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Pushing for change.

From societal trends
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Our normal way of life has ground to a halt because of the coronavirus disease (COVID-19) pandemic. This also holds true for the economy, as governments have shut down economies to contain the spread of COVID-19 and help their health systems cope with the sudden surge in critically ill patients.

This crisis is challenging existing systems and structures, sowing the seeds for further change ahead as we uncover limitations in how we learn, work, and live. Going forward, citizens, businesses, and governments will need to reconsider the balance between the urban and the rural, between cost-consciousness and investing for the future, and between a remote and centralized workforce. And when we look back, the 2020 coronavirus outbreak will likely be viewed as a turning point in our lives and thinking.

Some of the answers can be found within our Supertrends themes. The “Technology at the service of humans” Supertrend, for example, is particularly well-placed as it touches upon the type of flexibility suddenly required in terms of living and working that people around the world are now experiencing. Governments and companies will need to carry out large-scale upgrades to infrastructure.

The outbreak is also having an impact in terms of carbon and nitrogen dioxide emissions, as they decline in cities and industrial areas across Asia and Europe compared with the prior year. This development underscores the link between human activity and climate change, and could precipitate the decarbonization of economic growth going forward. Our new Supertrend “Climate change – Decarbonizing the economy” focuses on companies that should benefit from the transformation in energy, transportation, and agriculture in coming years.

As our Supertrends continue to evolve with the changing world around us, we believe that they remain compelling investment themes for today and the future.

Michael Strobaek
Global Chief
Investment Officer
Credit Suisse

Nannette Hechler-Fayd’herbe
Global Head of
Economics & Research
Credit Suisse

Table of contents

4 Foreword
10 Supertrends. From societal trends to investor impact.

Anxious societies – Inclusive capitalism

by **Reto Hess**

16 Anxious societies
19 Affordability
22 Employment
22 Personal security

Infrastructure – Closing the gap

by **Jens Zimmermann**

26 Infrastructure
29 Transport
30 Energy and water
33 Smart cities
34 Telecom infrastructure

Technology at the service of humans

by **Uwe Neumann**

36 Technology
38 Digitalization
40 Artificial intelligence
41 Virtual reality
42 Industry 4.0
45 Healthtech

Reto Hess
Head of Single Security Research, Equity & Industrials

Jens Zimmermann
Senior Equity Analyst, Energy & Utilities

Uwe Neumann
Senior Equity Analyst, Technology & Telecom

Table of contents

Silver economy – Investing for population aging
by **Lorenzo Biasio**

48 Silver economy
51 Therapeutics and devices
54 Care and facilities
55 Health and life insurance
56 Senior consumer choices

Millennials' values
by **Julie Saussier**

58 Millennials
60 Sustainable business and investments
62 Digital natives
64 Fun, health and leisure

Climate change – Decarbonizing the economy
by **Daniel Rupli**

68 Climate change
73 Carbon-free electricity
74 Sustainable transport
75 Oil and gas transition pioneers
76 Agriculture and food

80 References
82 Disclaimer
87 Imprint

Lorenzo Biasio
Senior Equity Analyst,
Healthcare

Julie Saussier
Senior Equity Analyst,
Consumer Goods

Daniel Rupli
Head of Single Security Research,
Equity & Credit

Supertrends. From societal trends to investor impact.

Daniel Rupli
Head of Single Security Research, Equity & Credit
Credit Suisse

When we introduced our Supertrends three years ago as our framework for high-conviction long-term thematic equity investing, we focused on multi-year societal trends that we believed would lead to fast-growing business opportunities. We expected the stocks of the related companies to outperform as a result, which has turned out to be the case.

We believe that all five of our initially identified Supertrends remain highly relevant. That said, the key societal, political, economic and environmental issues they touch upon are in continuous flux, which requires us to reassess and adapt some of our Supertrends as we go.

Addressing inequality
Take our "Angry societies – Multipolar world" Supertrend: popular discontent, which initially triggered a reaction to protect national self-interests, is still very high around the world. We are keeping track of whether anger is receding or increasing with the help of a new index that we created. While it is ebbing in some countries, it is rising in an increasing number of others. It is therefore still likely to influence political decisions, and, in turn, economic policy and business trends.

We find that popular frustration is focused more clearly on issues at home, in particular inequalities, rather than on perceived outside threats and a move toward protectionism. The coronavirus pandemic has, if anything, shown that the real emerging threats are global and require multilateral cooperation, as well as individual protection. Anger has now ceded to anxiety.

Effective (and profitable) responses to the key pain points of citizens around the world, including affordable and accessible housing, education and healthcare, individual and public safety, individual old-age funding, and access to jobs in spite of an ever faster changing labor market will overshadow many other public priorities for years to come. In response, we are closing our "National champions and brands" subtheme and instead focus this Supertrend on companies that are bringing solutions to the challenges listed above. We believe there is room and support for a mix of public and private efforts in these areas, as few governments have the means to finance such efforts and companies take their share of social responsibility. We evolve our socio-politically oriented Supertrend now toward what we believe will be the next one: "Anxious societies – Inclusive capitalism."

Protectionism has of course not disappeared. Investors will be closely watching relations between the USA and China once the coronavirus disease (COVID-19) pandemic is overcome: it will be an undoubtedly long and complicated process. Another important milestone ahead (post the coronavirus outbreak): the UK will initiate a long list of trade agreement procedures following its departure from the European Union (EU). This may well provide an opportunity to mobilize broader international support to reform the World Trade Organization (WTO) and make a fresh start. Furthermore, while the growth limitations of a world without the free flow of trade and people have been made clear during the COVID-19 crisis, companies will also likely rethink globalization and bring some production closer to home again.

> "Supertrends – From societal trends to investor impact.

Silver is gold

The "Silver economy – Investing for population aging" Supertrend, our most defensive theme, remains on track. The aging population is a well understood phenomenon by now and likely to continue to drive business opportunities and investment performance for many years to come.

Nevertheless, population aging will in particular unfold in emerging markets (EMs) at a speed not yet realized by most. Two-thirds of the incremental number of seniors will be living in Asia by 2050, dwarfing the contribution of any other world region, whereas the region is still underserved by international comparison in health services, according to the United Nations.

As we believe that the EM consumer can be better understood from a demographic perspective, we are moving the EM subtheme from "Anxious societies" into the "Silver economy" and the "Millennials' values" Supertrends. Just like their older EM counterparts in the "Silver economy," the young EM consumers in our "Millennials' values" Supertrend will drive consumption tastes and trends around the world in coming years.

Tipping point for climate change

Further changes are afoot for the "Millennials' values" Supertrends. The Millennials and Generation Z cohorts have pushed for and driven forward a more sustainable way of doing business. So much so that we believe a tipping point has been reached with respect to the responses of broader society including governments, consumers and companies to climate change. We hence introduced a new sixth Supertrend: "Climate change – Decarbonizing the economy."

Anthropogenic (man-made) greenhouse gas emissions (GHG), i.e. carbon dioxide (CO_2) and methane, are the main contributor to global warming, and experts forecast a material increase in the incidence of severe floods, droughts, fires and storms the greater the warming is. Under the 2015 Paris Agreement, countries agreed that emissions needed "to peak as soon as possible" and said they would follow up with reductions in order to achieve carbon neutrality (balance between emissions and removals) between 2050 and 2100.

In response, citizens and consumers will continue to adjust their behavior, which, combined with new climate-related legislation and incentives, is forcing companies to reconsider the way they conduct business. We believe there is an investment case to be made around the companies that contribute most effectively to the transition to a less carbon-intensive world economy. The recent economic shutdown caused by the COVID-19 outbreak has reduced man-made GHG emissions substantially in certain regions, which clearly signals what could be achieved in the future. The key sectors that our "Climate change" Supertrend focuses on are power generation and fossil energy sources, transportation, and agriculture/food production, as these are responsible for the bulk of man-made carbon emissions.

Change brings opportunity

In terms of our "Infrastructure – Closing the gap" Supertrend, we believe that infrastructure spending is on the verge of a boom phase. Gaps are everywhere as old economies struggle to address both existing as well as new needs. At the same time, new economies continue to urbanize at a fast pace. The expectation of lower (and sometimes even negative) interest rates for an extended period should provide the right incentive for investment and be a tailwind for this theme.

As climate change concerns have now attracted broad public attention, we expect powerful regulatory and political catalysts to add further momentum to this theme. The sustainability angle should, in particular, gain more traction within the "Transport" and "Energy and water" infrastructure subthemes. We have therefore decided to pull these together in a refreshed "Smart cities" subtheme, which combines transport, energy and water, and telecom infrastructure with data-driven technology in cities. We expect the latter to strengthen the need to ensure public health security.

Speaking of technology, ongoing innovation as well as the challenges uncovered by the coronavirus crisis continue to make technology a compelling sector for investors. We still believe that the drivers for this investment theme – in terms of demand as well as technological progress – remain powerful and firms within our areas of focus in the "Technology at the service of humans" Supertrend should benefit in coming years. For example, edge computing is opening new frontiers to digitalization and its related applications.

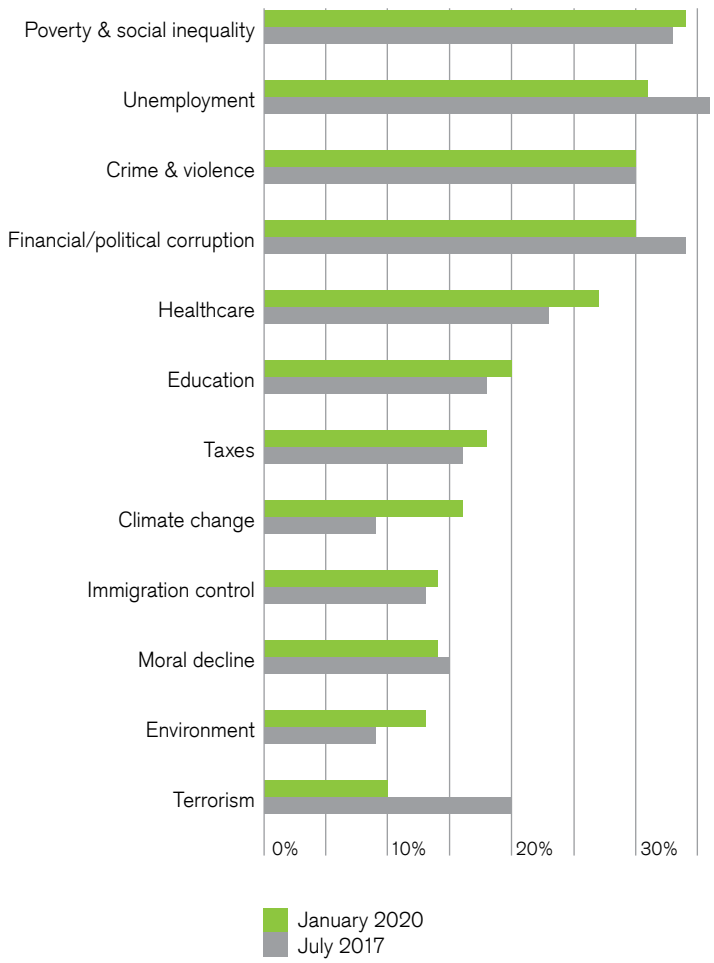
Finally, coming back to our "Millennials' values" Supertrend, we retain our strong responsible consumption and environmental, social and governance (ESG) focus. With health also at the top of the Millennials' agenda, we are witnessing the rise of healthy, sustainable food: the planetary diet. Hence, we incorporate the topic, along with the transition to a circular economy, into our "Millennials' values" Supertrend.

We hope you will enjoy reading this publication. Beyond the pursuit of financial goals, we continue to believe that the Supertrends provide a sound way for investors to also make a positive societal impact with listed equity investments through a highly focused thematic approach with societal needs and trends at the core.

Anxious societies

At the time of the launch of the "Angry societies" Supertrend a few years ago, a disgruntled middle class was shaking up politics in many developed countries, leading to the rise of political populism and protectionism in an increasingly multipolar world. Three years later, anger is ceding to anxiety. Faced with the coronavirus pandemic, governments and companies are facing a unique time of social responsibility. Investors can and will play an increasing role in enabling solutions that address the key concerns of citizens around the world, including inequality, rapidly changing work environments, old age funding, housing affordability, healthcare and education. Now is the time for inclusive capitalism.

What worries the world



Source Ipsos Public Affairs, What Worries The World, January 2020 (interviews conducted between 20 December 2019 and 3 January 2020, international sample of 19,508 adults, Ipsos Online Panel system).

