JULY 2023

SPRING WISE FUTURE NOW

THE TOP 10 IDEAS SHAPING THE WORLD AND YOUR INDUSTRY THIS MONTH

HERE'S WHAT YOU NEED TO KNOW THIS MONTH...

Last month, Texas experienced a three-week heat wave, at times becoming the hottest place on earth. And it's been a similar story around the world so far this summer. In the UK, June 2023 was the hottest since records began, while, in China, the number of 'high-temperature' days this year has been the highest ever recorded.

Scientists predict that the weather will only get hotter as climate change progresses, with days above 50 degrees Celsius likely to be an annual reality for several regions by 2100.

Extreme heat has drastic implications for our health, how we work, and how we live day to day. And, for urban centres – which will be home to two out of three people by 2050 – the issue is particularly acute. Many cities around the world are ill-equipped to deal with extreme temperatures, and simply adding more air conditioning (AC) isn't the answer. This is because AC itself accounts for nearly 4 per cent of global greenhouse gas emissions and places power grids under extreme strain in hot weather.

The issue of heat is intimately tied up with the need for urban greenery and smart water management. While our cities have been warming steadily – and at a faster rate than the countryside – one study has found that urban greening of European cities offsets heating by an average of 0.13 degrees Celsius per decade. And greenery can, in turn, improve water security, with another study finding that urban greening has the potential to reduce surface water runoff by around 17.5 per cent. The retention of water is crucial given that nearly half of the global urban population could face water scarcity by 2050.

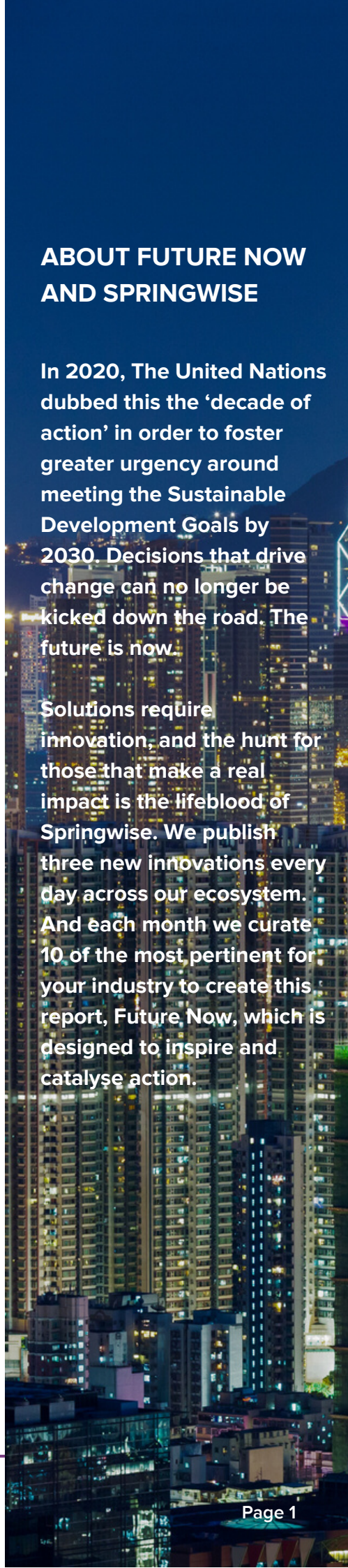
In short, if we are to live and work productively the cities of the future will need to be three things: cool, green, and water smart. From plants that can survive even where there is little soil, to recycled roof panels that retain water, read on to discover the solutions that are making this possible.

Angela Everitt, Content Director, Springwise

ABOUT FUTURE NOW AND SPRINGWISE

In 2020, The United Nations dubbed this the 'decade of action' in order to foster greater urgency around meeting the Sustainable Development Goals by 2030. Decisions that drive change can no longer be kicked down the road. The future is now.

Solutions require innovation, and the hunt for those that make a real impact is the lifeblood of Springwise. We publish three new innovations every day across our ecosystem. And each month we curate 10 of the most pertinent for your industry to create this report, Future Now, which is designed to inspire and catalyse action.



