COMMERZ REAL

Part 3
OF OUR
3-PART SERIES

In harmony with society

Infrastructure and people

Whitepaper — 03.2025

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Chief Executive Officer, Commerz Real AG

Foreword

Dear Readers,

Here at Commerz Real, we ask ourselves the following fundamental question: what does a future look like in which we as humans want to live? When viewed in its entirety, the topic of infrastructure represents one of the crucial aspects in terms of sustainably networking and designing environments. It forms the basis of our communities and links the major issues of our time, such as energy supply, urban development and safeguarding prosperity.

Despite the social, political and economic challenges of recent years, infrastructure transformation is increasingly gaining momentum – and in Germany, for example, there is currently a huge need for investment.

The reliable expansion of roads, railways, waterways, electricity supply and telecommunication networks benefits everyone – the state, citizens and companies.

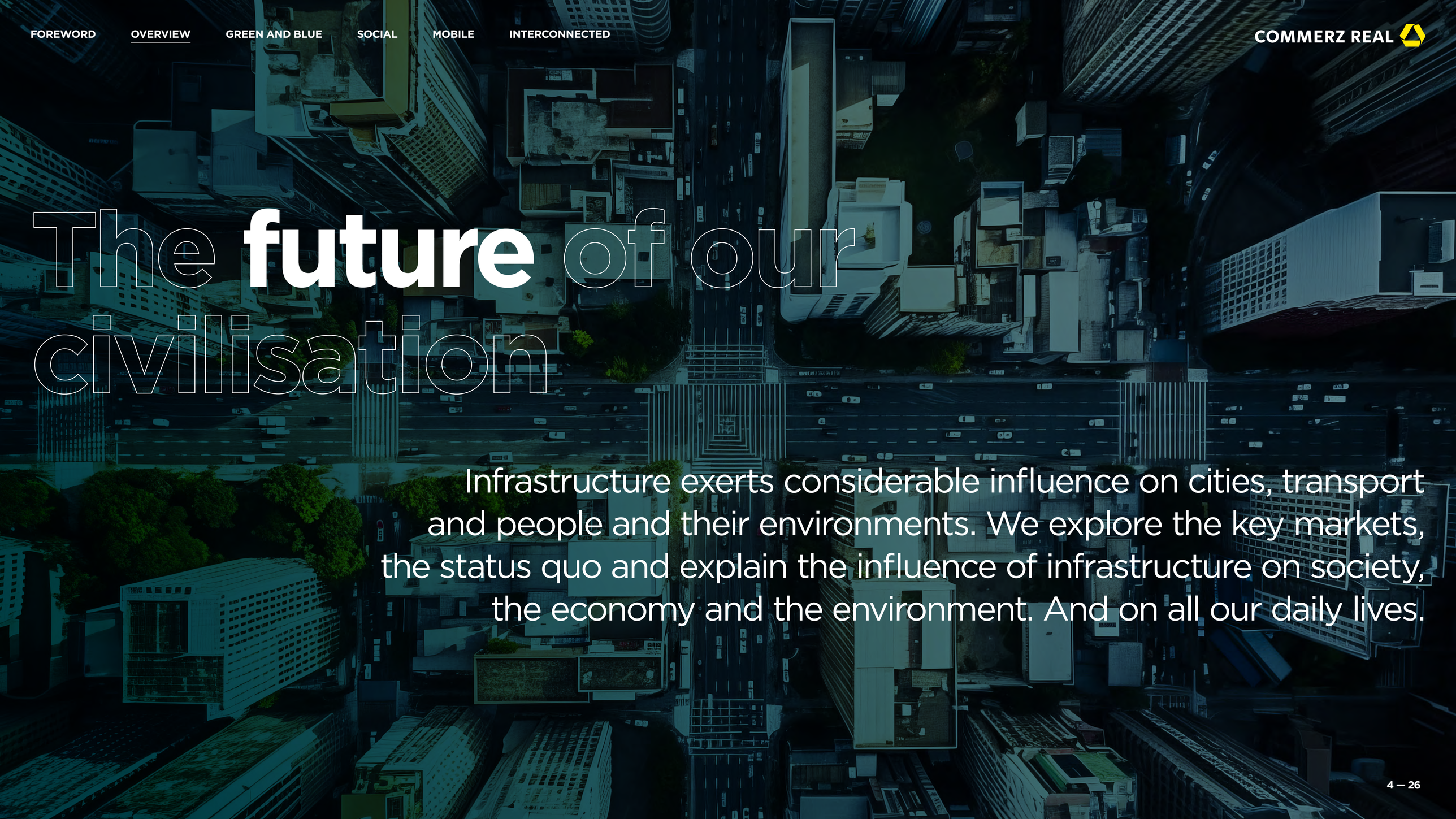
Innovative excellence and a network of strong partners are needed to make this happen. At Commerz Real, we focus on established technologies and assets. In recent decades, we have developed comprehensive expertise in the areas of property and renewable energies – two key segments with exceptional relevance for all aspects of infrastructure. It has long been clear that property and renewable energies are inexplicably linked, which is why we need to develop holistic approaches tailored to people's needs. These approaches support us on the journey to net zero and open up new income streams.

As we are aiming to provide a comprehensive picture of the global infrastructure market in this white paper, we have produced a three-part series. This first part examines the changing market and the opportunities it offers to institutional and private investors. Part two explores the influence of infrastructures on the energy transition, whereas part three centres on how they affect people and cities.

I hope you discover exciting and structured insights.

Best wishes,
Henning Koch

Contents



The future of our civilisation

Infrastructure exerts considerable influence on cities, transport and people and their environments. We explore the key markets, the status quo and explain the influence of infrastructure on society, the economy and the environment. And on all our daily lives.

Infrastructure interwoven with cities.

The future of our civilisation will be decided in cities.
Cities are central hubs for the global population, economic activity and cultural and social dialogue. According to the OECD, approx. 83.7% of the world's inhabitants will be living in cities by 2050 due to the megatrend of urbanisation. Even though cities generate huge volumes of greenhouse gases, targets for the infrastructure transition in urban areas go well beyond mere decarbonisation. The New Leipzig Charter, adopted by the EU in 2020, concludes the following based on people's needs: sustainable and integrated urban development for the common good not only includes climate protection, but also social cohesion and digitalisation.[1]

This goes hand in hand with infrastructural challenges such as higher demands in terms of housing, transport, healthcare and education. It therefore makes sense that the various infrastructure sectors – such as energy, transport, communication and social – seamlessly interconnect and can only be considered holistically, especially in cities.

The city as a global player: agility as an opportunity for resilient (infrastructure) transformation.
Changing global alliances are causing power to shift from individual superpowers to nation states, regions and even cities. In the process, many cities are gaining political, cultural and economic power and acting ever more independently from nation states.

