic values to strengthen healthcare across the Nordic countries. This later developed into *Future of Healthcare in the Nordics*, bringing together a number of leading decision makers from the industry, academia, and the public sector in a series of workshops to find ways to drive a shift from sick care to preventive health. The overall goal was to ensure the longevity of Nordic healthcare systems and improve quality of life for Nordic citizens. ■

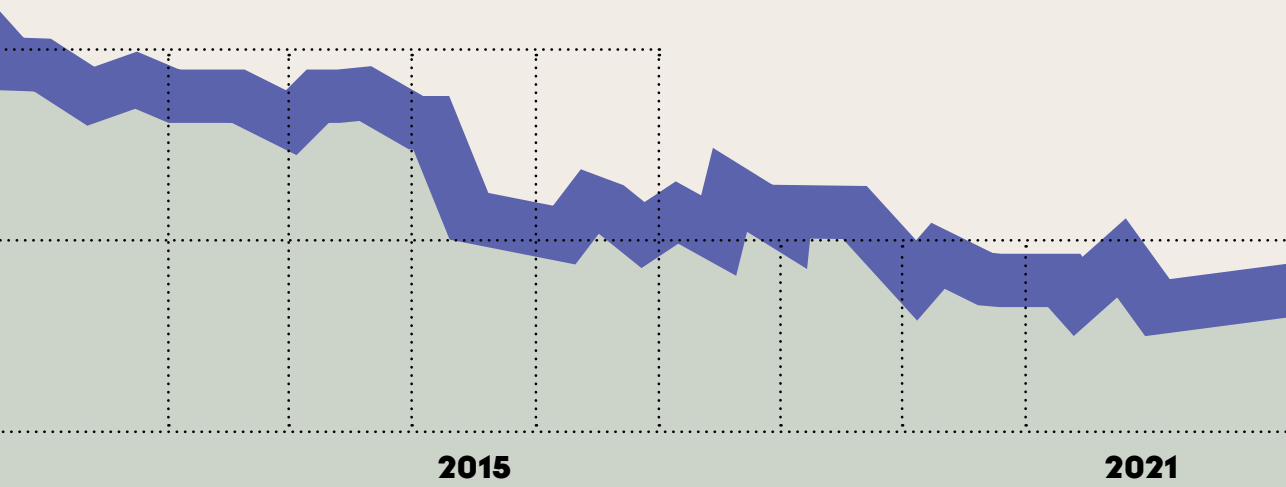


The cost of sequencing a human genome has dropped by a factor 10,000 in the last 15 years



Source:
National Human Genome Research Institute

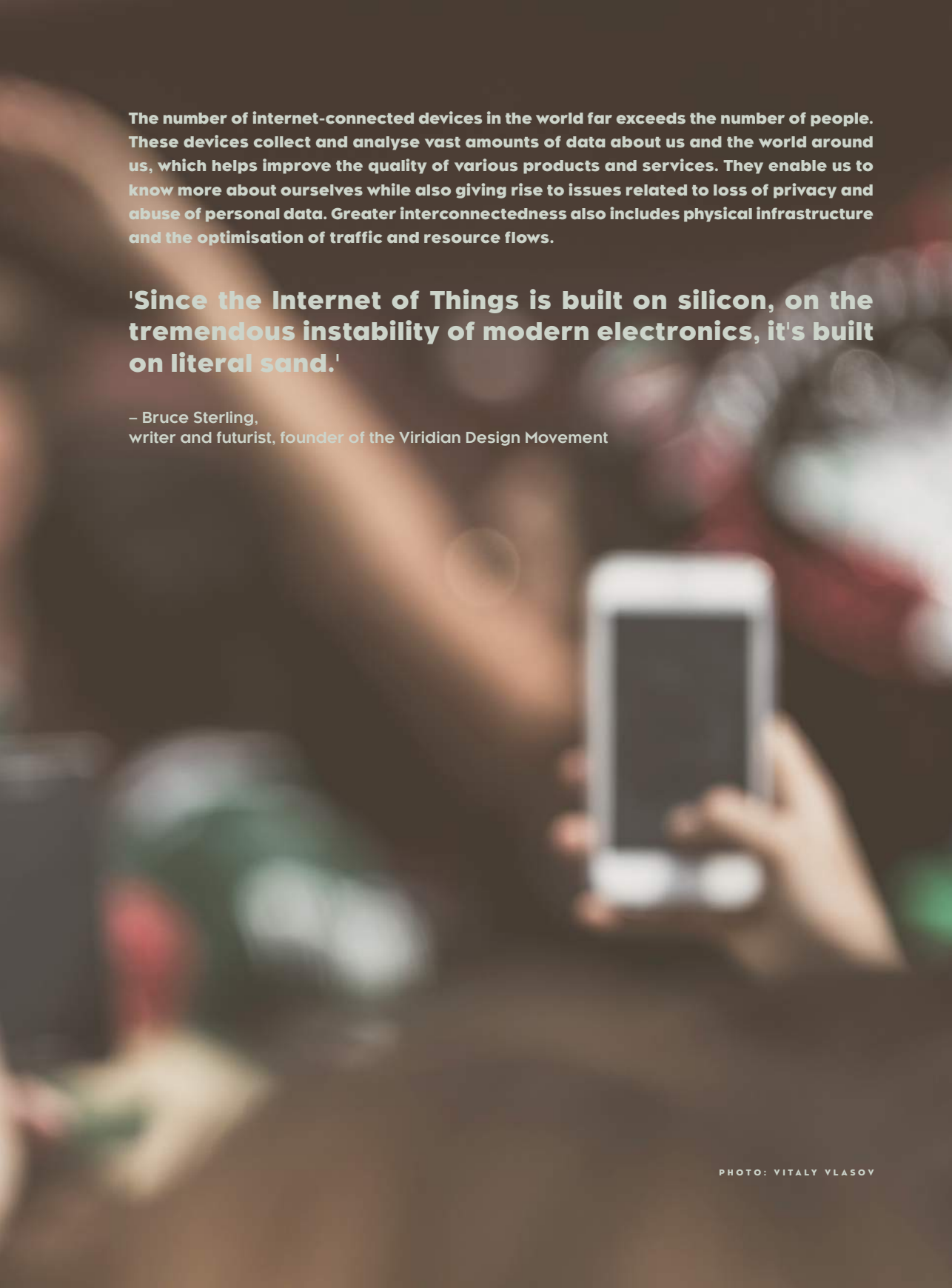
Moore's Law



GREATER INTER-CONNECTEDNESS

KEY TRENDS

- Internet of Things
- 5G communications
- Smart cities, smart homes
- Improved global transport infrastructure
- Grid/mesh technology
- Interdependence of systems
- Risk of cascade effect



The number of internet-connected devices in the world far exceeds the number of people. These devices collect and analyse vast amounts of data about us and the world around us, which helps improve the quality of various products and services. They enable us to know more about ourselves while also giving rise to issues related to loss of privacy and abuse of personal data. Greater interconnectedness also includes physical infrastructure and the optimisation of traffic and resource flows.

