

An aerial photograph of a modern urban park. In the foreground, a paved walkway runs alongside a river with a small waterfall. The park is filled with lush green trees and grass. In the background, several modern buildings with large glass windows and balconies are visible, some with green roofs. The overall scene is bright and sunny, with long shadows cast across the ground.

Climate action starts on the ground: climate resilience as a strategy for the future

Practical guidance for local authorities, planners and decision-makers

Dear readers,

How can we protect cities from the effects of climate change? From extreme heat, drought or widespread flooding?

Put simply: water. For these seemingly contradictory climate effects have the same root cause: a disrupted water cycle. Sealed surfaces, dense development and a lack of green spaces prevent rainfall from naturally seeping into the ground, being stored and evaporating. A city is only climate-resilient once the natural water cycle is active again – once the city has become a sponge city.

This white paper shows which solutions are already working today.

Enjoy reading.

Silvia and Bernhard Godelmann

About the publisher

As pioneers in paving, we are rethinking concrete paving stones – and developing solutions that go far beyond mere functionality. Our mission: to turn spaces into opportunities for the future and transform construction projects into climate projects.

Since 1980, we have been researching and developing ecological paving systems that do more than simply allow rainwater to infiltrate. With the GDM.KLIMASTEIN – the 5th generation – we have created an innovation that brings the natural water cycle back into the city. The world's first three-layer paving block stores, purifies and releases rainwater with a time delay – for fewer heat islands, less flooding and greater climate resilience.

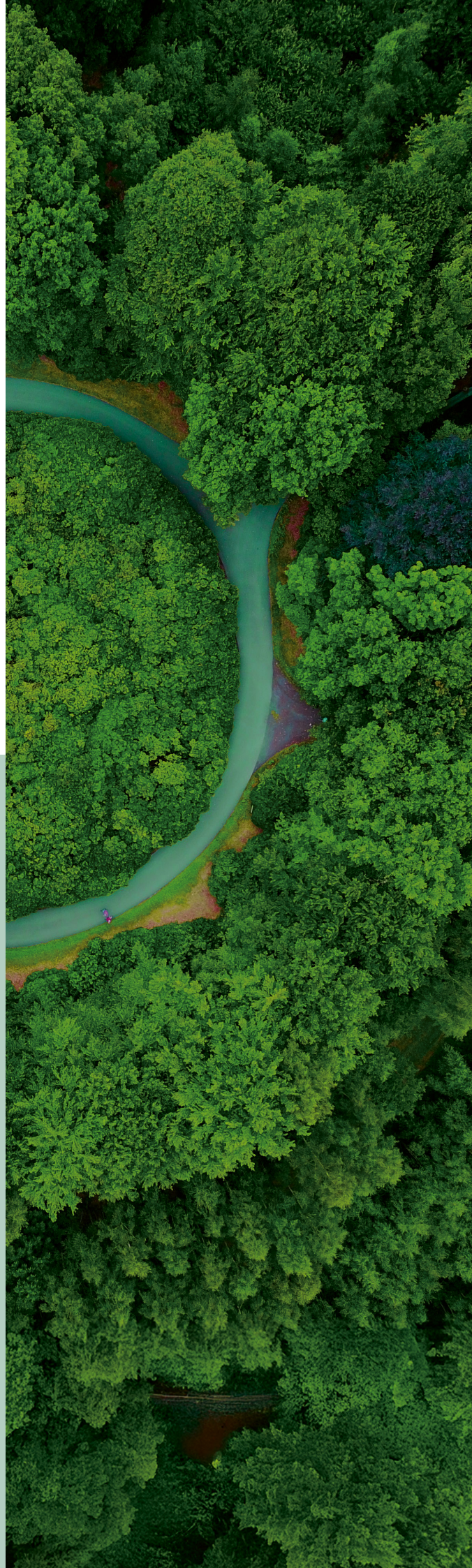
Our vision is clear

Living sustainability – through climate-friendly production and Cradle to Cradle-certified products.

Driving innovation – with technologies that combine environmental responsibility and technical excellence.

Shaping the future – by transforming paved surfaces into multifunctional, environmentally active systems.

