

IF DESIGN TREND REPORT 2

Foreword

This second iF Design Trend Report is an expression of our thanks to you: your positive feedback and constructive ideas reinforced our decision to make this service available again and, this time, to take an even deeper dive into the insights and issues relevant to designers. We are all in a tug of war of occupational and personal influences, which we expertly juggle, connect and also unconsciously process into something new. Much of this, especially in view of our day-to-day consumption, finds itself in the context of megatrends, according to which designed life and life yet to be designed develops.

Once again, in collaboration with the Frankfurt-based Zukunftsinstitut and other international partners, we have compiled significant design trends for you in this report and have used six currently distinctive megatrends as guiding themes. Our analyses are aimed at users, manufacturers and, most importantly, designers: How can product design, digital interfaces and the corresponding services be optimally aligned with one another? At which points do unexpected innovations arise and new business models surface as a consequence of this interplay? How will AI with all its facets and generated design results change the training and profession of designers? How do manufacturers need to react, which potentials and inconceivabilities slumber there?

This 2023 Trend Report provides possible answers: solid, exemplary best practices offer impetus as well as discourse for one's own ideas and plans. No matter whether you read from start to finish, leaf through at random, pick up bits of information here and there or are just looking for visual inspiration – we hope to provide you with extensive and insightful perspectives to the challenges and offer opportunities inherent in these megatrends.

We thank Karen Korellis Reuther, USA
Lidan Liu, China
Thomas Paulen, Netherlands
Johanna Loomis, Germany
Patricia Stark, Austria
Victor Choe, Republic of Korea
Jarred Evans, United Kingdom
for their expert support.

2023 is a special year for iF Design: For more than 70 years now, we as a design institution have stood for the continuously developed term “good design”. Initially from the base in Hanover, and meanwhile in offices around the world with proven local expertise. Every year, as innovation-driven manufacturers and creative agencies / studios, you give us your trust and submit your work to be judged by our international jury. We are very grateful to you for this and would like to give inspiring reading back to community in the form of this 2023 iF Design Trend Report.

We hope you enjoy reading this year's issue.

Sincerely,
Uwe Cremering
CEO
iF International Forum Design GmbH

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Design in dynamic times

Globalized, networked and dynamic – hardly any other time in history has been so marked by upheaval, sudden global crises and complex innovations as the present day. There is a steady stream of trends and countertrends, which have an impact on one another. Disruptive technologies meet traditional infrastructures, and world views, lifestyles and concepts of value are changing as a result of past experiences of crises. Complexity and dynamics are the fundamental constants of our times and the main drivers of the development of design professions.

This second iF trend report helps in the discovery of innovation potentials and provides designers with ideas and orientation. But, most importantly, it shows this: the allegedly wicked problems of the present day are often tackled with great curiosity, innovative spirit and high levels of efficiency when it comes to finding solutions. Many new and creative strategies have already been developed and can also be transferred to other areas of application. For every trend that is observed, there are numerous products and services that have exemplarily demonstrated which strategies and solution approaches are pivotal for today's challenges. We have included a selection of these in this publication. No advertising partnership exists with the companies, products, product examples and project examples contained in this publication – the selection of examples presented was made exclusively based on subject- and content-based considerations.

A selection of outstanding design experts accompanied us during our extensive research process and provided valuable insight into their own world of work. A multistage research procedure enabled us to make a broad analysis across the six megatrends and brought to light numerous interconnections between the individual megatrends and a wide range of very different industries and product categories.

This extensive analysis of the megatrends indicates fundamental requirements and weak signals, which keep surfacing in various forms. Many of the developments we were able to observe are evident across multiple megatrends. The dynamics of the individual megatrends reinforce each other and gain additional dynamics.

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Six megatrends are shaping design

For our second iF Design Trend Report, we have chosen six megatrends that have a particularly great impact on design:

Connectivity is the dominant underlying pattern of social change in the 21st century: the principle of connectivity based on digital infrastructures. As a new communication technology, the internet is changing our lives, our work, and our economies in their essence. The megatrend is reprogramming behaviors that have been socioculturally influenced and is ushering in new lifestyles, patterns of activity and business models.

Silver Society describes the widely varying impacts of the shift in demographics towards an ageing society, presenting society as a whole with major challenges – but also opening up great opportunities for a new sociocultural vitality. Along with the demographic shift, new social and economic framework conditions are arising that make it possible to view ageing not as a burden but as normality.

Health has firmly entrenched itself as a fundamental value in the societal consciousness over the past few years and has become synonymous with a high quality of life. This megatrend influences all aspects of life as a main life goal. Growing numbers of increasingly better-informed people wish to move in health-promoting spheres of life both professionally and privately.

Urbanization describes the growth of urban spaces worldwide. More and more people are living in cities and are making them the most important living spaces of the future. Cities are more than just places – they are hypercomplex, dynamic systems, crucial problem-solvers in the face of global challenges, creative centers of pluralistic society, hubs of the globalized economy.

Mobility is characterized by a mobile world culture, which is advancing with mobility offerings that are increasingly multifaceted and increasingly differentiated. New products and services are changing and expanding perspectives regarding means of transportation and their use. The mobility of tomorrow will be practical, sustainable, diverting and exciting.

Neo-Ecology shows a new sustainability paradigm that is changing behaviors and perspectives of global society as well as culture and politics. Corporate policy and the economic system as a whole are being fundamentally restructured.

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How to read this report

The iF Design Trend Report analyzes six megatrends that are influencing design across all categories. Every chapter begins with an analysis of particularly relevant developments of the megatrend and presents the needs that result from these changes. Then a second section presents the design trends which can currently be observed. What makes this report special: unlike most other trend reports, this investigation does not proceed on a product-specific basis, but instead across a range of very different product categories. This makes it possible to identify thrilling commonalities as well as different design approaches, which result in a variety of solutions to one and the same societal challenge.

This document is an interactive report that allows readers to jump in at any part, to cross-reference sections and find links between various trends. Time and again, cross references indicate parallels to related developments that are addressed in a different megatrend chapter. Information boxes succinctly summarize the definition of trends and all observations are underscored with collections of best practices and infographics. The trend report therefore serves as a reference overview in addition to being a work tool for simplifying design research processes.

You will find an overview of all the subjects contained in each chapter, conveniently located on the right-hand side for quick access to the design trends that interest you the most. The footer serves as a seamless guide for navigation between chapters. Click on “Back to the Menu” to return to the table of contents.

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a photo of real people exploring a metaverse



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MEGATREND CONNECTIVITY

Thanks to digital technologies, we are more connected today than we have ever been before. This has changed the essence of how we live together in many ways. Now that the real and the digital world are progressively merging, new space for innovation with regard to the design of hybrid living environments is being created.



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Over the course of the last decades, connectivity has taken hold as the central guideline of society, reaching far beyond digital technologies. The two dimensions “real” and “digital” are merging. Not everything that is technically possible addresses societal problems and basic human needs – but it is precisely these two that form the central goal of design.

In the future, solutions with a design that primarily focuses on the balanced interaction of connectivity and disconnectivity will gain significance. The design reaches far beyond the hardware: it excels when the different interfaces of all products in one system work together successfully.

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The trend towards hyper-personalization is slowly but surely being replaced by newer forms of design that, once again, lean more strongly towards the collective. The design principle seamless personalization addresses a clientele that is as wide as possible, whereas the experience of the product is hyper-individualized.

With the growing complexity of real-digital applications, it is important for the design to invite and motivate its users to engage with the product intensively and over a long period of time. Introducing playfulness and fiction helps to improve the user experience – and is, thus, advancing to become a central design strategy.

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An era of intertwined worlds

The megatrend **connectivity** particularly exemplifies the kind of force and speed megatrends are capable of developing. We can hardly envision a life anymore without the dense interconnectivity that we have gained through the internet and digital technologies. Our everyday lives are shaped by multiple possibilities to connect: people are connected with each other and with products – and even the products themselves are in contact with one another, forming their own ecosystems.

As digitalization moves forward, business models, products and lifestyle choices are undergoing fundamental change. Virtual levels are added to everyday life, enriching our experience of reality, as well as densifying and, in part, superimposing it. Real digitalism is becoming the defining phenomenon concerning work and everyday life. The two dimensions “real” and “digital” are merging as one, making it necessary to look at digital technologies from a new perspective.

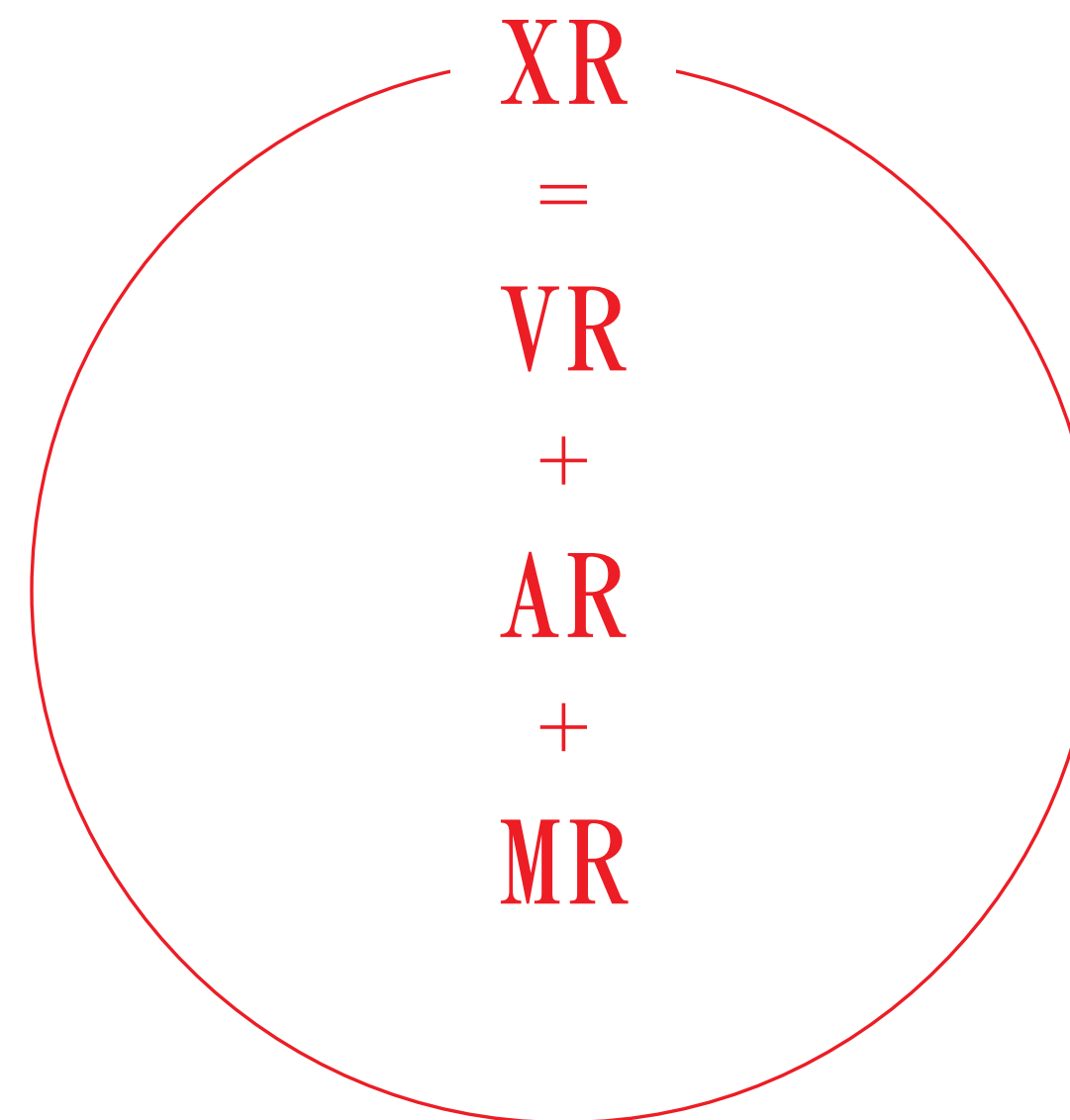
Not everything that is technically possible addresses societal problems and basic human needs – but it is precisely these two that form the central goal of design. (Zukunftsinstitut, 2021)

XR | VR | AR | MR

Extended reality (XR) refers to a range of technologies that enhance or extend the user’s perception of the real world.

This includes **virtual reality** (VR), which completely immerses the user in a computer-generated environment, and **augmented reality** (AR), which superimposes digital information on the user’s view of the real world.

XR also includes **mixed reality** (MR), which combines elements of both VR and AR to create a hybrid environment.



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All signs point toward immersion

The character of the internet itself is also developing further. Right now, it is still mostly used to visit websites; devices with screens enable users to view content or create and upload it themselves. However, in the future, all signs point toward immersion: entire new virtual worlds are being created, making new interfaces with the real world necessary. Applications of **extended reality**  are generating new kinds of interfaces that also require a new way of designing them.

A central task of the design is to ensure a high-quality experience of the virtual world. The design of devices themselves is key in determining how the real world and the virtual content superimpose one another.

The market value for *smart glasses* will reach *\$12.76 billion* in 2030.²

The *AR/VR headset* market is expected to *ship* around *50 million units* by 2026.¹

The *AR Software* market will reach a value of *\$137.14 billion* by 2028.³

Source: 1 IDC
2 Grandview Research
3 PR Newswire

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Connectivity: Powered by disruption

The breathtaking dynamics of the megatrend connectivity has captivated us over the course of the last 20 years: within only a few years, entire industries have developed; business areas have changed so much that they have become hard to recognize and a whole generation of new, interconnected products has gained access to the market. (Zukunftsinstitut, 2021)

Digitalization impacts the way we live and interact with each other. Availability no longer requires effort. Social networking (and with that committing to and organizing oneself in collectives) has reached a new level of speed and agility. The guiding principles by which organizations operate and the way they design processes is also developing further: Strict hierarchies and linearity are increasingly being replaced by iteratively designed and relational approaches. Design thinking is supplementing linear development processes, agile management is reacting to progressively growing dynamics in company processes and entire companies are reorganizing themselves in network structures. (Häusling, 2020) In short, over the course of the last decades, connectivity has established itself and taken hold as the guiding principle of societies, reaching far beyond the realm of digital technologies.

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Generative artificial intelligence as a challenge

After a disruption, the world is no longer the same world as it was before. These days, it is hard to imagine the world without its manifold simplifications. But these shifts in context also come with side effects that cannot always initially be predicted: Social networks enable new forms of cohesion but also reinforce social centrifugal forces. Interlinked digital services and infrastructures within the Internet of Things free us from many concerns but also cause new risks regarding hacker attacks on the critical digital infrastructure of companies and society.

A much-discussed topic right now: generative artificial intelligence, such as **GPT 3** and **Dall-E**, which simplify things in the work environment but at the same time, once again, bring up essential questions regarding copyright law, human core competence and the value of work itself. Apart from that, these new forms often cause the boundaries between work and leisure time to disintegrate. Applications that were initially supposed to lessen our burdens are increasingly becoming sources of stress.

AI Machine learning Generative AI

AI is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning, reasoning and self-correction.

Machine learning is a sub-field of AI that focuses on the development of algorithms and statistical models that allow systems to automatically improve their performance with experience. Machine learning is used to make predictions, classify data and identify patterns in data.

Generative AI is a specific type of machine learning that focuses on creating new, previously unseen data. Generative AI models are trained on a dataset and learn to generate new data that is similar to the training data.

GPT 3

A **generative pretrained transformer** (GPT) is a type of large language model (LLM) that uses deep learning to generate human-like text. They are called “generative” because they can generate new text based on the input they receive, “pretrained” because they are trained on a large corpus of text data before being fine-tuned for specific tasks, and “transformers” because they use a transformer-based neural network architecture to process input text and generate output text.

(World Economic Forum)

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Has the megatrend reached its turning point?

All these side effects accelerate the need to innovate, demanding a turning point in terms of the quality of the megatrend connectivity. Though it is unlikely that interconnectivity will completely stagnate or even lessen in the years to come, it is highly probable that the megatrend will gain different qualities due to new developments and even counteractive strategies. In the future, solutions whose primary focus of design is the balanced interaction of connectivity and disconnectivity will become more relevant.

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The thresholds between the real living environment and the purely digital, virtual world are dissolving. This process is also changing our understanding of property and individuality as well as demanding new solutions for products and applications.



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Metaverse – The next big thing?

When the term Web 2.0 caused an uproar at the beginning of the century, many progressive thinkers were already questioning which innovation would become “the next big thing”. Today, there is hardly a concept that seems more suitable to the task than the metaverse.

(Hackl et al. 2022)

The basic thought behind the **metaverse** sounds promising: we no longer visit websites or platforms, but instead access virtual worlds, which we step into with the help of avatars. These worlds aim to convey the feeling of presence. Ways of superimposing the real and the virtual world, such as by using hologram projections that are bound to specific locations and have a consistent timeline, are also being considered.

Michelle Crossan-Matos from Samsung Electronics America sums it up perfectly: “The metaverse empowers us to transcend physical and spatial limits to create unique virtual experiences that could not happen otherwise.”

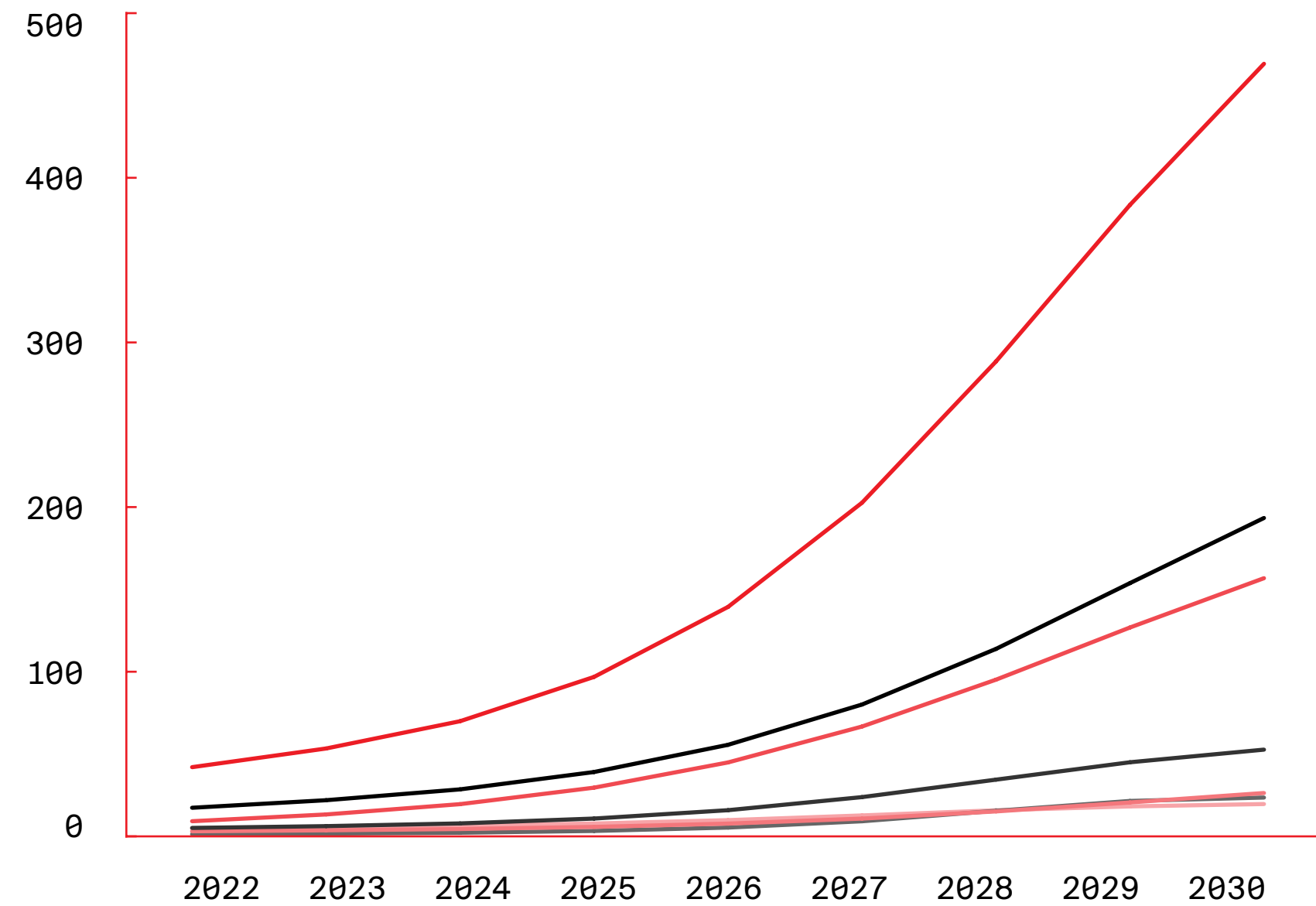
This way, social networks can achieve a new quality and become digital **third places** [↗](#).

Economic factor metaverse

Estimated development of global metaverse sales

(in billions of euros)

■ Total ■ Gaming ■ Workplace ■ Other*
■ E-commerce ■ Health and fitness ■ Education



* AR and VR hardware, digital media, live entertainment, virtual assets, advertising
 Source: Statista Advertising & Media Market Insights

Examples:

Decentraland, The Sandbox, Axie Infinity, Opensa, Fortnite, Meta, Microsoft Mesh, Nvidia Omniverse, OpenSpace3D

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THE BOUNDARIES BETWEEN OUR
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AMY WEBB

CEO of FTI New York



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The cold start of metaverses

The greater a vision is, the harder it is to get started. The biggest hurdle for the metaverse to overcome is the cold-start problem: just like all social networks, the metaverse will only have a certain allure once it has reached a critical number of users. It is becoming increasingly important for designers to not only address individual users, but to also consider **collective social dynamics** [↗](#) in their creative process.

Social networks can solve this cold-start problem by specifically targeting and convincing a very influential group to make use of their network as early adopters. Tinder launched its campaign by hosting parties on high school campuses with the goal of convincing the “cool kids” to use the platform. ^(Chen, 2021) Aside from the cold start problem, the metaverse is faced with an additional entry hurdle: acquiring new and expensive hardware is the basic prerequisite for use of the service.

It is becoming increasingly important for designers to consider collective social dynamics in their creative process.

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Future perspective: Metaverse

It is still hard to say how the potential of the metaverse will unfold: is it a vision or is the idea being overly hyped due to its many marketing potentials? Simply copying real product worlds into the virtual world or extending them with additional digital offers does seem to promise a lucrative outcome from a corporate point of view – however, new offers will only assert themselves if they prove to be an immediate benefit to everyday life.

Only solutions that generate a genuine surplus by using virtual worlds will be successful in the long term. These virtual solutions must have a direct reference to the real world – the application becomes part of a network, independently establishing relations with its surroundings. Creating and designing these relations will become a central task of product design.

Brands such as [Adidas](#), [Samsung](#), [Hyundai](#), [Bang & Olufsen](#), [BMW](#) or [Xiaomi](#) create new user experiences with the help of metaverses: Brand spaces, brand events or NFTs communicate the brand in an entirely new way.

Within the B2B sector, metaverse applications such as digital twins or virtual worlds are implemented to train AI.

Transport economy and warehousing companies, as for instance [DHL](#), develop new applications and digital twins such as track and trace, the smart management of warehouses or entire harbor facilities.

In medicine, digital twins of a patient's organs help to better evaluate the progression of a disease and how the organ will react to medicine, therapies or surgical interventions, such as [Siemens Healthineers](#) or [Q Bio](#).

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Victor Choe

is the Vice President of d'strict and Business Director of ARTE NFT, d'strict's new crypto art project. He is one of the founding members of d'strict and oversees various corporate tasks, including business development, support and R&D management. With an eye toward emerging technologies, he has spearheaded several R&D projects that integrate cutting-edge tech into the art and design industries, including VR theme parks, food retail tech and metaverse art platforms.

IF DESIGN: A year ago, the South Korean government surprised the world by announcing that it would invest in the metaverse with a \$170 million fund. For South Korean designers, it seems like it's never been easier to enter the metaverse. What should companies keep in mind when entering the realm of virtuality and the metaverse?

VICTOR CHOE: Virtual reality and the metaverse have been garnering significant attention from the public in the past two years, but the concept has been attracting designers and companies worldwide for over a decade. In the past, the limited usability and high cost of VR technology were obstacles to widespread adoption. However, recent advancements in technology such as blockchain and AI, as well as a gradual reduction in cost, have increased the potential of VR in various fields.

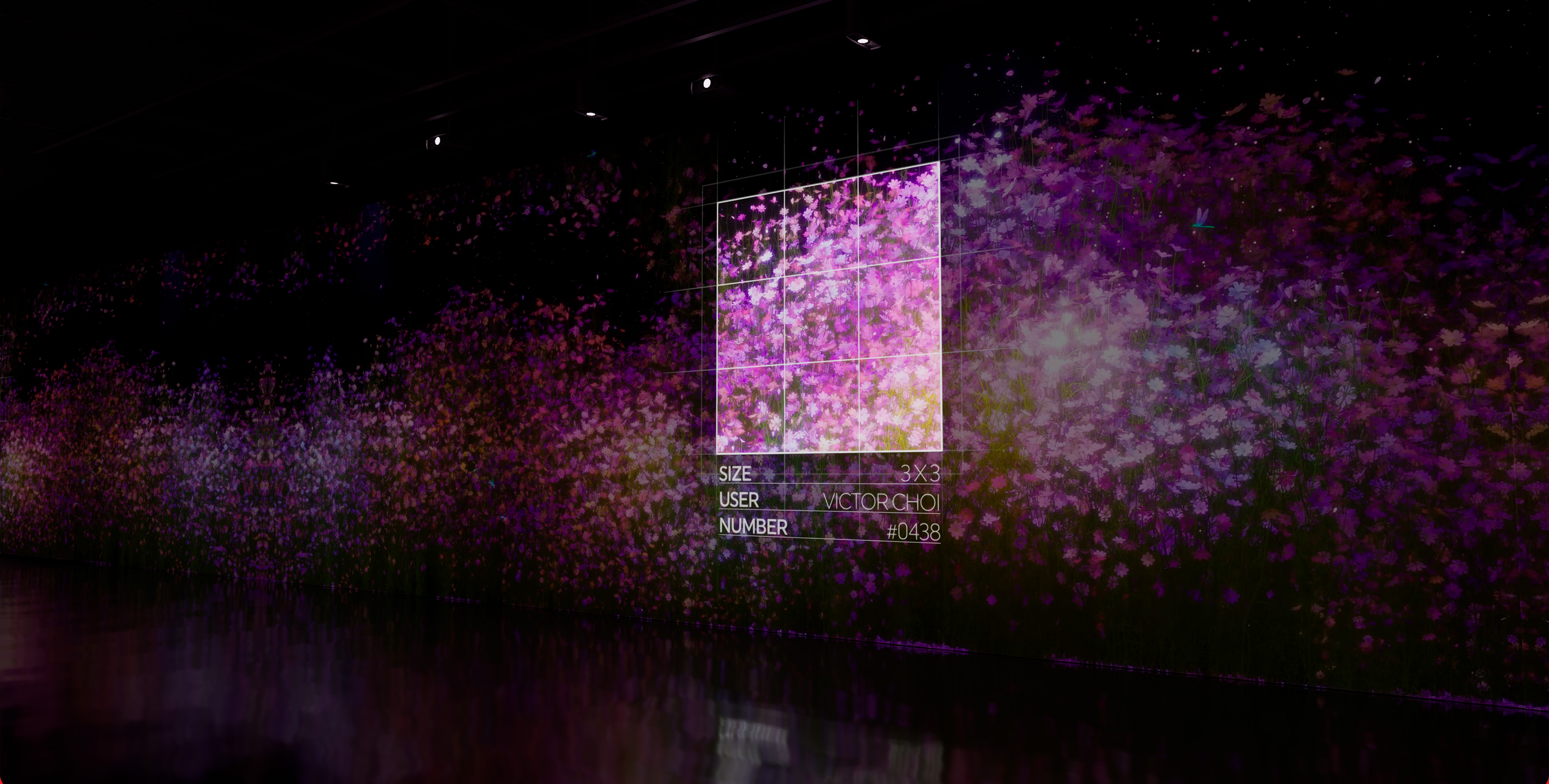
Despite this, there are still challenges to be addressed such as limitations in usability and cost. For it to be successful, the market players need to focus on improving usability and accessibility as well as finding cost-effective solutions throughout the production and operation process. It is important to acknowledge that most recent virtual reality/metaverse services lack a user-friendly interface and have a design and art perspective that is out of touch with the experience that users expect.

Therefore, the most crucial task is to provide a service structure with a design and art market-friendly grammar, innovative solutions to address current technological limitations, and new, useful experiences from a user perspective that are in line with the empirical laws of the metaverse.

IF DESIGN: Korean companies Naver and SK Telecom have further developed their platforms Zapeto and Iland, while other metaverse pioneers include Sandbox, Decentraland and Substrata. Without a doubt, it's a huge trend. What does this new development mean from a designer's perspective? What could be some potential "pitfalls" for them and companies diving into the metaverse?

VICTOR CHOE: From the viewpoint of enhancing customer or user experience, the development of technologies such as blockchain and AI linked to the metaverse has the potential to bring about innovative and unique experiences in the fields of design and art. However, most metaverse-based design and art experiences to date have merely replicated existing experiences, rather than providing something new. This presents both an opportunity and a risk for designers.

It is crucial for new entrants in this field to carefully consider how they can create unique and valuable experiences for users in the metaverse – experiences that offer a distinctly different "interface" from reality. As the metaverse market matures and some of the bubbles from the past two years resolve, success in 2023 will only be achieved by those who have effectively addressed this challenge.



SIZE 3X3
USER VICTOR CHOI
NUMBER #0438



IF DESIGN: Do you think there are areas where the metaverse could support designers in their work or design process?

IF DESIGN: Marketing solutions for areas such as employer branding, resolving security challenges through remote services for dangerous machines or medical applications, remote collaborations and other forms of usage in sectors like logistics, sports and education already show immense potential. Would you describe the metaverse as a kind of innovation driver that could change the whole digital era? How do you see the potential of the metaverse – is it more than just hype?

VICTOR CHOE: I envision that it will spur the development of production technologies that can effectively implement 3D interfaces, spatial transitions and other unique features brought about by the metaverse.

For instance, a tool like Tilt Brush, a VR-based authoring tool that was introduced a decade ago, is currently only used by artists. However, in the future, such a tool could be used to expand the space and experiences of the public within the context of metaverse. It may evolve into a tool for building interfaces or become a standard feature in real-time 3D engines.

Furthermore, services like Market Aggregator, which facilitates communication between metaverses with varying infrastructure, enable a single design to be utilized across multiple metaverses and the commercial services they provide. And a development like this can streamline the designer's production process.

VICTOR CHOE: It is true that the gradual improvement of inherent issues such as usability and cost, along with the development of complementary technologies like blockchain and AI, increases the potential for a sustainable metaverse. However, as the metaverse trend died down a few years ago due to unresolved issues, there is still a high potential risk for challenges.

There has been interest in the metaverse for at least 10 years, but declining in areas like design, art and entertainment that require a broader user base. The value of the metaverse experience is clearer in remote collaboration and training, but given the long-standing buzz surrounding the metaverse, it is important to take a more serious look at its trends.

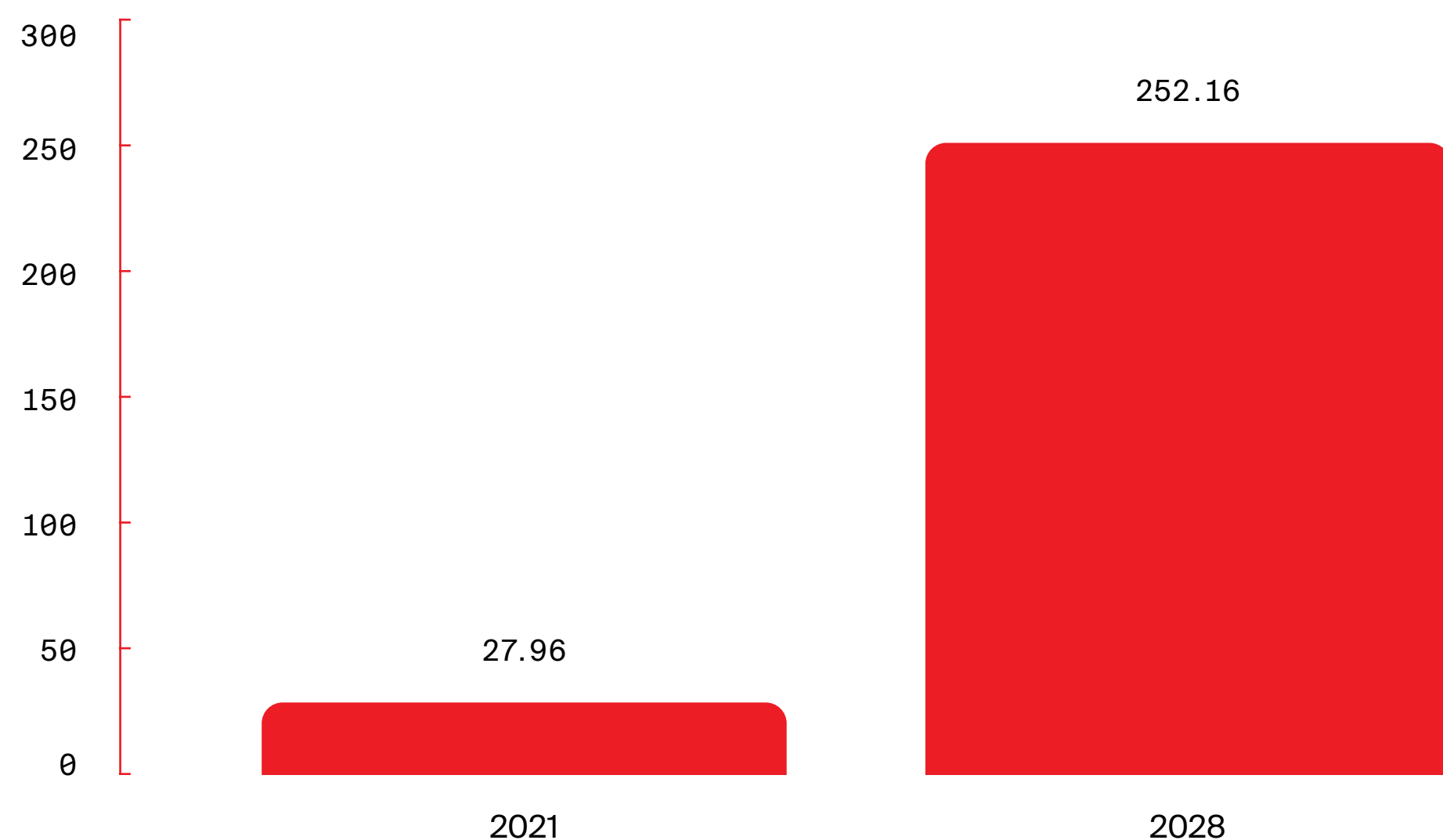
I believe that the future of the metaverse depends on the introduction and widespread adoption of a representative content or service that addresses its limitations. Without this, the future of the metaverse will remain uncertain. Now is a critical time for its development and growth.

Extended reality is augmenting our understanding of reality

Virtual worlds and immersive experiences require new devices that facilitate a more convincing experience of an illusion. Extended reality (XR) technologies are systems and technological environments that enhance and superimpose natural sensations caused by real surroundings with computer-based, artificial sensations. At the moment, the term largely refers to technologies belonging to **virtual reality** (VR) and **augmented reality** (AR).

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Augmented reality (AR), virtual reality (VR) and mixed reality (MR) market size worldwide in 2021 and 2028 (in billion US\$)

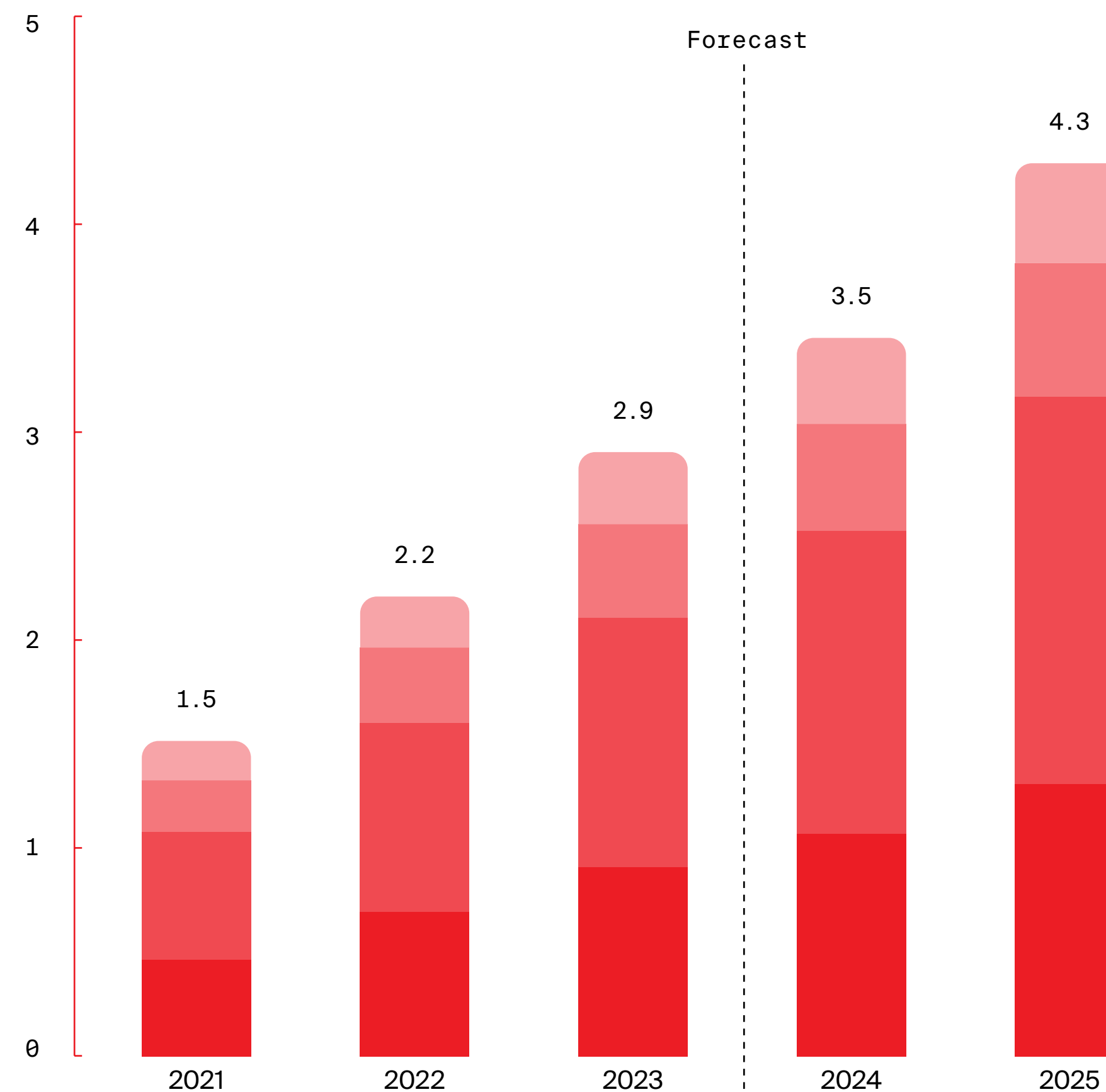


Source: theinsightpartners.com

Frequent AR consumers

Based on people ages 13 – 69 who use social/communication apps (in billions)

■ Gen Z ■ Millennial ■ Gen X ■ Boomer



Source: artlabs.ai

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**SMART GLASSES
WILL BE THE SUCCESSOR
TO THE SMARTPHONE AS
THE PRIMARY PERSONAL DEVICE,
AND WILL SERVE AS A CENTRAL
TECHNOLOGY FOR EXPERIENCING
XR AND THE METAVERSE.**



Immersion by the means of virtual reality

Virtual reality strives to make a fictional reality spatially and tangibly experiential in order to make the gaming and communication experience seem as real as possible.

An immersive experience can be achieved by replacing a person's real environment with virtual sensations that directly address a person's senses. Head-mounted displays or data gloves are often used for this purpose.

The gaming and entertainment industries have emerged as true pioneers in this regard. However, in the meantime, applications are also being developed for work environments and for therapeutic purposes. VR applications such as the **Waytous Avatar Driver** are now also being implemented to operate machines in dangerous environments. This way, the person in charge of controlling them doesn't have to put themselves at risk. A central challenge of VR applications is to create an immersive work atmosphere without excluding too many aspects of the real world. The VR headset Meta Quest Pro solves this problem by integrating a camera that records objects in the real environment and integrates them into the virtual world.

Examples:

Meta Quest Pro, Lenovo ThinkReality VRX, Sony PlayStation® VR2, Compal VR Frame

Visionary:

California-based startup Mojo Vision has already tested their first Smart Contact Lens in June 2022.

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01 VIVE Tracker 3.0

Multiple units can be connected at a time and act as body tracking nodes. This new way of tracking motion can be done in a tiny space. As a result, the tracker dramatically reduces equipment requirements and provides a cost-effective way for low-budget users to build mocap studios to produce more 3D content in any creative field.



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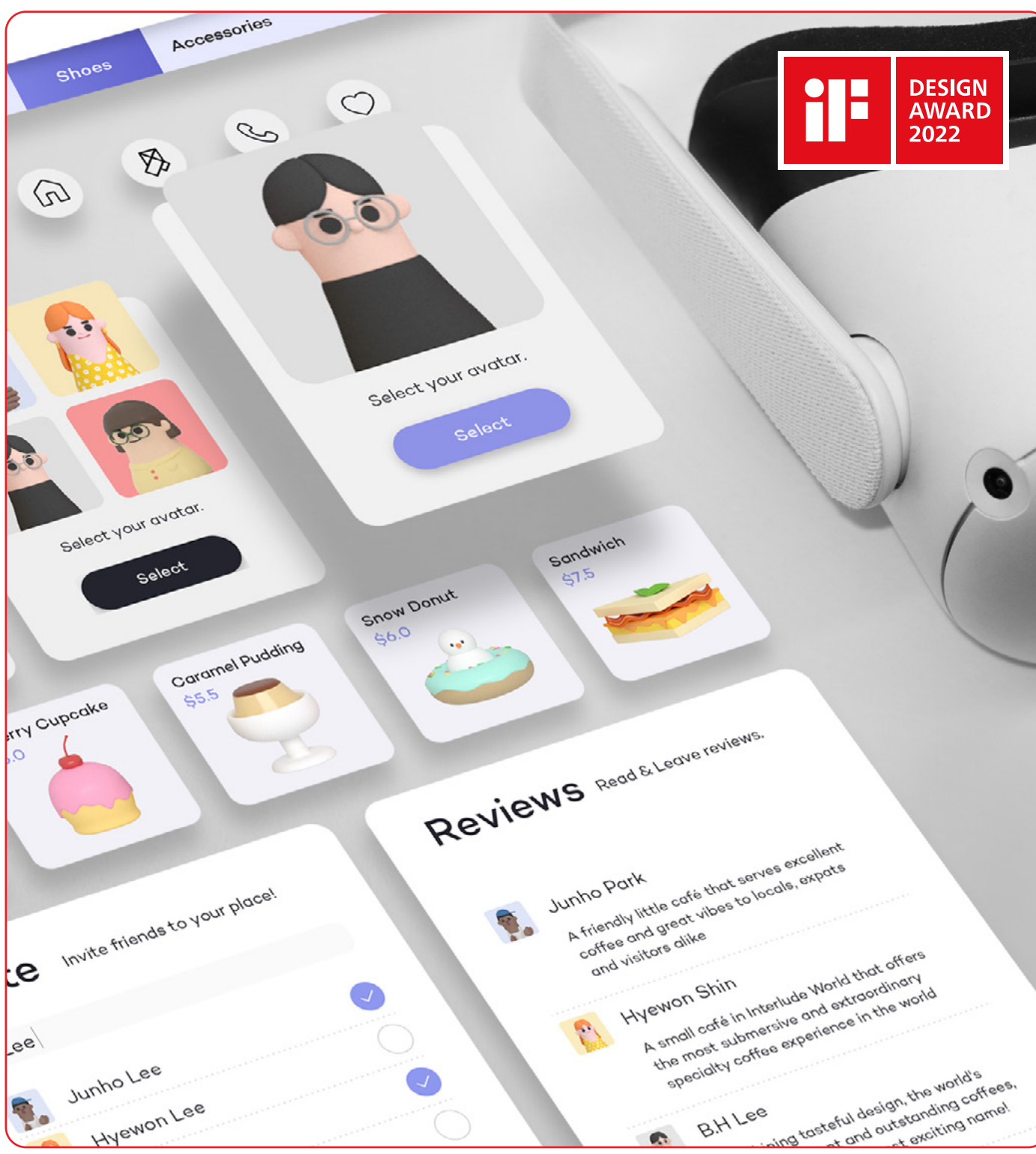


02 03
04



02 VIVE Focus 3 Controller
This 6 degree of freedom controller connects with VIVE Focus 3 VR to deliver a precise tracking and seamless VR experience for business applications.

03 Waytous AvatarDriver
The VR system Waytous Avatar Driver allows users to operate processes in production and logistics companies remotely and to supervise them on a daily basis. By linking the information systems to the driving system, the technical staff is protected from safety hazards that might arise due to bad weather and the rough mining environments. They can conduct their work more easily and safely from behind closed doors.



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04 The Interlude Project
The Interlude Project is an online platform that allows you to build your own cafe using various backgrounds, architecture, and interiors provided in the virtual reality world. While enjoying a game, you can create a space that you have always dreamed of and invite friends from all over the world to communicate and have fun vividly using VR devices.

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VR faces obstacles

VR systems have yet to tackle some of the obstacles that are momentarily still keeping the technology from becoming established on a wider scale:

Sensitivity: The more immersive the quality of the experience is designed to be, the more sensitively the product system reacts to errors. It quickly becomes irritating if the internet connections, data transfer pathways, computers, VR glasses and software are not harmonized for smooth operation. Fluctuations in performance, such as unsteady frame rates or latencies, have a much more immediate impact on the quality of the experience than they would normally have on display applications.

Motion sickness: Not all sensations can be completely superimposed, which causes many users to feel nauseous and dizzy. This motion sickness seems to be very similar to seasickness but has yet to be studied further. (Saredakis et al. 2019) However, initial results do indicate that training and reducing the utilization time can help users to slowly acclimatize to VR and minimize the respective symptoms. (ibid.)

Isolation through immersion: Gaming and working both require high levels of concentration, but neither are normally completely in isolation from the work environment. Games are often played with friends. Food is ordered on the side, or a second monitor is used to communicate with other people. Immersion only succeeds when it is possible to completely enter another world – but this is precisely what a lot of people do not actually want.