COOL CITIES

A MODULAR HYDROPONIC SYSTEM FOR GROWING SHADE PLANTS

An automated system for providing shade plants in urban areas

As anyone who lives in an urban area knows, cities are hotter than the surrounding area. According to the US Environmental Protection Agency, the annual air temperature of a city with 1 million people can be 1.8–5.4 degrees Fahrenheit (1–3 degrees Celsius) warmer than its surroundings.

In addition, NASA's Landsat satellite data has been used to demonstrate a correlation between dense vegetation and cool temperatures, and between sparse vegetation and high temperatures.

Early-stage startup BioShade is working to put this information into practical use. It has developed a technology that uses a solar-powered, water-saving, smart system to cultivate shade plants in urban areas. The system is fully automated, low-maintenance, and modular, so that it can be used to create various shaded microenvironments to suit different parts of any city.

The smart hydroponic system can be easily customised for any variety of plants and can interface with other shade elements. BioShade claims that plants cultivated using its system grow at twice the normal rate and with an 80 per cent saving in water when compared to soil irrigation. And by eliminating most pests, the system results in higher plant survival rates.

BioShade also claims that its systems create a shaded microclimate with a decrease of 11 degrees Celsius in physiological heat stress. The company adds that by placing BioShade on rooftops, users can save up to 80 per cent of the top floor air cooling expenses, which could be of interest to corporate property managers.

MOSS WALL BIOFILTERS CLEAN AND COOL CITY AIR

The plants absorb fine particulates as well as carbon dioxide

Moss is a highly efficient, natural air filter, attracting tiny dust particles to its fine, dense leaves. The plant biodegrades, stores, and eats airborne particles such as soot, ammonium salts, carbon dioxide, and pollen, all of which are harmful to human health. Moss also absorbs warm air, producing a local cooling effect as heat evaporates.

Startup Greencity Solutions has tested 16,000 species of moss to find the most effective ones for use in moss wall biofilters. Living walls are becoming more common architectural features, and with the company's new moss version, cities have an improved ability to bring the fresh smell and clean air of a forest to crowded, busy locations. After removing the pollution, the moss releases cleaned, cooled air. The effects can be measured up to one and a half metres away from the wall.

Greencity's three solutions are the CityTree, CityBreeze, and WallBreeze. All three designs use internet of things (IoT) technology to track local conditions and footfall and are connected to a proprietary, cloud-based data platform that automates irrigation and tracks plant growth and health.

