

# SOLUTIONS FOR RESILIENT CITIES



# THE FACT IS...



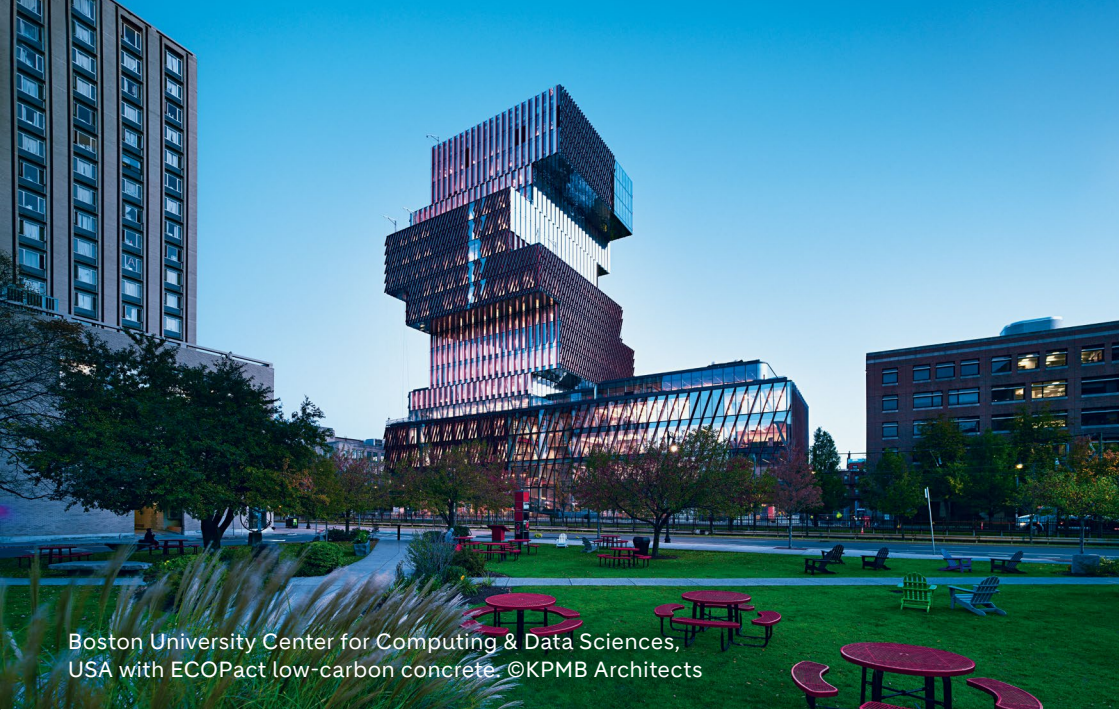
**Cities are in a race against time to adapt to a rapidly changing climate. As the leading provider of sustainable building solutions, Holcim is ready to be the key partner to cities on this journey.**

**We are putting our solutions to work to make cities climate resilient and improve quality of life.**

**We have identified five built environment challenges faced by city mayors today where Holcim can provide solutions.**



High Line Park,  
New York City, USA.



Boston University Center for Computing & Data Sciences, USA with ECOPact low-carbon concrete. ©KPMB Architects

# CHALLENGES:

1

**REDUCING CO<sub>2</sub> EMISSIONS  
IN THE BUILT ENVIRONMENT**

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2

**ACCELERATING CIRCULARITY  
IN CONSTRUCTION**

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3

**INCREASING BUILDINGS'  
ENERGY EFFICIENCY**

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4

**IMPROVING RESILIENCE  
TO CLIMATE EVENTS**

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5

**BOOSTING BIODIVERSITY**



1

BUILDING BETTER WITH LESS:

# REDUCING CO<sub>2</sub> EMISSIONS IN THE BUILT ENVIRONMENT



We expect nearly 70% of the world population to be living in cities by 2050, adding 2.5 billion people.<sup>1</sup>



About 60% of buildings that will exist by 2050 haven't been built yet.



This means constructing a city the size of Singapore or New York every month between now and 2060.<sup>2</sup>

Buildings account for 37% of the world's CO<sub>2</sub> emissions.<sup>3</sup>

We can help cities curb greenhouse gas emissions with our building solutions that enable a lower carbon footprint and reduced material use.

