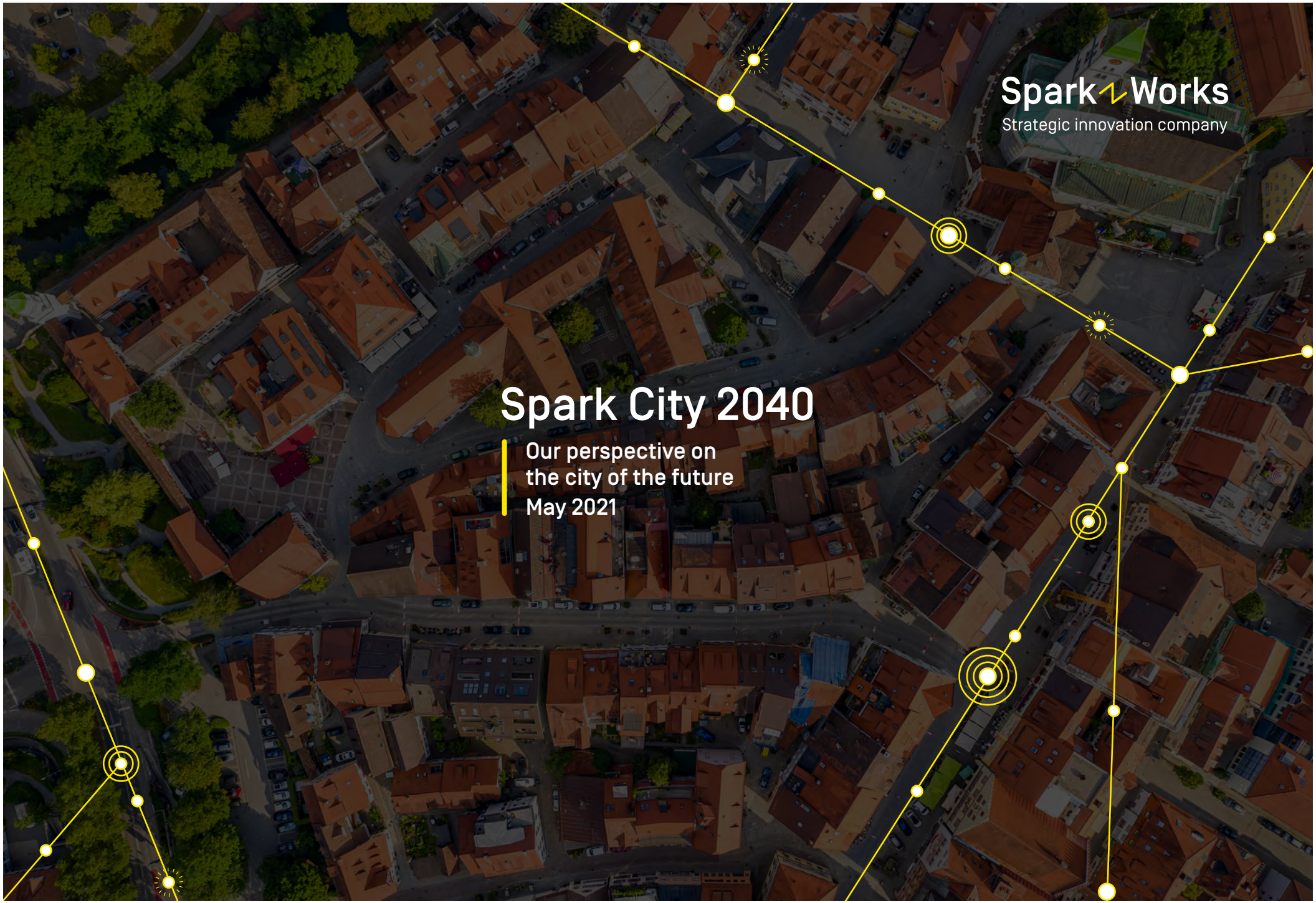

Spark Works
Strategic innovation company
Spark City 2040
Our perspective on
the city of the future
May 2021

The future city is resilient.

By 2050 more than two thirds of the global population will live in urban areas.

This trend will consolidate cities as the main location of innovation, where ideas will form and economic growth springs up. Through our academic research, work with municipalities, governments and smart city laboratories, and from our offices in Zürich and London, we have identified a number of trends that will disrupt industry, inspire the development of new services, and shape our urban lifestyles in the decades to come. New ways of moving around will impact infrastructures, lifestyles and economic activities. Public services will create opportunities of public-private collaboration and higher quality of living. Financial services will be invisible and seamlessly integrated into our everyday lives.

In this report, we detail 25 of the most influential trends across the social, technological, economic, environmental, and political (STEEP) framework, which we believe will have the most impact in 2040 and beyond. With insights across the future of work, artificial intelligence, cryptocurrencies, global warming, and democracy, we're certain you will find the insights presented, to be of great value.

Ultimately, prediction is not about identifying a specific end state. There are simply too many interconnected variables to accurately predict changes in the world beyond 2040. Rather, the aim is to build a transparent, inclusive process, through which stakeholders can voice their assumptions, co-create ideas, and highlight concerns, in a way that enables them in developing the products and services we, as humans, will depend upon in the future.

In closing this report, we present the Northern Hideaway – a depiction of life around Malmö, Sweden in 2042 – and leave you with a number of important questions, which we believe, will have a part in shaping humanity's response to these emerging trends.

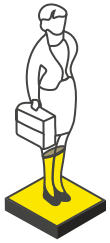
We hope you find the content within to be intellectually engaging, and invite you to join us as we look to our collective future.

44%

of marketing officers say employees will rely on advanced analytics for personalized offerings.

40%

say personal shoppers will use AI-enabled tools to improve services.



37%

say facial/location recognition, and biometric sensors will be common.

HYPER PERSONALISATION

Personalisation is everywhere: from the growing list of products offering personalised engraving to Apple's personal assistant Siri answering your summon with your own name, and of course targeted online advertising.[1] 44% of Chief Marketing Officers say that frontline employees will rely on insights from advanced analytics to provide a personalized offering; 40% say that personal shoppers will use AI-enabled tools to improve service; and 37% say that facial recognition, location recognition, and biometric sensors will become more widely used.[2]

Advances in technology, data, and analytics, will soon allow much more personal experiences across service offerings, from retail to mobility. (See also Conscious Prosumption). Increasing privacy regulations – which began in the political sphere with the European Union, and in the business community with Apple – could hinder data tracking across the internet,[3 4] and in turn, personalisation in advertising and marketing efforts. However, it is the capacity to creatively co-design products with engaged customers which will enable public-facing services and products in staying relevant well into the future.[5 6] "We adapt artefacts like our laptop or smartphone to the human body, the human behaviour and our conceptions[...]. We have to inscribe human characteristics into technology so that we can even operate it."[7]

In 2040, urban planners will utilise insights from advanced analytics to provide a seamless personalised service offering throughout the city landscape. With the use of AI-enabled tools, including facial recognition, location pinpointing, and biometric sensors, cities will be able to adapt public services, offices, parks, lightning, leisure facilities, and other civic buildings to suit the needs of the individual in real time. This information will also increase personal safety, reduce crime, and improve health.

CITIZEN PROSUMPTION

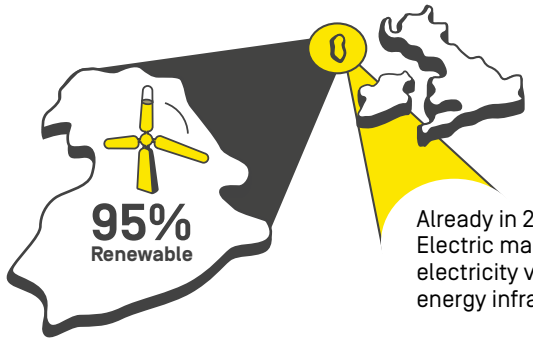
The term Prosumer is a portmanteau of 'producer' and 'consumer'. Research into the practices of prosumption has revealed six subcategories of prosumer, including Collaborative Prosumers, Monetised Prosumers, and Economic Prosumers. [8]

With the increasing price of corporate utilities and falling price of green energy infrastructure, there is growing recognition among citizens in Europe, North America, and Australia that the ability to cheaply produce and consume electricity is becoming more attainable each year. This awareness is bolstered by ever-present environmental concerns and growing recognition of the need for society to transition towards a more environmentally friendly, sustainable lifestyle, and reduce carbon emissions as a whole. [9 10]

By 2030 European citizens will consciously prosume electricity, and by 2040 Collaborative Prosumption and Monetised Prosumption will emerge, wherein high-density neighbourhoods will band together to create microgrids, producing for, and consuming alongside each other. [11 12]

As Adrienne Smith, Executive Director of Brooklyn Microgrid suggests, "[the] vision is to create a platform for peer-to-peer energy trading, creating communities of true prosumers — producers and consumers of their own energy supply.' [12]

This move towards neighbourhood-wide collaborative Prosumption will increase community resilience, and looming energy shortages, particularly in North America. [13] Ultimately, in larger cities, where co-production and trade of electricity between neighbourhood micro-grids will be most common, excess energy will be sold to utilities companies (Economic Prosumption), or directly to other micro-grids through inter-neighbourhood transactions.[14 15 16 17] Energy isn't the only example of prosumption, either. 3D printing, open-source software, and hyperlocal supply chains are others, which not just come with economic and environmental benefits, but also foster greater social interconnectedness.



Already in 2008, Eigg Electric made 95% of electricity via renewable energy infrastructures.

NEW WORK

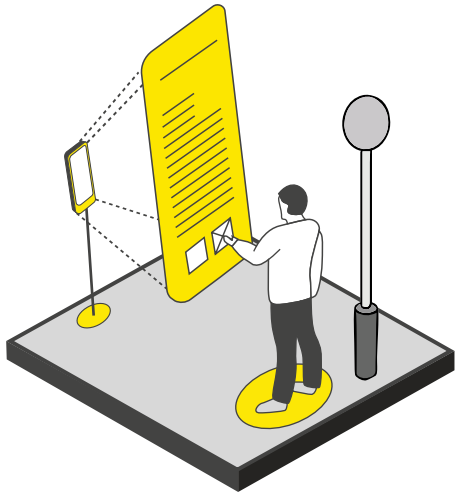
The uniform nine-to-five life rhythm of the industrial era, with its fixed business hours and rigid separation of work and leisure time, is giving way to a more flexible and mobile lifestyle. [18] A restructuring of the workforce will have drastic effects on the cities of 2040. Flexible work will result in less crowded hours of commute, [19 20] and what jobs are on-location in our urban centres, will start at non-regimented hours of the day. 'Rush hour' will be a thing of the past – public transport provision will see less intense demand during historical hours of the work commute, and instead provide even services throughout the day.

In cities around the world, including major hubs such as London, New York, San Francisco, Tokyo, and Sydney, office blocks are a lucrative cog in the urban machine. Governments, developers, and leaseholders generate substantial wealth through rent, rates, and other forms of property tax. [21 22] For this reason, any adverse impact on the office block, as a result of changing demand – including varied hours of labour, and a remote workforce – could mean not only hard times for the wider city, but also national governments.

Acknowledging this sentiment, cities of 2040 will have adapted their urban space to account for a flexible, satellite workforce, much in the way they are currently doing for the demise of Highstreet retail. [23] As highly developed economies continue to progress further toward providing high-tech services, we can expect that, more likely than physical robots, are AI-enabled non-physical personal assistants, available on the nearest visual interface, or more likely, in the ear of the human team, whether in the office, or working remotely. [24 25 26] "The hope from the beginning was that robots would be used for stupid, dangerous or dirty work - the so-called three D's: dull, dangerous and dirty. But what activities fall into these categories and who decides?" [27]

Furthermore, with the demise of the office, we can imagine the calculation of wages to depend on the employee's personal location (as opposed to office location), purchasing parity, and cost of living – with a stipend provided for travel when in-person meetings are required. [28]

Acknowledgement of this remote working life could lead to urban-suburban migration by 2040, but also exacerbate global migration, as the growing middle class moves to locations providing what is important to them, whether this is good healthcare (Singapore), active outdoor pursuits (Switzerland), or optimum diet (the European Mediterranean). [29]



SOCIAL PARTICIPATION

By 2040 digital technology – including real-time public e-voting, artificial intelligence, smart responsiveness, and more – will enable citizens in engaging with the micro-planning of urban space. In this respect, the role of the public will move from being an entity to be consulted on the improvement of their neighbourhoods, to active participants in the ongoing ideation and design processes. [30] "[An] utopia for 2050 [is] that there would be a transparent and inclusive discussion and that as many people as possible would have a say in social discourse, including structures that make this possible." [27]

However, as city planners will still have an important role to play in collating and making sense of this increase in public participation, it will be worth paying close attention to those cities who place importance in urban design recommendations made by Artificial Intelligence, over those made by the public through increased participation. [31]

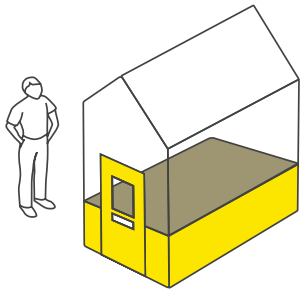
Ultimately, any form of social participation must be designed in a way that is equitable, enabling all voices to be heard, and consensus to be reached. As witnessed in the effects of social media on public sentiment, there is an increased risk that groupthink and extreme perspectives are given a platform: "The rise of social media is accompanied by a strong tendency towards the formation of [group-think]. Participation, especially in the online world, is often associated with pressure to conform [and] the fear of [being 'disliked']." [32 33] Unfortunately, it could be that, "people will [be] influenced by the arbitrary information and impressions impinging on them right at that moment." [32] So, how we design social participation into the urban environment will be an important balancing act.