Having been awarded the German Sustainability Prize, the GREEN AWARDS and the Federal Ecodesign Prize, we demonstrate that we are pioneers in climate-adapted urban design – with sound expertise and innovative strength.



Content

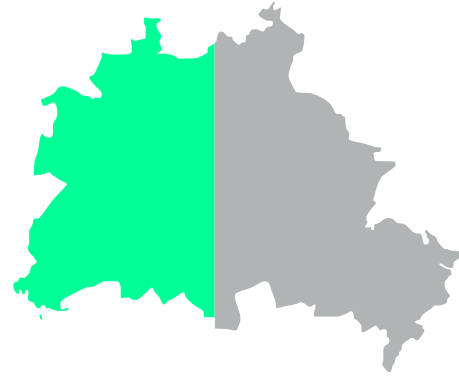
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01 Risks posed by climate change

A review of the situation in Europe

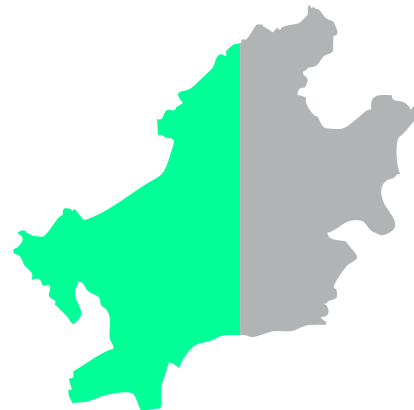
Europe is currently warming at the fastest rate. The global target of 1.5 degrees is already being exceeded here on a regular basis – eight of the last eleven years have been well above that threshold*. With temperatures rising by almost 2.5 degrees Celsius, 2024 was the hottest year on record for Europeans. Climate change is therefore well and truly underway. This has drastic consequences for our cities.



Berlin 45 %

High risks, high damage, high costs

The warming of the Earth's atmosphere is leading to more extreme weather events: week-long droughts, ever-new temperature records and torrential rainfall in a short space of time. Yet our urban infrastructure is not designed to cope with these weather extremes. Heat builds up between buildings, roads and cars, whilst heavy rain overloads the drainage system and, in the worst cases, floods entire towns. Both are life-threatening. Both incur immense costs. The economic damage caused by extreme weather within the EU amounted to more than 160 billion euros** between 2021 and 2023 alone. It is therefore time to bring water back into the city in the targeted manner.



Frankfurt 52 %

Towards a “sponge city” through de-sealing

On average, almost half of the land in German cities is sealed***. At first glance, that doesn't sound particularly dramatic. In densely built-up city centres, however, the degree of sealing is significantly higher. Without the unsealing of inner-city areas, the 'sponge city' concept remains unattainable. But even unsealed areas can be utilised for urban development. This is because there are now innovative, sustainable concrete block solutions that pave paths, squares or parking spaces whilst simultaneously activating the natural water cycle.



Paris 65 %

● Soil sealing

02 Planning and building climate-resilient cities

Challenges in planning

- Awareness of the climatic interrelationships within green-blue-grey infrastructure (plants, water, buildings) has not yet taken hold everywhere.
- Climate resilience is not automatically incorporated into urban planning. If the issue is only raised at the end of the planning process, there is little scope for creative design.
- Urban planning is not usually carried out across departments. Projects may, under certain circumstances, hinder one another.
- De-sealing is usually accompanied by the conversion of land use. This can trigger conflicts of interest and public resistance.
- New ecosystems require time and patience. It takes years for a car park to transform into a tree-lined meadow with maximum climate performance.
- The targeted transformation into a “sponge city” is very costly, and most municipalities cannot afford it on their own.

The best solutions

- Find out more. Make use of webinars, workshops, brochures, and contacts at institutions, government departments, associations and manufacturers.
- Incorporate climate resilience into every construction project right from the start.
- Bring all project stakeholders together right at the outset and plan across trades and departments.
- Involve the local community and the public in the planning process.
- Deal constructively with resistance and seek professional support if necessary.
- Weigh up the long-term costs and benefits, particularly with regard to potential damage. Make use of funding from central and regional government.

