INNOVATION CENTER

PERSPECTIVES FOR

INFRASTRUCTURE

DREES & SOMMER

SECURING INFRASTRUCTURE – AN INCREASINGLY COMPLEX TASK

Infrastructure such as transport routes, data lines and supply facilities – in short, all of society's tangible and intangible infrastructure – are only as good as the degree to which they are protected against disruption or failure. This poses growing challenges both for the public sector and private infrastructure operators, because danger threatens not only from outside influences such as natural disasters, but also internally. For example in the form of underutilization of an electricity grid or gas network. Against this background, the volatility of renewable energy sources and the increasingly flexible range of uses of them – for example the mobility of goods and people – play an important role. This makes the careful planning and execution of infrastructure projects in the future essential.

SUSTAINABLE INFRASTRUCTURE IS THE ORDER OF THE DAY (AND OF THE FUTURE)

Anthropogenic climate change means that there is no longer any way of avoiding the decarbonization of the economy and society. At the same time, the path to Carbon Zero also opens up new opportunities – not least for the modernization of our infrastructure. Transitioning heating technology away from coal, oil and natural gas, as well as digital approaches such as predictive analytics, can help. The aim must be to correctly assess energy consumption in advance, optimize it effectively and, most importantly, reduce it in a sustainable way. If a genuine circular economy is added to the mix – in a way that also makes effective use of digitization and connectivity where appropriate – we will also be able to make quantum leaps in the infrastructure sector – for example in the form of the 'autonomous construction site' or the BIM digital twin for rail projects.

FRANK BORNMANN

Partner, Drees & Sommer Smart Infrastructure Team

CLAUS BÜRKLE

Partner, Drees & Sommer Smart Infrastructure Team

DREES & SOMMER

PERSPECTIVE 01

COST-EFFICIENCY, ECOLOGY AND CLIMATE RESILIENCE

Intergenerational equity requires a resource-efficient and affordable infrastructure. It is the mainstay of the kind of world we want to leave for future generations.

PERSPECTIVE 02

WORRY-FREE ENERGY

Decarbonization is an integral initiative of the energy, mobility and industrial sectors. Energy carriers that are emission-free at both local and global level are among the pioneering technologies in this respect. The provision of appropriate forms of energy must be reliable – and not regarded as a luxury.

PERSPECTIVE 03

THE FUTURE OF HEATING TECHNOLOGY

In addition to electrical power supply, conventional heat supply also needs to shift to using climate-neutral energy sources if we are to achieve intergenerational equity. Alternative regenerative technologies offer key solutions in this area.

PERSPECTIVE 04

NEW HORIZONS – MULTIDIMENSIONAL MOBILITY

The future will see greater distribution of mobility in both space and time. Private transport and the movement of large quantities of people and goods require the spatial separation of transport systems – ranging from underground transport routes to roads, cable cars and drones.

PERSPECTIVE 05

CIRCULAR ECONOMY – USING RECYCLABLE MATERIALS

The recycling of raw materials is an essential factor in the infrastructure sector. Active tracking of the use of building materials, sustainable water management throughout the entire lifecycle and the application of intelligent raw material databases play key roles here.

PERSPECTIVE 06

MULTIUSE CAPABILITY

In future, our infrastructure systems will adapt to meet demand. Changes will range from the simple road zipper that efficiently reallocates lanes to the complete redistribution of space on urban roads and flexible mobility hubs that make space available to different mobility providers as required.

PERSPECTIVE 07

THE AUTONOMOUS CONSTRUCTION SITE

Both the infrastructure itself and its construction will become more and more digitized and networked. AI-supported construction progress control, autonomous construction vehicles and smart self-managing construction processes are the necessary virtual tools of the future.

PERSPECTIVE 08

IOT

The Internet of Things enables infrastructure elements to network digitally to exchange information in real time. Systems benefit from networked information, allowing intelligent and timely responses to various environmental influences. Microtransations allow data streams to be paid for in real time.

