

INNOVATION CENTER

10 THESES

FOR THE CONSTRUCTION AND REAL ESTATE INDUSTRY

NEW EDITION 2023

DREES &
SOMMER



Dall-E – AI-generated image series

10 THESES FOR THE CONSTRUCTION AND REAL ESTATE INDUSTRY

- THESIS 01 / Climate-positive and recyclable** The built environment and its existing buildings will be climate positive. New buildings will be built industrially in accordance with Cradle to Cradle design principles.
- THESIS 02 / Transformation of the energy industry** The era of linear energy flows is over and is making way for sustainable, renewable energy. Complete decarbonization paves the way for a future without carbon pollution.
- THESIS 03 / Smart City & Mobility** Cities of the future combine high-tech with a human focus – hardware, software and soulware form an inseparable unit. This not only creates livable space, but also optimizes mobility for all people and goods.
- THESIS 04 / Multi-use & adaptability** Innovative buildings, smart neighborhoods and smart cities provide the basis for new business models. Thanks to their versatility and wide range of uses, they are ready for the challenges of tomorrow.
- THESIS 05 / Open Source Building Cadasters & Smart Data** Data loss is a thing of the past: Digital information on buildings is freely available, based on decentralized data in a trusted network.
- THESIS 06 / Click & Deliver** A breakthrough for planning: Artificial intelligence, modularization and drag & drop enable virtual use of buildings on the same day as they are automatically planned.
- THESIS 07 / Autonomous construction site** In the future, more and more offsite production will take place. Robots will become standard on the construction site – and their use on site will be taken into account during planning. The autonomous construction site controls itself and is monitored remotely.
- THESIS 08 / Self-Organized Property & Asset Management** ‘Do it yourself’: Self-managing buildings, plant & equipment are the future – property and asset management, as well as financial services, will be organized digitally, decentrally and securely.
- THESIS 09 / Business models through virtual worlds** The combination of different technologies results in a metaverse in which real problems are solved in virtual spaces, processes are streamlined and new business models will be made possible.
- THESIS 10 / Everything remains different** There will be developments that we cannot yet foresee today.

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FOREWORD

Artificial intelligence and generative AI, virtual worlds, green cities, sustainability, data: What will our world look like in ten years? Which trends will prevail, and which innovations will simplify our everyday lives in the future?

These are matters of concern for people and industry worldwide – and the construction and real estate industry is also faced with the dual challenge of keeping up with developments while also driving them forward. With five years' experience and accumulated expertise, the Drees & Sommer Innovation Center observes general technology trends and future scenarios in order to develop theses and new business models for the construction and real estate industries.

The first edition of the 10 Theses in 2021 laid an important foundation for innovation activity in the industry – as a source of inspiration, for business model development, and as a guide.

The current rapid changes resulting from the increasing potential of and range of applications for artificial intelligence can be equated with the invention of the steam engine or electrification. There will be a paradigm shift, because new technologies always open up new possibilities. This results both in disruption potential and opportunity. The rules of the game are changing, and elements of planning, management and consulting – in other words, knowledge and office work – can often be automated and optimized. Those who seize this opportunity will be able to greatly expand their market potential, while those who wait too long will be disrupted and be relegated to a niche before disappearing.

As nothing is as constant as change, we have updated the 10 Theses. New trends, such as the development of the metaverse, have been added, while others have been condensed or expanded.

The focus continues to be on a holistic view of cities, infrastructure and technologies and their interaction, with people playing the central role. Sustainability continues to be one of the key premises of the position paper.

At Drees & Sommer, our primary goal is to create a sustainable future and ensure intergenerational equity. For this reason, everything we do is in harmony with the economy and ecology. We call this approach *'the blue way'*.

On the following pages, you can read about the developments that await us in the coming decade and how we can achieve our goals through the use of new technologies and trends, and with innovative partnerships and collaborations.



Patrick Theis
Partner, Drees & Sommer



Peter Möslle
Partner, Drees & Sommer



CLIMATE POSITIVE AND RECYCLABLE



The built environment and its existing buildings are climate positive. New buildings will be built industrially in accordance with Cradle to Cradle® design principles.

Good news: Over the past decade, we have taken a big step toward meeting our responsibilities as a construction and real estate industry. With a 13% share of global GDP*, our industry makes a significant contribution to the EU climate protection package and 'Fit for 55' legislative package. In this way, we are ensuring a livable, carbon

neutral future for coming generations. There is still a long way to go, but we are on the right track.