As they are directly affected by the issues involved, there is often considerable will and motivation to implement change at the level of citizens and local government, where there is also often more scope to act than at national level. Urban developments and interconnected technologies make it possible to tailor infrastructure more flexibly to the day-to-day needs and challenges of local people and to find more common ground with local communities. Developing these autonomous systems and regional alliances allows urban ecosystems to become systemically resilient against complex global networks.[2]

Example goals for infrastructure transformation in urban environments:

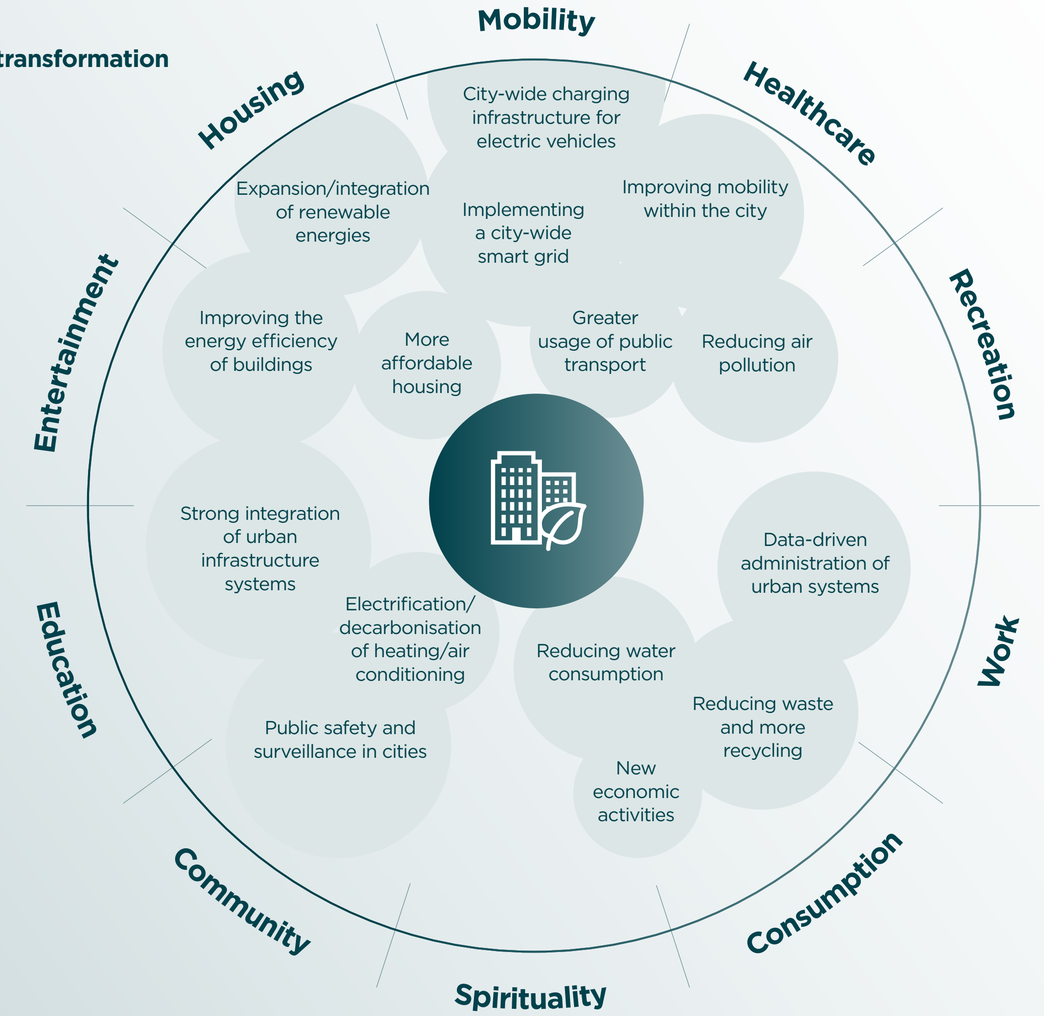


Figure: own chart/sample goals based on the OECD
See page 24 for an explanation of references

Infrastructure shapes its environment ...

... its appearance does matter.

1 AEG Turbine Factory, Berlin
2 Bastei, Cologne
3 Bierpinsel, Berlin
4 Bundesbüdchen, Bonn
5 DLRG headquarters, Berlin
6 Colonius, Cologne
7 Steam engine building, Potsdam
8 Elbphilharmonie, Hamburg
9 TV Tower, Berlin
10 Tegel airport, Berlin
11 Main train station, Frankfurt am Main
12 Radio tower, Berlin
13 Gasometer, Oberhausen
14 Göltzschtalbrücke, Netzschkau
15 Wholesale market, Hamburg
16 Flak Tower IV, Hamburg
17 Dockside crane, Rostock
18 Main fire station, Fulda
19 Haus der Statistik, Berlin
20 Hochbrücke, Rendsburg
21 Hohe Brücke Charlottenburg, Berlin
22 Hyparschale, Magdeburg
23 ICC, Berlin
24 Gut Großlappen Sewage Works, Munich
25 Köhlbrandhöft Sewage Works, Hamburg
26 Cathedral, Cologne
27 Köhlbrand Bridge, Hamburg
28 Kohlrabizirkus, Leipzig
29 Kriemhildmühle, Xanten
30 Lighthouse, Rostock
31 Mäusebunker, Berlin
32 Möhnetalsperre, Soest
33 Wambacher Mühle, Schlangenbad
34 Multihalle, Mannheim
35 Müngstener Bridge, Solingen
36 Olympiastadion, Munich
37 Paketposthalle, Munich
38 Parkhaus Osterstraße, Hannover
39 Philharmonie, Berlin
40 Town hall, Augsburg
41 Town hall, Mainz
42 Reinoldikirche, Dortmund
43 REWE Green Farming, Wiesbaden
44 Rotes Rathaus (Town Hall), Berlin
45 Schiffshebewerke, Niederfinow
46 Schwebebahn, Wuppertal
47 Seerose, Potsdam
48 Sendehalle Europe 1, Überherrn
49 SWR TV tower, Stuttgart
50 University clinic, Aachen
51 Unstruttal Bridge, Karsdorf
52 Vogelsangschule, Stuttgart
53 North water tower, Halle (Saale)
54 Rothenburgsort water tower, Hamburg
55 Zeche Customs Union, Essen

Infrastructure availability increases quality of life.
When taking people's needs as the starting point, an aspect not to be underestimated is that infrastructure can be used to create places of architectural beauty, thus generating and maintaining functional, social and aesthetic added value. Those who use and look upon infrastructure should benefit from the buildings' atmospheric effect.[3]

Figure: Source: Federal Foundation of Baukultur, Baukulturbericht 2024/25 Infrastrukturen, June 2024. Diagram © Federal Foundation of Baukultur; design: Heimann + Schwantes
See page 24 for an explanation of references

Green and blue infrastructure.

Transformation towards a climate-neutral city.

Urban heat islands[4]
The night-time temperatures in central London and central Paris are frequently 4°C higher than in the cities' rural surroundings. In summer, this temperature difference can be up to 10°C in Athens, Greece. In Sydney, Australia, the surface temperatures of built-up areas in the summer sun can be up to 16°C warmer than in shady areas. Blue-green infrastructure can neutralise these fluctuations.

More storage space for water!
Sponge city effect – storage and retention of water in built environments

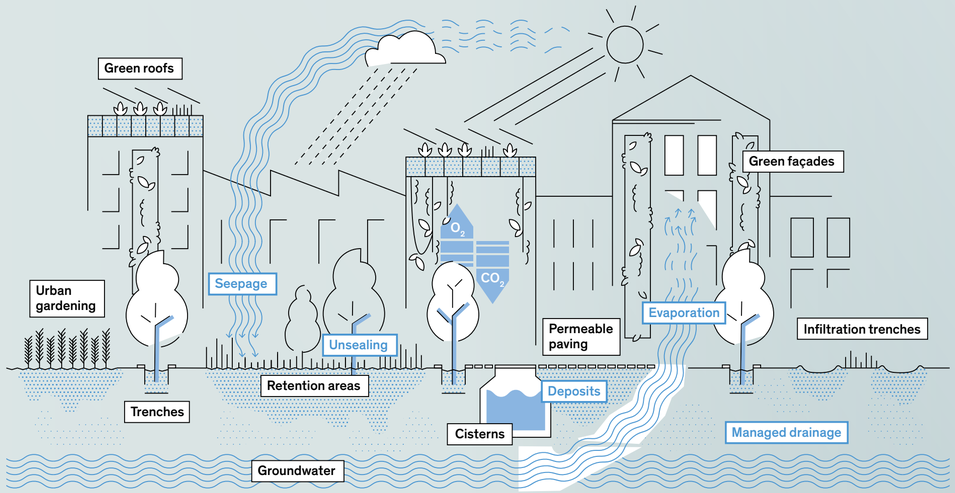


Figure: Source: Federal Foundation of Baukultur, Baukulturbericht 2024/25 Infrastrukturen, June 2024.
Diagram © Federal Foundation of Baukultur; design: Heimann + Schwantes

Modelled on nature.
Not every item of infrastructure comprises a building. Green and blue infrastructure consists of natural elements and water resources in cities and landscapes; these elements play a crucial role in adapting to climate change and enhancing quality of life.