Haptic immersion

The more sensory channels are targeted with stimuli that support the illusionist effect of the virtual world, the more convincing the VR experience becomes. The sense of touch plays a key role in this experience. VR worlds are often navigated with cursors, allowing the user to select and control virtual elements. The rigid form of the cursor, however, is counterproductive to the immersive process. It only allows tactile feedback to be given through vibration. Devices that enable virtual haptic feedback, such as **Emerge Wave 1**, pose a far greater technical challenge and are thus currently still in the development stage. Besides haptic feedback, gesture and voice control are also becoming more important. The goal is to broaden the **overall scope of interaction possibilities** with only one product.

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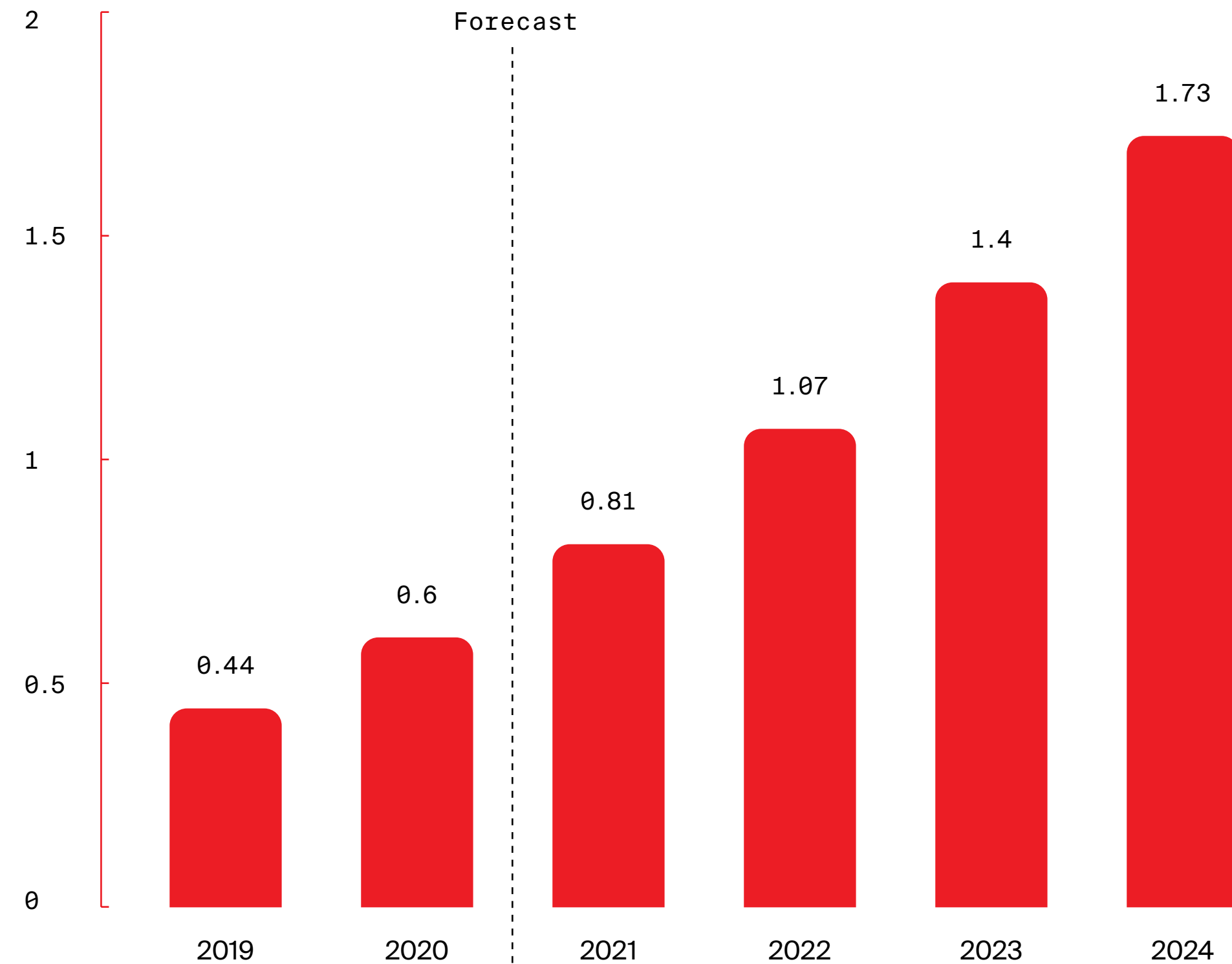
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Augmented reality offers new services

Augmented Reality systems project computer-based partial simulations into the real environment of the user. The external impressions of the environment are subsequently not excluded, but instead receive an additional level of information. Virtual artifacts, content or information are integrated into the perception of the real environment. This, in effect, fosters interactions with the real situation, instead of hindering them.

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Global mobile augmented reality (AR) user devices 2019-2024 (in billions)



Forecast. The figure represents AR active user devices. This has been de-duplicated to factor in platform overlap. Source: ARtiller Intelligence; AR Insider; Statista

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AR conquers the consumer electronics market

In **B2C**, the majority of AR applications were initially introduced for entertainment and gaming purposes. In the meantime, applications for sport and training purposes, such as the swimming goggles **FORM**, have also become available. Using smartphones in training situations often proves to be quite inconvenient and difficult. Here, AR is able improve the user experience significantly.

The hardware is used as an interface between the application and the training process. The design of the application extends far beyond the limits of the hardware: It excels when the different interfaces of all products of the system work together successfully.

Examples:

Lenovo glasses T1, Nreal Air, Snap Spectacles, Ray-Ben Stories

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01 Lenovo Glasses T1
A big screen in your pocket: Lenovo Glasses T1 is the newest consumer-level AR equipment. It creates a portable, personal and private virtual display to watch content, play games and work on the go. Audio speakers are built into each temple arm for a high-fidelity, open-ear experience.

02 FORM
constitutes the interface of an online platform for swim training sessions. The user can compile workouts and set goals in advance using an app. The swimming goggles are linked to the app and show all important data (time, distance and pace) for ideal training results on a small, integrated display. After the training session is completed, the goggles transfer the collected data to the app. The performance is then logged by the app and displayed in a clear and comprehensible manner.

03 Pixel Buds Pro
With Pixel Buds Pro earbuds, Google Assistant can be used on various digital devices – and it's all done handsfree. Messages can be read out loud, texts translated and recordings made with the help of voice control and tap signals. The multi-point connection capability allows the user to automatically switch between multiple end devices.

AR is building bridges

Augmented reality can resolve communication difficulties and save resources. Its quality as a bridge technology is even more evident in a professional context.

When a machine on a production line needs maintenance or has to be stopped completely due to a defect, every minute means money lost – in many cases this results in the entire production line having to be shut down. Bringing in a service technician from the machine’s manufacturer abroad becomes a costly affair as precious time is lost on arranging a suitable appointment and on actual travel time (cross-border travel is often required).

In cases like this, systems such as **Rokid Yoda OS-XR-E** enable remote collaboration. The service technician no longer has to travel to the location of the defective machine but can instead digitally contact an employee on-site. The employee is equipped with smart glasses that film the situation and transfer the data to the specialist, who can then add pop-ups containing instructions or highlight certain areas.

Examples:

Google Glass 2, Microsoft HoloLens 2, Magic Leap 2, Vuzix Blade 2

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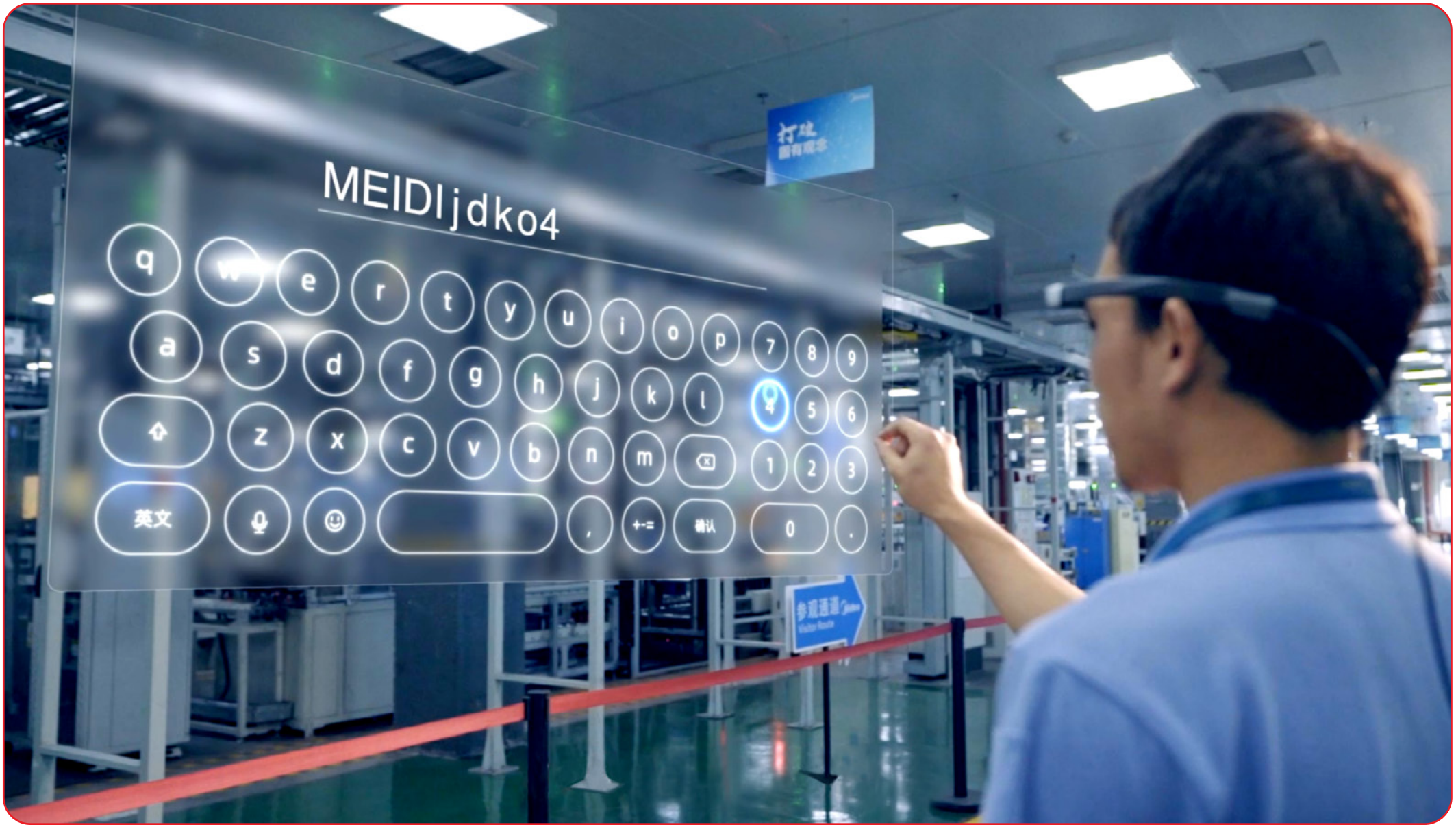
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01 Rokid Yoda OS-XR-E is a digital assistant that companies can use for inspections, remote collaboration, professional training, maintenance, and security and quality inspections. Users can effectively choose and switch between different functions using button control, voice control or gesture control. Standardized design guidelines for designers and developers make it possible to create apps easily and quickly while the entire user experience remains consistent.

02 Augmedit uses AR technology to transform medical findings that stem from two-dimensional imaging methods into three-dimensional models. This helps to prevent incorrect pre-operative decisions and to plan surgical procedures. During operations, these models can be projected onto the corresponding body areas of the patient as holograms with the help of AR. This allows for a more efficient surgical procedure. Furthermore, this technology also facilitates the pre- and post-operative communication with patients.

03 AR Fire-fighting UAV Helmet
 Product Concept: As an innovative and integrated firefighting helmet, Pathfinder is equipped with UAV to provide firefighters with information about the entire building, guide them through thick smoke, locate trapped people and indicate the fastest escape route.



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Holograms – the best of two worlds

Apart from glasses and headsets, holograms are being increasingly implemented to display virtual content in the real world. In most of these cases, images are projected onto transparent media such as glass or gauze or the illusion of a free-standing hologram is created by employing a mirroring effect. Holograms have the potential to fundamentally change how we use virtual media. The **High Resolution 3D Display** by Continental can, for instance, generate a three-dimensional pop-up without needing any further end devices.

Holograms combine the advantages of both augmented reality and virtual reality: they generate immersion and create a subtle interface with digital services – and, on top of that, they don't require any additional devices such as glasses or headsets.

*Holograms
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01 High Resolution 3D Display
by Continental uses light-field technology to generate a 3D experience that can be perceived without specialized glasses or head-tracking cameras. Thirteen simultaneous perspectives provide a very natural viewing experience as the display contents change to align with the proper perspective whenever the head moves.

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The shift from hyper-personalization to seamless personalization

The megatrend connectivity has an immense impact on our understanding of individuality and collectivity. Initially, the algorithmic evaluation of large data sets boosted hyper-personalized services. Coloring, materiality and modules can be individually combined in online stores and then produced as a custom item. CNC technologies, 3D printing and 3D knitting processes were central driving factors for hyper-personalization.

In the meantime, however, technological opportunities are once more being increasingly implemented to optimize processes and offerings with the goal of attracting as many people as possible. Hyper-personalization is slowly but surely being replaced by new forms that once again lean more toward the collective.

Thanks to big data and more and more sophisticated algorithms, products, services, music playlists, entertainment and marketing content are being precisely tailored to each individual.

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The collective taste of virtual tribes


The reason why **hyper-personalization** is being replaced by new forms of group identity becomes especially clear in **social networks**. Influencers curate the consumption of a very wide range of different products and services while conveying a distinctive lifestyle or way of life that animates others to follow suit. The consumption of products is often associated with a certain standing, philosophy or specific set of values. Preferences in taste, habits and behavioral patterns are no longer primarily dictated by one's age, place of residence or social class, but instead by the social group or lifestyles one symbolically chooses to identify with. (Bourdieu, 1987)

The tug of war between the human need to belong and to distinguish themselves becomes apparent in the virtual tribes that form around symbols, narratives, political views and activities. On the one hand, we seek to stand apart from the masses by behaving in a distinctive way – on the other hand, we want to feel that we belong to a group. Individuality in the sense of true singularity would cause irritation in the social context. In order to stay socially adaptable, symbols are chosen from a well-known repertoire and then combined to form patterns. (Böhme, 2016)

Seamless personalization forms new services

Many sharing services interpret the need for individualization in a completely new way. As the products are used by a large group of people and then made available to others, the material design remains as de-labelled as possible, making it acceptable to a vast consumer group. Light options, soundscapes and other non-material design elements, on the other hand, are used to personalize the user experience of the product. **Seamless personalization** has both a collective and an individualizing effect at the same time: the product design of the hardware addresses as wide a clientele as possible, while the experience of the product is hyper-individualized.

Seamless personalization is creating new ways for its users to participate in the design process. They can either chose specific light atmospheres, screen designs or color schemes from the default settings or compile their own individual set of design options. In the future, it will even be possible to save the personal preferences of a customer and mirror their “identity” in every product of that service provider.

This becomes especially evident when one looks at the **mobility**  sector. Here, a wide range of service offerings of various vehicle types enables the service utilization to become more and more adaptable to individual life situations.

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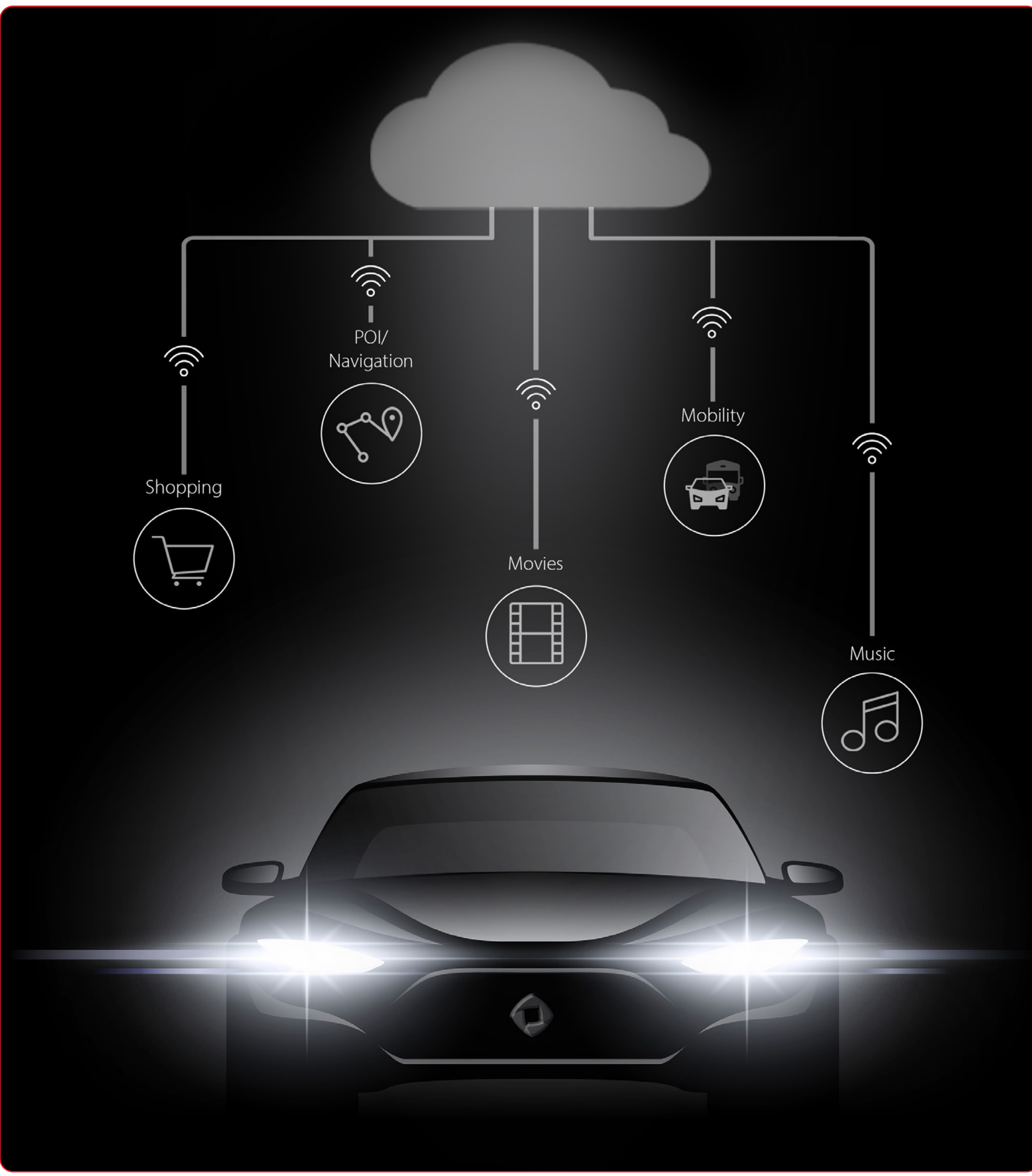
THE PRODUCT DESIGN OF THE
HARDWARE ADDRESSES AS WIDE
A CLIENTELE AS POSSIBLE WHILE
THE EXPERIENCE OF THE PRODUCT
IS HYPER-INDIVIDUALIZED.



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DESIGN AWARD 2023



01 LG Vision OMNIPOD
OMNIPOD is a futuristic concept for a vehicle cabin that is a spatial extension of the home. Users can subscribe to the additional space for their purposes, such as a work office, music studio, personal fitness area or outdoor restaurant. OMNIPOD not only provides a changing spatial arrangement, but also a metaverse experience connected with professional services and equipped with a meta-environment display, six kinds of expandable modular home appliances and a virtual AI concierge for human needs.

02 Cinemo Air™ Infotainment
The Cinemo Air™ Infotainment system completely decouples the infotainment system from the vehicle, thus offering the first completely cloud-based automotive infotainment-as-a-service solution. Automobile manufacturers can thus continuously offer personalized and “on-demand” new user experiences from the cloud to the infotainment system and thereby extend the vehicle’s lifetime.

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Universal and intergenerational design – new HMIs for the silver society

The aging process often involves changes in sensory perception. Presbyopia makes it hard to read fine print and the spectrum of perceived sounds is reduced. As people reach a very old age, the senses of touch and smell also diminish in many cases.

Approaches to product design up until now have only rarely considered these physiological changes. But now, pre-existing and unconscious assumptions about age, disability and participation are being renegotiated by the **silver society** . The concept of user-centered design is being called into question more and more.

The design theorist Krippendorff already proclaimed the end of user-centered design back in the 1990s. (Krippendorff, 1997) At this point, the human-centered design mindset and respective methods regarding interface design of the last few years have caused initial realignments. These have resulted in various stakeholders and user groups beyond the singular “end user” being considered in the design process.

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Real-digital accessibility requires new design approaches

Even today, users with physical or psychological disabilities are only rarely considered in the planning of digital interfaces. In many areas, accessibility is still a topic that is not sufficiently addressed. With the ever-growing connectivity and digitalization of many living environments, this issue has grown exponentially.

With somewhat rivalling terms such as integrative design, intergenerational design, design for disability, inclusive design, design for all or universal design, a realigning force in design has surfaced over the last few years. All these approaches share a specific focus on human diversity in terms of cognitive, physical and social differences. They attempt to consider these points more strongly in their designs in order to break down barriers and contribute to an inclusive society and infrastructure. The approaches vary in terms of the size of their scope.

Intergenerational design not only addresses older users but also focuses on the needs of children. It aims to design digital and analogue infrastructure, such as third places, in a way that unites different generations instead of segregating them. (Vanderbeck & Worth, 2015)

Inclusive design, design for disability, design for all and universal design share the goal of including all potential users despite their physical and cognitive differences.

Integrative design even considers the reality of non-humans in the design of products and systems. (Michel, 2019)

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The return of buttons

After having fundamentally revolutionized interface design over the course of the last few years, the touchscreen is slowly but surely being replaced by alternative forms of interaction. Not least importantly, this is due to the demographic shift in the mainstream: people with presbyopia have trouble reading small font sizes on small screens. And using graphic control surfaces without tactile feedback is often prone to error.

This has caused buttons and other forms of tactile interface to again be implemented more frequently. Especially in the automotive industry, manufacturers such as **VW** are making a U-turn in the design of their cockpits. Instead of smooth touch elements, **tactile interfaces** are being used to ensure improved operability and enhanced safety on the road. (cf. ADAC, 2022; Kurczewski, 2022)

These analogue buttons have left their slightly outdated image far behind them. Smart buttons combine the best of two worlds: their tactile simplicity as a haptic object is complemented by the information complexity of touchscreens. The **Morphing Buttons** by Continental, for instance, only rise from the surface if a hand draws near them – when not in use, they become part of the smooth surface and are consequently visually discrete. The regulation elements of the gas stove **Midea Timeless Series Hob** also make use of smart buttons. These can be pushed and turned just like regular stove buttons, but they also feature many different functions that are shown on the recessed smart screen.

An aging digital society requires interfaces that are correspondingly adapted to suit its needs.

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HMI via all the senses

In addition to smart buttons, forms of human-machine interaction that completely forgo any visual interaction are being used more and more. Examples include voice control, gesture control and solely tactile control.

With the implementation of smart technologies, human-machine interaction is becoming increasingly accommodating. It is not the machine that has to be understood by its users, but the users that have to be understood by the machines. Artificial intelligence also enables the further improvement of interfaces. Biofeedback, emotion tracking or eye tracking have better and better sensors at their disposal. They use these to gain information about the user, allowing them to address the user's needs and intent of action directly, without these needing to be articulated.

These technologies and approaches already show the wide range of possible innovation for the design of interfaces between humans and machines within the silver society. Especially when the design takes the specific context of its use and the cognitive, physical and cultural diversity of its possible users into account.

It is not the machine that has to be understood by its users, but the users that have to be understood by the machines.

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full product
will become interface

merging digital
& physical design

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BUT WITH
NEW DESIGN
APPROACHES**

**OTHER FORMS
OF INTERACTION**

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eye-tracking

gesture

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01 Alipay Palmprint recognition X1
By using biometric technology, Alipay X1 is able to identify human palm impressions and the veins of the hand, which it then uses to authenticate transactions. Using contactless interaction, this device makes online payments, access controls and passing through gates safer and more hygienic.

02 Midea Timeless Series Hob
Midea is seen as a leading technology enterprise in the sectors of consumer electronics and air conditioning, robotics, industrial automation and logistics. The smart stove from the "Timeless" series is a new and sophisticated technical solution for the kitchen. The entire design is clear and flat, simultaneously designed for high performance and easy cleaning. Inspired by the feature of the "circular house" in Chinese architecture, the semi-embedded burner not only focuses on producing heat but also on preventing heat from radiating to the control panel. The combination of the electrical rotary knob and the TFT display make precise yet intuitive temperature regulation possible.



03 Nomi
Nomi is an artificial intelligence that is installed in the interior of vehicles and interacts with its users through multiple sensors. The users communicate their individual requirements to the interior of the vehicle in the form of a token. The vehicle interior then adapts to the personal settings of the user. Nomi offers services that go beyond standard infotainment and navigation services. Voice control reduces distractions to a minimum and supporting features, such as the vibrating of the steering wheel to prompt the driver to adjust the driving position, enhance the driving experience.

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Playfulness and fiction as design principles

With the growing complexity of real-digital applications, it is becoming more and more important for the design to invite and motivate users to engage with the product intensively and in the long term.

Many technical innovations were initially tested and further developed by the gaming industry. Various apps, services and new learning formats use playful approaches, such as fictional and fantastical dream-like landscapes or surreal aesthetics. While playfulness addresses the *homo ludens* (cf. Huizinga, 1938) in users, urging them to playfully try out new interactions and goals, fiction addresses the human capacity for imagination and our need for creativity. They enchant our everyday lives and offer occasions to take short breaks. In fact, the two principles do not limit themselves to only entertainment and gaming products. When used in therapeutic offerings, gaming strategies help to achieve individual health goals, thus contributing to the success of therapeutic measures. (Martinez, Menéndez-Menéndez & Bustillo, 2021) Educational formats are also using more and more playful elements to foster motivation, creativity and collaboration.

Product developments that incorporate playful elements or illusions as part of the user experience facilitate a holistic way of coping with problems. They do so by being more considerate of the visceral level of cognition. (Norman, 2004) Consequently, playfulness and fiction offer much more than just an escape from reality: the implementation of playfulness and fiction helps to enhance the service and the user experience and, thus, becomes an important design strategy.

The implementation of playfulness and fiction helps to enhance the service and the user experience and, thus, becomes an important design strategy.

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01 Planet City
As speculative fiction, the virtually generated city Planet City unites statistical analyses, scientific findings and traditional knowledge about a very wide range of different cultural contexts to make the vision of a sustainable future city tangible. The project has been realized as a book, movie and VR experience.

02 Hipanda Flagship Store
The flagship store of the fashion label Hipanda uses augmented reality projections to turn the visit to the store into a fantastical experience. A virtual panda leads visitors through the shop and interacts with them in a playful way using a tablet that is handed to them when they enter.

03 ZECHE
As a virtual platform, ZECHE offers a creative exhibition space for virtual art. The elaborately designed virtual world, in which the art melts together with the virtual landscape, is an artwork in itself, generating a dream-like experience.

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04 #OceanDetox

With its campaign “Non-Fungible Animals”, WWF Germany was already using NFTs designed by artists in 2021. Their goal was to generate awareness about the preservation of species and to raise funds for the species protection projects of the WWF. The metaverse exhibition #OceanDetox, which opened in September 2022, allowed its users to playfully explore a virtual parallel world, created by the Savespecies artists. With its metaverse exhibition, the WWF created a virtual world to save the real one.

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3 Challenges

With the emergence of extended reality applications, ensuring a high-quality experience of the virtual world has become a design challenge. The design of the devices themselves is also key in determining how the real world and the virtual content superimpose each other.

It is becoming more and more important for designers to not only address the individual user, but to also consider collective social dynamics in their design process.

With the growing complexity of real-digital applications, it is becoming more and more important for the design to invite and motivate its user to engage with the product intensively and in the long term.

3 Solutions

The design of these applications reaches far beyond the hardware: it excels when the different interfaces of all products of one system work together successfully.

Seamless personalization has both a collective and individualizing effect: the product design of the hardware addresses an extremely wide range of clientele while the experience of the product is hyper-individualized.

The implementation of playfulness and fiction helps to enhance the service and the user experience and has thus become an important design strategy.

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A photo of a sculpture wearing headphones and vr glasses



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The widely varying impacts of the shift in demographics towards an ageing society presents us with huge challenges — but also opens up great opportunities for a new sociocultural vitality. An inclusive understanding of design guarantees quality of life — at any age.



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The shift in demographics is a challenge and an opportunity at the same time, as people are living longer and healthier lives. Products that focus primarily on the health-related challenges older people presumably experience therefore fall short of the mark.

With the silver society becoming mainstream, resilience strategies will need to adapt to address the effects of the climate crisis on more people. However, older adults bring valuable experience and skills to society, expanding its capability for resilience.

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Digital health apps are becoming more holistic, considering lifestyle, social context and personal circumstances in their design. Boundaries between medicine, therapy, lifestyle, and social media are blurring.

The multigraphy is replacing the linear biography. The living concept of “elastic dwellings” responds to the changing needs of society, where spaces can adapt to different stages of life and the number of residents.

People are increasingly seeking personalized options for end-of-life services, such as customized funeral arrangements.

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Era of healthy ageing

Around the world, industry- and technology-based countries are moving towards a silver society. Their populations are ageing and the proportion of people over the age of 65 is rising. This development is mainly the result of vast success: industrialization has led to better healthcare, and better living and working conditions. Life expectancy is not rising because the process of ageing is longer, but because the onset of this process is happening later and later in life. The term **downageing** describes this situation: elderly people are staying fit and healthy for longer than they used to – and are also remaining mentally flexible and agile.

At the moment, the ageing of society is an issue mainly affecting affluent industrial nations. But demographic changes are also occurring in many countries with high birth rates and low average ages. Life expectancy is rising as a result of vaccination campaigns and better basic care for children and young adults. Moreover, more and more couples are benefiting from easier access to contraception and education for women, which enables an additional source of income for families. (Institute for Health Metrics and Evaluation, 2022) Having many children is no longer an economic necessity. Consequently, many countries with high birth rates will also be experiencing a decline in births towards the end of the 21st century. (UN, 2022)

The pace of population ageing is *much faster* than in the past.

In 2020, the number of people aged 60 years and older *outnumbered* children younger than 5 years.

Between 2015 and 2050, the proportion of the world's population *over 60* years will nearly *double* from 12% to 22%.

Source: WHO 2022

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Silver is the new mainstream

We find ourselves in a global transition phase: There are many indicators that the population of the world will stop growing at the end of the century. (UN, 2022) This societal shift from growth to maturation is ushering in a range of challenges, which are begging to be broached with increasing urgency. The group of silver agers is united mainly in its heterogeneity and its constantly changing needs. Between the ages of 65 and 90, the world of experience and level of activity changes, as does the need for support.

A collective process of maturation is a requirement for ageing societies: on a political level, the search for new care structures begins as well as the reshaping of public life, which must adapt to a new, ageing mainstream. For the individuals themselves, the process of ageing is mainly a question of shaping life's circumstances – and mutually ageing along with society is an opportunity. As a new mainstream arises, the silver society can redefine ageing themselves and demand societal structures that allow them to live well.

*A collective process
of maturation
is a requirement for
ageing societies.*

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Multigraphies characterize the present

In the past, ageing was primarily viewed as a health and care issue. With a focus on mental health and sportivity, this stage of life is now being reassessed – and not only does the silver society stand to benefit, but also the rest of society.

Even though the shift in demographics is associated with a shortage of skilled labor, too great a burden on too few young adults and economic bottlenecks, this development does offer many opportunities. With a higher life expectancy, the number of healthy and vital years at one's disposal also increases.

As the generation which first introduced such concepts as the patchwork family, the **multigraphy** and lateral entry into careers, and raised them to the status of new life standards, the silver society maintains a relaxed way of dealing with transience and stages of life that run in a non-linear course. A product offering which focuses primarily on the health-related problems this age group presumably experiences therefore falls short of the mark. Those who feel “younger” want to actively participate in life in society and pursue goals – and are consequently also on the lookout for products and services that help them pursue their own interests.

For decades, most people's biographies comprised a linear sequence of life stages: childhood and adolescence, career, family life and finally retirement. We have long since bid farewell to this standard biography. Today, curricula vitae are becoming more and more unpredictable. Linear biographies have turned into diversified multigraphies, which run in parallel and in leaps and bounds. (Zukunftsinstitut, 2021)

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Climate change challenges the silver society

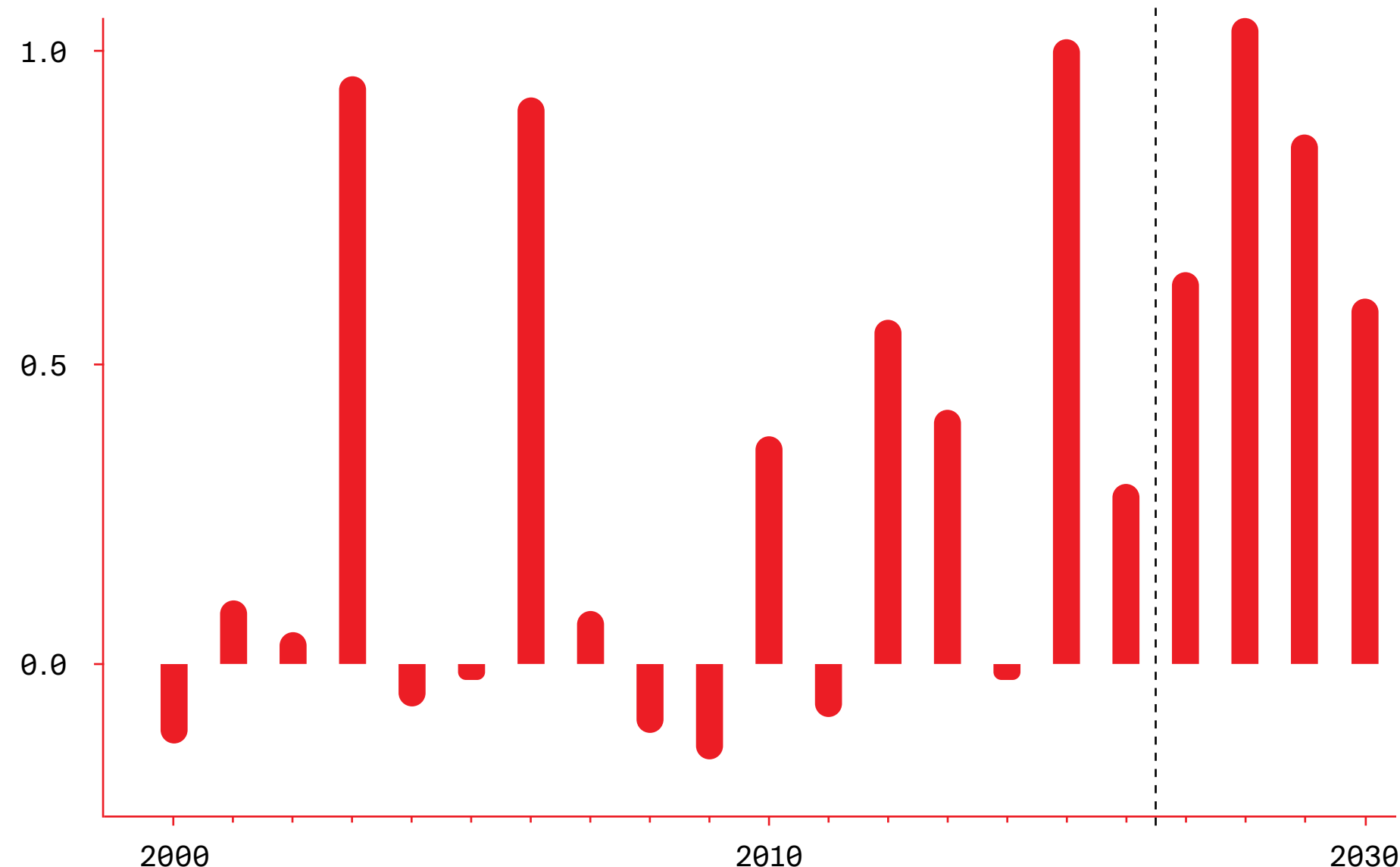
The silver society will be increasingly affected by the **neo-ecology** ↗ megatrend in future. This society reacts to the effects of biodiversity and global warming with particular sensitivity. The group was deemed especially vulnerable during the COVID-19 pandemic and also requires special protection and support during heat waves, which are occurring with greater frequency. (UN, 2021) The silver society is more greatly affected by sudden crises such as extreme weather events like flooding, hurricanes and cold fronts, which will likely make safety precautions even more necessary. Along with the shift in demographics, the necessity to develop new **resilience mechanisms** is rising for society as a whole.

At the same time, this group is characterized by a great wealth of experience and a broad repertoire of coping mechanisms. On average, older people coped considerably better with the isolation measures in the course of the pandemic – not least of all because they possessed a higher level of mental resilience as a result of their life experience. Thanks to the life crises they have already lived through, they had a larger repertoire of personal coping mechanisms than younger people. (Rostin et al., 2023) The fact that they have already learned to how put their own needs second and be grateful for what they have already experienced was especially helpful. (Wünsche et al., 2023)

More heatwaves

Exposure to change in heatwaves for over 65s

(relative to 1986-2005, in million person-days)



Source: The Lancet

Between 2000 and 2004 and between 2017 and 2021, *heat-related mortality* for people aged older than 65 years increased by approximately **68%** on a global scale.

Adults over 65 years experienced **3.1 billion more** person-days of heatwaves in 2012 – 2021, compared to 1986 – 2005.

Source: The Lancet

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Silver society drives resilience

When the silver society becomes mainstream, this will also change society's **resilience**. On the one hand, additional and new resilience concepts will be necessary in order to protect as many people as possible from the effects of the climate crisis. On the other hand, the proportion of people in society with a particularly high capacity for resilience is rising – which ultimately benefits everyone. The way the “new old” are setting an example by living in a mindful, decelerated manner supports the development towards a more sustainable and healthier society. The wealth of experience of older people constitutes an important resilience resource: tapping this will become a main future task, for companies as well as for society as a whole.

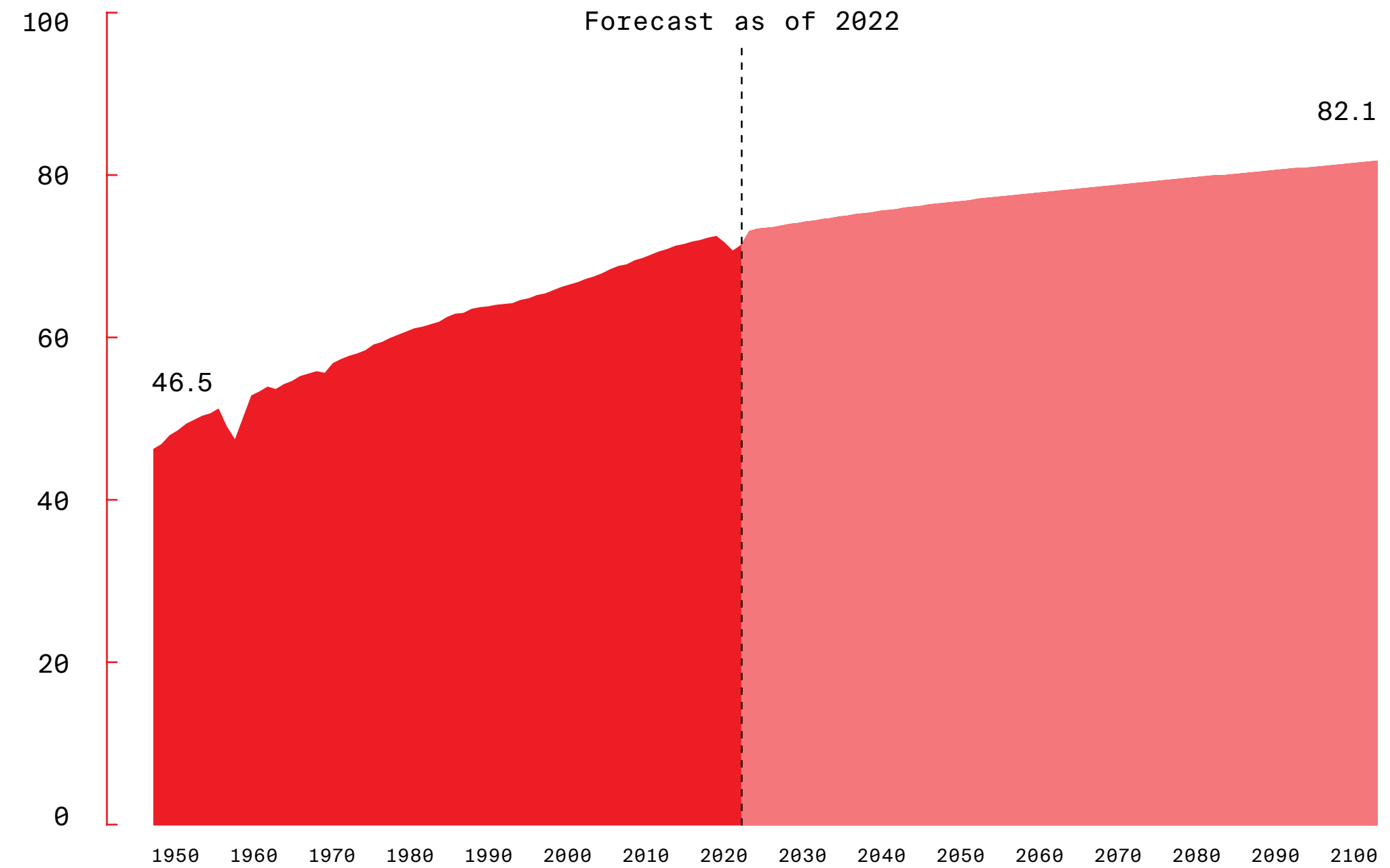
Generally speaking, **resilience** refers to a system's ability to react quickly to acute crises or set-backs and adapt itself to new framework conditions. Based on historical discourse, there are two main ways to approach resilience (cf Manyena et al. 2011; cf Roth 2020):

Robustness (“Resilience 1.0”): the system reverts to its original state after a disruption (bounce back).

Adaptability (“Resilience 2.0”): the system continuously adapts itself to changed environmental conditions (bounce forward).

Life expectancy on the rise

Average life expectancy worldwide at birth (in years)



Source: UN World Population Prospects 2022

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The silver society is changing the way society deals with age and ageing. The differences with regard to fitness and lifestyle between the generations are successively dissolving and innovative product and service offerings are helping build a new kind of solidarity in society.



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More efficient health support with digital health apps

Even though it's not generally possible to reduce the increasing age of people and society to health-related matters, health and thus also **digital health applications**  play an important role in the silver society – not least of all because a maturing society needs to make more efficient use of its resources.

A large portion of digital health apps make it possible to track body data and serve to encourage preventive measures resulting from physical fitness and relaxation. Online consultations are a low-threshold offering for patients and can even help make better use of the resources that are available, such as the prompt arrangement of therapy sessions.

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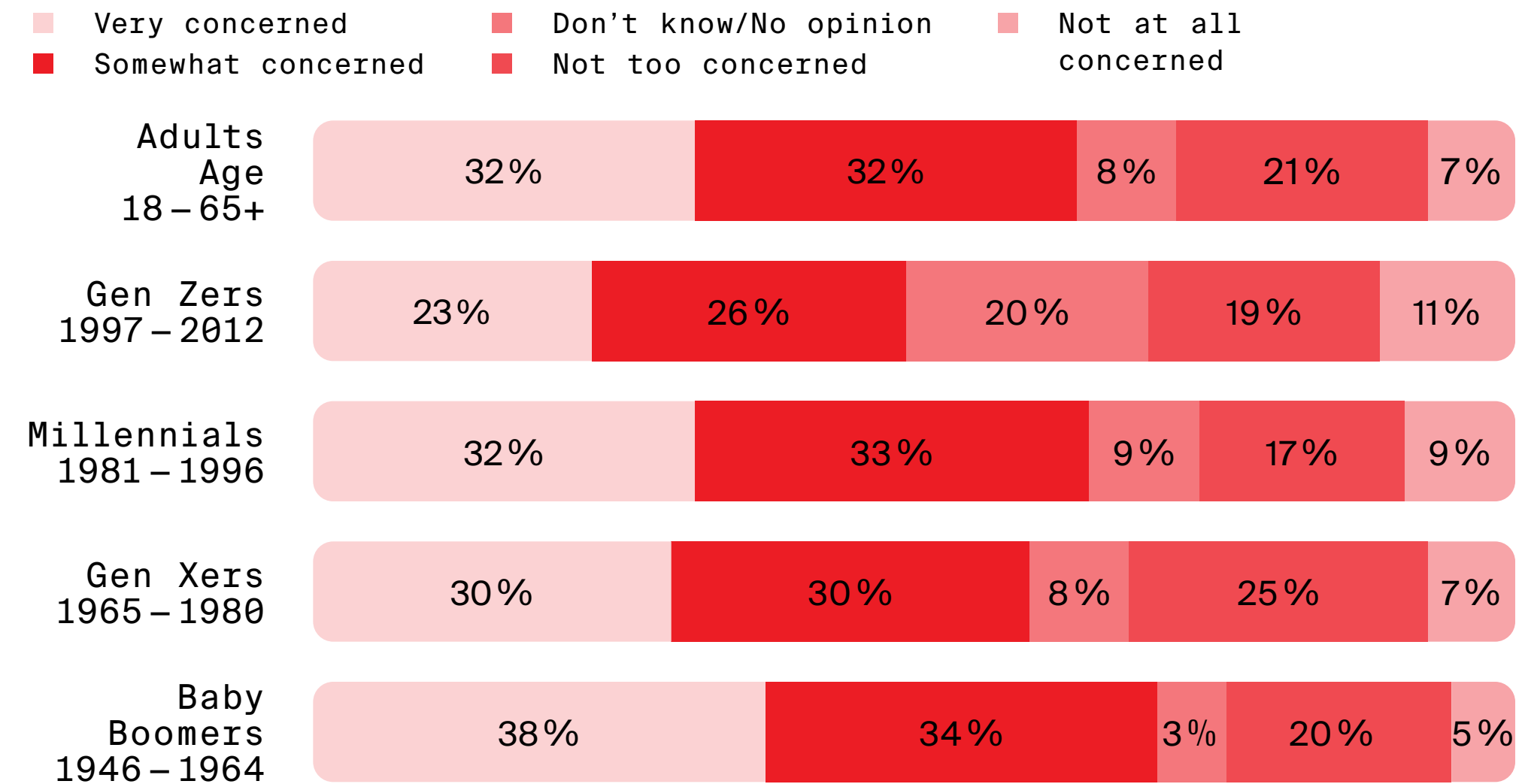
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Develop potential with strength-orientated design

Most digital health applications still have a deficit-orientated perspective when it comes to the human body and thus also when it comes to the ageing process. Body data is normally collected in order to draw attention to any deviations from a standard value. Recommendations for action consequently aim to minimize the deviation from the standard value as much as possible. But not every deviation is an indication of illness – and a deficit-orientated view of the data may lead to possibly existing potentials being overlooked.