Don't knock it down, upgrade it: Instead of demolishing and rebuilding, we help our manufactured environment to achieve long-lasting quality standards in terms of sustainability and cost-effectiveness through the use of innovative solutions, Cradle to Cradle materials, and digitization strategies. We focus on recycling and refurbishing existing buildings because the buildings of the future are already in place. Any necessary new buildings are always manufactured in accordance with the Cradle to Cradle principle and designed to meet a range of uses in the long term. Modularity is the key to the recyclability of building elements.

The triad of energy transition, construction transition and biosphere, in combination with a comprehensive digitization strategy, forms the basis for climate positivity: We have been tracking the energy transition over recent years, and now we are embracing the construction transition and, as a result, the resource transition. The biosphere will now come more sharply into focus.

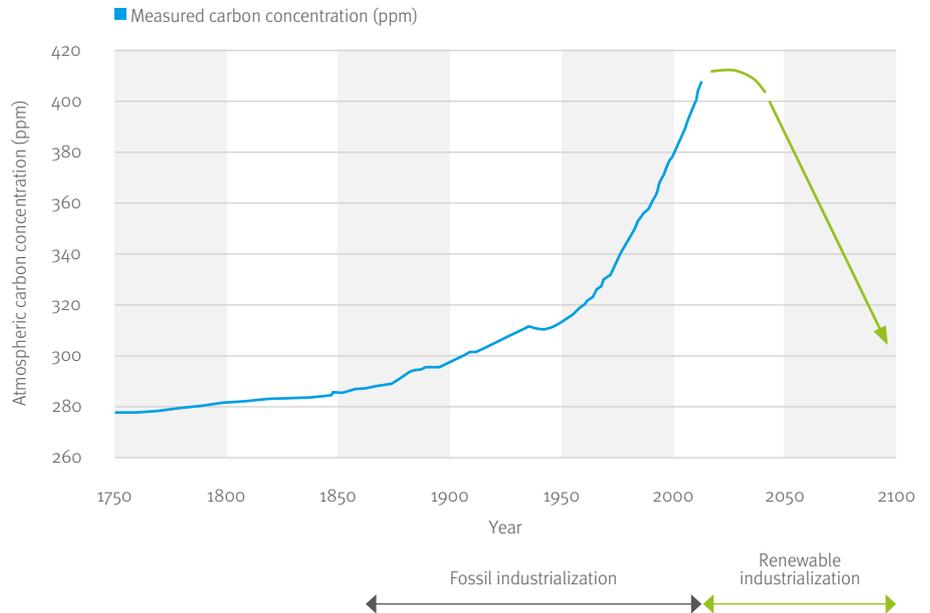
* (Source: McKinsey, The next normal in construction – How disruption is reshaping the world's largest ecosystem | McKinsey & Company)

CLIMATE POSITIVE AND RECYCLABLE

By 2100, the concentration of carbon in the atmosphere must have returned to the level it was before fossil industrialization.

We are already on the way to renewable industrialization, with a concentration of carbon in the atmosphere the same as it was before the industrial revolution in the 18th century.

(Graphic by Peter Möslé, Drees & Sommer, based on Prof. Michael Braungart's idea)



Drees & Sommer has been an innovation leader and sustainability pioneer since 1970. For this reason, one focus of the Drees & Sommer Innovation Center is the recyclable planning and construction ecosystem.

In order to support the complex and dynamic ESG challenges we encounter in our consulting activities and faced by our clients, we collaborate with the most innovative startups in the industry, developing our own tools for the market or participating in their development. **Examples include BIM & More and the ESG Toolbox.**

/ In order to be able to act in compliance with the law in the future, and to measure, optimize and meet the ESG criteria required by the EU, it is important to maintain an overview of the many different sustainability systems. Appropriate tools and strategies support this process.

The ESG Toolbox facilitates the use of the right tools to calculate and compile data on a company's actual ESG impact.

The platform allows users to select the sustainability system they want and then have their company evaluated against it.



/ **BIM & More offers planners access to up-to-date product information from manufacturers as a BIM plugin.** In this way, it draws manufacturers and planners closer together, as it promotes participation and collaboration between stakeholders in areas ranging from CAD planning, structural engineering, execution, contract award and construction right through to invoicing and facility management.