FLEXIBLE LIVING

With family sizes declining, an ageing population, and outdated housing stock, in many EU nations, residential buildings built in the post-war era are no longer appropriate for changing European demographics. [34] National governments are now placing ever-greater importance upon the practice of demographic forecasting. For example, we see an increasing number of single-person households. In Sweden, that number is over half, at 52%, and closely followed by Lithuania, Denmark, and Finland.[67] It is often difficult to foresee the many external forces which can adversely affect GDP, job growth, and in turn, population change. Mass youth migration from financially bankrupt European nations to those which were somewhat buoyant following the 2008 economic recession provide an apt example of sudden demographic upheaval. [35]

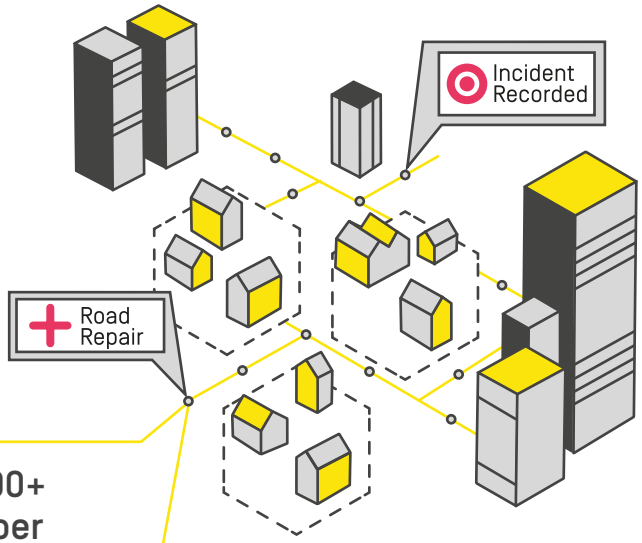
One of the ways in which governments can address this issue is through building adaptable housing stock suitable for all ages, lifestyles, and family sizes. By 2040 member states throughout the EU will have begun to adopt modular housing which can be easily reshaped and resized to suit the needs of individual tenants. [36 37 38] As with many areas of daily life in 2040, this process of mapping and adapting housing stock – based on individual use cases – will be assisted by artificial intelligence, which will suggest modular adaptations addressing the number of residents per household, and their needs, whilst at the same time reducing wasted space [39] and managing utilisation of shared open spaces. [40]

This process will also assist in addressing growing problems such as elderly care in the home, loneliness, building maintenance expenses, and clustering of similar lifestyles, [41 42 43] creating on the whole, more balanced and convivial residential spaces for all. [40]



33%

of households
are single person.



Most cities with 100,000+ people in Nordic Member States can be characterised as Smart Cities...

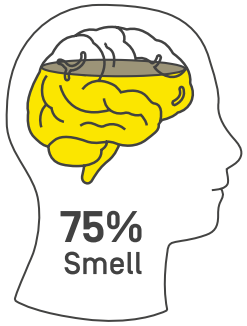
...along with the majority of cities in Italy, Austria, the Netherlands and approximately half of British, Spanish and French cities too.

ARTIFICAL INTELLIGENCE

It is certain that AI capabilities will advance by 2040, but whether they will improve at a linear, or exponential rate is unclear. Undetermined improvements in processing power such as quantum computing could dramatically accelerate capability growth, and may be used to solve some of the urban landscape's most complex issues, including traffic congestion, [44] transit demand, waste disposal, and energy management. [45 46]

The arrival of human-level AI is, however, highly speculative and contested by experts. [45 47 48 49] Some argue that "it is certain...we will develop an AI that is smarter than humans" [45] by 2040. Others counter that "[AI] will not be used to primarily replace human intelligence, but rather to enrich it." [45 49] Others further doubt that AI will ever take on human capabilities. Regardless, quantum computing will almost certainly have a key role to play in the future of the smart city, with its capacity to process vast quantities of data per second. [48 50]

Examples can already be seen in cities such as Amsterdam, where AI is being used to gauge the condition – and suggest repairs – of urban streets in footage streamed by citizens as they commute by bicycle, [51] or Montreal, where cameras and sensors are collecting data which will enable AI to optimise public services. [51] At the same time, the adoption of AI is heavily dependent on societal and political processes. Social and ethical implications are reflected in the increased concern portrayed by the Hollywood dramatisation of doomsday scenarios, but also, more realistically, as a result of looming job losses and overall reduction of the workforce in favour of AI and robotisation (see New Work). "These technologies will advance humanity as a whole....However, we will have to make the right choices before [they] are upon us." [45]



75% of emotions are provoked by smell.

We are 100 x more likely to remember something we smell over sight, sound or touch.

MULTI-SENSORY EXPERIENCES

In coming decades, the evolution of Virtual and Augmented Reality will continue to diffuse into every aspect of our lives, becoming as commonplace as video streaming is today. [48] [52] However, supplementing the primacy of visual/auditory interaction, by 2040 we can expect to see innovative breakthroughs in other modalities, including tactile, gustatory, and olfactory [53] human-computer interaction (HCI).

Digital environments will require a new generation of user interfaces and experiences. In this regard, multi-sensory interfaces will become increasingly important within HCI, fundamentally altering our experiences. In the near future, these developments will gain traction as sensory research enters the fields of machine learning, artificial intelligence, and HCI through association with psychology and neuroscience. "By understanding the ways in which our senses process information and how they relate to one another, it will be possible to create richer interactions. Studying these senses not only enhances the design space of multisensory HCI, but also helps to improve the fundamental understanding of these senses." [54]

Whilst current constraints include limited processing power, input methods, scalability, [55] sustainability, [55] and the need for a comprehensive codification of the complex data produced by sensory interactions, these issues may find resolution with the diffusion of quantum computing. "Smell and taste are known as chemical senses because they rely on chemical transduction. We do not yet know entirely how to digitize these senses in the HCI context. However, we are now ahead of technological development due to the rich understanding achieved by psychology and neuroscience." [54]

It is not unfathomable that gustatory and olfactory interaction could be used to induce more rational thinking, or as a sensory reward for good behaviour. [56] At the time of writing, a number of experimental sensory interfaces are already in development, including LOLLio, [56] and MetaCookie+.[57,58]

DECENTRALISATION

Decentralization is strongly linked to localisation (see Localisation), and whilst it is becoming an increasingly common process in many industries, services, and institutions – including the workplace, energy, government services, and city governance – in many cases it is enabled through the ongoing proliferation of blockchain technology.

Blockchain provides a number of important features for the city, each with their own ramifications. This includes its huge potential to create a more decentralised society, [59] [60] regulate and enable smart-traffic and city systems, and manage energy demands. It allows new incentive schemes to be tested, and could also support dynamic systems, [61] since no single entity would be able to abuse the system's parameters for individual utility maximization. "The blockchain and its smart contracts are technology layers that can enable the existence of Decentralized Autonomous Organizations and this machine-to-machine economy." [62]

Furthermore, Blockchain technology will improve both the privacy and security of shared public and private services, where users may be required to identify themselves before these services can be made use of. [63] Despite its appeal however, concerns surrounding the substantial environmental impact of blockchain will increase in years to come, and could create challenges for its future development.

Elsewhere, the 3D printing of goods will affect both industrial production and consumers, allowing customized repairs while reducing the need to buy replacements for broken products. [64] Moreover, higher market penetration can be expected, as costs for 3D printing devices steadily decline. [65] In this sense, it is also becoming increasingly likely that we will see an increasing decentralization of food production [66] (see also Urban Farming).

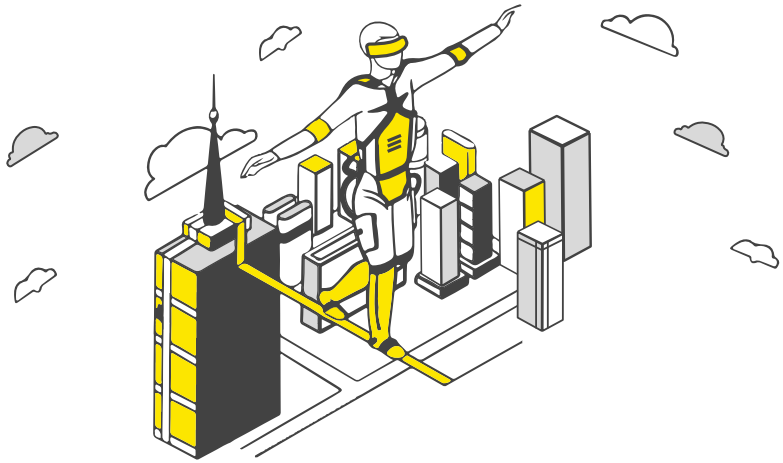
DIGITALLY ENHANCED REALITIES

In the future, reality will be increasingly enhanced or replicated via digital devices and technologies such as Augmented Reality (AR), Virtual Reality (VR), and hologram. [48] [52] Future applications may include the workplace, social interaction, the viewing of property, route planning, retail, and more. This trend will disrupt the way we live, work, and engage with the people and urban spaces that surround us.

AR is already being applied today in specific contexts, such as scanning luggage at airports. It will come to enhance not only the work environment, but also private life, offering enriching experiences where information about an individual's surroundings will become interactive and digitally manipulated (see also Human Enhancement). AR can, for example, transform visitor interaction and experience with city landmarks by illustrating their historic pasts, or provide traffic updates and route planning in real time.

Widespread adoption is expected to take place over the next ten years, as VR technology advances toward the perfect replication of reality. [67] (see also Multi-Sensory Experiences) The technology will eventually also provide new tools and opportunities to urban planners and governments, who, for example, can suddenly see cities from the perspective of many different ages and abilities, and thus improve urban safety for all individuals.

With the ability to provide data in real-time, engage users, and interact with real-life infrastructure, AR and VR have massive potential to transform urban spaces and services.[68] However, since humans are social, receptive beings, it is unlikely that virtual applications will replace physical interactions or experiences entirely. Evidence suggests that remote interaction via social media not only increases online social interaction, but also further creates the desire for in-person interaction. [67]



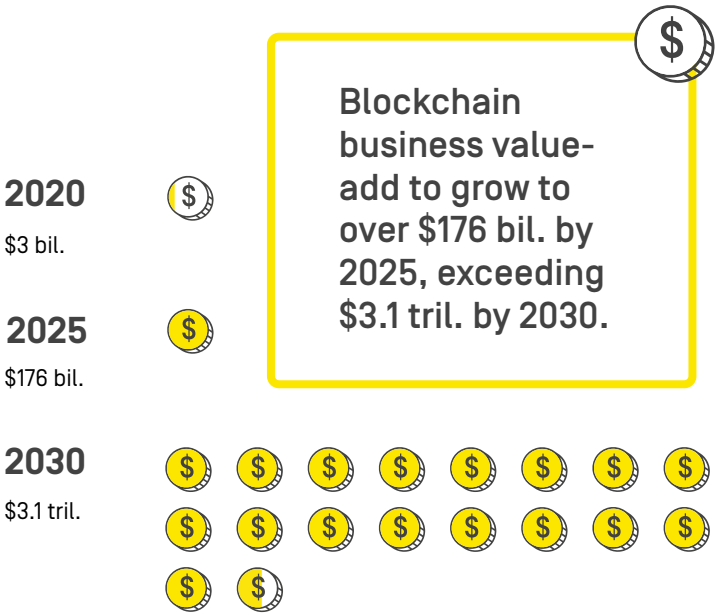
HUMAN ENHANCEMENT

In decades to come, (rightfully) stringent medical regulations, the complicated nature of neuroscience, concerns over cybersecurity, and the constraints of processing power will create impediments for physical and cognitive human enhancement. [69] By 2040, however, we can expect that exoskeletons – wearable robots with soft sensors and mechanised muscle – will become commonplace, due to developments in the field of robotics. These exoskeletons will be important in their ability to enhance human movement – enabling both the physically disabled, and elderly, to regain mobility. [70]

Similarly, glasses enhancing human vision with additional information are not yet ready for the mass market. In due course however, we can be confident that advances in processing, energy storage and the technical principles of digitally enhanced realities will enable the augmentation of human visual perception. This development will further include telepresence, allowing experts to operate complex mechanical technology from a distance.

These technologies offer exciting opportunities for the design of our cities in coming decades. However, until we see widespread proliferation of human-machine augmentation – afforded by the falling price of such technology – it is likely that the lack of uptake, may result in only minor, incremental changes in the design of our cities, as the need to design for all abilities includes those for whom augmented enhancements have not been designed, or who cannot afford the costs associated with enhancement. [69]

Equally, from an opposing perspective, it could be that human enhancement brings all members of society to the same level of physical mobility. This alternative perspective may have little effect on the design of cities, and instead result in a reduction in the number of disability-conscious designs, which are currently on the rise in cities throughout Europe.



RESILIENCE

With the increase in localisation (see Localisation) and the development of the 15-Minute City – wherein all amenities and public services a community needs are within a 15-minute walk or cycle – larger cities may seek to increase economic resilience through the creation of their own community cryptocurrency. Similar to the Local Currencies [71] which appeared in cities throughout the 2010s, community cryptocurrencies will seek to lock financial value within the local (city) economy, creating wealth for residents, businesses, and suppliers, and offering an alternative to national currencies. (See Monetary Substitution)

Where Local Currencies previously fell victim to the growing use of cash-free, contactless transactions via smart device, [72] with the proliferation of cryptocurrencies and dedicated cryptocurrency wallets [73] becoming commonplace, community – crypto – currencies may once again find their place within the local, city economy. [74 75 76 77] Similarly, it won't just be cities with dense populations which utilise community cryptocurrencies, smaller city regions in rural areas may also seek to utilise them in protecting their local economy and suppliers. The result could see a small, informal economy flourish, with metropolises and surrounding regions enacting transactions between local, community currencies.

Amongst several recommendations highlighted by the 15-Minute City concept, are the need to, "refocus on local supply chains and promote national production," and, "retain local jobs for local people." [78] In this, we can already see how the rise of the local cryptocurrency could improve city resilience. "But what we expect is also that there will be a great increase in the medium and small sized cities. Most of them still have to be built in the next decades. And of course, this makes a great difference in how people live in this kind of environment and also what kind of intervention can be done." [79]

The European Commission found the average household has an asset of $3,000 mainly sitting idle on the driveway.