In future, digital health applications will benefit from a holistic understanding of health: users' life circumstances, their societal context and their room to maneuver in the day-to-day routine will increasingly become part of the overall concept of the application. The focus is not on the absence of illness, but instead on physical and mental well-being. The borders are blurring between medicine and therapy, lifestyle offerings and social media – the range of health apps is becoming more varied and more holistic.

Respondents were asked how concerned they were about the privacy of their health information on an app.



Source: Morning Consult

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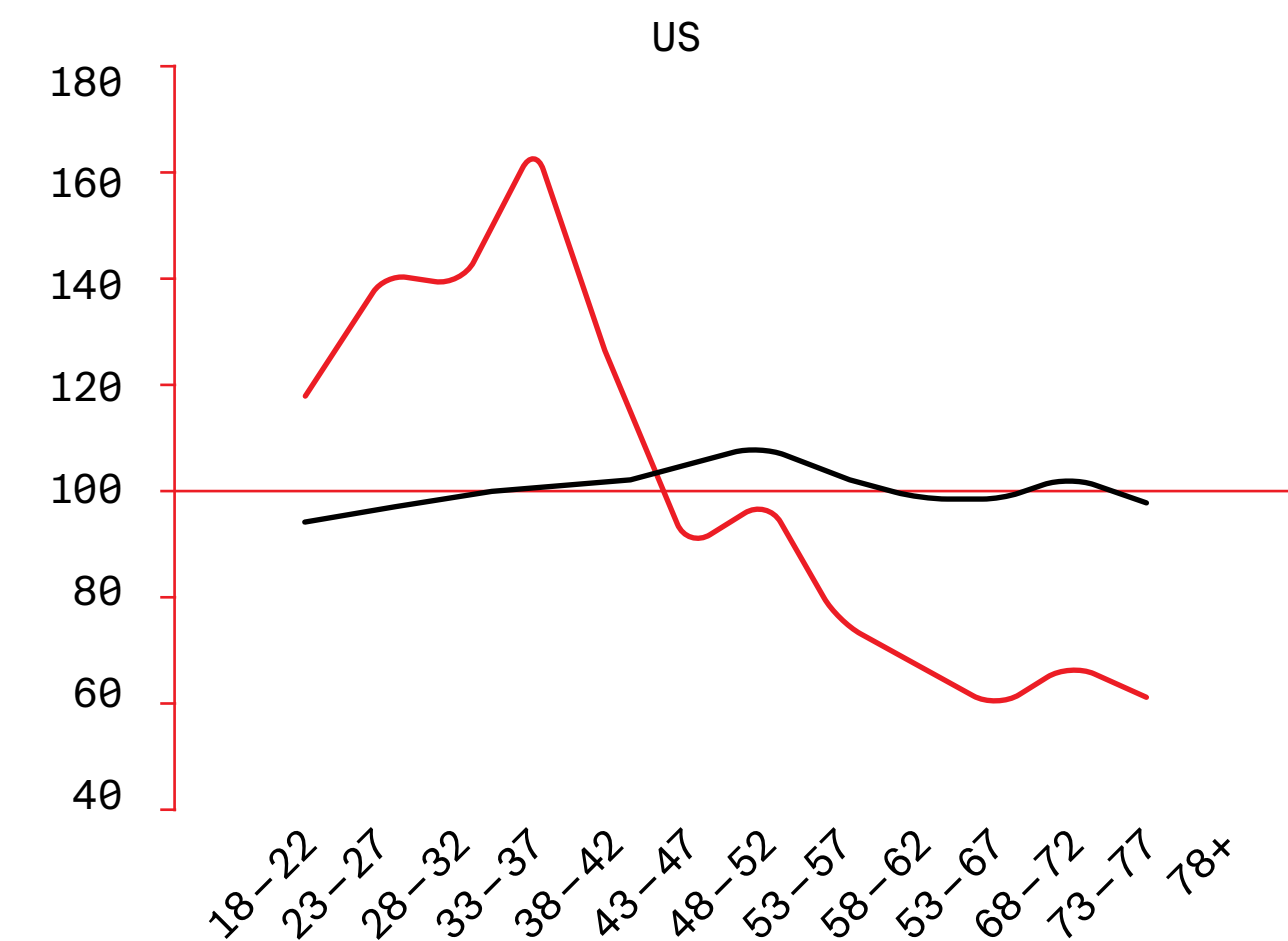
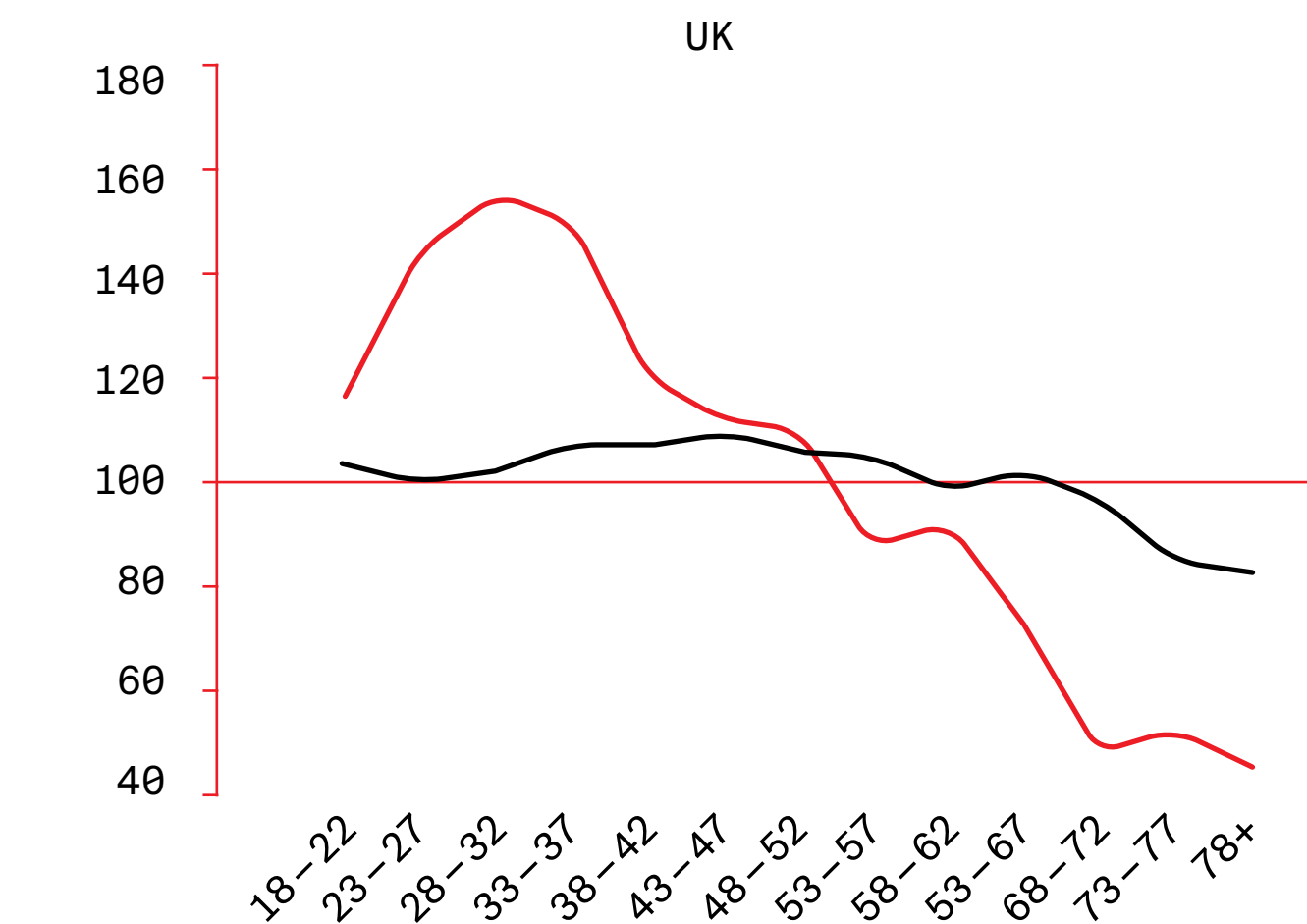
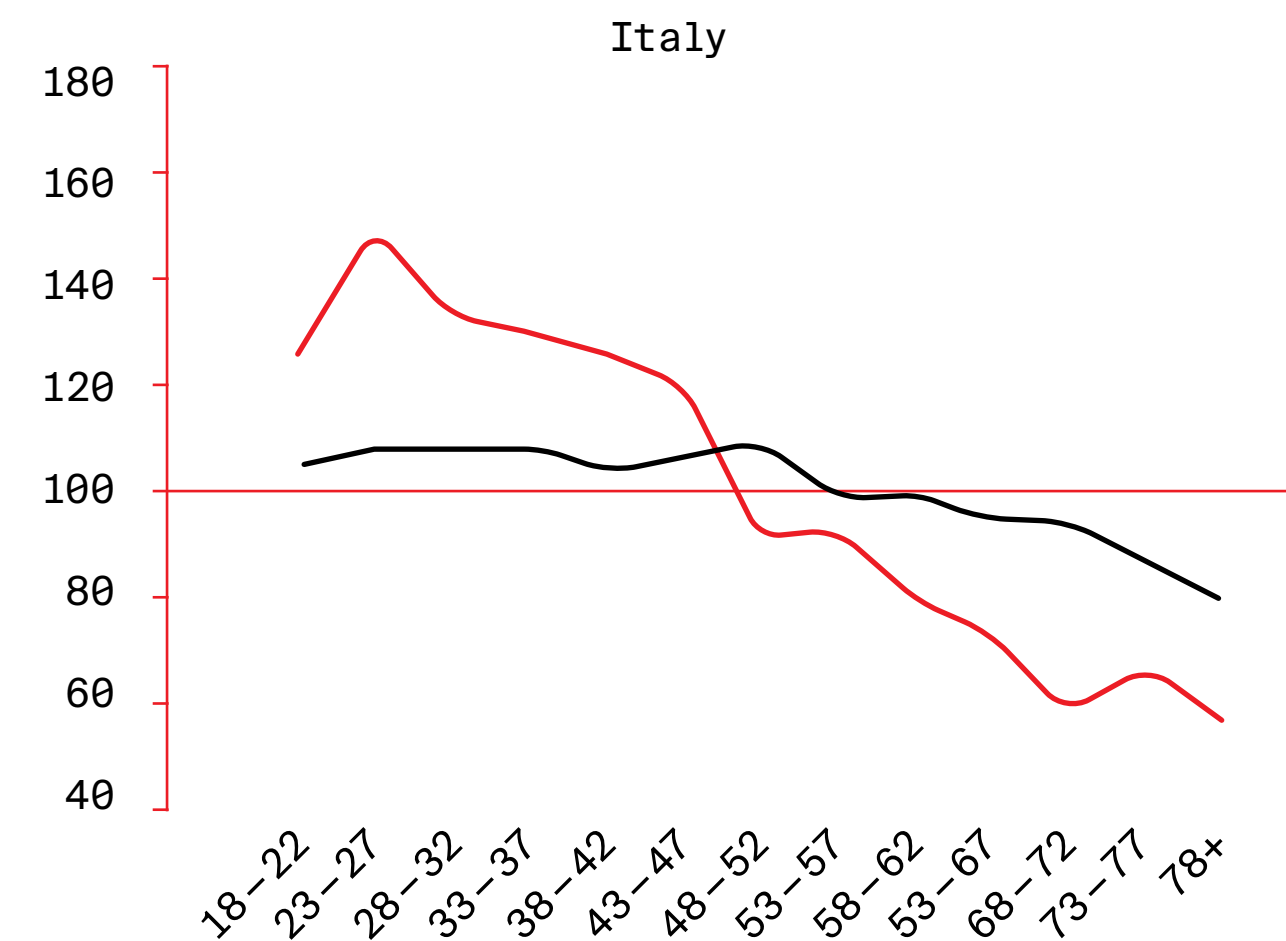
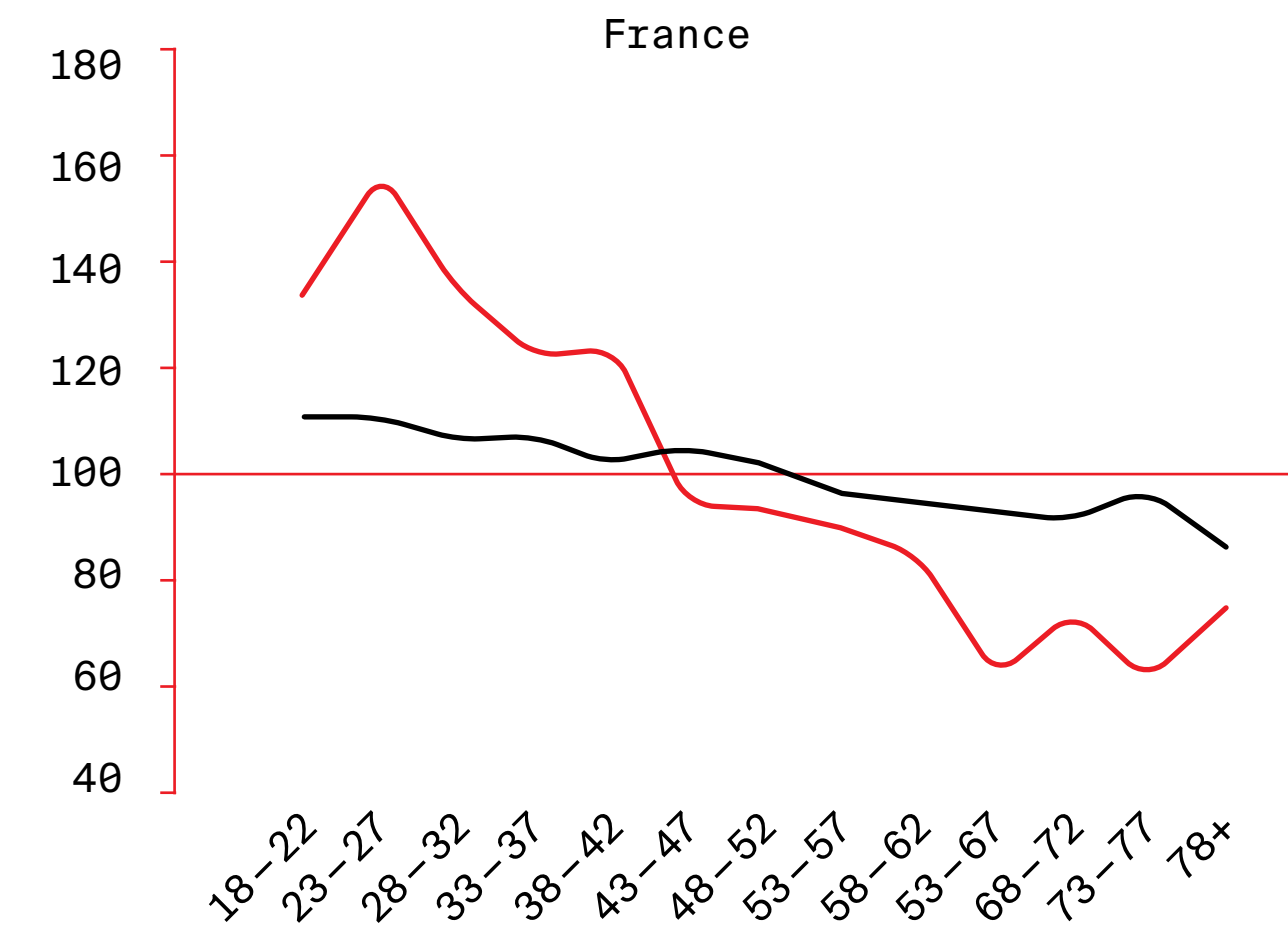
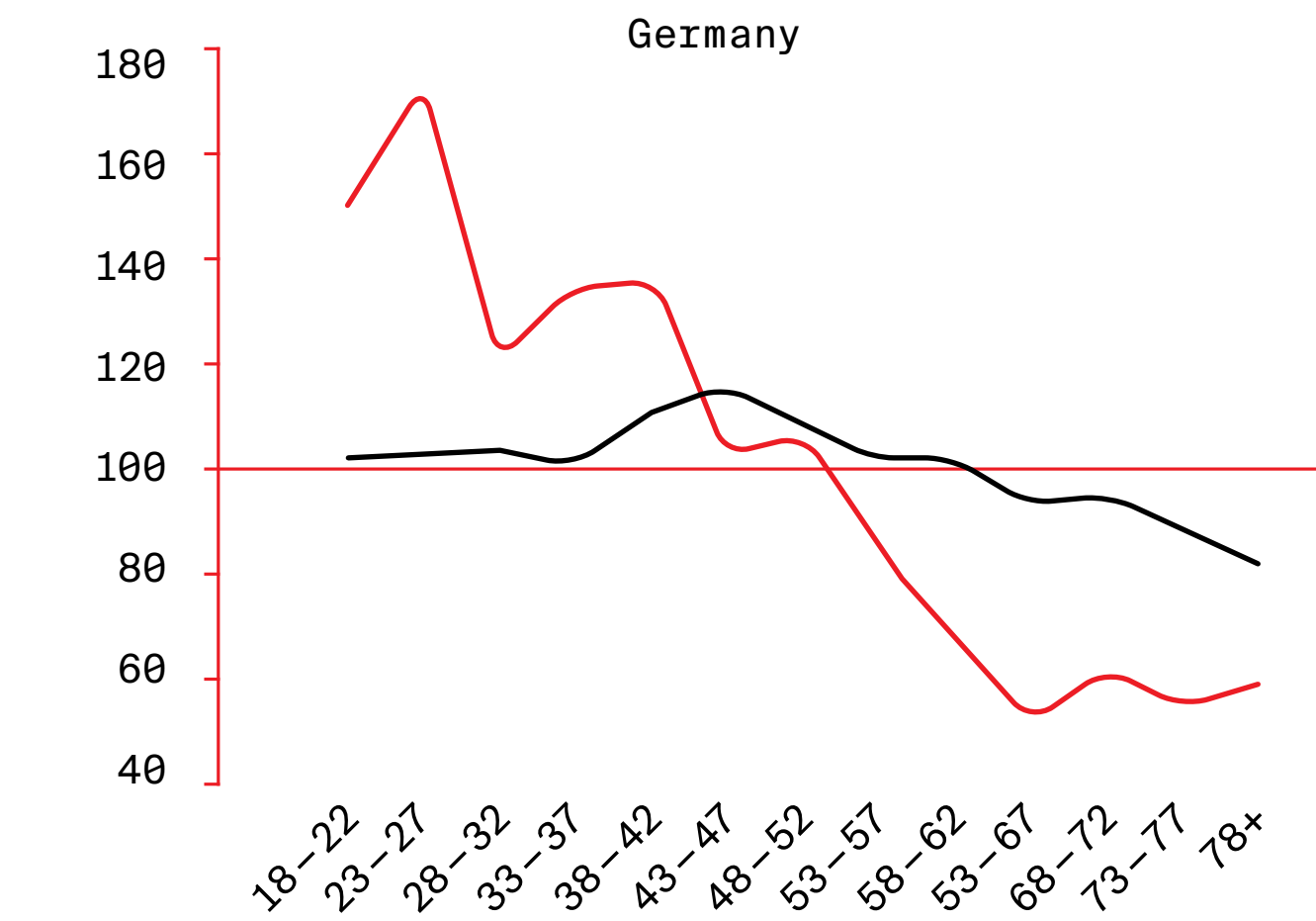
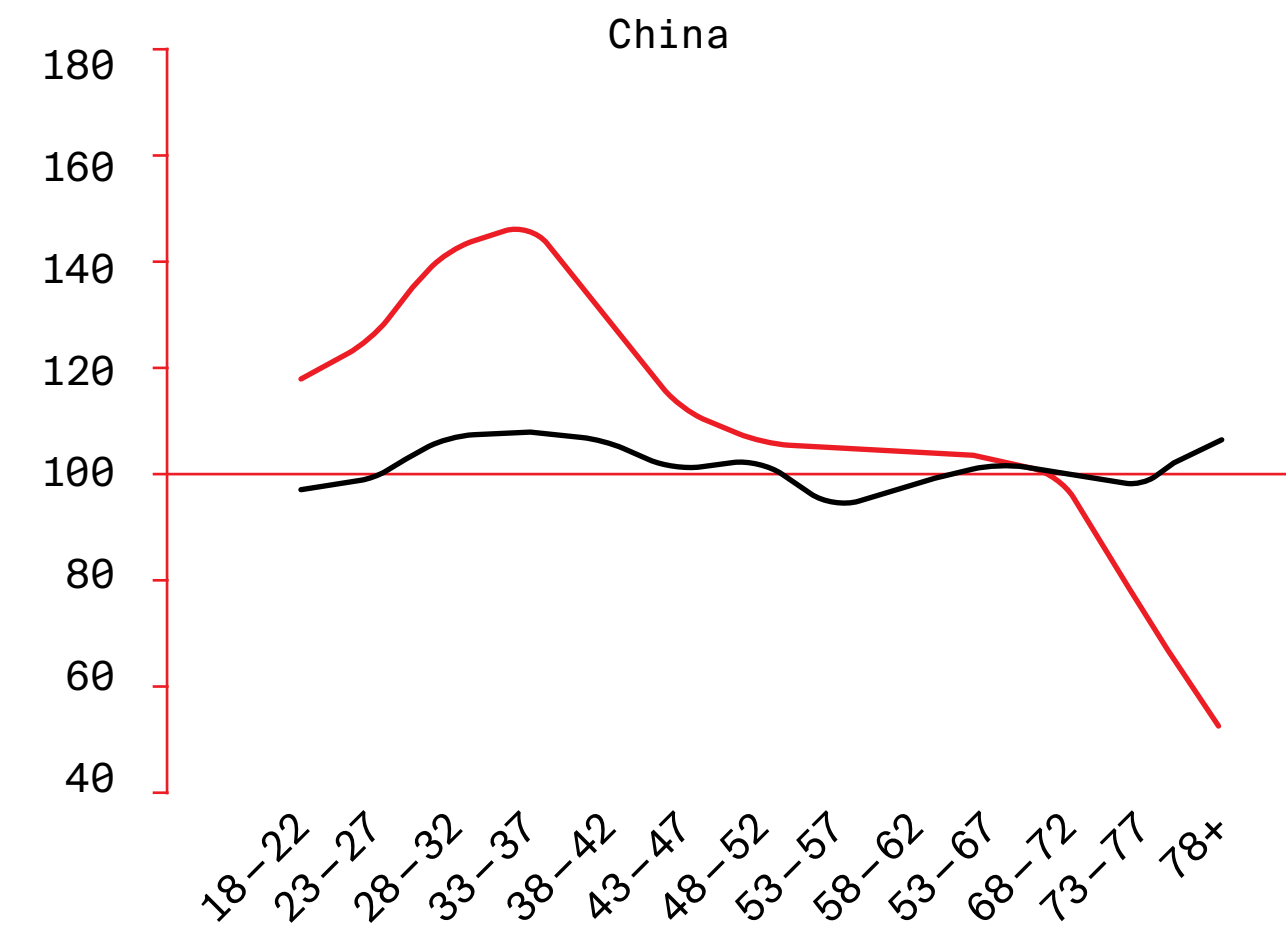
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Further potential for uptake of health and fitness technology among the elderly

— Indexed level of health and fitness technology use (avg=100)

— Indexed level of general digital technology use (avg=100)



Legend: Level of fitness and health technology use based on the number of corresponding smart devices and apps used* as well as the number of functions of these used and the number of metrics tracked digitally; level of general digital technology based on use of smartphone, tablet, PC, and smart TV as well as communications, social media, work-related, gaming, education, and streaming apps. Scores were normalized and indexed to the respective country average (avg=100); some results for China in the age bracket from 53 to 72 have been smoothed. N=18,358; * Base: The top ten most popular local health and fitness apps in each country based on the average monthly active users (MAUs) in the six months prior to the survey taken from Apple App Store and Google Play Store data; COVID-specific, health insurance and period tracker apps were replaced by the next most popular apps on the respective MAUs rankings.

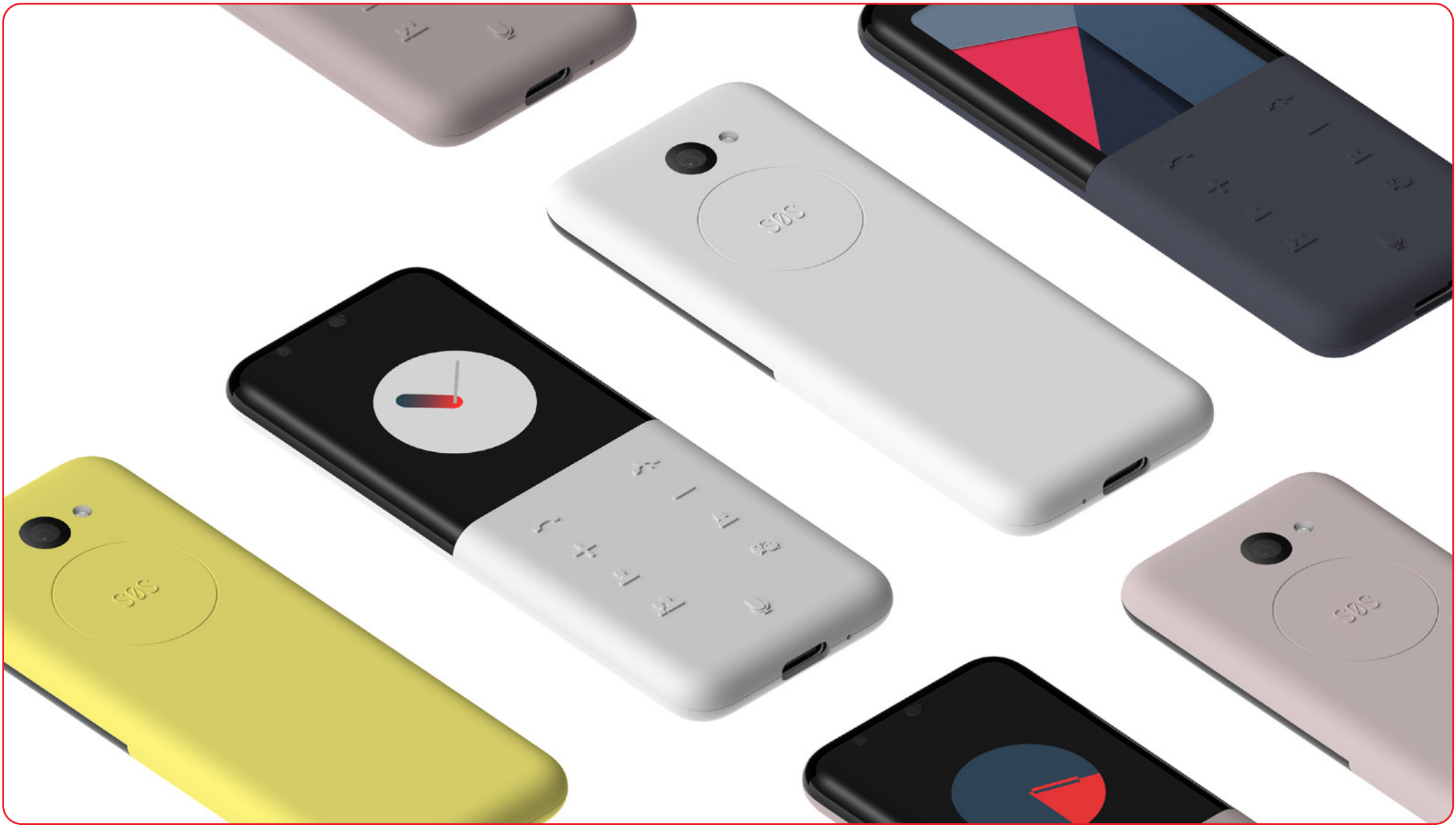
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01 AI Voice Service Phone
This smartphone works using a voice function based on artificial intelligence. It reacts specifically to the needs of people who either don't require touchscreens on their phones or who consciously choose to avoid using them. The supporting voice feature converts voice input to text, which is very practical for people who have difficulties typing on a touchscreen, such as children, the elderly or the visually impaired. In addition, the phone is equipped with an SOS button, which transmits the location of the user in case of emergencies.

02 Cionic Neural Sleeve
The Cionic Neural Sleeve supports people with multiple sclerosis, cerebral palsy, spinal cord injuries, stroke or other neuromuscular conditions. Personalized algorithms are used to analyze the gait cycle and deliver functional electrical stimulation (FES). As a result, the necessary muscles are activated and the gait is supported in real time. This activation of the muscles occurs using software-steered electrical impulses. This increases strength and the scope of movement, makes it easier for muscles to relearn and boosts overall comfort.

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03 ElliQ – A friendly robot to help us age healthily

As a sidekick, the digital assistant ElliQ helps older people with day-to-day living. The little robot reacts to voice commands and touch and can connect with users directly thanks to its personal recognition functionality. As an everyday companion, ElliQ provides reminders for appointments and for the right moment to take meds. Likewise, ElliQ helps people communicate with others digitally via the linked mobile device.



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Modern lifestyles require more flexibility

It is no longer possible to accommodate life stages, and consequently activities, wishes and values as well, in the old familiar linear order of “childhood and adolescence, career and starting a family, retirement.” Biographies are becoming more diversified, more complex and more erratic. Along with the silver society, an awareness is growing that our expectations, needs and wishes are variable: they are subject to change processes, arising suddenly as a result of new life stages emerging or new interests developing.

Our infrastructure to date, however, is based on constancy: Especially in big cities, it is often the case that the housing offering, municipal infrastructure and the individual needs of residents in their changing life stages are often out of sync. In the rush hour of life, for instance, plenty of space is needed to provide all the members of the family with rooms to retreat to and create space for working from home, which is becoming increasingly popular. But it is precisely this space that is often a financial and organizational burden in old age.

Switching to smaller accommodations is often uneconomical and means leaving the home neighborhood one has grown accustomed to over the decades. Those who can somehow avoid this do not move, but instead accept the status quo. However, this has societal consequences: many of the living spaces suitable for small and patchwork families are not available to them and are often only affordable for people who are at the end of their professional lives – a time when the children have already grown up and left home and the home office will no longer be necessary in the foreseeable future. The family dwelling is then too large and empty.

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ALONG WITH THE SILVER SOCIETY,
AN AWARENESS IS GROWING THAT
OUR EXPECTATIONS, NEEDS AND
WISHES ARE LESS CONSTANT THAN
GENERALLY ASSUMED. INSTEAD,
THEY ARE SUBJECT TO CONTINUOUS
CHANGE PROCESSES.



“Elastic” living promotes social attachments

At an advanced age, the need to withdraw is more easily provided for – but loneliness and the desire for new forms of living together grow. The concepts of “elastic dwellings” from the Viennese architects Anna Popelka and Georg Poduschka offer a solution approach to this issue. These dwellings shrink or expand depending on the number of residents and activity requirements, and they adapt to suit the respective life stage. As a result, it becomes easier to partition spaces and possibly rent them out. Sense and, more importantly, sensibility are also supported by new co-living concepts, in which one’s own living space is shared with others. Providers of new serviced living offerings are disrupting the real estate market by intelligently connecting information technology and real estate economics and thus simplifying communication between tenants and property managers. In future, it will be possible to offer numerous additional services via online platforms: concierge services, retail deliveries, moving services and sharing offerings can be booked without any complications to suit one’s life circumstances and personal situation. (Richter 2020)

Even entire municipal districts can promote new forms of living together in a shared space. The municipal district development and living project **The Fremtidens Sølund** in Copenhagen has opted for an integrative concept: This home for the elderly planned in the municipal district development, in contrast to the current norm, has permeable interfaces to other elements such as the Generation Square. An open space which creates meeting places for multiple generations with multifunctional offerings and third places such as a library, spa areas and cafés.

As an active and publicly social link, the residential district **Fremtidens Sølund** is home to a very wide range of offerings for people of all age groups. The architectural structure of the project attempts to design the public space in such a way that offers users meaningful experiences in the form of urban activities, light, views, human interaction and nature. In addition, a wide range of encounters between users and generations is facilitated, with everything in harmony with the surroundings and the peacefulness and security of the building.



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Adaptive products promote living comfort despite restrictions

Along with flexible living, expectations in terms of the design of everyday items are also changing. A smaller living space may mean less effort in terms of housekeeping and shorter distances to be covered – but this often involves making double use of rooms. Household appliances, which previously had a mainly functional context, consequently have a considerably greater impact on the atmosphere of the living space.

The refrigerator **Chiiil** from Hitachi responds to these needs with a housing design that can integrate aesthetically into a living or sleeping area.

The tumble dryer from **Winix** fulfils similar requirements by seamlessly fitting into various surroundings and taking up next to no space with its compact size.

In the case of product design, attention is increasingly being paid to the diminishing mobility and strength of older people without the language of design echoing this special consideration. The vacuum cleaner from **Gleam** is thus easy to operate for people who are a little less fit thanks to its lightness and ergonomic handle design.

These examples show how it is possible to account for changing needs by means of the design so that the result appeals to all groups, regardless of age and fitness level.

*The terms
of the design
of everyday
items are
changing.*

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01 Nobi Smart Lamps

Many elderly people want to remain independent for as long as possible. High-tech products can provide support, for example by detecting accidents or emergency situations, but they are often viewed as being difficult to use or intrusive. The Nobi smart lamp can help there. Equipped with artificial intelligence, it can detect falls and monitor the vital signs of the people in the room. The elegant, unobtrusive design of the lamp suits any interior and does not look like an item of care technology in the least.

02 Automatic Lifting Cabinet

As people age, their range of movement diminishes. High shelves become out of reach and climbing on chairs increases the risk of accidents. This automated lifting cabinet solves the problems that stem from using the space high up in a wall cabinet and provides more space for living. Older people as well as younger people and families all stand to benefit from the concept. The product shows that an accommodating design can contribute to a higher quality of life regardless of age.

03 Hitachi refrigerator "Chiiil"

The requirements refrigerators need to meet are changing with the times and with the changes in the social environment. The location-independent fridge can also be installed in rooms other than the kitchen, such as a living room or bedroom.

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04 Cordless vacuum cleaner
The Gleam vacuum cleaner was developed for convenient use anywhere, anytime. The handle is designed as a line, which naturally follows on from the lean body of the vacuum cleaner. This not only gives it an aesthetic beauty, but also makes it possible for the user to hold the vacuum at the most comfortable handle height and operate it. The center of gravity is at the bottom to reduce strain on the wrists and waist while the vacuum cleaner is in use.

05 Compact dryer
The Winix Compact Dryer is a mini dryer. As a result of its small size and low weight, it can be placed in any room. The wide circular door is minimalistically and aesthetically designed and the color scheme of the housing can be selected so that the product corresponds to the user's tastes and the room.

New solutions promote social connectivity

One major challenge facing the silver society is that of continuing to find and design ways to integrate its ageing members. While many are firmly established in society during adolescence and in the rush hour of life through structures such as family life, professional training and career, constant social interaction is by no means a given at an advanced age. In industrial societies in particular, where a high degree of mobility is often required during one's professional training and career, family members sometimes live in different cities or even in different countries. Silver agers must therefore be proactive if they want to make new contacts or maintain existing ones. An infrastructure designed with loving care, accessible **third places** [↗](#), appropriate **mobility concepts** [↗](#) and leisure activities can play a major role in this.

The small village of Pescueza in western Spain shows what this can look like. This little community has adapted its entire infrastructure to suit the needs of the silver society. The “Friends of Pescueza” association has set itself the goal of not only caring for ageing people, but also offering them support in all areas of life and thus enabling them to take active part in village life for as long as possible. The village is holistically orientated to serve the needs of its residents, who are predominantly elderly, for example with non-slip surfaces on roads and rails on walls. The village's day center offers a small shuttle that runs daily so that everyone can participate in shared meals and activities. (Montañés, 2019)

Example:

[MIEJA](#) is a Modern Elder Academy dedicated to long-life learning.

[Sixty and Me](#) is an online magazine and a global community for women over 60.

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01 The Embassies

The Swiss start-up The Embassies is developing a digital platform that offers age-appropriate luxury flats in global metropolises as well as the corresponding services and travel. Via the platform, users can visit the Embassies in various locations or take part in common activities such as fitness or spa programs. In this concept, too, everything revolves around community building.

02 Kampung Admiralty

The eleven-story mixed-use complex Kampung Admiralty in Singapore for a retirement community comprises 104 flats for older singles and couples, numerous health, spa and care facilities and a daycare center for children. The residential facility is considered to be a prototype of how it is possible to fulfil the complex wishes of an ageing population.

03 Quartier Rübekamp

The Hamburg project Quartier Rübekamp offers digital interfaces for social connectivity via apps and platforms. In order to establish direct contact to the neighborhood, residents of the quarter are digitally networked with the app "Meine Nachbarn" ("My neighbors"). This makes it possible for certain target groups, such as seniors, to be reached specifically; in closed areas, the tenants remain among themselves. The property management can use the app to contact people and motivate them to participate in events in the common building.

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03

Services promote cooperation between companies and silver agers

Leaving the world of work is a turning point for many people – and a minor crisis for a good number of them. But retirement doesn't have to be a hard break – it is more and more often the case that retired people make themselves available to their team as a freelancer or senior consultant for a single day or a single project. This benefits not only the pensioners themselves but, of course, the companies as well. These companies can avoid losing the valuable knowledge that comes from experience and, at the same time, are able to respond to the shortage of skilled workers with greater flexibility.

The retired workers, in turn, are the objects of growing appreciation for their life experience. **Lifelong learning**, meaning continued education and the lifelong acquisition of additional qualifications and new skills, has long been part of their lives. In a world in which work environments, job profiles and qualification requirements are in a constant state of change, the one credential gained back in the day is rarely sufficient an entire life long. The willingness to learn new things and embrace change is consequently amongst the main coping strategies of the silver society – from whom the rest of society can also learn and benefit.

Those on the lookout for new challenges or social structures after retiring from professional life may find a solution in dedicating themselves to social causes. Apps can serve as a main medium for information in this regard. They bring together dedicated individuals

and institutions, associations and NGOs who depend on volunteer work. The suggestions are targeted to suit the skills and interests of the people and the requirements of the institutions. Some apps also support individual organizations in coordinating volunteer work and structuring it so that it runs as smoothly as possible.

Work environments, job profiles, qualification requirements – all of these are in a constant state of change. The one credential gained back in the day will not normally suffice for an entire lifetime. Employees need to continuously train further and acquire additional qualifications or even completely new skills. However, lifelong learning is not just an occupational necessity but also the wish of many people to continue to develop throughout their entire lives.

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Elder orphans as the new target group

The term elder orphans refers to people who live their day-to-day lives at an advanced age without the support of family members and without being in a permanent relationship. In the United States, about every fourth person above the age of 65 is affected by such a lack of family. (Vespa et al. 2020) While delivery services ensure a supply of groceries, clothing and household products in case of physical limitations, there is currently often a lack of options to combat loneliness.

The elder orphan issue shows that the challenges which are inherent in the shift in demographics go far beyond the provision of life's necessities. The need for socializing and community does not diminish at the same rate as the decline of physical strength or structure-based opportunities for active participation in life. This makes definitive solution approaches that provide a new connection to individual traditions and communities all the more important.

Those who respond to these new needs with creativity and curiosity will discover new market potential: take, for instance, the [French postal service](#), which offers a new subscription for a fixed monthly fee. Instead of putting the post in a letterbox, the carrier rings the doorbell and has time for a brief chat.

The need for socializing and community does not decrease at the same rate as physical strength or structural opportunities for participation. That is why it is so important to find innovative solutions that create a new connection to individual traditions.

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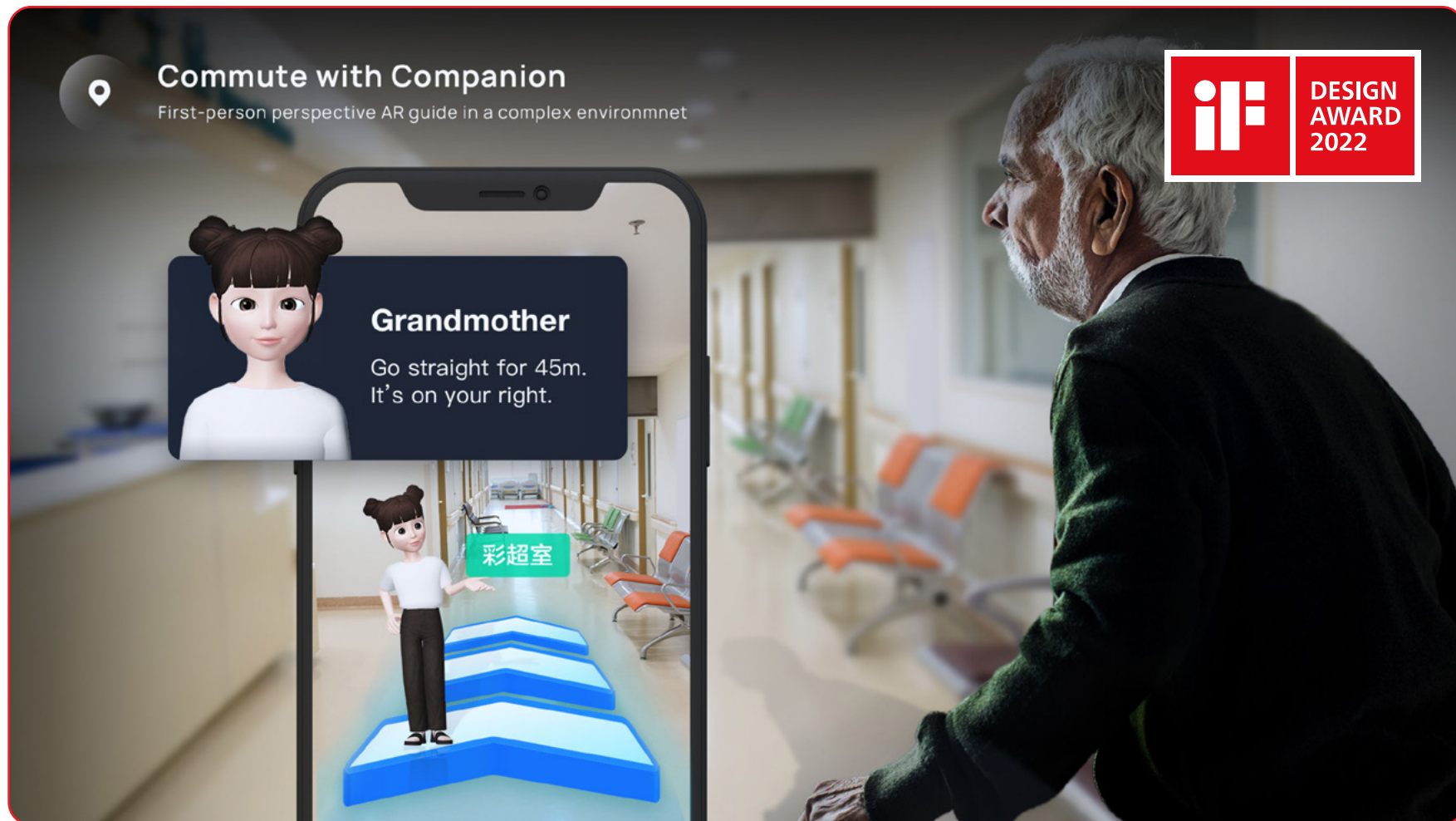
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01 A map for older people

The silver society is characterized by its agility and high levels of activity. In order to ensure that older people aren't brought to a standstill as a result of diminishing eyesight, hearing, control of their bodies and cognitive skills, Baidu Online Network Technology developed a card app with an individual travel service for older people. In addition to the objective of making travel easier and safer, the app attempts to counteract any possible feelings of loneliness during the journey with friendly communication.

02 Don't pray alone – Click to pray & E-Rosary

Faith plays an important role for a large portion of the older population. Praying and going to church is just as much part of the normal routine as a morning cup of coffee. With declining numbers of active churchgoers and age-related mobility problems, it can become difficult to maintain this routine. The click-to-pray app can be used for this, among other things. The offering is provided in English, Spanish, Portuguese and French. Every month, the Pope formulates his prayer requests, and the app provides its users with daily motivation to pray for the challenges humankind is facing and the mission of the church. A new initiative of the Vatican now extends the app with the addition of a wearable for its users: the e-Rosary.

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03 Share a Pot
The Share a Pot project was created on the basis of memories of family get-togethers around a steaming pot of soup set in the middle of a table. Partners, supporters and volunteers from the community come together at Share-a-Pot locations. The meetups there are used to encourage older people to get regular exercise, eat nutritious food and build close friendships.

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New services help to create goodbyes

Although it's a part of life, just like birth, a stigma weighs on death. But those who opt to repress the process of dying miss out on an important aspect: saying goodbye. The person dying and those around them all have the need to bid farewell to the world, to a person and to each other according to their own understanding of reconciliation.

A successful farewell requires sufficient space – architecturally as well as in terms of societal discourses. Death can be much more than a departure from life. As the final and special stage of life, the last few days can be shaped individually and be a time for meaningful encounters, reconciliation and loving care.

The shift in the significance of the final stage of life is especially evident in the design of hospices. ^(Voigt 2020) Based on a concept developed by Cicely Saunders, many hospices are set up in such a way that they manage to provide palliative medical care without feeling like a hospital, and instead present themselves as a place for life. The design of the interior allows for atmospheric support of possible spiritual guidance and individual design of the rooms to suit the preferences of the residents. ^(ibid.)

For people to be able to say goodbye, there needs to be sufficient space in society — both in terms of structures and in social discourse.

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Individualization of one's death

In these times of individualization, it is possible to adapt almost all areas of life to one's own needs and individual sense of aesthetics. The Berlin-based funeral parlor **The Funeralists** aptly puts this in a nutshell: "Funerals as individual and personal as life". It is therefore only too evident that there is a growing need to also individually shape one's own process of dying. Increasing numbers of services are arising which offer options for personalized structuring of funerals.