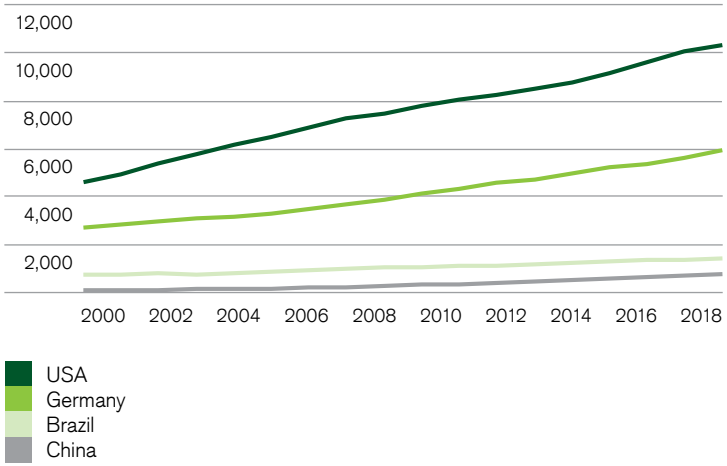
Affordability

Times are tight

In January 2020, poverty and social inequality, as well as unemployment topped the list of people's worries, followed by crime and violence, financial/political corruption and healthcare, according to Ipsos Public Affairs. The coronavirus pandemic is likely to have shifted up public health and job security as the world struggles with containment of the virus and its broad-based economic implications. The core of the anxiety of middle-class families lies in the rising cost of living. In the most recent Credit Suisse Progress Barometer, which surveyed more than 16,000 people in 16 countries, 71% of the surveyed participants agreed that only a small minority gets richer while the majority does not benefit [1].

According to the Credit Suisse Anxiety Index, which tracks whether the level of societal discontent is rising or falling, popular discontent continues on average to rise in the six countries included in the index, especially in Germany and China, and more recently in France. The index reflects changes in specific socio-economic, equally weighted indicators that are often the target of protests and rage when popular anxieties are not addressed. These include the crime rate, corruption, housing prices, health-care costs, inequality (measured by gross domestic product [GDP] per capita), as well as social progress (measured by life expectancy at birth). Macroeconomic policies will continue to support the economy through fiscal and monetary tools, as we have seen in the economic crisis triggered by the measures to contain the coronavirus pandemic. However, elected governments will also likely focus on providing solutions through a mix of public and private efforts. As high levels of public debt may constrain government spending, investors will play an increasingly important role in such efforts. Key areas include solutions that make housing, education and healthcare more affordable, that ensure individual old-age funding, and that enable employment amid a fast-changing labor market.

The healthcare challenge
Healthcare costs since 2000 for selected countries (per capita in purchasing power parity [PPP] terms)



Source The Global Health Observatory, World Health Organization, Credit Suisse

Housing becomes a burden

According to the Organization for Economic Co-operation and Development (OECD), a couple today with two children and a median income must pay 10.2 years' worth of their annual income to buy a 60 square-meter flat in a capital or financial center, compared to 6.8 years in 1985[2]. Increasing housing costs are becoming an ever bigger burden for many households.

A recent World Economic Forum (WEF) Insight Report, Making Affordable Housing a Reality in Cities, summarized various measures to lower housing costs, including land-use strategies such as transit-oriented development or measures to fund affordable housing, such as tax incentives or government-guaranteed bonds[3]. Innovation in construction techniques such as 3D-printed homes or digital tools such as building information modeling (BIM) could also lower costs.

Taming healthcare costs

Healthcare coverage and costs will become an even bigger focus than before. According to the World Health Organization (WHO), global health spending reached 10% of GDP in 2017[4]. With growth of 3.9% in real terms, according to WHO, health spending is exceeding global GDP growth[5].

There are various possible approaches to lower healthcare costs. One is the use of cheaper alternatives of innovative products such as generics or biosimilars. According to the US Food & Drug Administration (FDA), generic drugs cost, on average, 80%–85% less in the USA than brand-name products[6]. Technology also offers opportunities to reduce healthcare costs. According to a McKinsey & Company report in 2019, innovation in technology could enable USD 350–410 billion in annual value by 2025[7]. We believe this will be catalyzed by the current public health crisis.

Pensions under pressure

The risk to future pension benefits is another area of concern. An aging population and lower interest rates are putting many public and private pension schemes under pressure. According to a G30 report, Fixing the Pensions Crisis, the global lifetime financial security gap is forecast to widen to USD 15.8 trillion by 2050 from USD 1.1 trillion in 2017[8]. The pension issue must be solved – the sooner, the better. The most acute problem is funding retirees without excessively penalizing younger generations. A mix of measures that amount to nothing short of a complete rethinking of the lifecycle as we know it will be necessary to respond to these challenges. This will likely include prolonging workers' time in the active workforce through more individual work-life models, reforming the pension system by attributing greater weight to individual savings, and potentially more widespread individual management of retirement funds.

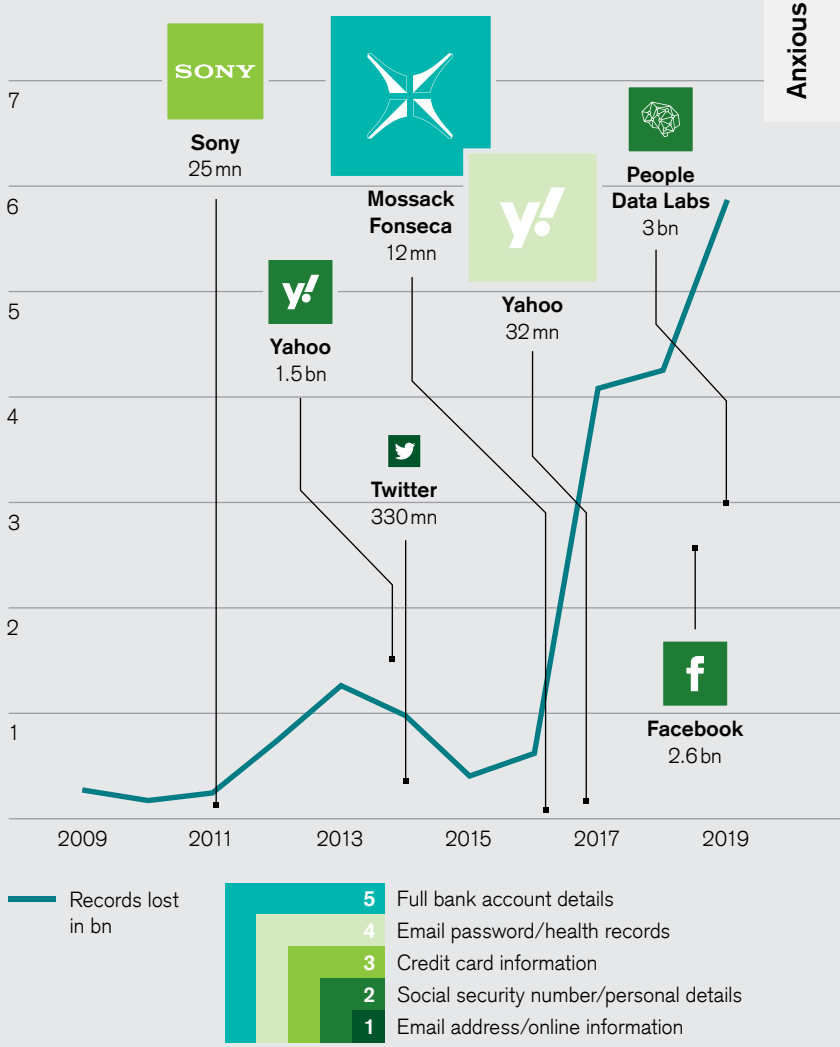
Employment

A fit workforce
The world of work is changing rapidly. Technological progress and climate change are going to render millions of jobs obsolete while simultaneously creating new opportunities, albeit with a radically different skill set, while pandemics require increased work flexibility. According to a McKinsey & Company report from 2017, automation could displace between 400 million and 800 million people by 2030, forcing them to look for new jobs [9]. Similarly, the International Labour Organization (ILO) estimates that while efforts to achieve energy sustainability will lead to the loss of 6 million jobs, another 24 million jobs will be created [10]. According to the ILO, increased investment in people's capabilities is one of the "three pillars of action," which in combination would drive growth, equity and sustainability for future generations [11]. A crucial step in that direction is the endorsement of lifelong learning, with a focus on skilling, reskilling and upskilling amid the so-called Fourth Industrial Revolution. In addition, the coronavirus pandemic may have long-lasting effects on labor markets.

Personal security

Displaced populations and pandemics
The geopolitical landscape remains unstable. Conflicts and political and economic unrest have displaced some 70.8 million people worldwide, according to the United Nations Refugee Agency [12]. While geopolitical risks should not be underestimated, everyday challenges pose greater pain points for people. For example, a pandemic risk was not in the public eye until the recent outbreak of the novel coronavirus in China and its subsequent spread around the world. Disease amplifiers such as population growth, urbanization, or increased international travel increase the global risk, according to the 2019 report of the Global Preparedness Monitoring Board (GPMB) [13]. The GPMB suggests various actions to improve preparedness, such as investments in innovative vaccine technology and therapeutics.

Data breaches since 2009



The size of the box indicates the sensitivity of the stolen data.

Source Information is Beautiful

Within the security subtheme, cyber security remains our key topic. After public outrage about data breaches and the misuse of data, governments are beginning to take action. The California Consumer Privacy Act (CCPA), which contains new consumer rights related to the access, deletion and sharing of personal information, became effective at the beginning of this year[14]. Despite such regulatory efforts, the number of data breaches continues to increase, offering a lot of potential for companies selling end-to-end solutions, as well as specialized next-generation security software companies.

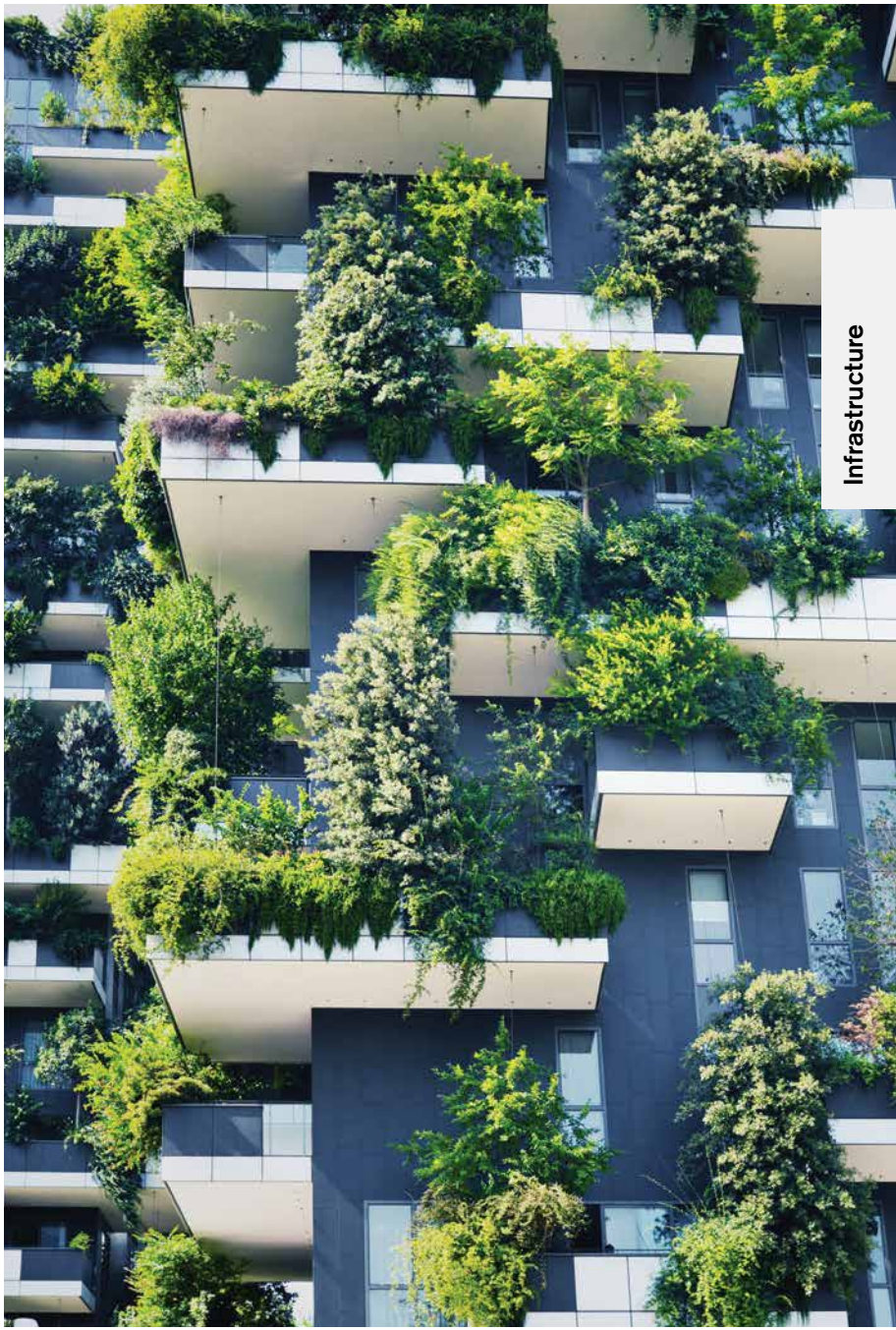
> “Anger is ceding to anxiety. Faced with the coronavirus pandemic, governments and companies are facing a unique time of social responsibility.