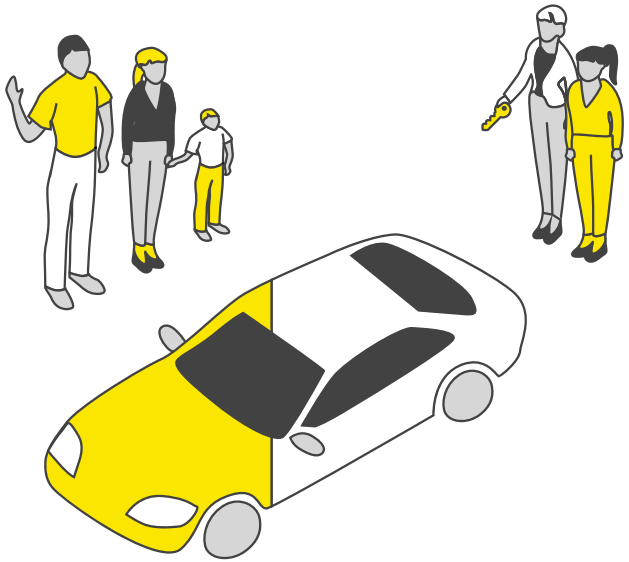
(TRUE) SHARING ECONOMY

For many, the most recognisable examples of the sharing economy are to be found in the ride-, and bike-sharing markets, including Lyft, Uber, and Mobike. There is however, a much wider sharing economy out there, including lesser-known markets such as community car sharing, collaborative consumption (see Citizen Prosumption), community bartering, collaborative caregiving, tool-sharing, and reuse hubs. [80] Whilst some of these examples have seen third-party monetisation through platform capitalism – including JustPark, TaskRabbit, and Eatwith [81] – evidence suggests the informal sharing economy will flourish in a non-monetised capacity.

There is a clear need to match supply with demand. The city is essential to the viability of the sharing economy, in that it provides the act of sharing with an economy of scale. Without an adequate number of individuals participating, any sharing service will quickly find holes in its provision and become unworthy of the time provided by its few active participants.

Possibly most important, are the social ramifications of a sharing economy. Despite current strain on social cohesion, by 2040 we could actually expect a more convivial society brought about by this emphasis on sharing. "With [...] technology, it becomes possible to involve [...] communities more. They have so much to offer: local knowledge, experience, ideas, planning and design suggestions. [The] precondition is that citizens have ownership [...] and can trust the system to respect their [...] contribution. [This] will enable a new type of architecture, urban design and city management." [171] One early example can be found in nations legislating against corporations through right-to-repair laws. These laws are themselves, the outcome of increased demand following the proliferation of tool libraries. [82] Other examples can be found in the rise of platform economics, which utilise a third- party corporate mediator.

1/2 of all cars will be shared by 2040



MONETARY SUBSTITUTION

Money is increasingly at risk of being replaced by unique forms of currencies. In economies of the future, novel modes of work will include passive (ie. providing access to your data) and quasi-passive modes (ie. watching YouTube advertisements), and will challenge our sense of value.

By 2040, we can expect the rise of non-monetary exchange, primarily within large urban centres. [83] [84] (See also (True) Sharing Economy) "In the year 2050 [we will] pay via 'silent' processes in the background, which also include automated payments between objects. [These] payments [will be] supplemented by 'splitting' and 'swapping,' creating a new system of 'valuation'. Consumers [will] create their own digital 'currencies.'" [84] (see also Resilience). Already, a number of pilot schemes in China are looking at social status as a form of freedom-enabling credit. Reinforced by technology and behaviours common to the urban environment such as purchasing habits, credit scores, facial recognition and AI, citizens could be denied certain privileges – such as purchasing a plane ticket or taking certain trains – if their social-credit is too low. [85]

The success of new currencies and the emergence of a diverse landscape of 'money' will ultimately depend on the creation of business models that benefit companies, city ecosystems and customers. [83] While the large-scale use of monetary substitution is not yet established, we can already see a shift, and digital currencies are on the rise in many industries. [61] In this sense, we can therefore expect lower importance placed on formal (national) currencies, less power for central banks, and greater importance on digital platforms, consumer-to-consumer transactions and shared consumption.

LOCALISATION

The megatrend of globalisation will continue, and, according to some experts, even accelerate in the coming decades [86] (see also New Work). At the same time, local economic activities and national value chains are growing in importance.[87] It may be that this is a reflection of society's changing levels of trust, as Europeans are reported to have more than twice as much faith in regional and city governments than they do in national counterparts. [88] "What's clear from mergers around the world – whether we look at Russia, China [or] Southeast Asia – is that the local operating model is the one that's going to win out over the long term." [89]

The move towards localisation is enabled by trends such as sustainability, health, and nationalism, as well as new technologies such as 3D printing, the mixing of global and local value chains (ie. which products are truly free of non-local inputs), resources, raw materials, and branding.

One disruptor of this trend may be that, in the wake of the Covid-19 pandemic, online-remote work will become commonplace, leading to a far more geographically and nationally diverse workforce, despite the localism of small businesses. Those businesses which are interested in expanding globally could hire individuals in time-zones on the other side of the world, creating a 24-hour workforce. Where this isn't the case, new hires will most likely be made in adjacent time zones, to reduce the likelihood of vastly different employee hours of work. Regardless of location, the need for on-location offices remains important, but less of a necessity, suggesting a contraction of urban populations, and resulting increase in vacant property may become commonplace by then.

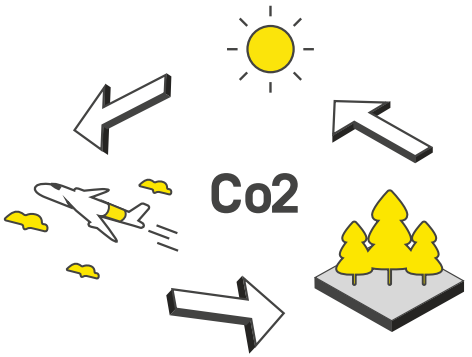
MEANINGFUL CONSUMPTION

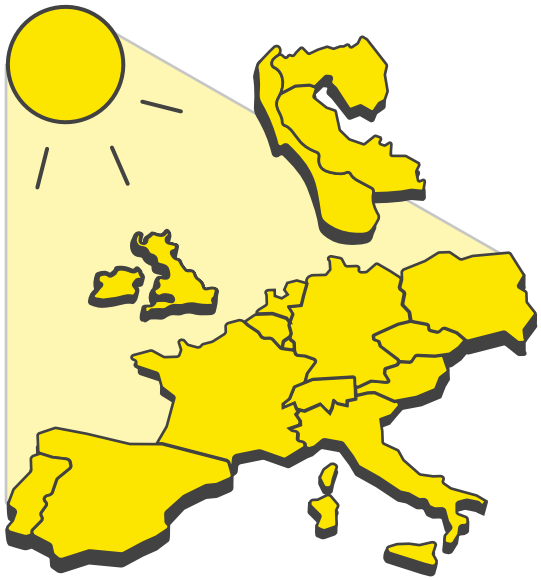
Around the world, the speed of living is accelerating. Communication, lifestyles and trends have an ever-shorter lifespan, while the internet allows for even faster diffusion. Consumer products are introduced to the market ever-more rapidly, and the success of services such as Amazon Prime reflect this preference for speed. At the same time, trends such as minimalism and the Green Wave point to a slower, more conscious, and more deliberate means of consumption (see Urban Farming).

We are now seeing a higher turnover and more variety in what we purchase, but at the same time, more targeted consumption – quality over quantity. These opposing trends are a direct result of both online shopping, and the increasing market share of organic and Fairtrade products.

Based on evidence indicating an emerging trend of conscious consumption, [90] [91] it seems likely that the current rapid turnover will be replaced by longer-lasting products, and profits will shift even further towards service-based business models (see (True) Sharing Economy). Nevertheless, if access is cheap and reliable, consumers are likely to replace their possessions more often, and conscious consumption will increase only for very specific markets, such as travelling or housing.

Products and services of 2040 may focus more on personal interaction, local experience and integrity, over quality or price. Moreover, it is likely that conscious consumption will be the result of greater concern over raw material extraction, and the lack of product reuse, and recycle. With a rise in conscious consumption, it is likely that we will see greater innovation within the wider circular economy, and calls from the public at large to make products and services carbon neutral and environmentally friendly.[92,93,94,95]





In Europe, 20,000+ deaths every summer will be the norm by 2040.

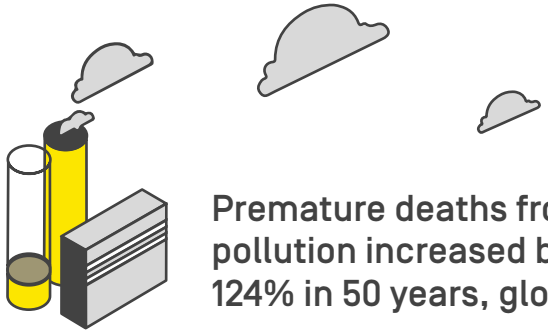
EXTREME WEATHER EVENTS

Among the many effects of global temperature rises is the growing number of extreme weather events around the world. Depending on the global region, in the coming decades droughts, floods, and heat waves are expected to occur more frequently,[96] with negative impacts on ecosystems, infrastructure and human life. These effects are already becoming evident through the increase of natural disasters in recent years.

In Europe, cities are particularly vulnerable to extreme weather events due to their dense accumulations of population, infrastructure and economic activity. [97] "One challenge is to manage heavy downfalls of storm water in cities,"[44] as permeable areas which could absorb water, have, until recently, been actively designed out of the cityscape, leaving urban sewage systems to process this immense quantity of water. In many European cities, the inability to account, and design for heavy rainfall, has led to an increase in frequent flooding and landslides. [98]

As most economies depend heavily on personal and freight transport, disruption of the transportation systems will incur severe damages – both personal and economic. [99] Furthermore, coastal cities, in particular, will be threatened by floods, storms, and rising sea levels. [100] There is even the risk that construction activities will be constrained by heat waves, making it harder to build and maintain essential infrastructure. [101]

"One challenge that we face in our cities is to handle storm water. We [must] think about re-creating some permeable areas in the city, bringing back some green spaces or redesign the green spaces that we have, for example, lowering the parks so that they can become sort of water basins when it's needed. For example, rain gardens. All these solutions put together can contribute to handle this problem of stormwater management." [79]



Premature deaths from pollution increased by 124% in 50 years, globally.

POLLUTION

Pollution comes in various forms. Water pollution is caused primarily by industrial sites and trash in urban areas. Soil pollution can originate from industrial sources, or the improper disposal of toxic chemical substances such as asbestos or lead. [102] Light and noise pollution are the direct result of human activity, and most pronounced in areas of dense urban development. Air pollution results from the burning of fossil fuels in vehicles or factories, and when released into the open air, are impossible to contain.

Global premature deaths attributable to pollution increased by 124% over the period 1960–2009. [103] In many urban areas, air pollution and emissions – particularly from diesel vehicles – contribute to the formation of smog: a dense layer of particulate matter that forms a low-hanging haze over many major cities and industrial zones. Nitrogen and Sulphur oxides in the air contribute to acid rain which harms forests and degrades outdoor monuments and buildings. [102] Furthermore, in line with seasonal changes and global warming, pollution levels often rise due to increased solar radiation.

Overall, the situation is urgent, and action is needed to reduce pollution levels in all sectors. So far, the lack of empirical air pollution data at a hyperlocal level has made it difficult for city leaders to incorporate local air pollution and associated health concerns into city policy discussions. In some locations, direct measures to reduce air pollution are already in force. These include the restriction of inner-city car usage in Delhi, [104] the creation of a comprehensive "hydrogen economy by 2040" in Japan' [105], and around the world, the reaction of the automotive industry to these developments, as it shifts its focus to electric- and hydrogen- based engines.

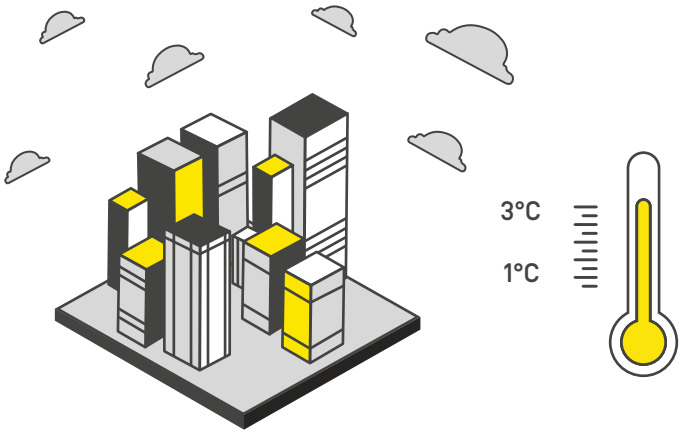
RESOURCE AVAILABILITY

Despite efforts to make European economies more energy efficient and environmentally sustainable, cities, due to their population density, complexity and economic activity, continue to be among the most resource demanding areas of the economy. As such, resource availability will, in the coming decades, become a central topic.

Alongside increasingly uncertain oil forecasts, more than 20 Critical Raw Materials (CRMs), including Cobalt, Magnesium and Silicon Metal, have high risks associated with their supply. These materials – used in environmental technologies, consumer electronics and aviation – are not only critical for key industry sectors and future applications, but also for the sustainable functioning of our economies [106] and many urban infrastructure projects.