Green infrastructure.
Green infrastructure refers to public green spaces such as parks, roadside trees, living facades/roofs as well as meadows and woodland. These elements help to regulate the climate, improve air quality and offer space for leisure and recreation. They play a key part in reducing urban heat islands and increasing biodiversity.

Blue infrastructure.
Blue infrastructure comprises water-related systems such as rivers, lakes, fountains and rainwater management. It is of vital importance for flood protection, water storage and in terms of improving urban water quality. In cities like Berlin, parks such as Kienbergpark help to save considerable amounts of money each year by acting as climate regulators and recreational areas.

Significance of blue-green infrastructure.
Blue-green infrastructure combines elements from both concepts in order to offer environmental, social and economic benefits. It reduces negative consequences of climate change, such as flooding and extreme heat, improves the population's quality of life and bolsters urban resilience. Examples such as rainwater management show that using this infrastructure results in considerable savings and environmental benefits.

See page 24 for an explanation of references

Social (golden) infrastructure.

Quality of life, social cohesion, public services.

Space for communication.
In cities, public spaces play a key role in promoting greater spatial justice by providing all of the city's residents with the same basic conditions. It serves as a shared space in which people come together, interact and build social ties.

To make it possible for people with different backgrounds and opinions to communicate, network and learn from each other, there is a need for constructive forms of communication and specific places that serve as open forums. These could be, for example, neighbourhood cafes, youth clubs, repair cafes, parks, associations.[5]

Space for shaping.
The quality of life aspect also plays a role here. On the one hand, there is a growing desire for individual uniqueness, with personal identities and lifestyles enjoying unprecedented free rein; at the same time, we are witnessing a burgeoning aspiration for belonging and guidance. The topic of mental health has made it into the mainstream of society, showing that increasing prosperity is no guarantee of improved well-being.[5]

Public space also stimulates economic activity. It has, for instance, been proved that people living in low-income parts of town have less access to green spaces than those living in higher-income areas.

Ageing urban populations also mean growing demand for age-friendly infrastructure and services specifically geared towards older people, giving rise to a 'silver economy'.[6]

Structures for greater cohesion.
In this regard, social infrastructure encompasses the buildings and organisational structures needed for societal living and public services. These include, for example, educational institutions, healthcare facilities, sporting and recreational amenities and cultural/social meeting places.

The challenges.
In many areas, there is an investment backlog, especially when it comes to modernising and expanding existing infrastructure. Moreover, the needs are particularly acute in rural areas, where social infrastructures are often hard to access or missing altogether.

The prospects for the future.
We are increasingly seeing calls to design social infrastructure to not only be functional, but also architecturally valuable, the aim being to increase the added value for society. In particular, educational facilities need to be multifunctional, meaning that they can host neighbourhood meetings and cultural events outside school hours.[7]

All inclusive.
Inclusive and healing design will be key principles in the future. Inclusive design is about considering the needs of everyone in society and removing social barriers and discrimination, e.g. by means of accessible public rights of way and modular furniture that people can adapt as they get older. Holistic approaches to design space generate positive effects, as the designed environment is regarded as part of active health promotion and increased quality of life.[5]

See page 24 for an explanation of references

Examples of social infrastructure.[7]

Education and knowledge

Schools, nurseries and universities are hubs of social infrastructure. They not only serve to educate, but also often double up as community meeting places and offer space for cultural and sporting activities.

Health and social care

Hospitals, doctors' surgeries and care homes count as social infrastructure. They ensure healthcare provision and are essential in keeping the population healthy.

Culture and leisure

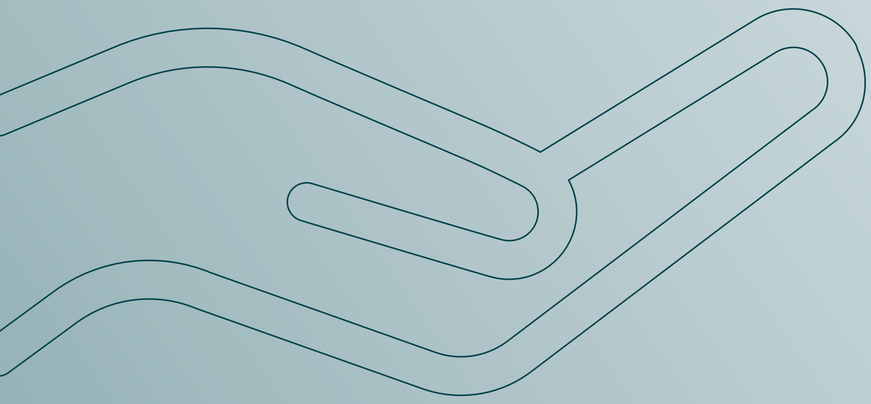
Libraries, theatres, museums and sporting/leisure facilities offer opportunities for education and recreation. These facilities make a vital contribution to quality of life in cities and municipalities.

Community meeting places

Parks, playgrounds and club-houses serve as meeting places for people of all ages and foster social cohesion. Easily accessible facilities provide space for encounters and communication.

Civil protection and emergency management

Shelters, efficient emergency communication and cooperation between official agencies and auxiliary services that protect the population in a disaster and prepare for emergencies.



See page 24 for an explanation of references

FOUR QUESTIONS FOR

Rasmus Duong-Grunnet

Rasmus Duong-Grunnet is
Project Director at Gehl Architects

— What criteria make an urban neighbourhood liveable?
Here at Gehl, we focus closely on everyday life and the lived day-to-day experience. People have needs – and a good urban area should meet these needs. For example, we conducted a study in Munich. This represents the first city-wide survey of usage patterns in Munich's public spaces. The city is home to some world-famous places, which people love. Nevertheless, more than 60% of people use the local spaces in the communities in which they live. We need to ensure that good public spaces extend beyond these well-known (tourist) places to include everyday public spaces in local communities.

— What gives rise to resilience when designing modern urban neighbourhoods?
Flexibility and multi functionality. These are the two keywords underpinning our work. We need spaces that are flexible enough to enable future usage and functions without the need to rebuild everything from scratch. Resilience is about being ready to consider new needs within a city; for us, this means ensuring that public spaces stay relevant. Multi functionality is really about sharing the city. Building multifunctional spaces poses a challenge on account of the lack of space. It is just as important, however, that we see substantial social benefits when we meet up in the city and use spaces together. Modern-day libraries are a great example. While they still stock books, they also serve as venues for community events, sport, music, talks and coffee breaks. They are genuinely multifunctional community spaces – real 'third spaces' where we meet up outside our homes and workplaces.