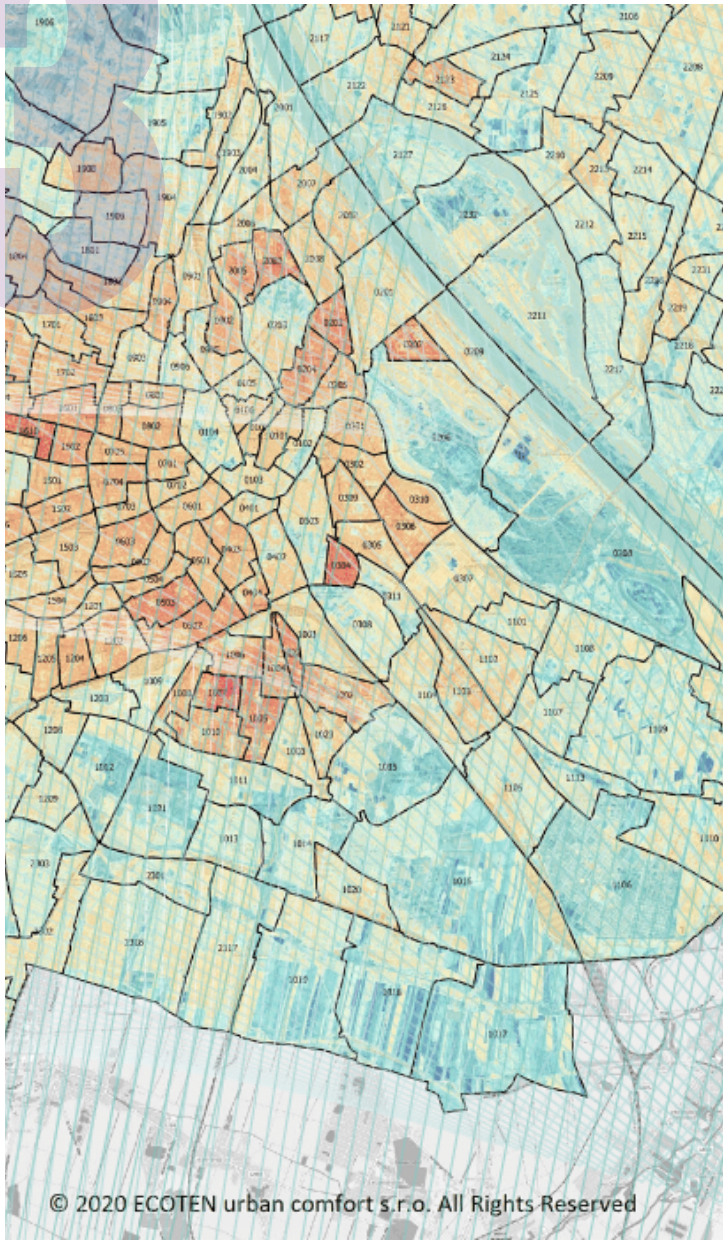
The CityTree is a freestanding pillar with a bench that cleans air from all angles. The pillar includes space for an LED screen or poster, allowing owners to customise and change messaging. The CityBreeze is a slimmer design created for high-traffic areas such as train platforms, shopping centres, and car parks. One side is a moss wall and the other is a 75-inch LED screen for high-resolution communication. The WallBreeze is fitted onto a wall, and up to 25 panels can be connected for management by a single account on the startup's data platform.

MAPPING URBAN HEAT VULNERABILITY

Today, most of the world's large metropolitan cities are facing multiple climate change-related issues. Czech company ECOTEN Urban Comfort is using a data-driven approach to help cities adjust by designing greener, cooler, healthier areas. The environmental engineering company is a spinoff of green building consultancy ECOTEN (Smart Energy Solutions). It provides tailored services and works to help urban developers build more resilient cities in a number of ways.

One is by conducting urban heat vulnerability assessments. These identify critical hotspots to allow decision-makers to implement heat mitigation strategies more efficiently. The company also conducts urban microclimate simulations to assess the microclimate impacts of potential urban projects. The goal of each is to protect citizens and provide a more comfortable urban environment.

ECOTEN assesses heat impacts and vulnerabilities using satellite data from Landsat and Sentinel satellites. Engineers then develop nature-based solutions, such as water features and vegetation, to cool down hotspots. Computer simulations of the microclimate in different areas are used to find efficient solutions to mitigate urban heat islands.



HI-TECH NATURE

The relief provided by the cooling shade of a tree would be as familiar to the earliest humans as it is to a modern city dweller. But what has changed, is our ability to calculate and quantify the impact of greenery on urban heat and to use some of our most advanced technology to plant our cities with a high level of precision.

All three of these cooling innovations combine the natural power of plants with modern sensors and data analytics to ensure that urban greenery is kept in optimum conditions and/or strategically located to maximise its cooling effect. In this way, they show that there is no trade-off between 'natural' and 'hi-tech' solutions, but rather that cutting-edge technology and the natural world can be made to work together.

GREEN CITIES

MOSS-FRIENDLY CONCRETE MAKES BUILDINGS FEEL MORE NATURAL

Creating greener cities with Respyre's concrete would provide cleaner air and reduce heating and cooling costs for building owners

The greying of the world's green spaces is cause for concern – as urban areas and their concrete infrastructures expand, less and less natural space is left for even small pockets of biodiversity in cities. Rather than live with great swathes of grey concrete in public spaces, Dutch material science company Respyre wants to turn those buildings green.