New digital planning tool for greater sustainability:

BIM & More empowers architects to plan the recyclability of buildings. For the first time, it makes sustainability globally scalable – with enormous carbon savings effects. Whether in new construction or existing buildings: With BIM & More, architects calculate and optimize both the recyclability of a building design and its carbon footprint, including an environmental assessment covering its entire lifecycle.

02 / TRANSFORMATION OF THE ENERGY INDUSTRY

The era of linear energy flows is over and is making way for sustainable, renewable energy. Complete decarbonization paves the way for a future without carbon pollution.

What's the simplest solution for a sustainable and secure environment? An equally sustainable local infrastructure.

This includes smooth operation of energy supply so that the provision of appropriate forms of energy is reliable –

without being regarded as a luxury. We are experiencing an energy transition that covers all aspects of the sector – from energy generation, transport and storage to its use. An autonomous local energy supply can minimize dependencies and ensure security of supply. In the future, energy generation, mobility and industry in Germany will be almost completely decarbonized and transitioned to renewable energy sources. Energy carriers – such as hydrogen – that are emission-free both on a local and global scale, are among the leading technologies in this area. To ensure the security of supply, it is important to

expand energy grids, as well as transport and storage systems.

In addition to achieving the energy transition, in ten years' time we will also have a handle on the heat transition. Like electricity generation, conventional heating needs to transition to using climate-neutral energy sources as part of ensuring intergenerational equity. Here, alternative renewable forms of operation offer important solutions.



Midjourney — AI-generated image

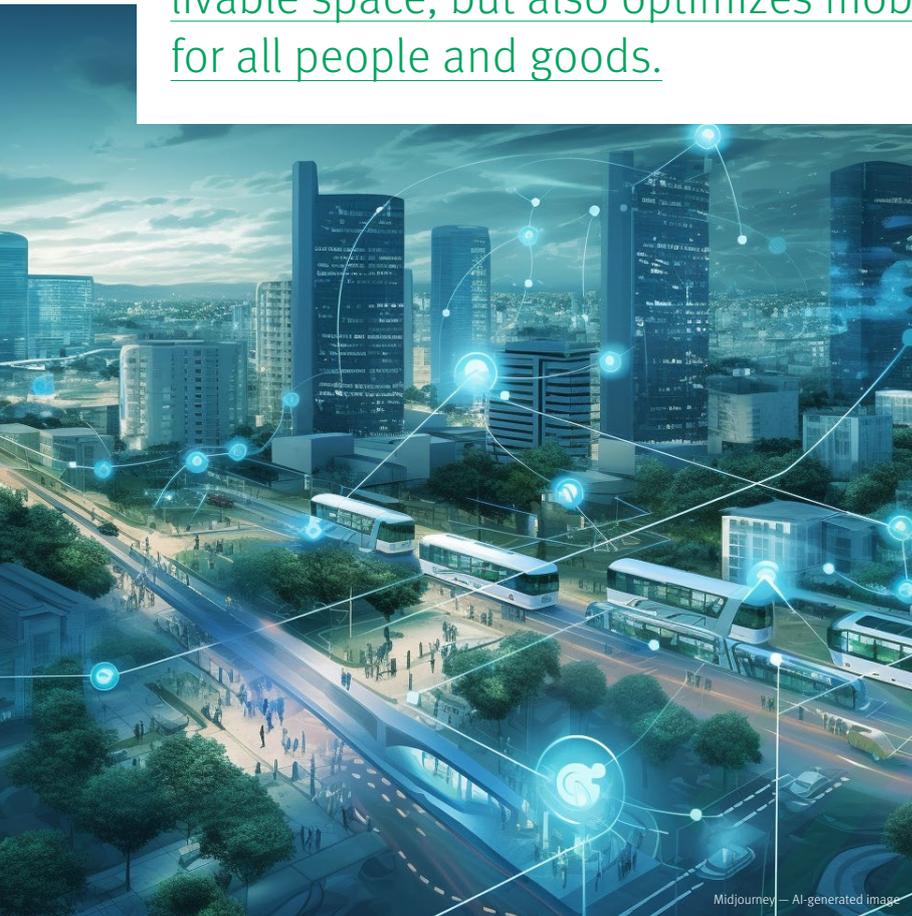
03 / SMART CITY & MOBILITY

Fit for the future: Over the next ten years we will secure the future of cities and create livable spaces to meet the needs of people and the urban environment. The smart city of the future takes will routinely consider a range of areas in urban planning and development using smart data on mobility, as well as on healthcare, industry, energy, migration, environmental protection and climate change. An integrated, multidisciplinary and user-centric approach with a human focus will be essential for this. Mobility systems rely on a shared economy and mobility hubs.