Takeaways: Ones to watch

- Companies providing solutions to lower costs of basic needs, such as healthcare and housing. This includes innovative and individualized products/services that are better aligned with personal needs, as well as the adoption of new technologies or materials.
- Companies providing reskilling and upskilling as skill requirements radically change. Furthermore, companies that continuously upskill their workforce have improved talent sourcing and retention, and increased productivity.
- Companies helping to improve safety and security of citizens. With ever-increasing data gathering, cyber security remains a key risk.

Infrastructure

Infrastructure stocks tend to offer solid dividend yields, which lends them appeal as investors struggle to generate returns amid low or even negative interest rates in many parts of the world. This low or negative interest rate environment, which aids the approval process for new projects, should remain a tailwind for the "Infrastructure – Closing the gap" Supertrend in the months ahead. Separately, climate change concerns are creating powerful regulatory and political catalysts within the infrastructure space. Finally, our new subtheme "Smart cities" focuses on the infrastructure challenges facing fast-growing urban centers, including new challenges revealed during the coronavirus pandemic.



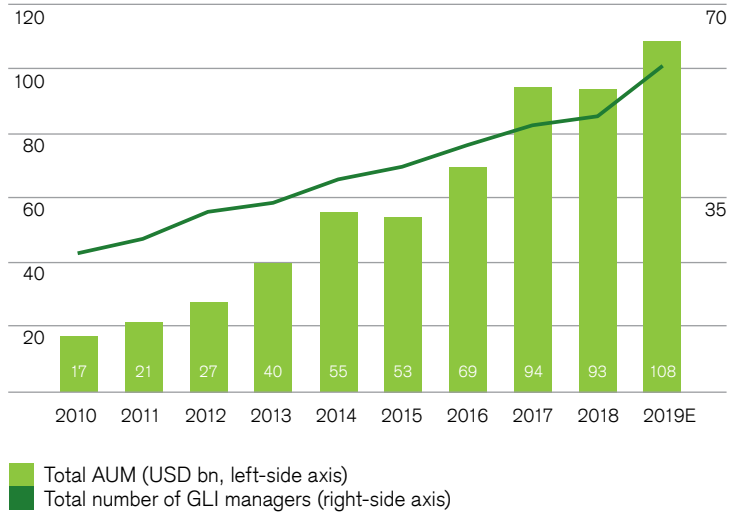
Listed infrastructure: The "It" asset class
Listed infrastructure is a young but fast-growing asset class. Based on estimates from the Global Listed Infrastructure Organization (GLIO), assets under management (AuM) for listed infrastructure funds have swelled to an estimated USD 108 billion in 2019 from USD 17 billion in 2010. At the same time, the total number of global listed infrastructure funds has more than doubled to about 60 from 25. GLIO projects that AuM could triple again and surpass USD 300 billion over the next ten years [1].

In the past, investing in infrastructure assets was only accessible to the private equity sector: institutional investors bought these physical assets directly in order to gain access to stable cash flow streams. In recent years, the supply of available infrastructure assets has become more limited so fewer assets are chased by a growing number of private equity funds. As transaction prices for infrastructure assets increase, lofty valuations present the main challenge for private equity infrastructure managers looking to deploy raised capital.

Listed infrastructure companies operate existing infrastructure assets (toll roads, airports, etc.). When investors (i.e. listed infrastructure funds) buy the shares of listed infrastructure companies, they acquire existing infrastructure assets with ongoing cash flow streams.

Accordingly, listed infrastructure companies have become an attractive asset class for the growing number of listed infrastructure funds, as well as for private equity funds that are looking for opportunities to deploy their capital. As a lot of "dry powder" (i.e. raised but not spent capital) from private equity funds is waiting to be invested in infrastructure assets, listed infrastructure companies can offer a short-term deployment of this capital or even become an attractive long-term investment alternative to physical infrastructure assets [2].

Young but fast-growing
Assets under management of listed infrastructure funds



Source Global Listed Infrastructure Organization

Transport

Build to boost
A confluence of factors, including slowing GDP growth, aging transport systems and climate change concerns continue to drive transport infrastructure investments around the globe.

Mexico, for example, announced a USD 43 billion infrastructure program to kick-start its economy after it slipped into a technical recession in 2019. The goal is to deliver annual GDP growth of more than 4% between 2020 and 2024 from 147 infrastructure projects, many of which are in the transportation sector, and to raise the share of investments in Mexico's GDP to 24% from 20.5% currently [3].

The Philippines has launched a USD 177 billion infrastructure program called "Build, Build, Build" to raise spending to 7% of GDP by 2022 from 2.6% in 2015. This is in response to its considerable traffic problem: the World Economic Forum ranks the country's quality of transport infrastructure at 102 out of 141 countries [4]. The capital city, Manila, ranked second out of 416 cities in the TomTom Traffic Index 2019, which measures urban congestion. According to the TomTom Index, people are losing 10 days and 17 hours each year due to traffic during rush hour. The government aims to cut the two million cars that move every day through Manila's main traffic artery by a third [5].

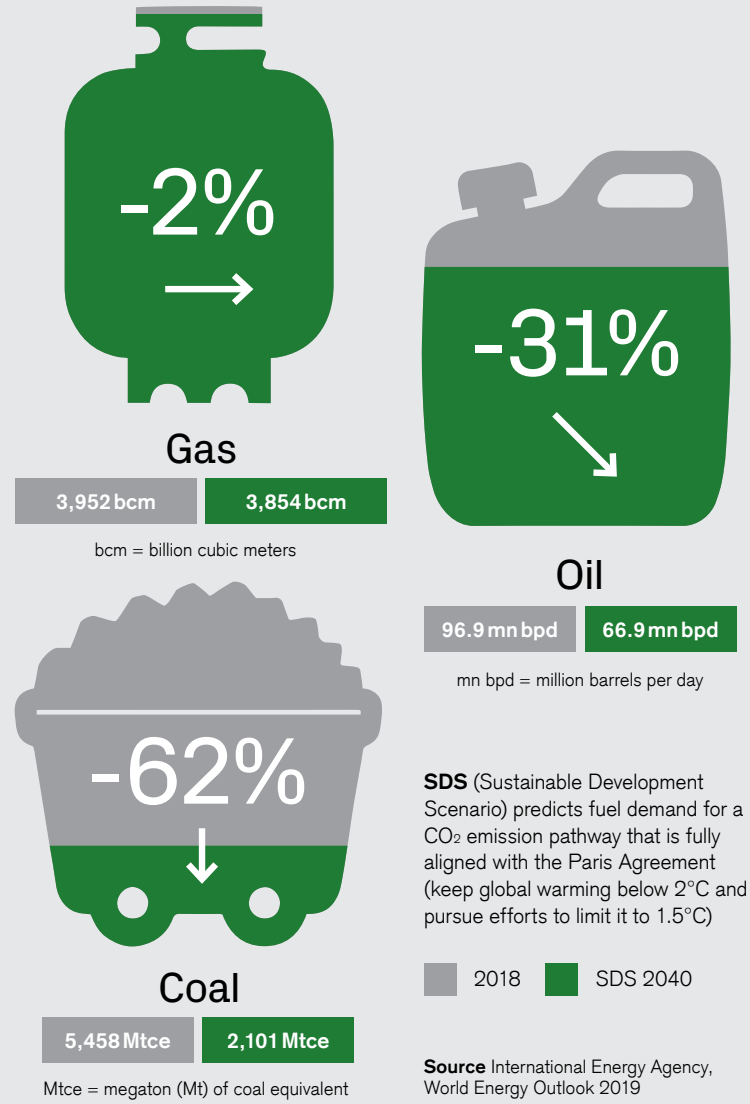
Germany is also trying to revive its slowing economy with the biggest modernization program (EUR 86 billion over 10 years) in the 180-year history of its railway system. Increasing the number of long-distance train travelers to 260 million by 2030 from 148 million in 2018 should also support the government's climate goal to "dramatically" cut CO_2 emissions.

Energy and water

Brace for change
Climate change, coupled with a growing world population, is forcing urgent changes in terms of power generation and water supply on governments around the world. The International Energy Agency (IEA) projects in its 2019 World Energy Outlook that the fuel mix in power generation has to change drastically under its Sustainable Development Scenario (SDS), which aims to limit global warming to 1.5°C by the end of the century. Under the SDS, more than 40% of global electricity supply will need to come from solar and wind by 2040 in order to cut carbon emissions meaningfully. Electricity generation capacity for wind and solar will therefore need to increase more than seven-fold to reach that goal, according to our calculations [6].

This requires a rapid build-out of power generation infrastructure for wind and solar energy. Furthermore, transmission grids need to be upgraded because the share of intermittent electricity supply from renewable energy sources will have to grow exponentially. Utility companies will benefit from this energy transition because

Coal, oil and gas demand forecasts



Source International Energy Agency, World Energy Outlook 2019

they have a large share of renewable energy in their generation mix and are growing their asset base through grid investments in their regulated distribution businesses.

Natural gas remains an important bridge fuel because it is cleaner than other fossil fuels (oil and coal). Accordingly, under the SDS, demand for natural gas will plateau between 2020 and 2030 and then start to decline gradually until 2040 (just a 2% drop from 2018 levels). Operators of natural gas infrastructure, including gas pipelines or liquefied natural gas terminals, will continue to benefit from stable gas demand going forward, even under the SDS. Nevertheless, gas pipeline operators still have to cut carbon emissions or face losing access to financing for new gas pipeline projects.

Other fossil fuels face a different fate. Coal demand would need to drop by 62% from 2018 until 2040, while oil demand would need to fall by 31% (around 30 million barrels per day) through 2040 to meet the 1.5°C global warming target under the SDS.

Zero-carbon nuclear energy also remains a key bridge fuel under the SDS, albeit less important than natural gas. The IEA projects that the share of nuclear energy in global electricity production will remain fairly stable at 11% through 2040 compared to 10% in 2018[7].

Access to clean water is another significant challenge that many countries will have to manage carefully. Water demand could grow by another 20% to 30% through 2050, according to the United Nations (UN) World Water Development Report 2019. As a result, the UN predicts that up to 5.7 billion people, mostly in Asia, could live in areas with potential water scarcity at least one month per year by 2050. One risk related to water scarcity is lower economic growth, with the World Bank estimating that this issue could wipe 6% off GDP by 2050 for some regions, including the Middle East and Africa as it affects health, income and agriculture. Another risk is that climate change could drive increased migration within countries, with a potential 140 million people on the move by 2050, according to the World Bank. The OECD estimates that there needs to be USD 13.6 trillion in water infrastructure investments between 2016 and 2030 to address water scarcity.

Smart cities

Smart cities, steep learning curve

The UN projects that the share of the world's population living in urban areas will increase to almost 68% by 2050 from 55% currently. This rapid urbanization increases the risk of climate change and traffic congestion in large cities. Heat waves – increasingly a reality due to climate change – are worse in large cities where skyscrapers, cars and paved roads trap the heat. Additionally, mega cities face unique challenges in managing pandemics, as the world has recently experienced.

Cities must therefore become smarter if they want to manage effectively urban growth and the challenges that come with it, including public health. Around the world, city planners and residents use data-driven technologies, such as the Internet of Things (IoT) and artificial intelligence (AI), to improve traffic flows, building design as well as waste and water systems in "smart cities." Yet there remain many hurdles for smart cities to overcome, including patchy data, funding, data storage and concerns about privacy, according to a blog by Scientific American.