Online planning: mymoria is a how-to service provider for funerals. Everything in connection with funerals is offered online, which makes the procedure considerably easier, on the one hand, and makes it possible to complete the whole process individually, on the other.

Transparency: Anternia has specialized in making various forms of forest burials and cremations as well as burials at sea transparent and in supporting their design to suit wishes. The design of the casket or urn can also be made according to individual wishes.

Personalization: Providers such as Colourful Coffins in England or Urnen Werk in Germany offer a wide variety of options when it comes to personalizing a casket or urn.

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01 Systrarna Ocklind Ocke urns
Memories of loved ones who have passed away are often associated with thoughts of home and big emotions. The design of the Ocke urn uses wool and leather as materials that impart feelings of home and warmth. The urn bridges the gap between tradition and modernity and also represents an expression of affection – in many other cultures, people who have passed away are lovingly wrapped in a shroud; one can also treat their ashes in a similar way. The natural materials provide a sense of warmth and protection and are of course also completely biodegradable.

02 Biodegradable coffin
Although burials actually have the aim of the body returning to the earth, most coffins are made of solid hardwood, which considerably slows down the process of natural decomposition. The biodegradable coffin from Loop becomes a living casket that reflects and actively supports the cycle of life. Made of a mushroom-based material, it makes it possible for people to enrich the soil and provide nutrients for new plant growth. Mushrooms are nature's great recyclers and the driving force in the earth's last cycle thanks to their ability to transform organic matter and toxins into new life.

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03 Flower Cafe BLOOMY'S

Funeral homes are seldom places one chooses to visit. In order to make the location more accessible and life-orientated, a funeral home in Kawaguchi has linked itself to Bloomy's flower café, which, as a place of relaxation, invites the neighborhood to come in and casually spend some time. As a result of the combination of these opposite roles, a new venue is created that permits easy conversation and a new way of seeing the culture of dying.



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3 Challenges

A maturing society has to make more efficient use of its resources: needs for medical care and support grow while, at the same time, the number of people of working age decreases.

The silver society lives in a manner which is modern and diversified and which grasps ageing as a chance to break free. As a result, in the case of this group, the need for flexible living solutions and neighborhoods that are appropriate for their stage in life is growing.

The need for socializing and community does not diminish at the same rate as the decline of physical strength or structure-based opportunities for active participation in life. There is a growing need for solutions that create a new connection to individual traditions and communities.

3 Solutions

Digital health applications can have a preventative effect by providing motivation to implement healthy measures or by facilitating contact to medical professionals via online consultations. In the future, digital health applications will be devised and structured according to a holistic understanding of health.

Concepts such as “elastic living” make it possible to have living environments grow and shrink to suit situation-based requirements. More and more frequently, silver agers can access serviced living solutions and thus determine whether and how much support they want to have in everyday life at any time.

Social connectivity can be promoted by means of integrative structuring of public spaces and third places. Services and applications can serve as main interfaces for finding new personal challenges or ways of dedicating oneself to social causes.

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a photo of a robot laying on a therapist's couch talking about its problems

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As a result of the pandemic, our understanding of health has evolved from an individual endeavor into an overall societal task. Although health continues to be a lifestyle component, the focus is on shaping an environment which can ensure the welfare of all as much as possible.



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The COVID-19 pandemic has led to innovations and insights now being developed into established structures, applications, and systems. However, the long-term consequences of the crisis are becoming visible, with challenges in mental health and the constant threat of renewed pandemic-like circumstances.

Health is being considered more dynamically and holistically, with solidarity becoming the main objective of a resilient society. New design concepts consider the impact on social and ecological surroundings. Due to their systemic dimension, these concepts help shape the environment in which they are used.

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Body data tracking is conquering new markets as it is expanding beyond wearables and into products integrated into living spaces. Monitoring physical state is becoming a new aspect of smart homes, with a focus on the health quality of surroundings.

Real-digital applications are increasingly being used for mental health support, utilizing gaming principles and artificial intelligence for self-care.

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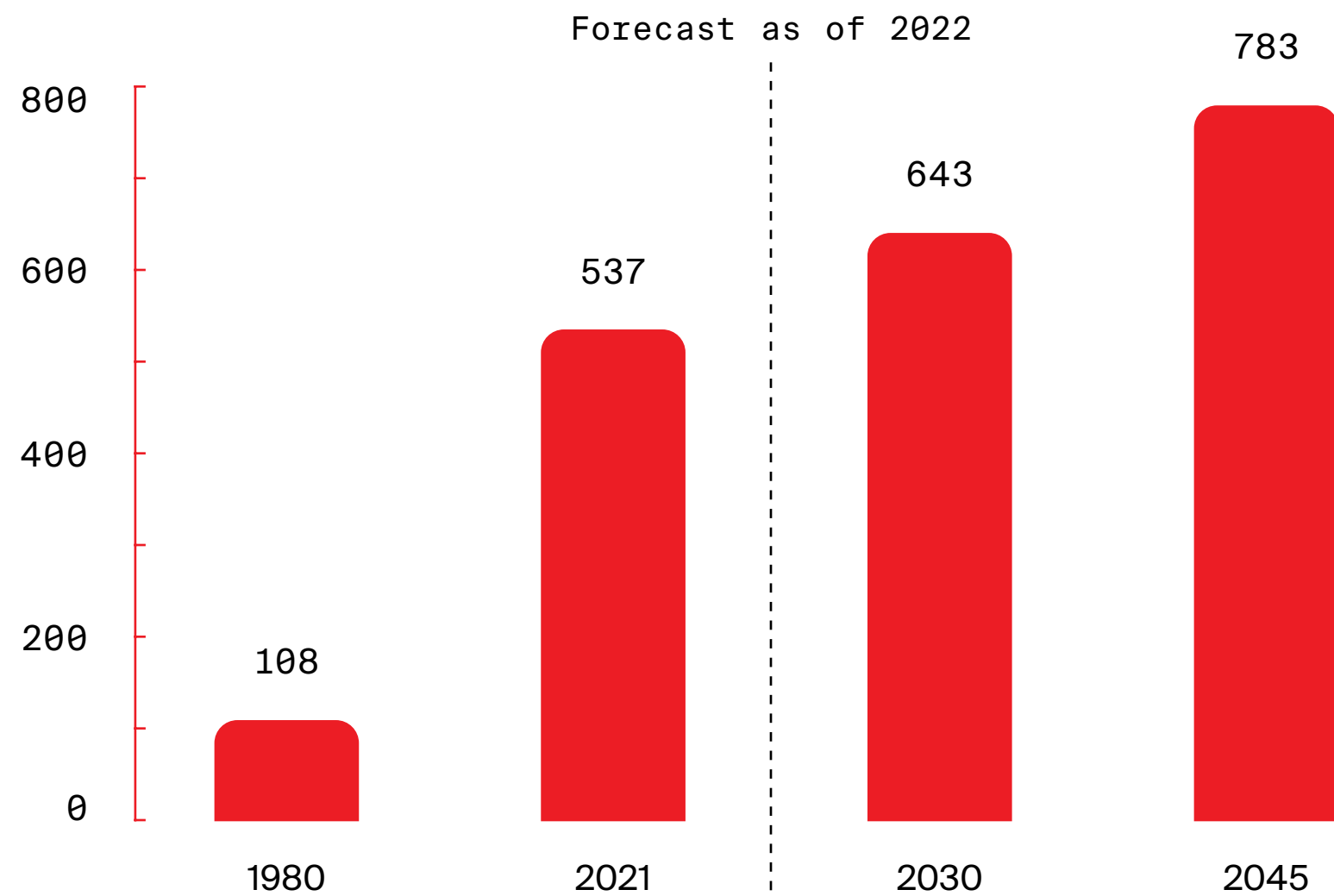
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Health and quality of life

The **health** megatrend has firmly entrenched itself as a fundamental value in the societal consciousness and has become synonymous with a high quality of life. As a result of scientific progress, health is often no longer a matter of fate but instead the consequence of one's own way of living. Increasing numbers of infectious diseases are curable or at least easily treatable – parallel to this, however, the effects of an all-too-comfortable lifestyle are on the rise. Obesity, lack of exercise and over-consumption of health-damaging foods and beverages are ensuring a wave of civilization-related ailments. (cf. IDF, 2021; WHO a, 2021)

Risk of diabetes rising globally

Number of people with diabetes worldwide (20-79 years, numbers in million)

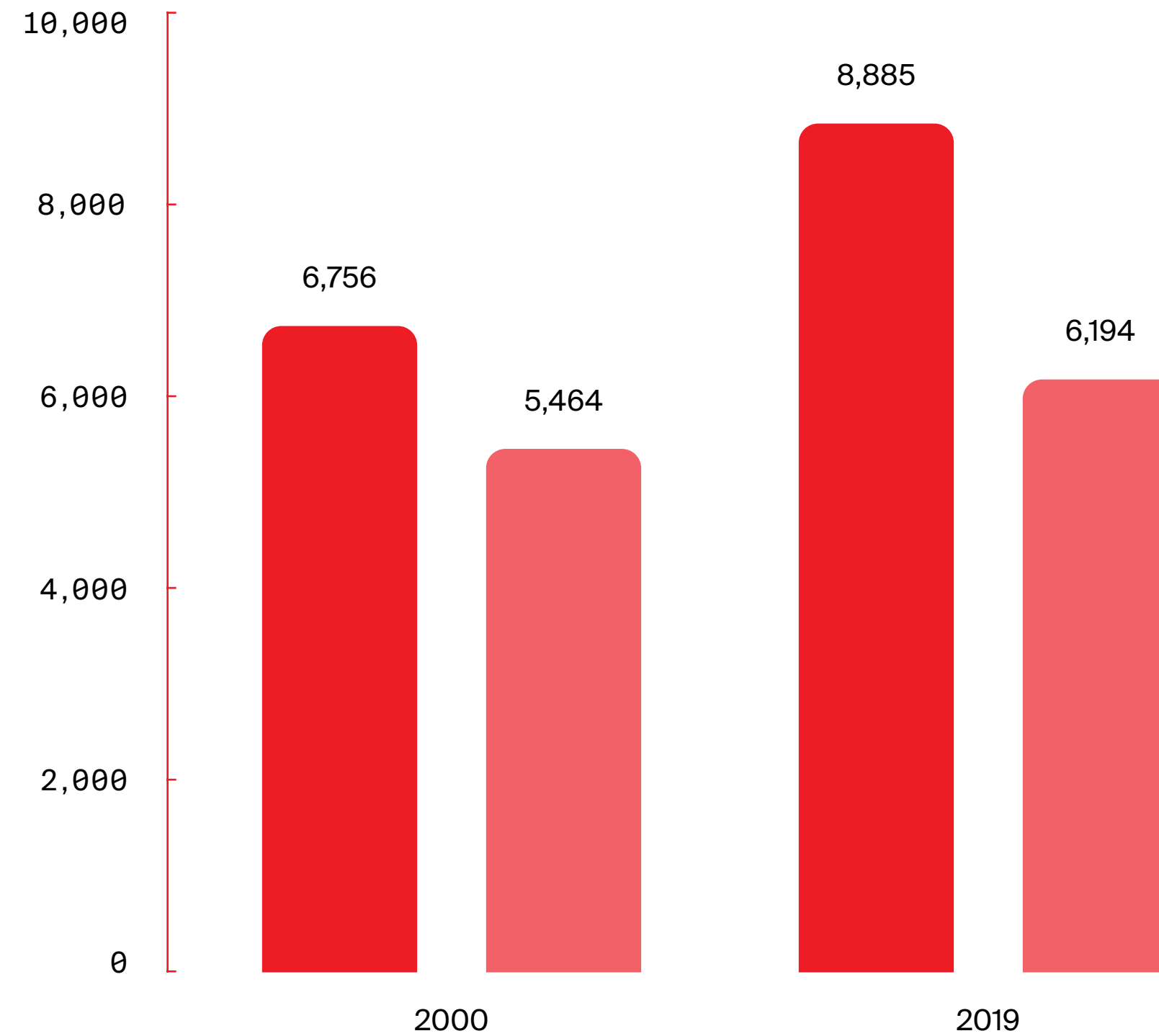


Source: diabetesatlas.org, 2021

Heart attacks and strokes are most common causes of death

Estimated deaths worldwide in thousands

■ Ischaemic heart disease ■ Stroke



Source: who.int, 2021

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Healthy lifestyles are trending

A large portion of civilization-related ailments can be prevented by getting sufficient exercise, sleep and relaxation, as well as having a balanced diet. Therefore, with increasing frequency, day-to-day life is adapted so that people can live as healthily as possible. Products for monitoring body data such as **wearables**  promote awareness that lifestyle choices have an immediate effect on health. New health apps not only indicate the state of one's health but also provide information on how illnesses can be prevented in the future, and the body's physical condition can even be improved. As a result, health is evolving into a self-optimization project.

*Health
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How COVID-19 shaped our understanding of health

The pandemic shed new light on our understanding of health. COVID-19 was not the first pandemic of the modern age – though this was the first time that a disease was globally researched with such intensity and that the interplay of policy and individual action for combatting disease was so intensive as a result of international campaigns. The pandemic clearly showed the risks of globalization as well as its enormous potential for innovation, collaboration and knowledge exchange. The interplay of proven strategies and the testing of new procedures ensured that the global community came through this crisis with much less detriment than was assumed would be the case in the interim. Innovative communication channels and a closely networked international knowledge exchange are making it possible to analyze different strategies for battling illness and to learn from one another across national borders.

The long-term consequences of the pandemic are currently also becoming visible: impacts on mental health are challenging us, as is the spread of other diseases, which are experiencing an increase as a result of new or recurring flare-ups of crises. Thus, several countries are simultaneously having to battle increasing numbers of tuberculosis infections since test and information centers were temporarily repurposed or neglected in the fight against COVID-19. (Simmank, 2022; Naestholt Dahl, et al., 2022) It was also possible for other types of health crises to spread during the pandemic times, such as the opioid crisis in the USA, which is closely linked to the mental strain and stress that is affecting increasing sections of the population.

The megatrend now is in a transitional phase: on the heels of the acute crisis phase, a time of renewal is now beginning. The strategies and innovations developed while battling the crisis can be transformed into established structures, applications and systems:

A holistic health perspective is reflected in numerous product developments and services

Apps that enable contactless health consultation have been raised to a new level

Digital and real-digital offerings impart health information and provide motivation for self-care and a mindful view of one's mental health

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Holistic health as a game changer

Holistic health shows that structures of all kinds can be conducive or detrimental to good health. With this systemic view of people's basic health needs, enormous potential arises in terms of shaping health: new health infrastructures support all who live with them to achieve greater well-being.

Individual microprocesses: It is becoming more and more evident how one can benefit from a targeted view of one's hormones and microorganisms. The microbiome has evolved into the key to greater fitness and resilience. Similarly future-orientated is the differentiated consideration of hormonal cycles. ^(Splett 2021) In sports, it is possible to prevent accidents, make better use of high-performance days and dose medications more precisely.

Healthy working conditions: The steadily rising numbers of sick days as a result of stress-induced symptoms clearly show that well-being in the workplace as well as occupational safety are part of having the right work equipment and preventing accidents. ^(TK, 2021) In the working world, holistic health is evident in the form of innovative office design and alternative management concepts. Initial studies are even treating the topic of optimizing the social behavior of robots in order to reduce feelings of unwellness and stress in the human team. ^(Leichtmann, et al. 2022)

Healthy cities: Municipal planning concepts and the design of public spaces have an especially large influence on the health of many people. Municipal districts that provide sufficient sunlight and quiet contribute to the physical well-being of the people who live there. **Third places**  can serve as meeting places, providing a safe place for conversation, relaxation and sports activities.

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Germophilia counters hypersterility

Killing germs has been the basis for a functioning healthcare system for more than 200 years. Meanwhile, however, it has become evident that all-too-rigid hygiene measures can also be problematic. Thus, the increase in allergies and autoimmune diseases in western industrial countries has been linked to the hygiene hypothesis. The hypothesis states that growing up in surroundings with too few germs can lead to a greater likelihood of diseases and allergies. (RKI, 2014)

Critical side-effects are also evident as a result of the overuse of antibiotics: The introduction of the antibiotic penicillin in the year 1939 has made it possible to treat almost all bacterial infections – but across-the-board use and all-too-careless handling has led to resistances. (Ebenhoch, Röhr, 2020) The more frequently antibiotics and disinfectants, for instance, are used, the faster the number of multi-resistant pathogens grows – a problem that is coming to a head not only in hospitals but also in industrial livestock farming. (Efsa Journal, 2019)

The most recent insights in microbiology call for a more differentiated approach to bacteria and microorganisms since many of them are not harmful, but instead even necessary for survival. This is clear given just the number of microorganisms with which we share our body – some 40 billion of them, exceeding even the number of our “own” cells. (Abbot, 2016) A bacterial colonization of the intestine that is out of balance will consequently have serious effects on the entire human organism and can even facilitate depressive diseases. (Anna-Chiara Schaub, Else Schneider, Jorge F. Vazquez-Castellanos, et al., 2022)

INCREASED HEALING
CHANCES FOR ILL OR
INJURED PEOPLE

TWO SIDES
OF STERILITY

MULTIDRUG-RESISTANT
PATHOGENS, ALLERGIES,
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The private space becomes probiotic

Hypersterile environments may help if one's body is out of balance as a result of a severe infection or injury and is unable to protect itself against harmful germs. In the normal case, however, microbiologically balanced surroundings are more conducive to health.

Insights in microbiology are promoting a new understanding of human health: every person is a separate ecosystem, which is colonized by a multitude of different microorganisms that keep it healthy and vital – or which can become ill if the healthy balance is disrupted. Symbiotic life is a prerequisite of life itself.

The trend towards microbiotic design will be replacing antibacterial products in some areas in the future: self-sterilizing surfaces continue to be used in public spaces frequented by a lot of people. In private spaces, on the other hand, the preference is for products that contain and support as great a diversity of health-promoting microbes as possible.

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EVERY PERSON IS A SEPARATE ECOSYSTEM, WHICH IS COLONIZED BY A MULTITUDE OF DIFFERENT MICROORGANISMS THAT KEEP IT HEALTHY AND VITAL, OR WHICH CAN BECOME ILL IF THE HEALTHY BALANCE IS DISRUPTED. SYMBIOSIS IS A PREREQUISITE OF LIFE ITSELF.



Pandemic pushes holistic health

The pandemic has clearly shown what fundamental impact the global knowledge culture has on world health. In the future, education and the communication of knowledge will be key factors for which break-outs of disease will again plunge the world into a state of crisis and what options are available to us to combat them. (Natividad, 2020)

Research has been able to make enormous strides and generate a great deal of insight pertaining to the spread of and response to diseases. Likewise, the effect of science on politics has been raised to a new level. Through new forms of knowledge communication, educational concepts, apps and services, this newly acquired knowledge is spread within society and consequently changes the way we think about health and disease as well: the topics of medicine, virology and epidemiology are naturally on people's minds. They want to make their own picture of illnesses and how to avoid them – and also regain some sense of self-determination.

This necessary and intensive pre-occupation with the COVID-19 virus has led to a **holistic understanding of health**, which accounts for individual, social, mental and material factors. Standardized norms and rigid models are making way for a dynamic and holistic consideration of the human body.

Our understanding of health is becoming more holistic – and does not end with people but also includes larger contexts: the complex network of interactions that influences the health of individuals as much as it influences the health of entire populations. In the future, the focus will also be on factors such as education, legislation, architecture and work environments. These do not lie within the responsibilities of individuals but rather appertain to the responsibilities of society, the government and the economy.

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Being part of an ecosystem

The conditions in which we live our lives have a significant effect on our health. “Highly advanced medicine alone is not sufficient for maintaining our health,” warns Sabine Gabrysch, epidemiologist and Professor for Climate Change and Health at the Berliner Charité. (cf. Rahmsdorf 2021)

In its initial effects, climate change is already showing how closely our physical well-being is linked to the **ecosystem of the earth** . (cf. Boileau et al. 2019) Diseases such as cholera and typhoid fever spread more easily due to more frequent flooding; drought results in failed crops and malnutrition. In 2022, the heatwave in Europe caused the deaths of at least 15,000 people. (Kluge, 2022)

Structural solutions such as early warning and fallback systems for critical infrastructures can provide support in terms of adapting to more extreme living conditions.

About a quarter of global diseases can be traced back to environmental factors such as air and water pollution or poisonous chemicals. (cf. Boileau et al. 2019) In Europe alone, elevated levels of particulate matter, radiation and environmental pollutants account for 1.4 million deaths per year. (cf. WHO, 2022 b) As a result, a product’s health-related impacts across its entire life cycle will become more and more of a focus in the future.

Holistic health design not only strives to promote a healthier way of living, but also encompasses the complete production process as well as the use and disposal of a product.

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Solidarity is a health issue

The pandemic has clearly shown us how closely health is linked to peace and social justice. The fight against disease always stagnates wherever social injustice and financial duress are prevalent, in places where there is unrest or where people have to contend with disasters. This is evident not only in the global south, where there is often a lack of basic healthcare. In wealthy industrial nations as well, such as Great Britain, mortality rates in poorer sections of the population are rising as a result of increasing heating costs. (Krall, 2021) Of particular concern: as a result of the war in Ukraine and the consequent destruction of the supply infrastructure, many forms of multi-resistant tuberculosis pathogens are spreading. (Simmank, 2022)

The social dimension of health is one of the main takeaways from the pandemic and will have considerable influence on the megatrend in the coming years: “Historical socio-epidemiological studies agree that the reshaping of social determinants relating to health provided the impetus for improved health in the 20th century. This still applies today: 60 to 80 percent of the factors which lead to good health are not of a medical nature.” (cf. Kickbusch, 2014)

Solidarity is becoming the main structural objective of a resilient society. New design concepts account not only for their effect on the end user, but also the impacts on social and ecological surroundings. The individual and the individual’s needs are specifically addressed as a result of personalized health-related offerings. At the same time, these solutions have a systemic dimension and thus help shape the environment in which they are used.

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Today's understanding of health is more extensive and more complex. Social aspects such as lifestyle and belonging to communities of solidarity have just as much of an impact on physical and spiritual well-being as symbiotic connections with chemical and biological elements, such as a favorable colonization of bacteria in the body.



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Healing architecture as a systemic approach to health

Health is becoming a design constant and thus integrated in the design process of a very wide range of product categories. Since the 1980s, it has been known that the use of natural colors as well as windows that provide a view of greenery help patients heal faster. (Ulrich, 1984) Plants and the use of natural materials and surfaces such as wood, clay and natural stone are also conducive to healing. (ibid.) Under the buzzword **healing architecture**, more and more doctor's offices, hospitals and long-term care homes have been designed in such a way that they have a positive effect on patients' well-being and health. Meanwhile, in private living environments as well, holistic design aspects and aspects that aim to provide mental and physical well-being are becoming more important.

For a long time, the architecture of health-related buildings was characterized by its functional aspects. In the future, the focus will increasingly be on other qualities of constructed spaces. As a preventive measure against hustle and bustle, stress and unhealthy environmental impacts, healing architecture, in a way, transforms buildings into medicine to promote healing processes. Healing architecture designs buildings, spaces, light, acoustics and air quality to serve the well-being of humans. Innovative strategies rely on the healing nature of spaces and materials as part of a holistic concept of modern healthcare.

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01 The Pavilion at the Hospital of the University of Pennsylvania

The Hospital of the University of Pennsylvania brings together research and applied medicine – and also the latest medical equipment along with an architectural design that provides ideal support to patients as they heal. The lighting concept of the interior spaces uses pleasant, indirect illumination and simultaneously serves as a guide system for staff and visitors. For increased comfort, the rooms on the ward can be redesigned to suit individual needs and also provide visitors with a place to sleep. Private areas with an expansive view of the surroundings, flexible furnishings and operating theaters with natural daylight also make the hospital a healthy and pleasant workplace for staff.

02 Royal Hospital for Children and Young People in Edinburgh

The department for mental health at the Royal Hospital for Children and Young People in Edinburgh was designed in collaboration with patients in order to support the mental healing process with an atmosphere that is as pleasant as possible. The challenge: on the one hand, the rooms should be inviting and cozy, but at the same time show a clear contrast to home. The opportunity to design rooms oneself gives people the feeling of being in charge. Since patients often spoke of the sea as being conducive to their mental health, the colors and motifs of the coastal landscape were adopted in the design concept.

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03 Friluftssykehuset – The Outdoor Care Retreat

Longer hospital stays in particular can be a strain on patients. In order to give patients and their families a break, a small retreat was developed where they can get away from it all, just a few minutes' walk from two of the largest hospitals in Norway. The Outdoor Care Retreats offer visitors a physical and psychological respite from strict treatment regimens and the isolation that often results from a long hospital stay. The concept provides for intensive contact with nature: the large windows offer views of the natural surroundings and the interior spaces were built using natural materials.

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Hedonic health as a lifestyle

Along with the many options for taking care of one's own health, expectations in regarding one's own health are also increasing. While it used to be enough to be able to perform one's daily duties, the term now also entails striving for physical and mental well-being. The pandemic may have reinforced this development, but at least temporarily it also took all the fun out of things: no longer was the focus on smoothies, fitness contests and wellness programs, but instead on vaccinations, disinfectants and mask quality. Now that people have made it through the crisis stage of the pandemic, the need to embrace the topic with greater hedonism is growing all the more. Health and wellness are merging into a new entity in the process.

Health apps in particular are picking up on the trend to hedonic health and turning health into a lifestyle:

- [Noom](#)
- [Fooducate](#)
- [Headspace](#)
- [Aaptiv](#)
- [Sleep Cycle](#)
- [Lumosity](#)

The publication "Sanitas Health Forecast" uses an appealing graphic design and entertaining text to provide information on the latest health trends and health insights. The aim: to impart the knowledge and tools for a healthier life for all. The publication focuses on trends relating to the brain, sleep and diet.



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NOW THAT PEOPLE HAVE MADE IT THROUGH THE CRISIS STAGE OF THE PANDEMIC, THE NEED TO EMBRACE THE TOPIC WITH GREATER HEDONISM IS GROWING ALL THE MORE. MEDICAL CARE AND WELLNESS ARE MERGING INTO A NEW ENTITY IN THE PROCESS.



Body data tracking takes over the smart home

The market for products that measure and interpret body data has been growing steadily for years. While they used to be mainly worn directly on the body as wearables, the product range has been steadily expanding, as has the functionality of the applications:

Consumer products: More and more consumer products integrate functions for extensive measurement of health-related data. The analysis of data relating to mental health plays just as much of a role as the analysis of data relating to physical health, in conjunction with recommendations for action for the user.

Examples:

[Apple Watch](#)

[Honor Earbuds 3 Pro](#)

[Yunmai Premium Bluetooth Smart Scale](#)

[JINS MEME smart healthcare eyewear](#)

[AI Healthcare Oven](#)

Remote technology: The use of telemedicine has increased considerably over the past few years in the course of the COVID-19 pandemic and will also play a major role in the future. The interaction between patients and physicians is being advanced as a result of remote technologies such as video calling, apps and at-home medical measuring devices. This interaction makes it possible for experts to diagnose, advise, treat and monitor patients remotely.

Examples:

[SmartHEAL](#)

[Homedoctor Medbot](#)

[Wearable Health Sensor](#)

Smart home products: The devices not only analyze an individual's state of health but also determine the quality of the surroundings in terms of health.

Examples:

[Future Air](#)

[Aqara Presence Sensor FP2](#)

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01 HONOR Earbuds 3 Pro

HONOR Earbuds 3 Pro are the first headphones that measure the user's body temperature and then inform the user. Paired with an app, it is possible to set how often one's temperature should be measured per interval of time.

02 Aqara Presence Sensor FP2

The Aqara Presence Sensor accurately detects human presence by detecting breathing activity and other vital signs with millimeter-wave radars. It is a device that can help users monitor the heart rate, breathing or sleeping state of elderly family members living alone or of young babies. When there is human presence or abnormal vital signs in the monitoring area, the device will send a notification to your mobile app through a nearby Zigbee Hub, and it can also be linked with other smart devices.

03 Homedoctor Medbot

Homedoctor Medbot is a networked health robot that closes the gap between the hospital and the household using high-quality personalized health technology. The device provides an immediate connection to medical professionals and comes with intuitively usable tools for monitoring health for home-based diagnostics and treatments that are just as precise as in the hospital.



Jarred Evans

leads PDR, a leading product and service design consultancy in the UK. He has over 30 years of experience in product and service design and innovation, over 70 major international design awards and numerous patents. With extensive experience in medical device design, Jarred is also a Non-Executive Director of the Life Science Hub Wales, the body promoting and supporting industry and NHS collaboration in the UK. Jarred has undergraduate and master's degrees in industrial design and an MBA. In 2019, he became a Professor of Applied Design Innovation at Cardiff Metropolitan University, where he contributes to design research and education alongside his PDR role.

iF DESIGN: COVID-19 shaped healthcare like nothing else. There was a crisis and now there is renewal. Especially applications that enable contactless health advice have been taken to a new level. How do you see this and where do you think, in which healthcare sector, is the biggest potential (and/or need)?

iF DESIGN: Wearables and newer health apps show users how they can protect themselves from a bad lifestyle for their health and even how they can avoid illnesses. As a result, health, which is not new, becomes a self-optimization project. Is this something that will gradually improve health systems? Where do you see the most potential?

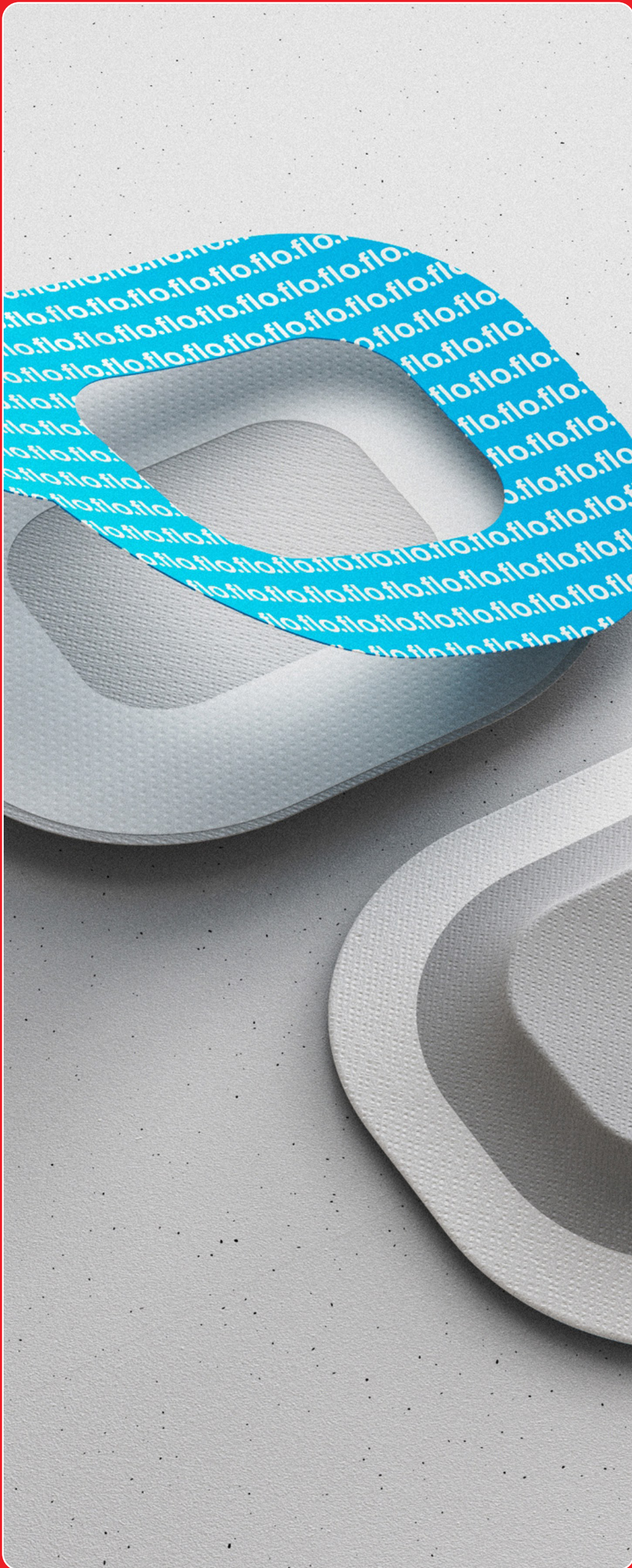
JARRED EVANS: Generations of patients have grown up with effective digital service from banking to transport. As fluid consumers, they expect similar levels of service, access and immediacy in their healthcare. The rise in ubiquitous and wearable healthcare sensing alongside the challenges of the pandemic created the conditions for a consumer healthcare revolution that we are just at the start of.

There is a lot to do beyond simply mimicking existing healthcare pathways with video calls and digital forms, and whole new ways of understanding, supporting and treating conditions will emerge as new service models become available across the healthcare landscape. A key challenge and significant opportunity lies within the challenges of elderly care and increased availability of mental health services.

JARRED EVANS: Health apps today are still largely centered around wellness and lifestyle data such as activity levels and sleep patterns. Emergent now are more significant health monitoring sensors entering the general consumer market. Consumer technology companies as well as more traditional medical device companies are bringing out their own consumer health wearables for general use, capturing more clinical and vital signs data.

With this increasing level of more essential clinical data recording, clinical assessment of health can go beyond supporting a healthy lifestyle to something that can leverage accurate longitudinal data across multiple parameters. Data analysis and the use of predictive algorithms allow clinical issues to be predicted at an early stage and make it possible to assess the effectiveness of treatments, therapies and medications in a way that has never before been possible.





iF DESIGN: With Flo, you created a revolutionary medical device that can detect heart attacks and strokes before they really happen. Which is groundbreaking. How will the boom of such devices change the health system and health services in the long run?

iF DESIGN: In your words, what are the biggest potentials and highest risks of implementing AI and digital devices into healthcare in general?

JARRED EVANS: Flo is a great example that illustrates how traditional healthcare provision can change as computational power and sensor technology become increasingly ubiquitous. Professor Barry McDonnell and his international research team had undertaken pioneering work in cardiovascular medicine and predictive analytics, and design teams are perfectly placed to translate work like this into viable, impactful new products.

A more distributed healthcare approach is able to identify and address issues before they become chronic or critical, to allow a far greater number of patients to be seen, to keep expensive facilities reserved for those who need them the most and to ensure that medicines and treatments are having the impact predicted.

JARRED EVANS: Healthcare systems are under pressure globally, a pressure that will grow as populations age and new treatment opportunities become available. While genetics and personalized precision medicine offer the prospect of amazing advancements in healthcare outcomes, there will need to be a revolution in general healthcare provision to meet demand.

Digital devices, connected services and AI, working closely alongside healthcare professionals, have the potential not just to make existing patient pathways more efficient but to completely change them and the way we diagnose, prevent and treat health conditions.

There are many barriers to overcome, beyond technology to the human and ethical dimensions. I believe good design has a role to play to ensure that we enhance and not dilute the essential human empathy and contact that underpins great healthcare.



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Gaming for health

Health games use the motivating power of games to motivate their users to take action that is conducive to good health and provide them with information on illnesses.

In particular, it is possible to train emotional regulation in a targeted way using games, thus reducing or preventing mental problems. (Carras et al. 2018; Khamzina et al. 2020)

Games have a key advantage: they are popular and fun. The British government made use of this when they used the digital advertising space in the popular mobile game Candy Crush to provide information on the novel coronavirus. And in a version of GTA Online, it was possible for players to even get vaccinated in the game to complete missions and receive badges – the hashtag #InGame-Vaccine went viral, and in-game vaccination made the step to real vaccination easier. (Zukunftsinstitut, 2022)

Some games even target the neural plasticity of the human brain to maintain or – in the case of an accident or serious illness – regain certain abilities through gaming, VR and AR.

Games that encourage health-orientated behaviour or which are dedicated to a health-related topic:

Pokémon Go promotes more exercise in the fresh air.

Re-Mission was developed for children who suffer from cancer.

Sparx is a 3D fantasy game that helps with depression.

SuperBetter is an app to improve resilience, mental health and social-emotional learning.

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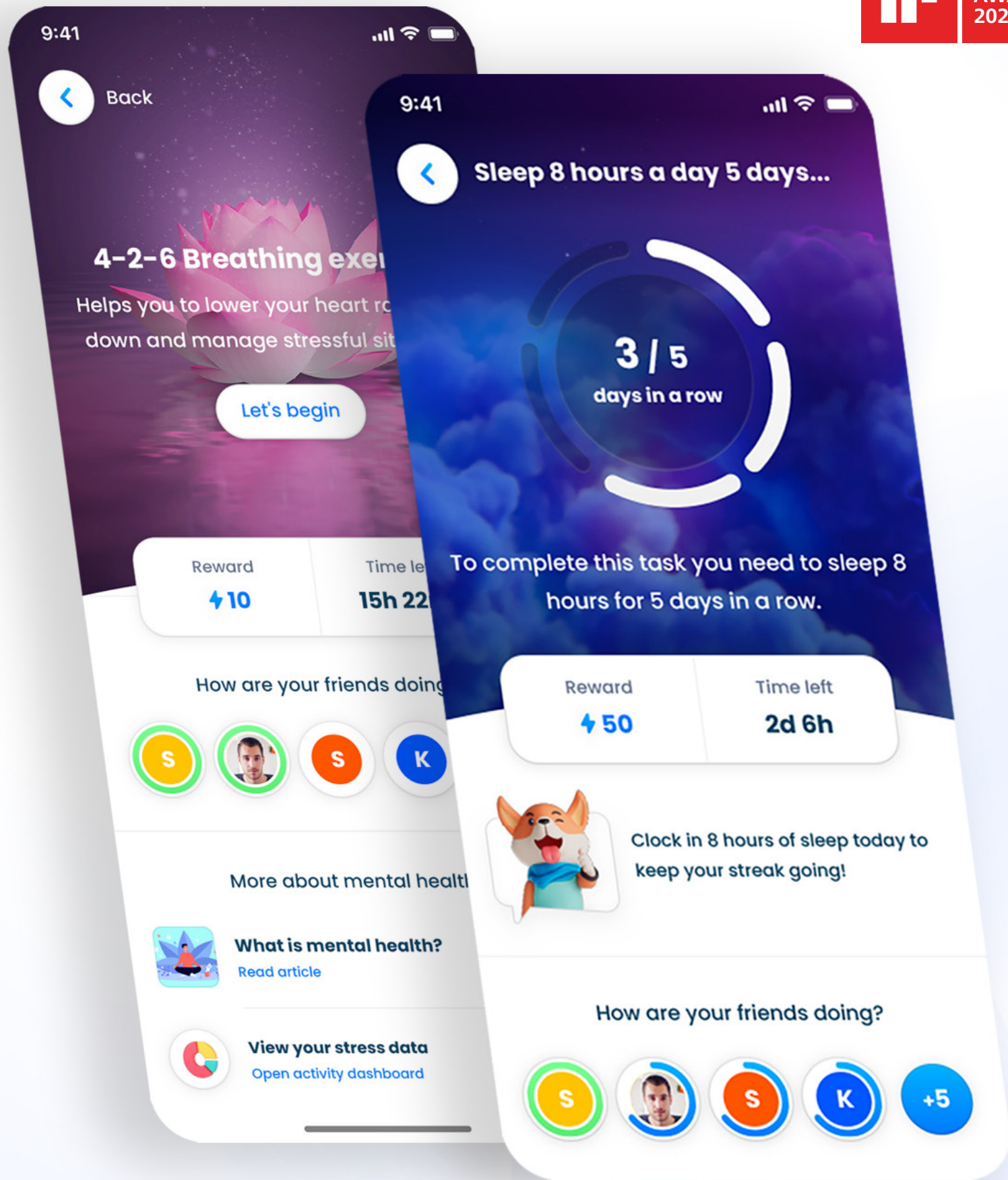
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01 Good Life – A health and wellness engagement app

Keeping users onboard in the long term is a challenge for wellness apps that aim to promote positive and healthy lifestyles. The Good Life app offers a UI solution, which combines the established principles of habit formation with innovative artificial intelligence. An appealing user experience is generated through changing 3D arcade game environments, AI cartoon coaches and scientific algorithms, which provide valuable health-related insights backed by a global reinsurer. The functionality of the app is extended by means of UI designs that integrate the five pillars of health – physical, mental, sleep, diet and social – in an extensive library of tasks and challenges.

02 Philips Pediatric Coaching

Philips Pediatric Coaching is a holistic coaching solution for preparing children aged 4 to 8 for an MRI exam, and also accompanies them through the procedure. It consists of a gamified mobile app for preparing children at home, an educational toy scanner for getting children ready for the exam while they are still in the waiting room and a tour inside the MRI scanner.

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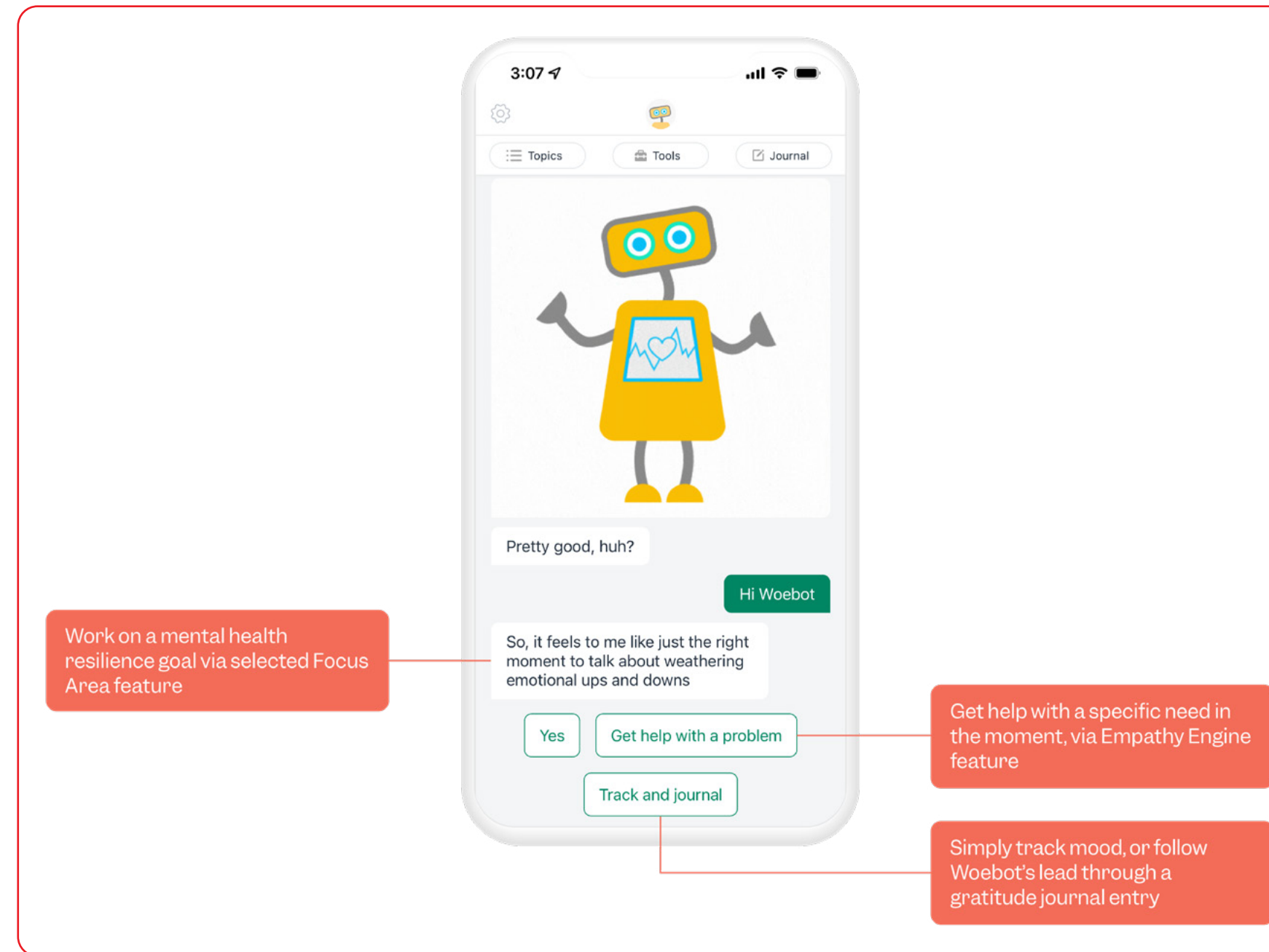
An AI for mental well-being?

Currently, the use of artificial intelligence to support or achieve mental health is a real game changer. Systems such as the [Wysa AI Coach](#) use algorithms, either in addition to human-based therapies or even independent of any such therapy, to offer psychological support.

Chatbots such as [Woebot](#) provide instruction for behavior therapy exercises or track the moods of people with depression. The advantage of this: the apps' basis of data is often much more precise and individual than the one therapists have at their disposal – and, unlike human specialists, there are hardly any restrictions to the app in terms of accessibility. All too often, mental health services and crisis interventions are not made available to those who urgently need them.

Platforms such as [Koko](#) use artificial intelligence to comb chat strings on forums and social platforms in order to detect persons at risk and offer them the option of self-help.

But the therapeutic application of artificial intelligence has its limits. Wherever interpersonal interaction is part of the healing process, it is only possible to use chatbots and tracking as supplementary measures; they cannot take the place of human expertise and attention.