— As a team of placemaking experts, what challenges do you face in your projects?
We aim to understand the public life and range of needs behind our projects before we start planning. At Gehl, we like to say 'first life, then spaces, then buildings – it doesn't work the other way round'. This means that we always have the challenge of understanding the people and rhythm of life in a city before we embark on designing places and spaces. We have amassed considerable experience in our work, but we continue to challenge ourselves to become even better and to examine our own blind spots and prejudices. We recently took part in the →

'First life, then spaces, then buildings – it doesn't work the other way round.'

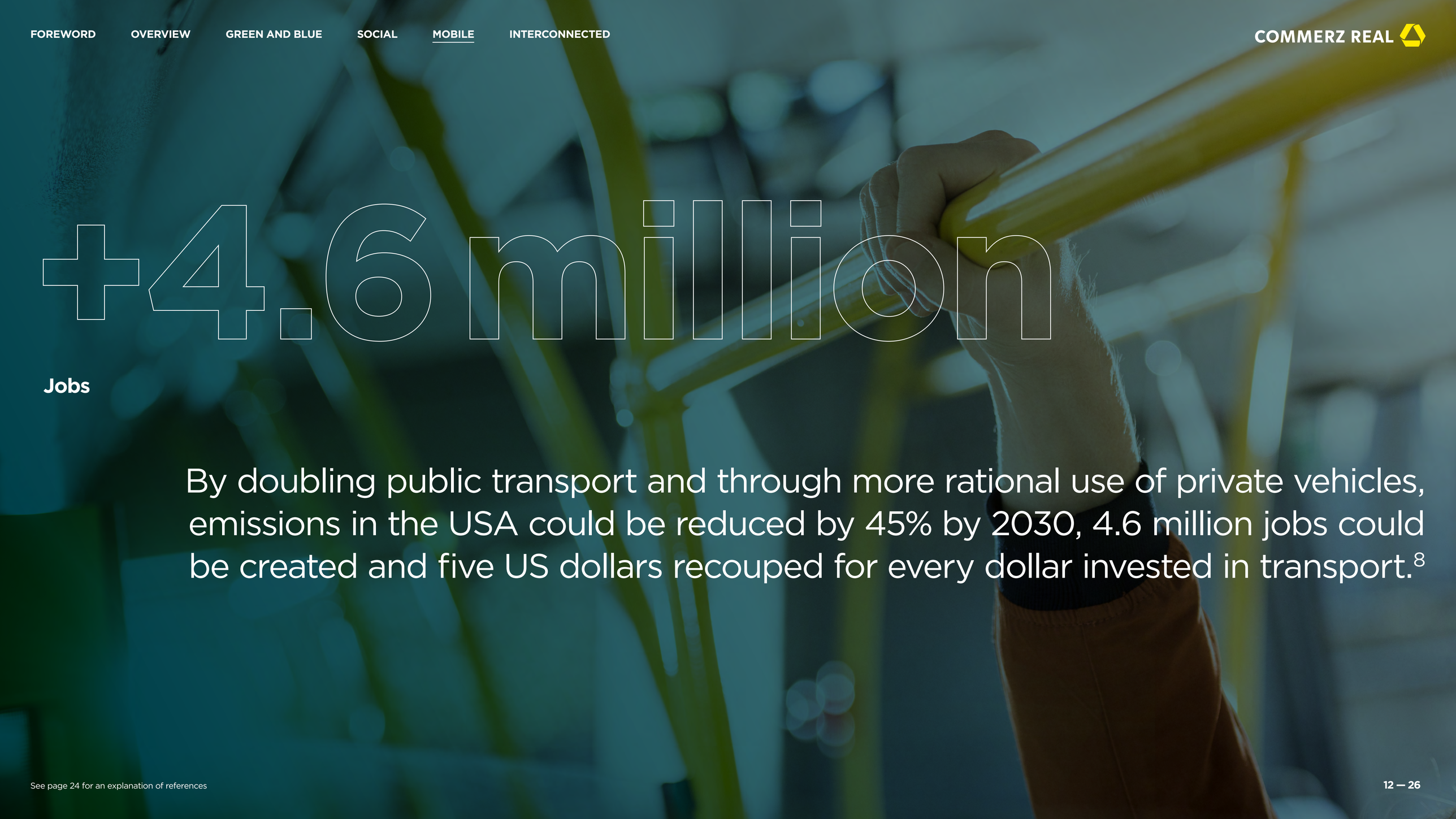
Gehl Architects is one of the world's leading consultancy firms in the area of urban research and design; based in Copenhagen, it was set up in 2000 by Professor Jan Gehl and the urban planner Helle Søholt and, for more than two decades, has been putting the human dimension at the forefront of urban planning in more than 250 cities by designing healthier, more liveable, more resilient and more integrative places.

gehlpeople.com

'Urban Belonging' project in Copenhagen, which aimed to understand how minority groups feel a sense of belonging in their own home city. Based on this experience, we are improving our methods and developing new approaches.

Gehl Architects comes from Copenhagen – what makes the city a trailblazer when it comes to transforming cities into future-proof living environments?
Copenhagen is the home of Gehl; Professor Jan Gehl and his colleagues were working in Copenhagen before Gehl even opened an office. Copenhagen is our 'living laboratory'. We are proud of the city and the role our firm has played in its development. Copenhagen has done many great things. Focusing systematically on a transport revolution, in which pedestrians and cyclists have priority, has created a superb urban environment for people. A further example is the redesigning of the port area, where the focus was on transforming the space from an industrial port to a post-industrial port for the benefit of people.

At Gehl, we operate worldwide. While Copenhagen is always a source of inspiration for us, we never want to copy ideas from the city. Whether Berlin, Munich, Münster or Konstanz, each and every city has its own characteristics – and the people who live there have their own needs and dreams. We need to understand these before we start searching for the right solutions.



+4.6 million

Jobs

By doubling public transport and through more rational use of private vehicles, emissions in the USA could be reduced by 45% by 2030, 4.6 million jobs could be created and five US dollars recouped for every dollar invested in transport.[8]

See page 24 for an explanation of references

Transport infrastructure.

‘Mobility is an essential prerequisite for prosperity.’

World Economic Forum

Mobility as a basic need.
Humans have never been more mobile than they are today. Mobility is a basic human need, and freedom a fundamental right in our society. Transport infrastructures are essential in order to safeguard this mobility for everyone, whether on land, on water or in the air. In this regard, it is important to make mobility accessible to all.

This means that transport infrastructure designed for rapid mass transit also has to be compatible with people‘s needs. It cannot become an obstacle within public space. There is a desire for seamless, intermodal mobility. To this end, new and traditional forms of mobility, such as sharing services, micro mobility and self-driving vehicles, need to be digitally interconnected in real time and made available across all providers.[9]

Promoting mobility over short distances – in order to avoid unnecessary journeys and enhance quality of life – also represents a feature of more liveable and equitable urban spaces; this is, for instance, holistically incorporated within the fifteen-minute city approach. Short, easily accessible routes and functioning public transport are essential.

Climate-friendly and resilient.
In the context of climate change, it is crucial to retain, modernise and future-proof existing infrastructures. Here, it is essential to implement climate-friendly and resilient infrastructures that do justice to sustainability requirements. Each construction project should aim to support climate targets and strengthen resilience to extreme weather events.

Maintaining and looking after existing infrastructures should take precedence over demolition and rebuilding. What is needed is a transformation of existing infrastructure that makes infrastructure longevity the top priority. Considerations concerning the costand emission footprints of a structure over its entire life cycle are arguments in favour of maintenance. In addition, it is important to maintain the cultural and identity-building significance of infrastructures such as railway stations, bridges and town halls.