PERSPECTIVE 09

BIG DATA – PREDICTIVE ANALYTICS

Identifying events before they occur makes a significant contribution to secure budget planning. Intelligent preparation of the right data and information will make costly failures a thing of the past and increase the reliability of our infrastructure.

PERSPECTIVE 10

REACHING FOR THE STARS

The exploitation of space and the possibilities it brings are as exciting and diverse as the stars in the firmament. In future we will mine resources on asteroids while at the same time dealing with the increasing challenges posed by space debris.

COST-EFFICIENCY, ECOLOGY AND CLIMATE RESILIENCE IN OUR INFRASTRUCTURE

The necessary transformation of our infrastructure will be felt in many aspects of everyday life. Apart from their high emissions, many of our facilities are not designed to cope with future weather events. Added to which, Germany is seeing record electricity prices – the highest in the world – a development that is impeding the transition to electromobility.

The justified demand for ecologically sustainable infrastructure includes not only energy generation, distribution and storage, but also the universal future viability of transport facilities and supply networks. But in addition to the aspects mentioned above, the resilience and independence of infrastructure also play a key role.

In order to ensure a secure future for coming generations, it is essential that infrastructure also serves as a role model from an economic perspective, so that environmentally friendly solutions are economically attractive and can be adapted worldwide.

Ideally, this reimagined infrastructure would be far superior to the existing one, so that it accelerates a change in the social mindset.

Intergenerational equity requires a resource-efficient and affordable infrastructure. With all its various facets and touchpoints in our personal and collective everyday life, it is the mainstay of the kind of world we want to leave for future generations.

DREES & SOMMER

PERSPECTIVE 02

WORRY-FREE ENERGY

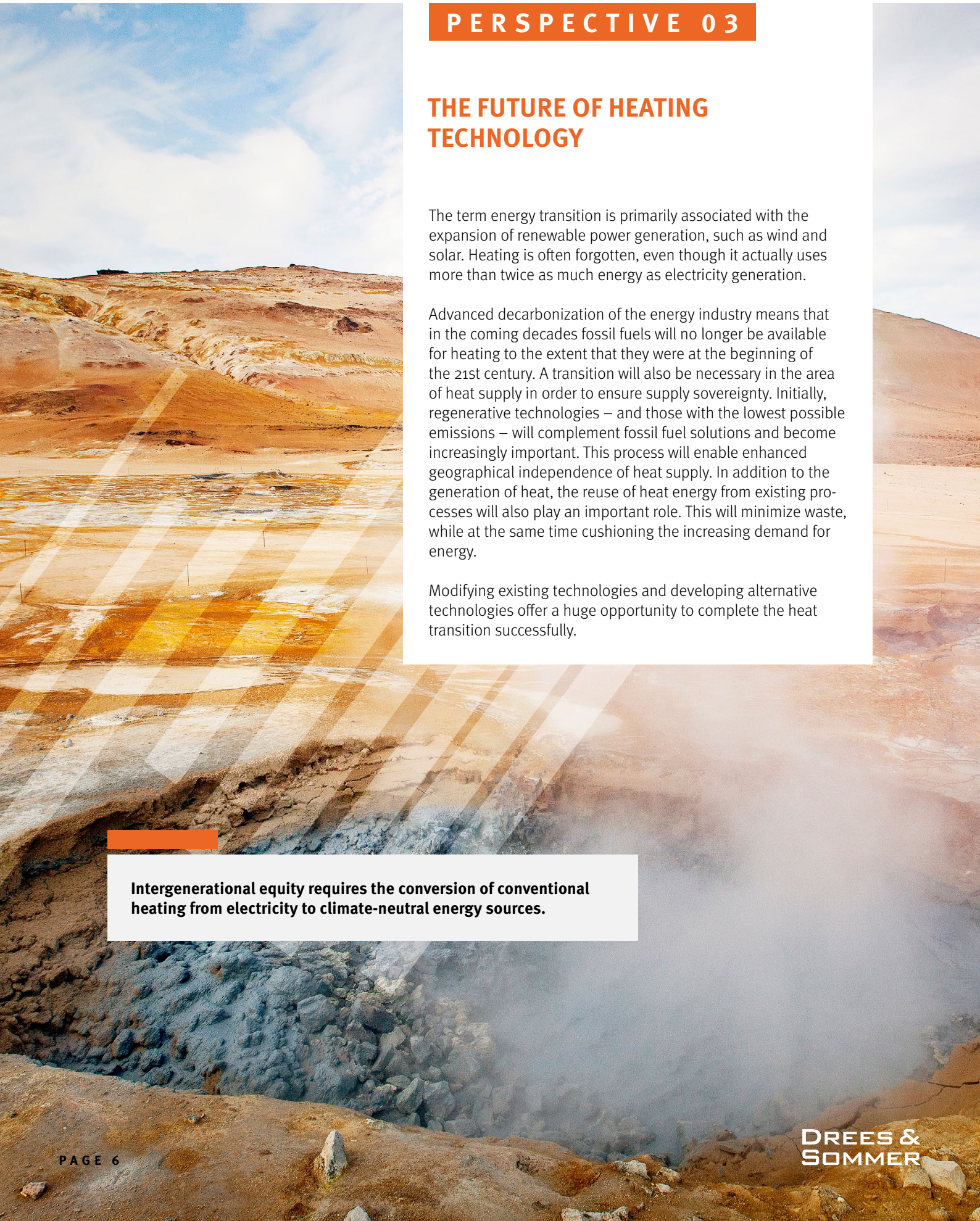
Regarding the expansion of renewable energy generation as the sole means of achieving the energy transition would very quickly lead to insuperable barriers. In addition to generation, the energy transition must also closely examine all aspects of transport, distribution, storage and consumption. A major challenge lies in dealing with supply volatility, which is reflected in pricing and availability. Plan B: An adequate and autonomous local energy supply would minimize dependence on third parties and ensure lasting security of supply.