Where possible, our solutions are independently verified through Environmental Product Declarations (EPDs), which validate the environmental profile of a product and ensure transparency.



OUR SOLUTION

## **DECARBONIZING CONSTRUCTION BY REDUCING THE CO<sub>2</sub> FOOTPRINT OF BUILDING MATERIALS**



We are making sustainable construction possible at scale around the world, from Zurich to New York and Mexico City to Manila, with our low-carbon building materials.

We offer the world's broadest ranges of low-carbon concrete with ECOPact and low-carbon cement with ECOPlanet, delivering 100% performance with at least 30% less CO<sub>2</sub>, in line with the most advanced sustainability certifications from LEED and BREEAM to WELL.

The largest urban regeneration project in Europe, Greece's Ellinikon is built with ECOPact low-carbon concrete.

Image: DBOX

[Read more here.](#)

**ECOPact.**  
The Low-Carbon Concrete

**ECOPlanet.**  
The Low-Carbon Cement

OUR SOLUTION

## SMART DESIGN AND NEW TECHNOLOGIES FOR EFFICIENT MATERIAL USE



We are empowering smart design and deploying new building technologies to use minimum materials for maximum strength:

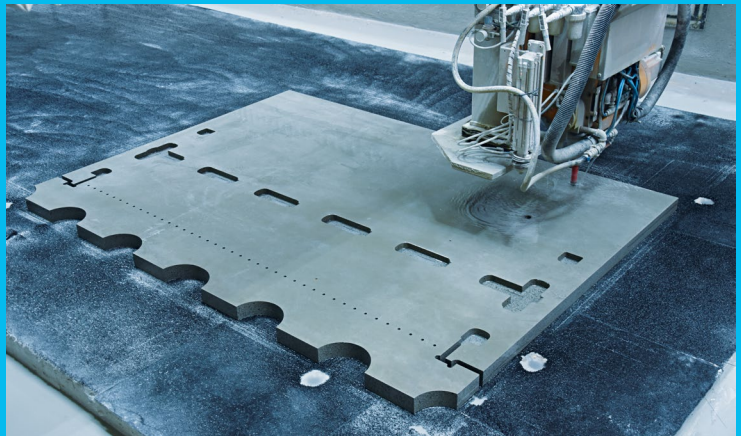
- DYNAMax high performance concrete delivers high strength, outstanding durability and superior rigidity to optimize usable space and build longer-lasting buildings.
- Carbon pre-stressed concrete (CPC) slabs are thin, light precast plates made of high-strength concrete reinforced with prestressed carbon fibers, which have the same load-bearing capacity as standard concrete slabs. They use up to 80% less material with up to 75% lower CO<sub>2</sub> emissions, and are circular by design.
- Construction 3D printing using our proprietary TectorPrint range of inks can reduce material use by up to 50% with no compromise in performance.
- The Rippmann Floor System is a low-carbon, fully circular prefabricated concrete floor solution that can reduce material use by up to 70%. It was developed by the Block Research Group at ETH Zurich and implemented as a prototype in partnership with Holcim.

**DYNAMax**

**TectorPrint**



Carbon pre-stressed concrete slab production. The solution won a 2022 Bauma Innovation Award. [Read more here.](#)



The Rippmann Floor System,  
installed in the NEST, Switzerland.  
Image: Roman Keller





2

BUILDING CITIES FROM CITIES:  
**ACCELERATING  
CIRCULARITY IN  
CONSTRUCTION**

Construction materials and the building sector are responsible for almost a third of global resource consumption.<sup>4</sup>

We can help cities respect planetary boundaries with our building solutions that drive circular construction to build new from old.



With ECOCycle® inside, Recygénie (Paris) is the world's first fully recycled concrete building. Image: A26 BLM [Read more here.](#)



## OUR SOLUTION

# CIRCULAR ROOFING SYSTEMS

Our commitment to driving circularity extends to our roofing offering.

- A standard Malarkey residential roof upcycles at least 3,000 plastic bags into new shingles.
- As part of its award-winning “Recycle Your Roof” program, Duro-Last takes manufacturing waste and roofs at the end of their life and recycles them into new materials. The company also upcycles waste from the roofing manufacturing process into flooring systems. To date, Duro-Last has recycled more than 36,000 tons of roofing material.