'Since the Internet of Things is built on silicon, on the tremendous instability of modern electronics, it's built on literal sand.'

– Bruce Sterling,
writer and futurist, founder of the Viridian Design Movement

PHOTO: VITALY VLASOV

The number of devices connected to the internet today (in 2022) is estimated to be between 25 and 50 billion, and this number is expected to grow rapidly as more 'smart' devices become connected through 5G wireless technology. These devices communicate with us and each other in decentralised networks, i.e. the *Internet of Things*, aiding a more efficient flow of energy, traffic, and resources. Devices can react near-instantaneously to data received, allowing rapid response to changing situations. Data increasingly flows in interconnected decentralised networks that can run independently of central authorities or corporations in local or mesh networks.[1]

1 Glenn Fleishman: "Wireless mesh networks: Everything you need to know", PCWorld (2020), bit.ly/3rXdaT7.

Depending on whom you ask, between 100 and 500 billion devices will be connected to the internet by 2030, between a dozen and sixty times as many as the number of people in the world. More data will be transmitted and analysed at the command of machines than at the command of human beings. This will give machines and people access to real-time information necessary in making our increasingly complex societies function. Smart city solutions are an example of this, as traffic and resource flows can be optimised and energy consumption minimised. Our needs can be predicted and met almost before we become aware of them on both personal and societal levels, making everyday life run more smoothly and increasing societal resilience.

Greater interconnectedness means that any event, anywhere in the world, will affect the rest of the world more rapidly. The great physical interconnectedness achieved today through our highly developed transport infrastructure has allowed mutations of the Covid-19 coronavirus to spread across the world in a matter of days. In return, global response to local disasters has become far more efficient. This physical interconnectedness is likely to grow in the future with the expansion of high-speed rails and autonomous vehicles.

However, this real-time interconnectedness can also lead to cascade effects where responses are blown out of proportion or oscillate between two extreme modes. Such cascade effects have been seen in *flash crashes*, where computers trading stock or commodities on digital markets react indiscriminately and rapidly to small changes in values, leading to sudden, short-lived market crashes.[2]

2 Kimberly Amadeo: "What Is a Flash Crash?". The Balance 2021, bit.ly/3lNUTxm.

The growing number of internet-connected devices that record, store, and analyse vast amounts of data about everything we do has led to privacy concerns as well. While such analysis can benefit us immensely by anticipating our needs, the potential for abuse of our personal and behavioural data is also immense. Measures

that are introduced as a reaction to this concern, like EU's General Data Protection Regulation, are unlikely to prove adequate and may create as many issues as they solve, for instance by introducing an additional bureaucratic burden for businesses and organisations.

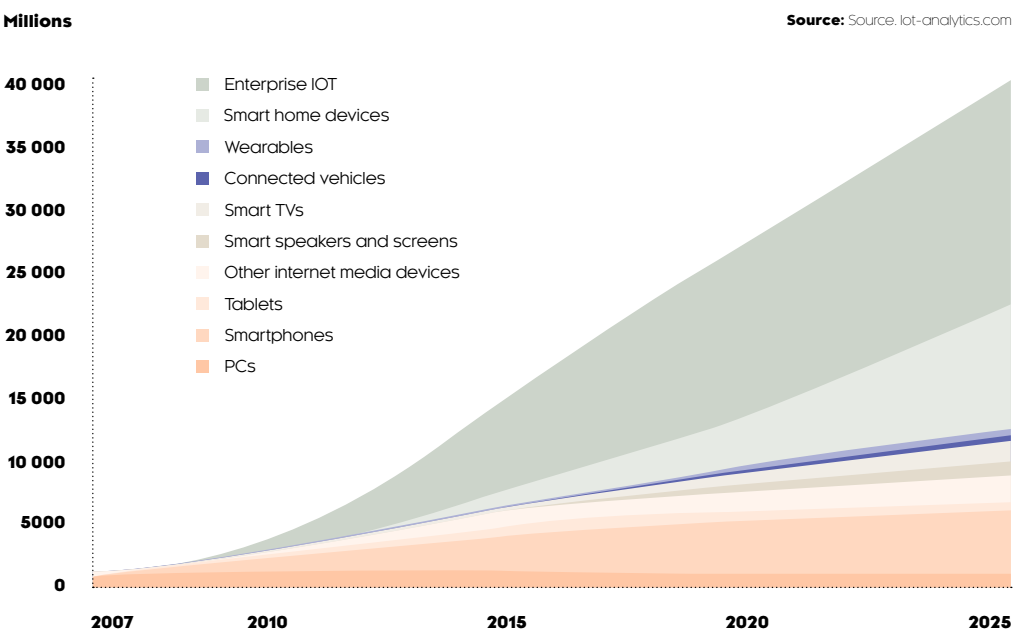
CASE STUDY:

New mobility solutions and their impact on urban development

CIFS was commissioned by the Danish law firm Gangsted to produce a report detailing how developments in mobility can affect urban life and the property market in the future. The analysis examined possible effects of developments in AVs, mobility-as-a-service, e-commerce, logistics, and public transport. The project presented several trends that may affect future housing prices, urban development, and the need for policy action. The report was widely circulated in Danish media, creating buzz around Gangsted's position as urban mobility and housing thought leaders. ■

Link in Danish

Global number of internet-connected devices



ENGINEERING ADVANCES

PHOTO: THANOS PAL

KEY TRENDS

- Nanotechnology
- New composite materials
- New manufacturing technologies
- Advanced energy technology
- Aerospace tech
- High-speed railways
- Evolutionary algorithms

'The scientist discovers a new type of material or energy and the engineer discovers a new use for it.'

— Gordon Lindsay Clegg, mechanical engineer & author

Engineering is what turns science into useful technology. Engineering gives us new materials, new energy sources, better production processes, and improved product designs – even designs that no human brain could envision. Innovations in engineering are sure to play a major role in combating climate change and environmental damage.

Engineers design and build the computers, robots, cars, factories, energy plants, and infrastructure that society relies on, effectively creating the technology that makes our world run. As the US writer and professor of biochemistry Isaac Asimov (1920-1992) said: 'Science can amuse and fascinate us all, but it is engineering that changes the world'.