Over the coming decades, the composition of energy budgets in energy generation, mobility, manufacturing and other sectors in Germany will undergo substantial change. Renewable energy sources will have to be highly available following advanced decarbonization of energy production and the transition away from fossil fuels. By then, advanced expansion of energy networks and transport systems will be essential to guarantee security of supply. In addition, storage systems will be able to provide buffers against peak load and support renewables.

All means of transport will have to transition away from fossil fuels. Effective provision of alternative energy sources to means of transport will be a key challenge in view of increased demand. This not only has an impact on primary power production, but also on the necessary infrastructure for custom energy supply.

A cost-effective and secure supply of energy to the end consumer is essential to ensure that Germany does not lose its attractiveness for industry and commerce. Only then can the energy transition succeed.

Ongoing decarbonization is an integral initiative of the energy, mobility and industrial sectors. Energy carriers that are emission-free both locally and globally are among the leading technologies in this respect. In future, the provision of appropriate forms of energy must be straightforward – and they must not be regarded as a luxury.



PERSPECTIVE 03

THE FUTURE OF HEATING TECHNOLOGY

The term energy transition is primarily associated with the expansion of renewable power generation, such as wind and solar. Heating is often forgotten, even though it actually uses more than twice as much energy as electricity generation.

Advanced decarbonization of the energy industry means that in the coming decades fossil fuels will no longer be available for heating to the extent that they were at the beginning of the 21st century. A transition will also be necessary in the area of heat supply in order to ensure supply sovereignty. Initially, regenerative technologies – and those with the lowest possible emissions – will complement fossil fuel solutions and become increasingly important. This process will enable enhanced geographical independence of heat supply. In addition to the generation of heat, the reuse of heat energy from existing processes will also play an important role. This will minimize waste, while at the same time cushioning the increasing demand for energy.

Modifying existing technologies and developing alternative technologies offer a huge opportunity to complete the heat transition successfully.