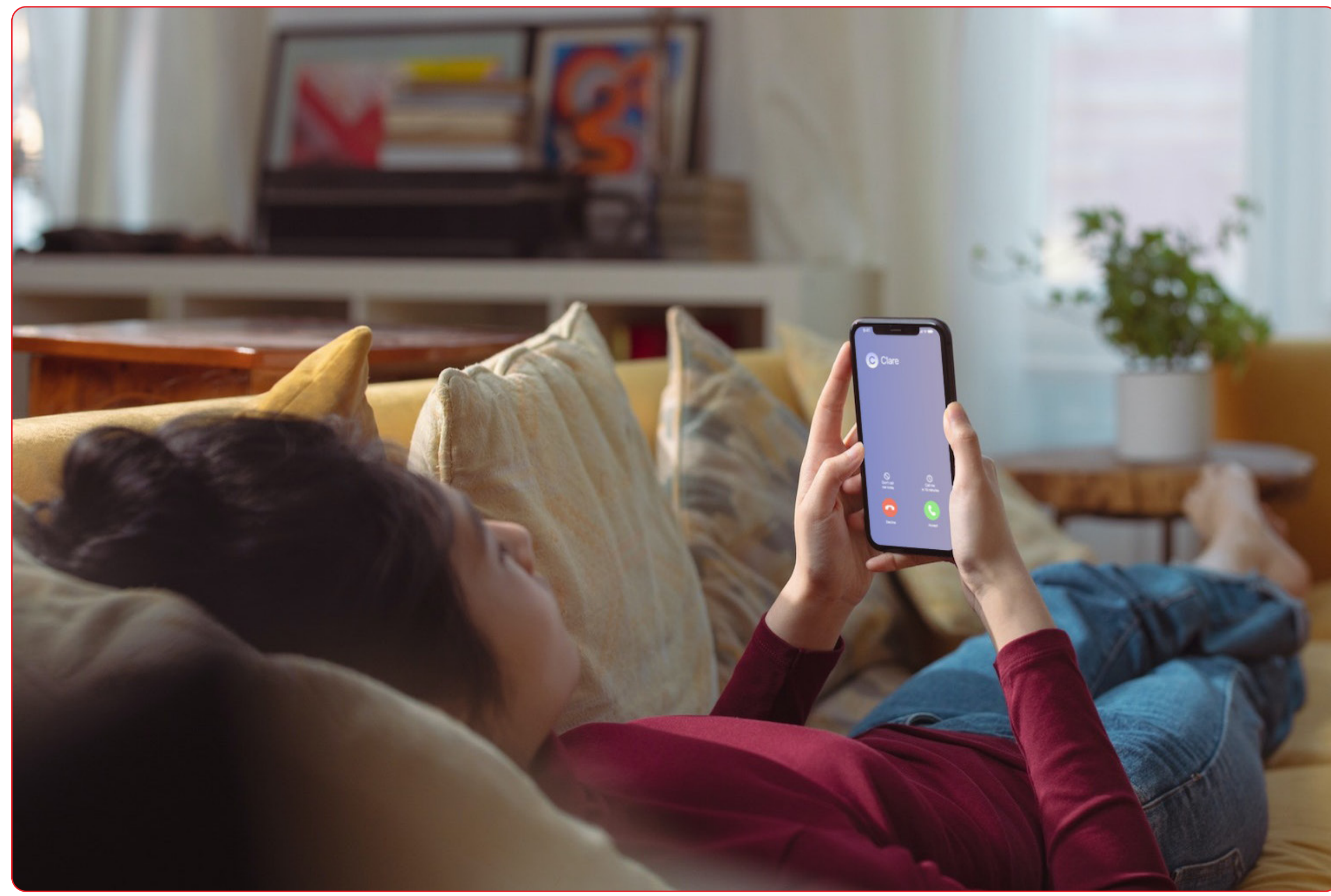
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01 JINS MEME UX
JINS MEME is a smart healthcare eyewear equipped with two sensors built into the core of the nose piece. These sensors are synced to a smartphone app via Bluetooth to analyze information and measure the user's physical and mental state, to support self-care practices for everyone.

02 Clare
Clare is a young start-up based in Berlin. Based on the perceived discrepancy between the demand for therapeutic treatment and the insufficient number of available psychotherapists, the enterprise developed an alternative. Artificial intelligence is used to create a safe space in which users can express themselves freely. Communication is via phone calls or WhatsApp and aims to impart self-reflection and grounding techniques through guided exercises.

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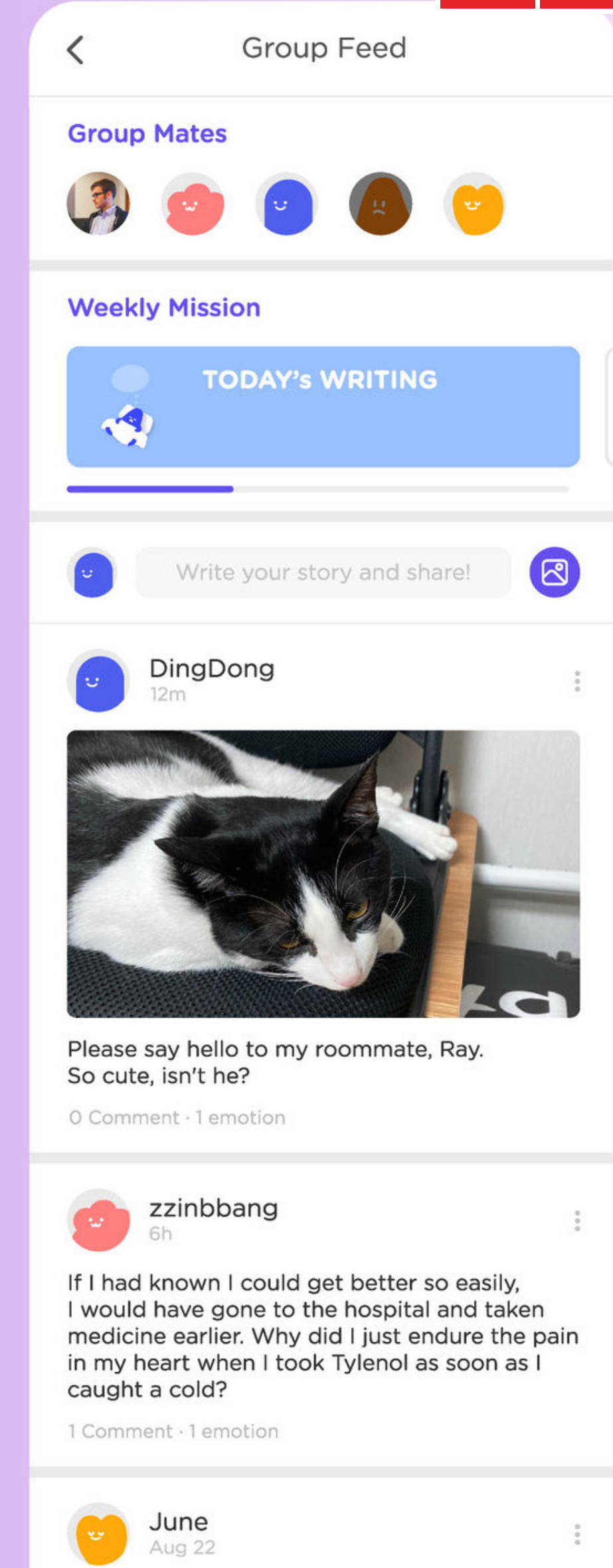
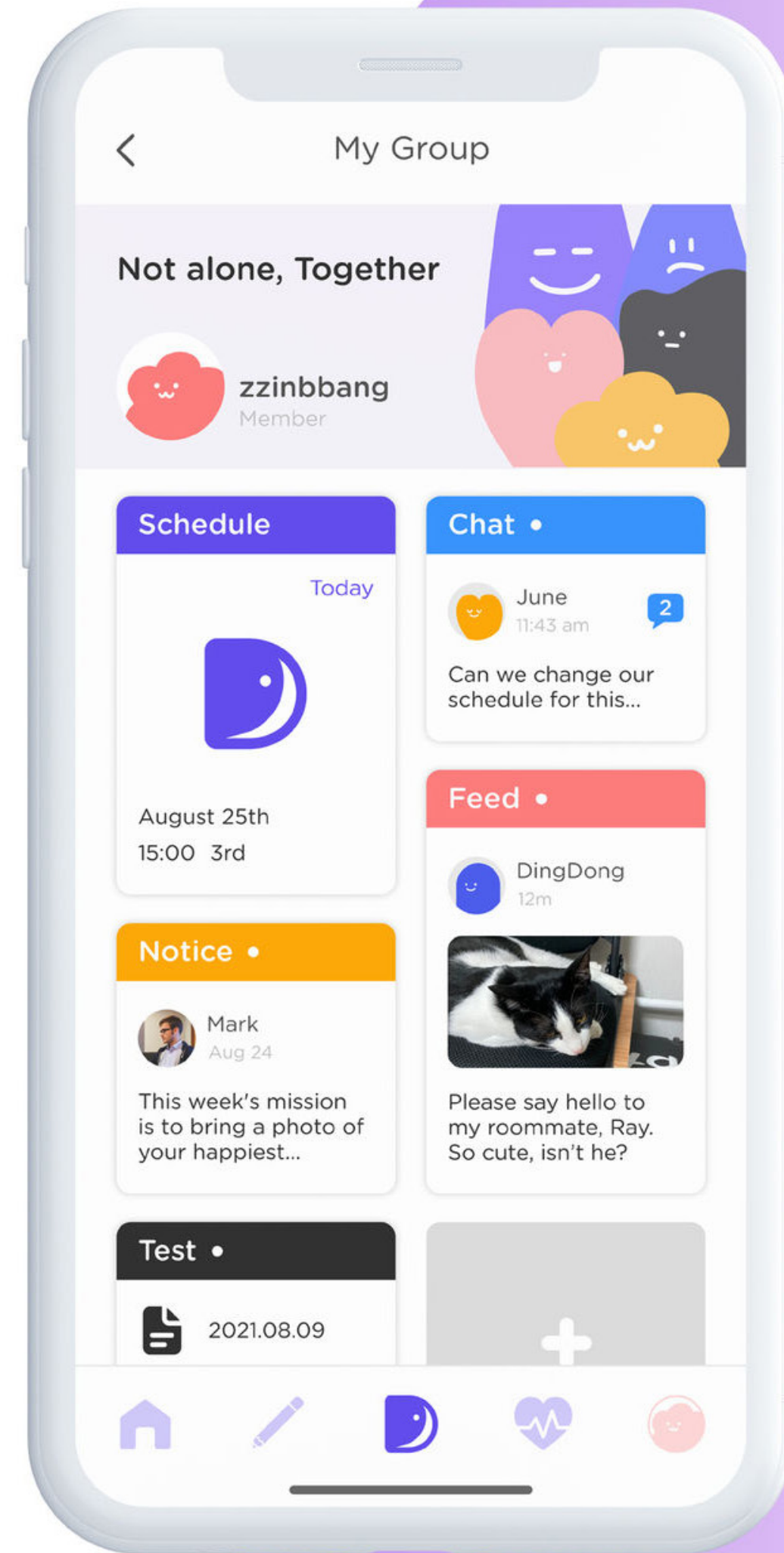
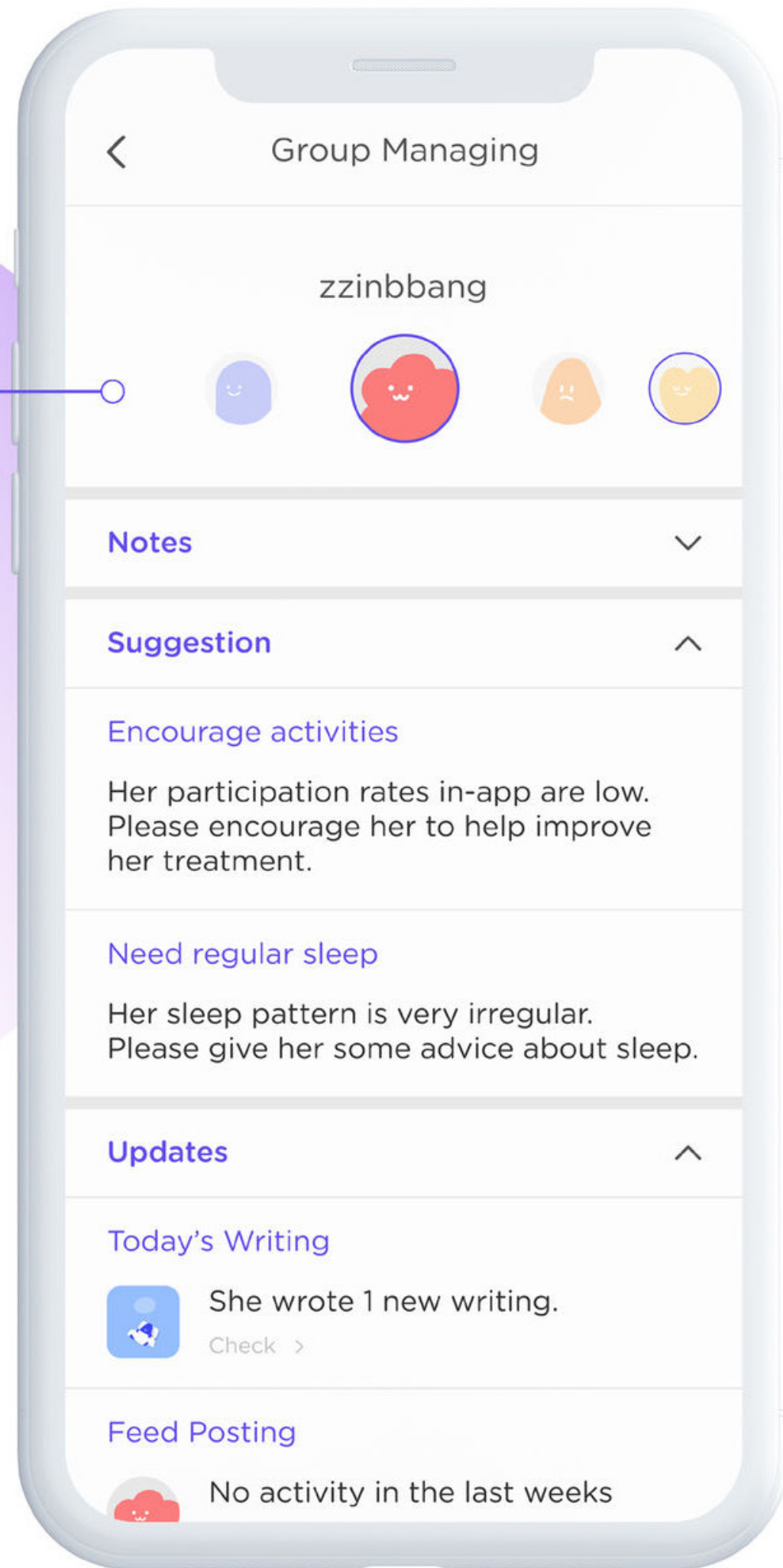
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03 DADLE

DADLE is a platform that helps users overcome depression through online group therapy and activities. Based on a user's psychological test results and preferences, the platform recommends groups with similar challenges and a therapist with relevant expertise to increase the efficacy of the therapy. The platform also helps fight the stigma around depression and its treatment, which is still a prevalent attitude in Korea.

03

3 Challenges

The pandemic advanced the need for a differentiated handling of health-related knowledge.

Digital and real-digital offerings are designed to collect information on the state of one's health and show it in an appealing way.

The pandemic advanced a holistic health perspective: individual, social, mental and material factors are considered equally and can advance each other.

Labor shortages, supply bottlenecks and a growing demand for psychological care are making new solutions for mental health necessary.

3 Solutions

Wearables that focus on the individual are being supplemented by body data tracking products that are integrated in the living space. Health monitoring is becoming a new aspect of smart homes. Consequently, the purpose of data tracking is also changing: it's not the individual person being monitored but instead the health quality of the surroundings.

With healing architecture, the surroundings are specifically designed to have a positive effect on health. Furniture facilitates healthy movement and posture, smart systems regulate the climate of a room in sync with one's natural biorhythm.

Digital spaces are increasingly integrating offerings designed to actively promote and maintain the well-being of their users. Health apps can help bridge staff shortages and supply bottlenecks in healthcare. Health games motivate people to adopt health-promoting behaviors or convey health information in an entertaining way.

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a Photo of an island in the sky covered in skyscrapers



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As intersections of the globalized world society, cities function as workshops of innovation for social justice, innovative technologies and new forms of living together.



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EXECUTIVE SUMMARY

Cities offer manifold opportunities to work and develop, thus attracting many people from the rural surrounding areas.

As cities become denser, they become more complex and dynamic, presenting both global challenges and the creative potential to solve them.

Third places are the core of any lively neighborhood: they strengthen the community and foster a sense of belonging. As public spaces outside of our homes and workspaces, third places create a space for social interaction, sports and leisure activities.

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Adaptability is an essential design principle, for example with elastic floor plans providing apartments that can be adjusted to changing needs. This approach creates elastic cities that interpret the built environment as a material, social and ecological system, which can be adjusted to suit changing internal and external circumstances.

The impact of the climate crisis has changed the way cities are viewed, with urban areas now seen as habitats and complex ecosystems that support not only humans but also animals and insects.

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The power of cities

The urbanization megatrend describes the global growth of urban spaces. Cities offer manifold opportunities to work and develop, thus attracting many people from the rural surrounding areas. The more cities grow and densify, the more they turn into hypercomplex and dynamic systems. Cities, as junctions of a globalized economy, are political stakeholders. Often, the influence they radiate can be felt on a global scale.

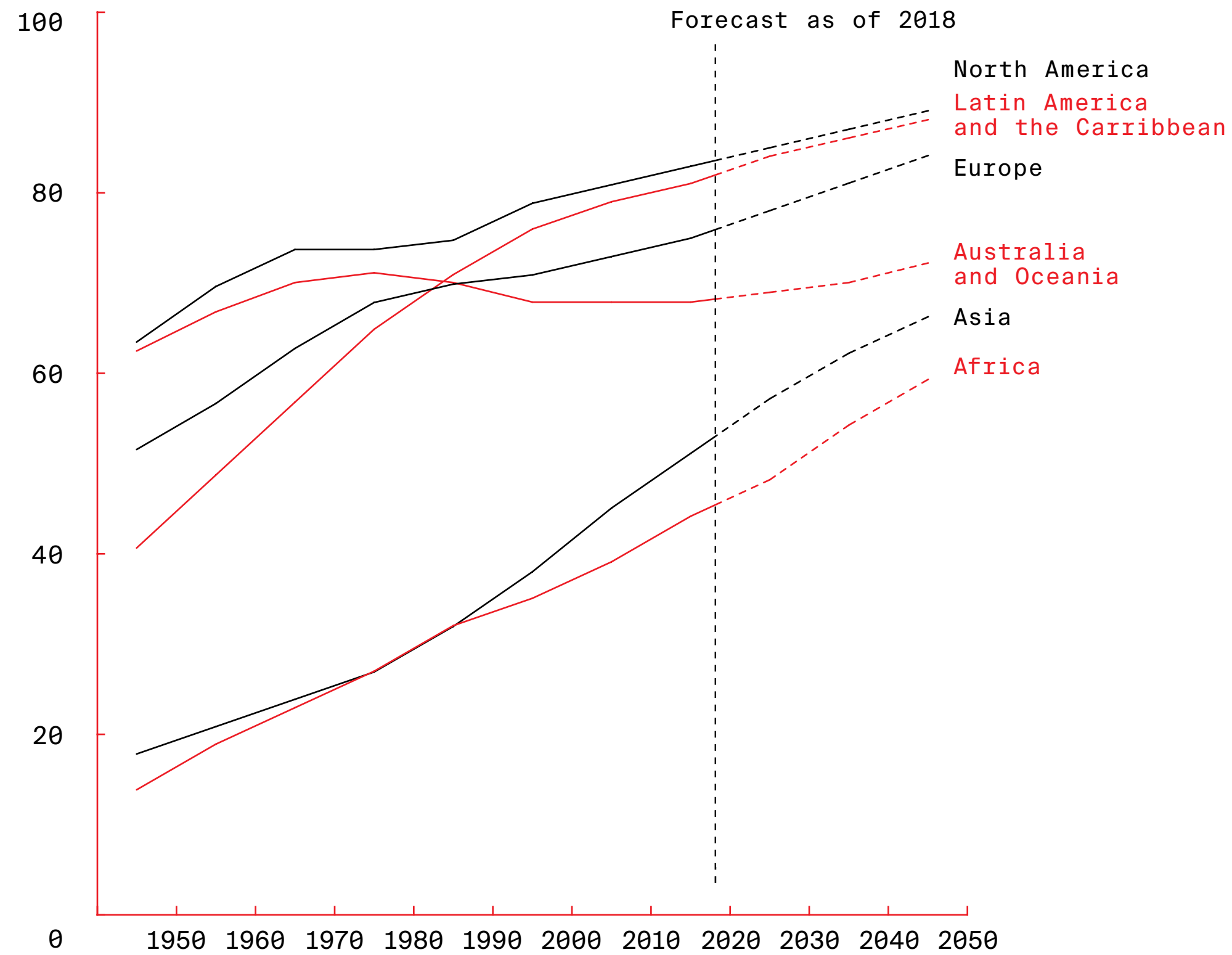
Global challenges and also the creative potential to solve these are concentrated in cities. This leads to the serious consequences of the climate crisis being magnified. However, targeted measures are also able to address and relieve an especially large number of people in the urban context.

Social justice, the future of labor, family life and mobility are constantly being renegotiated in metropolises – the city becomes a place for progressive ways to live as well as a place for technological and social innovations.

Cities are appealing because they offer many opportunities to develop. Large cities offer various options to those wanting to change their job, place of residence or way of life. Cities promote **multigraphies**  – and the inconsistent curricula vitae of their residents, in turn, require the cities to be even more flexible and adaptable. These cities become volatile places that adapt elastically and flexibly to the changing needs of their residents.

The future is urban

Share of population in cities (in percent)



Source: United Nations

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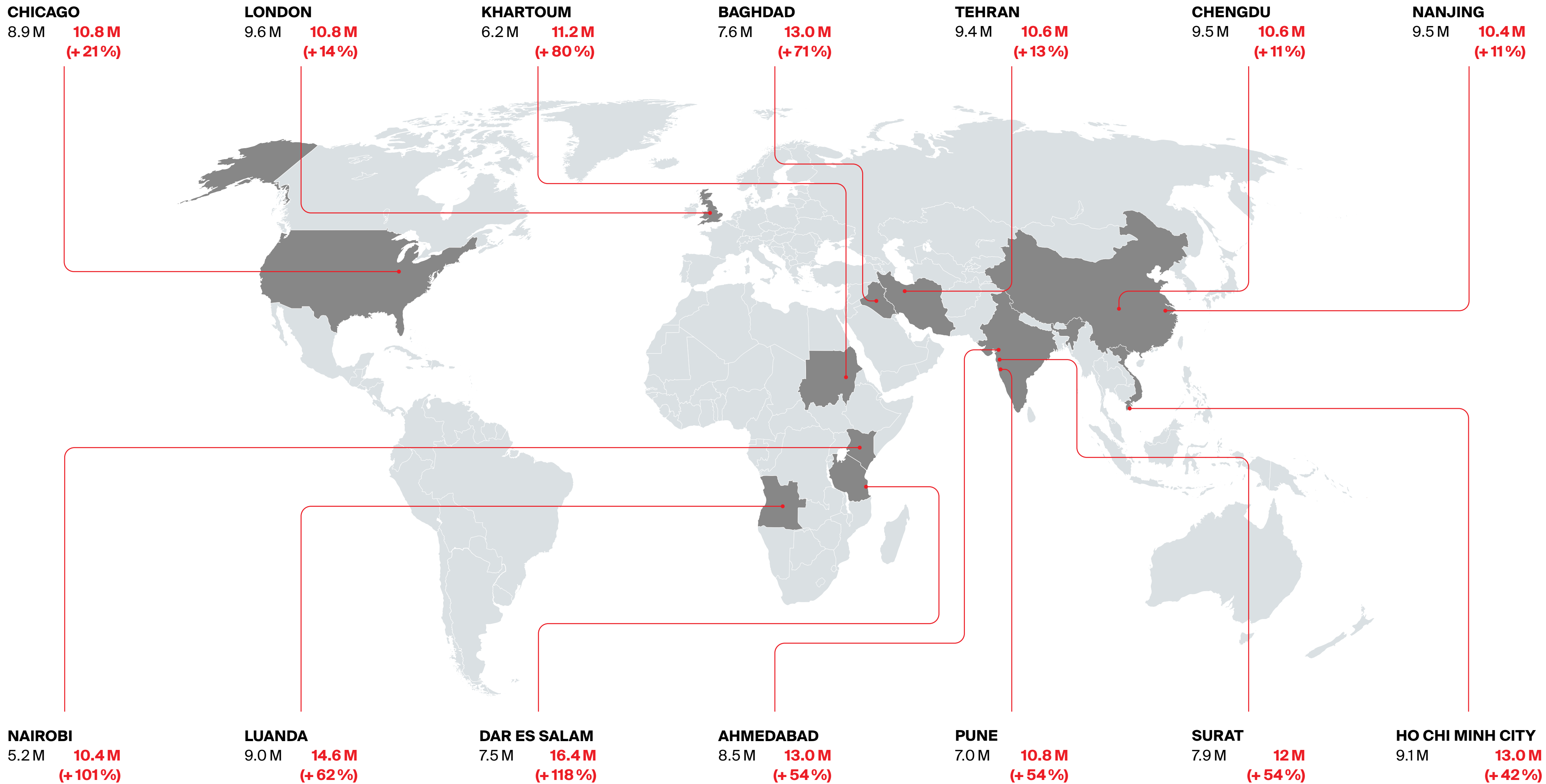
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GLOBAL CHALLENGES
AS WELL AS THE CREATIVE
POTENTIAL TO SOLVE THEM
ARE CONCENTRATED IN CITIES.



These will be the world's next megacities

Population growth of the next cities expected to hit 10 million+ people by 2050 (33 cities already have megacity status).



Source: "Ecological Threat Report: 2022" by the Institute for Economics & Peace

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Cities and villages learn from each other

The past years have shown a countertrend to unhinged urbanization. Especially many European and North American cities are experiencing city-to-country migration. From a historical perspective, this turn of events is nothing new: preferences for either the city or the countryside shift back and forth time and again. In today's urban spaces, there are many ways of living that can only be accomplished with great difficulty: living space is almost impossible to afford and often too small for families. (Germerott, 2023; Gavin, 2022) The COVID-19 pandemic further accelerated this development: the nature and vastness and the reduced number of restrictions outside of the city became favorable – and being able to work from home, as well as the increase in cultural offerings due to digitalization, relativized the disadvantages of country life.

With this new dynamic, the social topographies of the city and countryside have become part of a recursive loop. An increasing number of “village-like” structures, containing hybrid functions and co-living concepts, are accruing in large cities. Small city districts with village-like structures are arising and are, once again, being inhabited by social life: more and more offerings promote **mutual welfare** [↗](#) and a neighborly community. On the other hand, concepts that originated in cities, such as **sharing services** [↗](#), **delivery services** [↗](#) and co-working spaces, are now becoming more and more popular in villages.

In short: rural structures are being urbanized and metropolitan structures are becoming more rural. This conversion process is what we call ‘rurbanization’ – the rural redefinition of urbanization.

Co-living: People's biographies have developed into multigraphies. Last but not least, this presents itself in the way people live together: new collectives, communities and neighborhood networks are being created everywhere – a development which was only able to arise because of individualization.

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RURAL STRUCTURES ARE BEING URBANIZED AND METROPOLITAN STRUCTURES ARE BECOMING MORE RURAL. THIS CONVERSION PROCESS IS WHAT WE CALL RURBANIZATION – THE RURAL REDEFINITION OF URBANIZATION.



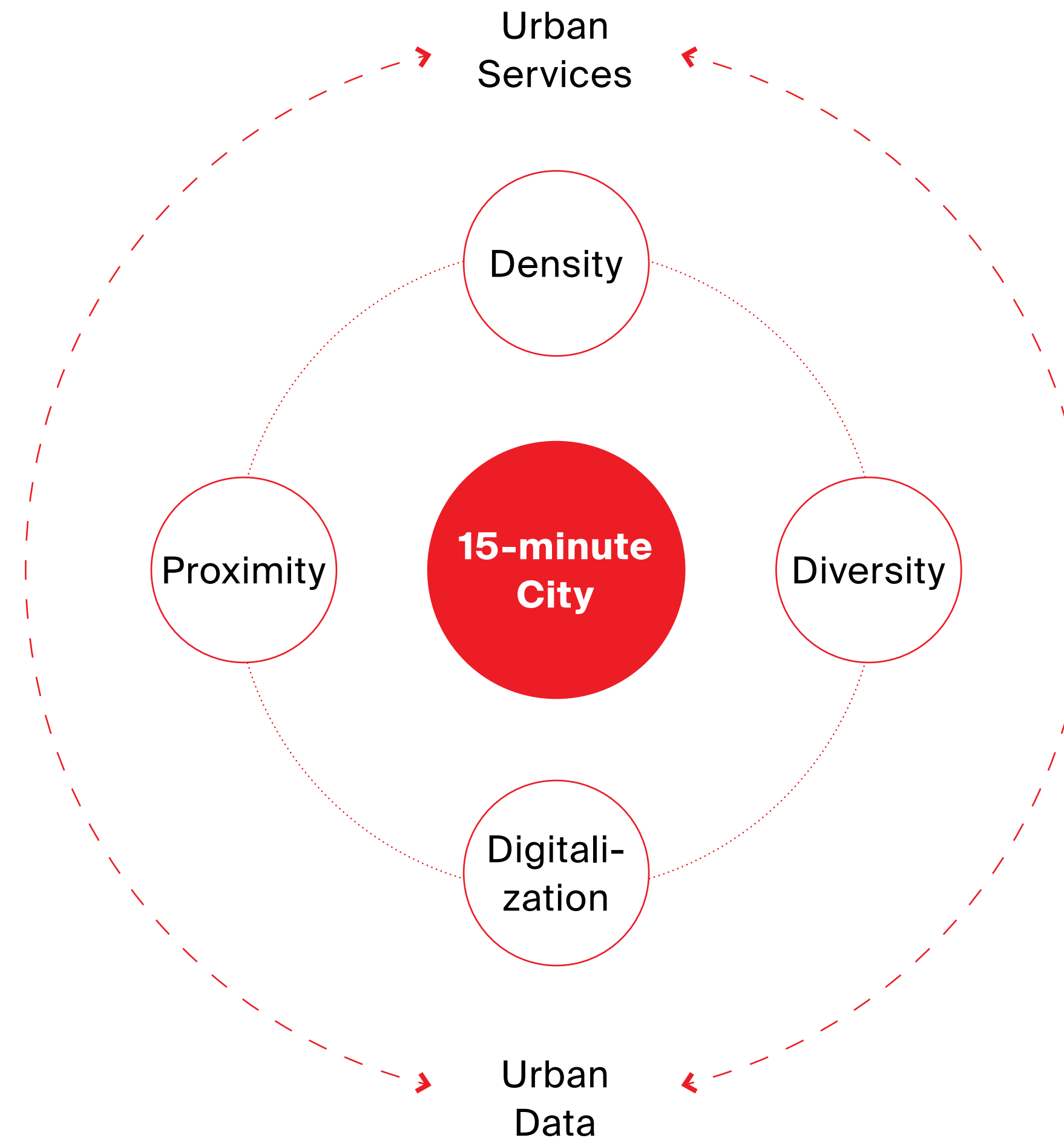
Short pathways, long-term effect

The structures of the **15-minute city** are a main prerequisite for **urbanization** to take place. All fundamental needs, such as access to public transportation, shopping opportunities, schools, parks, medical institutions, workplaces and leisure activities, can be fulfilled without having to travel more than 15 minutes on foot.

A city neighborhood meeting the criteria of this concept is characterized by a high density of apartments and a wide range of different ways to make use of public space. A sufficient number of bike and foot paths and a good connection to public transportation promote **mobility** ↗ within the neighborhood.

One substantial way to design public spaces in a **15-minute city** is to create attractive dwellings that can be used by residents and visitors alike. Public squares, parks and green spaces offer room for relaxation and can also be used to host local parties and neighborhood events.

In a 15-minute city, space has to be segmented and decentralized in such a way to ensure that all necessary areas of everyday life are accessible on foot or by bike within 15 minutes: places to shop, doctors, educational institutions, public authorities, sports facilities, local recreational areas and public transportation have to be reachable from everywhere within a short amount of time.



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Welfare becomes a design principle

Public space is a crucial factor for the quality of life in cities. However, more often than not, it is solely treated as a transit zone for traffic and designed to that end. In contrast to the design paradigm of the car city, the **caring city** sets forth the principle of welfare.

A public space designed with care not only offers protection from the adversities of the weather but also creates a health-promoting environment. Instead of polluting, this space cleanses the air and water and encourages social interactions and the welfare of all creatures sojourning within. Life in the neighborhood is seen and designed as an ecosystem. As a **habitat** , offering room for diversity, the public space in the caring city adapts to the seasons and to its residents: in summer, it offers cooling shade; in winter, it provides protection from the wind and rain. The niches and free spaces give way to diversity, while opportunities to co-design boost the imagination of its residents and their creative collaboration. Those wanting to frolic can use this space as a playground, while those looking for a place to relax will find a haven of tranquility.

Examples:

[Rooftop orchestra – a garden to play sound,](#)

[Tokyo, Japan](#)

[First and Broadway Park \(FAB Park\),](#)

[Los Angeles, USA](#)

[Catharrijnesingel, Utrecht, Netherlands](#)

A public space designed with care not only provides a protected space from inclement weather but also an environment that is beneficial for health.

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Whether we are talking about the design of furniture and services or of entire spaces and neighborhoods — urban design has an integrating function: it promotes encounters, offers niches for self-development and constantly adapts to the ever-changing needs of its residents.



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Third places are the key to a vibrant neighborhood

Third places are the heart of a vibrant neighborhood: they strengthen the community and promote the sense of belonging. As public spaces that are used as a place to stay at outside of the home and workspace, third places create room for social interaction, sports and leisure activities.

Third places can also provide relief from crowded living conditions, as can be seen in the versatile parks of Chinese megacities. (Wang et al., 2021) A comfortable and welcoming atmosphere invites people to come and spend time, and it creates a space in which one can form new relationships and friendships. Often it is precisely these third places that make a city feel like home.

The home base of the future is everywhere. Third places are everything that occurs between being at home and at work: waiting areas, shopping malls, beer gardens, coffee houses, modern libraries, accessible and welcoming places that enable an informal exchange and a casual stay. In a mobile society, these places are gaining significance and are thus being confronted more and more with the demands of their users.

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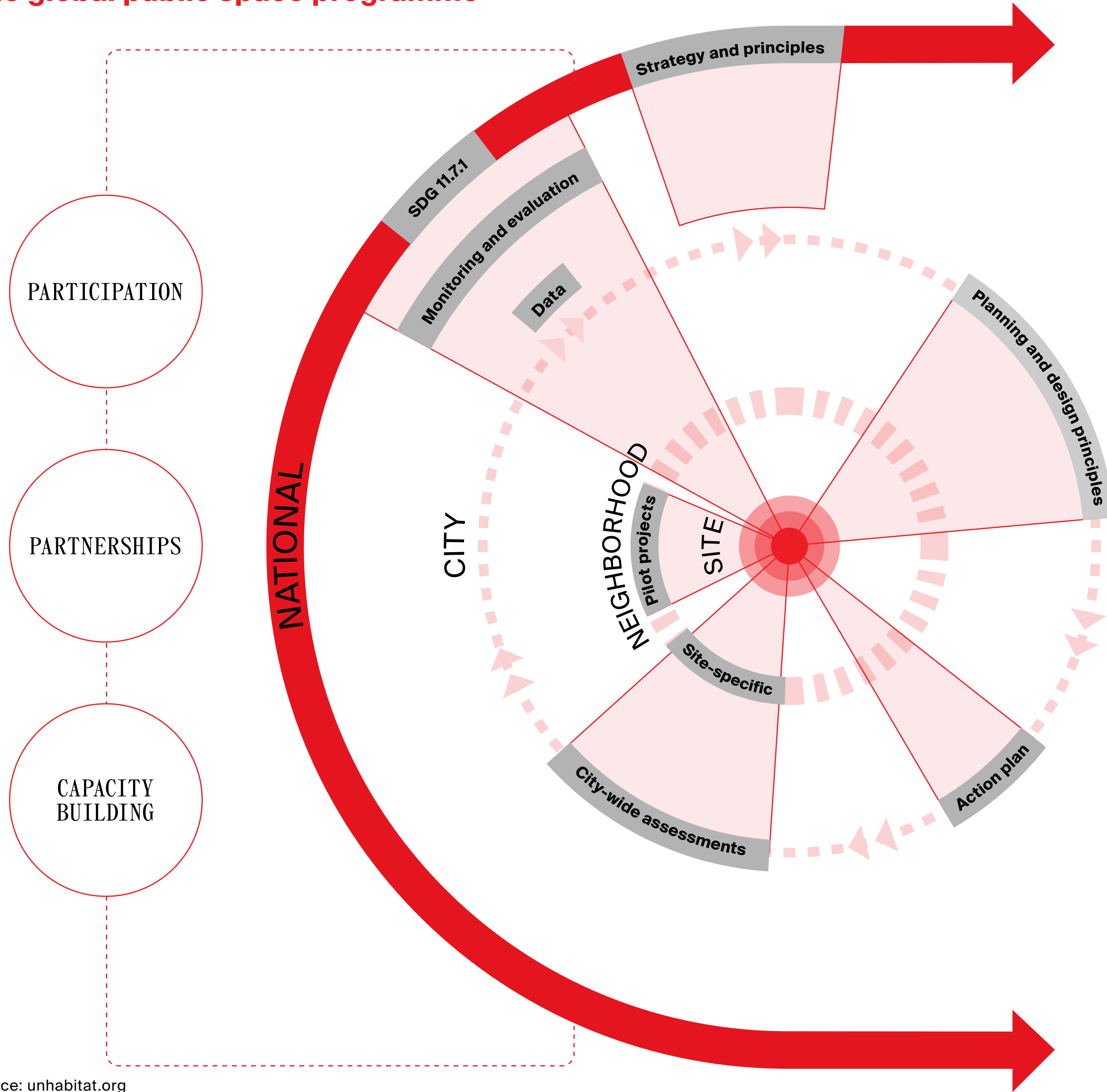
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The global public space programme

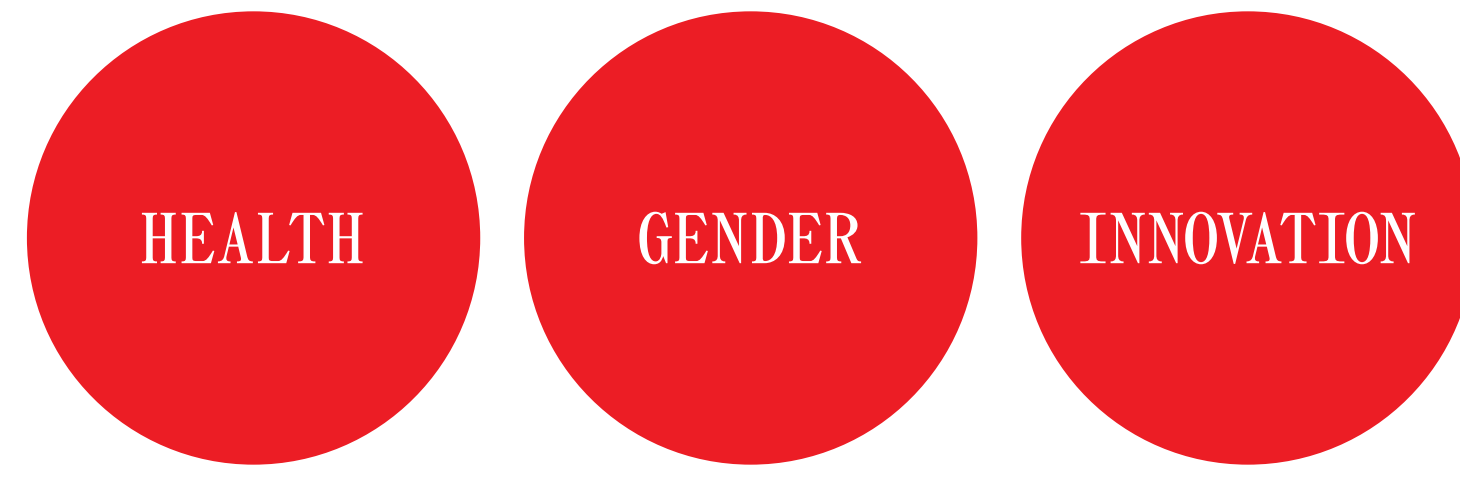
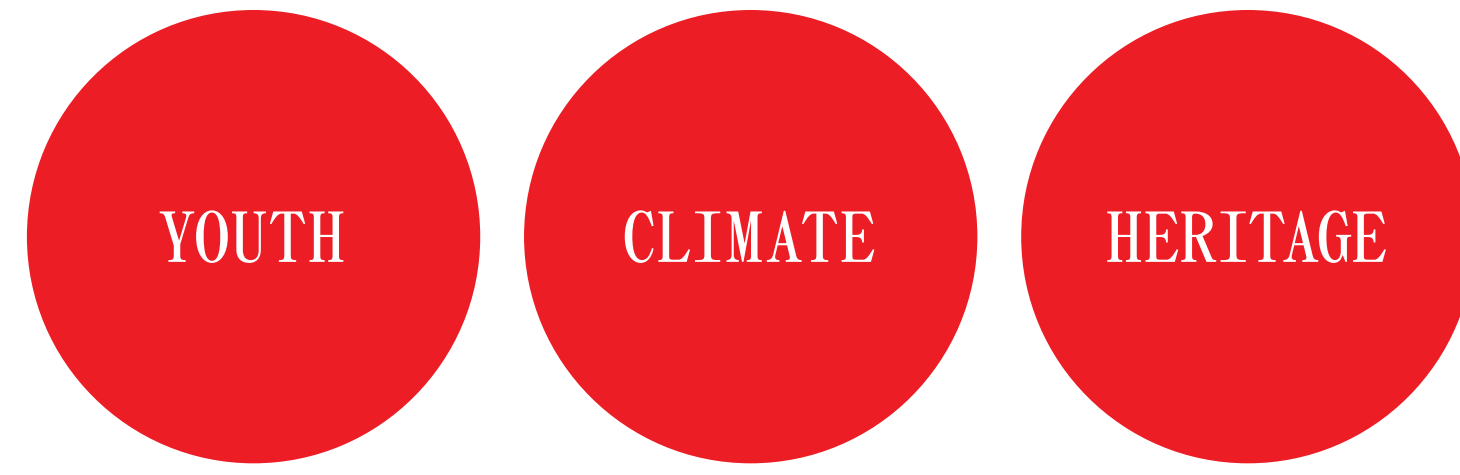


PARTICIPATION

PARTNERSHIPS

CAPACITY BUILDING

Source: unhabitat.org



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Three characteristics that make third places successful

The oldest predecessor of third places is likely the market square. Even in the cultures of antiquity, it had already taken on a characteristic role in urban life as a place for trade, politics and culture. (Williams, Hipp, 2019)

Over the course of centuries, a wide range of different public spaces have been added: parks, libraries, university grounds, pedestrian zones, shopping malls, co-working and maker spaces serve as buffer areas between the home and the workplace. In addition, they offer room for social encounters – especially for groups of people who would otherwise have no points of contact.

The following characteristics make for a successful third place:

Good accessibility The location is well connected and can be accessed on foot, by car or via public transportation, insuring that people can get there easily and in a short amount of time.

Various activities People and their wants concerning a specific place are diverse. The broader the range of activities offered at a site, the more people will feel comfortable there. This could include, for instance, cafés, bars, restaurants, parks, libraries and shopping opportunities.

Security Only public spaces which are able to convey a feeling of security will have a welcoming effect. In this respect, both good lighting concepts and well-designed city furniture that is easy to clean but difficult to damage are crucial.

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Welcoming design counters hostile architecture

One main characteristic of third places is that they function as a fall-back for people who are lonely or who have fallen through the social safety net. In the UK, warm banks offer a warm place to stay for people who can no longer afford increasing heating costs. (Enkin, 2022; Shine, 2022) Libraries all over the world fulfil a similar task. They not only provide access to knowledge but are also used by many people as a safe haven and a place to warm up.

Even during the turn of the millennium, people were still trying to separate this characteristic from third places: in keeping with the trend of hostile architecture, parks, benches, waiting rooms and the architecture of city squares were designed to subtly suggest that people use them briefly and for specific purposes only. Moreover, uses such as skateboarding or sleeping were also discouraged. However, what was initially intended to be a service to public security often had the opposite effect: places designed to exclude and not welcome are more often vandalized – and our sense of security diminishes when there are only a few people in a space. This led to locations becoming vacant and deserted.

Today, public spaces frequently offer a specifically inclusive overture, such as **Nike's Public Sports Park** in Tokyo. Instead of solely avoiding bad or destructive behavior, the design focuses on positive feedback mechanisms that encourage everyone to take responsibility for the quality of the time spent on site.

Open to all, **Nike's Public Sports Park** in Tokyo features basketball courts, skateboard area and track and field provides areas in particular for sports activities that are not met with kind eyes in other public spaces.



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01 Cité Fertile

Establishing the Cité Fertile on the grounds of a former goods station in Pantin, a city located northeast of Paris created an ecological place for social encounters. At this temporary location intended as a social experiment, people can develop personally regardless of age, interests or gender. A small café, craft beer breweries, green spaces and gardens with bee colonies offer places to linger. Art exhibitions, concerts and lectures provide a cultural exchange. Flea markets frequently take place in front of the main building – without stall fees so that people with less income can also sell their goods.

02 Copenhagen Islands

Copenhagen Islands is a park comprised of modular islands created from recycled materials. They were built implementing traditional wooden boat-building techniques. These floating islands provide people with a place to relax and, at the same time, offer animals a place of refuge. Endemic plants promote biodiversity on the islands, and the islands provide new habitats for creatures living below the water's surface. The project signifies how cities can adapt in times of climate change: in the course of climate change and in view of rising sea levels, places to stay on water will only become more relevant.

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03 Superkilen
For many years now, Superkilen in Copenhagen has been setting the bar for the design of public spaces. The park, which opened in 2012, is divided into three color-coded zones, each accommodating different activities. The design also takes the different wishes of the multicultural neighborhood into consideration. Over 100 objects from 60 cultures were selected in an intensive curation process, broadening the diversity of public space. A bike path and a footpath extend through the entire park, improving the infrastructure of the area, and myriad trees and plants promote biodiversity and the quality of time spent there.