Smart transport and mobility solutions can reduce traffic congestion and improve connectivity. They can also spur economic growth by providing reliable access to cities and creating so-called agglomeration economies. In France, the "Grand Paris Express" rail project will improve connections between the suburbs and developing neighborhoods in Paris and the city's business districts, research centers and airports by 2035. For example, it will take just 15 minutes – instead of 66 minutes – for a researcher to travel from the Orly airport to the Paris Saclay University Campus, according to the Grand Paris Express website.

Smart water infrastructure focuses on automated pollution and leakage detection in order to minimize the loss of water. The US city of South Bend, Indiana, for example, uses IoT sensors in the sewer system to monitor water levels and redirect wastewater instead of letting it flow into the river. In Europe, the city of Cascais in Portugal uses underground recycling bins fitted with sensors that monitor waste levels and enable drivers to focus on collection routes where the bins are full, delivering both cost savings and reductions in carbon emissions. Smart buildings

use real-time data about occupancy and temperature conditions (e.g. lighting, security and heating) to optimize space and energy consumption. MarketsandMarkets estimates that the annual market for smart building technology will increase to USD 106 billion by 2024 from USD 61 billion in 2019.

Telecom infrastructure

Towering growth
Telecom tower companies offer an attractive growth component within a global infrastructure portfolio. Sustainable growth comes from the acquisition of new tower assets and from an increasing number of tenants per tower.

As telecom towers are not mission-critical assets for mobile network operators (MNO), they sell their tower assets to independent tower companies because it is more economical for an MNO to lease the tower access than to own the tower itself. This trend of MNOs monetizing their tower assets started in the USA, which drove the strong growth of listed US tower companies. The growth potential for European tower companies is huge because there are about 420,000 telecom towers in Europe – three times more than in the USA. However, network operators still own about 80% of these European towers, compared to only 16% in the USA, according to the GLIO[8].

Accordingly, listed European tower companies could experience the same growth rates going forward as their US peers have registered over the past 15–20 years. Spain's Cellnex and Italy's INWIT have led this growth trend in Europe with several tower acquisitions over the past year. In addition, some network operators appear to be considering an initial public offering of their tower businesses to unlock shareholder value. In addition to expanding their portfolio of assets, tower companies can also increase the number of tenants per tower to grow their businesses.

Takeaways: Ones to watch

- Transport infrastructure operators of airports, toll roads and railways with regulated business models and inflation-indexed cost-plus-pricing formulas, which allow them to raise prices in order to pass rising inflation on to their customers.
- Utility companies with a growing share of renewables in their generation mix. This energy transition also requires smarter transmission lines (smart grids) and energy storage technology to keep electricity supply reliable when more power comes from renewables.
- Data-driven technology solution providers that help city planners and residents to manage the infrastructure challenges related to traffic flows, building design as well as waste and water systems in fast-growing urban centers.
- Companies that provide infrastructure equipment for the roll-out of the new fifth-generation (5G) telecom technology, such as data centers, telephone tower companies and equipment providers for 5G telecom assets.

Technology

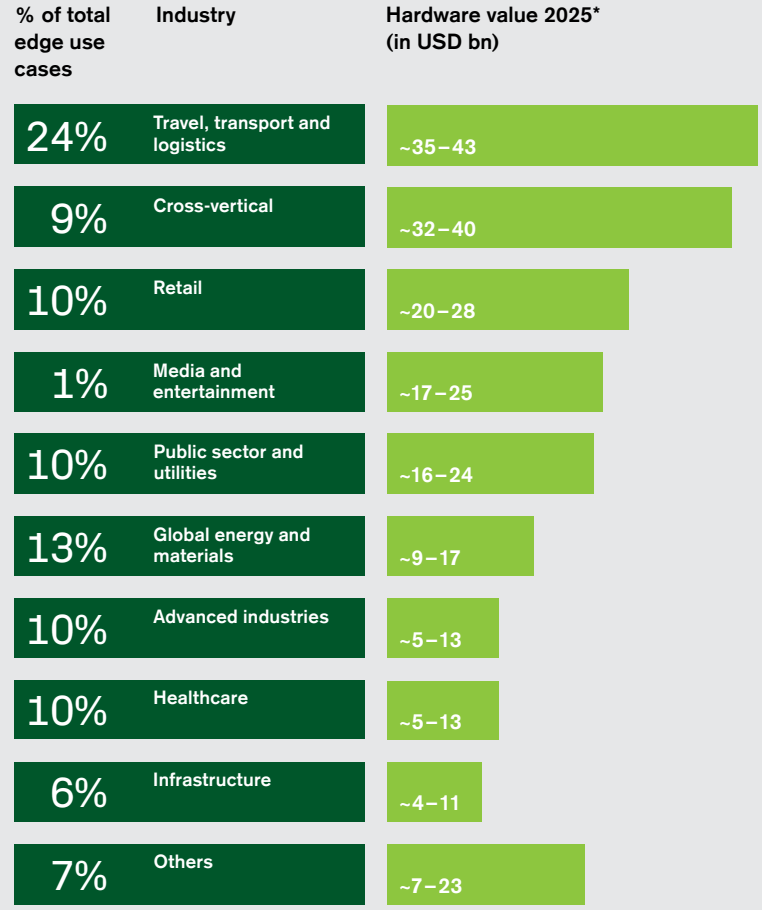
There are many reasons why companies continue to invest in their digital transformation, such as adapting more quickly to changing customer needs, gaining operational efficiency, and boosting profitability. The coronavirus pandemic has uncovered many new reasons to further increase investment in digitalization. Increased mobility, automated real-time processes (edge computing), and at-home education and entertainment are just a few of them.

Digitalization

Moving to the edge

The digitalization trend remains strong. The proliferation of devices connected to the internet is expanding capabilities to collect, manage and analyze a fast-growing data flood. According to Intersect360 Research, IT companies such as Google, Amazon and Microsoft spent USD 57 billion on hyperscale infrastructure (e.g. cloud datacenters) in 2018, and the hyperscale market is expected to cross the USD 100 billion mark by 2023. These investments are a reflection of the huge value in analyzing data created from the data cloud in almost all areas of life and business. However, there is a growing need to increase not only the central cloud computing capacity, but also the local computing power close to the edge of a network, known as edge computing, in order to capture even more value from data. Compared to central cloud computing, edge computing can provide real-time local data analysis to devices with very low latency, along with context-awareness, and increased security and scalability. Edge computing complements cloud computing, particularly in a 5G network environment that offers low-latency data transmission rates. One large US telecom company posted in a blog earlier this year that 2020 would be an "epic year for the edge." Indeed, a large number of edge computing projects initiated by telecom operators are already on the way, as they aim to make the best use of 5G networks, according to the European 5G Observatory. Examples include small data centers, which can be placed at mobile towers or in large buildings to build out services, such as secure drone delivery networks, augmented reality (AR) gaming and marketing services, improved billing/material handling in self-checkout machines in stores, or to track real time the condition of patients in hospitals. According to McKinsey & Company, this new area of edge computing (including sensors, on-device firmware, storage and processors) could create more than USD 200 billion in hardware value in the next five to seven years. Edge computing is most attractive in areas such as travel, transportation, logistics, global energy and materials, the public sector, agriculture and utilities. It could further help in finding solutions to the challenges presented by climate change, energy consumption, water quality and shortages, and autonomous transport. This area should, therefore, benefit from government support as well.

Hardware value forecasts for different industries



* Hardware value includes opportunity across the tech stack and for a use case across the value chain.

Source McKinsey study "What edge computing means for hardware companies" (November 2018)

Technology

Artificial intelligence

Real-world applications
Artificial intelligence (AI) has grown substantially in the last couple of years, and is finding its way into real-world applications. According to McKinsey's Global AI Survey, 58% of respondents reported that their organizations have embedded at least one AI capability into a process or product in at least one function or business unit. That was up from 47% in 2018, which shows a steady increase in AI adoption. IDC estimates that global spending on AI systems will increase to USD 98 billion in 2023 from USD 38 billion in 2018. Additionally, a surge in Internet of Things (IoT) devices and the proliferation of edge computing will push AI in cybersecurity to an estimated USD 38.2 billion by 2026 from USD 8.8 billion in 2019, according to MarketsandMarkets.

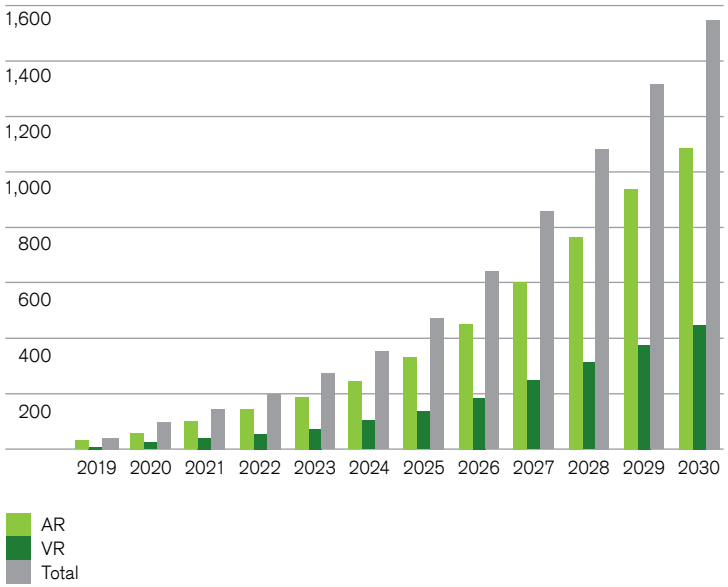
Larger tech players continue to play a critical role in AI's development, thanks to their vast customer bases that churn out huge amounts of data every day. This provides the opportunity to test and enhance AI technologies. That said, startups are also helping fuel further innovation in AI. Total private investments in AI reached around USD 40 billion in 2018 and are expected to exceed that in 2019, according to CapIQ and Crunchbase. But while AI's potential technology has been firmly established, actual applications remain limited to a few areas. AI technology will continue to gain scale in coming years.

AI is leading to exciting innovations. For example, the UK-based startup Exscientia and the Japan-based pharma company Sumitomo Dainippon Pharma used AI algorithms to develop in about 12 months a drug molecule that could treat patients with obsessive-compulsive disorder. Typically, drugs can take more than 4.5 years to get to the trial phase. Exscientia is now working on potential drugs to treat cancer and heart disease, according to a BBC report. We would also expect AI application fields in viral outbreak modeling to emerge from the coronavirus pandemic. Oil companies like ExxonMobil and Royal Dutch Shell Plc are using AI in their exploration efforts. There are many examples that reflect the true potential of AI: solving real-world problems.

Virtual reality

New worlds bring new business opportunities
Virtual reality (VR) continues to make small inroads into the consumer electronics space, with improved experience on headsets in terms of weight, processing power and latency issues. Mixed-reality headsets (in which virtual objects are linked to the real world) have also been making slow but steady progress. Facebook recently reported that it sold nearly USD 5 million worth of content in its Oculus VR hardware and software store on Christmas day, a landmark that indicates that a larger ecosystem is in development. Innovation is also continuing, with Panasonic Corporation recently unveiling new VR eyeglasses that are smaller and do away with the uncomfortable head strap. As such, the market will continue to grow amid increased adoption in various industries, such as manufacturing, healthcare, retail and entertainment.

VR vs. AR
Economic contributions from VR versus AR (in USD bn)



Source "Seeing is believing" 2019 report by PwC, Credit Suisse

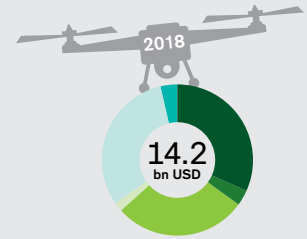
These new technologies including VR, augmented reality (AR) and AI should be considered in terms of the larger potential economic change they bring about rather than their short-term impact, such as in the consumer devices market. In its "Seeing is believing" report from December 2019, PwC estimates that VR and AR have the potential to boost the global economy by USD 1.5 trillion by 2030, compared with a current estimated contribution of USD 46.4 billion. PwC predicts that in 2030, 23 million people will work with AR/VR, an increase from 824,000 jobs in 2019. The large-scale test case for remote-working during the coronavirus pandemic will likely accelerate this trend. These technologies offer benefits to businesses, including improved product development (speedier trainings, collaboration, testing and simulation of scenarios, etc.), enhanced workplace safety, lower costs and the development of new customer experiences.

The AR space, in particular, is becoming more interesting. While VR has been more visible to date, AR could be twice as large a value creator in the long run with applications in both the consumer and enterprise space, according to PwC. Apple is enthusiastic about AR: Chief Executive Officer Tim Cook has said that "in a few years, we're not going to be able to imagine our lives without [AR]." New products feature hardware specifically designed for AR experiences. A suite of tools unveiled at the Apple Worldwide Developers Conference make the creation of ARKit apps easier than ever.