Intergenerational equity requires the conversion of conventional heating from electricity to climate-neutral energy sources.

PERSPECTIVE 04

NEW HORIZONS – MULTIDIMENSIONAL MOBILITY

How can society's need for flexibility with regard to the times of use be reconciled with the increasing demand for private transport without placing an even greater strain on the existing transport network?

Currently, daily transport mainly takes place in two dimensions. But particularly in metropolitan regions, a world without underground railways is almost unimaginable.

One way to distribute traffic more efficiently according to future needs is by constructing medium-volume underground transport tubes that allow car-sized mobility capsules to move autonomously. But airspace also offers potential for development. Whether locally, using cable railways that can bridge huge height differences over short distances, or through the use of drones that also enable transregional connections to airports or other metropolitan areas.

The more flexibly the infrastructure is designed to accommodate different applications, the more efficiently it can be utilized. This not only reduces the volume of traffic in existing transport networks, but also leads to high cost-efficiency of he new three-dimensional infrastructure.

Down-to-earth plans up in the air: The future will see greater distribution of mobility in the dimension of space and time. Private transport and the movement of large numbers of people and quantities of goods require the spatial separation of mobility carriers – ranging from underground transport routes to roads, cable cars and drones. Systems must be designed for flexibility because the use of transport systems varies with the time of day and the season.

PERSPECTIVE 05

CIRCULAR ECONOMY – USING RECYCLABLE MATERIALS

Recycling of materials is essential given that the supply of raw materials is not infinite and that we want to minimize emissions when building and maintaining infrastructure. It also allows at least partial avoidance of unnecessary resource consumption and the resulting pollutant emissions.

It is desirable not only to recycle conventional building materials in the course of regenerative infrastructure projects, but also to avoid downcycling. In addition to the consumption of conventional materials, resources such as drinking water must also be considered in the context of a holistic and systematic circular economy based on the Cradle to Cradle® philosophy.

And how do we obtain the necessary resources? In the future, we will see our cities as raw material mines that contain valuable and finite supplies of non-renewable raw materials such as gravel, sand, metals and clay in infrastructure such as roads, buildings and old power lines.

But transparency is essential so that all market players know when what quantities of which recyclable materials will be available. For this reason, all resources available from recyclable materials will in future be recorded in central databases accessible to any interested parties.

The recycling of raw materials is an essential factor in achieving the sustainable recycling-oriented use of raw materials in the infrastructure sector. Active tracking of the use of building materials, sustainable water management throughout the entire lifecycle and the application of intelligent raw material databases play a key role here.

PERSPECTIVE 06

MULTIUSE CAPABILITY

Being stuck in traffic jams will become a thing of the past thanks to the growing number of different types of needs-based means of transport. This, however, will require road networks that allow, and ideally promote, multiple use. The infrastructure achieves this by proactively adapting to meet future demand.

Flexible mobility hubs are part of this variable network and promote the changing use of micromobility, including connections to subways and air mobility. The precursors of such hubs are already with us, for example in the form of car parks that can also be operated more cost-effectively by varying their use at different times of the day and night, while also making additional surface sealing unnecessary.

Livable urban space can also be enhanced through the multiple use of functional areas, for example by using washland as a parks or event spaces when not being used for flood mitigation. können.

We're keeping our options open – in the future, use of our infrastructure systems will no longer be rigid, but able to adapt to current demand. From the simple road zipper that efficiently reallocates lanes to the complete redistribution of space on urban roads and flexible mobility hubs that can adapt the space made available to different mobility providers as demand requires.

PERSPECTIVE 07

THE AUTONOMOUS CONSTRUCTION SITE

Ongoing digitization will have a direct impact on the construction sector and change it significantly. It is an important step towards optimizing construction projects. Ideally, construction processes will be more efficient, cost-transparent and adhere more closely to schedule.