With a proprietary mix of recycled concrete aggregates, other waste streams, natural acids, and nutrients, Respyre produces bioreceptive concrete that provides the perfect home for moss. Moss walls clean the surrounding air, provide an aesthetically pleasing green space, reduce noise pollution, and reduce a building's heating and cooling costs. Respyre's concrete contains the perfect mix of porosity, nutrients, and water retainment to support the growth of moss.

Moss does not require an anchoring system, nor does it grow roots, making it the ideal plant for a green wall. To make it easy to implement, Respyre's concrete is available in pourable form for on-site application, as well as prefabricated pieces or as a plaster solution. All versions support moss, with most structures being completely covered within a few months. The moss can also be grafted directly to a wall, which produces the fastest growth.

With many varieties of moss available, it is possible to find a successful match for almost any location, and Respyre's team works closely with designers and builders to match the type of moss to the local conditions.

Photo Source: Plastic Energy, INEOS Olefins & Polymers Europe

UNLOCKING THE GREEN POTENTIAL OF ROOF TOPS

A social enterprise in Spain is helping communities save energy and create community space with green roofs

Every building has a roof, and, increasingly, innovators are realising that these spaces provide an invaluable opportunity to improve the urban environment.

Eixverd is a social enterprise focused on promoting the sustainability of urban centres by supporting climate change adaptation and mitigation projects. One of its major initiatives is the installation of green roofs on both private and public buildings. These offer significant absorption of pollutants and CO2, reduce water runoff, promote urban biodiversity, and mitigate the urban heat island effect.

And, on top of the environmental benefits, Eixverd points out that green roofs require little maintenance and create space for communities to gather and grow their own food, while also providing acoustic insulation. One of the green rooftops installed by Eixverd is even watered, in part, using the condensation that forms around rooftop refrigeration units.

While Eixverd offers design and management of green roofs, it does not perform installations or recommend particular suppliers or installers, preferring to “keep all doors open to recommend the most suitable and most economical option to the client”.

The company adds that, “innumerable studies show that a well-functioning green roof provides excellent thermal insulation. In our own experimental green roof, we have observed that, in contrast with the temperatures of up to 60 and 70 degrees Celsius prior to installation, 28 and 35 degrees Celsius are reached under the green roof’s soil.”

SPREADING PLANTS IN CITIES EVEN WHERE THERE IS LITTLE SOIL

A French startup is finding solutions to boost nature in cities and make them greener

By 2050, the majority of countries will have more inhabitants living in cities than rural areas, and the urban built environment will continue to grow accordingly. Not only does increasing urbanisation infringe upon essential local biodiversity as natural areas make way for tower blocks, but urban cities are also at greater risk of flooding because of the introduction of hard, impervious surfaces like, stone. This means less water is able to infiltrate the ground when it rains.

As a solution, French startup Vertuo is implementing a rainwater management strategy with its innovative and modular nature blocks. The startup has created two solutions: Oasis and Urban Bocage. Urban Bocage is a solution that uses modular cubes buried flush with the ground and is designed specifically for spaces where there is no longer direct access to soil. In each block, there is a planter and water retention basin, and many blocks can be fitted together to create a planted hydraulic network that makes use of runoff rain to water the plants within the cubes.

Oasis blocks function much the same way by collecting rainwater for self-irrigating plants, but they also act as a green furniture system and can be fitted with wooden seats to create outdoor rest areas. The Lego-like system is easy to install, does not require civil engineering, and can be deployed in one day.

Both systems aim to make plants autonomous in the city by revaluing rainwater automatically and maintaining good soil moisture all year round, without the need for expensive maintenance and time-consuming groundskeeping.