As European economies transition from fossil-fuel based energy production, to renewable sources, (which must be generated in advance, stored and carefully managed), the need for large industrial batteries to store this energy will become more pronounced in coming decades. Experts identify various challenges related to this reliance on batteries, particularly rare earth metals, stating "Lithium and cobalt can be classified as critical, which is already visible today, as shown by the current market volatility." [107] However, the importance of these challenges is rated differently depending on the source: "In the future, we will encounter a bottleneck of traditional metals rather than one of rare earth metals. For example, a complete shift to electromobility by 2040 will lead to a copper scarcity." [108]

Furthermore, many of the materials used for applications such as generators in wind turbines, and motors in electric vehicles, are obtained in countries where basic human rights and the environment are insufficiently protected (ie. China, the Congo), [109] and hence supply is tied to severe social and environmental consequences.



The annual air temperature of a city with 1 mil. people can be 1.8–5.4 °F (1–3°C) warmer than its surroundings.

URBAN HEAT ISLANDS

Cities are becoming too hot. This is primarily due to global warming, but also as a result of the increasing density of urban areas, the copious use of glass and concrete – which reflect heat into urban spaces – and an increase in urban populations, which in turn, result in an intensification of human activity and heat emissions. These factors combine to create what are known as Urban Heat Islands, wherein cities are substantially hotter than surrounding rural areas. [110]

Green space and vegetation are natural barriers to sunlight and the heat which is reflected off glass and concrete surfaces. This verdure also helps to diffuse heat and humidity within the atmosphere, and absorb carbon dioxide. [111] Dense urban areas can be designed [112 113 114] in a way that regulates overheating within the city microclimate. This is already the case in Singapore which has effectively addressed its Heat Island problem through legislation (the Parks and Trees Act, 1975), public engagement (the annual Tree Planting Day has been celebrated since 1971), and the creation of, 'A large network of tree-covered pedestrian corridors connecting parks with one another.' In Singapore, "[...] the number of new trees increased from approximately 158,600 in 1974 to 1.4 million in June 2014." [115]

By 2040, cities around the world will be actively engaged in regreening cities through microclimate design alongside other efforts to diffuse the Urban Heat Island effect. Furthermore, research suggests an increase of green space within urban areas could actually have a positive effect on other areas of city life – including the lowering of crime rates. [116] As researchers explain, "The presence of [Urban Green Spaces (UGSs)] has a positive impact on general health. [They] also contribute to the reduction of crime. This might be linked with the social functions of UGSs, for example, the reinforcement of community interactions.' [116]

URBAN FARMING

Industrial agriculture and ecologically unaware food systems are a growing concern for many citizens around the world. Carbon dioxide emissions associated with industrial farming, and research into the effect pesticides are having on public health have been effective in raising awareness of the risks posed by those food systems which fail to put environmental health first. The increased uptake of vegetarian and vegan lifestyles, as well as engagement with the Meat-Free Mondays campaign in the Western world are direct responses to these concerns. [117 118 119]

Over the coming decades these apprehensions will lead to increased demand for sustainable produce, and by 2040, grow-it-yourself urban gardening will be commonplace in city neighbourhoods throughout Europe and North America. [120 121 122] These urban gardens will become the locus of sustainable urban farming, with the intent of supplementing existing food production systems in a way that can relieve pressure on strained agricultural practices, and advocate for a departure from industrial food production. Already ahead of the curve, [123 124] with the goal of producing 30% of its own food by 2030, [125] Singapore's government Food Agency has begun to actively design urban farms in a bid to increase food security within the city-state. [125]

This urban farming will also have positive side effects in terms of regreening cities (see Urban Heat Islands), improving health and wellbeing, and providing a better quality of life overall. In the UK, the platform economy AlotMe app[126] enables homeowners to rent their garden as an allotment to tenants through an AirBnB-like business model, providing early evidence of a growing interest in urban farming, within a Western context.

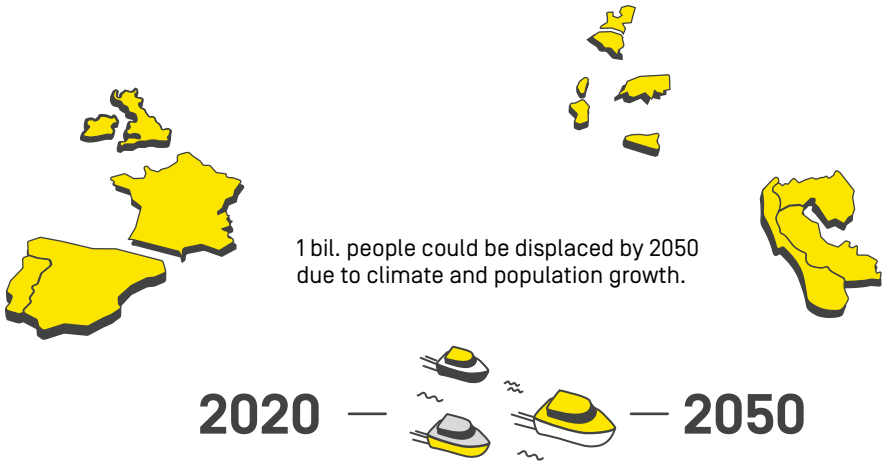
BIG TECH IN POLITICS

Besides covert influencing, tech companies also collect a great deal of personal data on their users, which can be (mis)used for economic gain or in creating a technological edge over competition. In enacting GDPR, the EU has become the guardian of its citizens' digital privacy rights and, globally, a bulwark against data surveillance by states – such as China – who are intent on surveilling citizens. [127] [128] As Erik Schönenberger suggests, "GDPR forces big tech to respect EU data privacy laws." [128]

As public and private services utilise our extensive personal data, including that which they have gathered from our urban surroundings (see Artificial Intelligence), how states enforce the new legislation [128] could have fateful implications for a vast range of service provisions. Ultimately, this could lead to cumbersome regulatory processes that slow down or prohibit the introduction of public services provided by private companies, who are heavily reliant on gathering personal data. In recent years, one such example has been the introduction of 5G in the UK – the infrastructure of which was to be provided by Chinese telecoms giant Huawei, before concerns over national security, and sanctions imposed by the USA led to the deal's collapse. [129]

Elsewhere, Facebook's cryptocurrency project, Libra, is another example of how tech giants may influence politics. Competing against governments, in creating their own monetary policies, Facebook could undermine the importance of existing national currencies and financial institutions. [18] (See Monetary Substitution and Resilience).

In the future we can expect to see more instances of Big Tech being implicated in politics, particularly with the proliferation of smart cities, algorithms, and AI-controlled services. How we react to these developments will depend on the nature of our political representatives and wider institutions.



CLIMATE MIGRATION

With many nations failing to take necessary action on reducing their carbon emissions in line with the Paris Climate Accords, global warming is certain to continue unabated over the coming decade. [130] By the time necessary action is finally taken, it may be too late for many citizens living in urban areas across the world as rising sea levels, increasing temperatures, and other natural disasters drive them from the cities [131] they once called home.

By 2040, cities less affected by climate change will be in the business of marketing themselves as climate disaster refuges [132 133] to those fleeing cities which have fallen victim to global warming. This trend has already begun within the vast continental expanse of the United States, where, internally, those who have experienced climate disaster in the less protected southern states, of Texas, Louisiana, and Florida, are migrating north to cities such as Duluth, MN; Buffalo, NY; and Portland, OR. [134 135 136 137 138]

In the future, cities with ageing populations and a falling labour force will use their location and climate resilience to attract these climate migrants, who will in turn, be able to support the economy of their refuge nation and city of residence. [132] Given Europe – and especially Scandinavia's ageing population – we can expect that many northern European nations will benefit from this migration from both southern European nations, [139] but also the Middle East, Africa, and Asia. [140] In this respect, the European parliament has already begun considering the legal ramifications and policy responses to climate-induced migration both internally and from external nations. [141]

Ultimately, whilst these global migration streams will compliment a shrinking population within the European Union, forecasts show that this migratory influx will also create challenges for European nations, particularly surrounding integration, and social cohesion. [142]

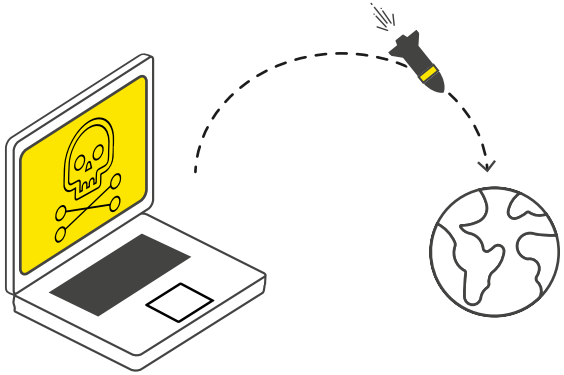
DECENTRALISATION OF POLITICS

One of the primary concerns with European politics in the 21st Century, is the extent to which constituents believe decision-making is being consolidated at a higher political level, inaccessible to the common man – not only in our urban spaces – but also the wider rural areas. For many, institutions such as the European Union and its many constituent parts embody this abstraction of power. [143] Broadly speaking, it is this perception which has been the primary driver of Eurosceptic attitudes, the re-emergence of Right-wing ideologies across the continent, and Brexit. [144 145 146]

Whilst several nations – under demand for political reform – are increasingly devolving power to constituent parts in some form or another, many national and federal administrations continue to retain control over other areas, such as taxation [147 148] and national healthcare. Some theorists and politicians argue this retaining of power at a national level wise, as granting cities and smaller regions the independence to set, and control issues such as taxation autonomously, could lead to a race to the bottom in terms of corporation tax and other incentives to outside investment.

There is a fine balance to be struck, in order to maintain social cohesion, prevent inter-region/-city acrimony, and safeguard citizen's faith in national/federal governments. [149] For this reason, we can expect any decentralised regions will continue to have some form of restriction imposed upon them, in an effort to ensure fair economic competition and prevent complete autonomy. [150]

Over the coming decades we will see a steady proliferation of direct democracy across Europe and further afield. [151 152 153] The Citizens' Assemblies of recent years – including those on Climate Change – provide early insight on this burgeoning political trend. [154 155 156 157] Gaining traction in cities at first, this direct democracy will quickly spread to rural constituencies, before pressure eventually mounts on national governments to reform democratic institutions, making space for a legislative body based on stratified sortition of the general population. [158 159 160 161] By 2040, we could be looking at cities and national institutions governed directly by the citizens themselves.



DIGITAL WARFARE

Through increasingly connected global technologies, so-called 'rogue' nations, non-state actors, cyber-criminals, and hackers now find themselves in a position of being able to challenge not only major nations – such as the US or China – but also vital city infrastructure such as energy supply, [162] water, [163] traffic management, [164] and healthcare services, [165] with potentially catastrophic effects on both citizens' daily lives [166] and the wider city economy. [167] Political defiance, espionage, and economic gain, and challenging of international power dynamics stand as just a few of the motivations for doing so. Regardless, the dangerous potential of this growing threat has led to an urgent demand for international regulation. "We need a controlled approach to regulating cyber conflict. If it's uncontrolled, it will be tit-for-tat – attacks will be countered with attacks. We need to cooperate on a global level." [127]

Some experts predict massive attacks within the next 15 years with the goal of destabilizing, or destroying democratic societies. The threat of cyberwarfare will create greater awareness of the threats that digital systems inherently bear, and hence lead to a more cautious approach with regards to data security, protection, and storage.

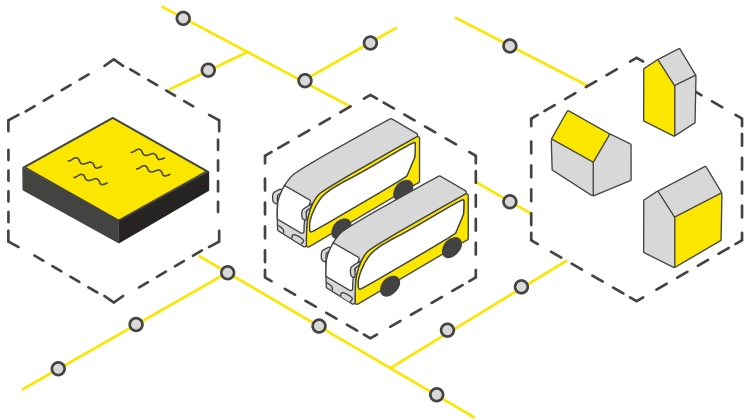
To prevent large-scale attacks, both a global framework, and individual city cyber-defences will need to be rapidly designed and constructed over the coming decade. As such, cyber-security and -defence will continue to grow as a substantive industry, as nations and individual cities of all sizes seek to safeguard essential services and protect their citizens from the potential fallout (see also Resilience). These threats may ultimately prompt more supranational collaboration, and within the European context, could prove to be the primary benefit of staying within the European Union. [127]

PREDICTIVE GOVERNANCE

Data and algorithmic decision-making are already widely used in areas such as law enforcement and criminal justice. Artificial Intelligence can help detect patterns in huge datasets, identify people in videos using facial recognition, and play a part in predictive policing (see Artificial Intelligence). However, as the UN Institute for Disarmament Research notes, "the use of predictive analytics to flag potential future behaviour [...] has been particularly controversial, as the data used may be biased against particular groups or communities, resulting in discriminatory decisions." [168] What's more is that this behaviour is often based on past behaviour, usually without consideration for the context in which this previous behaviour occurred. One possible safeguard against the potential abuse of power by a centralized entity could be found in the utilisation of a decentralized technology such as blockchain. [61]

Within the urban environment, algorithmic decision-making is expected to further proliferate over the coming decades, with predictive governance increasingly being used to plan and execute essential services such as water, energy, transport, and waste management. It is, however, unlikely that this decision-making will ever be perfect, and critical scrutiny can be expected to continue well into the future. Ultimately, the behaviour of extreme users suggests that there may in fact be strong resistance towards a largely data-driven government. Hence, regulations could slow down, or even restrict the use of artificial intelligence. [212] [169] [128]

It remains to be seen whether an attempt at data sovereignty, in its current form is the optimal solution for citizens. For example, in most cases when users are browsing the internet and receive a cookie notification, they don't understand or care about the availability to protect or actively own their personal data, seeing this opportunity as a mere interruption or inconvenience. [83]



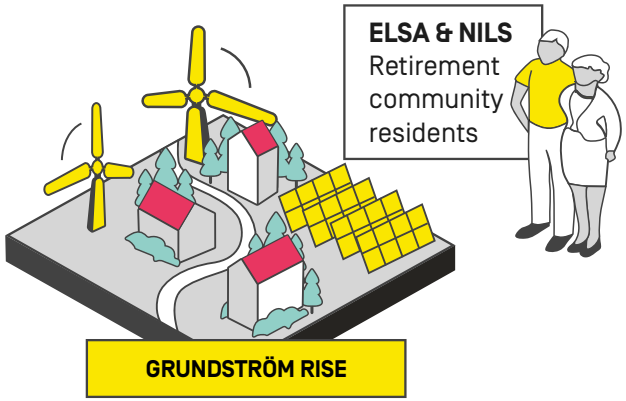
Urban Farms serve three key purposes:

They cool down the city, complement traditional agriculture and support integration of climate migrants.