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Third places taken a step further

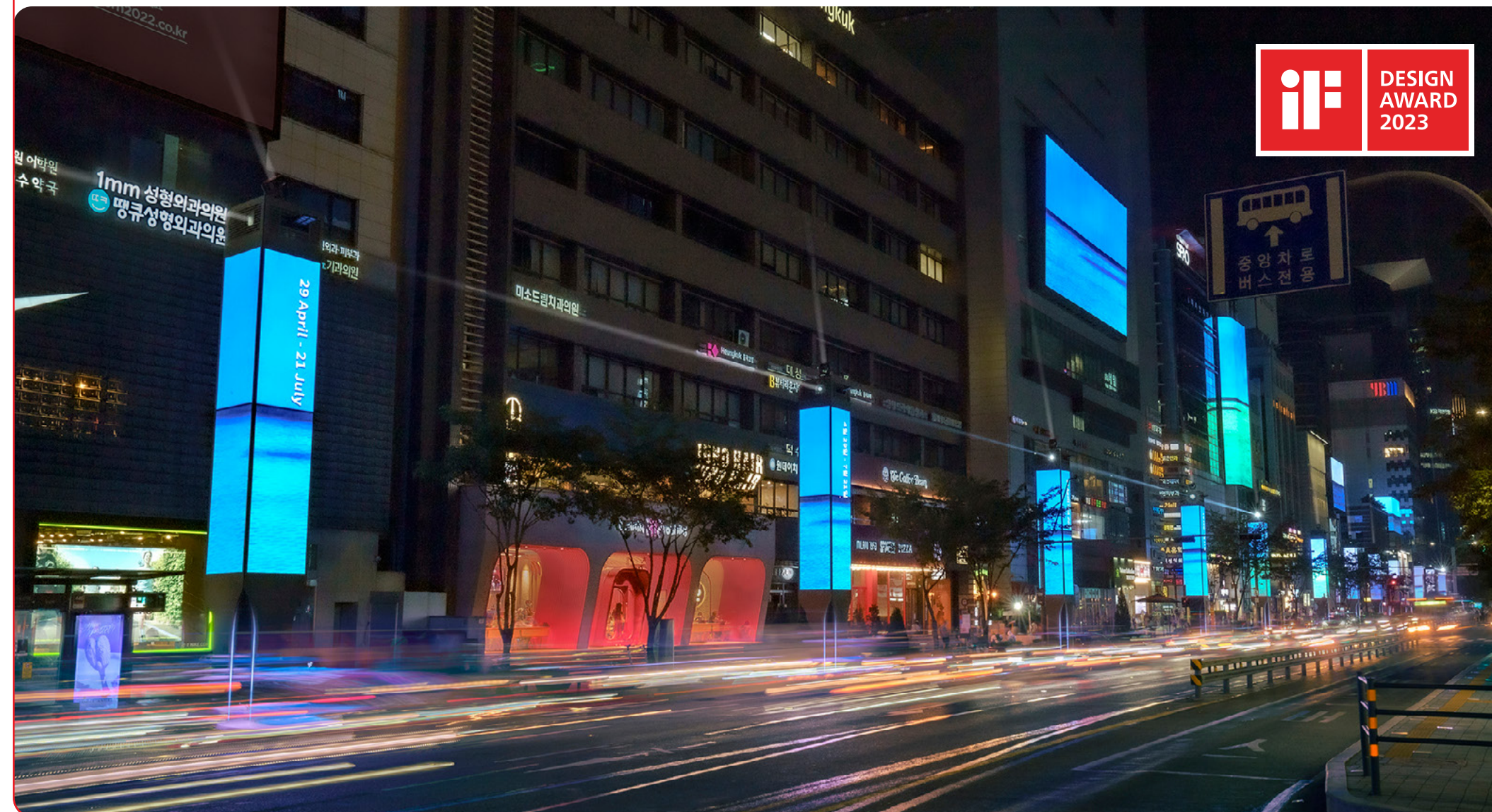
Parks and courts only represent part of the spectrum of third places.

Public third places are public spaces that invite as many different people as possible to come and spend time there. Their design sets them apart from their surroundings and encourages pro-social behavior. Examples: public green spaces, sport parks, squares.

Social third places are places where social events and gatherings take place. They are usually dedicated to a specific activity and contain structures that facilitate and promote social commitment. The people who meet there often share common interests. Examples: associations, sport clubs, libraries, event venues.

Virtual third places With the rise in digitalization and new possibilities offered by VR, AR and metaverses, the concept of third places can now be transferred to virtual space. This dissolves the notion of being bound to a specific location and makes third places accessible from anywhere in the world. New forms of community culture are being tested and developed here. Many virtual third places also address specific groups, such as the gaming community. Currently, many digital third places are bound to a business model, meaning they must finance themselves by either collecting data, advertising or selling products, in contrast to public spaces.

ARTSCAPE, a combination of art and landscape, is a public media art program that provides sensuous digital art content, various attractions, and public information, and is built as a landmark of a culture and art city that can provide the joy of walking to pedestrians. The public media art show program runs for five minutes three times every night. Starting with a collaboration with the MMCA (National Museum of Modern and Contemporary ART, Korea), the ARTSCAPE program selects fine art digital works by representative Korean artists every quarter and digitalized them in each display.



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New flexibility in urban centers

Cities are neither exclusively homogeneous nor static entities. Rather, they are made up of different rhythms (Burkhardt, 1980) and patterns. (Alexander, 1977) Within them, different dynamics and various social movements are superimposed on each other. The built surroundings serve as a frame for this and are perceived and used differently depending on the given context. Impacted by the megatrends **neo-ecology** , **connectivity**  and **silver society** , new concepts that account for these dynamics are being created.

Elastic cities interpret the built surroundings as a material, social and ecological system that can adapt to changing internal and external circumstances. Adaptability is becoming a new design principle. Elastic floor plans provide apartments that can adapt to biographical turning points and altered needs. Innovative, adaptable utilization and functionality concepts help to bridge the gap between the longevity of built infrastructure and the dynamics of human needs and environmental conditions. The shift to the elastic city changes the living machine into a living organism, unifying various functions besides being a place to work and a place to live and creating both social and ecological offerings.

Elastic cities that interpret the built environment as a material, social and ecological system, which can adapt to altered internal and external circumstances, are being created.

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01 Heijmans ONE
The project Heijmans ONE consists of several prefabricated wooden houses. These can be moved around flexibly, allowing them to simply be placed on vacant properties for a period of time and taken away again as needed. The prefabricated house was created in collaboration with architect Tim van der Grinten. It comprises two living levels, featuring a generously proportioned living room, a kitchen, a separate bedroom and a bathroom, as well as an outside terrace. With its high-quality implementation of the “flexi house”, this project is paving the way to not only think of living in the sense of permanent real estate.

02 DUS 3D Printed Urban Cabin
Another sustainable housing concept was created by DUS architects together with the development company, Aectual. By designing a tiny house built with 3D printing technology, a new solution for the constantly increasing housing issue, especially in cities, was further explored. The prototype cabin is located in a former industrial area in Amsterdam, aiming to transform a vast empty space into an urban getaway. The tiny house unit contains its own pocket park and outdoor bathtub. Made entirely of bio-plastic, the cabin can be fully recycled and reprinted at any time.

01 02

Pop-up, participation and plurality

Elasticity takes the temporal, social and factual changeability of drafts into consideration. The great skill of elastic design is to be mindful of more than one perspective and more than one interest group. Pop-up designs are one way to flexibly adapt to changing requirements in one location. (Gonzalez Angue, 2022)

Pop-up parks forgo the lengthy planning process that normally precedes parks. Pop-up parks can achieve a great effect in a short time period and at low cost. Their implementation is a favored method to gain a better understanding of the needs of the people living in a neighborhood. They are often planned as participation projects to encourage social exchange within an immediate neighborhood.

Pop-up bike paths enable the consequences of mobility planning measures to be tested before they are implemented permanently. This often helps to better mediate between conflicts of interest that arise between residents, shop owners and car drivers.

Pop-up events and pop-up culture projects help to make use of vacant shops in downtown areas, thus counteracting the obliteration of downtown areas. Though only engaging with a space for a short period of time, pop-up shops temporarily attract a large number of people. Temporary events and festivals upgrade locations and provide a vibrant cultural life, as well as temporarily increasing retail sales.

Pop-up housing can expand and be minimized again fast. Especially when many people seek refuge within a very short period of time – for example after natural disasters, fires or waves of migration – suitable infrastructures for great numbers of people can be created quickly with the help of pop-up architecture.

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01 Grätzloase, Vienna
The “Grätzloasen” (“Grätzl oases”) belong to all residents and foster ideas that make public spaces in Vienna more worth spending time in. Grätzloase is an initiative promoted by the City of Vienna and implemented by the association “Lokale Agenda 21 Wien”. It supports interested parties in the implementation of green parklets or “Junge Grätzl” in the city. In 2020, nearly 100 activities were held, despite COVID-19. In 2023, there are 106 Grätzloasen in Vienna. The goal is to create a city that is worth living in and equally shared, with neighborhoods that are socially heterogeneous and residents who take active part. “Grätzloasen”, which is Viennese for “living areas”, promote neighborhood life and social activities.

02 Street Moves, Sweden
The public initiative Street Moves enables residents in Stockholm, Gothenburg and Helsingborg to decide themselves how to use road space. The residents discuss the utilization in workshops – be it for use as parking, as a gathering space or a green space. This method is meant to improve the design of neighborhoods, tailoring them more precisely to their residents’ needs. The goal of this participative process is to transform the majority of Sweden’s cities into one-minute cities. The project is run by ArkDes, Sweden’s national center for architecture and design, and financed by Vinnova, Sweden’s Innovation Agency.

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03 Frankfurt Pavilion
The remit for the Frankfurt Book Fair was to design a temporary robust structure that, which could be easily dismantled, put into interim storage and later reassembled. The Frankfurt Pavilion is a great example of prefabricated modular architecture that is both beautiful and reusable.



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Living environment city: Resilient habitats of the future

The city not only provides a living space for humans, but also serves as the basis for life for various other creatures. Bees more often find blossoming plants on balconies, in court yards and in parks than they do in the surrounding countryside, which has become barren due to monocultures and the use of pesticides.

More and more frequently, the biodiversity of a neighborhood is already considered in the planning process – often, simple planning measures are enough to generate niches, nesting sites and food sources for various organisms. (Hauck, Weisser, 2021) Finally, this also has a positive impact on the neighborhood’s residents: the more plants and green spaces a neighborhood contains, the better the climatic conditions, air quality and sound reduction become. Additionally, the now perceptible effects of the climate crisis are noticeably lessened in terms of their impact by means of green spaces, façade and roof greening and the re-naturalization of nearby bodies of water. The City of Rotterdam is raising the bar with its ambitious “[Urban Roof Landscape](#)” program: a new city level, with plenty of green, garden projects and rooftop bars, is being created high above the city.

It is time to understand the city as a habitat in which human, biological and artificial circumstances refer to each other and coexist. Cities are no longer primarily viewed as compounds of built infrastructure, but instead as habitats and complex ecosystems.

Biodiversity School and Gymnasium, Boulogne Billancourt

The school building designed by Chartier Dalix in the township of Boulogne Billancourt shows that design which promotes the preservation of biodiversity in urban spaces also leads to a higher quality of the time people spend there. Besides the interlaced façade on which plants can grow, the main design element of the building is its accessible roof that features various vegetation zones. Students can use narrow paths to get to a tree island in the middle of the roof and experience animals and plants first-hand.



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Sponge cities for more climate resilience

One of the greatest challenges for cities worldwide is adapting to climate change and the altered **living conditions** [↗](#) that come with it. One main challenge is having to deal with water in a new way. While entire neighborhoods in some cities – such as in Jakarta, Ho Chi Minh City and Bangkok – are already underwater due to rising sea levels, other metropolises have to fight drought, heat and water scarcity. These circumstances have caused the groundwater level in many places to fall so low that the houses and streets built above it have cracked and are in danger of collapsing. (Deltares, 2013)

The concept of the **sponge city** is meant to offer a solution to this predicament by analyzing the natural water cycle on site and considering it in municipal planning processes. Open and unsealed ground surfaces can absorb rain more easily and use it to nurture trees and plants. This water can also be fed into water cisterns and then tapped for irrigation during droughts. Dense and location-appropriate cultivation of plants in public spaces has several advantages: tree roots quickly drain off the water into the ground, thus preventing floods after heavy rainfall. Treetops serve as windbreakers, preventing storm damage, and also lessening wind in urban canyons, thus upgrading the environment. The leaves of the plants provide shade, cool the ambient air through evaporation and filter CO₂ and particulate matter out of the air.

A sponge city is a city devised to passively absorb, cleanse and use rainfall in an environmentally friendly way. Its goal is to reduce runoff water. Rainwater, for example from rooftops, playgrounds and roof gardens, is passed on to trees, which absorb it. Water-permeable streets make cities safer – which is becoming more and more relevant in light of impending floods as a result of climate change.

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Fighting the heat

With the progression of global warming, cities are turning into heat islands as we speak: glass façades create a greenhouse effect, black asphalt absorbs sun energy and stone walls even store the heat overnight. The consistently rising number of air conditioning systems amplifies the problem further – though they provide cool interiors, these devices heat up the streets even more.

Innovative approaches are introducing new ways of cooling. Cooling systems based on the heat pump principle are especially promising because they are four times as effective as common devices. At the moment, Paris is putting ten large cooling systems into operation which use ground and river water to cool entire living and office areas when temperatures are high. An urban cooling system is in place as far as 30 meters below the French capital which cools sites such as the Louvre and many other large buildings with water from the Seine. The network currently stretches across an area of almost 89 kilometers. However, the long-term plan is to extend the system to over 252 kilometers in order to also cool schools, hospitals and metro stations. (Hofmann, 2022)

But the heat of the summer can also be stored and used: Denmark is pioneering seasonal [heat storage systems](#). These use the sun's energy in the summer to heat during winter. This involves the use of large sand and water basins, which heat up in the summer and provide households and companies with heat in winter.

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How to make a construction site climate friendly

Adapting to the climate alone is not enough to turn cities into resilient places of the future. As an industry, the building sector produces the most waste and requires plenty of resources. “Gray” energy, which arises as a result of the building process, is only rarely accounted for in energy balances. However, a city only qualifies as sustainable if its construction sites cause as few greenhouse gas emissions as possible and find ways to make efficient use of resources.

Urban mining Urban mining permits materials from infrastructure, buildings and goods to be used as sources for secondary resources. As opposed to waste management, this approach includes “the entirety of all durable goods in order to predict future mass flows”. (cf. Umweltbundesamt (German Environment Agency) 2022) This makes it possible to estimate when bound materials will be released again.

In the case of urban mining, planning processes and suitable service infrastructure engage in order to save resources and complete material cycles. Services such as **Concular** document the materials and building components in old buildings that are ready to be torn down and offer matchmaking for the resources needed.

Zero-emission construction site Construction sites are omnipresent in cities – and, sadly, they are also sources of environmental pollution and noise. However, with the realignment of building machinery manufacturers such as **JCB**, the production of electric construction site equipment has begun. In the future, excavators, bulldozers and wheel loaders will be powered electrically, which will not only lessen their emissions but will also make them significantly quieter.

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BEST PRACTICES



01 Moringa, Hamburg
The project Moringa by kadawittfeldarchitekten is being created in the Elbbrückenquartier of the Port of Hamburg and aims to become the first residential building in Germany that was constructed on the cradle-to-cradle principle. Three residential complexes are grouped around a green courtyard. The green spaces at and on top of the buildings serve as recreational spaces for visitors and residents. They also improve the air quality and biodiversity of the neighborhood. Vertical surfaces provide air cleansing and cooling, while horizontal surfaces primarily serve private and communal uses. As a socially integral project, Moringa offers a third of its apartments as subsidized housing and integrates co-living and co-working spaces as well as a kindergarten and various spaces for leisure activities. The materials used in the construction project are all recyclable and are implemented in such a way that they can be disassembled by type and reused.

02 Concular, Berlin
The start-up aims to support the building industry in developing a circular economy. With the help of a digital database, individual construction materials, modules and décor elements of existing buildings are recorded so that these parts can be brokered to other planned projects if the building is demolished.

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3 Challenges

Social and societal problems can become concentrated in cities: living space is often scarce and difficult to finance and does, on many occasions, not provide families with sufficient space to develop.

Because of the multigraphical lives of city dwellers, what's required of a city is subject to an ongoing change process: apartments that were initially too small may be too large only a few years later. And the function of public spaces is also continuously being renegotiated.

The consequences of climate change are raising the importance of the adaptability of cities. Many cities are turning into heat islands or are having to find new ways to use water to protect themselves in cases of floods or droughts.

3 Solutions

Third places offer additional spaces for self-development and social exchange. Their easy accessibility, wide range of services and design conveying a sense of security contribute to turning a neighborhood into a home.

Cities are material, social and ecological systems that can adapt to altered internal and external circumstances. Adaptability becomes a design principle: With elastic floor plans, apartments can adapt to changing needs at biographical turning points. Pop-up designs flexibly react and adjust to changing demands and allow for interaction with residents during the planning process.

While individual adaptations such as air conditioning systems can often act as problem amplifiers, systemic solutions can offer efficient adaptations to climate. Targeted greening, the formation of sponge cities and the purposeful use of water bodies make cities more resilient.

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a photo of an astronaut riding a horse

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MEGATREND MOBILITY

The world of mobility is in transition: digitalization, the shift to renewable energy and new lifestyles are driving a wave of innovation that is giving rise to all kinds of new services and offerings. But it isn't just the vehicles themselves that are adapting. The structures around them are also becoming adaptive, sustainable and connected.



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Demand for seamless mobility is growing alongside the increasing availability of different mobility options. Seamless mobility serves as a guiding concept: Digital connectivity makes it possible to book and plan various means of transportation through online platforms. In the ideal case, this does away with longer distances covered on foot and cuts down on the time needed to change trains, buses etc.

In the medium term, autonomous driving as a future scenario and connected driving are fundamentally changing what is expected of the driving experience. This leads to the emergence of new sharing services and a reimagining of vehicle interiors as spaces for work and leisure, with these undergoing a design upgrade.

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Adaptive infrastructures are required to support innovative mobility concepts, with elements serving networking functions, collecting data, and communicating with vehicles. Dynamic infrastructures also enable energy management tailored to vehicle requirements.

Increasing connectivity blurs the boundaries between vehicles and their surroundings. Vehicles can use sensors to assess their environment and interact with other road users, while new communication signals and projections integrate the surroundings, such as road surfaces, into vehicle communication.

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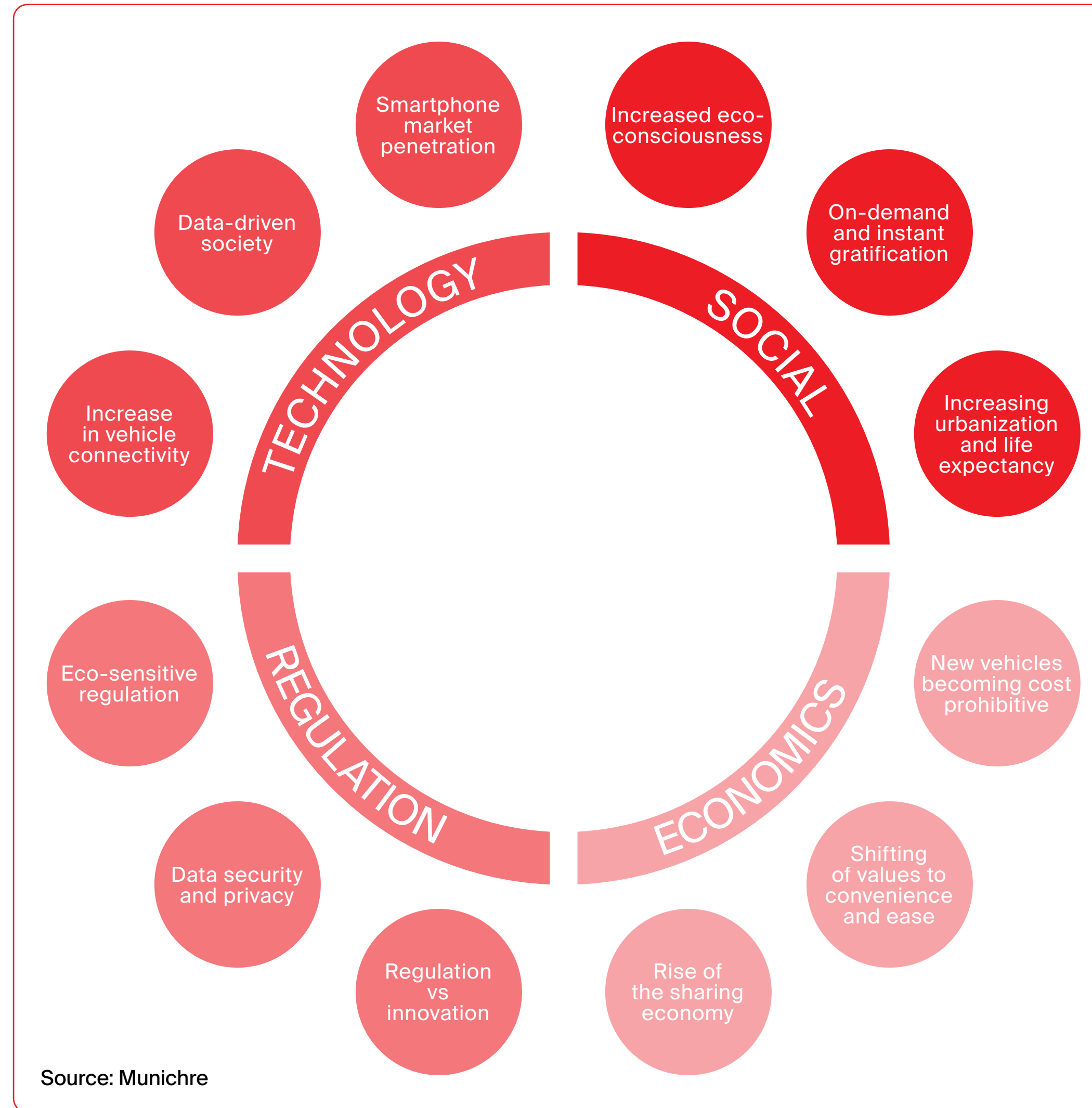
MOBILITY

Mobility in transition

The mobility megatrend describes the evolution of a mobile world culture, driven by increasingly multifaceted and differentiated mobility offerings. New products and services are changing and expanding perspectives regarding methods of transportation and their use. Getting from A to B is not the most important consideration, but instead whether and how work, life and leisure optimally dovetail. The mobility of tomorrow will be practical, sustainable, diverting and exciting. (Zukunftsinstitut, 2021)

As a result of the developments of the **urbanization** ↗ and **connectivity** ↗ megatrends, expectations in terms of mobility have undergone massive changes: mobility should be more efficient with regard to time and space, and should connect urban and rural areas without any detriment to the quality of life along the routes. Digitalization is ensuring a shift in mobility – some stretches are becoming superfluous as a result of improved communication. At the same time, on-line trade is giving rise to a booming delivery business. The impact of the neo-ecology megatrend is by no means slighter, along with the corresponding demand for mobility that is emission-free, sustainable and healthier.

What's required of future mobility is in part contradictory – there is hardly a service, product or solution approach that can satisfy all requirements simultaneously. But these very contradictions are resulting in new spaces for innovative products and services.



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It is not possible to achieve the transition in mobility with product innovations alone – it is just as important that people change their day-to-day lives and that there is an infrastructure which adapts to the new needs. Thus, e-mobility doesn't just require new vehicles that can deliver driving performance comparable with their alternative drives; what's also required is a suitable charging infrastructure to make longer rides with e-vehicles possible. (ICCT 2021) Sharing solutions, for instance, won't work until a custom of sharing has also established itself in day-to-day actions and shared products are treated with the same care as one treats one's own possessions. In addition, an infrastructure that is aligned with these services is similarly important – for example, if there are no spaces to park shared e-scooters, they will be left on sidewalks and will consequently become a nuisance to the neighborhood.

Much of the transportation infrastructure was constructed in the 20th century and was designed for the needs of those times. The result: on roads that were built for cars, cars, buses, delivery vehicles, bikes, e-bikes and scooters are now all vying for space.

One main challenge of the transition in mobility lies in finding a new way of dealing with the existing infrastructure. It is only with great effort that things that are already constructed and established can be adapted to suit the volatile needs of the future. Dynamic infrastructure elements will become necessary in the future to make road networks and route networks **smart and adaptive** [↗](#).

Dynamic infrastructure elements will become necessary in the future to make road networks and route networks smart and adaptive.

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Seamless mobility as a guiding concept for the mobility of the future

All roads lead to Rome – and, meanwhile, a whole range of extremely different means of transportation help us to structure the trip to suit our own needs.

But along with the myriad offerings, a new complexity is also emerging: every mobility offering can be booked as an individual solution – those wishing to switch between means of transportation often need a multitude of apps in order to obtain the necessary information and make the bookings. The drastic rise in mobility options available is paving the way for **seamless mobility**. The concept of seamless mobility describes seamless and integrated mobility solutions that link the different means of transportation with one another, making it possible for people to quickly and easily switch between various means of transportation.

The consolidated access to various transportation services – public transit, ride-sharing, car-sharing, bike-sharing and scooter-sharing, taxis and car rentals – in one single digital mobility offering continues to further dissolve borders between the individual offerings. For customers, this means that a comprehensive, seamless mobility experience is successively arising, which extends from trip planning and navigation all the way to booking, payments and notifications. In Europe, 93 percent rate a consolidated offering as important or very important; in China even 98 percent; in the USA 83 percent. (cf. Wyman 2022) The great majority of customers is even willing to pay more for access to a multimodal, seamless chain of mobility. The alternative to

having one's own car, i.e. situation-based access to rental vehicles, ride-sharing or car-sharing services, is consequently evolving into a convincing offering. Depending on the occasion, it is possible to choose the ideal vehicle, for example for special transport tasks or a weekend trip.

Seamless mobility aims to achieve seamless, integrated mobility for people and goods within a transportation system. As a result of the digital connection of all means of transportation with a centralized communication platform, changing from one means of transportation to another, route planning and the availability of information will be considerably easier. Seamless mobility will result in improved efficiency and trouble-free travel for users.

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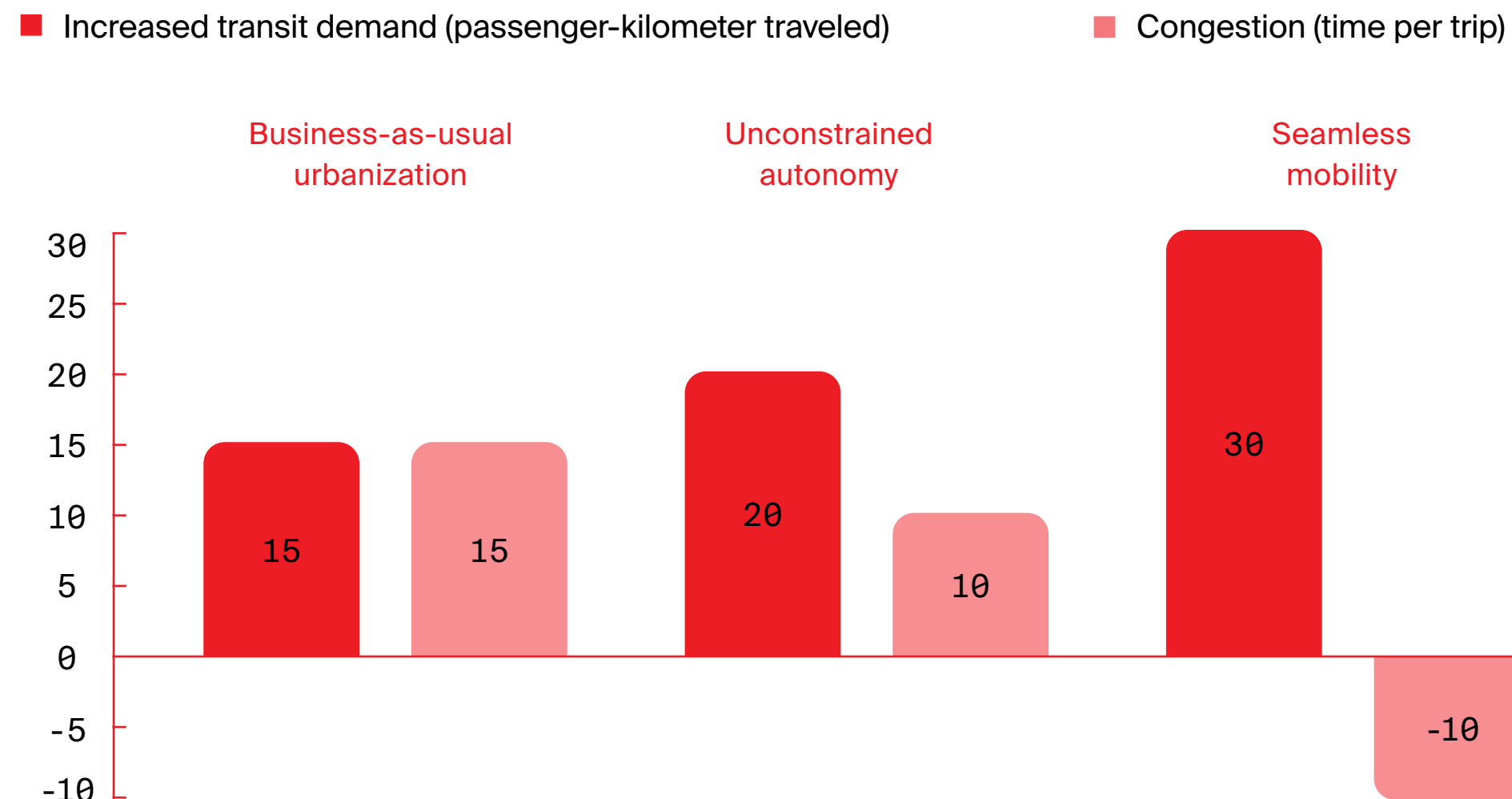
MOBILITY

The many potentials of seamless mobility

Sustainable mobility options such as shared bicycles, car-sharing and public transit profit in particular from seamless mobility. As a result of seamless transitions between means of transportation, it is possible to create personalized offerings that make walking long distances or waiting times unnecessary. Seamless mobility has the potential to get people to change their mobility behavior and at the same time contribute to reducing strain on roads and on the environment as well as improve the quality of life in cities.

Although demand rises in the seamless mobility scenario, congestion falls

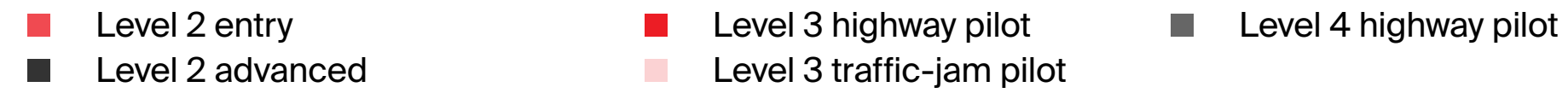
% change, 2018 – 30



Source: mckinsey.com

Level 2 features will be the main growth driver until 2025

Vehicles by autonomous driving features, % of total vehicle sales



Source: mckinsey.com

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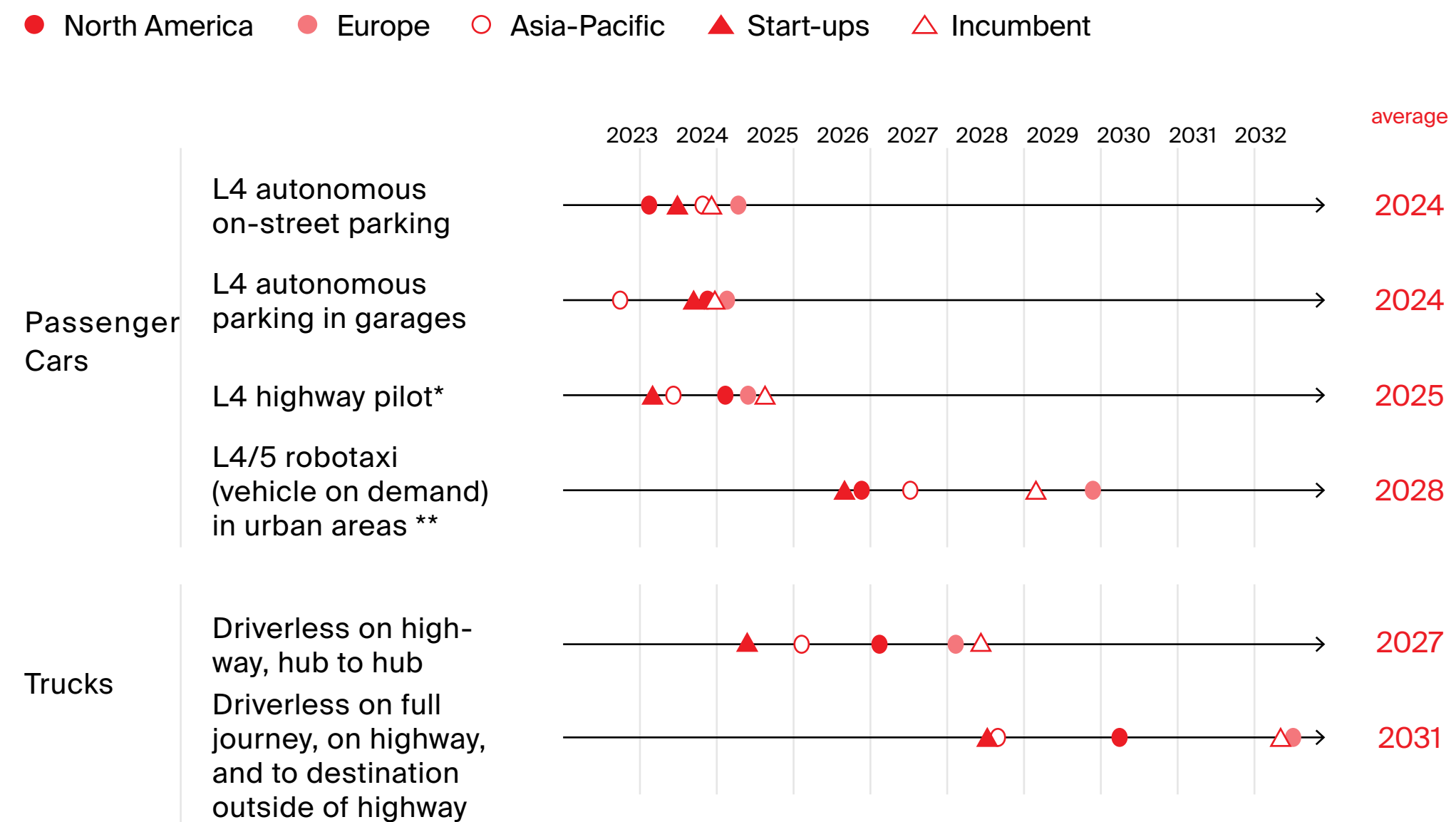
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Sci-fi vision takes to the streets: Autonomous driving breakthrough is imminent

What was long the stuff of sci-fi films now appears to be about to take off. Autonomous driving is taking to the streets in test programs around the world. Since 2022, a completely autonomous “robotaxi” has been driving through the streets of Seoul, taking passengers where they want to go. There are still numerous legal, ethical and technical questions still to be resolved in detail, but the successful test drives of individual enterprises and a huge wave of investment indicate the potential which lies in this development.

With autonomous driving, new forms of mobility services will become possible: “RoboCabs” combine pooling, sharing and calling a ride in a novel way and are generating a whole new range of **mobility services**. Public and private ride-sharing services are an attractive and efficient alternative to private forms of transportation. Autonomous vehicles are evolving into their own activity spaces – new features are being added to them serving as a means of getting from A to B. Thus, a ride in an autonomous vehicle can be used as a site for business meetings or a place for concentrated work or leisure activities.

Most survey respondents expect L4 use cases to emerge by 2024 or 2025



* Driver can use the time on highways for work or leisure activities using in-car or own solutions but needs to take over at highway exits.

** Robotaxis drive everywhere fully automated with no driver and accept and conduct transportation requests (goods, passengers), passenger can use the travel time for work or leisure activities.

Question: In your estimation, what is the rollout (i.e., commercial availability of vehicles / service) timeline for autonomous driving across use cases in your region?

Source: 75 respondents (North America, n = 31; Europe, n = 33; Asia-Pacific, n = 11)

Source: mckinsey.com

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New city structures for autonomous transportation

Meanwhile, entire cities are being designed on the basis of an autonomous transportation infrastructure. These cities often possess a model character, and their concept simultaneously combines several future hypotheses.

Xionang: Xionang is referred to as a “city without streets or cars”. This city is still in the planning stage, but it will be the Chinese ideal for an ambitious urban development program – a population of 5 million, development based on neighborhood centers (a so-called “15-minute city”) with the main means of transportation being micromobility, walking and autonomous mobility.

Neom City: Although the project is still being planned and is the subject of much controversy, Neom City is said to point to a future in which people at the wheel are passé. Around US \$500 billion will be invested in the implementation of an emissions-free mobility infrastructure. The core of the project is the LINE – a 170-km-long urban corridor with underground high-speed trains that connect the two ends of the city.



Woven City: Also in the planning stage is the Woven City, which is to be built starting in 2024 on the former site of the plant Toyota Motor East Japan Higashi-Fuji in the City of Susono in the Shizuoka Prefecture. As a real lab, the Woven City offers infrastructure for pedestrians, micromobility and autonomous driving. In the city, it is to be possible for people to live a normal life, on the one hand, while at the same time the site will serve as a test track for evaluating autonomous vehicles and services and perfecting them to the point of market maturity.



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AS A GLOBAL SOCIETY,
WE NEED TO COME TOGETHER
TO HEAL, GROW, LEARN AND
CREATE NEW POSSIBILITIES
FOR A COLLECTIVE FUTURE.

AKIO TOYODA

President of TOYOTA Motor Corporation



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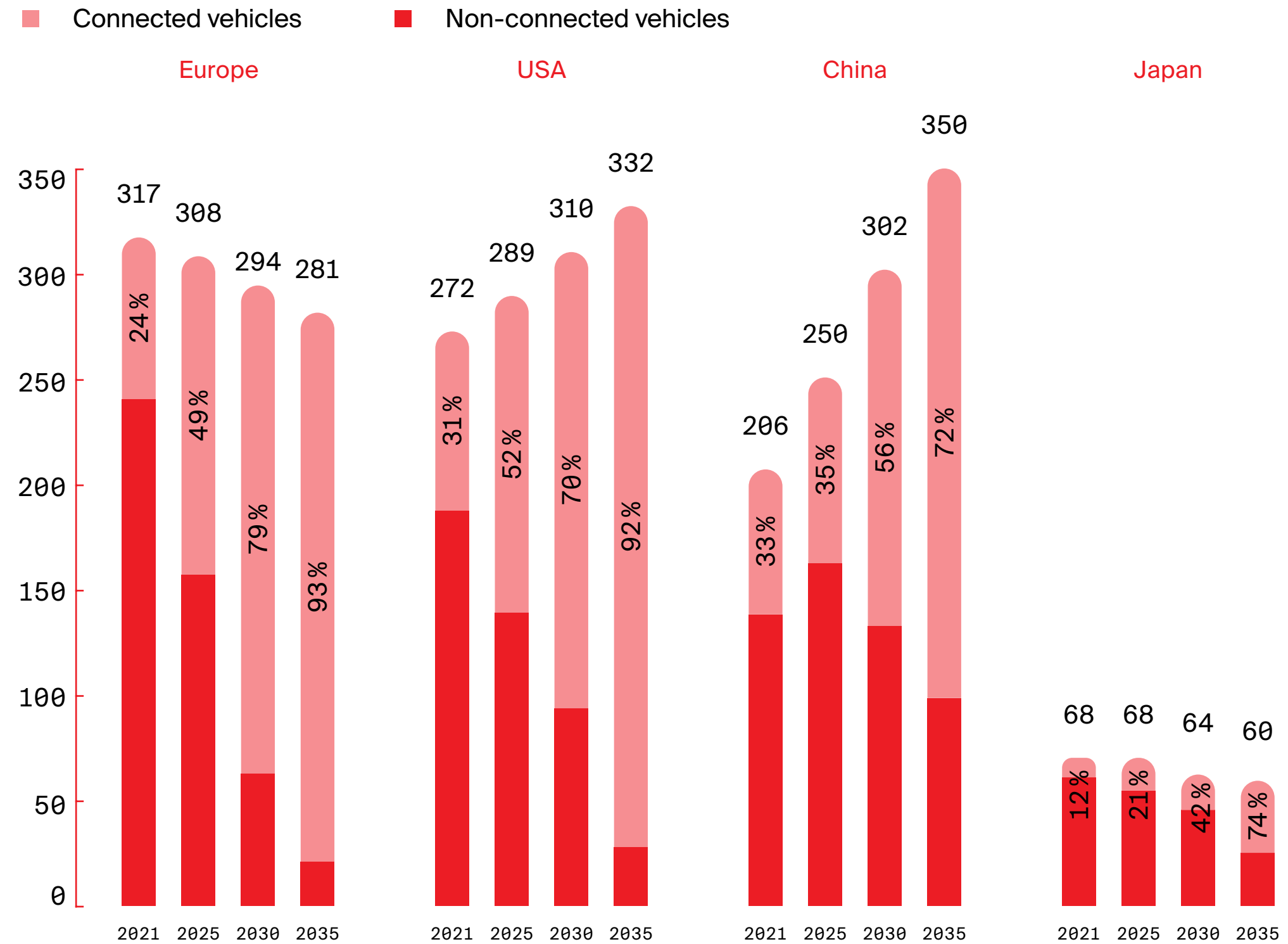
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Vehicles are part of a network

While the road to purely autonomous mobility is still a long one, connected driving already appears to have arrived in the present day. (PwC 2021) Increasing numbers of vehicles are equipped with SIM cards, which enable data to be exchanged with other vehicles (vehicle to vehicle or V2V) and with the surroundings (vehicle to X or V2X). As a result of the connection, it is possible to recognize dangerous situations early on, e.g. a looming collision, and prevent them by means of a warning or a direct reaction on the part of the vehicle. While V2V communication mainly refers to vehicle movements in relation to one another, in the case of V2X concepts, it is possible to forward accident alerts or detour information via infrastructure elements. The connection allows traffic congestion to be detected early and alternative route options to be communicated. In the future, such services could provide early indication of park-and-ride alternatives in cities at peak traffic times in order to reduce traffic in the city center at rush hour.

Connected mobility is currently being driven forward most of all by the automotive sector – but other vehicle types also stand to benefit from connectivity between road users and with the infrastructure. Sharing providers of micromobility vehicles are already using this connection today in order to ensure adequate vehicle use – many scooters turn themselves off when close to rivers in order to make throwing them into the water more difficult. Moreover, incentive systems could be created so that the scooters are left in a place that makes it easier for others to use them. An especially large field of innovation is resulting for the design of **connected infrastructure** ↗ elements.

Total vehicle fleet and connected car share in million units, %



Source: Strategy&

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Autonomous driving enables new forms of travel

With autonomous driving, a new form of driving experience is arising, initial traces of which are already evident in today's vehicles. Travelers view themselves more as passengers than as the driver of the vehicle. And unlike public transit, use of the autonomous vehicle is private and independent of other co-travelers: the vehicle interior is becoming a new space whose functions align with the needs of the passengers. Things no longer revolve around the vehicle and its symbolic value, but instead around the quality of the travel experience.

What was once a cockpit can now be designed as a versatile media landscape, for instance. Entertainment technologies boost the quality of the experience; in part, emotion detection is implemented in order to respond to the passengers' moods with lighting elements, fragrances and sounds. Materials and the design of the interior are critical in determining how passengers feel while using the vehicle. (cf. University of Southern Denmark et al. 2017; Crippa et al. 2012) Similar to the smartphone, connected vehicles consolidate a multitude of different services and are thus becoming their own service platform.

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Immobility as a countertrend promotes innovations

When the whole world temporarily came to a halt at the beginning of the COVID-19 pandemic, the importance of mobility was brought home to us in no uncertain terms. However, the pandemic also showed us the advantages that working from home and “staycations” (vacations at home) as well as day-to-day life in the immediate neighborhood have to offer. In the day-to-day work routine, virtual conference formats and remote maintenance proved to be cost-effective and time-saving alternatives to business travel. As a result of technological advances, **remote driving** ↗ is now also experiencing a boost. In the future, truck drivers and train operators will be able to do their work from an office and return home again quickly once the work is done.

In our personal lives, mindfulness and deceleration are ushering in a growing popularity of small-scale urban structures. The **15-minute city** ↗ and shorter distances on foot to **third places** ↗ in the quarter have become attractive offerings. The **metaverse** ↗ and new digital services, on the other hand, are making many day-to-day errands superfluous, such as a quick trip to the nearest store or meeting friends at the cinema.

For some years now, we have consequently seen two parallel developments: on the one hand, mobility is growing worldwide; but, at the same time, new forms of immobility and reduced mobility are becoming more and more relevant. In this tug of war between these contradictory developments, an innovation potential for new solutions is coming into being, not least of all in the field of **last-mile** ↗ logistics.

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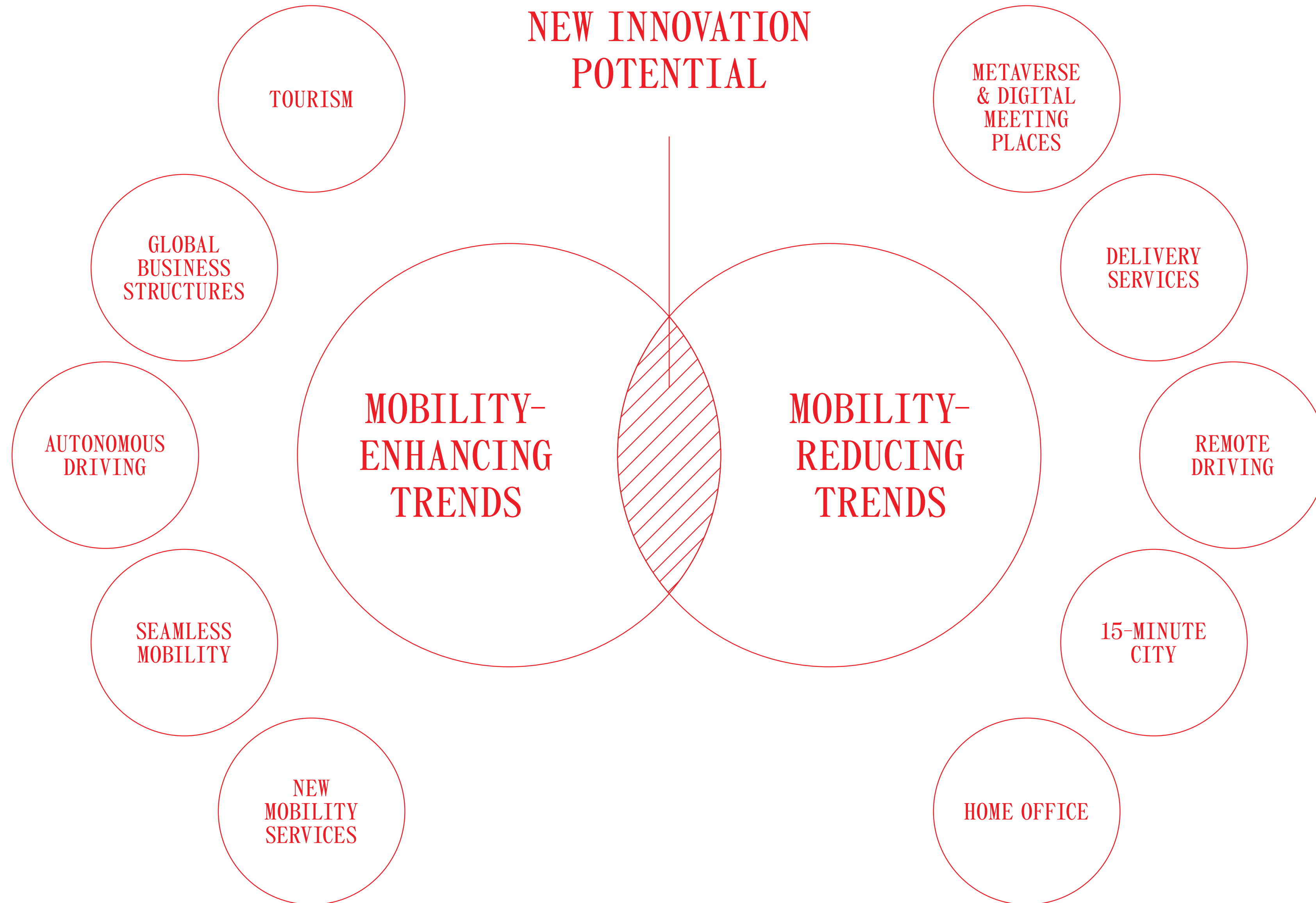
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NEW INNOVATION POTENTIAL



Source: ZKI

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The developments of the megatrend are a challenge for the vehicles as well as for the infrastructure in which they are embedded. Vehicles and infrastructures are combining to form one system; solutions are becoming adaptive and sustainable, and new ways of communication are being found.