Cities of the future will combine high-tech with a human focus – hardware, software and soulware will form an inseparable entity. This not only creates livable space, but also optimizes mobility for all people and goods.

When it comes to creating networked cities and buildings, data and artificial intelligence drivers are our most valuable assets. They help to optimize the functionality of the city and reduce energy consumption.

Digitization, intermodality and multi-modality also play a central role in optimizing mobility and creating mobility hubs, because in the future, these will be more than ever geared toward the needs of users. In ten years' time, alternative means of transport will have brought about the transport transition. Cities in which all services and facilities required to meet everyday needs are within a 15-minute walk will be the norm, resulting in less traffic and enhanced quality of life in the city.



MULTI-USE & ADAPTABILITY

X today, Y tomorrow: Redesigned usage concepts for our buildings and flexible mobility hubs that adapt the space available for forms of transport based on demand are examples of multiuse and adaptability. Extreme situations, such as the COVID-19 pandemic, have shown just how much and how abruptly usage requirements for buildings can change. In this context, mixed-use and multi-use properties are of increasing importance. They combine different functions and spheres of life under one roof. These buildings will be designed to be as well prepared as possible for such exceptional situations, in terms of both design and construction. It will be normal for buildings to be planned from the outset not for a specific use, but for easy modification and versatility.

In ten years, we will have created buildings that are fully focused on their users and automatically adapt to changing situations. **Home is where your software is:** Even though users change and are becoming more and more mobile, they take their customized software with them. This allows the building to respond to the current users and their needs. Real estate is increasingly mobile too, as we focus ever more on the pure utility of buildings.

Innovative buildings, smart districts and smart cities provide the basis for new business models. Thanks to their versatility and wide range of uses, they are ready for the challenges of tomorrow.



Midjourney — AI-generated image

OPEN-SOURCE BUILDING CADASTERS & SMART DATA

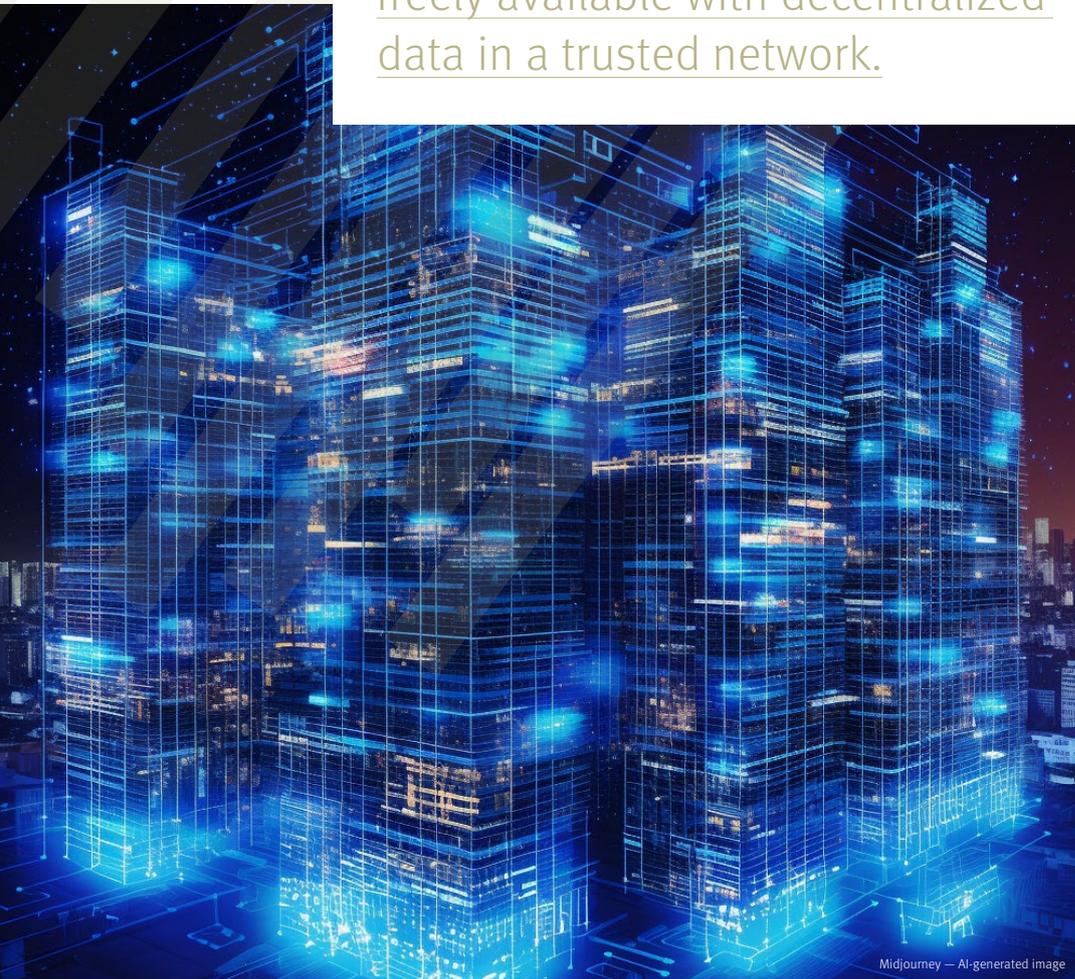
Digital open-source building cadasters – freely available digital files containing the data of a building – will be the **‘single source of truth’** in ten years’ time. The smart data is permanently and autonomously organized in a ‘Real Estate Cloud’, so that up-to-date information is available with a single click. The standard database includes information such as the property’s size, location, use, land register entries, and land tax. Data on due diligence, building status, required maintenance measures, media consumption and rental income is also always transparently available in the cloud. This open-source software ensures comprehensive high-quality data over the property’s entire lifecycle. The system is based on blockchain technology, which enables data availability and communication via secure interfaces.