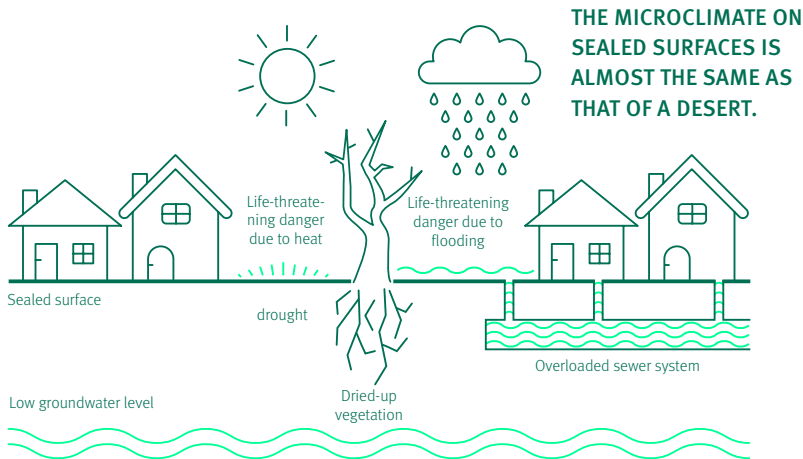


03 Urban water management

Restoring natural water cycles

Only around 3% of the water on Earth is fresh water. It falls as precipitation, collects in streams, rivers and lakes, and seeps away as groundwater. Evaporation from the ground, vegetation and bodies of water then creates new precipitation. This cycle ensures the survival of humans, animals and plants. By sealing the ground, we halt the natural water cycle in built-up areas. Instead, we channel rainfall through the sewer system for miles out of the city. This worked until climate change altered the conditions.

Separate water circuit



Rainwater can only drain into the sewer system through small manhole covers. If there is heavy rainfall in a short space of time, the sewer system becomes overwhelmed. Rainwater mixes with sewage, streets and buildings flood, and torrential streams form in valleys.

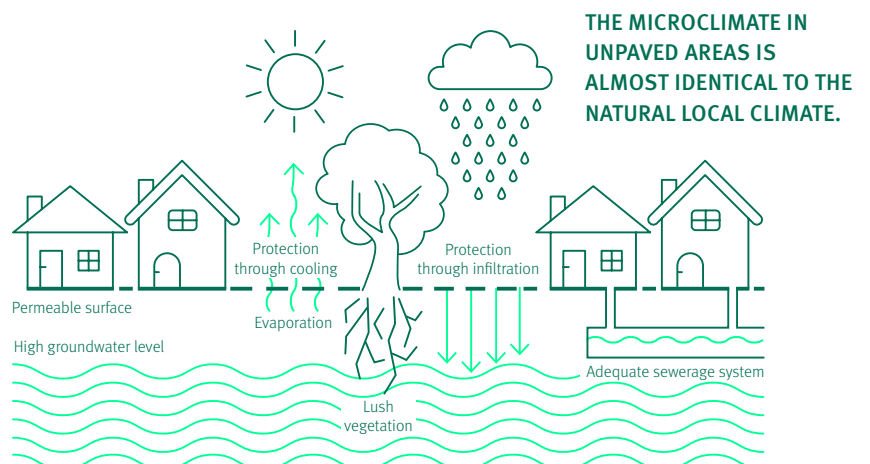
There is hardly any water stored in the ground. The water table is falling. Plants have no chance of drawing water through their roots. They wither and die. This destroys the habitats of insects and small animals.

Sunlight is almost entirely converted into heat. Asphalt, concrete and steel absorb it and release it into the environment at night. The built-up environment prevents air circulation. As a result, the heat continues to rise day after day.

Natural water cycle

The open ground absorbs and stores water. The water table is high. Trees and shrubs can draw nutrients and water through their root systems. This creates ecologically valuable habitats for plants and animals.

The sun warms the soil, enabling plants to carry out photosynthesis. The water stored in the soil and vegetation evaporates, cooling the surrounding area. The shade provided by large trees and shrubs reduces the heating up of buildings, roads and cars.