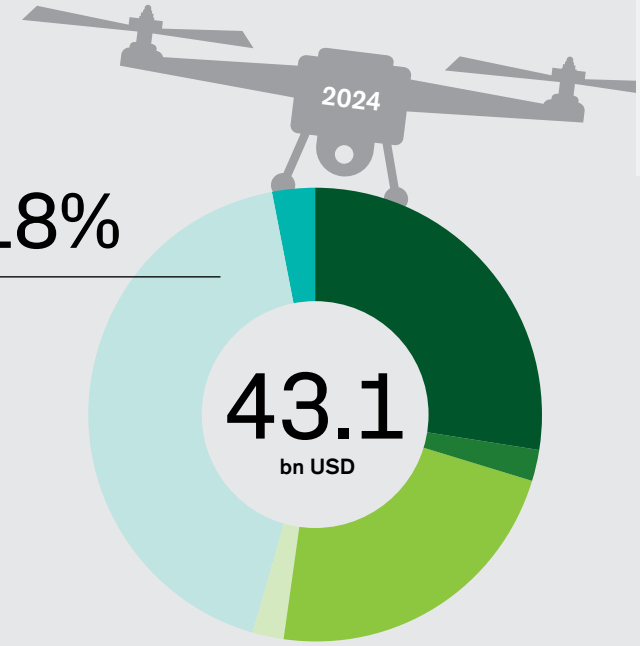
Industry 4.0

Robots master more tasks
More than 2.4 million industrial robots are currently operating in factories around the world, according to a report from the International Federation of Robotics (IFR). Though this number is slightly below the industry group's own 2016 prediction (2.6 million), the industrial robots market is still showing impressive growth. But there is room for further upside: the IFR's 2020 World Robotics Report shows that robot density in the manufacturing industry is 99 per 10,000 employees. Going forward, the rollout of 5G networks with increased data transmission capacity combined with local edge computing power will open up many more uses of robots, including unmanned vehicles and the automation of processes in manufacturing as well as non-industrial areas.

Drone market size and forecast



	2018	2024
North America	4.5 bn	11.9 bn
South America	0.5 bn	1.0 bn
Europe	4.0 bn	9.7 bn
Middle East and Africa	0.3 bn	0.9 bn
Asia	4.4 bn	18.4 bn
Oceania	0.5 bn	1.2 bn



+318%

Asia

Source Drone Industry Insights, April 2019

Drones crowd skies

Drones are no longer a "toy" and are quickly turning into a business tool. Given progress in software, cameras, sensors and edge computing technology, Drone Industry Insights expects the drone market to grow by a compound annual growth rate (CAGR) of 20.6% between 2018 and 2024 to USD 43 billion. More companies are exploring innovative drone-driven services. Indeed, the Federal Aviation Administration (FAA) said in its FAA Aerospace Forecast Fiscal Years 2019–2039 that the commercial drone market could triple in size by 2023. Companies in various sectors are exploring drone technology. For example, a UK-based telecom service operator has announced plans to partner with a Chinese drone company to build a drone delivery network in Germany.

Digital twins

Another interesting area that is at an inflection point is the "digital twin" market. According to a definition by GE, "digital twins are software representations of assets and processes that are used to understand, predict and optimize performance in order to achieve improved business outcomes." This pure software market is expected to grow to USD 35.8 billion in 2025 from USD 3.8 billion last year, according to a 2019 MarketsandMarkets report. Given progress in advanced communication interfaces, analytical technics (e.g., machine learning, AI) and higher flexibility of data storage (e.g., dynamic flash storage technology) companies are increasingly adopting digital twins in order to achieve operational efficiencies, cost savings and improved time-to-market and product designs.

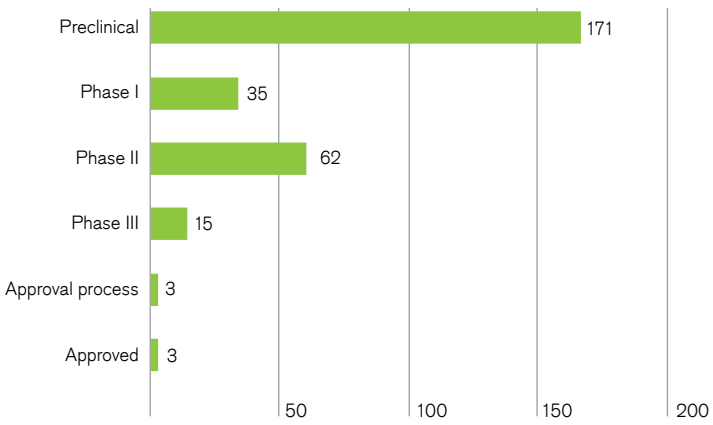
Healthtech

Beyond the doctor's office

The healthcare market is increasingly becoming an area of interest for large IT companies, which are approaching it in different ways. German software company SAP has announced an application targeted at senior citizens that combines input from multiple data sources, including wearables, sensors, and even voice assistance, into a single dashboard view. This solution helps predict risks, organize care, share visibility with the family, and provide independence to elderly people. Another example comes from the US startup firm Komodo Health. It collects anonymized data from patients and payers (insurers), capturing every interaction between patients and the US healthcare system. This provides improvement opportunities for the healthcare ecosystem. Other US technology companies – through their own organic business and acquisitions – are focusing on the mHealth (mobile health) sector and the monitoring and managing of individual health anytime, anywhere.

Hope in gene therapies

Viral gene therapy programs by pipeline stage



Source Biomedtracker | Informa
Last data point: 19 February 2020

This is creating an explosion in personal health data, which consumers can share with their doctors (even in real-time using edge computing power in the future). According to Fortune Business Insights, the global wearable medical device market could grow by a CAGR of 24.7% to reach a size of USD 139.4 billion in 2026 from USD 24.6 billion in 2018. For now, this market is highly fragmented with different niche areas.

The more interesting healthtech area seems to be the diagnostic and gene therapeutics market, where the use of robots, big data and AI is opening many business options. While only a few gene therapies have so far received regulatory approval, there is a huge and increasing number of preclinical projects. The main beneficiaries and drivers of growth are specialized biotech firms and big healthcare companies. The latter are already adjusting their business cases to expand in the new growth areas through the acquisition of successful smaller companies or through investments in their own research. The coronavirus outbreak will also likely serve as a catalyst for the development of telemedicine services, as regulators become more supportive of such solutions, and health insurers less reluctant to cover them.

> “The healthcare market is increasingly becoming an area of interest for large IT companies.

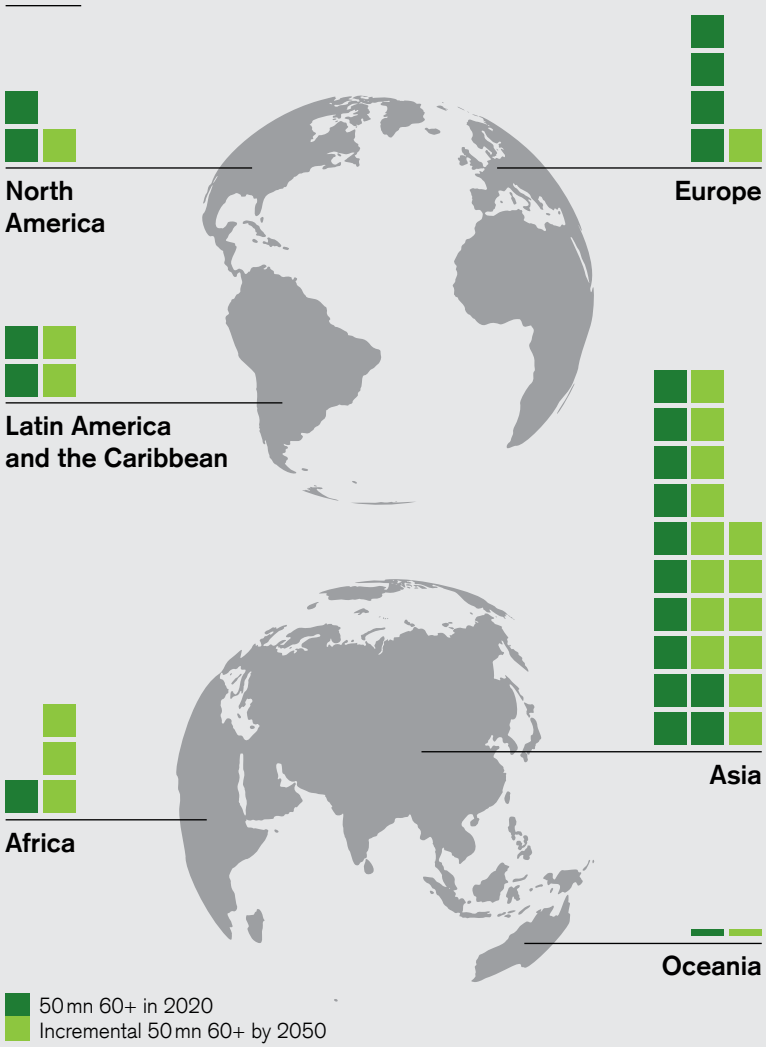
Takeaways: Ones to watch

- Telecom equipment and semiconductor firms with strong exposure to the rollout of 5G networks and edge computing architecture, tower companies and construction firms that maintain and implement 5G networks, and local data transmission platforms.
- Software, IT services and semiconductor companies that are enablers for AI, VR, AR and industry automation processes.
- Internet platform providers that disrupt traditional businesses; for example in healthcare, media, advertising and agriculture.
- Companies in the healthcare sector that use technology to improve execution in areas such as diagnostics, sequencing, therapeutics, care delivery and the development of medical devices.

Silver economy

At the heart of the “Silver economy – Investing for population aging” Supertrend lies the projection that the world’s senior population will double to more than two billion by 2050. This evolution is set to proceed regardless of the state of the world economy or political events, creating needs associated with an aging population in healthcare, insurance and funding solutions, and consumer and property markets. Looking ahead, a focus on emerging markets (EMs) makes sense, given that two-thirds of the incremental number of seniors will live in that group of countries, which remain under-resourced in both healthcare provisioning and public and private insurance solutions.

Population aged 60+ by 2050



Source United Nations, Department of Economic and Social Affairs, Population Division (2019). "World Population Prospects 2019," Online Edition. Rev. 1, Medium Fertility Variant; Credit Suisse

Therapeutics and devices

Addressing aging

Healthcare remains the sector most pronouncedly affected by an aging population. The incidence of many chronic diseases increases with age, which is why a larger elderly population is linked to a disproportionate rise in healthcare expenditure. Based on the historical trajectory, healthcare costs can be expected to continue to rise at a rate several hundred basis points above GDP growth. This raises an important debate and requires solutions to contain healthcare costs amid such demographic developments. Technology can and will play a critical role in providing such solutions.

Medical progress should also provide more effective and affordable therapies for the diseases or disorders that come with age. Ideally, preventative intervention can avoid costly disease in the first place, e.g., lifestyle-related cardiovascular complications. However, this approach seems less effective with cancer, another leading cause of death that carried a cumulative healthcare burden in excess of USD 1.2 trillion in 2010, according to the World Health Organization. Unlike other cancer risk factors such as smoking and an unhealthy lifestyle, aging cannot be avoided. Next-generation technologies, such as antibody-drug conjugates and personalized cancer vaccines, are making great strides in clinical testing. Considering the industry's full oncology pipeline, it will be paramount that healthcare systems exploit the full savings potential from patent expiries through the development of generics as well as biosimilar products of biologic drugs, creating financial headway for innovation.

Regardless of indication, therapeutic area, or nature of intervention (drugs, disease, or other forms of therapy), a focus on value-creating innovation or cost leadership is critical, as it alone ensures negotiating leverage for pharmaceutical, biotech and medtech companies in a world facing steepening healthcare costs. Transasia Bio-Medicals, for example, has become the number one supplier of in-vitro diagnostics in India through a strong focus on costs and profound understanding of local requirements, allowing the company to expand its model to other emerging markets as well as certain developed ones.

> “The world’s senior population will double to more than two billion by 2050.