New materials allow us to make stronger, lighter, or more durable products. New engine and energy technologies give us faster or more sustainable transport and cleaner energy. New manufacturing technologies allow faster, better, and less wasteful production. New processes can reduce carbon emissions or extract carbon dioxide from the atmosphere, even converting it into a useful resource.[1]

A recent advance in engineering with huge potential is *evolutionary algorithms*, where product designs mutate, compete, and evolve in a virtual environment until a superior design is found, mirroring the way natural evolution has produced highly complex living organisms.[2] Today, evolutionary algorithms are mainly used in architecture, where the process is known as *parametric design*.[3] Evolutionary algorithms have the potential to find design solutions that perform far better than any human mind could envision – though we might not understand why.

We need advances in engineering to handle the challenges of the 21st century. To meet future energy demands in a sustainable way, we need improvements of solar and wind energy. Moreover, new nuclear technologies, such as fusion reactors,[4] may be required to reach the goal. Improved battery technology will be an important part of the transition to electrical vehicles, decreasing the weight of vehicles while extending their range. Novel airplane designs can significantly reduce fuel needs, and high-speed railways can provide rapid transport in a more sustainable fashion. New production technologies can ensure less wasteful production at lower energy cost, perhaps also in a more decentralised way that reduces transport needs. Reusable space technology may herald a new space age.

Nanotechnology in particular may be a gamechanger. So far, nanotechnology has mainly been confined to nanomaterials used as coatings that repel dirt or kill microorganisms, or to composite materials strengthened by graphene or carbon nanotubes.[5] However, there is huge potential in nanomachines, tiny robots that can fight cancer, provide targeted delivery of drugs, destroy microplastics, and more.[6] In recent years, much progress has been made in nanomachines made from bioengineered DNA. Such nanomachines are self-propelled and can react to their environment, for instance by releasing drugs in the presence of tumours.[7]

1 Kyoto University: "Simple method for converting carbon dioxide into useful compounds", Science Daily (2021), bit.ly/33lORUr.

2 Derya Ozdemir: "Evolutionary Algorithms: How Natural Selection Beats Human Design". Interesting Engineering (2021), bit.ly/3s5IJeO.

3 Tal Friedman: "Towards a parametric future", AEC Magazine 2021, bit.ly/3EYRV72.

4 Thomas Overton: "Fusion Energy Is Coming, and Maybe Sooner Than You Think", Power Magazine (2020), bit.ly/2QXgwFF.

5 Nadeem Baig,Irshad Kammakakam & Wail Falath: "Nanomaterials: a review of synthesis methods, properties, recent progress, and challenges", Royal Society of Chemistry (2021), rsc.li/3s8HD0u.

6 Simon Batt: "4 Tiny Robots That Are Changing the World", MUO (2021), bit.ly/3q1LLwS.

7 "What are DNA nanomachines and how can they be helpful for us?", ChemDiv 2021, bit.ly/323hrt5.

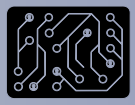
CASE STUDY: Fire safety for a low-carbon future

CIFS was commissioned by DBI Fire and Security to explore and provide an overview and insights into possible fire safety issues associated with the transition into a low-carbon future. Future fire safety concepts and solutions face challenges that can only be solved through concerted action of key stakeholders across science and technology, sectors and regulators. Among these challenges are the lack of empirical data and safety management experience in applying low carbon technologies in a broad societal context and in complex systems. Novel fuels, along with low-carbon technologies, will be accessed and used by urban citizens and mass consumers alike. ■

PHOTO: KINDEL MEDIA

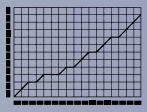
PART 4

Economy

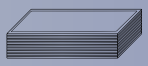


Network Economy

Service Economy



Economic Growth



Concentration of Wealth

NETWORK ECONOMY

The digitalisation of society gives rise to new peer-to-peer processes and the creation of value in decentralised networks operating both on local and global scales. The network economy stands in contrast to the logic of the industrial market economy, in which products and services are provided in a top-down manner and where decision-making power is concentrated at the top of the hierarchy. Instead, the network economy relies on flat structures and collaboration. Prime examples are the sharing economy, crowd funding, and crowd creation, as well as the open source/open content movement.