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Adaptive systems for the mobility of the future

One main problem with innovative mobility concepts is that they are usually based on roads and infrastructures that were built in the 20th century and adapted to suit the circumstances of those times. But the challenges of our volatile present day require approaches that flexibly and adaptively react to changes in context. In the future, infrastructure elements such as signs and guardrails as well as traffic lights and street lights will increasingly be equipped with smart technology in order to agilely react to changes in traffic. With the use of screens and illumination elements, these infrastructure elements can take on an additional communicative function and, for instance, divert or adjust streams of traffic at short notice without requiring any investment in terms of time or resources.

Dynamic concepts also lend themselves to reducing the energy consumption of these structures: the most well-known example of this are street lamps that only turn on when people pass by.

Companies such as [Yunex Traffic](#) are working on how to prioritize traffic using digital controls and smart networking: for instance, this could involve giving preference to service vehicles, public transit buses and cyclists by using smart traffic light controls. This makes it possible to control traffic volumes and lower CO₂ emissions.

In the future, infrastructure elements will increasingly be equipped with smart technologies in order to agilely react to changes in traffic.

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01 Smart road system with flying drones – Emergency system

The smart road system is a concept design developed by the Carlo Ratti Associati in collaboration with the Italian road authority, ANAS. The project aims to place a digital layer on existing roads and thus enable a dense exchange of data between infrastructure elements and vehicles on the road. As a result, in case of an accident, it will be possible to respond quickly and efficiently. The street poles are equipped with display panels as well as drones, which can provide first-aid support in an emergency.

02 SMART HIGHWAY, Studio Roosegaarde, Netherlands

With SMART HIGHWAY, Design Studio Roosegaarde has implemented several concepts simultaneously which serve as food for thought for a new kind of infrastructure. Glowing Lines are light strips that are integrated in the road surface and charge using sunlight during the day. At night, they serve as a subtly glowing orientation aid and increase driving safety. Similarly, in the case of the Van Gogh Path for bikes, luminescent paint is used to create an extraordinary cycling experience without using any electricity.

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Make your rented car feel like home with seamless personalization

As a result of the growing range of sharing services, generating an immediate sense of familiarity by means of design will become more and more important. As a result of **seamless personalization** ↗, the properties of the vehicle are adapted to the preferences of the customer – the hardware of the vehicle is not changed, but adaptive design elements such as light ambiances, display designs and sound designs are used. The personalized driving experience can thus be “taken along” from one vehicle to the next and can even be extended across an extremely wide range of vehicle types.

Visionary concepts such as the **LG Vision OMNIPOD**, in which borders between individual living spaces, mobility, the virtual world, individual day-to-day activities and artificial intelligence dissolve, are going a step further. In this way, the interior of the vehicle is becoming a **real-digital third place** ↗, which completely adapts to one’s preferences and needs in terms of appearance, activity and function.

OMNIPOD is a leading futuristic concept for a vehicle cabin which constitutes an extension of the home space. Users can subscribe to the offering of additional space for their own purposes, such as for use as a work office, music studio, personal gym area or outdoor restaurant. OMNIPOD not only offers an adaptable interior arrangement but also a metaverse experience, which is connected to professional services and a meta environment screen, six types of extensible modular household appliances and a virtual AI concierge, which is equipped for human requirements.



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Sharing is caring

The COVID-19 pandemic drove numerous sharing services into ruin – the fear of catching the virus was just too great. While the trend towards sharing is only slowly picking up speed again in Europe and the USA, vehicle subscriptions are being embraced in China and India. A distinction is made between the following types of service:

Ride-pooling is a form of commercially organized personal conveyance, which flexibly transports passengers from one stop to another upon request. The ride is independent of any schedule or line route, and passengers are free to get on or off on the way – meaning that the vehicle is not used by one passenger alone. An algorithm plans and optimizes the routes; in many cases, passengers require a separate app for usage.

Examples: [MOIA](#), [CleverShuttle](#), [Ridesharing](#), [Carployee](#)

Sharing services offer a flexible range of vehicles for different purposes. Instead of owning the vehicles, customers can use them for individual trips and then return them. A differentiation is made between free-floating and station-based car-sharing. In the case of free-floating car-sharing, the vehicles are available in a specific area and can be left at a different location in that area other than where they were picked up.

Examples: [SHARE NOW](#), [MILES Mobility](#), [Ubeevo](#)

Ride-hailing refers to transportation services which can be booked via an app. A private driver can then take the passenger to their destination in return for a small fee. Unlike ride-pooling, the vehicle is only used by the person or people who together requested the vehicle.

Examples: [Uber](#), [Lyft](#), [FREE NOW](#)

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Better understanding: Communication made easy

The more autonomous vehicles become, the more necessary new forms of human-machine interaction will become. When there is no longer a human sitting behind the wheel and making decisions, the communication axes shift from the passenger to the car and from the car to the environment. Assistance is provided in the form of orientation signals, which the vehicle emits and communicates to other road users, for example through visual vehicle gestures. Precise sensor technologies are making it increasingly possible for the vehicle to not just recognize other people in traffic but also anticipate their intentions (such as a cyclist who wants to change lanes) by means of gestures and to be able to react in good time. Conversely, the vehicle should be able to not only display which information it has received but then also clearly communicate how it will react to this information. The repertoire of vehicle communication that people are already familiar with, consisting of braking, lights turning on and lights flashing, will be expanded to include vehicle gestures.

Moreover, products for unmotorized mobility also benefit from a design that facilitates gesture-based communication with the environment. Bicyclists can benefit from new communication solutions such as the **FARO Smart Helmet** since traditional gestures such as an outstretched hand to indicate turning often go unnoticed.

Continental presents a holistic concept of human-machine interaction with the driverless concept vehicle **CUBE**. In addition to the various vehicle sensors' precise perception of the entire surroundings, these sensors are designed so that the information they collect can be shared equally with passengers and other road users in a way that is barrier-free. Thus, external displays let pedestrians know that the vehicle has registered their presence. With this approach, Continental aims for an intuitive interaction between autonomous vehicles, passengers and other road users.



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01 smart vision EQ

The smart vision EQ fortwo is an electric vehicle that was designed as an autonomous ride-sharing vehicle. One special feature of this urban vehicle is that any energy it doesn't use can be fed back into the power grid. If the battery does happen to deplete, the smart vision EQ automatically finds an inductive charging station. The vision for the way this vehicle can be used extends from car-sharing services to shuttle services, such as for taking kids to school or sports training. The smart vision EQ is operated either via the passenger's mobile phone or via the touch screen inside the vehicle. In order to communicate with the outside world, there are also screens mounted on the exterior.

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iF GOLD AWARD 2023

02 Smart glasses, Gauzy

With its smart glasses, Gauzy shows which new use potentials are opening up for the mobility sector. Thanks to smart or switchable glass, car windows can be used in a variety of ways, such as for instant dimming at the press of a button, for privacy or for use as an HD projection surface for advertising. In addition, in conjunction with autonomous vehicles, the panes can now be used as displays for an improved ride experience.

03 FARO Smart Helmet

FARO can detect a hard fall and call for help if the rider is unresponsive. Powerful built-in lights make the rider more visible at night. A second light array hidden beneath a unique fabric that is only visible when switched on keeps the helmet clean. This 'hidden light' can display animations, change color and even display turn signals that the rider controls through a remote mounted on the handlebar.

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Vehicle and surroundings are increasingly meshing

As a result of the digital connection, more and more vehicle functions are extending out into the immediate surroundings. Information that is made visible outside the vehicle specifically shows safety-relevant aspects or functional details.

Using light projected onto the ground, for instance, truck can indicate where the vehicle's blind spots are to the outside world and thus prevent accidents involving bicyclists and pedestrians. Projecting light onto the ground around the vehicle can also be used to make transportation services easier to use:

SHARING SERVICES WILL BE ABLE TO MAKE THE BOOKING PROCESS FOR SHARING VEHICLES MORE SEAMLESS AS A RESULT.

VEHICLES ARE CONSEQUENTLY ABLE TO COMMUNICATE WARNINGS TO THEIR SURROUNDINGS, FOR EXAMPLE IN ICY CONDITIONS.

PUBLIC TRANSIT VEHICLES CAN USE THIS TO EFFICIENTLY GUIDE FLOWS OF PEOPLE AND PREVENT DELAYS DURING BOARDING AND DISEMBARKING.

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01 Exterior projection systems, ams OSRAM

ams OSRAM uses projected lighting elements in order to enable new forms of interaction between the vehicle and user. Illuminated patterns are projected onto the road or sidewalk using special optoelectronic technology. The semi-dynamic projection illuminations allow for targeted communication with the outside world, in addition to the development of a brand-specific communication style. Moreover, improved use of the lighting for communication ensures considerable potential for greater safety on the road.

Alternative infrastructures for greater sustainability

Sustainable mobility can only be accomplished if vehicles and a suitable infrastructure mesh together. Promising approaches for the sustainable mobility of tomorrow already exist today:

Solar-powered roads: As solar panels become more weather- and impact-resistant, it will be possible to integrate them into road surfaces. The idea: if roads produce energy, mobility will be directly and indirectly electrifiable. Pilot systems from Solmove and Rolling Solar are still battling with wear and tear from heavy vehicles, which makes using panels uneconomical (Ruhmann 2022) – but across-the-board use of solar-powered roads are nevertheless conceivable as a future perspective.

Inductive roads: If vehicles could be charged by means of induction while on the go, this would save all kinds of time and make vehicles considerably lighter, cheaper and more energy efficient. The first electric road was tested in Lund, Sweden, between 2019 and 2022. The electric municipal buses were able to charge their batteries while stationary as well as in motion. (Elonroad 2022)

E-car grids: E-vehicles can make a significant contribution to grid stabilization. Vehicles that are connected to the local power grid can also supply this grid with power from their batteries in an emergency. (Energie-Experten 2022) Vehicle-to-grid is the name of the concept which is based on car batteries for actively shaping the peaks and lulls of renewable energy. In the USA, Ford and Duke Energy are trailblazers of a new business model: drivers of the [Ford F-150 Lightning](#) with the smart charging program from Duke Energy receive discounts on their leasing payments when they feed power back into the grid to help out during times when demand is high. (cf. Spector 2022)

Solar-powered rails: Railway lines of rail networks offer enormous areas for solar energy production. By installing photovoltaic panels between the individual rails, it is possible to generate rail-based power locally. This would support the generation of 100 kilowatts on every kilometer of railway line – if a state's entire rail network is taken into account, a huge potential arises for energy generation. (cf. Stern 2022) The great advantage: the railway lines are already leveled and free of trees that cast shadows. And power lines are also already available.

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Cycling to a healthy future

Developments for bike mobility are becoming increasingly relevant especially in view of transportation in city centers. Biking is deemed the most efficient and most environmentally friendly means of transportation in urban spaces and has a positive effect on the health of all city residents. Unlike motorized transportation, bicyclists do not cause noise or generate particulate matter that is a health hazard – and, as a result of their bikes' light weight, injuries to third parties in case of accidents are considerably more seldom and less severe. Individuals also benefit significantly from hopping on their bikes. The additional physical exercise increases levels of fitness and health and reduces stress. Numerous studies show that personal satisfaction rises when more distances are covered by bike. (Wild et al., 2019; Sundfør et al. 2020) In short: the bike is an important step towards a healthier, more affordable and environmentally friendlier future.

In order to pave the way, however, a better infrastructure of bike paths will be necessary. Safe and well-developed bike paths are conducive to bike mobility. Likewise, parking options, comprehensible navigation systems and meaningfully structured transfers to other modes of transportation are becoming more and more important. A further incentive in favor of bikes could also be electronic signs that show bicyclists the speed they have to travel in order to have a series of consecutive green lights – such experiments are being conducted in Utrecht, Eindhoven and Antwerp. (Reidl, 2021)

All around the world, cities today are already shining with innovative bike path projects:

[Xiamen Bicycle Skyway](#)

Xiamen, China

[Cycling through Water](#)

Limburg, Belgium

[Utrecht Station and Bicycle Parking](#)

Utrecht, Netherlands

[LightPathAKL](#)

Auckland, New Zealand

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01 Utrecht Station Square
In accordance with the preferred method of mobility of the Dutch, the Station Square in Utrecht was designed to be a mobility hub, connecting bike travel with public transport. The Station Square is the meeting point of a now pedestrianized street leading to the railway station and bus terminal. The station comprises of a large public square on the upper level, from which one can enter the station or shopping mall. Beneath the square, a three-storey bicycle parking facility holds can accommodate 12,500 bicycles. The levels are connected by gently sloping ramps, enabling cyclists to find parking spaces without getting off their bikes. The overall design is bright and airy, making the station feel safe and welcoming.

02 Cycling through Water in Bokrijk
The cycling experience created in Bokrijk in the Dutch province of Limburg is one of a kind. As the project's name 'Cycling through Water' reveals, it is situated uniquely, crossing through a pond. The path for cyclists, walkers and joggers leads through the width of the pond, connecting two sides. The path was constructed so the water is at eye-level in the middle of the pond. The project was designed to provide a unique experience while also caring for the nature surrounding it.

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03 Xiamen Bicycle Skyway

The Xiamen Bicycle Skyway was built as a reaction to increasing traffic congestion and pollution in the city of Xiamen in China. It is the world's longest bicycle bridge, spanning eight kilometers and connecting the city's five major residential areas and three business centers. The Bicycle Skyway has eleven access points, which are each connected with either a bus or subway station. This infrastructural project solves a pragmatic transport-related problem while promoting a shift towards a greener, more livable city at the same time. And also enhancing the mobility and connectivity of the citizens of Xiamen.

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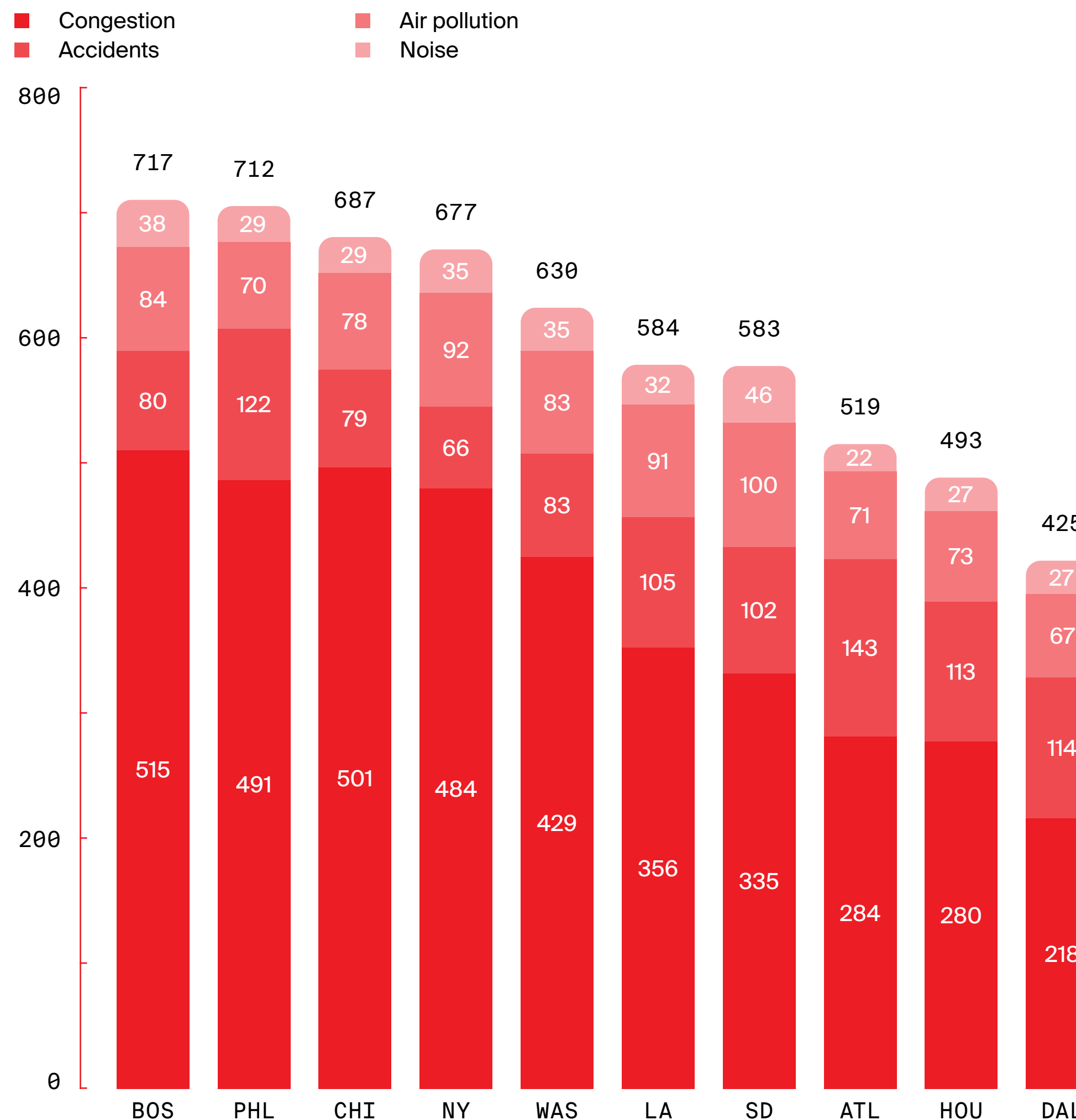
Delivery robots as last-mile solution

Delivery services have experienced a boom in the past couple of years as a result of people working from home, online shopping and the pandemic. The last mile, i.e. the part of the supply chain in which the goods are conveyed from the means of transportation to the end customer, is becoming more and more of a strain on traffic in city centers with growing numbers of packages. For suppliers, the last mile is associated with high costs and emissions. The subsequent costs of deliveries – in terms of traffic, air pollution, noise and accidents – are however usually borne by society.

It is possible to counter one part of the problem by means of an alternative design of the delivery vehicles. In addition to electric vehicles and bikes, electric robots are also being used more and more frequently. If these robots are paired with smart delivery systems, they can even adapt deliveries to the needs of customers in real time and, for instance, spontaneously make the delivery to a different address. Similar to autonomous vehicles, delivery robots are equipped with a multitude of sensors and cameras, which they can use to evaluate ambient conditions and get their bearings. Since they normally drive on bike paths and pavements at reduced speed, special consideration is required. Safety is the top priority. Beyond that, however, the robots will only meet with acceptance if they do not constitute any form of hindrance to others on the go.

The external costs of last-mile delivery are high

annual external costs per capita (in dollars)



Source: European Commission, Directorate-General for mobility and transport; BSG analysis

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01 MobED
 MobED (short for Mobile Eccentric Droid) is a design concept for a mobility device that can be used as delivering, guiding or filming equipment or as a service robot. The robot owes its extraordinary maneuverability to independent 4-wheel steering and a flat, height-adjustable body. In direct interaction with people, MobED can serve people with reduced mobility as a mobility aid, in addition to its use as a stroller or leisure vehicle.

02 Nuro autonomous goods delivery vehicle
 Nuro is a design concept for an autonomous last-mile delivery vehicle that leaves more room for cyclists and pedestrians on shared paths because of its compact size. The interior's compartments and insert structures are flexibly adjustable and can hold up to 500 pounds of groceries. In addition, Nuro has an integrated HVAC system, which can simultaneously heat or cool. Nuro is fully electric and can operate all day long on one charge. In order to make using Nuro as safe as possible, an industry-first external airbag has been integrated for the protection of others who are on the go in case of a collision.

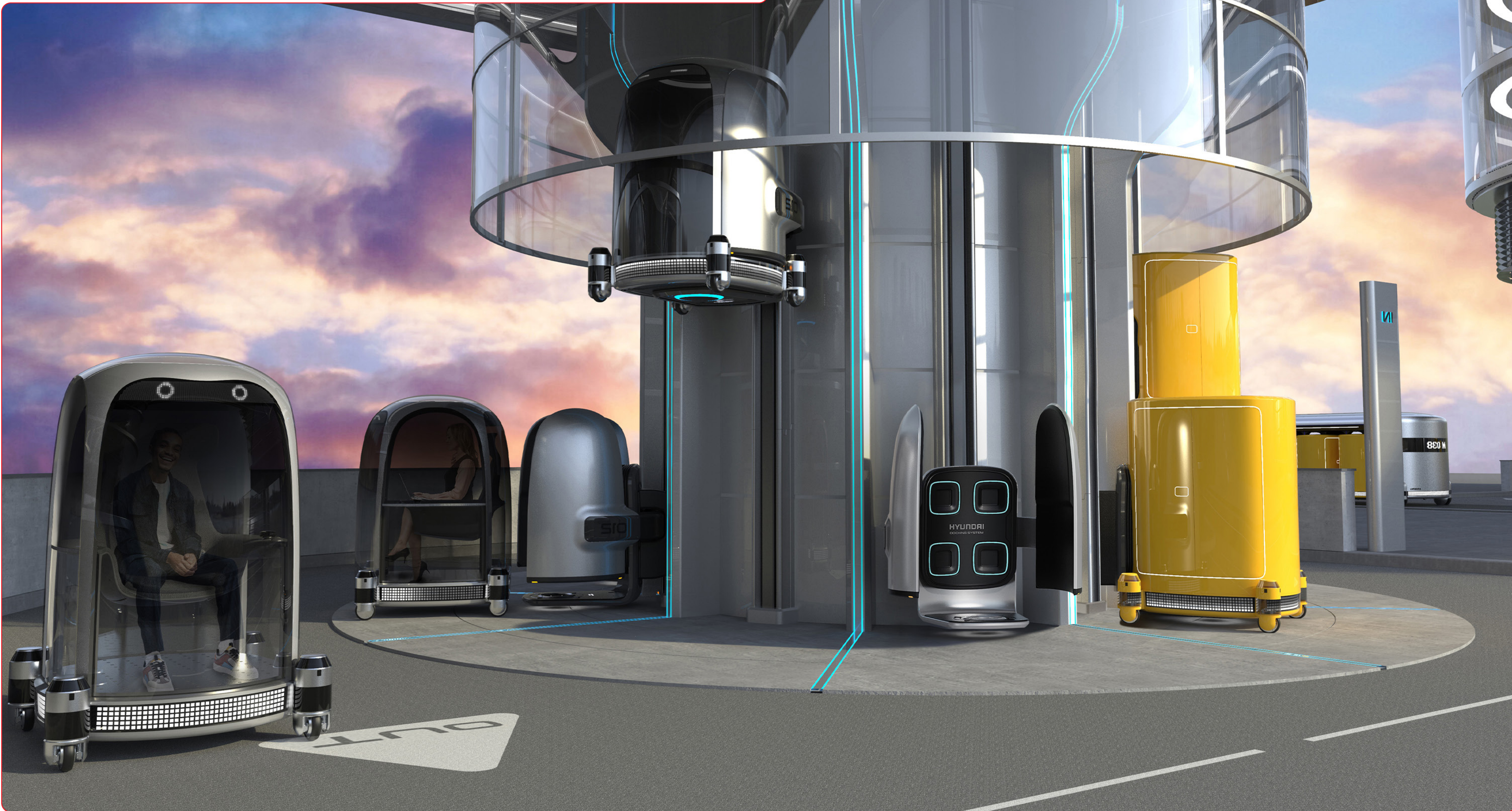
03 Rhaetus – Electric folding cargo trike
 Cargo bikes may be enjoying great popularity as a result of their large carrying capacity – but they are also clunky and awkward as a result. The design concept from Rhaetus solves this problem by means of a foldable design of the loading area. In just a few steps, the cargo bike can be turned into an agile and space-saving transporter.

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04 PnD Mobility

The PnD Mobility design concept visualizes a platform solution, which combines innovative technologies such as intelligent steering, wheel suspension, brakes and an in-wheel electric drive all in one. LiDAR technology makes it possible to measure distances to other objects and speeds. The size-adjustable platform allows for the connection of the corresponding PnD modules. In addition to providing a range of usage surfaces that can be structured flexibly, the PnD modules make it possible to individualize public transit. For instance, individual modules can initially remain docked to a mother shuttle and then, shortly before reaching their destination, detach and head for individual final destinations.



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THE PND MODULE CAN BE ADAPTED
AND EXTENDED TO MEET HUMAN
NEEDS. IN THE FUTURE WORLD,
PEOPLE WILL NO LONGER MOVE
OBJECTS – INSTEAD, OBJECTS WILL
MOVE AROUND PEOPLE.

DONG JIN HYUN

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Remote driving makes drivers' jobs safer and enables new services

The ability to remotely operate vehicles has fundamentally changed working conditions for drivers. On construction sites and in mines, dangerous tasks can be carried out from a safe distance. At the same time, the occupational life of drivers has become considerably more compressed because, as a result of remote control, several vehicles can be driven at once – breaks for loading and idle time no longer exist.

The start-up Vay is currently conducting initial test drives in Germany, during which remote driving is the basis for a new form of car-sharing. The vehicles are operated remotely from an office – after a customer leaves the vehicle, it is possible to take the next customer for a drive with no problems at all. The advantage: as a result of remote driving, providers can get by with much smaller fleets – and the user experience benefits because there's no need to search for or park the shared vehicle. The remotely operated vehicles are equipped with four cameras, which ensure 360-degree visibility. Blind spots are de facto a thing of the past. In addition, exterior microphones are installed, which capture traffic sounds such as sirens. (Götz 2023)

The advantage of teledriving compared to autonomous driving is the ongoing connection to the person as the control factor. While autonomous driving still has many hurdles to overcome, remote driving can already be technically implemented today. That's why regulatory requirements are easier to get through. (ibid.)

Companies which have specialized in remote driving for car-sharing:

[Vay Technology](#)

[Halo](#)

[Waymo](#)



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3 Challenges

With the growing range of mobility options, the demand for solutions to ensure a seamless chain of mobility is also growing.

Autonomous driving as a future perspective and connected driving of the present day are changing what people expect of the travel experience: entertainment and an intensive experience involving the senses is becoming increasingly important. Sharing services additionally face the challenge of generating tangible recognizability, despite the fact that a different vehicle is used each time.

Mobility innovations frequently have to battle with infrastructures that are not aligned with changes in the transportation system. This results in conflicts of usage and increased development costs.

3 Solutions

Seamless mobility serves as a guiding concept: transportation solutions are becoming digitally connected and can be planned and booked via online platforms. Ideally, longer walking distances and transfer times are eliminated.

The vehicle interior is increasingly equipped with entertainment technologies, which can be used for professional purposes or leisure activities. Sharing providers use customized profiles of design elements such as lighting, scent and sound to personalize the travel experience in the vehicle and create a sense of ownership.

Dynamic infrastructure elements can help make infrastructures more flexible and adaptive. With adaptable elements such as light and displays, it is possible to respond to changes in the transportation system at short notice. The more elements are equipped with connectivity technologies, the sooner it is possible to use them to solve challenges, such as the efficient use of energy.

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a photo of people trying to lift up a fallen ice berg

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As it enters an ecological age, the world community is currently undergoing an economic and industrial transformation that is affecting all areas of life and society. The sustainability paradigm is changing behaviors and perspectives regarding society, culture and politics — and is fundamentally restructuring corporate policy as well as the economic system as a whole.



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Our understanding of complex systems is expanding due to the urgency of the sustainability crisis, leading to an increased use of systemic design approaches like tipping point dynamics, decentralization and multistage transformation processes.

The transition to a sustainable global economy involves both a new discourse that combines ecological, technological and scientific knowledge to form new models and concepts, as well as the dissemination of these ideas through culture and design formats.

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First-generation sustainable products implement individual sustainability concepts and communicate them through product design. However, they are limited in a system that has not adapted to a sustainable global economy.

Second-generation sustainable products are emerging with new infrastructures for production, logistics and distribution, allowing for the combination of multiple sustainability concepts in a holistic approach. They use systemic design approaches and are embedded in decentralized structures. The focus is on technological innovation and product advantages, rather than symbolic concepts of value.

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The most important megatrend of our time

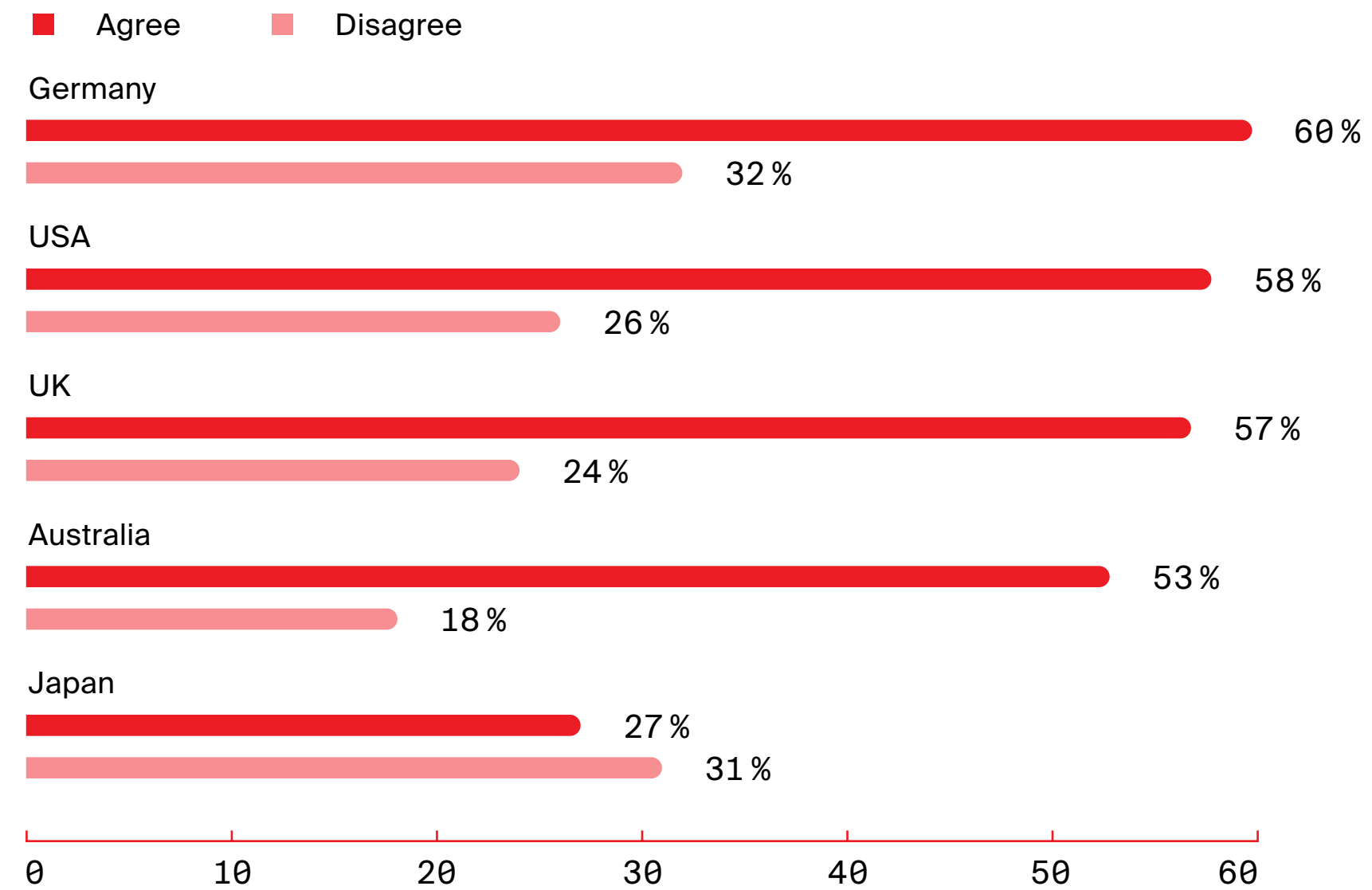
At the moment, hardly any other megatrend appears to have such a major influence on the economy, politics and society as neo-ecology. Around the world, the effects of climate change and environmental pollution are becoming ever more tangible.

In some places, the quality of life is declining considerably as a result of changed climate conditions; other places are becoming uninhabitable and people are already dying as a result. The world community is confronted with a continuously growing mountain of challenges: on the one hand, it's crucial to find a sustainable way to do business and produce without any sacrifices to the standard of living already achieved. On the other hand, changes that are already occurring in the climate and ecology are forcing us to adapt to new living conditions.

The more tangible the undesired consequences of our current ways of consuming and doing business become, the more a new way of seeing the world asserts itself. We are learning that our actions are enmeshed in multi-causal interdependencies and that events often take a non-linear course. More and more frequently, we are confronted with acute escalations of crises: multiple events occur as a result of each other, and local incidents suddenly have global consequences. We are learning to view the world, and also ourselves as individuals, as complex ecosystems that are considerably more than the mere sum of individual parts. The more in-depth our understanding of the relationships within a system is, the better we can understand the interdependencies they contain and cope with these.

Key markets: Consumer willingness to pay more for environmentally friendly products

Please state your level of agreement with the following statement: I don't mind paying more for products that are good for the environment. (% of adults in each market who are mainly or partly responsible for grocery shopping for their household)



Source: YouGov

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Dealing with tipping points

Resolving the climate crisis will require understanding the fundamental dynamics of complex systems and taking these into consideration in plans and drafts. The tipping points of systems play a special role in this regard. Tipping points are crucial turning points in complex systems that appear to be suddenly triggered by a small change and then, with extreme dynamics, lead to an irreversible shift. In the discussion about the climate crisis, two different forms of tipping points are relevant:

Climatic tipping points Changes in climate systems that have drastic and irreversible effects on ecosystems and the quality of life of entire regions are referred to as climatic tipping points. Climatic tipping points often have additional reaction loops and trigger further tipping points, lending an added impetus to global warming. Some such climatic tipping points have already been reached or it is very likely that they can no longer be prevented. These include the demise of the coral reefs as a result of ocean acidification, the thawing of permafrost in Siberia and a consequent release of greenhouse gases that had been contained in the ice. (Rising et al. 2022)

Social tipping points But not only ecosystems and climate are subject to tipping points; societies have them, too. Social tipping points describe societal transformations that develop major dynamics as a result of a minor trigger and that enable political decisions, social movements and technological advances that were previously difficult to imagine. Of particular interest: there doesn't even necessarily need to be a societal majority for a social tipping point. Quite the contrary: it is often the case that a committed and adamant minority gets the ball rolling. (Otto et al. 2020)

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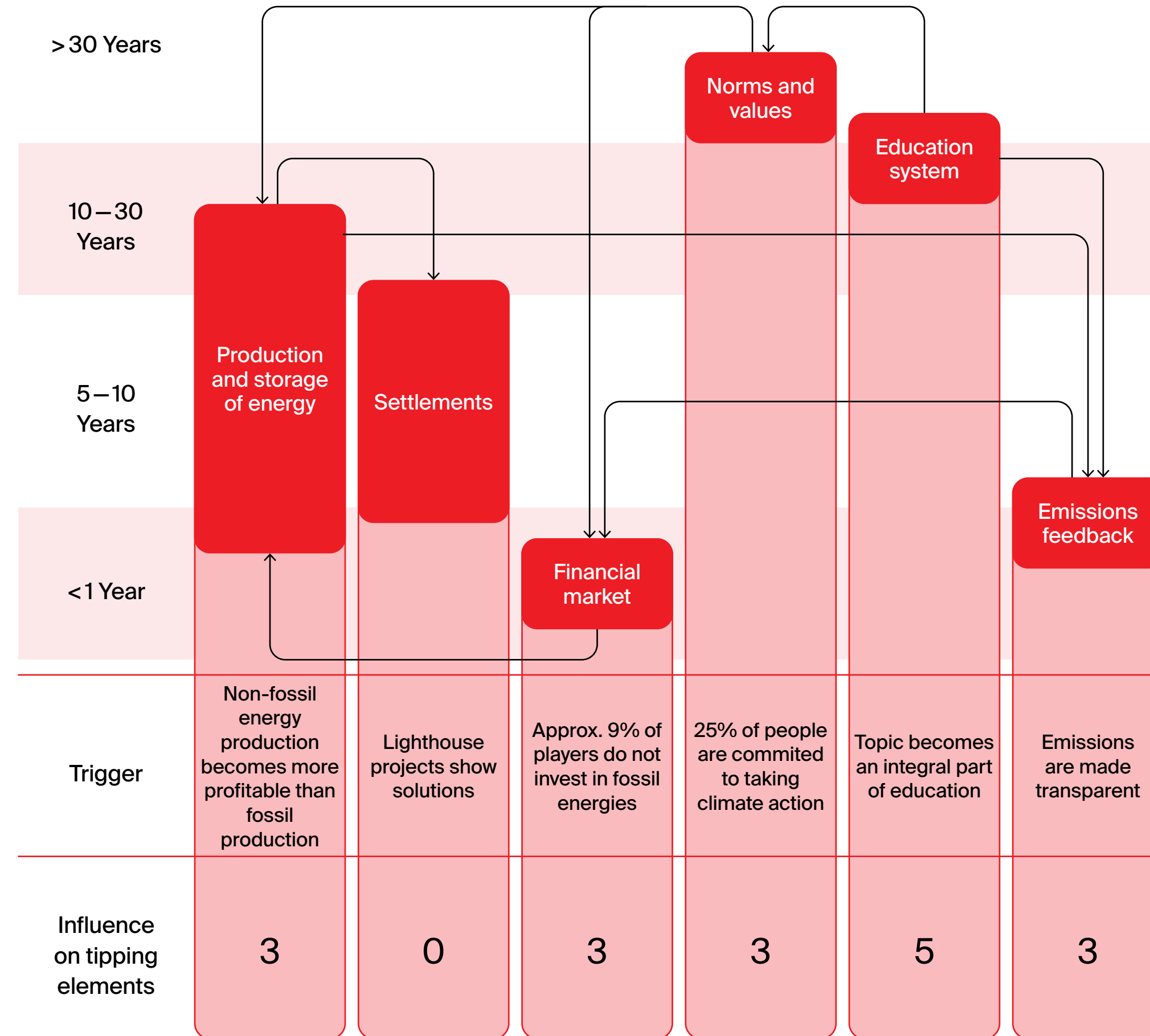
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Explanation of tipping point figure

With a new research group for social complexity and system dynamics, the Graz-based scientist Ilona M. Otto developed a holistic model of the climate transition. (Otto et al. 2020) The model examines the interdependencies of education systems, value systems, financial markets, types of production and technologies with reference to decarbonization. Financial markets react relatively quickly, but are also able to “tip back” with similar speed. Value systems, on the other hand, transition slowly, but their development can only be reversed with great effort. The more elements exceed the tipping point towards a shift to renewable energy sources, the greater the pressure will also be on other areas of society.

The six tipping elements for a dynamic climate change

The different elements have different time spans in which they are tipping. Due to their social interconnectedness, they can also set each other in motion.



Source: pnas.org

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Multiple boundaries

One main problem with the sustainability crisis lies in the fact that industrial processes have a linear effect on natural cycles – resources are removed from ecosystems and emitted again in a changed form, and usually also in different locations. As a result of the interrupted cycles, ecosystems fall out of balance. Greenhouse gas emissions and the climate change associated with them are just one of several crises that are occurring in parallel and are in part mutually responsible for causing each other. The model of planetary boundaries developed in 2009 by Johan Rockström and his team shows the nine fundamental biophysical processes that determine how our planet functions as well as the boundaries which, if exceeded, are associated with serious consequences for the environment and humankind. It is distinctive that three boundaries have already been critically exceeded, which are being met with only little consideration in the current discourse: the loss of biodiversity and the disruption of phosphate and nitrate cycles.

One reason for the lack of adequate representation of these issues could be that it is considerably more difficult to quantify the problem as well as the possible solution approaches than is the case with CO₂ emissions. The **biodiversity** of systems in particular is difficult to express in numbers – most ecosystems are too complex for this. However, this does not diminish their value: If we were to factor in ecosystem services, they would be more than double the worldwide gross domestic product. (Nabu, 2020)

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1960 – 1969

1962 Rachel Carson publishes “Silent Spring”; it is considered a turning point in our understanding of the interconnections between the environment, the economy, and social well-being.

1966 Kenneth Boulding describes Warth as a “closed spaceship” laying the foundation for the concept of circular economy.

1968 The Club of Rome is established; it commissions a study of global proportions to model and analyze the dynamic interactions between industrial production, population, environmental damage, food consumption, and natural resource use.

1970 – 1979

1970 The First Earth Day is proclaimed in San Francisco.

1971 Founding of Greenpeace.

1972 First international United Nations Conference on the Human Environment is held in Stockholm.

1972 Report “The limits to growth” published by the Club of Rome, which discussed the possibility of exponential economic and population growth with finite supply of resources, studied vby computer simulation.

1972 René Dubos and Barbara Ward publish “Only One Earth;” it discusses the impact of human activity on the biosphere.

1972 Edward Goldsmith and Robert Allen publish “Blueprint for Survival;” it warns of the breakdown of society and irreversible disruption of life-supporting systems, signed by more than thirty leading scientists.

1973 Paul Palmer first uses the term “zero waste” in public.

1974 Foundation of the Worldwatch Institute by Lester R. Brown, widely known for the annual publications “State of the World” (1984 – 2017)

1979 First World Climate Conference in Genf. The World Climate Program (WCP) is adopted.

1980 – 1989

1980s “Total Recycling” concept developed by Daniel Knapp.

1982 The UN General Assembly adopts the “World Charter for Nature”.

1985 The ozone hole is discovered over the South Pole for the first time (in 2020 over the North Pole).

1985 Vienna Convention for the Protection of the Ozone Layer

1986 Chernobyl disaster, nuclear accident

1987 Report “Economic Strategies of Durability – longer product life of goods as a waste prevention strategy” by Stahel & Börlin

1987 Report “Our Common Future” published by the WCED. It contains the definition of sustainable development, which has been the guiding principle of international environmental policy ever since.

1990 – 1999

1990 Foundation of the International Institute for Sustainable Development (IISD)

1991 Persian Gulf oil spill, one of the largest oil spills in history, resulting from the Gulf War.

1996 No Waste by 2010 Goal – waste management strategy for Canberra

2000 – 2009

2000 First Zero Waste Conference in Kataia by campaigner Warren Snow.

2002 “Cradle to Cradle” concept was formed by Braungart & McDonough, an approach for a continuous and consistent circular economy.

2003 Zero Waste International Alliance formed in Wales.

2005 The Kyoto Protocol enters into force and sets binding targets for greenhouse gas emissions for the first time.

2008 Global food crisis based on increasing food prices between 2007 and 2008.

2010 – 2019

2015 Paris Climate Agreement, a legally binding international treaty on climate change. Its overarching goal is to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels.”

2015 The United Nations adopted the 2030 Agenda as the world’s future treaty for a more just and sustainable future (17 SDGs).

2019 First Global Climate Strike For Future (Fridays for Future) is set in motion by Greta Thunberg.

2020 – 2029

2020 EU-wide classification system (EU Taxonomy) for sustainable activities in order to meet the EU’s climate and energy targets for 2030. In place of divergent national, largely voluntary criteria, concepts and labels of “sustainable” will be replaced by a uniform and ambitious European labeling system.

2023 Report “Climate Change 2022/2023” by IPCC, underscores the urgency of taking more ambitious action. Emissions will need to be cut by almost half by 2030 if warming is to be limited to 1.5°C.

* Selection of some sustainable milestones.