The Federal Foundation of Baukultur is therefore also calling for mobility infrastructures to not only be functional, but also aesthetically and architecturally valuable. Infrastructures that are carefully developed, paying due regard to architectural/cultural principles, can substantially improve people’s quality of life and thus add long-term added value for the common good and the environment.

See page 24 for an explanation of references

Cities in focus.

Road damage, roadworks and repeated traffic jams at the same bottlenecks are the hallmarks of German infrastructure.
Following the collapse of the Carolabrücke bridge in Dresden in September 2024, Michael Hüther, Director of the German Economic Institute (IW), spoke of '20 years of failure to act' and once again highlighted the fact that infrastructure investment has been too low for decades.[10] But how can cities actually become investable? Road projects in Germany could be contracted from the public sector to construction companies by means of public–private partnerships (PPPs). To implement these projects, a separate project company is usually set up, with investors able to get on board via these companies. Depending on when the investors decide to get involved (during the road's construction/expansion phase or during subsequent operation), the risk/return profiles of the projects vary (greenfield vs. brownfield). In terms of PPPs, there are three distinct options, with the expansion and availability models the most established.

Expansion model ('A model')
These concession models became possible with the introduction of an HGV toll in 2005; the holder of the concession expands a busy section of the motorway to six lanes and, during the term of the concession, is responsible for operating and maintaining the section of road. In return, the concession holder receives compensation dependent on traffic volume that is calculated using the HGV toll. The concessions generally run for 30 years.

More information (in German):
Federal Ministry of Digital and Transport – the 'A' model, Bund.de

'F' model (FStrPrivFinG)
Although the 'F' model is actually the oldest concession model in Germany (since 1994), it has only ever been used to implement two projects nationwide. Unlike with the other models, the operator of the section of road has their own toll stations and charges their own tolls. The model is limited to federal highways, bridges, tunnels and mountain passes that are akin to motorways. Once the concession expires, the section returns to public ownership.

More information (in German):
Federal Ministry for Digital and Transport – the 'F' model (FStrPrivFinG), Bund.de

Availability model ('V' model)
Launched in 2009, the second PPP model enables transport volume-independent compensation for the concession holder. As with the A model, the concession holder remains responsible for planning, building, operating and maintaining the section of road, but instead receives an availability fee. A contract stipulates the degree of availability required for the section (i.e. no roadworks, lanes open, etc.). When it hits these targets, the concession holder receives the full fee. In the event of reduced availability, the fee is reduced. Generally speaking, project terms are between 20 and 30 years.

More information (in German):
Federal Ministry of Digital and Transport – the 'V' model, Bund.de

See page 24 for an explanation of references

Supra structures – an increasing strain on roads.
There is a risk that technological progress results in ever larger and heavier vehicles (**supra structures**) without assessing the impacts on the environment, the economy and the spatial setting. The Federal Foundation of Baukultur is calling for new supra structures to be introduced with caution and foresight in order to prevent unnecessary strain on existing infrastructures and the environment.

Goods transport placing a considerable strain on infrastructure
A 40-tonne HGV places a strain on roads and bridges equivalent to 60,000 passenger cars, source: VC. 2023

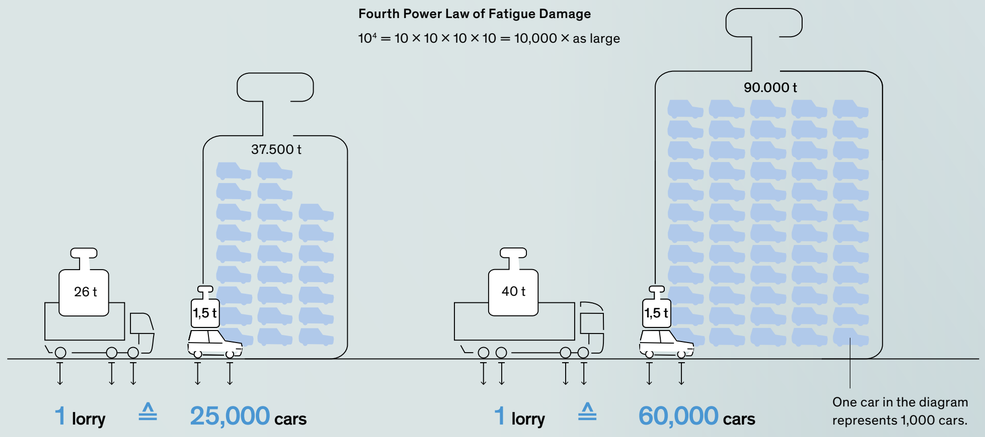
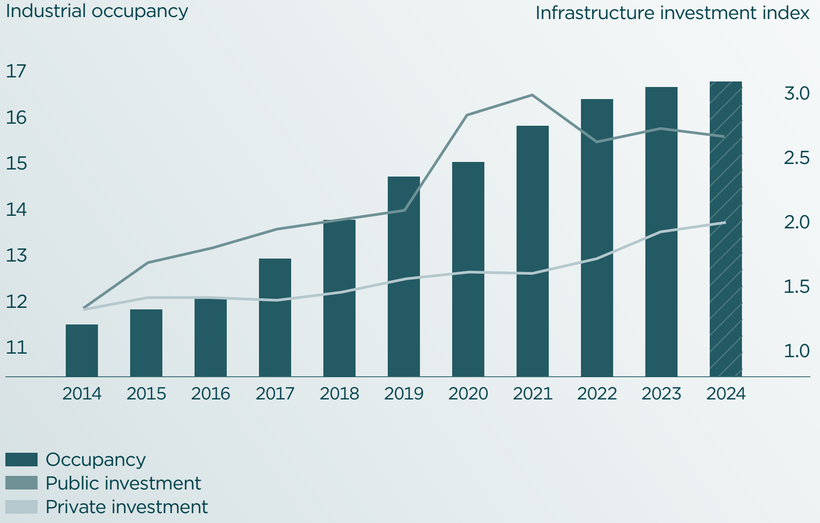


Figure: Source: Federal Foundation of Baukultur, Baukulturbericht 2024/25 Infrastrukturen, June 2024.
Diagram © Federal Foundation of Baukultur; design: Heimann + Schwantes

Intact roads, an intact economy – good for growth.
Studies conducted by Newmark Research indicate a strong correlation between investments in transport infrastructure and industrial growth.

Take the USA, for example: public and private transport investment exhibits a strong correlation with growth in industrial occupancy



Source: Newmark Research, U.S. Census Bureau, USAspending.gov, October 2024

Looking at rolling stock.

Getting aboard the investment train.
Compared with 1992, transport capacity in rail has risen by more than 75%. On average, it takes almost 23 years from the start of preliminary planning for a new railway line until the first train embarks on its maiden journey. More money alone is not the answer. The money has to be used, but there is a lengthy planning and approvals process before this can happen. Transport ministers have to cut unnecessary red tape.

Rolling stock investments relate to vehicles used to transport goods and passengers on both regional and mainline routes. Investors interested in the rolling stock market have a wide variety of investment vehicles to choose from. Alongside PPP concessions that make the concession holder responsible for providing, maintaining and insuring a new vehicle fleet of wagons, railway vehicles and locomotives during the term of the concession, there are also PPP models in which the concession holder is responsible for maintenance, infrastructure and expansion work at the railway depot.