Hospital beds, nurses, midwives

Country, region	Incremental number of seniors 2020–2050 in mn	Hospital beds needed* to reach global average of 2.7/1,000 population	Nurses & midwives needed* to reach global average of 3.4/1,000 population
China	236	✓	1,605,854
India	180	2,766,909	1,815,948
Indonesia	42	411,653	373,278
Brazil	38	107,343	✓
USA	31	✓	✓
Bangladesh	29	313,733	513,222
Pakistan	26	464,978	645,580
Mexico	20	155,364	67,432
Iran	20	101,212	130,441
Vietnam	18	10,221	193,791
Europe	57	✓	✓

Source United Nations, Department of Economic and Social Affairs, Population Division (2019). “World Population Prospects 2019,” Online Edition. Rev. 1, Medium Fertility Variant; The World Bank Data Catalog; Credit Suisse

* as of today

Care and facilities

Breaking ground
An aging population – in conjunction with the age-related conditions and diseases that go with it – calls for dedicated care options and settings as well as facilities equipped to provide them. Today's senior cohort often live a healthier and more active life than earlier generations, which enables them to live independently for longer and they seek to maintain this lifestyle as long as possible. The one-size-fits-all retirement home option will no longer satisfy the diverse demands of this cohort. Builders and operators of dedicated senior housing concepts – spanning the full spectrum of the care continuum, from assisted living to intensive care – will therefore play a crucial role in satisfying demand. In order to conceptualize the sheer scale in terms of both demand and investment, we calculated the incremental hospital beds that would currently be required to lift the top ten countries (with the highest absolute increase in seniors) to the global average in terms of hospital beds per capita. The result – four million beds – may not sound like a significant investment at first glance. But consider that this number represents four times the number of US hospital beds or the equivalent of 10,000 mid-sized hospitals. Furthermore, this is merely the required investment today and it will only rise going forward as the senior population rapidly expands. Training new doctors and nurses to staff additional infrastructure will also increase costs. Any advances on this front, however, will help alleviate significant shortages across prominent EMs today and thereby contribute to social equity.

When it comes to care provisioning, managed care organizations (MCO) will also play an important role. These companies combine their deep understanding of risk factors, the healthcare environment and a wealth of data on historic care episodes and claims in order to guide patients to the most effective care setting, ideally before catastrophic (and costly) consequences and complications strike. For example, MCOs can identify early on those patients on a trajectory toward dialysis and transition them into dialysis care, avoiding a "crash" into dialysis through a serious and expensive medical emergency.

Health and life insurance

Pension pain point
With a growing senior population comes the need for funding solutions for both living expenses as well as healthcare expenditures. The latter, as mentioned before, can be substantial despite ongoing efforts to rein in healthcare costs. The fact that many of these countries that will add the highest absolute number of seniors between now and 2050 seem ill prepared to ensure the funding of their senior population is of concern. For an assessment, the Melbourne Mercer Global Pension Index is informative. The index awards most of these countries' pension systems a grade C or even D, highlighting the inadequacy of present systems. Even the USA appears to fall short of expectations, with the index awarding that country a C+. This seems consistent with a report from the Federal Reserve Bank of St. Louis that found that 35% of US households do not participate in a retirement plan. "For many American households, the total balances of their retirement accounts may not be sufficient to ensure a solid life in retirement,[1]" the report warned.

Part of the solution will come from shoring up pension systems through unpopular measures (e.g., increasing contributions, increasing taxes, and raising pension systems). However, it is also becoming increasingly clear that the private sector will also have a role to play. Against this backdrop, it makes sense that a German insurer bought a stake in a Chinese life insurer in 2019, and we expect more such transactions aimed particularly at companies operating in EMs. A similar trajectory can be expected with regard to the development of health insurance in EMs, given the similar underlying backdrop: under-penetration of insurance in EMs, and patients' needs to cover unexpected out-of-pocket healthcare costs in both developed markets and EMs.

Senior consumer choices

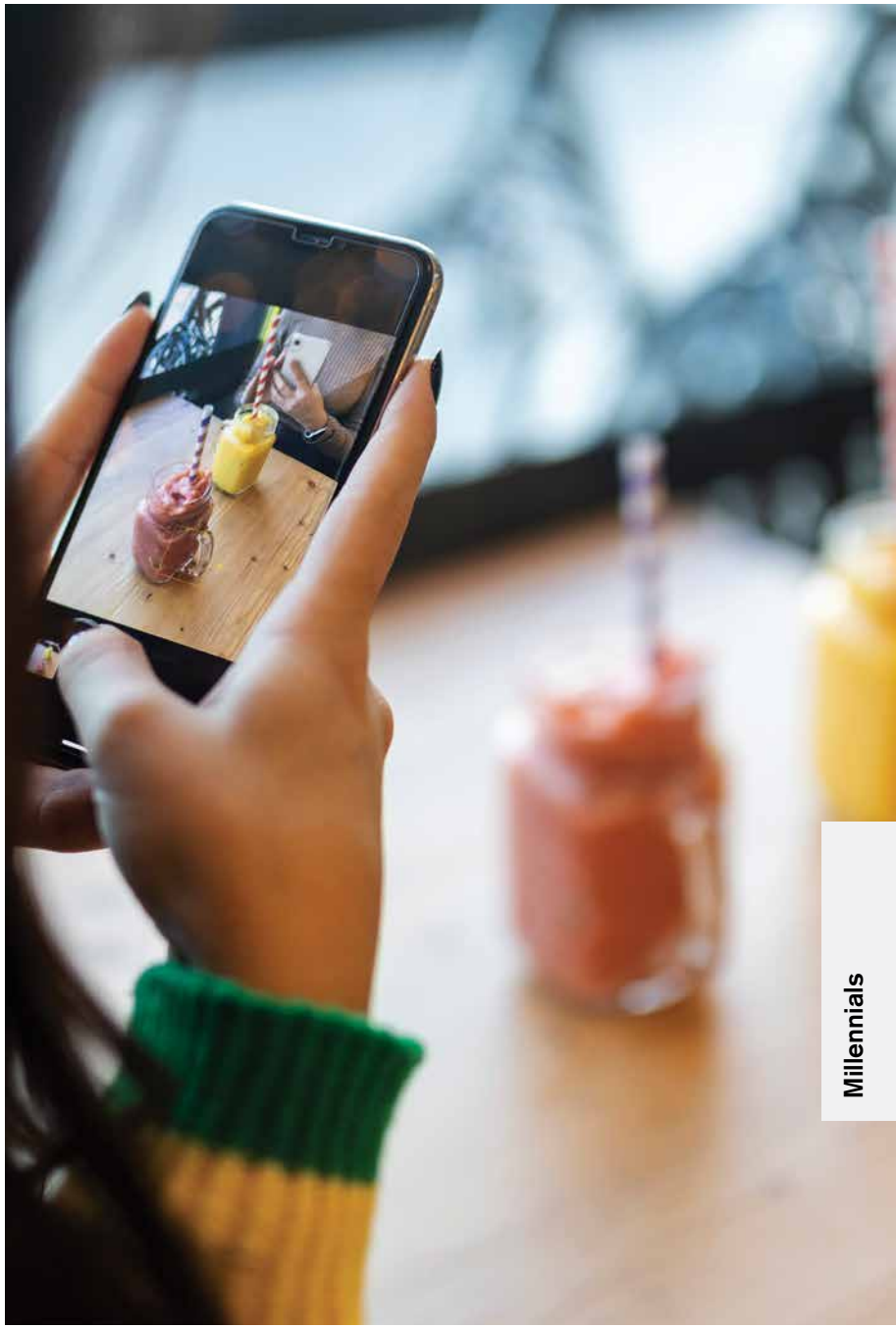
Big spenders
Despite the concerns mentioned earlier, seniors today are a powerful consumer group with high spending power, reflecting the accumulation of wealth over the course of their lives as well as the inheritances received closer to retirement age – another effect of increasing longevity. This significant spending power combined with ample free time makes the leisure and tourism sector a major potential beneficiary once coronavirus-related travel restrictions are lifted and activity rebounds. Additional industries that should benefit include personal care and beauty products and home automation manufacturers. Furthermore, some medical equipment and devices, such as prescription glasses or hearing aids, only receive patchy insurance coverage in most countries and thus usually feature high out-of-pocket expenditures for patients, making the decision to acquire them essentially a consumer choice.

Takeaways: Ones to watch

- Biopharmaceutical, medical technology and life sciences companies that address conditions affecting the elderly through innovative products such as immunotherapies or personalized cancer vaccines.
- Providers and operators of senior housing, dialysis clinics and other care facilities, as well as managed care organizations that can direct patients to the most efficient care setting.
- Health and life insurance companies, private wealth advisors and asset managers with strong pricing capabilities.
- Consumer companies focusing on basic needs as well as the more discretionary wishes of senior consumers, such as tourism companies, beauty product companies, or manufacturers of prescription glasses and hearing aids.

Millennials

Sustainability has been a key subtheme of the “Millennials’ values” Supertrend since launch. Take food choices: while vegans remain a small minority in developed countries, Generation Y and Z are more likely to adopt a plant-based or vegetarian diet due to concerns about the environment and health. This cohort’s evolving food preferences are influencing broader society, driving sales of meat and dairy alternatives. Now even well-known fast-food chains are testing plant-based meat and hamburgers on their menus. Millennials are also taking the lead in other areas, including subscription-based services.



Sustainable business and investments

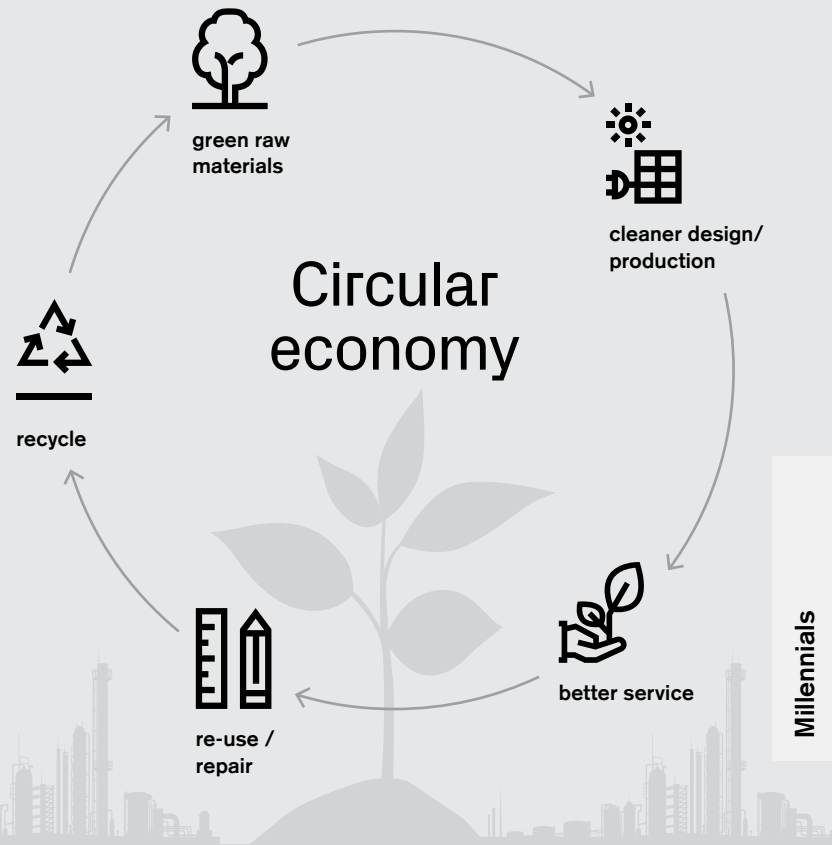
Responsible consumers square the circle
Sustainability is fast becoming a priority for companies, driven by Gen Y's and Z's climate change concerns and increasing spending power. While some shoppers still give little thought to the environment, the ranks of the responsible consumer are growing. When making purchases such as food or clothing, these consumers seek to minimize their environmental footprint, including through recycling. They do not want their bottles of shampoo ending up in the ocean. Posts containing the words recycling or "plastic-free" are trending on social media.

Companies are responding with innovative solutions, albeit on a limited scale for now. A leading sporting goods company, for example, sells shoes made from plastic trash from the ocean. Many apparel companies have introduced sustainable collections, including ethically sourced and recycled materials. The food, beverage and consumer care industries aim to use more recycled plastics in their packaging, and to use more packaging materials that can be recycled. Consumer goods companies are working with retailers to collect goods such as shoes, apparel, or soap bottles after their use, while waste management companies are developing machines to collect such items for recycling. Resale and rental platforms that extend the life of apparel, including designer dresses and purses, are being launched.