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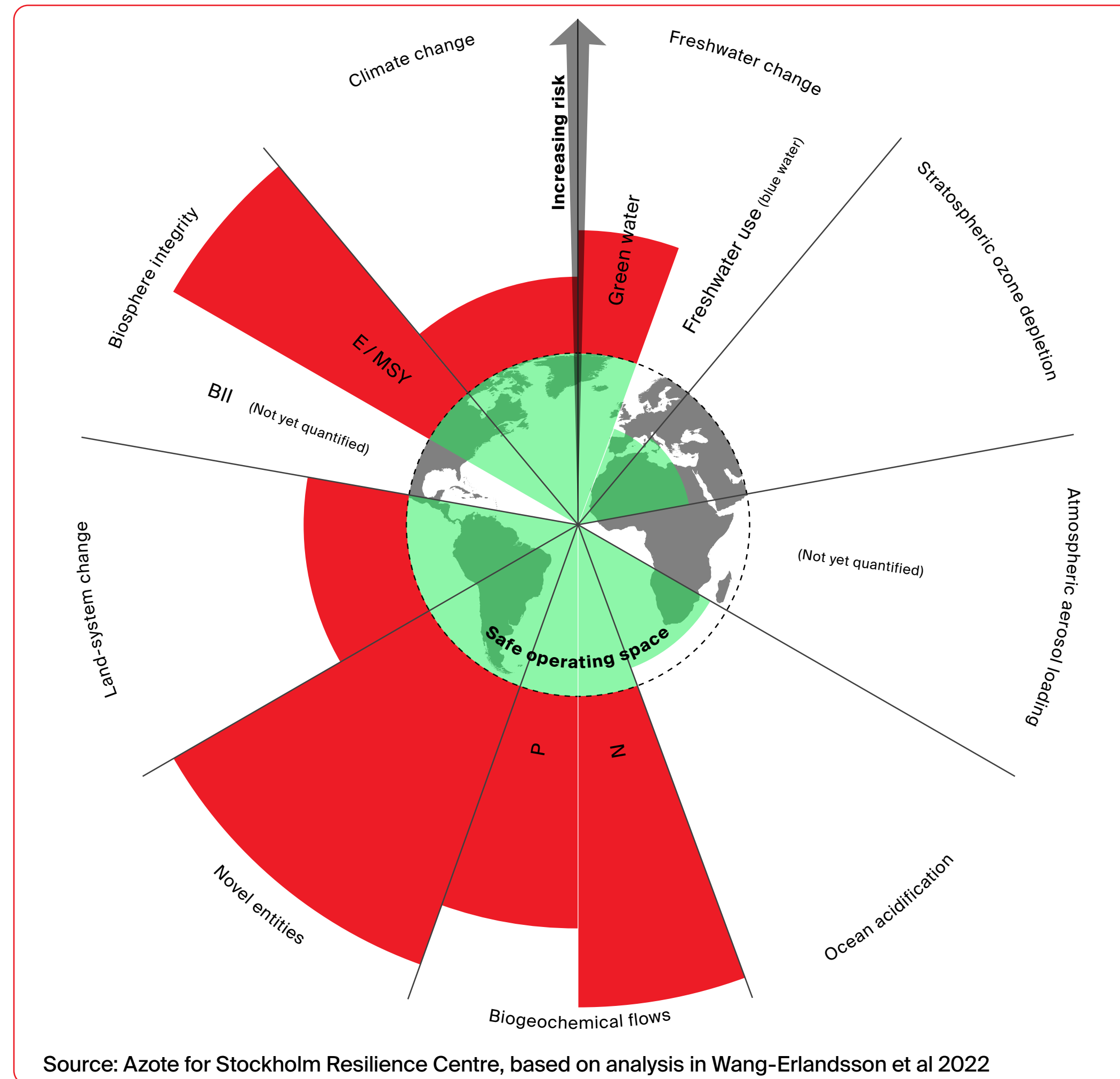
Circular design

Intact ecosystems are based on a very wide range of different material cycles – there is no waste or unexploitable end products. Water as a resource, for instance, traverses an extremely wide range of stations and states of matter in ecosystems, and remains always available to other life forms or system elements. Falling leaves from the trees serve as food for other living creatures, which in turn transform it in such a way that makes essential nutrients available again to plants. Cradle to Cradle (C2C) and circular economy approaches use these ecological principles for orientation and offer new concepts for business, design and consumption. (McDonough & Braungart, 2009)

In the **circular economy**, waste and surpluses are viewed as resources, which are to be used and, wherever possible, fed back into production processes. The aim is to clearly decrease requirements of primary resources and at the same time reduce the waste created.

Cradle to Cradle, in contrast, differentiates between biological and technical cycles, which respectively form a closed process. Unlike the circular economy, in which waste is reduced and reused, in the case of C2C, the idea is to design products in such a way that they are completely biodegradable at the end of their lifetime or that their components can be reused from a technical viewpoint.

Both concepts can play a decisive role in a sustainable economy. However, their implementation has a decisive impact on the role of product design – how successfully the concepts can be implemented it is already determined in the draft stage. It is therefore crucial that in-depth knowledge of the corresponding production technologies, materials and logistics options flows into the draft stage.



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Decentralization as a systemic design principle

Transforming into a sustainable society has the prerequisite that major portions of our infrastructure need to be converted. It is necessary to produce and process energy and raw materials in other ways. Likewise, transportation, urban construction and communication channels require different structures in order to minimize their negative impact on the environment.

But large-scale systems such as physical and digital infrastructures are hard to redesign or develop from scratch – not least of all because they usually have to continue to exist in dynamic contexts. Such systems are often where one encounters the notorious wicked problems. (Rittel; Webber, 1973) Their complexity and ambiguity make it difficult to distinguish the problem from the overall system and find a definitive solution since ever-changing factors keep influencing the framework conditions. Additional difficulties arise as a result of the fact that decisions are made by a relatively small group of people and no consideration is given to local conditions, the individual wishes of various stakeholders or side effects.

One way to rise to these challenges is to enrich large-scale structures with decentralized solutions. Decentralized solutions are normally better able to handle local capabilities, regional knowledge and resources and integrate these in the system in a targeted fashion. This consequently makes solutions possible which are more sustainable and more resilient. If such decentralized systems are connected to each other in a larger network, they may additionally have a stabilizing effect on the overall system. At the moment, the potentials are especially clear in the case of decentralized energy supply structures: these are less susceptible to interruptions and contribute to the reliability of the overall system.

In the digital sector as well, decentralized solutions are becoming more and more relevant: many blockchain concepts are still in their infancy and struggle with their energy inefficiency – but their structural advantages are huge. These concepts will make it possible to render supply chains and production cycles transparent and, as a result, enable an economy that is fairer and less harmful to the environment.

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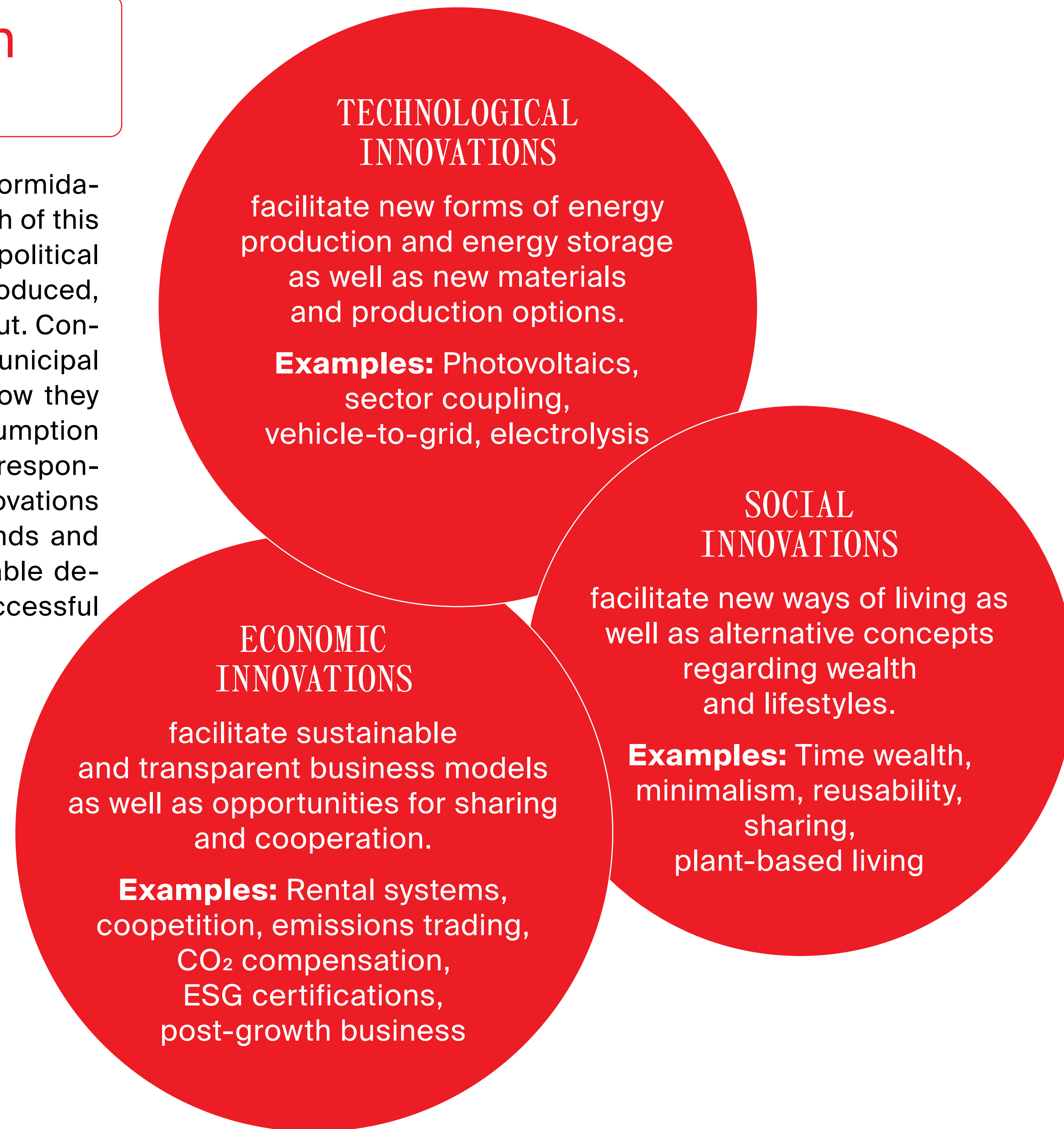
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It takes three levels of innovation to become sustainable

The transformation into a sustainable world community is a formidable task. It encompasses almost all aspects of our lives. Much of this transformation lies in the responsibility of enterprises and political decision-makers, for instance, regarding the way energy is produced, raw materials are mined and industrial production is carried out. Consumers also have little influence on trade, logistics and municipal planning – although these areas have a direct impact on how they experience day-to-day life and on every individual's consumption options. However, viewing climate change as the exclusive responsibility of business and politics doesn't go far enough – innovations take place not only at the material level but also in our minds and value concepts. (Rifkin, 2022) It will not be possible for sustainable developments to fully release their impact unless there is a successful interplay at different levels:



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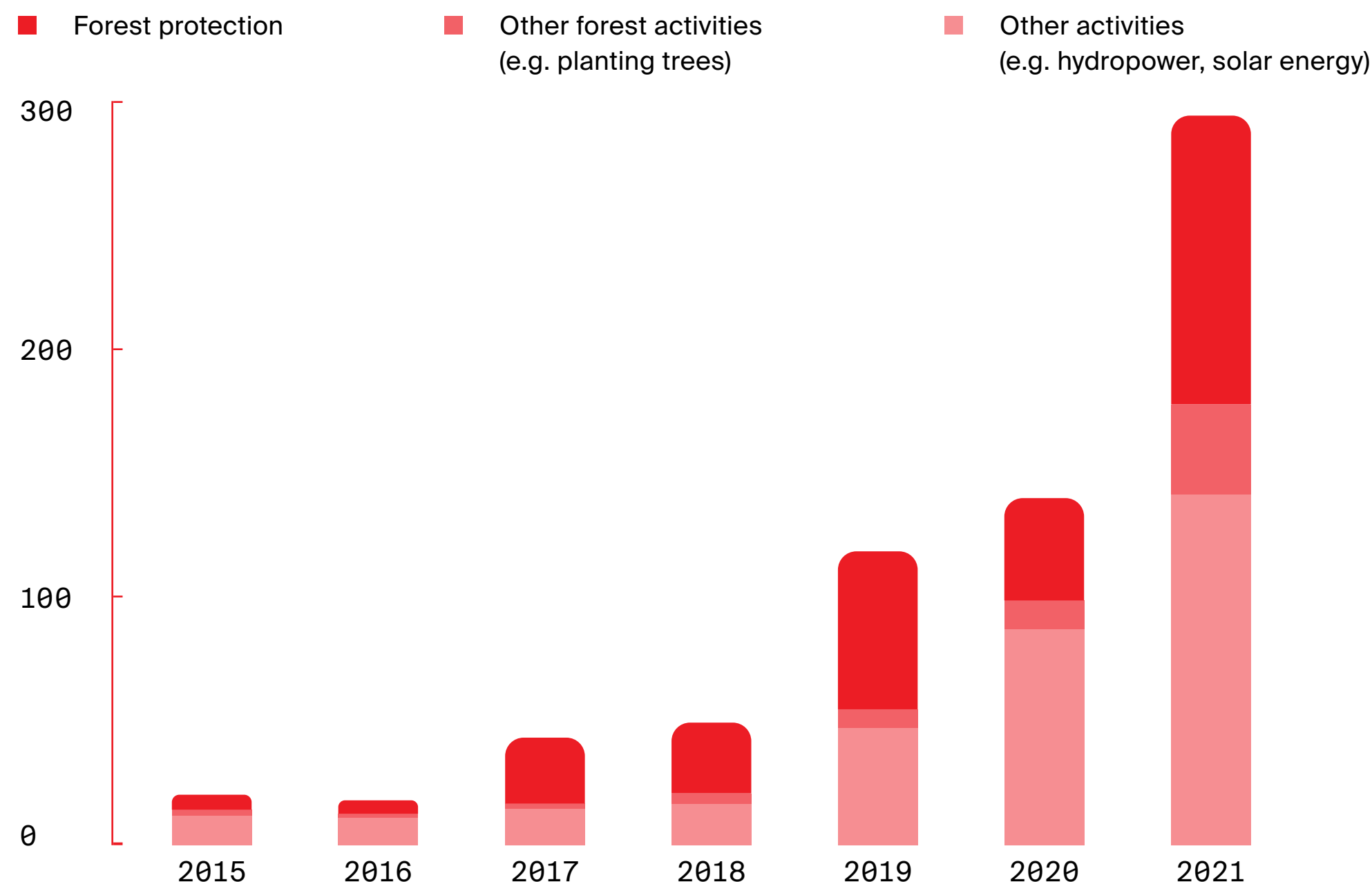
Under suspicion – A differentiated look at greenwashing

Sustainability has long been a competitive advantage. Increasing numbers of low-emission technologies have been paying off economically, and more and more people prefer sustainable products and are even willing to spend more for them. A sustainable brand identity has thus long been a must not only for niche markets – more and more “mainstream” brands are opting for a brand strategy that unites consumption and sustainability. But it is often easier to communicate a strategy than actually implement one in real terms. The list of sustainability claims, which are then debunked as mere greenwashing at second glance, is long: all too often, considerably fewer trees are planted as CO₂ compensation than specified and product figures are often glossed over to make the products appear “emissions-neutral” when, in fact, they are anything but. Claims regarding the recyclability of packaging are often confusing. (Fischer; Knuth, 2023) Consequently, sustainable brandings increasingly fall under the general suspicion of greenwashing – there is a great deal of distrust that the presumed environmental friendliness is merely a means of justifying a higher price.

Across-the-board denunciation puts the brakes on sustainability transformation and hurts those companies which, although they have taken initial steps in a sustainable direction, are not yet able to change the entire production system. Transformations and innovations always run in stages: initial steps serve as a basis for subsequent steps, which then in turn make way for a new further-reaching stage. Every stage is characterized by products and services that support a certain property of the transformation process. If the products are seen as part of such a process, it is easier to determine what a step in the right direction is and what is merely intended to give the brand a green coat of paint.

Compensation is booming

Number of certificates sold under Verra’s supervision (in millions)



Source: Verra Registry

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It takes two generations of products to become sustainable

The basis for any transformation is a gain in scientific insight. Often technological progress and a shift in humanistic perspective mutually advance each other. (Rifkin, 2022) Insights have an influence on current discourses as a result of scientific communication. New narratives, concepts and guiding principles develop, which then spread and constitute the basis for new scientific solutions. This transfer of ideas and concepts can be promoted through entertainment formats and intercorporate cooperations.

Partially sustainable products

The first applications in business arise from experimental research findings. Ideas in connection with sustainability are initially structured as niche products for clearly distinct markets and only become mainstream over time. The products and product marketing often are limited to communicating specific environmental problems and individual concepts (e.g. plastic pollution and reusability). Even if they are consequently not entirely sustainable and are frequently part of the problem as much as they are part of a solution, they fulfil a critical function for the process as a whole: They establish the subject of sustainability in day-to-day life and make sustainable forms of consumption, production and design seem possible.

Fully sustainable products

In a second step, individual sustainability strategies and sustainability technologies are brought together in order to subsequently generate holistic and systematic solutions. It is now possible to sustainably structure production conditions, logistics, distribution, use and disposal of the products since they are embedded in a sustainable infrastructure and the users' habits have already been adapted to a sustainable way of living.

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Over the past few years, a multitude of different concepts have been developed which are able to pave the way to a sustainable society. While initially the spotlight was on the communication and acceptance of the concepts, with the creation of sustainable production and supply structures, it is possible to also broach sustainability holistically..



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Communicating new ideas

Every innovation is preceded by insights. Not seldom are these based on research findings or studies that enable viewing the problem from a new angle or shifting the view to potentials that were previously hidden. The shift to sustainability in particular is dependent on close cooperation with science:

The transformation on the discourse level is often already further advanced than the actual implementation of the concepts. On the one hand, it's good the way it is because then innovations and new concepts land on fertile soil; at the same time, this circumstance causes a certain psychological strain among individuals. Many know that their purchase decisions have harmful impacts but are unable to adopt a lifestyle that corresponds to their own sustainability aspirations, or would only be able to do so by making great sacrifices.

1. ECOLOGICAL KNOWLEDGE

is essential to comprehend the effects of business and industrial production and incorporate them into product planning. Despite this, consumers struggle to grasp the ramifications of mining and industrial processes. Effective communication of this knowledge can enhance environmental awareness and pave the way for sustainable purchasing decisions.

2. TECHNOLOGICAL KNOWLEDGE

enables the development of new technologies for production and energy generation. The GreenTech sector profits from many years of research, which has now made it possible, for instance, for photovoltaics to become the most economical form of energy generation worldwide. (Rosser, 2020)

3. SCIENTIFIC KNOWLEDGE

lays the cornerstone for alternative business models and sustainable businesses. Easily understandable models and buzzwords make it easier to convince investors and customers. Familiar examples of the successful communication of knowledge are, for example, sharing business, rental systems, post-growth and cradle-to-cradle.

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New forms of prosperity

The first report of the Club of Rome in the 1970s on the limits to growth already had considerable influence on the premise that the basis for wealth has to be constant growth. (Meadows et al., 1972) The close interwovenness of the terms 'growth' and 'wealth' was successively called into question. In 2015, in the course of the Climate Accord in Paris, a new framework was presented to the UN that was designed to pave the way for sustainable wealth worldwide: the 17 [Sustainable Development Goals](#) (SDGs). What is striking about the goals is that they take three different forms of sustainability into equal consideration: ecological sustainability, economic sustainability and social sustainability. To this day, the SDGs constitute the framework for the sustainability strategies of internationally active corporations.

The discourse-driven occupation with the limits to growth and post-growth ideas open up space for new concepts of wealth. In addition to the accumulation of material goods, new forms of consumption are gaining relevance. The boom in vintage fashion, sharing options and minimalistic décor of the past years were the first indications of this shift in attitude.

In the age of neo-ecology, a much more in-depth shift is taking place, in which a new category of status symbols is arising. The factor of time plays a key role in this. One widespread symptom of traditional affluent society is a chronic lack of time: affluence in terms of goods and affluence in terms of time are inversely proportional – the more we possess, the less time we have. (Linder 1971) A counterpart to this time economy is the term time affluence, which revolves around actions characterized by time sovereignty and a lifestyle characterized by time ecology. (Boes 2021) This (more) conscious perspective of how we treat time also contributes to de-economizing thinking and bidding farewell to a purely material understanding of wealth.

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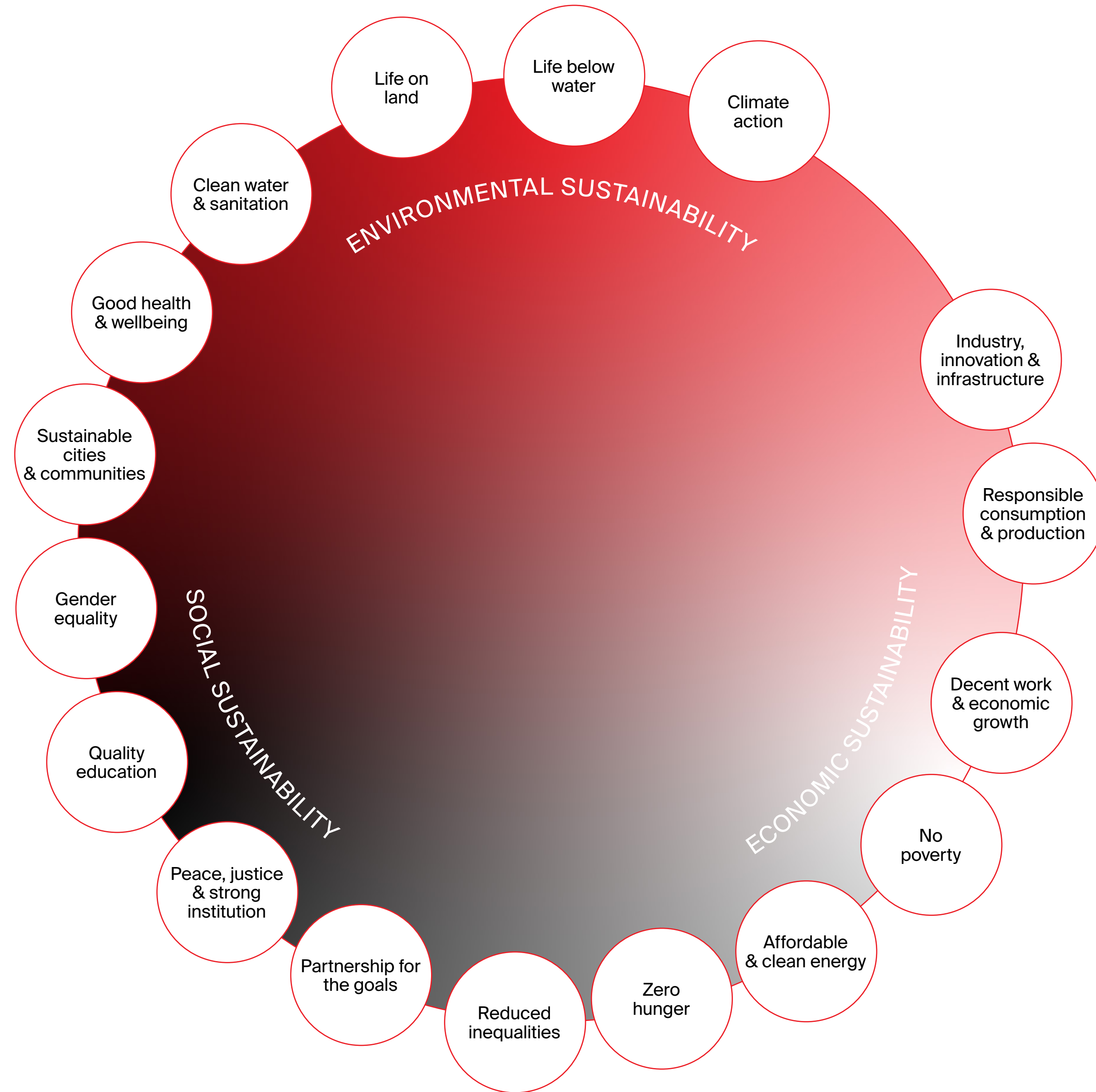
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Forms of Prosperity



Source: ZKI

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Culture and entertainment as a bridge between philosophy and natural science

Numerous new approaches are now coming into being in the social sciences as well as in the natural sciences, which may support the shift to a sustainable world. It is often the case that sectors mutually fuel and inspire each other. Art and entertainment formats pick up complex discourses and make them accessible to a wide audience by means of entertaining formats.

Such formats usually use a solution-orientated approach: the spotlight is not on providing information on the problems but on discussing possible solution approaches, future-orientated concepts and social innovations for a sustainable society of the future.

Games referred to as 'serious games', which pursue a specific educational goal, have a special role in this.

Games:

[Season](#)

[WWF Forests](#)

[Eco Game](#)

Eco art:

[Plant Fever](#)

[Geomerce](#)

[Fashioned From Future](#)

[Acla](#)

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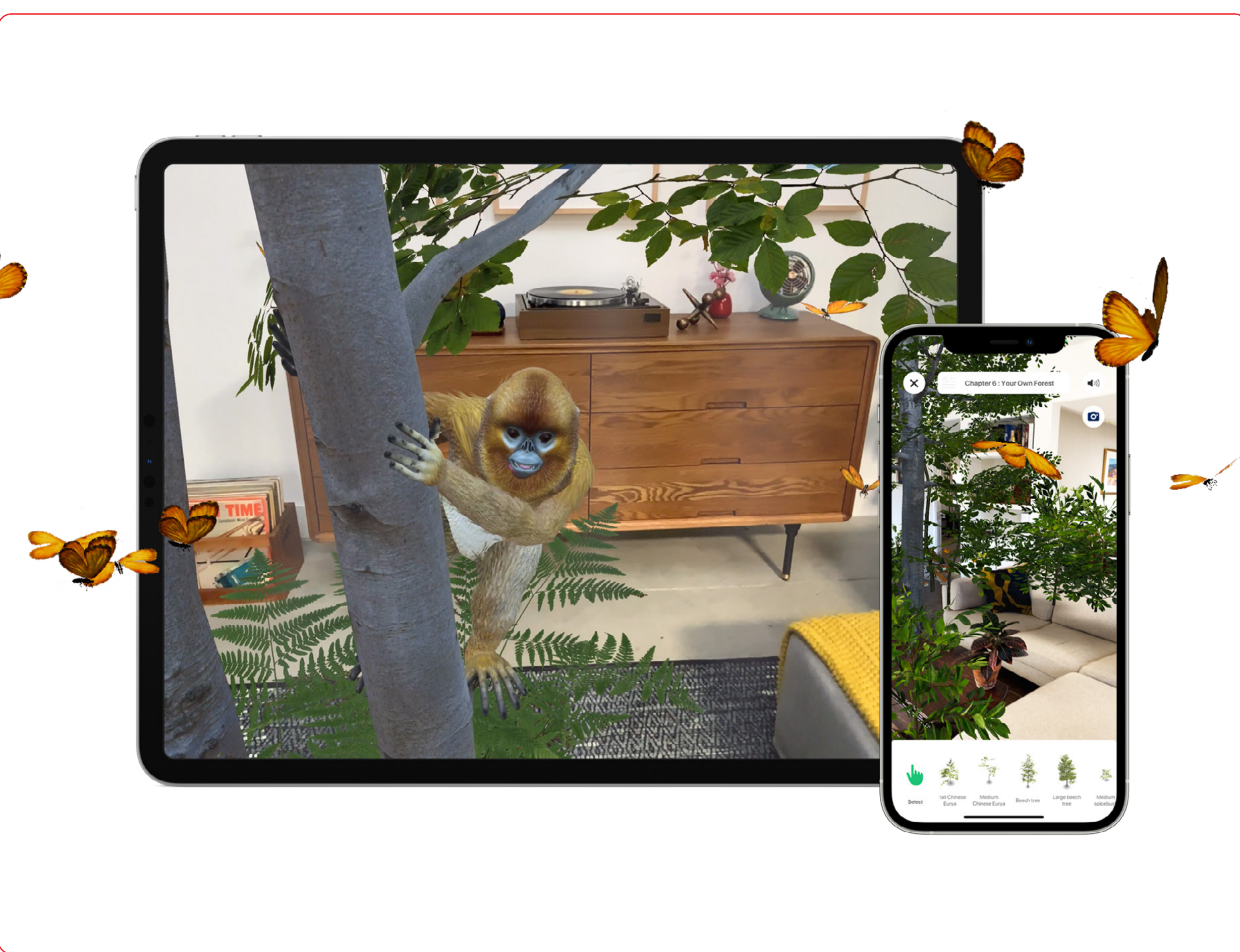
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01 plant fever
In keeping with the idea of American ecologist Ian Baldwin that we should try to think like plants, studio d-o-t-s (Laura Drouet, Oliver Lacrouts) conceived and curated the touring exhibition “plant fever”. Plant fever aims to awaken curiosity about the hidden potential of plants, which has been lost in the many years of alienation from nature. Focusing on new scientific discoveries and philosophical approaches, the exhibition tries to act as a catalyst for new design scenarios and wishes to serve in the development of a changed, possibly more intensive relationship between people and the plant world.

02 WWF Forests
WWF has partnered with an Indonesian startup company, Assemblr, to create an augmented reality (AR) app called WWF Forests. Using cutting-edge technology features provided by Apple, the AR tools help WWF protect forests by connecting people to the natural world in vivid detail and showing the impact of their actions on forests. Through this app, WWF aims to bring nature into people’s homes and educate them about their direct impact on forests and the important role forests play in everyday life.

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03 Geomercer

Geomercer explores the disconnect between humans and nature, in contrast to the artificiality of modern society. Inspired by the Neomercer exhibition from 1984, Geomercer takes a different direction, emphasizing the connection between nature and artificiality through plants' biochemical processes. The installation showcases how plants absorb metals from the soil, turning them into raw material sources. This concept highlights how the availability of raw materials affects international metal markets, positioning plants as parameters on the financial market.



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Sustainable materials as a first step

As always, when new key aspects, technologies and topics arrive in day-to-day life, they need to be expressed by means of a corresponding structure. On a semantic and material level, ideas of sustainability are frequently displayed through the choice of an aesthetic that is associated with naturalness and sustainability in the broadest sense. Matte surfaces, plain colored cardboard, earth tones and greens as well as natural materials are used particularly often. New, less environmentally harmful or regenerative material developments, such as vegan leather alternatives or plant-based polymers, are also being used with increasing frequency.

If products require new ways of handling them, then these are showcased as part of a new, mindful lifestyle. The three circular concepts of reusability, recyclability and repairability are focused on by means of the product design as a main feature of the product.

Sustainability products of the first generation are often not holistically sustainable, but instead focus on communicating a problem and a specific solution. It is consequently often the case that the problem and the solution seem to be disproportionate in relation to one another.

One example of this are the sneakers Adidas makes using ocean plastic. In order to end up with processed ocean plastic, plastic rubbish is fished out of the oceans and upcycled into fabric for the shoes. In terms of the problem of polluted oceans, it would be considerably more efficient to burn the rubbish collected and turn it into energy. To manufacture recycling thread, it would make more sense to use “fresh” rubbish. But if these solutions were implemented, users would remain ignorant of the underlying problem as well as the specially developed innovation. The ocean plastic sneakers fulfil their function as a medium by drawing attention to the problem of plastic pollution and communicate the fundamental idea of upcycling. At the same time, the response of customers and the market provides important information on which readjustments and new ways of acting are already accepted and thus serves as preparation for the development of products of the second generation.

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Alternative Materials

LEATHER SUBSTITUTE

Mylea

leather substitute made from fermented mycelium

EPHEA

leather substitute made from mycelium fed with production waste from other industries and fermented

Reishi

leather substitute made from the fruiting body of the reishi mushroom using the patented process Fine Mycelium to cultivate the mycelium.

Trama

leather substitute made from the fruiting body of the tinder fungus

APVELSKIN

leather substitute made by mixing dried apple pomace with a polyurethane binder and applying the mixture to cotton fabric

“Bio-TEX”

leather substitute made from plant-based proteins and bio-based polymers

Desserto

made from the Nopal cactus in Mexico

LEFA

composite material made from animal natural fibers and binders, which includes leather production waste such as sanding dust and offcuts

ALUMINUM SUBSTITUTE

Carbon

replaces aluminum in lightweight construction

Magnesium

replaces aluminum in lightweight construction

SuperBee Wrap

cotton coated with beeswax that can replace aluminum foil as a food packaging material

CONCRETE SUBSTITUTE

Recycling concrete

Recycled concrete is made using at least 25% recycled aggregate from crushed concrete or mixed demolition waste.

CO2-enriched recycled concrete

CO2-enriched recycled concrete is made using up to 85% recycled aggregate from crushed concrete waste that has been industrially enriched with carbon dioxide.

Bio-concrete

Bio-concrete made from invasive weeds and crayfish shells.

Finite

Biodegradable building material made from desert sand.

Sea Stone

Concrete-like material made from shells.

Shards

Tiles made from construction debris.

COTTON ALTERNATIVES

Nettle fibers

Nettle fibers are the fibers of the stinging nettle (*Urtica dioica* L. convar. *Fibra*) and belong to the bast fibers.

Abaca banana fibers

Abaca banana fibers: Abaca or Manila hemp is the term for the hard fibers of the fiber banana (*Musa textilis*).

Pineapple fibers

Pineapple fibers refer to textile fibers made from the leaves of the pineapple plant.

Bacterial cellulose

Bacterial cellulose: Certain types of bacteria produce a very pure form of cellulose during the conversion of sugar compounds, such as from carbohydrates.

Chiengora

Wool from dog hair.

UTILIZATION OF WASTE / SIDE PRODUCTS FROM ALUMINUM PRODUCTION

Crust

use of leftover sections in aluminum production

RedMud

Bauxite residues, also known as red mud, are by-products of aluminum production from which vases can be produced.

PLASTIC ALTERNATIVES

Radical Matter

A composite material made from slaughterhouse waste (blood).

Bananasplit

A composite material made from banana fibers, which can be separated into individual components.

Kuori

Made from byproducts of food production, such as banana and nut shells.

“Elos”

A series of switches and sockets made from bone powder. The molded pieces are made of bone powder mixed with a biobased binder.

Polyamid 11

Made from castor oil, which is cold-pressed from the seeds of the castor plant. The monomers from the castor oil are used to create an amino acid, which is then polymerized to form the polyamide polymer 11. Although it is biobased, it is not biodegradable.

Polybutyratadipat-Terephthalat (PBAT)

A biodegradable polyester that is synthetically produced from partially biobased and fossil-based raw materials.

Biobasiertes Polyethylenterephthalat

A plastic that is chemically identical to conventional PET (polyethylene terephthalate), but with a biobased component replacing a petrochemical one.

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Making small changes with day-to-day items

Many approaches for sustainable business require small changes in behavior or in expectations. Communicating that such changes can pay off is especially easy if one looks at small everyday items.

Most everyday items come in all kinds of variations – for instance, when purchasing a toothbrush, customers have long been used to having a wide selection of functional options to choose from although the action carried out with the item isn't all that complex. Moreover, many everyday items are replaced at regular intervals, so the purchasing decision is made regularly and repeatedly. Daily contact with the product makes it possible to impart a very wide range of sustainability concepts with particular impact. One thing is clear: even the smallest detail of our day-to-day lives is embedded in a complex system and can either contribute to a problem on a global scale or not.

Reusability:

[Dove Refillable Deodorant](#)

[Recup](#)

[Everdrop](#)

[Rezemo](#)

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01 r507 H2O
 r507 H₂O is the remote control that takes sustainability to the next level with its innovative solar cell technology. The solar cell stretches across the entire surface of the remote control, intentionally kept visible to capture maximum light and energy, ensuring reliable performance. Say goodbye to non-sustainable chemical storage options like lithium rechargeable batteries, as r507 H₂O features a physical storage solution that promotes eco-friendly practices.

02 F SolidPod
 F SolidPod is a functional applicator designed for a line of gel and shampoo bars, offering an eco-friendly solution to the excessive use of single-use packaging in the cosmetics industry. The unique shape of the F SolidPod allows for maximum product utilization, effectively doubling the lifespan of the bars. Made from recycled materials and built to last for over 10 years, the F SolidPod replaces and reduces the need for plastic bottles.

03 Electrolux 600
 The Electrolux 600 series / AEG 6000 series represents the latest advancements in canister vacuum cleaners, with a focus on sustainability, usability, and home contextualization. These products are crafted using 50% – 65% recycled plastics and are designed with no painted parts, eliminating harmful processes during production and enhancing future recyclability.

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04 LEMMO One

Lemo introduces the innovative E+Bike concept, which separates the main electric components from the frame, resulting in an extended usage time for the frame. Unlike electric parts that may require frequent updates, the frame remains durable, allowing customers to enjoy their bike for 10+ years. Additionally, customers can easily upgrade their Smartpac after 3 to 4 years, reducing the need for complete bike replacements. This forward-thinking approach aims to minimize the number of bicycles ending up in depots as waste, promoting sustainability and longevity in cycling.



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Interior designs as an expression of sustainable lifestyles

In the area of interior design, more and more often furniture is designed to combine several concepts of sustainability. The interior décor is a way for many people to express their lifestyle and individual values. Sustainable products are becoming status symbols which show that one is familiar with current international issues and that one feels one is in a position to assume responsibility. In most cases, sustainable furnishings are also the healthier alternative. The production of these items forgoes environmentally damaging substances and consequently these items have less of an impact on the health of those who use them. The longer and more conscious use of furnishings makes it possible to combine different sustainability concepts with one another and a greater adjustment can be expected of users. For instance, it is possible to acquire an easy chair through a rental system for a time that is made of natural materials and which can be repaired easily.

Sustainable products are frequently associated with high prices. But the fact that many concepts can also be implemented at affordable prices is evident in the new offerings from [IKEA](#).

The company has set itself the goal of making sustainability an affordable alternative. Many items of furniture are now part of a cycle and can be sold back to IKEA after use, thus making them available on the second-hand market.

It is easy to imagine that in future it won't be just the actual state of an item that determines its symbolic value, but also its past: with [digital product passports](#), it would then even be possible to trace all the stations of an item of furniture and thus provide the product with a biography.

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01 Sunne self-powered indoor solar light

Sunne is a solar-powered designer window lamp, which collects energy during the day in order to generate light at night. The lamp has a battery capacity of 14 hours. Using an app, the lamp can be configured with three light settings: Sunne Rise, Sunne Set and Sunne Light. What's important for the positioning of Sunne is that it must be near a window that gets a lot of sun exposure during the day so that the sun's rays can reach the solar surface on the back of the lamp.

02 MEISTERSTÜCK OYO DUO

There is a rising demand for freestanding bathtubs, especially for freestanding bathtubs in organic shapes in the market. In the meantime people become more and more conscious using resources. Comparably low water consumption and also the circularity of the material steel enamel is the huge benefit of the freestanding bathtub OYO DUO.

03 move chair by noho

The noho move chair excels with its dynamic and environmentally friendly design. Developed and manufactured in New Zealand, the material of this chair comprises recyclable materials such as ECONYL™ and recycled post-industrial polypropylene. This makes it possible to avoid using new materials for production, which in turn means a lower CO₂ footprint.

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04 tala light solutions

tala is at work developing and designing a sustainable solution for sources of artificial light. The company uses recyclable materials which can be procured responsibly and avoids plastic at all costs. In order to make as much of the chain of production transparent as possible, the supplying companies are chosen with extreme care. In order to counteract the amassment of electronic waste, part of the company's strategy is to develop lighting systems that are long-lived and easy to repair. Repairability presents itself as an essential factor in the development of technology as well as in the creation of design.

05 HiSolutions. Sustainable workspace for pioneers

The new offices in the Forum Steglitz building were designed for longevity and sustainability. Flexible planning took into account a growth in staff numbers and change. Refurbishing an existing building helps to save resources. The diverse workplace typology reflects the core values of individuality, exchange and community and brings these to life through different atmospheres. The pursuit of excellence, a further core value, is represented in state-of-the-art fittings and equipment, high-value buildout and the quality of the indoor climate, which is in part due to a sophisticated biophilic design.

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Sportswear and outdoor products as innovation drivers

Sports and outdoor products meet high-level functional requirements and are consequently often pioneers for material and technological innovations. Complex composite materials and chemicals often come into play to fulfill conflicting needs such as resistance to water paired with breathability or elasticity paired with providing support.

In the world of sports, however, there is a growing health awareness and a holistic perspective is taking hold: if, for instance, the chemicals used are hazardous to health or if it is accepted that, in order to produce these sports articles, working conditions put workers' health at risk, then the product does not serve its function.

Meanwhile, a separate market segment for sustainable sports articles is arising, which forgoes health-damaging "forever" chemicals such as PFAS and achieves functionality through other solutions (e.g. waxed textiles). (Wahnbaeck, 2023)

This development is even more evident with outdoor products – not least of all because the sector is dependent on an environment that is intact. Numerous outdoor brands have therefore set themselves the goal of developing high-tech textiles using natural materials such as merino wool or algae, which surpass conventional materials in terms of their functionality. [Patagonia](#), as a model company, demonstrates that sustainable business permeates all areas of the company: the founder recently transferred his shares to a foundation that ensures that all proceeds of the company are used for environmental projects.

The Circular Series Jackets from [Napapijri](#) are 100% recyclable thanks to their mono-material composition. Fillings and trims are made of Nylon 6, while the fabric is made of ECONYL® Regenerated Nylon, a high-performance nylon 6 yarn recycled from discarded fishing nets and other waste materials. The product series has the certification Cradle to Cradle Certified® Gold.

The sustainable sneaker brand [Fullup.](#) has removed lamination, metal logos, PVC patches, metal eyelets, and toxic synthetic materials from their shoes in an effort to make our manufacturing process as short and energy efficient as possible. Also each pair of Fullup. shoes are made from recycled PET recovered from 10 plastic water bottles, recovering waste to be used again.



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New infrastructures enable holistic sustainability

The first generation of sustainable products is characterized by the fact that it needs to exist in a system which is not yet sustainable. However, as the sustainability transformation advances, the corresponding infrastructures are coming into existence for an economy and industry that are emissions-neutral and environmentally friendly. As decentralized supply structures come on the scene, numerous interfaces between the new infrastructures and end users come into being – and with them also a new field for designing:

Sector coupling As a result of connecting various sectors and cascading use, it is also possible to optimize the application and consumption of renewable energies. For this, the energy consumption of one sector becomes an energy source for another. In this way, it is possible to make outstanding use of the waste heat of data centers to supply residential areas with heating or to cultivate plants. In the Frankfurt district Westerville, for instance, a nearby data center supplies waste heat to just under 3,000 people. (cf. Apel 2022) Meanwhile, the waste heat from server farms is also being used to grow algae. For instance, a greenhouse for algae attached to the data center belonging to the Windcloud company uses – and monetizes – the waste heat. (cf. Maas 2021)

Microgrids Smart grids are a key element in increasing energy efficiency and controlling capacity fluctuations. For this, the components are connected in order to provide network operators with information on energy production and energy consumption at short intervals. (cf. BMWi 2019) Microgrids are one special form of smart grids: intelligent systems which self-sufficiently bring together those who generate energy with those who consume it since these grids can be operated independent of the superseding energy grid. As local grid stations, microgrids constitute a kind of island grid, which coordinates the various inputs of renewable energies – and which strengthens the autarky of individual energy grids. (zhaw, 2022)

Battery-sharing As a result of the decreasing prices of regenerative energy, the number of people who are self-sufficiently supplying themselves with energy is growing. In order to produce, store and distribute electricity as a community, with self-sufficiency vis-à-vis the general energy grid, corresponding technologies and services are needed. (cf. Sonnen 2020) If energy stores in households are networked with each other, huge, decentralized energy supply grids will successively come into being and these will enable uniform voltage.

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Sustainable products as part of a system

The emergence of new infrastructures for production and business is making holistic product planning possible, which provides a sustainability strategy for a product's entire life cycle. Now it is no longer the communication of individual sustainability concepts that is in the spotlight, but the design of a successful interface between the individual and the infrastructure. Products are turning into parts of a complex system and are offered more and more frequently in conjunction with services. New offerings, for instance, combine delivery services with multiuse systems and are thus no longer associated with additional effort, but instead are becoming conveniences.

Likewise, expectations in terms of aesthetics and user experience are developing further. Sustainability is no longer viewed as part of a value set, but instead is an integral component of everyday life – the technological innovations, which arise in the course of the transformation, are raised to the level of status symbol. This becomes clear if one looks at the example of a heat pump installed outside a building. This heat pump requires neither a green color scheme nor natural materials to communicate its sustainability – the function itself already makes this evident.

Instead, the technological, innovative strength of the product is highlighted. The product isn't designed to be unobtrusive, as is often the case with infrastructure elements. Quite the contrary, many heat pumps are elaborately designed and staged as an object in front of a building.

The **Vitocal** heat pump enables owners to heat their homes with carbon-neutral renewable energy. The monolithic shape of the newly designed outdoor unit blends into the architectural environment. Refined details such as the thin frame of the generous noise-optimized front grille and the convex-shaped top cover create a robust and durable design.



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01 Recycling shower from Grohe

Water scarcity as well as a lack of access to fresh potable water are also among the challenges that are being ushered in by changing environmental conditions. In the course of these challenges, GROHE, a globally leading brand for complete bathroom solutions and kitchen fittings, has presented a new concept for a water-saving shower – the water-recycling shower. This newly designed shower not only ensures a pleasant shower experience, but also decreases water consumption by up to 75 % and energy consumption by up to 66 % in the case of a 10-minute shower. This would result in yearly savings of more than € 1,300 for a family of four. The shower mechanism works by having an initial flow of fresh water, with the user switching the shower mode as soon as shampoo or soap is used. After switching, the water in the drain is collected and pumped to a circuit that maintains the temperature and treats the water.

02 autarq – Building Integrated PV Roof Tiles

atarq's building integrated photovoltaic (BIPV) system with proprietary PV-module architecture is designed and produced in Europe. The uniquely miniaturized PV-module, combined with a proprietary wire harness made from standard tier 1 components, allows for a Plug & Play installable BIPV system that operates in a parallel circuit with SELV (safety extra low voltage).

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03 Novartis Pavillon – A Zero-Energy Media Facade

the innovative zero-energy media facade at Novartis Pavillon is a cutting-edge fusion of organic photovoltaics and LEDs that creates a communicative and visually captivating skin. With 10,000 solar modules and 30,000 embedded LEDs, this multi-layered membrane consumes only the energy it produces. It serves as a canvas for the works of renowned international artists Daniel Canogar, Esther Hunziker and Semiconductor, creating a dynamic display of art and technology. Located in Basel, Switzerland, Novartis Pavillon is a hub for learning and exchange, bridging the worlds of science and medicine with the community.



3 Challenges

Sustainable design concepts require new bases of knowledge, alternative manufacturing technologies and concepts that designers first need to familiarize themselves with in order to successfully put them into practice.

A first generation of sustainable products still needs to become established in a system that has not adapted to the requirements of a sustainable global economy. These products need to make individual changes to the production system economically viable as well as convince users to accept new habits and establish new ways of doing things.

Establishing new production systems and sustainable infrastructures makes it possible to integrate sustainability more holistically into the design of products. The main challenge then lies in combining concepts that have already been developed in a way that is appropriate and congruent in order to achieve the best possible holistic results.

3 Solutions

At the interface between nature and social sciences, numerous discourses are arising with regard to sustainable living, which serve as a breeding ground for innovative concepts. Culture and entertainment formats make the ideas developed within this context accessible to a broader audience.

Using natural materials, colors and surface design, distinctive aesthetics impart the fact that the product is associated with a sustainable value set. This conveys a new type of lifestyle and the concepts and behaviors associated with it.

Products now integrate into complex systems and are increasingly bundled with services. As a result, products are no longer associated with additional effort, but are instead becoming conveniences. The interfaces to the underlying infrastructure are no longer concealed, but instead highlighted as a design feature.

MEGATREND NEO-ECOLOGY

Executive summary

Key megatrend

Tipping points

Milestones sustainability

Circular design

Decentralization

Sustainable innovation

Greenwashing

Sustainable products

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Communicating new ideas

New forms of prosperity

Serious games

Best practices

Sustainable materials

Best practices

Interior design

Best practices

Sportswear and outdoor products

Holistic sustainability

Systemic sustainability

Best practices

Challenges & solutions



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Publishing information

Publisher

iF International Forum Design GmbH
Bahnhofstraße 8
30159 Hannover
Tel: +49 511 5 42 24-206
www.ifdesign.com

Publication date

May 10, 2023

Project management iF

Rylana Kossol

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2023
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Zukunftsinstitut GmbH
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