Rainwater seeps directly into the ground where it falls, nourishing the vegetation and replenishing groundwater reserves. During heavy rainfall, open spaces act as flood defences, allowing excess water to collect there.

04 What the **experts** say

Climate resilience is green, blue, grey and colourful

Five perspectives, one direction: however varied daily practice may be in landscape architecture, architecture, urban planning, water management and research, the experiences of the experts all point in the same direction.

Research and teaching

We need to shift our planning paradigm towards green urban development. In the long term, our cities must look different. We must preserve our existing trees, expand green spaces, experiment more and conduct research into new materials.

Within local authorities, all disciplines should engage with one another as equals, particularly before a project begins. This is about us as people, so we must pay particular attention to the needs and concerns of the public.



Dr. rer. nat. Simone Ines Linke

Professor of Urban Planning and Landscape Architecture and Director of Studies for the 'Green Urban Design' programme at Weihenstephan-Triesdorf University of Applied Sciences

Engineering and Water Management

We need to retain, store and allow water to evaporate at a local level. Our salvation lies in architecture, in the interplay between roads, green spaces and water. I believe the greatest challenge lies in bringing all the local authority departments together around one table.



Dr.-Ing. Carsten Dierkes

Owner of H2O Research GmbH and scientific management consultant specialising in rainwater management, including for GODELMANN



Urban planning and academia

Climate adaptation requires cross-departmental planning and coordination, discarding old certainties, embracing new approaches and forging new networks. The issue of land use is central to this, because we need to completely reverse the old logic of urban drainage – which involves channelling water quickly into the sewers and out of the city.

The earlier discussions about new projects take place, the more creativity and scope there is for blue-green infrastructure solutions. The best time is before the formal development plan is initiated. Ultimately, this transformation is a task of networking.



Dipl.-Soz. Jan Hendrik Trapp

Researcher and Team Leader
at the German Institute for Urban Studies (Difu)



Stephan Lenzen

Landscape architect, President of the bdla (Association of German Landscape Architects), owner of the firm RMP SL and Honorary Professor of Landscape Architecture at Dortmund University of Applied Sciences

Association of German Landscape Architects

I am convinced that a green, blue and colourful infrastructure – that is, plants, water and biodiversity – is our only chance. We need to use air movement to draw cool air from outside back into the city. To combat flooding, we need systems that retain and store water. The ground must be unsealed so that rainfall can seep into the groundwater.

We can only unseal traffic areas, car parks and the inner courtyards of blocks of flats. That is why the mobility transition is a prerequisite for the transformation. Concrete has been made the enemy. But we cannot do without paved surfaces. The crucial question then is: what happens to the water as it passes through the paving?

Climate measures compete with major infrastructure projects in political decision-making. The joint task of climate adaptation can only succeed if the federal government provides financial support to cities.

Project development GDM.KLIMASTEIN

I hope we come to realise the potential for climate adaptation that lies in the ‘grey’ areas – that is, the built-up areas of our cities. We need to rethink these spaces – as multifunctional elements. This means challenging existing ways of working and adapting planning processes.



Andreas Voigt

Architect, Head of the Berlin office, as well as consultant and product developer for GODELMANN

05 The GDM.KLIMASTEIN

Innovation across the board

Surfaces paved with GDM.KLIMASTEIN allow rainfall to seep away, store water within the paving stones and release almost as much moisture as a meadow. They also improve air quality and protect groundwater.

In this way, the three-layered paving stone supports the transition to a climate-resilient sponge city.



Unseals, evaporates and cools

Unsealed ground and paved surfaces go hand in hand in a climate-resilient city. This is achievable – with the GDM.KLIMASTEIN. A multi-award-winning concrete block from GODELMANN with a dual climate benefit: firstly, through its CO₂-free production and 100% recyclability; and secondly, through its climate-enhancing properties as a multifunctional paving material.



**bundes
preis
eco
design**

Winner of numerous awards and certifications

The GODELMANN concrete block is approved by the German Institute for Building Technology (DIBt) as a treatment system for rainwater. As a fully recyclable product, it holds Cradle to Cradle Certified® Gold status and has been awarded both the Federal Ecodesign Prize and the Green Award. Its manufacturing process is certified as climate-neutral by TÜV Rheinland.