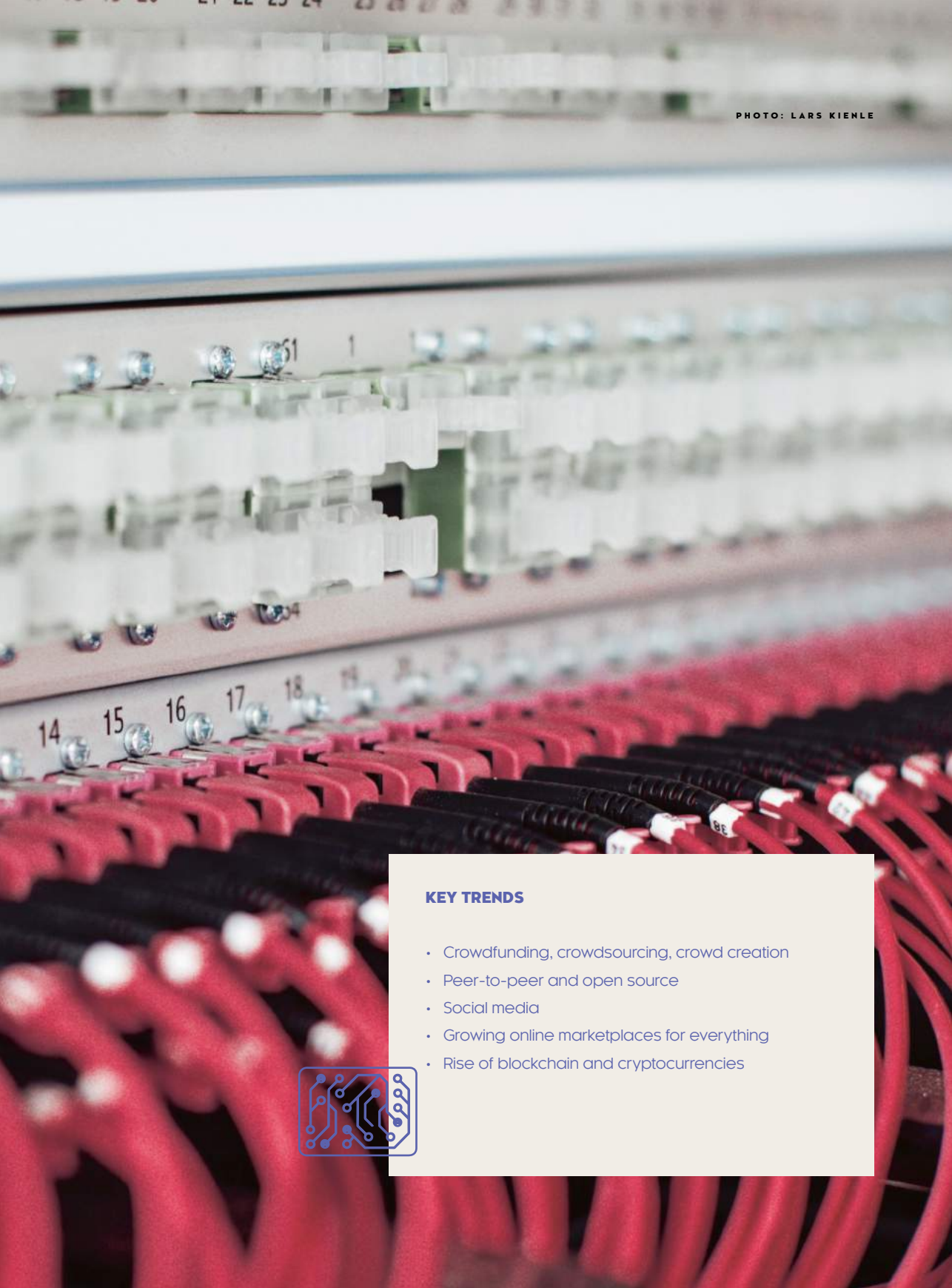


PHOTO: LARS KIENLE

KEY TRENDS

- Crowdfunding, crowdsourcing, crowd creation
- Peer-to-peer and open source
- Social media
- Growing online marketplaces for everything
- Rise of blockchain and cryptocurrencies

'The network economy is founded on technology but can only be built on relationships. It starts with chips and ends with trust.'

- Kevin Kelly, US author and former editor of Wired Magazine

The network economy takes many different forms, all of which have the decentralisation (or distribution) of value creation as a common denominator. One manifestation is *P2P (peer-to-peer)* markets, which are characterised by the shared creation, distribution, and consumption of goods and services by different people and organisations. P2P markets offer an extra-institutional solution to in-demand products and services, which are created and funded in collaboration between users rather than by commercial companies. Although P2P markets are in themselves nothing new (arguably existing since the dawn of humankind), new technologies are facilitating their seamless operation at scale. *Blockchain* is a good example, as it replaces the need for trust in central authorities with a distributed ledger governed by a protocol.[1]

Another prime example of the network economy is *open source* communities, where groups of programmers collaborate to produce free digital tools that can compete in quality with commercial software. Examples are LibreOffice, a free alternative to Microsoft Office, the operating system Linux (from which Android is derived), and the web server applications Apache and Nginx, which together run more than 70% of all web servers in the world.[2] Similarly, *open content* offers access to knowledge and entertainment free of charge, with Wikipedia and open-access science journals perhaps being the best-known examples. These products compete with commercial alternatives, forcing them to keep their quality high and prices low.

Individuals and companies increasingly use *crowdfunding* platforms and social media networks to garner funds for projects, while simultaneously testing the water to see if there is interest in their venture and generating PR for it. Crowdfunding reduces risk for entrepreneurs and, peering into the long-term, could pose a challenge to a major source of revenue for banks, at least if current trend lines continue. Market research projections expect a growth at a CAGR of no less than 16% between 2021 and 2026.[3]

1 Adam Hayes: "Blockchain Explained", Investopedia 2021, bit.ly/3q9jGDD.

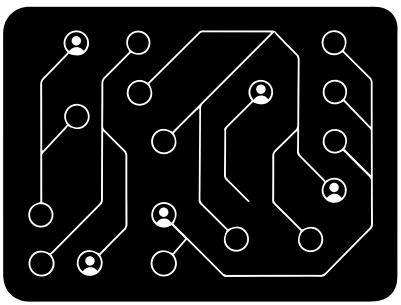
2 "What Is the Most Popular Web Server Application in 2021?", Digital in the round 2021, bit.ly/32n9leY.

3 Mordor Intelligence: "Crowdfunding Market – Growth, Trends, Covid-19 Impact, and Forecasts (2022 – 2027)" (2021), https://bit.ly/3rtyyxg.

Finally, the sharing economy can also be considered a subset of the network economy. The term refers to the exchanged access to goods and services between more than one party and like P2P markets, the *sharing economy* is not exactly new. It has, however, seen explosive growth with the advent of social platforms designed to facilitate this exchange at scale. This includes platforms for co-working and freelancing, P2P lending, second-hand retail shopping, hospitality, and car sharing. For the consumer, advantages to this *freedom from ownership* (beyond saving money) can be convenience and access to a greater variety of goods and services, which is why some forecasts expect the sharing economy to grow at such a rate that it will eclipse certain sectors with a traditional operating model by 2025.

CASE STUDY: Anarconomy

The CIFS report Anarconomy charted the rise of open source culture on the internet and the proliferation of free content and services via voluntary networks operating according to anarchic principles. The report presented several scenarios for the future development of the digital network economy and outlined new business models arising under anarconomy. ■




SERVICE
ECONOMY

KEY TRENDS

- From manufacturing to service economy
- Platform economy
- XaaS
- From product to service
- Servitisation, services on top of products
- Freedom from ownership

PHOTO: VIKTOR AVDEEV

The service economy refers to the growing importance of the service sector in industrial economies and to how the old dichotomy between products and services is increasingly replaced by a service-product continuum, where 'solutions' that combine the two are what's on offer to businesses and consumers (also known as servitisation). An important component of the evolution of the service economy is the shift toward freedom from ownership through everything-as-a-service (XaaS) as well as the rise of the platform business model characterising Uber, Amazon, AirBnB and others.

'The key to using the Internet to extend and build relationships is to view ownership of information differently. You need to bring customers inside your business to create information partnerships. Relationships become the differentiator, more than products or services. Businesses become intertwined.'

– Michael Dell, CEO of Dell Technologies

Like most transformative historical developments, it's hard to set a clear starting date for when the shift from industrial to a service-based economies began in developed nations, but we can point to some important milestone in the transformation. One such milestone was reached in 1991. In this year, according to a study by the Bureau of Economic Analysis, spending on IT equipment and spending on traditional capital goods, engines, processing machinery, and agricultural machinery intersected.[1] Since then, although the kinds of equipment and devices produced have undergone transformations several times over, the cost of information technology has only continued to decline, while spending has increased.