These many small steps are leading to the development of a larger circular economy in which companies design goods in a way that every part has value and can be recycled or reused. This stands in stark contrast to the current "take-make-waste" linear economy, as described by the Ellen MacArthur Foundation, a charity that is working with businesses, governments and academics to accelerate the transition to a circular economy that would reduce waste and carbon dioxide emissions. It is an immense challenge. The world burns or sends the equivalent of one garbage truck of textiles to a landfill every second, while the production and use of goods and food account for 45% of greenhouse gas emissions, according to the Ellen MacArthur Foundation. While the consumer goods sector is among the first to embark on this revolution, other industries including mining and construction will need to follow.

Circular economy

A circular economy is based on the principles of "designing out" waste and pollution by keeping products and materials in use.



Source Credit Suisse

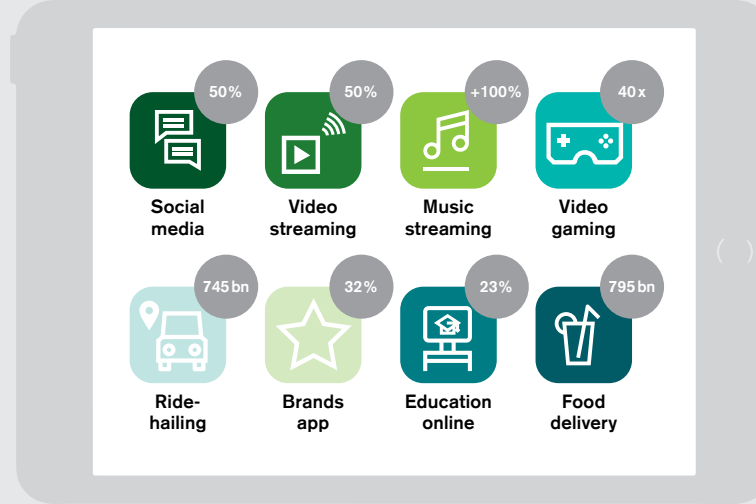
Digital natives

Subscriptions rule
Besides closely monitoring their social media accounts, the daily habits of Gen Y and Gen Z include listening to music, streaming videos and gaming. Most of these activities are subscription-based, reflecting a long-term shift in consumer behavior toward subscription-based content, products and services.

Digital content consumption has been at the forefront of the move toward subscription-based models and has significantly benefited from this trend. The success of the music streaming business, which has reshaped the music industry in recent years, is one example. After 15 straight years of decline until 2014, the global music industry is growing again. The trend is equally strong in the video streaming industry, with a shift to direct-to-consumer subscriptions and a decline in US pay TV subscribers, where penetration of households is down from 84% in 2014 to 74% in 2019, according to the US Census Bureau and Credit Suisse estimates. Competition is picking up with top-tier tech players entering the subscription video streaming space.

In light of heightened regulation with regards to personal data, and with personal data better-protected within subscription models (e.g., credit card data is entered on one occasion and users can choose how their personal data is used), the adoption of subscription models should further accelerate and push beyond the music and video industries. For example, subscription models are making inroads with product and services companies: one large internet retailer provides preferential terms to its subscribers when they buy goods, which has led to an increase in the average basket size. More retailers are following in these steps. In addition, companies providing dating, ride hailing and other services also offer preferential terms or pricing for subscribers.

Millennials app world



Social media Online advertising accounts for 50% of media spend globally.

Video streaming Netflix penetration of US households amounts to 50%. Pay TV penetration is down from 84% in 2014 to 74% in 2019.

Music streaming Global (ex China) audio subscribers will double between 2018 and 2023.

Video gaming Game streaming subscribers are expected to grow over 40x in the next 10 years.

Ride-hailing Adoption had risen to 4% in the USA in 2018 of a total addressable market of USD 745 bn.

Brands app In 2019, Nike Direct (sales through own stores and own app) amounted to 32% of Nike brand sales.

Education online Proportion of Chinese K12 students paying for online tutoring is expected to soar from 2.9% in 2016 to 23.4% in 2020.

Food delivery The global consumer food services addressable market is estimated to be USD 795 bn.

Source Magna Global; Netflix; Newzoo; Frost & Sullivan; Credit Suisse

IoT and AI should further deepen the connection between subscription models and digital ecosystems, creating a circular economy for service applications. For example, consumers could receive a pair of shoes for an annual subscription fee and exchange them for a new pair the next year, or subscribers could receive an electronic device that is maintained and recycled by a servicing company.

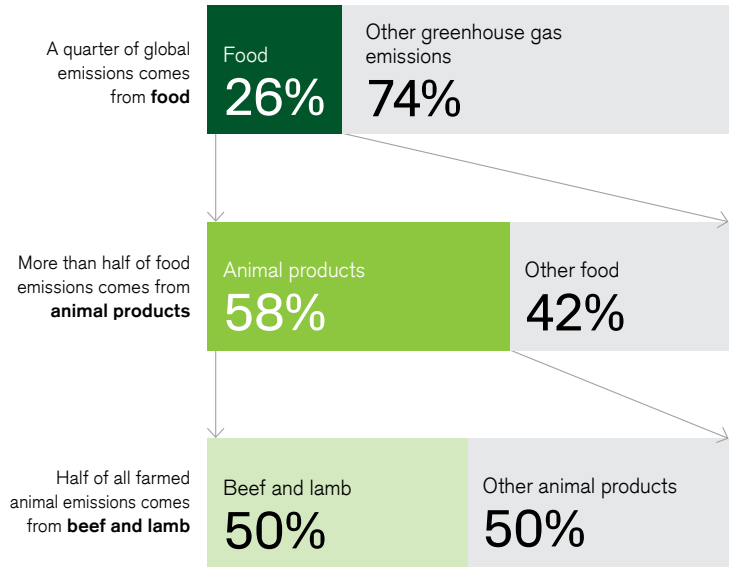
Fun, health and leisure

Growing potential for plant protein
Millennials are mindful of greenhouse gas emissions and the impact they have on our planet. As health is another priority for this group, healthy and sustainable food is on the rise.

Critics are increasingly targeting meat as an issue for both the environment and human health. Meat production is responsible for 58% of food-related greenhouse gas emissions (see chart on the next page). Separately, the World Health Organization has classified processed meat as carcinogenic to humans, while a 2020 study published in the Jama Internal Medicine journal found that the consumption of processed meat, unprocessed red meat and poultry was "significantly" associated with cardiovascular disease.

A 2019 report commissioned by the leading medical journal The Lancet developed a "planetary health diet" that aims to improve human health, while ensuring environmentally sustainable food production for a future global population of 10 billion people. The report – a three-year collaboration between scientists in areas ranging from environmental sustainability, agriculture, political science and health – recommends cutting red meat and sugar consumption, increasing intake of fruits, vegetables and nuts, and adding plant protein to diets. The recommendations also include a shift toward enhanced biodiversity in terms of crops, sustainable expansion of agriculture, reduction of food waste in production and consumption, and stricter rules for protecting oceans. "Food is the single strongest lever to optimize human health and environmental sustainability on earth," according to the report from the EAT-Lancet Commission.

The environmental cost of food production
Proportion of total greenhouse gas emissions from food



Source Poore & Nemecek (2018), Danone, Credit Suisse

We are thus seeing the rise of meat and dairy alternatives. The plant-based protein market, helped by the development of increasingly tasty products, has huge potential. In the USA, for example, plant-based milk products account for 13% of the overall milk category, according to a 2019 report from the Plant Based Foods Association. While consumers in the USA and Europe are familiar with these products, the Asian market has yet to be conquered, which should lead to further strong growth. More recently, media attention has turned to plant-based meat options, such as burgers or sausages, and if we see a similar development as for dairy products, plant-based meat could conquer 10% of the meat market. Consumers are also pushing for food that is low in sugar and additives. In response, traditional food companies are investing in innovation to alleviate market share losses. Ingredients companies, which are bringing novel solutions to food manufacturers, are well-positioned to benefit from this trend.

> “Meat production is responsible for 58% of food-related greenhouse gas emissions.

Takeaways: Ones to watch

- Companies that score high in terms of environmental, social and governance (ESG) criteria and embrace sustainability as part of their strategy. We apply an ESG overlay to the entire stock selection.
- Companies exposed to digital native platforms (social media sites, e-commerce, internet services, streaming platforms).
- Companies exposed to fun, health and leisure (video gaming, eSports, Millennials’ consumer brands).

Climate change

Global warming has caused major disruption in weather patterns, and extreme conditions appear to be becoming the new norm. The United Nations World Meteorological Organization estimates that if we do not change the way we consume and produce worldwide, global temperatures are likely to rise by 3–5°C by the end of 2100. In light of these prospects, governments around the world have stepped up efforts to fight climate change and embarked on energy transition strategies to achieve the targets established under the 2015 Paris Agreement.

Anthropogenic (man-made) greenhouse gas (GHG) emissions, i.e., carbon dioxide (CO_2) and methane, are the main contributor to global warming. Experts forecast a material increase in the incidence of severe floods, droughts, fires and storms, the greater the warming is. At 2.0°C of warming above pre-industrial levels, for instance, 37% of the global population could face at least one severe heat wave every five years, instead of 14% if warming is capped at 1.5°C, according to CarbonBrief. The recent economic shutdown caused by COVID-19 has reduced man-made GHG emissions substantially in certain regions, which clearly signals what can be achieved in the future.

Under the 2015 Paris Agreement, countries agreed that emissions needed "to peak as soon as possible" and said they would follow up with reductions in order to achieve carbon neutrality (balance between emissions and removals) between 2050 and 2100. Yet to put the world on course to reach this target, the International Energy Association (IEA) projects that CO_2 emissions would have to almost halve from around 39 gigatons (Gt) in 2017 to about 21 Gt by 2040. The biggest emission reductions will come from a shift from fossil fuels to renewable energy sources for electricity production, industrial activity and transportation, and/or less carbon-intensive technology, as well as less greenhouse gas-intensive agriculture and food production. Methane emissions from agricultural sources such as cattle or poultry, as well as oil and gas drilling sites, are even more potent than CO_2, although their concentration and duration in the air is much lower than CO_2, according to a scientific study published by the Intergovernmental Panel on Climate Change (IPCC).

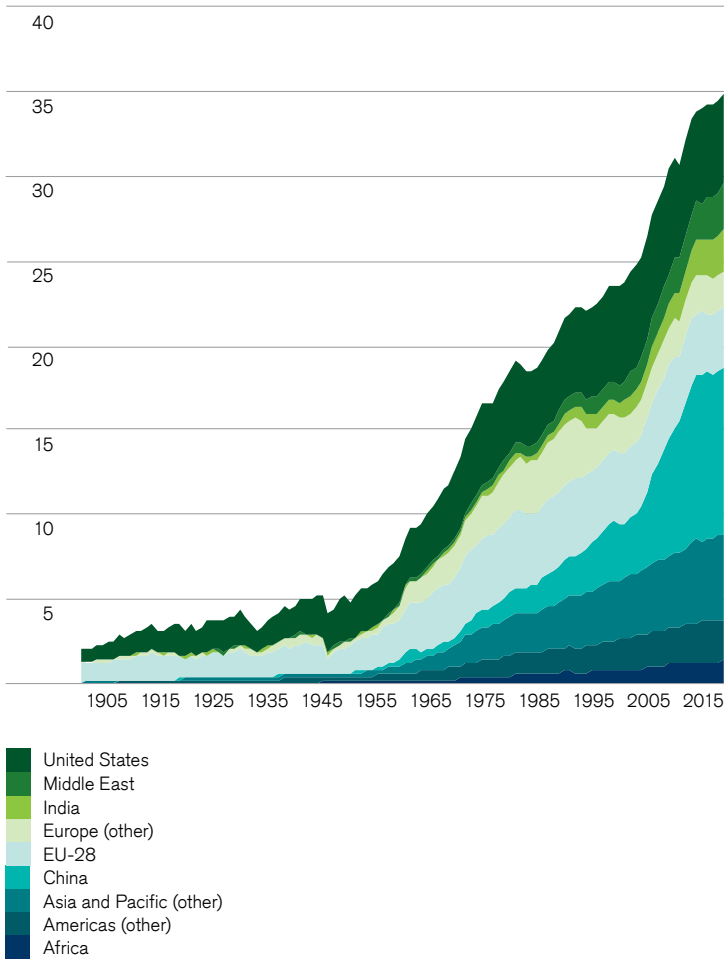
By 2018, 135 countries had adopted power regulatory policies, 70 had adopted transport regulatory policies, 44 had implemented carbon-pricing policies and 20 had put in place policies governing heating and cooling. Developed countries are at the forefront of CO_2 reduction commitments. The European Union (EU), for example, in December 2019 announced a Green New Deal for Europe with a commitment to become the first climate-neutral economy by 2050. While the implementation itself will pose substantial challenges for all countries involved, the cornerstones of the deal are to supply clean, affordable and secure energy; mobilize the industry for a clean and circular economy; accelerate the shift to sustainable and smart mobility; and design a fair, healthy and environmentally friendly food system.