## OUR SOLUTION

# RECYCLING CONSTRUCTION DEMOLITION MATERIALS INTO NEW BUILDING SOLUTIONS

Making construction circular is essential to stay within our planet's boundaries while we improve living standards for all.

ECOCycle®, our proprietary circular technology platform, recycles construction demolition materials into new building solutions.

- All products with ECOCycle® inside – cement, concrete or aggregates – contain from 10% to 100% recycled construction demolition materials.
- ECOCycle® also enables the upcycling of decarbonized cement paste from construction demolition materials into new, low-carbon materials.





# 3

MAKING CITIES SUSTAINABLE:

# INCREASING BUILDINGS' ENERGY EFFICIENCY



Energy used to power, heat and cool buildings causes up to 80% of CO<sub>2</sub> emissions in cities.<sup>5</sup>



Roughly 75% of all global energy consumption occurs in cities.<sup>6</sup>

Buildings present a unique opportunity to speed up the transition to decarbonized energy and highly energy-efficient cities.

World's largest Passive House building, the Winthrop Center (Boston) with Elevate™ UltraPly TPO™ membrane and ISOGARD™ insulation. [Read more here.](#)



## OUR SOLUTION

# IMPROVING ENERGY EFFICIENCY WITH ADVANCED ROOFING AND INSULATION SYSTEMS



We are making buildings more sustainable in use to decarbonize cities with a range of roofing, insulation and retrofitting solutions both for new builds and existing building stock.

- Our insulation systems offer advanced energy efficiency benefits enabling Passive House buildings. Holcim's Elevate ISOGARD boards provide the highest thermal insulation in the US market, up to 40% above standard competing solutions making buildings more energy-efficient and cost-effective in use.
- As a cool roof system, Duro-Last's Bright White Membrane reflects up to 88% of the sun's energy. This ENERGY STAR qualified membrane also releases energy and heat efficiently, greatly reducing energy costs.
- Malarkey 3M™ Cool Roofing Granules include a technology based on granules that reflect 20–25% of the sun's energy, reducing cooling-related energy needs.
- SES Foam develops advanced insulation systems such as its bio-based SucraSeal spray foam insulation, designed to improve buildings' energy efficiency and thermal comfort while lowering their carbon footprint.
- Made of up to 95% air, Airium™ is an extremely lightweight mineral-based insulating foam. For both new builds and green retrofitting, Airium™ can be used in roofs, walls, floors and terraces, as well as inside concrete blocks.
- PRB External Thermal Insulation Composite Systems (ETICS) are multilayer insulation solutions applied to the exterior surfaces of a building to improve energy efficiency, reducing heat loss by 20–30%.





Elevate solar-enabling roof at Apple Park, Cupertino, USA.

#### OUR SOLUTION

## SHIFTING TO DECARBONIZED SOURCES OF ENERGY

Holcim solutions are enabling the energy transition.

- One prerequisite for installing solar panels is having a roof that can last as long as they do. Elevate EPDM Roofing Membrane systems have a lifespan of over 50 years, allowing rooftop renewable energy systems to maximize their use life.
- Cutting-edge innovation allows electric vehicles to be charged conductively via the road surface they travel on. Holcim is partnering with German startup Magment to optimize its magnetizable concrete charging technology.