GREENERY BRINGS MULTIPLE BENEFITS

While it's true that urban greening has a significant cooling effect on cities, this is not the only benefit it brings. Eixverd's green roofs offer opportunities for socialising as well as improved biodiversity. And the presence of greenery also has an important impact on human health and wellbeing. According to one review of academic papers on the topic, a greener environment can improve residents' overall sense of happiness and social satisfaction, while also providing more specific health benefits such as improved sleep and reduced stress. And, as Vertuo's solutions show, greenery has a significant impact on water management, a theme we will explore in more detail in the next section of this report.

WATER SMART CITIES

RECYCLED TYRES MAKE GREEN ROOF PANELS

The panels also cool buildings and reduce carbon emissions

Around one billion tyres reach the end of their life each year, and there are already more than four billion tyres in landfills around the world. But end-of-life tyres are an inexpensive, yet valuable, resource for the circular economy with a variety of potential applications. Dutch tyre recycling consultancy company Ceyes provides businesses with several tyre recycling service options along with green roof cooling panels. Urban buildings use Ceyes' CE Green City stormwater retention panel as the basis for a green roof that reduces heat and noise stress. As well as used tyres, Ceyes incorporates the waste from artificial grass playing fields into the company's green panels. Built in a grid shape with small pockets to hold water, each Green City panel holds around 20 litres of liquid. In hot weather, the water evaporates, providing a cooling effect for the building. In cooler temperatures, the water sits longer and provides irrigation for plants.

EMBRACING CIRCULAR PRINCIPLES

- The recently published Circularity Gap Report 2023 states that the global economy is only 7.2 per cent circular, down from 9.1 per cent in 2018, driven by an increase in use of virgin materials and more materials being used for roads, homes and durable goods. A more circular economy, the report says, can fulfil people's needs with 70 per cent of the materials currently used. It could also help companies with
- Net-Zero goals.
- Circular principles work across industries. For example, The Circular Fashion Partnership connects large suppliers, recyclers and brands in Bangladesh to build the necessary infrastructure to process textile waste and unworn clothes, capturing 1.5 tonnes of waste to date.

FILTERING RAINWATER WITH UPCYCLED BRICKS

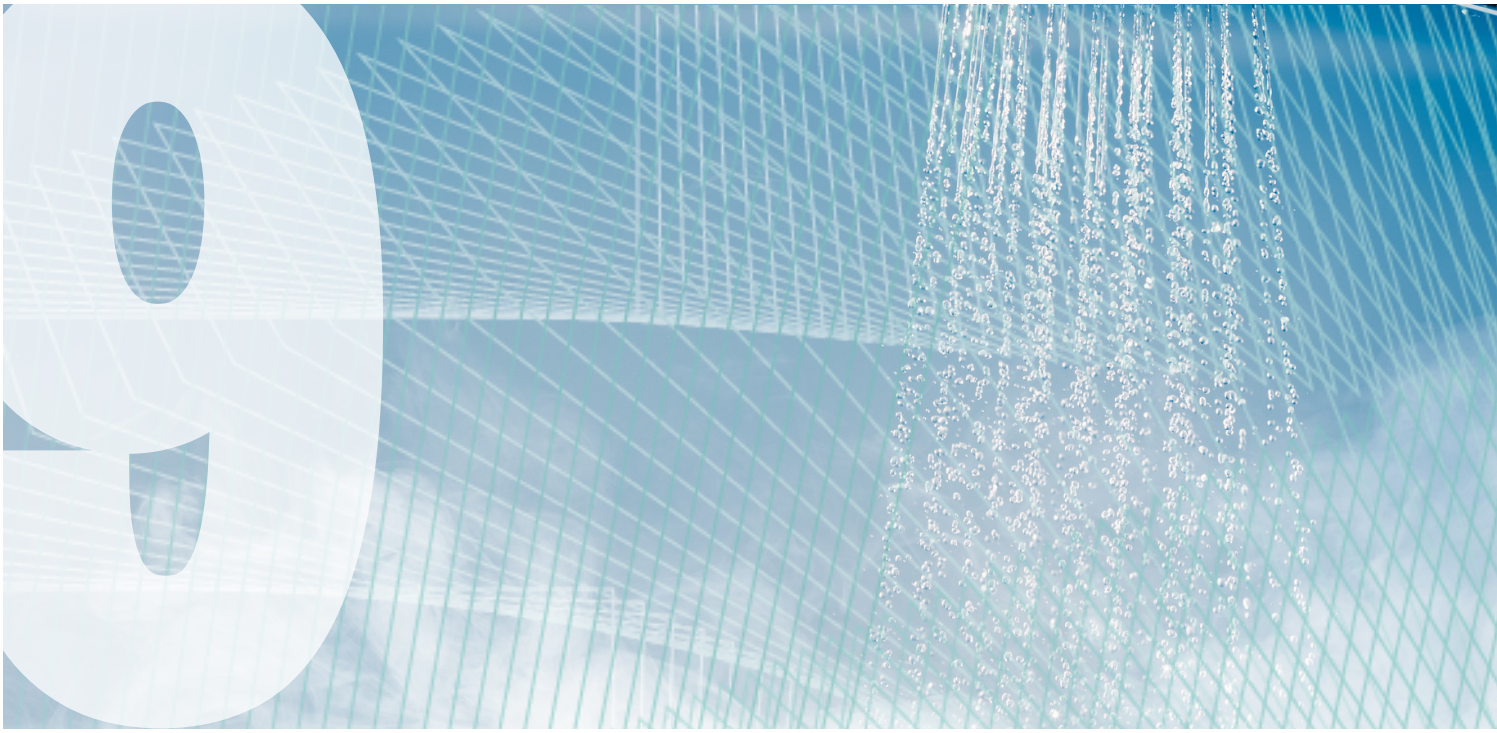
The new material is a direct replacement for concrete