NORTHERN HIDEAWAY

The year is 2042. The world has been slow in responding to the climate emergency. Many nations have had to take drastic measures in order to reach their target of 1.4°C by 2030. The solutions enacted in order to reach this target, and the failure to meet this sooner, have led to a society that has been vastly altered since the early 2020s. In Europe, many cities along the Mediterranean, Atlantic and Black Sea's have become largely uninhabitable as they are persistently lambasted by extreme weather events – from wildfires to hurricanes, severe flooding, and ceaseless drought. Despite getting off relatively unscathed, Northern Europe does experience soaring temperatures from April through to October. This has led municipal governments to attempt a regreening of their urban space, in the hope of making city living more comfortable for residents. Interestingly, a number of these cities – such as Malmö, Sweden – are now marketing themselves as an opportunity for a new beginning to those Southern Europeans fleeing their increasingly uninhabitable home cities. Urban farming, city cryptocurrencies, decentralisation, and increased prosumption, are all new developments, proliferating in response to these changes in environment, and the socio-political and -economic ramifications which have ensued.

Elsa Johansson is a retiree living with her husband Nils in Oxie, a village suburb of Malmö, Sweden. They are part of a self-managed retirement community of 27, having moved here just over three years ago following Nils' retirement. They quite like the peaceful rural life – away from the busyness of inner-city Malmö – which Grundström Rise – their retirement community – has afforded them. A city ordinance recommended that Birger_v7.4 be installed in every home, even those constructed before Birger 'Flexi-Living' modular apartments became commonplace in the residential property development industry. Neither Elsa nor Nils liked the idea, that a form of AI personal assistant – Birger, as he is known – was watching them at all times, recording how they used their private home and local social spaces, and ultimately, making recommendations on how they could rent out their spare bedroom, or incentivising down-sizing to a smaller residence.



Having been offered a good price for their home by the municipal government – who have plans to flatten the neighbourhood and build low-rise 4-storey Birger apartments on the site – Elsa and Nils finally decided to take the offer and move to Grundström Rise, which, as a self-managed community, is entirely off grid and without the prying eye of either Birger, nor subject to Malmö City directives.

When Elsa first suggested they move to Grundström Rise Nils was unsure. As a proud Swede, he had always trusted the local and national governments to provide for him and keep his family safe. The idea of being off-grid and having to produce their own electricity, water, and other utilities and amenities was of great concern to him. Three years on however, he couldn't be happier. He's found the co-production and consumption of utilities alongside Elsa and the other 25 residents is exactly the sort of convivial, interdependent lifestyle he has always yearned for – it's a natural progression of the Socialist ideals he has held dear all his life. His only wish is that the government had fostered this attitude towards neighbourhood planning, as opposed to the technological route they took with the introduction of Birger in 2033. What's more, is that Nils and the other prosumers in his community are able to monetise their surplus energy, selling it back to the city of Malmö on very favourable terms, since their system is 100% sustainable in utilising natural resources: solar, wind, geothermal and biomass.

It pleases Nils that the Malmö government pays for the energy surplus in Malmö CityCoin, the municipal cryptocurrency which – with his background in cultural economics – Nils helped develop as Assistant Project Manager at the Department of Finance when blockchain took off back in the mid-2020s. The economic resilience of the Malmö CityCoin – or MalmCoin as it is known colloquially – has become a major success story, for its proven ability to retain wealth within Malmö and the surrounding provinces of Skåne and Halland, supporting not just the urban area, but also the rural supply networks. Nils is modest about his achievements, but Elsa likes to remind her friends of her husband's involvement, and even keeps newspaper clippings of examples where the MalmCoin has provided a case study for many other cities around the world.

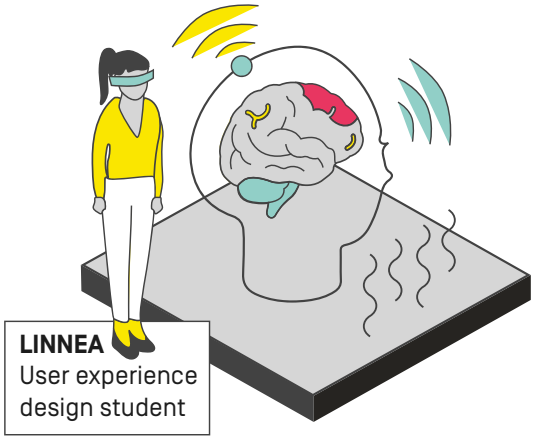
Over her lifetime, Elsa has come to notice the temperature change in Sweden – especially in the summer months. As a child, she remembers that on a hot July day in Malmö temperatures would reach 28°C. These days however, it regularly surpasses that 28°C mark from May through to September, and on a few really bad days each year, it will soar to around 39°C. On these days, the city centre – which is surrounded by water – becomes so hot and humid that it's unbearable.

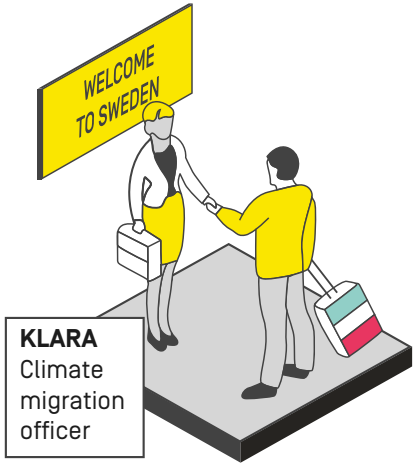
Working as an engineer, Elsa and Nils' son, Oscar supports Malmö's city planners in combating this urban heat island effect, following the lead of Singapore and New York City, where – for decades now – city planning authorities have been regreening the city as a means to deflect and dissipate heat within the urban area. In Malmö, with Oscar's help, city planners have – with the support of residents – sought to re-green the city in a way that can address both the immediate effects of the rising temperatures in the city, and the long-term carbon emissions that have been produced as – until recently – a result of farming practices in Sweden's southern agricultural region, and the wider European Union.

Through redesigning the urban area with hundreds of small pockets of urban (vegetable) farming – on streets, rooftops, parks, and communal gardens – Oscar and the city planning team have been able to bolster international food supply networks, relieve pressure on domestic agriculture, and provide city residents with a better quality of life. Studies conducted by Malmö University have revealed that positive indicators of social cohesion have tripled since the introduction of these urban farms. More significantly, these farms are now being used as a means to welcome and integrate climate migrants from southern Europe, into Malmö city life.

Keeping busy in her retirement, Elsa likes to borrow the Grundström Rise community's shared car and commute into the city a few times a week, where – alongside her granddaughter Linnea – she tends to the Urban Gardens, volunteering as a welcoming guide for newly arriving climate migrants who want to get stuck in and grow their own vegetables. As a former Professor in Cultural Anthropology at Aalborg University, Elsa finds great enjoyment in helping out, whilst Linnea finds the natural sensory aspects of growing vegetables enriches her understanding of human sensory experience and contributes to her university coursework.

Studying BDes Hons Neo-User Experience Design at the University of Copenhagen, Linnea is fascinated with technological advances in human-computer interaction over the past few years. Now in her final year, she is specialising in novel user interface design, specifically looking at how human-computer interactions can



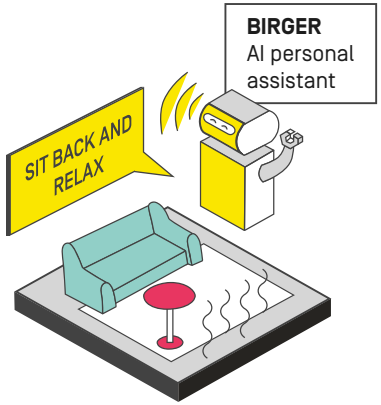


KLARA
Climate migration officer

utilise machine learning in tailoring taste and smell to individual users, for the purpose of creating a more relaxing interactive experience in new and challenging surroundings. Examples of this already exist. In the downtown nightlife district which often sees anti-social behaviour and violence on the weekends, Malmö city authorities have begun filtering chamomile into the air in an attempt to diffuse any tension. In the rare instance that this fails, and there is violence, the chamomile scent is quickly replaced with a strong odour of garbage, dispersing the crowds in minutes. Seeking to work with one of the major sensory design consultancies in Sweden, Linnea is excited for what the future holds post-graduation. This is a growing industry as businesses seek new ways in which to differentiate their services and product offerings from competitors. Novel olfactory and gustatory experiences are seen as key assets in supporting the now $70 billion dollar Virtual, and Augmented Reality industries.

As well as volunteering with her grandmother in welcoming climate refugees to the Urban Farming initiative, Linnea has also undertaken primary research in the workplace of her mother, Klara. Klara works as a Case Officer in Malmö's Office for Climate Migration, within the Swedish Department of Communities. In this role Klara assesses climate refugee applications, and assists migrants – many of whom are from Spain, Greece and Italy; but also the United Arab Emirates and Australia – in their relocation and integration journey. Her job is one of the rare professions which expect in-person interaction, as opposed to the usual online/remote working from home, or residential hub.

Klara doesn't mind the on-location nature of her job. In fact, she really enjoys the in-person interaction. As part of her role, she is one of the very few people in her neighbourhood who owns a private car, which she uses to visit climate migrants throughout Malmö and the surrounding villages. Klara is extremely proud of both Linnea and her mother-in-law Elsa. She recognises the work each of them do is vital to the welcoming of climate migrants, and supporting social cohesion in Malmö.

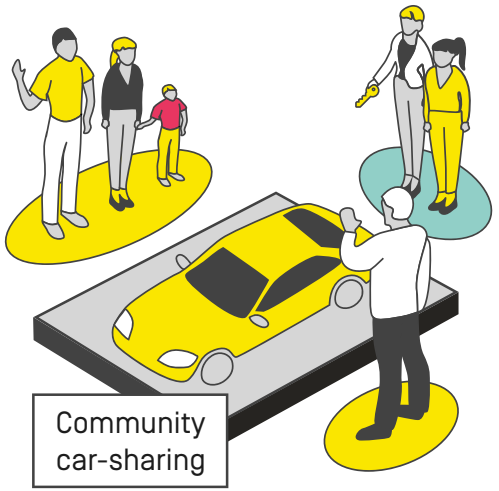


BIRGER
AI personal assistant

Unlike Klara, the vast majority of European citizens are employed in the digital and cybersecurity industries, and as such, are expected to work remotely in the interest of creating both physical and digital security through decentralisation of the workforce.

In 2042, the cyber threats posed by non-state actors and those who would like to dismantle European infrastructure, utilities, the economy, and broadly speaking, the European way of life are all too apparent. In just over two years Europe has witnessed six major external attempts at espionage or ransomware, and two successful campaigns to disrupt vital infrastructure, including the London to Edinburgh Hyperloop, and Denmark's North Sea wind farm.

More concerning is the number of internal ransomware attacks on Sweden's Birger Flexi-Living system. As an AI Personal Assistant, Birger not only makes recommendations on the reformatting and reallocation of space in private residences. With version 7.4.1, he also adjusts social spaces for desired activities – allocating time to each resident based on their individual needs – and provides assistance to building residents, scheduling deliveries, maintenance and repairs, car or bike parking, and more. Attacks on this system can be incredibly disruptive to everyday life, and can even lead to the misallocation of space to individual households. Just last month, a family of five received notice that their apartment would be remodulated from seven rooms, to three, as a result of a successful hacking attempt. Many think Birger is brilliant. It rarely occurs to many of them that this might be due to the fact Birger filters the soft scent of Lavender and Sandalwood into their home, helping each of them relax after a busy day. Like many Malmöits, the Johansson family like to share their skills with their neighbours and other residents of the Gröndal neighbourhood. When he isn't engaged in engineering projects for the municipal government, Oscar helps out on the weekends offering handiwork and making design recommendations on various social infrastructure projects around the city. Similarly, as the rare owner of an electric car, Klara provides her vehicle to the residents in her apartment block for carsharing in the evenings and on the weekends – she loves to hear of young families taking trips to the countryside with their children.



Community car-sharing

When she's not helping at the Urban Gardens, or working on her thesis, Linnea loves to co-design novel sensory interfaces with her friends. Making use of the outdoor space in her apartment block, she is able to test what she has built with her neighbours and the local kids. When she's happy with what she has made, she uploads the interface or software to her website, under an open source, non-commercial license, for all to use. Birger knows by now that Linnea can make use of any outdoor area, if Birger can just leave her enough space for 30 over-excited kids on a Saturday afternoon.