This transparent database management puts an end to the loss of information.

Data loss is a thing of the past:
Digital information on buildings is
freely available with decentralized
data in a trusted network.

How do the open-source building cadasters & smart data lead to intergenerational equity?

Digital building information is sustainable because it stores information as an important ‘resource’, instead of wasting it. While the purchase and sale of property tends to be a variable process, the property data always remains constant. The digital open-source building cadaster is created by collating all digitized and smart data. This solves the problem of stranded assets, as all information over the entire lifecycle of the property is documented in the smart contract. But that’s not all: Open-source cadasters will play an important role beyond their use in buildings – for cities, traffic flow (such as traffic light switching), as well as for water and flood protection, disaster warnings, and much more.



Midjourney – AI-generated image

OPEN-SOURCE BUILDING CADASTERS & SMART DATA

One example of how data silos can be linked is the new BIM & More plugin with its Material Passport and recyclable building planning.

Madaster – the global online register for products and materials – is also a step toward ‘a single source of truth’.

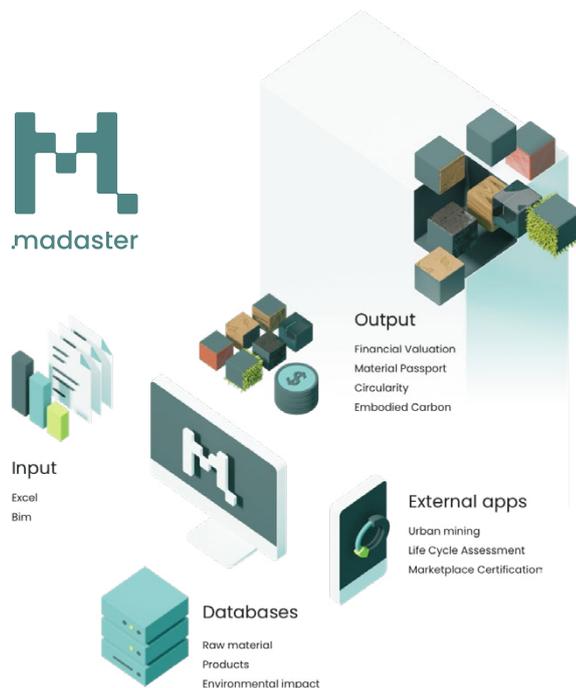


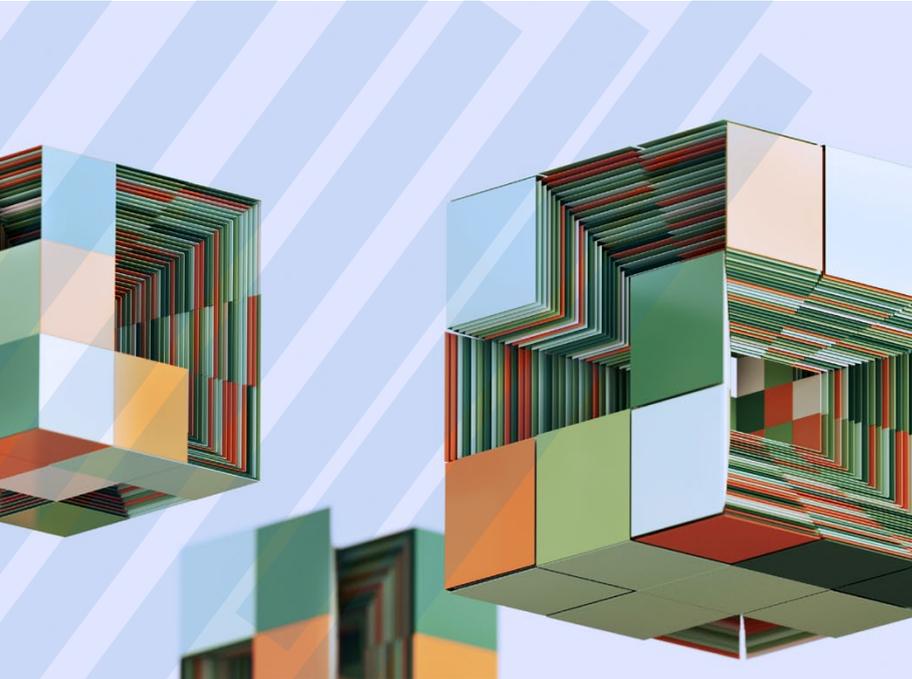
The Building Circularity Passport and planning with BIM & More provide the perfect basis for the use of Madaster, and with it the possibility of using buildings as ‘raw material repositories’.

The intermeshing of these applications shows the importance of breaking down data silos and of promoting cooperation between the various players.

/ **Sustainable, digital, and cost-efficient:** The innovative BIM & More plugin from EPEA – Part of Drees & Sommer and Die Werkbank IT GmbH – Part of Drees & Sommer creates the first green tech solution that combines Cradle to Cradle® principles with lifecycle assessment. For this purpose, the manufacturers’ building products are incorporated into the planning environment with all relevant sustainability information. This allows buildings to be tailored precisely to the client’s requirements, while at the same time presenting available products and optimization possibilities.