1 Thomas A. Stewart: Intellectual Capital (1997).

All this technology, and the ongoing digitalisation of society that follows with it, is foundational to the growth of the service economy, which is characterised by three broad trends. The first, as the name straightforwardly implies, is the evolution of developed economies from being based on agricultural and industrial production to services. The second movement relates to the rise of platform businesses that provide integrative services characterised by massive scalability and little or no capital expenditure. Some of these platform business models are also known as 'category killers' precisely because of their scale, with Amazon being the best example.

The third movement, which is much more recent, is toward *servitisation*. More and more businesses in a broad range of sectors, from media to manufacturing, now combine products and value-added services into packages (or 'solutions'), that rely on digital infrastructure and data to function. The *everything-as-a-service* paradigm, (XaaS – with the 'X' being a placeholder for any kind of product or offering) is characterised by providers delivering outcomes in a convenient and seamless way, rather than customers having to buy a product or piece of equipment that produces that outcome for them.

This fundamentally changes the way companies and customers interact by moving what used to be consumption of products to digital, subscription-based consumption. Media like music and movies used to be something we bought and owned. Now we stream it from online subscription-based platforms. Software packages like those offered by Office or Adobe have likewise shifted from being one-off purchases of products to being subscription-based. The same is true for file storage, which has largely moved to the cloud. Yet it's not only on the consumer market that servitisation is gaining ground. With the rise of Industry 4.0 and the ubiquity of data ecosystems, servitisation is also increasingly seen in things like predictive maintenance of industrial machinery.

Servitisation has also impacted the financial and insurance industries. In the case of finance, more OEMs (original equipment manufacturers) are moving from one-off-payments to subscription and outcome-based business models. Financial institutions, as a consequence, are moving from lending out for asset purchasing to supporting OEMs to take risk of the balance sheet – in essence moving from B2C to B2B. In insurance, the *subscriptionisation* of risk transfers the need for insurance from the customer to the provider, who then only has to insure against systematic risks. For example, instead of buying a product (a car) or providing a service (transportation), the consumer subscribes directly to a service ensuring that she will get transported whenever she wants. She has bought a transportation guarantee.

CASE STUDY: Future of the insurance industry

CIFS assisted one of the largest insurers in the US in exploring the future of the insurance industry. CIFS identified, analysed and described the trends influencing the future of the client. Through a co-creation process, uncertainties and potential impacts were assessed, and several plausible future scenarios were described. Based on the scenarios, the strategy in place was re-evaluated, and a new strategy process was implemented centred around a futures-oriented mindset. ■

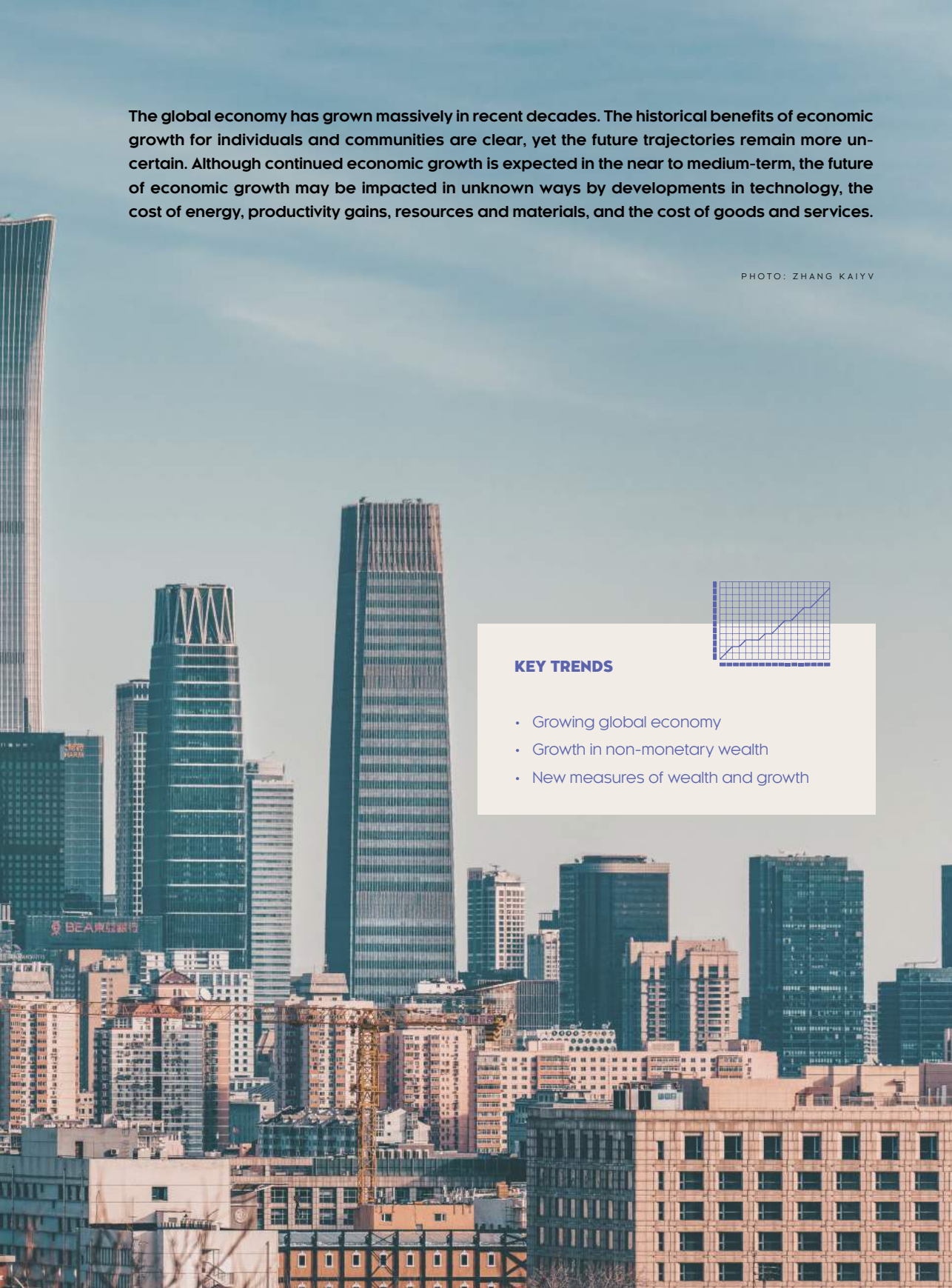
ECONOMIC GROWTH

'Sustainable development is the pathway to the future we want for all. It offers a framework to generate economic growth, achieve social justice, exercise environmental stewardship and strengthen governance.'