1. de Bruin, M. Personalization is dead, long live hyper-individualization. Future of Commerce. [Online] 09 01, 2019. https://www.the-future-of-commerce.com/2019/01/09/what-is-hyper-indi-vidualization/.
2. McKinsey. The future of personalization—and how to get ready for it. McKinsey. [Online] 06 18, 2018. [Cited: 05 01, 2021.] https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/the-future-of-personalization-and-how-to-get-ready-for-it.
3. Hyatt, Anthony. What Apple's New Privacy Push Means for Your Digital Advertising. Magneti. [Online] Magneti, 04 23, 2021. [Cited: 05 01, 2021.] https://www.magneti.com/blog/apple-fb-ads/.
4. Wiles, Lani. The Truth About Apple iOS 14 and Your Digital Marketing Strategy. Wrayward. [Online] Wrayward, 11 03, 2020. [Cited: 05 01, 2021.] https://www.wrayward.com/articles/the-truth-about-apple-ios-14-and-your-digital-marketing.
5. Team, Adobe Communications. Privacy and personalisation: Can they coexist in a cookieless world? Adobe. [Online] Adobe, 04 27, 2021. [Cited: 05 01, 2021.] https://blog.adobe.com/en/publish/2021/04/27/privacy-and-personalisation-can-they-coexist-in-a-cookieliess-world.html.
6. Page, Rosalyn. As the cookie crumbles, what comes next for digital advertisers? CMO. [Online] CMO, 08 17, 2020. [Cited: 05 01, 2021.] https://www.cmo.com.au/article/682134/cookie-crumbles-what-comes-next-digital-advertisers/.
7. Liggieri, Kevin. Interview. 09 18, 2018.
8. Prosumers in times of crisis: definition, archetypes and implications. Lang, Bodo, et al. 2, s.l. : Journal of Service Management, 2020, Vol. 32.
9. Times, Green City. Microgrids: Powering the future. Green City Times. [Online] Green City Times, 01 01, 2021. [Cited: 05 01, 2021.] https://www.greencitytimes.com/micro-grids-powering-the-future/.
10. Spector, Julian. Microgrids Might Be Ready for the Big City. Bloomberg. [Online] Bloomberg, 01 22, 2016. [Cited: 05 01, 2012.] https://www.bloomberg.com/news/articles/2016-01-22/mit-study-microgrids-can-handle-real-world-urban-energy-demands.
11. Knowledge, Microgrid. What's Ahead for the Future of Microgrids? Microgrid Knowledge. [Online] Microgrid Knowledge, 03 06, 2020. [Cited: 05 01, 2021.] https://microgridknowledge.com/future-of-microgrids-sc/.
12. Goodwin, Lena. Community Microgrids: Four Examples of Local Energy that Improves Lives. Microgrid Knowledge. [Online] Microgrid Knowledge, 12 19, 2019. [Cited: 05 01, 2021.] https://microgridknowledge.com/community-microgrids-examples/.
13. Nichols, Megan Ray. Community Microgrids Change the Future One Neighborhood at a Time. altenergymag.com. [Online] altenergymag.com, 08 09, 2018. [Cited: 05 01, 2021.] https://www.altenergymag.com/article/2018/08/community-microgrids-change-the-future-one-neighborhood-at-a-time/29079.
14. Eigg, Isle of. Eigg Electric. Isle of Eigg. [Online] Eigg Electric, 01 01, 2021. [Cited: 05 01, 2021.] http://isleofeigg.org/eigg-electric/.
15. Gardiner, Karen. The small Scottish isle leading the world in electricity. BBC. [Online] BBC, 03 30, 2017. [Cited: 05 01, 2021.] https://www.bbc.com/future/article/20170329-the-extraordinary-electricity-of-the-scottish-island-of-eigg.
16. Energy, US Department of. Community Microgrids — "Cornerstone Of Future Energy Operations". Clean Technica. [Online] US Department of Energy, 02 28, 2021. [Cited: 05 01, 2021.] https://cleantechnica.com/2021/02/28/community-microgrids-cornerstone-of-future-energy-operations/.
17. Roberts, Kale. Community Microgrids: A Smart Future. Mother Earth News. [Online] Mother Earth News, 01 01, 2021. [Cited: 05 01, 2021.] https://www.motherearthnews.com/green-homes/home-design/community-microgrids-zm0z1908zsta.
18. Zukunftsinstitut. Zukunftsinstitut New Work Glossar. Zukunftsinstitut. [Online] Zukunftsinstitut, 10 17, 2019. [Cited: 05 01, 2021.] https://www.zukunftsinstitut.de/artikel/mtglossar/new-work-glossar/.
19. Knights, Digital. Speeding up innovation in a corporate environment. Digital Knights. [Online] Digital Knights, 09 11, 2017. [Cited: 05 01, 2021.] https://www.digitalknights.co/blog/innovation-in-a-corporate-environment.
20. Work, The Future of. The Future Commute. The Future of Work. [Online] The Future of Work, 01 01, 2021. [Cited: 05 01, 2021.] https://www.callisonrtkl.com/future-of-work/the-future-commute/.
21. Greene, David. Why Real Estate Builds Wealth More Consistently Than Other Asset Classes. Forbes. [Online] Forbes, 11 27, 2018. [Cited: 05 01, 2021.] https://www.forbes.com/sites/davidgreene/2018/11/27/why-real-estate-builds-wealth-more-consistently-than-other-asset-classes/.
22. Lhermitte, Marc. Is this the end of the central business district? Is this the end of the central business district? EY. [Online] EY, 05 19, 2020. [Cited: 05 01, 2021.] https://www.ey.com/en_gl/real-estate-hospitality-construction/is-this-the-end-of-the-central-business-district.
23. Death of the high street: identification, prevention, reinvention. Hughes, Cathy and Jackson, Cath. 1, s.l. : Regional Studies, Regional Science, 2015, Vol. 2.
24. Williams, Andrew. Virtual Assistants Evolve, But Will They Be Integrated in Robots? Robotics Business Review. [Online] Robotics Business Review, 10 08, 2018. [Cited: 05 01, 2021.] https://www.roboticsbusinessreview.com/consumer/virtual-assistants-integrated-robots/.
25. Gaudin, Sharon. Instead of robots taking jobs, A.I. may help humans do their jobs better. ComputerWorld. [Online] ComputerWorld, 09 22, 2015. [Cited: 05 01, 2021.] https://www.computerworld.com/article/2985100/instead-of-robots-taking-jobs-ai-may-help-humans-do-their-jobs-better.html.
26. Statistics, Office for National. Which occupations are at highest risk of being automated? Office for National Statistics. [Online] Gov.uk, 03 25, 2019. [Cited: 05 01, 2021.] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/whichoccupations are at highest risk of being automated/2019-03-25.
27. Loh, Janina. Interview. 09 30, 2019.
28. van der Voort, Job. [Updated] How to calculate compensation for remote employees. Remote | ASYNC. [Online] Remote | ASYNC, 01 01, 2021. [Cited: 05 01, 2021.] https://remote.com/blog/remote-compensation.
29. 17 destinations welcoming remote workers. Insider. [Online] Insider, 02 10, 2021. [Cited: 05 01, 2021.] https://www.insider.com/countries-welcoming-remote-workers-live-and-work-2020-7.
30. CITY OF THE FUTURE: Technology and social participation as Fundamentals for a new conception of city design and management. Guimet, Jordi. Tokyo : Theme Session no 2, in the UIA 2011 Congress, 2011.
31. Hitachi. Innovations for a people-centric, happy city. Hitachi. [Online] Hitachi, 01 01, 2021. [Cited: 05 01, 2021.] https://social-innovation.hitachi/en/article/urbanization-peoplecentric/.
32. Brandes, Ulrik. 10 02, 2019.
33. Schetse, Michael. 05, 01 : 2021, 10 01, 2019.
34. Arup. An Introduction to Corporate Foresight. Arup Foresight. [Online] Arup, 01 01, 2021. [Cited: 05 01, 2021.] https://foresight.arup.com/publications/an-introduction-to-corporate-foresight/.
35. A Crisis-Driven Migration? Aspirations and Experiences of the Post 2008 South European Migrants in London. Pratsinakis, Manolis, et al. 01, s.l. : International Migration, 2019, Vol. 58.
36. Foresight, Arup. Could modular construction spark a housing revolution? Arup. [Online] Arup, 01 01, 2021. [Cited: 05 01, 2021.] https://www.arup.com/perspectives/could-modular-construction-spark-a-housing-revolution.
37. Magnini, Elsa. Reconfigurable Modular Apartment Interiors. Open Inspire. [Online] Open Inspire, 04 02, 2021. [Cited: 05 01, 2021.] https://inspire.driversofchange.com/insights/reconfigurable-modular-apartment-interiors/.
38. Space10. Flat Pack Modular Housing Proposal. Open Inspire. [Online] Open Inspire, 08 07, 2020. [Cited: 05 01, 2021.] https://inspire.driversofchange.com/insights/flat-pack-modular-housing-proposal/.
39. Griffin, Matthew. This AI will design your house, over and over again. Fanatical Futurist. [Online] Fanatical Futurist, 11 18, 2019. [Cited: 05 01, 2021.] https://www.fanaticalfuturist.com/2019/11/this-ai-will-design-your-house-over-and-over-again/.
40. Inspire, Open. Communal Garden Housing Project. Open Inspire. [Online] Open Inspire, 04 02, 2021. [Cited: 05 01, 2021.] https://inspire.driversofchange.com/insights/communal-garden-housing-project/.
41. RIBA. A Home for the Ages: Planning for the Future with Age-Friendly Design. RIBA. [Online] RIBA, 12 03, 2019. [Cited: 05 01, 2021.] https://www.architecture.com/knowledge-and-resources/resources-landing-page/a-home-for-the-ages-planning-for-the-future-with-age-friendly-design.
42. Arup. What does an age-inclusive city look like? Arup. [Online] Arup, 06 27, 2019. [Cited: 05 01, 2021.] https://www.arup.com/perspectives/what-does-an-age-inclusive-city-look-like.
43. Inspire, Open. Anti-loneliness Housing Concept. Open Inspire. [Online] Open Inspire, 04 21, 2021. [Cited: 05 01, 2021.] https://inspire.driversofchange.com/insights/anti-loneliness-housing-concept/.
44. Could quantum computing be the key to cracking congestion? Smart Cities World. [Online] Smart Cities World, 12 13, 2019. [Cited: 05 01, 2021.] https://www.smartcitiesworld.net/news/news/could-quantum-computing-be-the-key-to-cracking-congestion-4860.
45. Seba, Tony. Interview. 10 16, 2019.
46. Pezous, Aurélie. Interview. 10 10, 2019.
47. Farge, Yves. Interview. 09 24, 2019.
48. Schimpel, Ulrich. Interview. 10 04, 2019.
49. Siegwart, Roland. Interview. 09 25, 2019.
50. Technology, Inside Quantum. Smart Cities May Be Best Business Case For Quantum Computing. Inside Quantum Technology. [Online] Inside Quantum Technology, 01 01, 2021. [Cited: 05 01, 2021.] https://www.insidequantumtechnology.com/news-archive/smart-cities-may-best-business-case-quantum-computing/.
51. Pringle, David. AI opens new avenues for smart cities. Science | Business. [Online] AI opens new avenues for smart cities, 01 01, 2021. [Cited: 05 01, 2021.] https://sciencebusiness.net/data-rules/news/ai-opens-new-avenues-smart-cities.
52. Saymudinov, Murod. Interview. 10 06, 2019.
53. Inbodied Interaction Design Example: Smell. Gayler, Tom. 2, s.l. : Interactions, 04 2020, Vol. 27.
54. Sensing the future of HCI: touch, taste, and smell user interfaces. Obrist, Marianna, et al. 5, s.l. : Interactions, 2016, Vol. 23.
55. The Future of Tangible User Interfaces. Holmquist, Lars. 5, s.l. : Interactions, 2019, Vol. 26.
56. LOLLio: exploring taste as playful modality. Murer, Martin, Aslan, Ilhan and Tscheligi, Manfred. New York : TEI '13: Proceedings of the 7th International Conference on Tangible, Embedded and Embodied Interaction, 2013.
57. ikinamo. Virtual Taste Variation - Metacookie + : DigInfo. YouTube. [Online] YouTube, 10 27, 2010. [Cited: 05 01, 2021.] https://www.youtube.com/watch?v=MBS-5oIS4Xo.
58. IEEE Virtual Reality Conference. Narumi, Takuji, et al. Singapore : IEEE Explore, 2011.