But new requirements and regulations will result in more complex processes and interfaces. Any resulting challenges can be better mastered through the coordination and efficient management of project participants. Networking on the construction site and the application of new methodologies – such as AI-supported robots and camera surveillance – play a key role here.

In addition to the seamless use of BIM, high-tech construction equipment communicates with the companies involved in construction and ensures that the construction site operates independently and automatically. Ideally, this will result in shorter construction periods and minimal waste of resources, ultimately reducing costs.

Both the infrastructure itself and its construction will undergo ever-increasing digitization and networking. AI-supported construction progress control, autonomous construction vehicles and smart self-managing construction processes are the necessary virtual tools of the future.

PERSPECTIVE 08

IOT

IoT – the Internet of Things – connects our physical world with the virtual one. We use our infrastructure every day – but we only become aware of it when faults lead to failures or events like uncoordinated switching of traffic lights lead to unnecessary delays. This is where digital networking of infrastructure elements with their environment will help us more than ever in the future. In addition to the infrastructure generating data using suitable sensors, other relevant data sources are used to make everyday systems more flexible and enable them to predict possible faults and prevent them from occurring.

Virtual interaction between physical elements of infrastructure and the environment requires the exchange of information by means of microtransactions to also allow financial processing of data streams in real time. As a result, fees – which are only due when the infrastructure is used and the associated data is generated – correspond to the actual resources used.

The Internet of Things enables infrastructure elements to network digitally to exchange information in real time. Systems benefit from networked information, allowing a more intelligent and timely response to various environmental influences. Data streams are paid for by microtransactions.

PERSPECTIVE 09

BIG DATA – PREDICTIVE ANALYTICS

Identifying events before they occur makes a significant contribution to secure budget planning. Intelligent preparation of the right data and information will make costly failures a thing of the past and increase the reliability of our infrastructure.

The predictability of maintenance, revisions and failures is of great importance in the operation of infrastructure. The growing number of extreme meteorological events will further increase the need for the constant availability of (critical) infrastructure.

Comprehensive data management is the first step towards achieving effective plannability. Ideally, this data is stored on platforms, with AI-supported pattern recognition ensuring better plannability and acting as an early warning system, allowing future-proof and economically viable operation of infrastructure.

It also potentially allows system redundancy to be reduced, which in turn conserves resources and cuts costs.