- Ban Ki-moon, former UN Secretary General

The global economy has grown massively in recent decades. The historical benefits of economic growth for individuals and communities are clear, yet the future trajectories remain more uncertain. Although continued economic growth is expected in the near to medium-term, the future of economic growth may be impacted in unknown ways by developments in technology, the cost of energy, productivity gains, resources and materials, and the cost of goods and services.

PHOTO: ZHANG KAIYV



KEY TRENDS

- Growing global economy
- Growth in non-monetary wealth
- New measures of wealth and growth

The history of economic growth is a relatively simple story. For most of recorded human history, the average person was very poor, and societies achieved very little sustained economic growth to change this condition. However, over the past two centuries, the Industrial Revolution ushered in a new period of steady economic growth to radically change the human condition. New technologies, energy sources, education systems, political models, and rapid gains in productivity all contributed to a 30-fold increase in incomes and economic prosperity over this time.[1] During this period, economic growth has become a global megatrend which has carried a number of positive benefits with it relating to rising prosperity, better quality of life, and value for money.

1 Max Roser: "Economic Growth", Our World in Data, bit.ly/3G2NeZH.

In much of the world today, societies are also significantly better off than their ancestors when measured economically. Economic growth has resulted in significant improvement in the conditions characterising the 'state of humankind' when most individuals were trapped by poor health and environment, hard and monotonous work, and malnutrition.[2]

2 Ibid.

More value for money means greater wealth at lower cost. The increases in economic productivity have resulted in lowering the real cost of many goods, many of which fell by over 90% over the course of the 20th century.[3] New smartphones and computers typically have far more functionality at the same or lower cost than old ones, giving you more for less. Streaming services provide access to a wide and regularly updated selection of content at a lower cost than buying a single new Blu-Ray every month. Free software and free content have no direct monetary value yet hold very high experienced value for users (see *Network Economy*). The experienced value of more leisure time can be very high, but more leisure time counts against GDP if it means working less and spending less money.

3 "Nathan Rosenberg: Inside the Black Box: Technology and Economics (1982).

Although the historical benefits are clear, the future trajectories of economic growth are much less certain. While growth is expected to continue in the near to medium-term, such growth will be driven (or hindered) by developments in automation technologies (AI, robotics, etc.), cost of energy (high, low, free), productivity gains (human and machine), resources and materials (abundance vs. scarcity), and cost of goods and services (inflation vs. deflation). As such, all forecasts for economic growth should be viewed with heavy scepticism, but especially those over long-term time horizon.

A key question relating to economic growth is who stands to benefit from it (see also *Concentration of Wealth* on page 82). First published by Christoph Lakner

and Branko Milanovic in 2013 as part of a larger article called 'Global Income Distribution: From the Fall of the Berlin Wall to the Great Recession', the so-called elephant curve is a graph that illustrates the unequal distribution of income growth for individuals belonging to different income groups for the time period of 1988 to 2008. Named for resemblance to the side profile of an elephant, the key takeaway is that incomes for the global middle class have increased by 70-80%, the Top 1% global elite by 60%, while the middle class in the developed world realised 0% or even negative growth.[4]

4 Wikipedia: "The Elephant Curve", bit.ly/3ANfiIR.

CASE STUDY: Megatrends-driven thematic investments

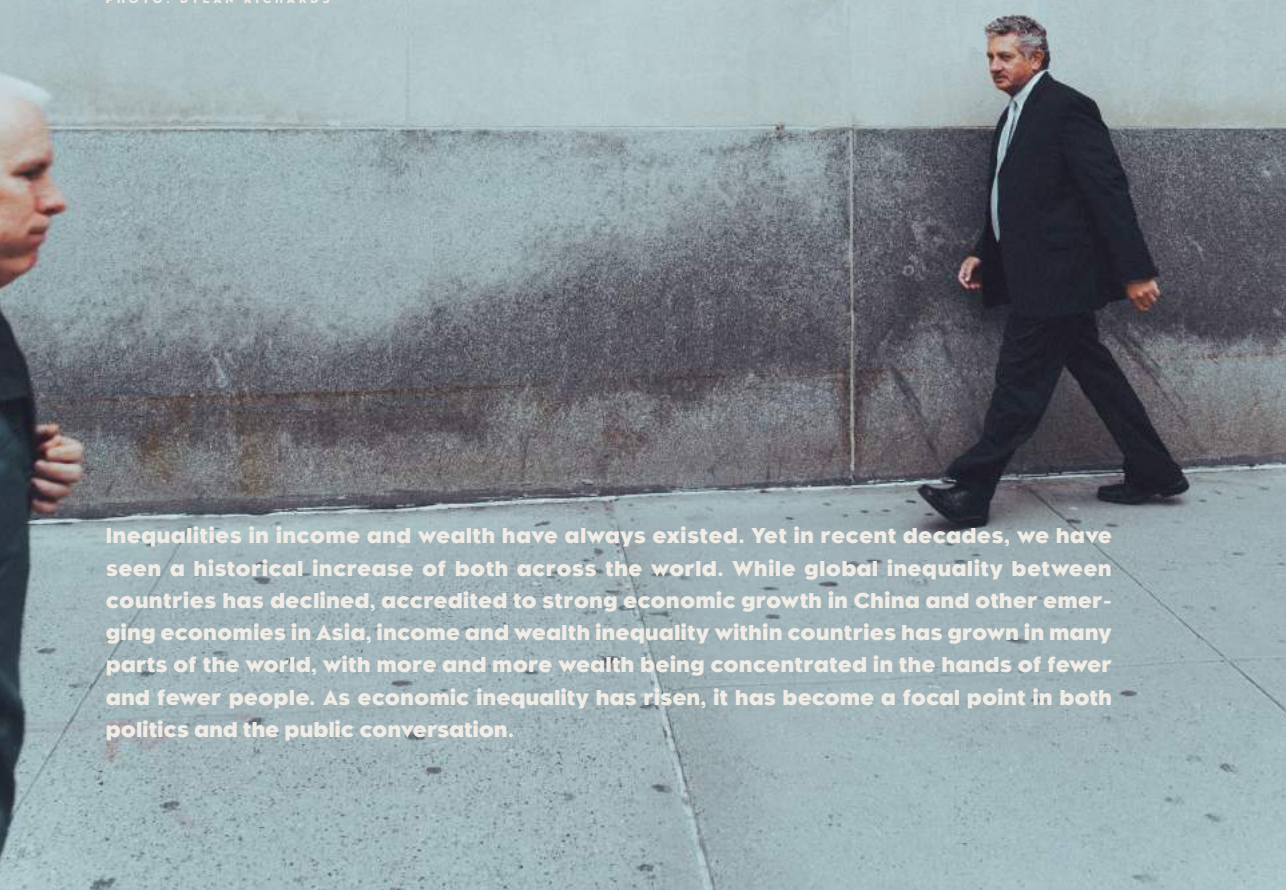
CIFS has repeatedly cooperated with the financial services company Pictet on analysing the implications of megatrends on their thematic investments. Pictet's thematic strategies are powered by the megatrends shaping our world and are designed to provide a source of sustainable capital growth. The company's thematic strategies aim to harness the potential of companies that will succeed in the future. By identifying the megatrends changing the world, Pictet believes that its teams can select the long-term winners in the global stock markets. As a result, the approach has delivered positive investment returns over the long term. ■