Moreover, there are numerous M&A transactions in which investors generally acquire shares in railway depots, maintenance firms, operators and/or manufacturers of rolling stock infrastructure. Leasing structures have also been established in which the investor provides capital for acquiring new trains.[11]

Phase zero using the example of the executive organisation DB InfraGO Hamburg

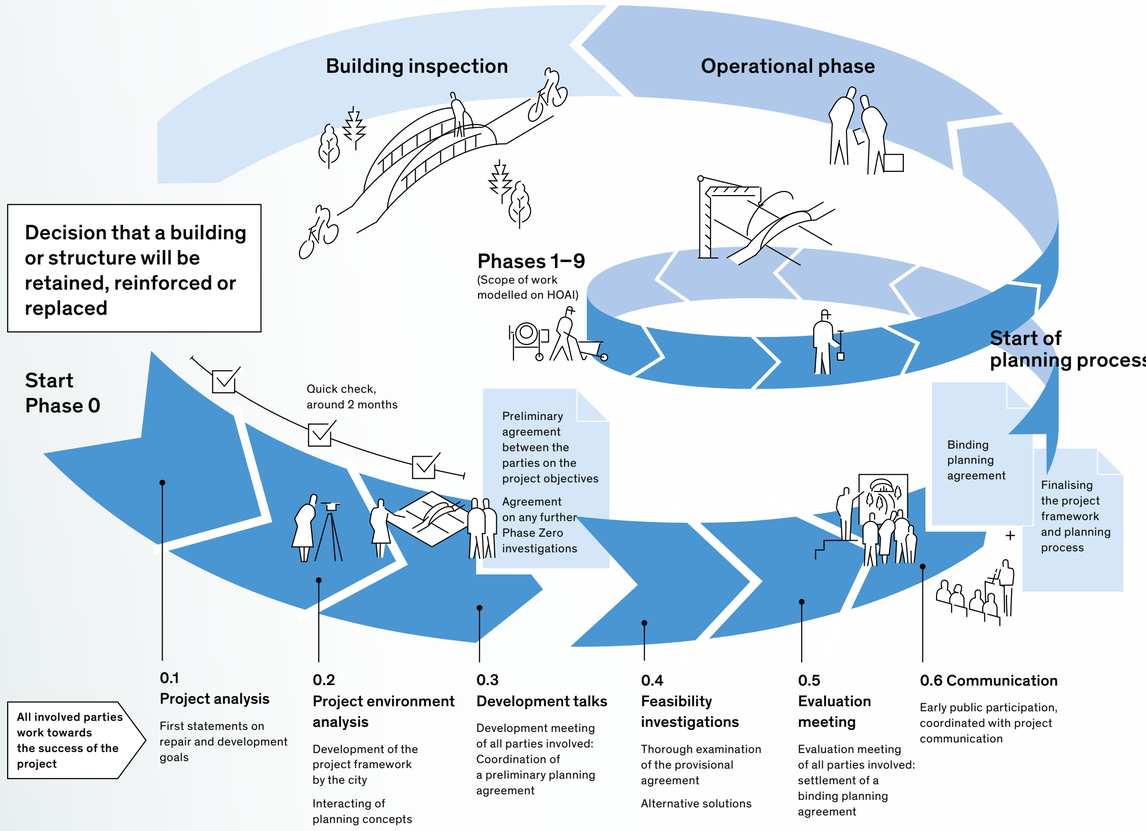


Figure: Source: Federal Foundation of Baukultur, Baukulturbericht 2024/25 Infrastrukturen, June 2024.
Diagram © Federal Foundation of Baukultur; design: Heimann + Schwantes

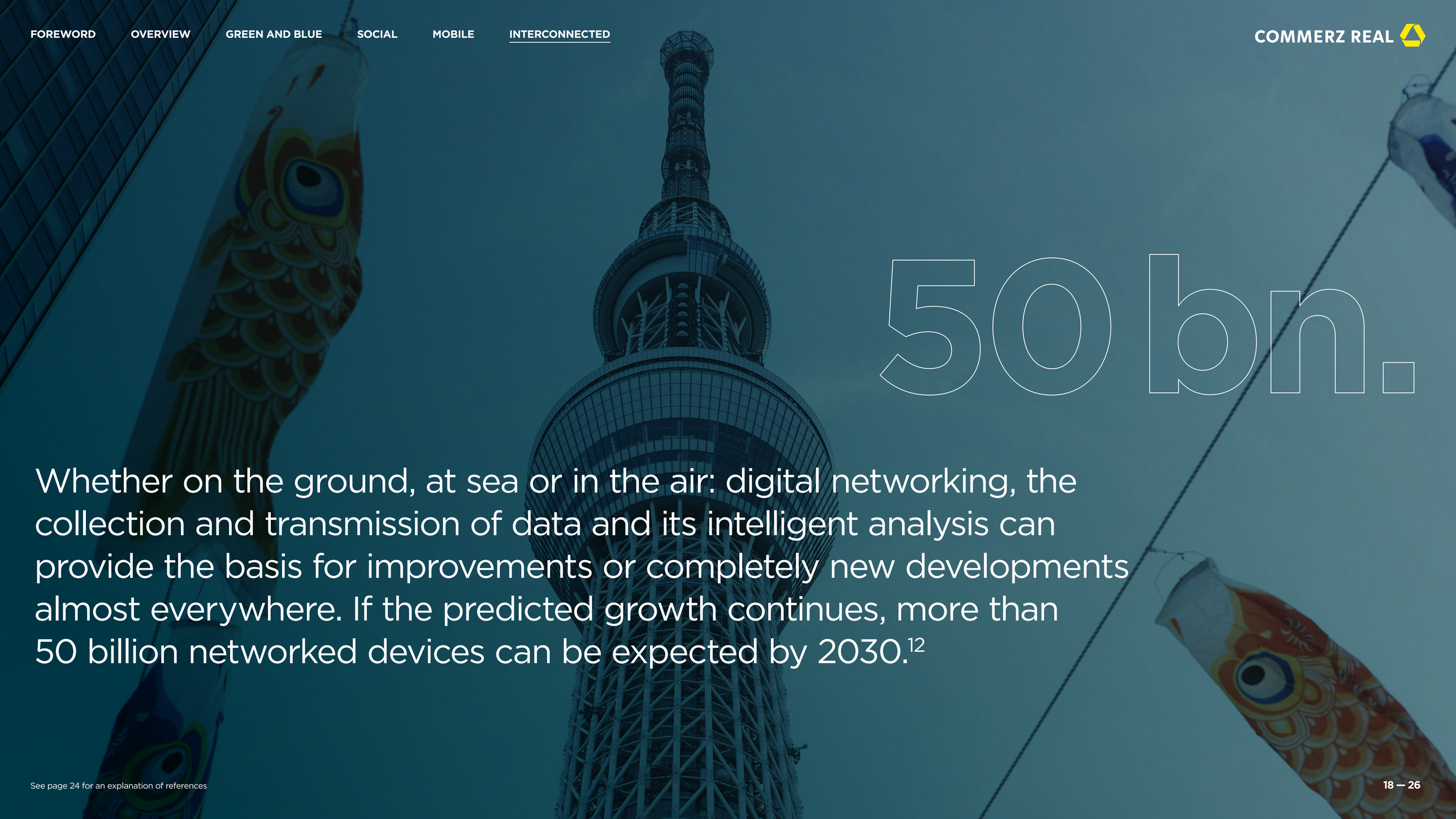
See page 24 for an explanation of references

TRANSPORT INFRASTRUCTURE

‘... apologies for the delay ...’
Instead of proceeding in baby steps, Deutsche Bahn plans to close and completely modernise 40 routes nationwide by 2030, with closures of months at a time.

Deutsche Bahn‘s high-performance network in 2030

Source: Deutsche Bahn, The high-performance network 2030, accessed February 2025



50 bn.