In the USA, although the current administration has pulled out of the Paris Agreement, many US states are taking the lead in the use of renewable energies. California, for example, aims to have 100% zero-carbon electricity by 2045 through a continued expansion of renewables such as hydro, solar, biomass and wind (60% of total electricity production is to come from renewables by 2030) and existing nuclear power as well as natural gas resources with carbon capture and storage.

In emerging markets (EMs), the balance between economic growth and decarbonization remains a challenge. China's rapid economic development in recent decades has turned the country into the largest CO_2 emitter globally, according to the Global Carbon Project. Coal remains a key component of China's power generation in the shorter term, but the country is on track to achieve the renewable energy targets laid out in its 13th Five-Year Plan (2016–20), increasing the share of non-fossil fuel energy in total Chinese primary energy consumption to 15% by 2020 (2018: 14.3%) and to 20% by 2030, according to the IEA. A similar picture arises for India, where over 70% of power production still comes from coal, according to the IEA. Yet India is shifting aggressively to renewable energy, in particular solar energy. In 2015, the government announced a target of 175 gigawatts (GW) of renewable power capacity by 2022, 100 GW of which would come from solar energy. The country has since said it could exceed that target and reach 225 GW. India currently has over 80 GW of installed renewable energy capacity (large hydro not included).

We consequently focus on carbon-free electricity, sustainable transport, energy transition, sustainable agriculture and food in our new Supertrend.

Going in the wrong direction
Sum of annual CO_2 emissions (in billion tons)



Source Our World in Data

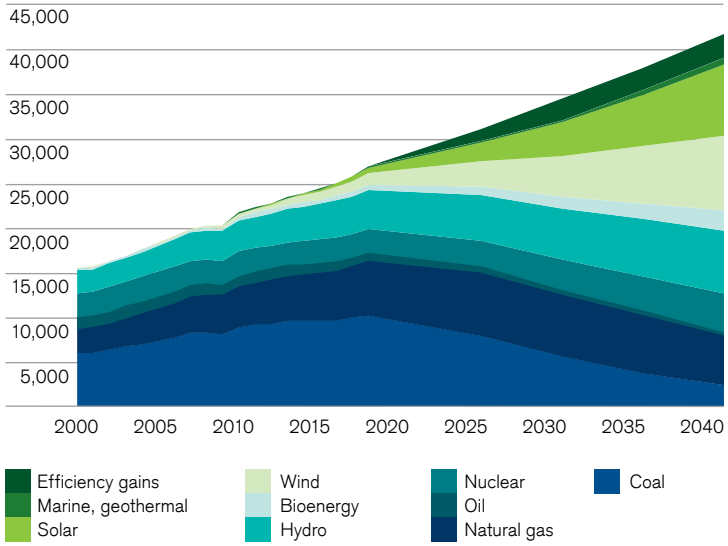
Carbon-free electricity

Renewables power ahead
Within global energy demand, the IEA projects that demand for electricity generation will continue to grow strongly, at a compound annual growth rate (CAGR) of 2% from around 25,500 terawatt hours (TWh) in 2017 to over 40,000 TWh in 2040. Most of the growth will come from emerging markets, while growth in demand in developed markets (DMs) can be curtailed by a more efficient use of electricity. In its Sustainable Development Scenario (SDS), the IEA projects that efficiency gains will be necessary to cut the CAGR for global electricity demand to 1.6%, while a significant change in the fuel mix for power generation will also be required. According to the IEA, wind and solar will likely become the cheapest sources of electricity in many countries, as their cost is expected to continue to decline over the next 20 years. They are projected to provide nearly 40% of all electricity in 2040 (compared to 6% in 2017), according to the IEA. At the same time, the IEA projects in its 2019 World Energy Outlook that the global share of coal in power generation is forecast to decline from 39% in 2017 to 5.5% by 2040. Companies leading in renewable power generation, as well as electricity storage, will likely benefit from this shift. In addition to an increasing share of renewables, the IEA also estimates that the share of nuclear power generation will increase. EMs, in particular, will likely look to nuclear energy as a reliable and cost-competitive source of electricity to substitute base-load energy from coal and lignite power plants.

Sustainable transport

Going electric
Approximately 23% of global energy-related GHG emissions stem from the transport industry, which includes not only road and rail but also air and water transport. One important avenue to reduce carbon emissions in the transport sector is the electrification of engines. Another is to shift to more sustainable fuels and energy sources such as natural gas, biofuels and hydrogen. In a recent report, the IEA highlighted "unprecedented momentum" for hydrogen and said it can help to decarbonize long-haul transport, chemicals, as well as iron and steel, to provide an important reduction in global emissions. But at this stage, infrastructure investments as well as regulatory changes are needed to pave the way for expansion in these areas.

Unlocking the potential
World electricity production under the Sustainable Development Scenario (in TWh)



Source World Energy Outlook 2019, International Energy Agency

Potential improvements go beyond electric vehicles to include electrified air transport and cleaner sea freight transportation. Companies that offer low emissions and renewable energy solutions for the shipping industry will likely benefit from developments in this area. By installing marine solar power panels, for example, a vessel's emissions can be reduced by as much as 10%, according to a PBS article. Companies that enable switching from fossil fuels to biofuels in air and water transportation can help reduce CO_2 emissions by up to 90%, according to GoodFuels. While security requirements in the aviation industry might be an entry barrier for now, the application to the shipping transportation industry is already available. Railroads remain the most environment friendly means of transportation, particularly for longer distances.

Oil and gas transition pioneers

Plan B for fossil fuels
Despite pressure on the energy sector, and coal in particular, demand for fossil fuels will likely remain high during the energy transition in the coming decades. How much oil and gas the world will need will depend on the speed with which governments pursue environmental policies to reduce carbon emissions. Different energy transition pathways lead to various oil demand scenarios and peak oil projections. In a world with limited oil demand under climate constraints, only the most cost-competitive oil supply options will be developed to meet demand.

In response to increasing pressure from both investors and the public, integrated oil companies (IOCs) have committed to lowering their GHG emissions by pursuing different strategies, such as complementing their traditional oil production and refining activities with investments in renewable power generation, producing cleaner transportation fuels, and investing in carbon capture. Net-zero CO_2 emissions have become the new yardstick for government policymakers across the world. The concept of net-zero emissions implies that all produced emissions must be removed by equivalent carbon-reduction measures that generate "negative emissions" in order to equalize the net carbon balance to zero. Among the IOCs, only Repsol aims to achieve net-zero

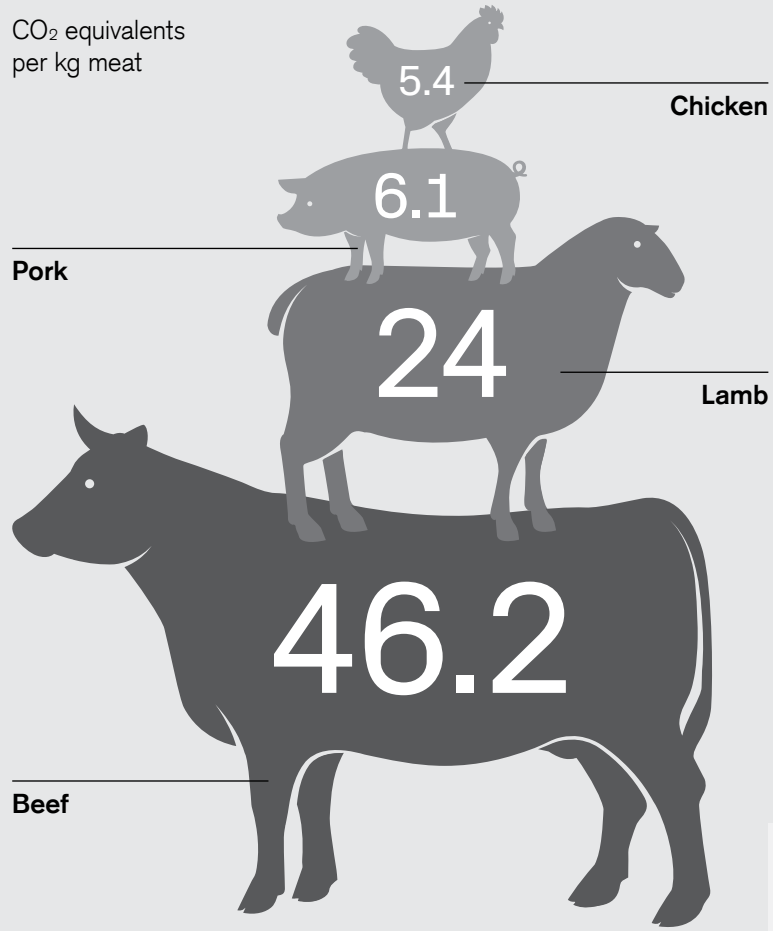
emissions by 2050. The biggest challenge for IOCs will be to transition to a renewable energy business that yields lower returns than traditional oil and gas projects, without jeopardizing shareholder returns and by supporting a shift from coal to gas. IOCs that can square the circle by cutting GHG emissions through investments in less profitable renewable energy projects, while maintaining attractive dividend yields for shareholders, will likely be the winners of the energy transition. Leaders in carbon-capture technology should benefit from capacity enhancements in less carbon-intensive fossil-based electricity production.

Agriculture and food

Harvesting innovation
The global food system is responsible for 25%–30% of global GHG emissions, according to the IPCC. Demand for food will only increase going forward as the global population is expected to reach 9.8 billion people in 2050 and 11.2 billion in 2100, according to the United Nations (UN).

New farming techniques relying on an increased use of technology are set to transform the industry in the years to come. Vertical farming, often combined with controlled-environment agriculture (CEA), reduces the use of land and increases the efficiency of single crops. However, vertical farming requires substantially more electricity to ensure light and temperature stability compared to a traditional greenhouse. CEA can optimize the use of water and energy as well as reduce land usage and labor costs, as it allows for an automated process and control from seeding to harvesting. Separately, gene-editing technologies can help increase the size of plants and make them more resistant to disease and drought. As such, they can further increase the efficiency of agriculture, both economically and environmentally, as they require less land and machinery for seeding, cultivating and harvesting. As agriculture improves land usage, reforestation can take place concurrently.

Comparison of emissions



Source Food and Agriculture Organization of the United Nations (FAO)

Climate change

From a consumer perspective, humans are increasingly reducing food waste and adapting their dietary habits. Plant-based diets can not only positively impact long-term health, but also can help further reduce GHG emissions. According to statistics from the UN's Food and Agricultural Organization (FAO), 1 kg of beef meat results in emissions of 46.2 kg CO_2 equivalents, compared with 5.4 kg of CO_2 equivalents for chicken. Companies leading the charge toward more sustainable agriculture and food production will likely benefit from the combination of rising global food needs coupled with emerging food trends.

> "If we do not change the way we consume and produce worldwide, global temperatures are likely to rise by 3–5°C by the end of 2100.

Takeaways: Ones to watch

- Companies leading in renewables (wind, solar, water, etc.) and other CO_2-free (i.e., nuclear) power generation and electricity-storage technology providers.
- Integrated oil and gas companies that can square the circle by cutting GHG emissions through investments in renewable energy projects while maintaining dividend yields. Carbon-capture technology companies amid capacity enhancements in less carbon-intensive fossil fuel-based electricity production.
- Automobile manufacturers offering electric vehicles and companies offering sustainable fuels such as biofuels, hydrogen, or other technologies. Transport companies with a strong commitment to CO_2 reduction, and the railroad industry overall.
- Companies providing vertical farming technology, gene editing technology providers, as well as controlled-environment-agriculture technology providers that can enhance agricultural efficiency. Low GHG emission meat processors and plant-based food product providers.

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Editor-in-chief
Dr. Nannette Hechler-Fayd'herbe

Authors
Daniel Rupli
Reto Hess
Jens Zimmermann
Uwe Neumann
Lorenzo Biasio
Julie Saussier

Editorial support
Catherine McLean Trachsler
Christa Jenni
Christine Mumenthaler
Flurina Krähenbühl
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Joseph Antony

Product management
Camilla Damm Leuzinger
Claudia Biri
Serhat Günes

Contributors
Rizwan Siddiqui
Dhaval Sangoi
Madhu Appissa
Manas Panda
Nandeep Karande
Dinoj Dwararaj
Fabian Schurter

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