CONCENTRATION OF WEALTH

KEY TRENDS

- Economic polarisation within countries
- Decreasing wealth at the disposal of governments
- Concentration of corporate wealth

PHOTO: DYLAN RICHARDS



Inequalities in income and wealth have always existed. Yet in recent decades, we have seen a historical increase of both across the world. While global inequality between countries has declined, accredited to strong economic growth in China and other emerging economies in Asia, income and wealth inequality within countries has grown in many parts of the world, with more and more wealth being concentrated in the hands of fewer and fewer people. As economic inequality has risen, it has become a focal point in both politics and the public conversation.

'It is no secret that the past few decades of widening inequality can be summed up as significant income and wealth gains for those at the very top and stagnant living standards for the majority.'

– Janet Yellen, United States Secretary of the Treasury

A greater share of global wealth is becoming concentrated in fewer hands. The net worth[1] of the top 1% of the world population now exceed USD 1 million, according to Credit Suisse, and they own 45.8% of all assets in the world, while the bottom 55% only owns 1.3%.[2] This inequality is rising. The richest 1% has captured more than a third of all additional wealth created since 1995, whereas the bottom half has captured just 2%. The world's 2,750 billionaires now control 3% of global wealth, up from 1% in 1995, according to World Inequality Lab.[3]

Although economic inequality between countries has decreased, owing in large part to growth in China and other Asian economies, growing economic inequality *within* countries is a trend encompassing both developed and developing economies. The gap has widened at differing paces, with the US, Russia, and India, for instance, having experienced rapid increases in both income and wealth inequality since the 1980s. In comparison, China has experienced only a moderate rise in inequality over the same period, and in Europe the increase has generally been low, although with significant variance between countries and a slight overall decline since 2016 in income inequality between all EU citizens.[4]

When it comes to wealth, the poorest half of the population owns just 2%, whereas the richest 10% own 76%. The widening gap is seen in the growth rates between the top and bottom segments of wealth distribution. Since the mid-1990s, the global top 1% has captured 38% of all additional wealth accumulated, while the bottom 50% has captured just 2% of it. The wealth of the richest individuals of Earth has grown by 6 to 9% per year since 1995, whereas average wealth has grown by 3.2% per year.[5] The causes for both wealth and income inequality vary from country to country, with some commonly identified causes being financialisation, globalisation, technological change, the decline of labour unions, and the erosion of minimum wages.[6]

1 defined as the value of financial assets plus real assets (principally housing) owned by households, minus their debts.

2 Credit Suisse Global Wealth Report 2021, bit.ly/3506QxD

3 World Inequality Report 2022, wir2022.wid.world

4 World Inequality Lab: "World Inequality Report" (2022), bit.ly/3H9a9DK; UN: "Inequality – Bridging the Divide", bit.ly/345nBtJ, VoxEU: "Income inequality in the EU: General trends and policy implications" (2021), bit.ly/35nRh6c.

5 World Inequality Lab: "World Inequality Report" (2022), bit.ly/3H9a9DK.

6 Juliane Menasce Horowitz et al.: "Trends in income and wealth inequality", Pew (2020), pewrsr.ch/3KJBFu5.

The global concentration of wealth is accompanied by a widening gap between the net wealth of governments and the net wealth of the private sector, expressed in how public wealth as a percentage share of national income has declined globally since the 1970s. The gap was widened as a result of the Covid-19 pandemic during which governments borrowed the equivalent of between 10% and 20% of their GDP.[7]

Contributing to this gap is the fact that the global nature of markets makes taxation of capital very difficult. According to the European Commission, close to 40% of the profits of multinational companies are shifted to tax havens each year.[8] Following the 'Pandora Papers' leak of 2021, which revealed widespread systematic use of offshore companies to reduce tax bills, tax evasion once again became a focal point in the public conversation. The European Commission has since proposed new legislation to combat tax avoidance and better facilitate exchange of information between national tax authorities.[9]

It can be argued that some degree of economic inequality may not be such a bad thing as it incentivises humans in various ways and leads to capital accumulation and economic growth. Yet most would probably agree that there is such a thing as *too much* wealth and income inequality. For individuals, entrenched inequality of outcome (income, wealth, and expenditure) can undermine equality of opportunity, affecting health, education, occupational choices, and other life decisions. Indeed, countries with higher levels of income inequality tend to also have lower levels of economic mobility between generations.[10]

Studies have found that increasing economic inequality also negatively affects economic growth and its sustainability; analyses by the IMF have shown that if the income share of the top 20% increases by 1 percentage point, GDP growth is 0.08 percentage point lower in the following five years, meaning that the benefits tend to not trickle down. Conversely, a similar increase in the income share of the bottom 20% is associated with a higher growth of 0.38 percentage point.[11]

On a wider societal level, assessing the consequences of widening inequality is much more speculative. Yet granted that financial power, at least to some degree, tends to translate into political power, economic inequality can lead to political inequality unless correction mechanisms are implemented. Viewed in this light, the offset in the balance between the economic power of governments and multinational corporations risks constituting a democratic threat, potentially undermining the social coherence and trust in democracies associated with the pre-

7 Ibid.

8 "Brightest minds in economics meet to tackle tax evasion and avoidance", EC 2021, bit.ly/32tw6OM

9 Reuters: "After Pandora Papers, EU says it plans new rules against tax avoidance" (2021), reut.rs/3r1qe9f.

10 Era Dabla-Norris et al.: "Causes and Consequences of Income Inequality: A Global Perspective", IMF (2015), bit.ly/3INISHN.