/ The non-profit association’s platform allows real estate and infrastructure owners and managers to have web-based Material Passports of their buildings issued at any time – including details of all materials and products registered as included in the buildings. **The Madaster Material Passport provides an insight into the material assets of the registered property and shows the current residual raw material value of the buildings.** In 2020, Drees & Sommer launched a partnership with Madaster in Switzerland to further advance the circular economy in Switzerland and to further promote the concept of ‘buildings as raw material repositories’.





A planning breakthrough: Artificial intelligence, modularization and drag & drop enable the virtual use of buildings on the same day as they are automatically planned.

The client and the architect discuss the requirements for a new building. After 30 minutes, the AI interrupts the conversation and asks the two to put on VR headsets and enter the virtual model of the new building to make any required changes to the design and materials. After another 30 minutes, planning is complete and can be published for on different platforms for tendering.

In the future, users will be able to use drag and drop to configure entire buildings and building complexes – in the same way as you can configure cars and family homes today. Spaces are defined by modules. How does this work? Quite simply, using artificial intelligence software that responds to various changes.

Smooth integration of different modules also requires extensive and exact standardization.

One possible application is changing the color of a facade. This seemingly small alteration also changes the cooling capacity of the building, as it affects the amount of solar heat absorbed. Both the calculation of such changes and any necessary adjustments to the cooling capacity of the building are automated. The smart application also suggests suitable construction systems, which can be integrated into the model from the module library with a single mouseclick. In addition to this technical support, the software calculates cost elements and ESG criteria for each change, thus providing a permanent basis for user decisions.

© Eugene Mymrin — gettyimages.com

As soon as the building has been configured, it is available for a virtual walkthrough, for example using a VR headset. Costs, carbon footprint and delivery information are also calculated in the background by an AI during planning and immediately made available.