Whether on the ground, at sea or in the air: digital networking, the collection and transmission of data and its intelligent analysis can provide the basis for improvements or completely new developments almost everywhere. If the predicted growth continues, more than 50 billion networked devices can be expected by 2030.[12]

See page 24 for an explanation of references

Information technology and telecommunications infrastructure.

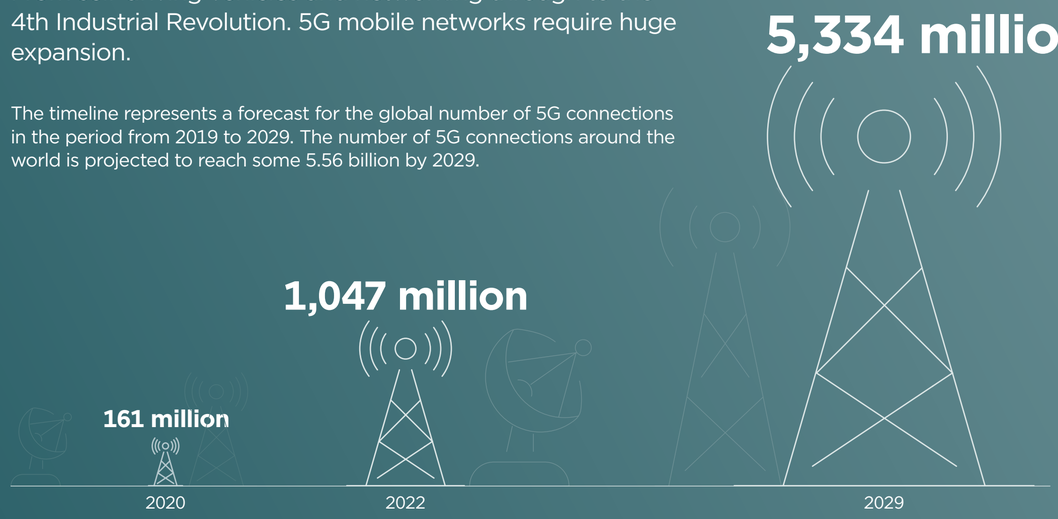
From a networking boom to cultivated digitalisation

Welcome to what economist Peter Drucker calls the ‘next society’ – a new, computerised form of an information and knowledge society and the successor to the industrial society. Following decades of digital transformation, technologies have now entered all areas of life. ‘The communicative complexity unleashed has opened up huge possibilities for connectivity and has led to deep-rooted uncertainties that prompt hysterical and extreme reactions,‘ says The Future:Project, commenting on the major transformation of human digitality. They argue that the time has come to cultivate this complexity and no longer to demonise it; to find a new human relationship towards it and to harness the potential created by digitalization to not only ‘reconstruct the functional conditions of computers but also of human activities’.[13]

Expanding digital infrastructures, such as smart city systems and fibre-optic/5G networks, is becoming ever more important. Modern communication facilities are largely replacing more traditional ones, with new fibre-optic/5G technologies not only offering faster data speeds, but also being more climate-friendly. Competition and usage disputes are currently hampering the speed of fibre-optic expansion, whereas the increasing number of data centres is significantly increasing energy consumption.[14]

5G as the new standard.
From self-driving vehicles and networking through to the 4th Industrial Revolution. 5G mobile networks require huge expansion.

The timeline represents a forecast for the global number of 5G connections in the period from 2019 to 2029. The number of 5G connections around the world is projected to reach some 5.56 billion by 2029.



Source: Statista and Ericsson, Prognose zur Anzahl der 5G-Anschlüsse weltweit von 2019 bis 2029 (in Millionen), June 2024. 5G-Anschlüsse weltweit 2019–2029 | Statista

See page 24 for an explanation of references

Spotlight on fibre-optics.

Investments generally take the form of shareholdings in fibre-optic companies and/or infrastructures that are responsible for expansion or operation, or minority interests in project companies that handle expansion and that are contracted for this purpose by network operators. Private debt structures are also commonly used to financially support established market actors.

When it comes to fibre-optic connectivity and infrastructure projects, there are three basic connection types:

Fibre to the home (FTTH)[15]:
Here, the fibre-optic connection is installed in the customer's residence. In blocks of flats, this means there is a connection in every flat.

Fibre to the building/Fibre to the basement (FTTB):
With an FTTB connection, the direct fibre-optic cable ends in the cellar/basement of the building. Connections to individual flats then take the form of copper cables running into each flat, which is why this system is usually used in high-rise buildings and blocks of flats in towns and cities.

Fibre to the curb (FTTC):
Here, the fibre-optic cable is only connected with the distribution box, which is linked to the building by copper cables. As a result, it is not possible to achieve the same connection speeds in the building as with a direct FTTH connection.

Investment opportunities in fibre-optics may also involve purchasing dark fibre networks, i.e. fibre-optic networks that have already been laid, but that are still dormant due to a lack of connection in the homes concerned. In recent years, there has been a considerable boom in fibre-optic investments; however, this is currently levelling off as individual networks are gradually being consolidated. Given a failure to reach pre-marketing rates, fibre-optic companies are also struggling with expansion, which also serves to reduce investment opportunities.

Top ten OECD countries by number of fibre-optic (broadband) connections

Figure: own chart. Source: Statista and OECD, Anteil von Glasfaseranschlüssen an allen Breitbandanschlüssen in OECD-Staaten, July 2024

Of all OECD countries, South Korea boasts the highest proportion of fibre-optic connections. Some 90 per cent of all broadband connections in the Asian country run on fibre-optics. It is followed by Iceland, Spain and Lithuania. With a fibre-optic percentage of 11 percent, Germany occupies **36th place** in the international rankings. This means that only two countries have a lower share of fibre-optic connections than Germany.

In Germany, the expansion of fibre-optic connections is progressing slowly. Compared with June 2014, it has risen by only about ten percentage points. By far the largest share of broadband connections run on (V)DSL, even though the market share of DSL has been continuously falling in Germany for several years. This is mainly due to the fact that the number of Internet connections via cable TV networks has risen considerably in the past fifteen years. One in four broadband connections in Germany are now cable connections.

See page 24 for an explanation of references

INFORMATION TECHNOLOGY AND TELECOMMUNICATIONS INFRASTRUCTURE

Centring on data.

The four data centre tiers

TIER IV

- Fault-tolerant infrastructure
- Components: 2x (N+1)
- Supply lines: 2 (active/active)

Availability: **99.995%**
Max. downtime per year: **0.8 hrs**

TIER III

- Redundancy and continuous maintenance
- Components: (N+1)
- Supply lines: N+1 (1 active, 1 passive)

Availability: **99.982%**
Max. downtime per year: **1.6 hrs**

TIER II

- Redundant component capacity
- Components: (N+1)
- Supply lines: 1

Availability: **99.749%**
Max. downtime per year: **22 hrs**

TIER I

- Basic infrastructure set-up
- Components: 1 (no redundancy)
- Supply lines: 1

Availability: **99.671%**
Max. downtime per year: **28.8 hrs**

Source: FS.COM GmbH, FS community, Tiers: What are data center tiers?, June 2022.

Data centres are an increasingly relevant infrastructure component, enabling more and more data to be stored and processed. They serve as hubs and enable comprehensive data processing for people, companies and government institutions.

Fundamentally, it is possible to distinguish between two kinds of data centre. In addition to highly specialised data centres (e.g. for supercomputers), we are also witnessing increased construction of co-location data centres and hyperscale data centres.

Co-location data centres are built to meet the needs of multiple users and are utilised by several companies simultaneously, with each user provided with their own area for operating services and storing data. These data centres let space for servers and IT infrastructure and provide the necessary power supply, cooling equipment and network connectivity.