 ELEVATE

  
MAGMENT



OUR SOLUTION

## DESIGNING FOR EFFICIENT HEATING AND COOLING

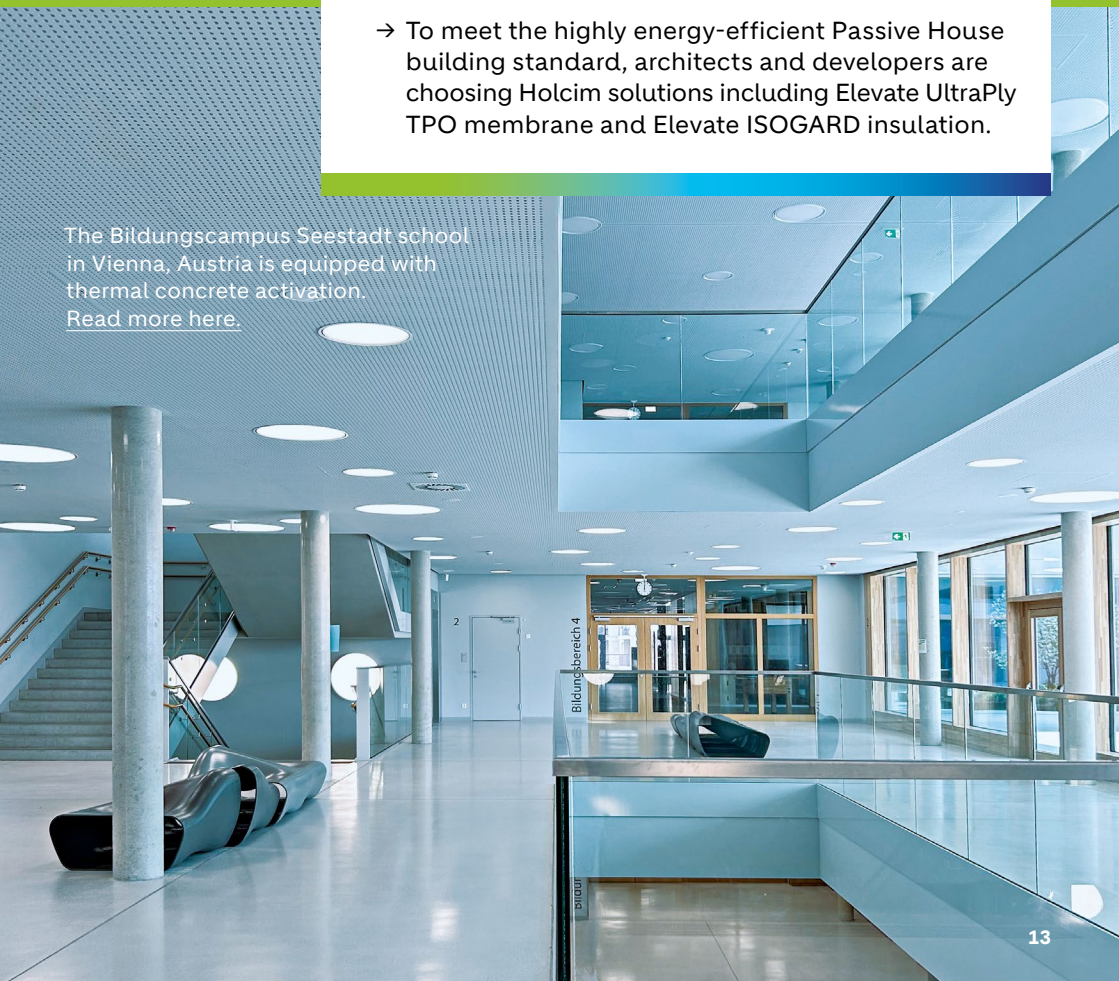
Building energy-efficient cities starts at the design stage.

- Thermal concrete activation (TCA) is one of the most effective solutions to achieve energy storage. Concrete is excellent at storing and conducting heat, so concrete load-bearing components can play the role of energy storage units if they are designed accordingly. Combined with low-carbon concrete such as ECOPact, this solution can pre-charge buildings with energy that can be stored and released for heating and cooling as needed in an even more sustainable way.
- To meet the highly energy-efficient Passive House building standard, architects and developers are choosing Holcim solutions including Elevate UltraPly TPO membrane and Elevate ISOGARD insulation.

**ECOPact.**  
The Low-Carbon Concrete

**ELEVATE**

The Bildungscampus Seestadt school in Vienna, Austria is equipped with thermal concrete activation.  
[Read more here.](#)





# 4

PROTECTING OUR CITIES:

## IMPROVING RESILIENCE TO CLIMATE EVENTS

Cities are already experiencing a new climate reality:

→ 650 million people will face water scarcity in 2050

→ 1.6 billion people will face extreme heat in 2050<sup>7</sup>

Adaptation work helps cities take action to protect residents and infrastructure from immediate and future climate risks, as well as to develop solutions and implement actions towards transformational, city-wide resilience to the impacts of climate change.