1. layer

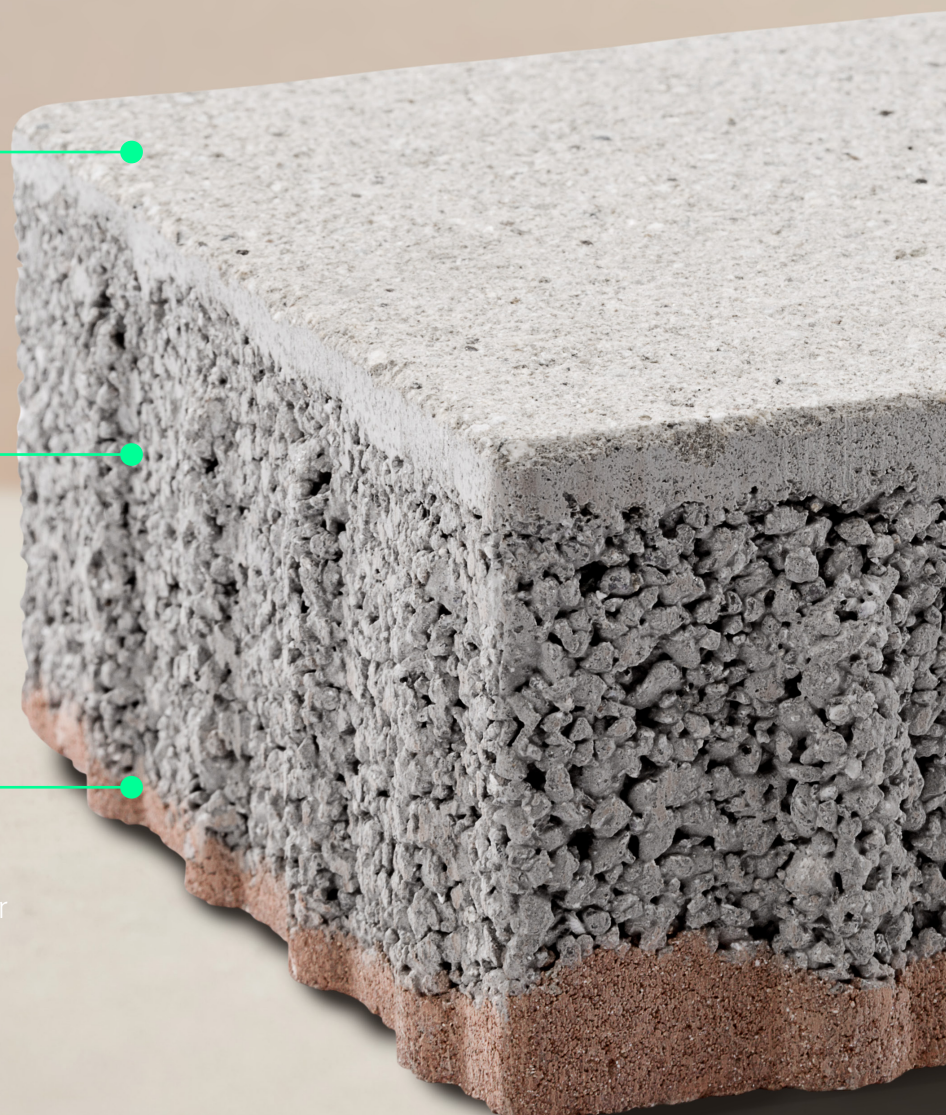
The catalytic layer reduces air pollutants