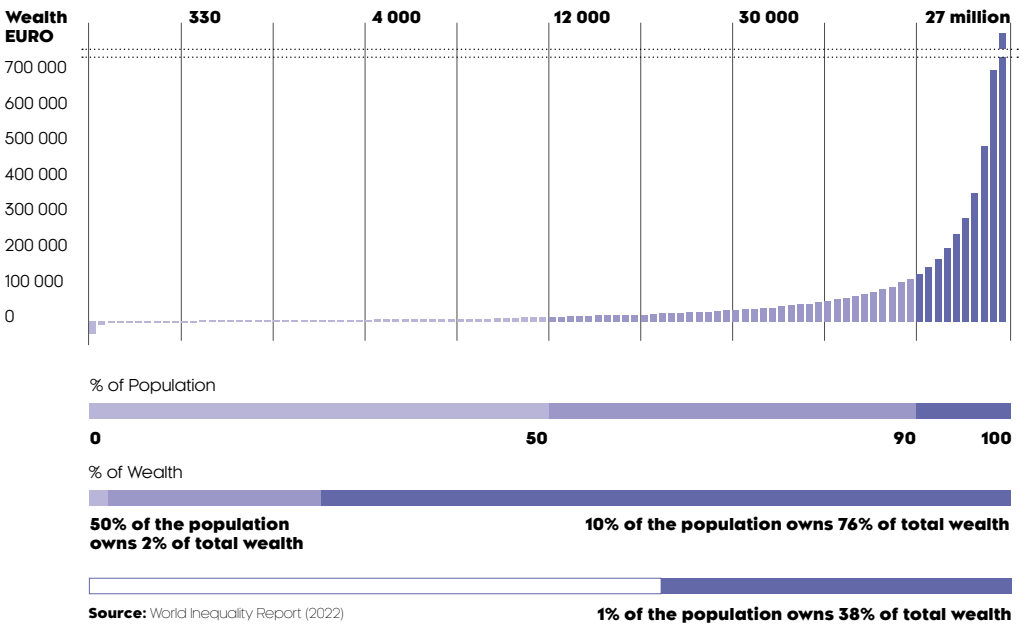
11 Ibid. GINI koefficienter Kilde: voxeu.org/article/income-inequality-eu-trends-and-policy-implications

sence of a large and prosperous middle class. Yet the clash between the state and powerful corporate entities extends to non-democracies as well, with China's more aggressive recent approach to tech sector regulation being an example.

CASE STUDY

CIFS was tasked with developing scenarios around critical geopolitical and technological uncertainties facing a Fortune 500 company. The workshop talks were dominated by conversations around the effects of increased social and economic polarisation and the risks of social unrest associated with inequality, which the management worried could spill over and affect their business. ■

Global concentration of wealth



Source: World Inequality Report (2022)

Outro History is often understood as sequences of major events set in motion by the actions of powerful individuals. While such narratives may give us a good picture of how change occurs in the short term, if we want to understand transformations over prolonged periods of time, they will not always suffice. To put short-term change into perspective, we must also look toward the deeper tectonic shifts of developments that happen over the course of decades or even centuries that single individuals, governments, or nations have little control over. French historians working in the post-war period had a term for this approach to history: *longue durée* (history in the long term). They stressed that only by examining extended periods of time and giving priority to structures over events are we able to draw conclusions from trends and patterns. This is true for studying the future beyond the immediate short term horizon as well.

To construct plausible scenarios of the future, we need to rely on what we know about the past and the present. Megatrends can help us bridge this gap. As we hope we have shown in this publication, megatrends inject some relative certainty into a principally uncertain future. They can help us see the long term through the short-term fog of uncertainty.

Although megatrends provide some clarity about future trajectories of change, the closer we look at them, the more they also open the door to new questions, and when we consider how megatrends intersect and impact one another, even more new uncertainties arise. When the impacts of human decision-making are added to the mix, it quickly becomes clear why the future can never be predicted and why we always need to consider more than one possible outcome.

For this reason, the strong foundation provided by megatrends is often paired with other tools in the futurist's arsenal. As an example, by combining megatrend analysis with the more speculative worldbuilding and backcasting aspects of scenario planning, we can consider and compare multiple critical uncertainties and possible outcomes, and new avenues of change will appear that might otherwise have been hidden from our view.

Megatrends are in and of themselves neither positive nor negative, but they may present either opportunities or threats when interpreted into the context of the future of any given organisation, government, or community. From an organisational perspective, megatrend analysis can marry short-term operational and business risk management with long-term strategic risks, both of which are detrimental to an organisation's survival and longevity. As such, organisations may benefit from including megatrend analysis as an integral part of the process of strategic decision-making.

At the very least, our list of megatrends should be used as a checklist of future changes that you must consider when planning your long-term strategies, since the megatrends form the backdrop for almost all plausible future scenarios. Even wildcard events like the Covid-19 pandemic will usually at most be temporary setbacks for the megatrends. We could view megatrends as nigh-unstoppable tidal waves. The question isn't if a tidal wave comes, but how you will react when it does; will you be taken by surprise by it and be run over and swamped, or will you choose to prepare for it by building dams – or even by riding the wave to new heights?

We hope you have enjoyed reading.

SCENARIO reports

Scenario reports are published four times a year by the Copenhagen Institute for Futures Studies.

BLOX, Bryghuspladsen 8, 1473 Copenhagen, telephone +45 3311 7176
publications@cifs.dk
www.cifs.dk

Writers
TIMOTHY SHOUP, KLAUS Æ. MOGENSEN, MARTIN KRUSE, LOVISA VOLMARSSON, CARSTEN BECK, TAMIRA SNELL, LASSE JONASSON, EMILIE BALK-MØLLER, DARIA KRIVONOS, CASPER S. PETERSEN

Editor
CASPER S. PETERSEN

Design & Art Direction
SARA FROSTIG

Infographics
LOVISA VOLMARSSON, SARA FROSTIG

Illustrations
SOPHIA PRIETO

Proofreading
EMILÍA ANNA WARD

Print House
ROSENDAHLS

February 2022

Get in touch:

Senior Advisor & Futurist

T I M O T H Y S H O U P

tsh@cifs.dk

exploring possible futures

COPENHAGEN INSTITUTE FOR FUTURES STUDIES is an independent, global, and non-profit futures think tank. The Institute was founded in 1969 on initiative of former Finance Minister and OECD Secretary-General, Professor Thorkil Kristensen. The foundation was established in collaboration with visionary Danish public and private organisations to better qualify decision-making through futures studies for the betterment of our society. The Institute works to equip and inspire individuals and organisations, decision-makers and the public, to act on the future, today. Read more at **WWW.CIFS.DK**