In the face of a rapidly changing climate, from rising sea levels and flooding to severe temperatures, we need to make our homes, schools and other vital infrastructure climate resilient to keep citizens safe.

OUR SOLUTION  
**COASTAL RESILIENCE**



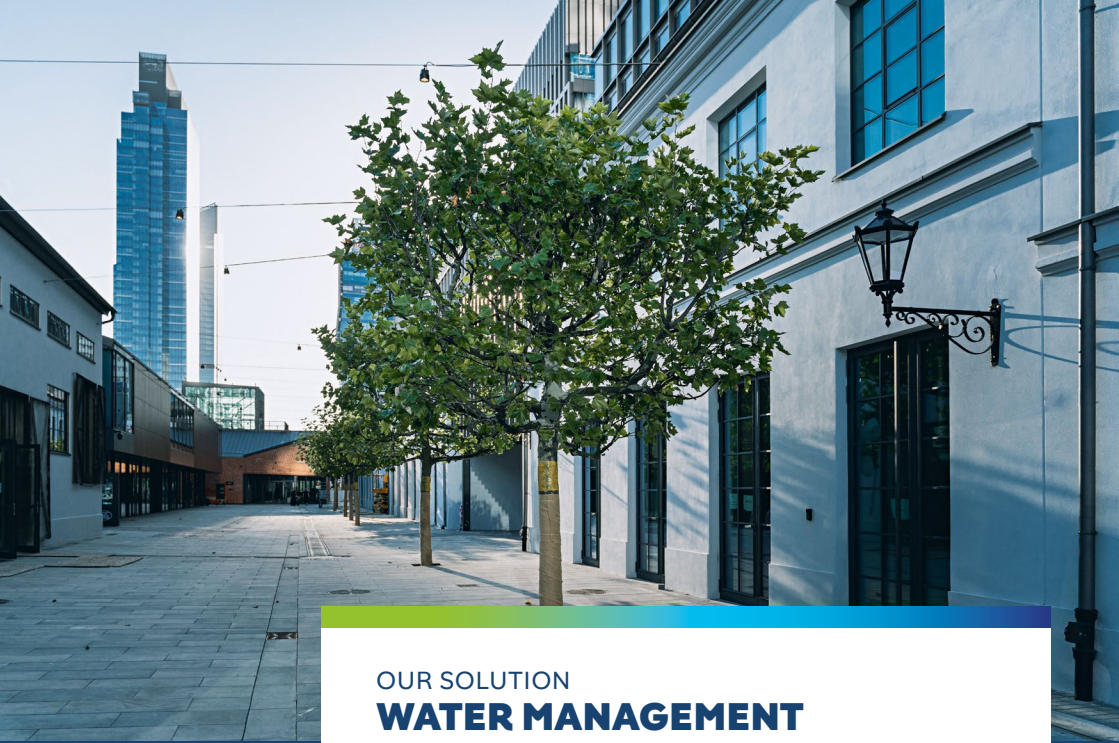
By 2025, 410 million people in coastal communities could be at risk of coastal flooding and sea-level rise.<sup>8</sup> Holcim offers innovative solutions for the coastal engineering, river protection and infrastructure construction.

- Basalton shore protection system for coast and revetment areas provides stabilization and erosion control.
- Xbloc is a coastal breakwater armor system using Holcim low-carbon concrete solutions such as ECOPact.

**ECOPact**  
The Low-Carbon Concrete



Basalton Quattroblock  
renovation of closure dam in  
Afsluitdijk, The Netherlands.



Hydromedia was used in Warsaw's Norblin Factory to improve drainage of water from surface.

*Hydromedia*

 **ELEVATE**

#### OUR SOLUTION

## **WATER MANAGEMENT AND PROTECTION**

Water-related disasters – heavy rains, river floods, storm surges, inland flooding and flash flooding – are the most destructive of all natural disasters, costing lives and money. Holcim offers a wide range of innovative solutions to avoid flooding and improve cities' water management capacity:

- Hydromedia permeable concrete is a water management system that rapidly absorbs rainwater off streets, parking surfaces, driveways and walkways – reducing the risk of flooding. It enables the ultra-rapid evacuation of water directly into the soil, producing a natural aquifer recharge or allowing the water to be recycled.
- Holcim's precast stormwater management solutions include drainage, detention, treatment, harvesting and reuse systems, such as the Universal Pollutant Trap (UPT).
- Elevate PondGard system is designed for outdoor water storage and usage.