59. Atzori, Marcella. Blockchain Technology and Decentralized Governance: Is the State Still Necessary? Blockchain Technology and Decentralized Governance: Is the State Still Necessary? s.l. : University of Nicosia, Cyprus, 2015.
60. Boucher, Philip. How blockchain technology could change our lives. How blockchain technology could change our lives. s.l. : European Parliamentary Research Service, 2017.
61. Karpischek, Stephan. Interview. 11 21, 2019.
62. Leiding, Benjamin. Interview. 10 07, 2019.
63. Fourie, Pieter. Interview. 09 27, 2019.
64. Sancho, Raphael. Interview. 10 15, 2019.
65. Eurostat. Population on 1st January by age, sex and type of projection. Eurostat. [Online] Eurostat, 01 01, 2019. [Cited: 10 17, 2019.] https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=proj_18np&lang=en.
66. Gandecki, Mickhaël. Interview. 09 27, 2019.
67. Doll, Claus. Interview. 09 25, 2019.
68. MDPI. Special Issue "Advances in Augmented Reality and Virtual Reality for Smart Cities". MDPI. [Online] MDPI, 01 01, 2021. [Cited: 05 01, 2021.] https://www.mdpi.com/journal/ijgi/special_issues/AR_VR_smartcities.
69. Miah, Andy. The Ethics of Human Enhancement. MIT Technology Review. [Online] MIT Technology Review, 09 08, 2016. [Cited: 05 01, 2021.] https://www.technologyreview.com/2016/09/08/107711/the-ethics-of-human-enhancement/.
70. Simič, Slavko. Interview. 05, 01 : 2021, 10 04, 2019.
71. Blog, The Polis. Local Currency Supports Resilient Cities. Smart Cities Dive. [Online] Smart Cities Dive, 01 01, 2021. [Cited: 05 01, 2021.] https://www.smartcitiesdive.com/ex/sustainablecitiescollective/local-currency-supports-resilient-cities/108501/.
72. Hargrave, Sean. From Brixton to Totnes, the UK's dream of local currencies is over. WIRED UK. [Online] WIRED UK, 03 02, 2020. [Cited: 05 01, 2021.] https://www.wired.co.uk/article/local-currencies-dead.
73. Khalili, Joel and Sharma, Mayank. Best Bitcoin wallets in 2021. techradar.pro. [Online] techradar.pro, 04 31, 2021. [Cited: 05 01, 2021.] https://www.techradar.com/uk/news/best-bitcoin-wallets.
74. Poon, Linda and Holder, Sarah. Why Do Cities Want Their Own Cryptocurrencies? Bloomberg. [Online] Bloomberg, 06 20, 2018. [Cited: 05 01, 2021.] https://www.bloomberg.com/news/articles/2018-06-20/why-do-cities-want-their-own-bitcoin-alternatives.
75. Fred, Alexander and Baird, Kyle. City-Cryptos: An Introduction to Geographically-Based Cryptocurrencies. Be In Crypto. [Online] Be In Crypto, 12 06, 2018. [Cited: 05 01, 2021.] https://beincrypto.com/city-cryptos-an-introduction-to-geographically-based-cryptocurrencies/.
76. Kennedy, Ed. City Coin: a Cryptocurrency for the Metropolis. BlockTelegraph. [Online] BlockTelegraph, 11 02, 2018. [Cited: 05 01, 2021.] https://blocktelegraph.io/city-coin-cryptocurrency-metropolis/.
77. Kahn, Fouad. Why New York City Needs Its Own Cryptocurrency: The case for making money local again. Nautilus. [Online] Nautilus, 02 22, 2018. [Cited: 05 01, 2021.] https://nautil.us/issue/57/communities/why-new-york-city-needs-its-own-cryptocurrency.
78. Media, CPI Trade. ME Consultant January 2021 . ISSUU. [Online] Middle East Consultant, 12 31, 2020. [Cited: 05 01, 2021.] https://issuu.com/cpitrade/docs/mec_jan_2021.
79. Cortinovis, Chiara. Interview. 10 30, 2019.
80. Young, Meghan. 31 Examples of Sharing Economy Innovations. Trendhunter. [Online] Trendhunter, 10 21, 2014. [Cited: 05 01, 2021.] https://www.trendhunter.com/slideshow/sharing-economy.
81. Neighbor. Sharing Economy Pioneers: 15 Companies Disrupting Industries Left And Right. Neighbor. [Online] Neighbor, 10 01, 2018. [Cited: 05 01, 2021.] https://www.neighbor.com/storage-blog/sharing-economy-pioneers/.
82. We Have the Right to Repair Everything We Own. iFixit. [Online] iFixit, 01 01, 2021. [Cited: 05 01, 2021.] https://www.ifixit.com/Right-to-Repair/Intro.
83. Müller, Patrick. Interview. 11 26, 2019.
84. Puschmann, Thomas. Konsumenten schaffen ihre eigenen digitalen Währungen. Netzwoche. [Online] Netzwoche, 05 26, 2019. [Cited: 05 01, 2021.] https://www.netzwoche.ch/news/2019-05-26/konsumenten-schaffen-ihre-eigenen-digitalen-waeh-rungen.
85. Kobie, Nicole. The complicated truth about China's social credit system. WIRED UK. [Online] WIRED UK, 06 07, 2019. [Cited: 05 01, 2021.] https://www.wired.co.uk/article/china-social-credit-system-explained.
86. Commission, European. Global Europe 2050. s.l. : European Commission, 2012.
87. System, European Strategy & Policy Analysis. Global Trends to 2030: The Future of Work and Workplaces. 2019.
88. Regions, European Committee of the. Reflecting on Europe: How Europe is perceived by people in regions and cities. s.l. : European Committee of the Regions, 2018.
89. Russel, Jon. https://techcrunch.com/2018/11/29/ europes-ride-hailing-companies-arent- scared-of-uber/. Tech Crunch. [Online] Tech Crunch, 11 09, 2018. [Cited: 05 01, 2021.] https://techcrunch.com/2018/11/29/ europes-ride-hailing-companies-arent- scared-of-uber/.
90. Schulze, Lisa. Interview. 10 09, 2019.
91. Strautmann, Jean. Interview. 10 09, 2019.
92. The Circular Economy Business Model: Examining Consumers' Acceptance of Recycled Goods. Calvo-Porral, Cristina and Lévy-Mangin, Jean-Pierre. 28, s.l. : Administrative Sciences, 2020, Vol. 10.
93. Klaver, Jessica. Individual Sustainable Consumption and the Circular Economy: Research challenges and Opportunities. 2018.
94. Fernandez, Isabel. Learning from consumers: How shifting demands are shaping companies' circular economy transition. s.l. : ING, 2021.
95. Bäunker, Lena. CIRCULAR CONSUMPTION IN THE LINEAR ECONOMY: ONLY A DROP IN THE OCEAN? Circle Economy. [Online] Circle Economy, 10 14, 2020. [Cited: 05 01, 2021.] https://www.circle-economy.com/blogs/circular-consumption-in-the-linear-economy-only-a-drop-in-the-ocean.
96. Pachauri, Rajendra K., Meyer, Leo and al., et. Climate Change 2014: Synthesis Report. s.l. : Intergovernmental Panel on Climate Change, 2015.
97. Future heat-waves, droughts and floods in 571 European cities. Guerreiro, Selma B., et al. s.l. : Environmental Research Letters, 2018, Vol. 13.
98. Landa Mendez, Naia. Adaptation to Urban Floods by Planning and Design: GUIDELINES FOR AN ADAPTIVE MANAGEMENT TO URBAN FLOODS AND STORM WATER USE TAKING AS A CASE STUDY THE CITY OF BILBAO. Stockholm : KTH Royal Institute of Technology, 2014.
99. globalchange.gov. Transportation. globalchange.gov. [Online] globalchange.gov, 01 01, 2021. [Cited: 05 01, 2021.] https://nca2014.globalchange.gov/report/sectors/transportation.
100. Agency, European Environment. EEA Report No 1/2017. European Environment Agency. [Online] European Environment Agency, 02 11, 2016. [Cited: 05 01, 2021.] https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016.
101. Systems, The Geography of Transport. Climate Change and its Potential Impacts on Transportation. The Geography of Transport Systems . [Online] The Geography of Transport Systems , 01 01, 2021. [Cited: 05 01, 2021.] https://transportgeography.org/contents/applications/climate-change-transport-infrastructure/climate-change-impacts-transportation/.
102. Berg, Susan. Types of Pollutants. Sciencing. [Online] Sciencing, 04 24, 2017. [Cited: 05 01, 2021.] https://sciencing.com/types-pollutants-5270696.html.
103. Global and regional trends in particu- late air pollution and attributable health burden over the past 50 years. E.W., Butt, et al. 10, s.l. : Environ Res Lett, 2017, Vol. 12.
104. Press, Associated. Delhi restricts cars in attempt to lessen pollution. The Guardian. [Online] The Guardian, 11 04, 2019. [Cited: 05 01, 2021.] https://www.theguardian.com/world/2019/nov/04/delhi-restricts-cars-in-attempt-to-lessen-pollution.
105. Nagashima, Monica. Japan's Hydrogen strategy and its economic and geopolitical implications. s.l. : études de l'Ifri, 2018.
106. Alliance, CRM. Critical Raw Materials. CRM Alliance. [Online] CRM Alliance, 01 01, 2021. [Cited: 05 01, 2021.] https://www.crmalliance.eu/critical-raw-materials.
107. Reller, Armin. Interview. 11 11, 2019.
108. Lutz, Ernst. Interview. 11 1, 2019.
109. Chen, Angela. WHERE WILL THE MATERIALS FOR OUR CLEAN ENERGY FUTURE COME FROM? The Verge. [Online] The Verge, 02 15, 2019. [Cited: 05 01, 2021.] https://www.theverge.com/2019/2/15/18226210/energy-renewables-materials-mining-environment-neodymium-copper-lithium-cobalt.
110. Geographic, National. Urban Heat Island. National Geographic. [Online] National Geographic, 01 01, 2021. [Cited: 05 01, 2021.] https://www.nationalgeographic.org/encyclopedia/urban-heat-island/.
111. CBRE. The role of green space in cities. CBRE. [Online] CBRE, 01 01, 2021. [Cited: 05 01, 2021.] https://www.cbre.co.uk/research-and-reports/our-cities/the-role-of-green-space-in-cities.
112. Arup. Microclimate design: Activating essential outdoor spaces. Arup. [Online] Arup, 01 01, 2021. [Cited: 05 01, 2021.] https://www.arup.com/perspectives/microclimate-design-activating-outdoor-spaces.
113. Bloomberg. CityLab Daily: Singapore's Plan to Cool Its City of the Future. Bloomberg. [Online] Bloomberg, 10 21, 2020. [Cited: 05 01, 2021.] https://www.bloomberg.com/news/newsletters/2020-10-21/citylab-daily-singapore-s-plan-to-cool-its-city-of-the-future.
114. Zürich, ETH. Keeping Singapore cool. ETH Zürich. [Online] ETH Zürich, 12 04, 2020. [Cited: 05 01, 2021.] https://sec.ethz.ch/news-events/news/2020/12/keeping-singapore-cool.html.
115. Tomorrow.city. SUCCESS STORY: THE TRANSFORMATION OF SINGAPORE INTO A SUSTAINABLE GARDEN CIT. Tomorrow.city. [Online] Tomorrow.city, 01 13, 2021. [Cited: 05 01, 2021.] https://www.tomorrow.city/a/singapore-transformation-garden-city.
116. Provision of urban green spaces: Some insights from economics. Choumert, Johanna. 3, s.l. : Landscape Research, 2008, Vol. 33.
117. PeTA. Veganism and the Environment. PeTA. [Online] PeTA, 01 01, 2021. [Cited: 05 01, 2021.] https://www.peta.org/issues/animals-used-for-food/animals-used-food-factsheets/vegetarianism-environment/.
118. Friendly, Vegan. Environmental Reasons to Be Vegan. Vegan Friendly. [Online] Vegan Friendly, 01 01, 2021. [Cited: 05 01, 2021.] https://www.veganfriendly.org.uk/articles/environmental-reasons-to-be-vegan/.
119. Williams, Sage. 17 Environmental Benefits Of Veganism (As Proven By Science). Future Kind. [Online] Future Kind, 05 29, 2020. [Cited: 05 01, 2021.] https://www.futurekind.com/blogs/vegan/17-environmental-benefits-of-veganism.
120. Future, Forum for the. Global Challenges: Food. Forum for the Future. [Online] Forum for the Future, 01 01, 2021. [Cited: 05 01, 2021.] https://www.forumforthefuture.org/Pages/Category/food.
121. Global Challenges: Supply chains and livelihoods. Forum for the Future. [Online] Forum for the Future, 01 01, 2021. [Cited: 05 01, 2021.] https://www.forumforthefuture.org/Pages/Category/supply-chains.

122. Global Challenges: Growing our Future. Forum for the Future. [Online] Forum for the Future, 01 01, 2021. [Cited: 05 01, 2021.] https://www.forumforthefuture.org/scaling-regenerative-agriculture-in-the-us.

123. Arup. Arup Explores: Urban Agriculture. Arup. [Online] Arup, 01 01, 2021. [Cited: 05 01, 2021.] https://foresight.arup.com/publications/arup-explores-urban-agriculture/.

124. (FAO, Food and Agriculture Organization of the United Nations. With micro-gardens, urban poor "grow their own". Food and Agriculture Organization of the United Nations (FAO). [Online] Food and Agriculture Organization of the United Nations (FAO), 01 01, 2021. [Cited: 05 01, 2021.] http://www.fao.org/ag/agp/greenercities/en/microgardens/index.html.

125. Tomorrow.city. THREE WAYS SINGAPORE IS DESIGNING URBAN FARMS TO CREATE FOOD SECURITY. Tomorrow.city. [Online] Tomorrow.city, 04 01, 2021. [Cited: 05 01, 2021.] https://tomorrow.city/a/three-ways-singapore-is-designing-urban-farms-to-create-food-security.

126. AllotMe. Homepage. AllotMe. [Online] AllotMe, 01 01, 2021. [Cited: 05 01, 2021.] https://www.allotme.co.uk.

127. Klimburg, Alexander. Interview. 09 27, 2019.

128. Schönenberger, Erik. Interview. 10 17, 2019.

129. Kelion, Leo. BBC News. Huawei 5G kit must be removed from UK by 2027. [Online] BBC News, 07 14, 2020. [Cited: 05 01, 2021.] https://www.bbc.co.uk/news/technology-53403793.

130. Collins, Matthew, Knutti, Reto and al., et. Long-term Climate Change:Projections, Commitmentsand Irreversibility. 2013.

131. Henley, Jon. Climate crisis could displace 1.2bn people by 2050, report warns. The Guardian. [Online] The Guardian, 09 09, 2020. [Cited: 05 01, 2021.] https://www.theguardian.com/environment/2020/sep/09/climate-crisis-could-displace-12bn-people-by-2050-report-warns.

132. Bryce, Emma. These cities are opening their doors to the first climate migrants. WIRED UK. [Online] WIRED UK, 12 31, 2020. [Cited: 05 01, 2021.] https://www.wired.co.uk/article/climate-migrant-cities.

133. McDonnell, Tim and Shendruk, Amanda. It's time to prepare cities for people uprooted by climate change. Quartz. [Online] Quartz, 09 01, 2020. [Cited: 05 01, 2021.] https://qz.com/1895263/how-cities-can-prepare-to-support-climate-migrants/.