PERSPECTIVE 10

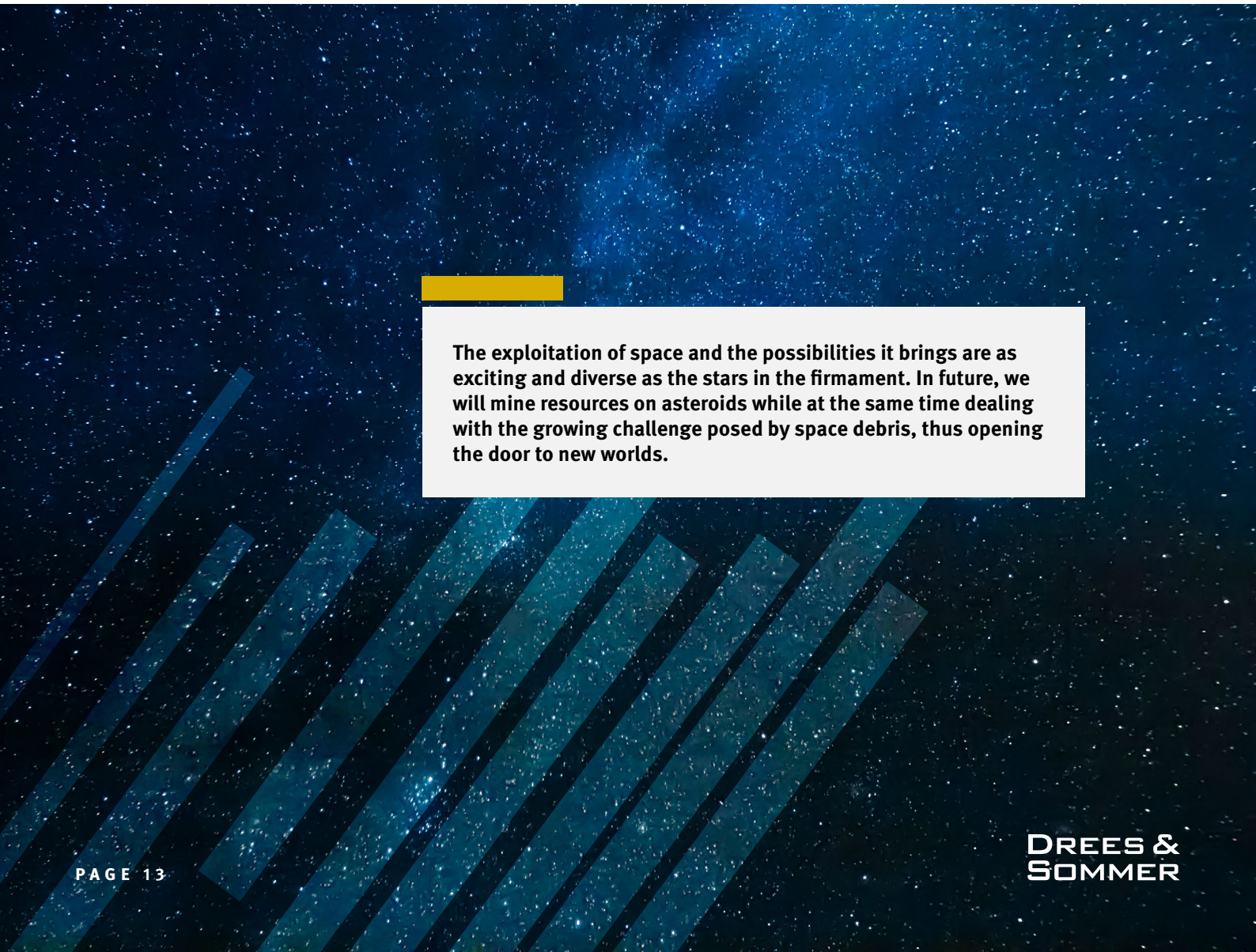
REACHING FOR THE STARS

"The world is no greater than the window you open on it."

Developing space and exploring and using the cosmos are no longer just long-cherished dreams of humanity, but increasingly a reality. But how do we want to develop space and how can we use it sustainably?