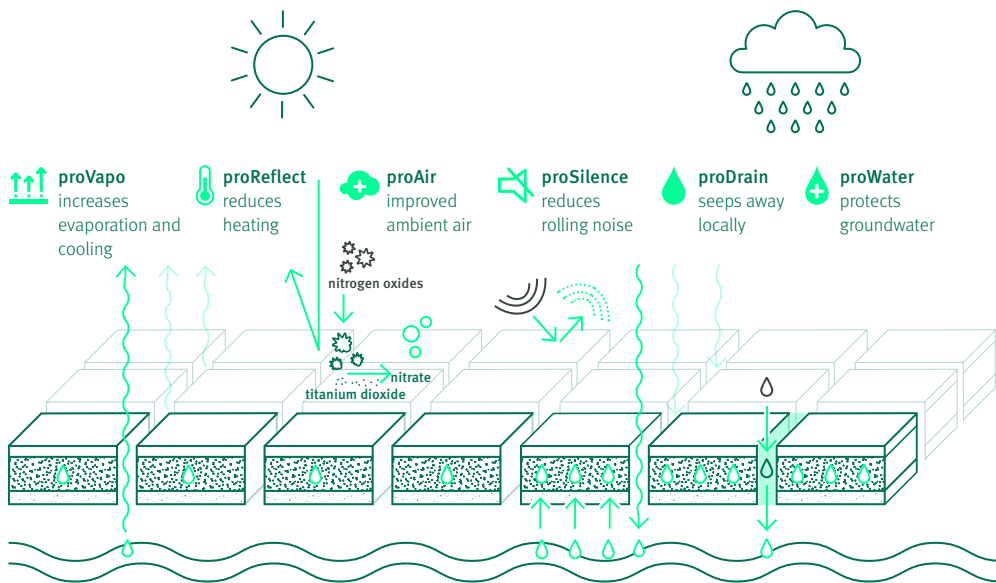
2. layer

The storage layer absorbs water and evaporates it

3. layer

The capillary layer conveys water into the storage layer

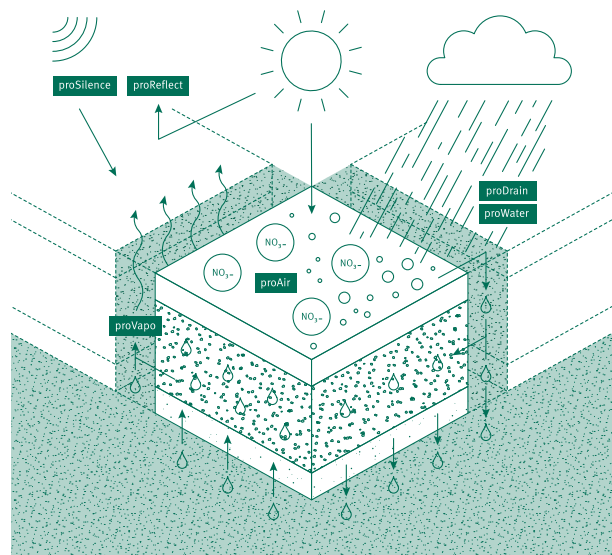




Depending on the weather conditions, the GDM.Klimastein and the proActive functions work in different ways to create the best possible environment for people and infrastructure.

Sustainable paving with proActive features

The Klimastein paving block is most effective when used as a paving surface: when it rains or snows, the precipitation can seep away and the blocks' reservoirs fill up. In combination with the joints and bedding, pollutants are filtered out of the runoff to keep the groundwater clean. When the sun shines, the surface of the blocks reflects the radiation and removes harmful substances from the air. At the same time, the water in the blocks and from the ground evaporates. This cools the surroundings and improves the microclimate. The special laying technique used for the concrete blocks also reduces road noise from vehicles.



proActive Principle



proDrain
Decentralised on-site infiltration keeps the local water balance largely intact and reduces the burden on the sewerage network.



proVapo
Evaporation helps improve the urban climate: it increases humidity and provides more cooling.



proWater
The jointing material filters pollutants out of rainwater from traffic areas: groundwater protection.



proAir
Thanks to a modified concrete mix, the surface helps to reduce air pollutants.



proSilence
Certain formats, the joint width and surface texture, as well as the laying pattern, ensure a particularly quiet paving surface.



proReflect
The surface reflects the heat from the sun's rays and protects against overheating.



proCycle
Conserves raw material resources through recycling and upcycling.

06 From a construction project to a climate project

Unsealing as the key to the sponge city

A selection of construction projects: the redesign and de-sealing of town centres, urban neighbourhoods, public spaces and school playgrounds using the GDM.KLIMASTEIN demonstrates how construction projects can become climate projects. What all these projects have in common is early, collaborative planning and a commitment to greater climate resilience in the city.