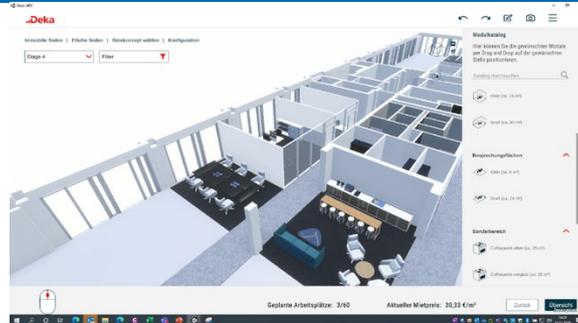
Today, people are already supported significantly by artificial intelligence. This potential will be further exploited in ten years' time. However, important decisions will still be made by human intelligence. This type of planning is changing and revolutionizing the construction industry.



/ **Using configurators:** v.create goes from an idea to a 3D office building in minutes.

v.create allows you to configure office space and experience a virtual walkthrough just seconds later – interacting directly with potential tenants. This speeds up the leasing process and reduces the effort involved for all parties.

www.vcreate.de



Spaces can be virtually designed for potential tenants using a modular approach. The 3D configurator can also be adapted to different types of buildings – for example, office buildings and, in the future, logistics warehouses.

We also raise the bar for virtuality at events and trade fairs by providing a 360-degree experience in the form of a cube that allows visitors to experience virtual worlds.



/ **vCreate sandbox:** The universal configurator for innovative planning processes

With BIM modules saved on the platform, planning can be carried out in the VR / 3D configurator and then fed back to BIM. This revolutionizes the planning process.

The Blue Modularity team at Drees & Sommer is working intensively on exploring the potential of modular construction. The vision is that, in the future, Blue Buildings – buildings that are sustainable in every respect – will be designed, built and produced just like modern products.



BLUE MODULARITY

powered by Drees & Sommer

/ **Blue Modularity provides customers with a package tailored to their needs** – from consulting services to the Building-as-a-Product. As a result, the customer gets a modular, adaptable building that makes optimal use of digitization and that is truly livable, thanks to its resource-conserving approach to production and use. And the special feature is that the customer does not get an ‘off-the-shelf’ building. Rather, Blue Modularity aims at providing an architecturally customized building, both in terms of construction methods and materials. At the same time, all the advantages of industrial production come into play, such as efficiency, cost savings, speed and reduced defect rate.

So the message from Drees & Sommer is: “Your building as an efficient, customized and recyclable product.”

Blue Modularity | Drees & Sommer (dreso.com)

AUTONOMOUS CONSTRUCTION SITE

An autonomous construction site is a concept in which machines and robots perform tasks on a construction site independently, without constant human supervision or control. The goal is to improve efficiency, productivity and safety. There are various aspects that have to be taken into account for an autonomous construction site:

In the future, more production will take place offsite. Robots will become standard on the construction site – and their use on site will be taken into account during planning. The autonomous construction site controls itself and is monitored remotely.

Robots and autonomous machines: On an autonomous construction site, robots and machines will be used to perform various tasks, including, for example, autonomous excavators, cranes, concrete paving machines, and drones. These machines will be equipped with sensors, GPS technology and artificial intelligence, enabling them to perceive their surroundings, detect obstacles and complete tasks independently.

Construction site monitoring: Construction sites are monitored autonomously using cameras, sensors and other monitoring technologies. These systems can record the progress of the work, monitor the condition of the machinery, and detect any potential safety risks.

Data analysis and artificial intelligence: Autonomous construction sites use advanced data analysis methods and artificial intelligence to process information and make informed decisions. This can include optimizing workflows, predicting site needs, and analyzing construction quality and standards.

Communication and coordination: Autonomous construction sites rely on efficient communication

and coordination between the various machines and robots. Wireless communication technologies such as 5G and special networks can be used to ensure the smooth flow of information and effective collaboration.



SELF-ORGANIZED PROPERTY & ASSET MANAGEMENT

Do it yourself: Self-managing buildings, plant & equipment are the future – property and asset management, as well as financial services, will be organized digitally, decentrally and securely.

Switch on the ‘Brain’: The ‘Brain’ already manages technical operations in buildings, communicates with users, and responds to their needs. Blockchain technology will also make it possible for the first buildings to manage themselves almost completely independently. In ten years’ time, for example, a building will be able to detect technical faults, anticipate failures, and call in service technicians – and also call for tenders for additional facility management services. **We don’t manufacture buildings for the sake of building, but for operation.**

Entire pioneer districts can manage themselves and network with the city and the outside world. If, for example, the system detects tenant vacancies, it automatically fills them. The building is able to make proposals for any decisions regarding property and asset management services, taking the level of ESG compliance into account. All information is collected with its own building ID – an IP address for the build-

ing – making its full independence a reality. Human beings retain higher-level authority, but their role changes – they empower, prevent, manage value, make the final decisions.