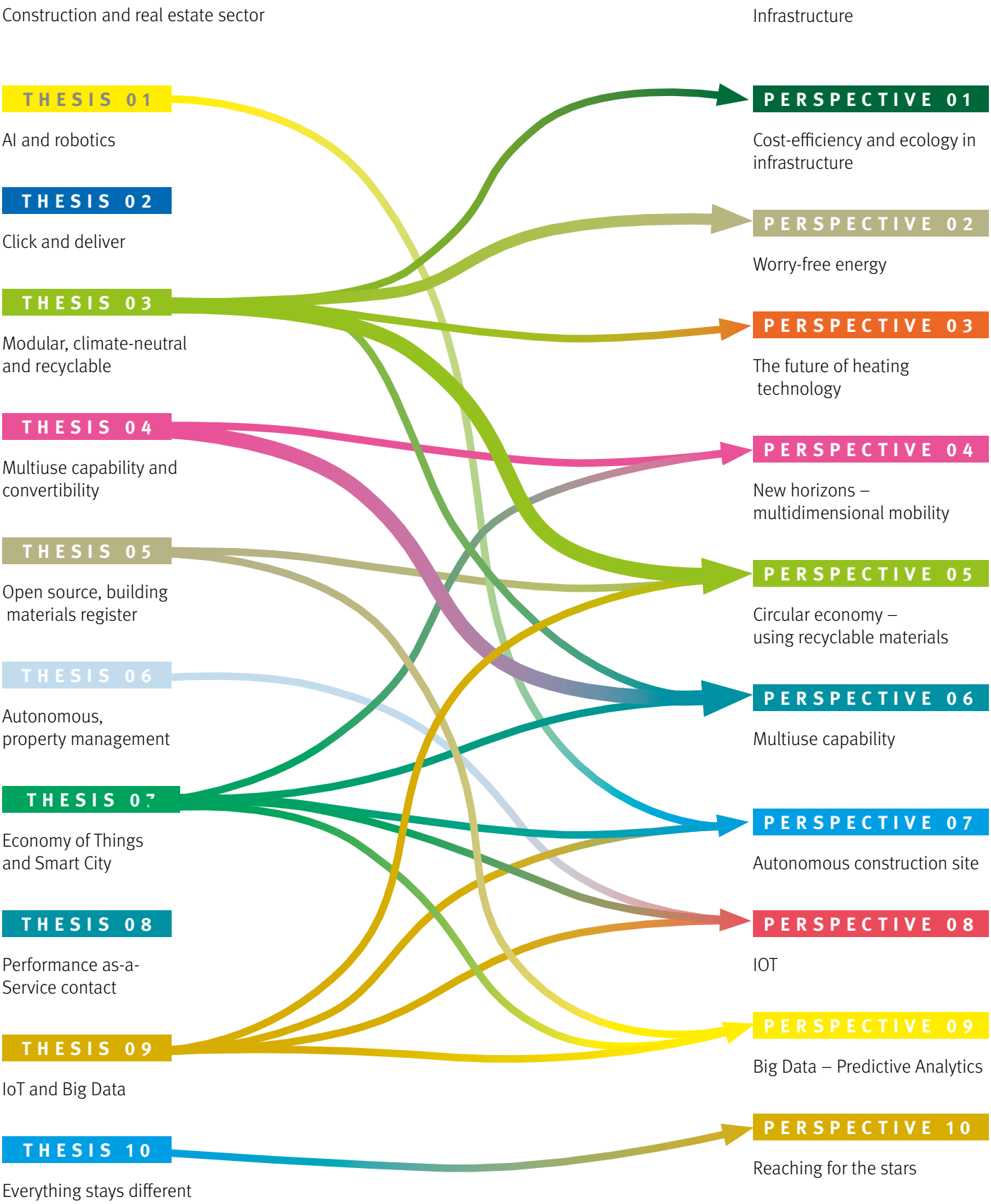
We will find the answers to such important questions by building infrastructure that enables the launch and landing of space shuttles, simplifying the prospecting and even the systematic mining and cultivation of raw materials on other celestial bodies, and creating entire transport networks that may one day be the cornerstone of largely autonomous space operations.

It is important that we take a careful approach to access to space and minimize space debris by developing powerful reusable launch systems that are completely recyclable at the end of their service life.



The exploitation of space and the possibilities it brings are as exciting and diverse as the stars in the firmament. In future, we will mine resources on asteroids while at the same time dealing with the growing challenge posed by space debris, thus opening the door to new worlds.

The interrelationship between the construction and real estate sector and infrastructure



WHAT PERSPECTIVES DO YOU SEE FOR THE INFRASTRUCTURE SECTOR?

Innovation cannot be achieved single-handedly – we need exchange and cooperation in order to find answers to the big questions of the future. Would you like to exchange ideas with us about future challenges and design opportunities in the field of infrastructure? If so, please get in touch:
innovation.infrastructure@dreso.com

Our future scenarios take a look forward to the year 2030 for the construction and real estate industry – and find concrete expression in the 'Perspectives for Infrastructure'. You can find out more about our Future Scenarios 2030 here.

We publish content on the future and innovations at irregular intervals – if you are interested, we will be happy to add you to our mailing list: dreso.com/innovation-update

Drees & Sommer SE
Obere Waldplätze 13
70569 Stuttgart

Telephone +49 711 1317-0
info@dreso.com
www.dreso.com

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