134. Bendix, Aria. We asked 12 climate scientists where they'd live in the US to avoid future natural disasters. Here's what they said. Insider. [Online] Insider, 02 27, 2020. [Cited: 05 01, 2021.] https://www.businessinsider.com/where-to-live-to-avoid-natural-disaster-climatologists-2018-8?r=US&IR=T#even-if-boulder-colorado-gets-hit-by-a-major-drought-in-the-next-10-years-the-city-wont-run-out-of-water-3.

135. Rossi, Marcello. Some northern cities could be reborn as 'climate havens'. Yale Climate Connections. [Online] Yale Climate Connections, 08 07, 2019. [Cited: 05 01, 2021.] https://yaleclimateconnections.org/2019/08/some-northern-cities-could-be-reborn-as-climate-havens/.

136. Pierre-Louis, Kendra. Want to Escape Global Warming? These Cities Promise Cool Relief. New York Times. [Online] New York Times, 04 15, 2019. [Cited: 05 01, 2021.] https://www.nytimes.com/2019/04/15/climate/climate-migration-duluth.html.

137. Malo, Sebastien. Cool U.S. cities prepare as future 'havens' for climate migrants. Reuters. [Online] Reuters, 04 06, 2019. [Cited: 05 01, 2021.] https://www.reuters.com/article/us-usa-climatechange-migration-idUSKCN1RI061.

138. Deaton, Jeremy. Will Buffalo Become a Climate Change Haven? Bloomberg. [Online] Bloomberg, 12 05, 2019. [Cited: 05 01, 2021.] https://www.bloomberg.com/news/articles/2019-12-05/the-consequences-of-being-a-climate-refuge-city.

139. Rodriguez Martinez, Marta and Montalto Monella, Lillo. Extreme weather exiles: how climate change is turning Europeans into migrants. Euro News. [Online] Euro News, 06 17, 2020. [Cited: 05 01, 2021.] https://www.euronews.com/2020/02/26/extreme-weather-exiles-how-climate-change-is-turning-europeans-into-migrants.

140. UK, UNHCR. Climate change and disaster displacement. UNHCR UK. [Online] UNHCR UK, 01 01, 2021. [Cited: 05 01, 2021.] https://www.unhcr.org/climate-change-and-disasters.html.

141. Coalition, Climate and Migration. Report summary: "Climate refugees" legal and policy responses to environmentally induced migration. Climate and Migration Coalition. [Online] Climate and Migration Coalition, 01 01, 2021. [Cited: 05 01, 2021.] https://climatemigration.org.uk/report-summary-climate-refugees-legal-and-policy-responses-to-environmentally-induced-migration/.

142. Goodfellow, Maya. How helpful is the term 'climate refugee'? The Guardian. [Online] The Guardian, 08 31, 2020. [Cited: 05 01, 2021.] https://www.theguardian.com/world/2020/aug/31/how-helpful-is-the-term-climate-refugee.

143. Guérot, Ulrike. Now the EU needs to hand power to its citizens. Here's why. The Guardian. [Online] The Guardian, 02 07, 2018. [Cited: 05 01, 2021.] https://www.theguardian.com/commentisfree/2018/feb/07/european-union-power-citizens-republic.

144. Böttger, Katrin and VanLoozen, Gabriel. Euroscepticism and the Return to Nationalism in the Wake of Accession as Part of the Europeanization Process in Central and Eastern Europe. Cairn.info. [Online] Cairn.info, 12 10, 2012. [Cited: 05 01, 2021.] https://www.cairn.info/revue-l-europe-en-formation-2012-2-page-323.htm.

145. Dennison, James and Carl, Noah. https://blogs.lse.ac.uk/politicsandpolicy/explaining-brexit/. LSE Blog. [Online] London School of Economics, 07 18, 2016. [Cited: 05 01, 2021.] https://blogs.lse.ac.uk/politicsandpolicy/explaining-brexit/.

146. Boddey, Daniel, Stewart, Heather and O'Carroll, Lisa. Breakthrough on fishing rights as Brexit talks hang in the balance. The Guardian. [Online] The Guardian, 12 06, 2020. [Cited: 05 01, 2021.] https://www.theguardian.com/politics/2020/dec/06/major-breakthrough-on-fishing-rights-brings-brexit-deal-closer.

147. Gash, Tom, Randall, Joe and Sims, Sam. Achieving Political Decentralisation: Lessons from 30 years of attempting to devolve political power in the UK. London : Institute for Government, 2021.

148. Ward, Matthew. City Deals. London : House of Commons Library, 2020.

149. Taylor, Cliff. French move highlights dangers for Ireland in brewing tax war. The Irish Times. [Online] The Irish Times, 11 25, 2020. [Cited: 05 01, 2021.] https://www.irishtimes.com/business/economy/french-move-highlights-dangers-for-ireland-in-brewing-tax-war-1.4418997.

150. Guardian, The. Biden's plans for a global corporate tax rate could make the world a fairer place. The Guardian. [Online] The Guardian, 04 11, 2021. [Cited: 05 01, 2021.] https://www.theguardian.com/politics/2021/apr/11/bidens-plans-for-a-global-corporate-tax-rate-could-make-the-world-a-fairer-place.

151. House, Chatham. The Future of Democracy in Europe: Technology and the Evolution of Representation. Chatham House. [Online] Chatham House, 01 01, 2021. [Cited: 05 01, 2021.] https://www.chathamhouse.org/2020/03/future-democracy-europe/7-conclusion.

152. London, King's College. The Future of Direct Democratic Voting in the EU - 22 May 2020. King's College London. [Online] King's College London, 04 01, 2020. [Cited: 05 01, 2021.] https://www.kcl.ac.uk/events/the-future-of-direct-democratic-voting-in-the-eu-eusol.

153. The Role of Direct Democracy in the European Union. Feld, Lars P. and Kirchgässner, Gebhard. 2003.

154. UK, Climate Assembly. Climate Assembly UK. Climate Assembly UK. [Online] Climate Assembly UK, 09 11, 2020. [Cited: 05 01, 2021.] https://www.climateassembly.uk.

155. Works, Citizens' Assemblies: Democracy that. Concept Design: European citizens' assembly. Citizens' Assemblies: Democracy that Works. [Online] Citizens' Assemblies: Democracy that Works, 01 01, 2018. [Cited: 05 01, 2021.] https://citizensassemblies.org/european/.

156. Assembly, Citizens'. Citizens' Assembly. Citizens' Assembly on Brexit. [Online] Citizens' Assembly, 01 01, 2021. [Cited: 05 01, 2021.] https://citizensassembly.co.uk/brexit/about/.

157. Assembly, An Tionól Saoránach | The Citizens'. An Tionól Saoránach | The Citizens' Assembly. Citizens' Assembly. [Online] An Tionól Saoránach | The Citizens' Assembly, 01 01, 2021. [Cited: 05 01, 2021.] https://www.citizensassembly.ie/en/.

158. Foundation, Sortition. Let's do democracy differently. Let's do democracy better. Sortition Foundation. [Online] Sortition Foundation, 01 01, 2021. [Cited: 05 01, 2021.] https://www.sortitionfoundation.org.

159. Tsakiliotis, Konstantinos. Applying Sortition in the EU: House of Lots or Random Votes? Institut für Internet und Gesellschaft. [Online] Institut für Internet und Gesellschaft, 02 14, 2019. [Cited: 05 01, 2021.] https://www.hiig.de/en/applying-sortition-in-the-eu-house-of-lots-or-random-votes/.

160. Glogowski, Paweł. Sortition as a Finalite Politique for EU Democracy. European Consortium for Political Research . [Online] European Consortium for Political Research , 09 07, 2019. [Cited: 05 01, 2021.] https://ecpr.eu/Events/Event/PaperDetails/47670.

161. Sortition, its advocates and its critics: An empirical analysis of citizens' and MPs' support for random selection as a democratic reform proposal. Jacquet, Vincent, Niessen, Christoph and Reuchamps, Min. 22, s.l. : International Political Science Review, 2020, Vol. 1.

162. Fedor, Lauren, McCormick, Myles and Murphy, Hannah. Cyber attack shuts major US pipeline system. Financial Times. [Online] Financial Times, 05 08, 2021. [Cited: 05 08, 2021.] https://www.ft.com/content/2ce0b1fe-9c3f-439f-9afa-78d77849dd92.

163. MacColl, Jamie and Dawda, Sneha. US Water Plant Suffers Cyber Attack Through the Front Door. Royal United Services Institute (RUSI). [Online] Royal United Services Institute (RUSI), 02 10, 2021. [Cited: 05 01, 2021.] https://rusi.org/commentary/us-water-plant-suffers-cyber-attack-through-front-door.

164. Vulnerability of Traffic Control System Under Cyberattacks with Falsified Data. Feng, Yiheng, et al. 1, s.l. : Transportation Research Record: Journal of the Transportation Research Board, 2018, Vol. 2672.

165. Davis, Jessica. Healthcare Cyberattacks Doubled in 2020, with 28% Tied to Ransomware. Health IT Security. [Online] xtelligent Healthcare Media, 02 05, 2021. [Cited: 05 01, 2021.] https://healthitsecurity.com/news/healthcare-cyberattacks-doubled-in-2020-with-28-tied-to-ransomware.

166. Hackett, Robert. Ransomware attack on a hospital may be first ever to cause a death. Fortune. [Online] Fortune, 09 18, 2020. [Cited: 05 01, 2021.] https://fortune.com/2020/09/18/ransomware-police-investigating-hospital-cyber-attack-death/.

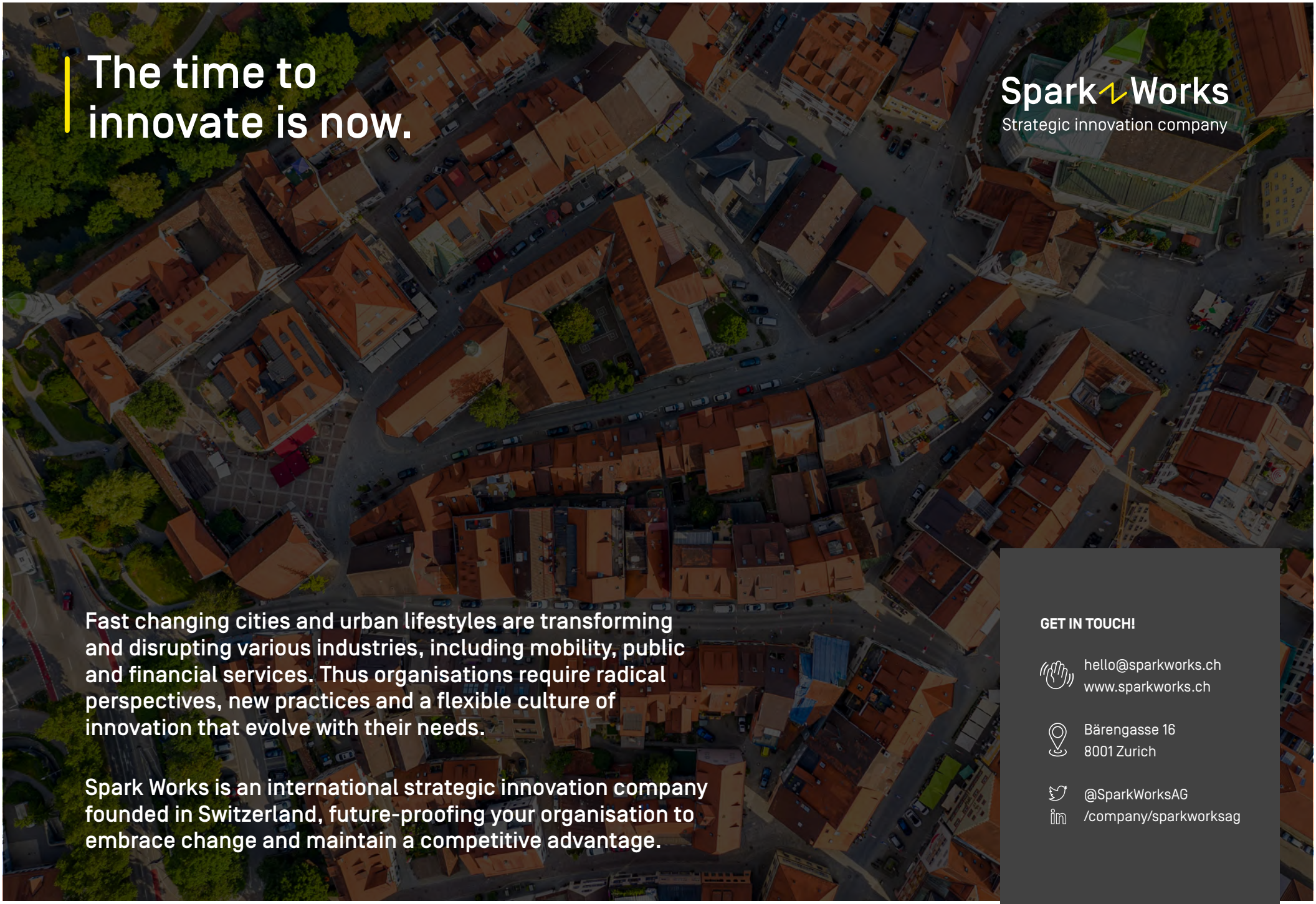
167. KnowBe4, Inc. The Economic Impact of Cyber Attacks on Municipalities. Clearwater, Florida : KnowBe4, Inc., 2020.

168. Kostopoulos, Lydia. The Role of Data in Algorithmic Decision-Making A Primer. s.l. : United Nations Institute for Disarmament Research, 2019.

169. Hofman, Tom. Interview. 10 07, 2019.

170. E.W., Butt, et al. Global and regional trends in particu- late air pollution and attributable health burden over the past 50 years. [Online] http://stacks.iop.org/1748-9326/12/i=10/a=104017?key=crossref.bc64d-d6aa09e5969ceea0653e8f66e65.

171. Schmitt, Gerhart. Interview. 09 27, 2019.



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