By contrast, **hyperscale data centres** are large, highly standardised facilities that are used exclusively by a single organisation – usually a major tech firm or cloud service provider – and are frequently deployed to provide IaaS solutions such as Azure and AWS. The owners of hyperscale data centres receive set rental income from a single party in exchange for letting the entire building.

Generally speaking, specific supply requirements apply to the different usage models, such as in terms of electricity supply, server cooling, data storage and digital/analogue security precautions. Here, investment volumes are usually in the tens to hundreds of millions. However, returns on individual assets vary considerably according to usage type, availability model (tier) and development status (greenfield vs. brownfield). Additionally, distinctions can be made between the four different availability models of data centres, which vary in terms of their redundancy, reliability and availability.

Infrastructure is king. Networking is key.

Henning Koch
Chief Executive Officer,
Commerz Real AG

To ensure sustainable growth, we need to design our infrastructure with intelligence and foresight. The rapid global changes require us to think and cooperate at an overarching level. Here, both private and institutional investors are indispensable in order to successfully spearhead the transformation. Innovative technologies and close partnerships will lay the foundation upon which we will develop an efficiently interconnected infrastructure that is equal to the demands of tomorrow.

The question is no longer property and energy – anyone serious about genuine sustainability and avoiding CO_2 has no alternative to taking an integrated approach to property and energy. We are already in the thick of things and look forward to taking further huge strides in partnership with you.'

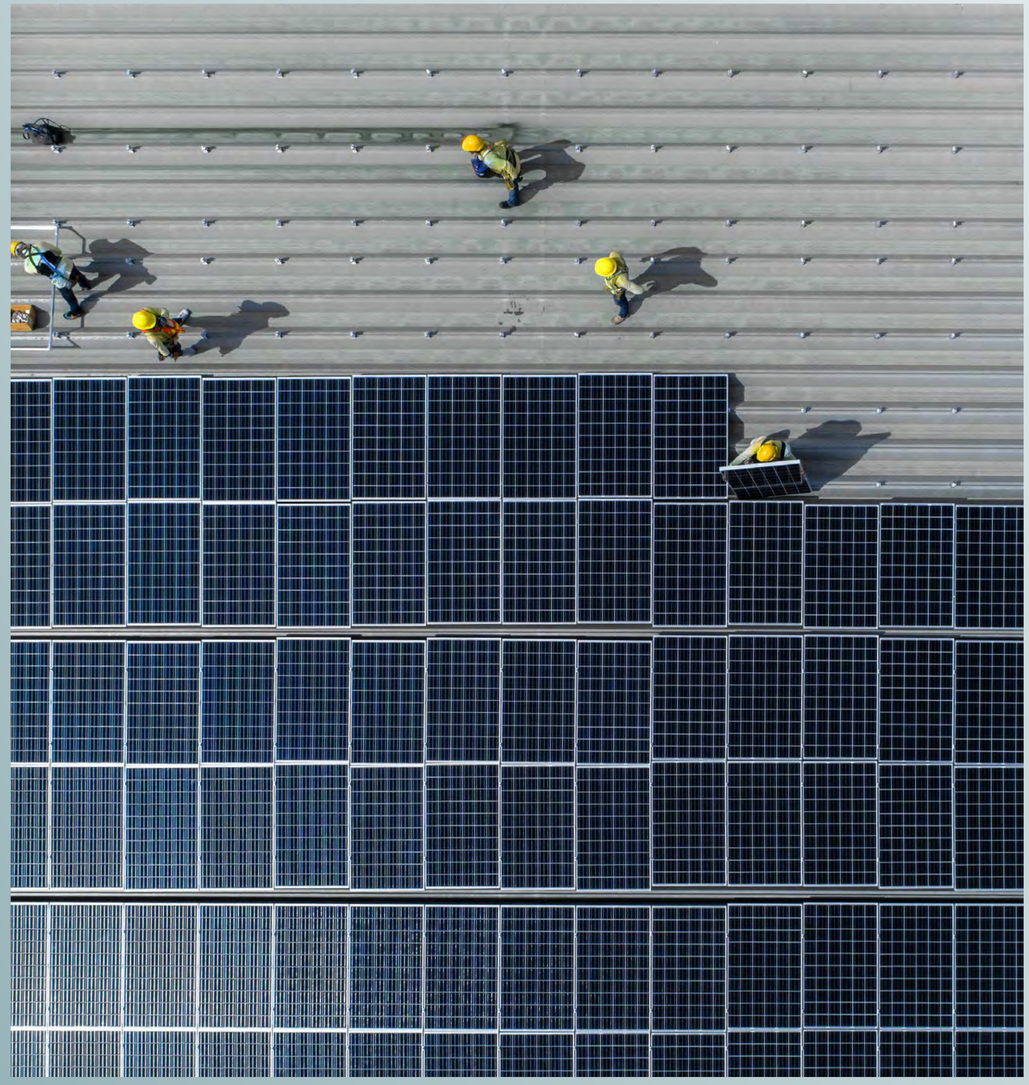
Glossary

Fifteen-minute city
The idea behind the fifteen-minute city is an urban development concept that seeks to design cities in such a way that all key everyday needs – such as housing, work, education, shopping and leisure – are only a fifteen-minute walk or a short cycle away. The aim is to enhance quality of life, reduce the transport burden and promote sustainable urban development. This concept helps to reduce reliance on cars, lower carbon emissions and strengthen social connections by fostering local communities. The core principles of the fifteen-minute city are functional diversity (mix of uses), a people-centred infrastructure and the prioritisation of pedestrians and cyclists. To enable implementation, districts need to be redesigned to incorporate access to green spaces, healthcare facilities, educational institutions and workplaces. A key strategy for the sustainable transformation of urban environments.

Smart city systems
Smart city systems are technology-based solutions that harness digital technologies, data analysis and networked infrastructures to make urban environments more efficient, more sustainable and more liveable. They encompass applications in the fields of transport, energy, waste management, environmental monitoring and communication, the aims being to optimise resources, improve services and facilitate interaction between citizens and their environment.

Supra structures
Supra structures are elements that build on and influence infrastructure. Traditionally, the term includes add-on structures, technical equipment and movable objects. The term is used particularly with relation to seaports: the infrastructure of a port includes, for example, docks, quays and railway tracks. Other facilities – such as warehouses, gangways, loading cranes, pallet jacks and trolleys – are classed as supra structure. In a wider sense, the term comprises everything from signal houses adjacent to railway tracks and roadside signs/lighting through to vehicles. Changes to supra structures (e.g. the size and weight of cars and freight trains or the draught of ships) impose new requirements on the underlying infrastructure.

Third space/third place
Third spaces/third places are public meeting places that bring people together. Thanks to their socially inclusive impact, third places help to strengthen social cohesion (Source: The Future:Project).



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About us

WHAT SPURS US ON

We create connected and sustainable life spaces that inspire. Success through responsibility.

Commerz Real
Commerz Real is the Commerzbank Group's asset manager for investments in tangible assets and has over 50 years of international market experience. More than 800 employees manage assets of around 34 billion euros at the headquarters in Wiesbaden and 17 other sites and subsidiaries in Germany and abroad. Commerz Real combines comprehensive asset management know-how and broad structuring expertise to create its characteristic range of tangible asset-oriented fund products and individual financing solutions. Our portfolio also includes entrepreneurial investments with investments in tangible assets in the key segments of real estate and renewable energies. In its role as the leasing service provider of the Commerzbank Group, Commerz Real also offers tailored equipment leasing concepts.

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