*Hydromedia*

All Malarkey shingles are coated with photocatalytic granules that help clean the air of pollutants.

#### OUR SOLUTION

## **MAKING CITIES CLEANER BY REDUCING AIR POLLUTION**

Air pollution is a global challenge, and urban environments often suffer the most.

- Malarkey launched the world's first smog-reducing shingle that removes smog gases from the air in the same way that trees do, by using sunlight. An average-sized Malarkey roof improves air quality to a similar extent as planting two new trees.
- Hydromedia New Air permeable concrete contains patented activated charcoal that acts as a filter to remove pollutants from the air, such as nitrogen oxide and fine particulates.



Meama Coffee  
Factory, Tbilisi,  
Georgia  
with Elevate  
RubberGard  
membrane.



 ELEVATE

*Artevia*

*Hydromedia*



## OUR SOLUTION

# MAKING CITIES COOLER BY REDUCING THE URBAN HEAT ISLAND EFFECT



The urban heat island effect makes cities warmer than the surrounding rural area, putting urban dwellers at high risk of various heat stress conditions. Our range of innovative solutions can help cities reduce these risks.

- Green (or vegetative) roofs control temperature and combat the urban heat island effect. Elevate SkyScape™ Vegetative Roofing Systems are designed to encourage plant growth and come in two styles: pregrown modular and built-in-place. EPDM and TPO roofing membranes offer a reliable and durable solution for extensive green roof applications. Duro-Last roofing systems can also be installed under vegetative roofs.
- Hydromedia permeable concrete can lower the temperature in cities by up to 6°C when used to bring greenery into urban areas.
- The Artevia collection of decorative concretes comes in highly reflective coloring to increase the albedo of the surface and reduce the heat island effect.



# 5

CREATING GREENER CITIES:

## **BOOSTING BIODIVERSITY**

Existing forecasts of global urban expansion suggest that 290,000 km<sup>2</sup> of natural habitat is likely to be lost to urban expansion between 2000 and 2030.<sup>9</sup> A positive natural future for the “urban century” necessitates sustainable urban growth that occurs in appropriate places while nearby nature is protected, restored and enhanced.

Nature in and near cities is crucial not just for maintaining biodiversity but for ensuring human wellbeing, which depends on the benefits that nature provides. These benefits include serving as a major carbon sink, with land and oceans absorbing more than half of all greenhouse gas emissions.<sup>10</sup>

Green roof of Les Trèfles school in Anderlecht, Belgium (built with Elevate) provides a place for biodiversity to thrive. [Read more here.](#)

## OUR SOLUTION

# HOSTING ECOSYSTEMS ON GREEN ROOFS



Studies show that birds use green roofs as a stopover habitat during migration and a foraging habitat during the breeding season, helping to mitigate the loss of habitat due to increasing urbanization. They also provide a good forage source for bees and other important pollinators in the urban environment.

Elevate green roofing systems host complex ecosystems with trees, plants and irrigation.






*Hydromedia*

OUR SOLUTION

## **CREATING URBAN GREEN SPACES**

Communities can create urban forests and green spaces to reduce the effects of heatwaves in cities as trees and other plants cool the surrounding environment by offering shade and releasing water through their leaves.

With its permeability properties, Hydromedia permeable concrete allows direct rainwater infiltration over urban surfaces, meaning we can create an urban forest environment without the need for irrigation.



Urban forest, Paris, France with Hydromedia permeable concrete.  
[Read more here.](#)



Bioactive concrete reefs are regenerating ecosystems to preserve biodiversity. [Read more here.](#)

OUR SOLUTION  
**RESTORING MARINE ECOSYSTEMS**

Marine habitats have suffered dramatic damage in recent decades due to climate change and pollution.

Our bioactive concrete can be used to build biogenic infrastructures for marine and coastal ecosystems, including artificial reefs. The solution's mix design, patented by Holcim, combines porous and standard concrete to enable rapid colonization by marine animals and plants.