Midjourney — AI-generated image

SELF-ORGANIZED PROPERTY & ASSET MANAGEMENT

Such systems are already

in use: Examples include the Drees & Sommer InnovationHub in Stuttgart, the new Cube office building in Berlin, and the Hammerbrooklyn campus in Hamburg.

The bottom line: We are on the right track – with both new and established buildings. With the right digitization concept, both have the potential to be self-organizing.



© Adam Mørk



© Hammerbrooklyn

BUSINESS MODELS THROUGH VIRTUAL WORLDS

Double saves trouble: In the future, the client will always get two buildings, first the virtual one and then the real one. The virtual building is used to visualize and experience the building before construction, and problems will be investigated and corrected in this virtual world using predictive analytics before construction of the real building even begins.

The metaverse is seen as another layer of reality, complementing, expanding and developing new possibilities. It allows things that physical laws in the real world make impossible. Currently, the major area of application of the metaverse is not yet broad-based, but limited to special applications. The first broad-based applications could be in film, sports events or concerts. In the future you will be able to view a specific film scene in the metaverse in the same way as you can watch a goal in a football match from various angles today.

So the metaverse does not exist in isolation, but is part of a greater whole currently called Web 3.0. No ‘iPhone moment’ – that is, a sudden revolutionary change – is expected here in the near future. Rather, it will be a steady development, driven by the availability and convenience of the necessary hardware.

Meetings using avatars in a metaverse will be part of everyday life in ten years, and training and further education opportunities for employees will be supported by VR technology. In addition, the mapping of various work processes or of exceptional situations in virtual worlds will be a matter of course and an efficient addition to the real world.

XR technologies will be used to overcome boundaries in the metaverse. The vision is to create a virtual world in which people can interact regardless of their actual location or personal background. In this metaverse, geographical boundaries have no meaning.

The metaverse will take not just the construction and real estate sectors, but also art, education, medicine, and indeed, our entire coexistence, to a new level.

The combination of different technologies results in a metaverse in which real problems are solved in virtual spaces, processes are streamlined, and new business models are made possible.



EVERYTHING REMAINS DIFFERENT



Nothing is as constant as change:

There is still a lot ahead of us that we do not even dare to dream of today. Because it is not only technology that shapes change, but also generations, global events and natural phenomena. So we can only guess what the construction and real estate industry will look like in the distant future. That's why our Innovation Center works with startups and trend scouts, bringing together different stakeholders and their opinions. **Because we firmly believe that exchange promotes innovation.**

Changes in the industry, the use of technologies and accelerated technological adaptation are also changing our job profiles. In the future, asset managers will become tech entrepreneurs. And architects will have more and more AI skills.

There will be developments
that we cannot yet foresee.

EVERYTHING REMAINS DIFFERENT

CREATORS

powered by Drees & Sommer

/ **But we still stay on top of things:**

That's why we founded CREATORS, our innovation ecosystem for all innovation enthusiasts and leaders who, as early adopters, discuss novel ideas with the aim of making the industry more digital and sustainable.

<https://creators-ecosystem.de/>

DREES & SOMMER

ON THE WAY TO BECOMING A BENEFICIAL COMPANY

Back at the beginning of 2020, we committed to sustainable corporate development, and we are now well on our way to becoming a Beneficial Company. A Beneficial Company gives back more than it consumes – not only to the environment, but also to society. To achieve this, we have to meet various criteria. We are guided by the Sustainable Development Goals (SDGs), we plant trees, cut carbon emissions, and apply future-oriented concepts such as the Cradle to Cradle design principle. We also seek to reduce business travel and the number of single-use products, and we offset our unavoidable carbon emissions, promote biodiversity, and purchase green electricity.

Aspects of our social commitment include our commitment to the welfare of our employees through healthcare offerings and our support of aid organizations and welfare organizations. With the help of these measures and continuous improvements, we aim to develop into a Beneficial Company in the long term.



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A photograph of two men wearing safety glasses and dark jackets, holding lit sparklers. The sparklers are bright yellow and orange, creating a starburst effect. The background is a gradient of purple and blue with diagonal lines. The overall mood is one of innovation and excitement.

LET'S INNOVATE REAL ESTATE & CONSTRUCTION

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