Sustainable development in the town centre: new public buildings and spaces create opportunities for people to meet.

Community Centre and Town Centre in Niederwerrn

In the Lower Franconian municipality of Niederwerrn, a new town centre has been created at the junction between the old town and the established residential area, following extensive consultation with local residents. The new development plan, which includes a community hall, museum, café and other buildings serving as meeting places, supports the sustainable inward development of the town and sets an example for circular construction and upcycling.

www.godelmann.de/neues-buergerzentrum

The playground of a school in Burghausen

As part of the extension to the Hans-Kammerer Primary School in Burghausen, a new playground was created, amongst other things. In the run-up to the project, the pupils were able to contribute their own ideas to the planning process. To promote a climate-positive urban environment, those involved in the project decided to preserve existing trees and to lay out the playground as a paved yet permeable surface.

www.godelmann.de/hans-kammerer-schule



The tiles are laid in a random pattern. This emphasises the natural look of the moisture-releasing GDM.KLIMASTEIN.

Town centre in Jettingen

Much like in Niederwerrn, the town centre of Jettingen in Swabia has also been redeveloped. The Partnership Square by the town hall is now a barrier-free, modern, open town centre featuring seating and water features. GDM.KLIMASTEIN was used for the eco-friendly paving.

www.godelmann.de/partnerschaftsplatz



The GDM.KLIMASTEIN, in a warm beige tone, lends the newly designed town hall forecourt in Jettingen a contemporary and sustainable character.



The tarmac has been removed here to make way for more lawns and flower beds.

School refurbishment in Heilbronn

As part of a comprehensive refurbishment of the Fritz-Ulrich-Schule in Heilbronn, the southern school playground was redesigned and, at the same time, de-sealed. The asphalt had to be removed to make way for more lawns and flower beds. The paved areas between the green spaces were laid with GDM.KLIMASTEIN, a permeable paving stone that allows water to seep through and evaporate.

www.godelmann.de/fritz-ulrich-schule



Scan the QR code and discover more visualised projects with GDM.KLIMASTEIN.





Thanks to the climate project, the entire neighbourhood around Aalen Town Hall is becoming a more pleasant place to live and spend time. The GDM.KLIMASTEIN plays a key role in this.

Pilot project in the district town of Aalen

Another land-unsealing project is being carried out in the district town of Aalen. Around the town hall, a sealed car park and a culverted watercourse are being transformed into a green park with direct access to the River Kocher. With the Gaulbad and Stuttgarter Straße pilot project, part of the federal funding programme 'Adaptation of urban and rural areas to climate change', the city is setting new priorities, as this mammoth project will bring about a significant improvement to the entire urban environment.

Unsealing and greening improve the climate and quality of life: cooling, rain-water retention, fresh air and attractive public spaces promote sustainable urban development in Aalen. Safe footpaths and cycle paths are also part of this approach: accessible, noise-reducing surfacing ensures comfort and mobility for all. GODELMANN concrete blocks are also used here.



The open riverbank provides an attractive recreational space and creates new retention areas. The GDM.KLIMASTEIN system also supports the natural water cycle.



You can find out more about the Aalen project and the GDM.KLIMASTEIN in the latest Future Report from GODELMANN.

Do you have any questions for our experts?

Our specialists in eco-friendly paving and the GDM.KLIMASTEIN will be happy to assist you.



Max Godelmann
Management

M +49 151 15058002
max@godelmann.de



Andreas Voigt
Dipl.-Ing. Architect

M +49 151 15058031
andreas.voigt@godelmann.de



Michael Kösling
Dipl.-Ing. LA

M +49 151 15058022
michael.koesling@godelmann.de



Find out how spaces in your town can become multifunctional and climate-resilient. All the information can be found at www.godelmann.de/gdm.klimastein.

GODELMANN GmbH & Co. KG
Industriestraße 1 · 92269 Fensterbach
T +49 9438 9404-0

info@godelmann.de · godelmann.de



Sources

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