Freshwater is a finite resource, yet pollution is endemic. Concrete-heavy urban areas have no way to absorb stormwater, so pollution-carrying runoff can be extensive. And as extreme weather conditions increase in frequency, so too does the volume of runoff.

US-based AquiPor is a startup reconsidering the problem from the very start – when rain hits the ground. Using patented technologies, the company's paver material is porous enough for water to filter down to the soil, yet dense enough to capture many of the pollutants that otherwise would end up in drainage systems.

AquiPor's new material is a direct replacement for concrete and could be installed in curbs and gutters for immediate impact. Anywhere that water gathers on or runs along the surface is a candidate for replacement with the permeable paver.

As strong or stronger than concrete, the pavers also make use of leftover materials from other industries, reducing the product's carbon footprint. Additionally, AquiPor provides a customisation option for clients seeking different levels of porosity and temperature ranges.



A SMART SHOWER REDUCES BEHAVIOURAL WATER WASTE IN HOTELS

A low-cost device helps hotels reduce bathroom water use and analytics

Globally, water scarcity is a growing problem. According to some estimates, demand for water could exceed supply by 40 per cent as soon as the year 2030. At the same time, a typical 300-room hotel will use nearly 200 gallons per room a day, with the bulk of that coming from the bathroom.

To encourage hotel guests to use less water, startup Shower Stream has developed a device that attaches easily to the shower head and connects to Wi-Fi for collecting water usage, temperature, and pressure data in real time. Guests turn on the shower as usual and, when the water has reached a desired temperature, the device will pause water flow and restart it at the same temperature once the motion sensors detect the guest has entered the shower.

Not only does the device lower water costs for the hotel, but it also provides monthly reporting of energy and water data that helps hotel operators identify potential maintenance issues before they become expensive. The data collected also helps hotels apply for local rebates and incentives that act as additional revenue streams.

According to Shower Stream, the device averages water and energy savings of around $30,000 (around €28,000) per hotel. The technology is also low-cost, at around $5 (around €4.67) per unit and $10 (around €9.34) per month for the advanced analytics. This device is attracting the attention of a number of hotel chains and investors, with Shower Stream already installed in properties belonging to Hyatt Hotels, Global Hotel Group, Extended Stay America, and more.

USING SLUDGE TO MAKE SEWAGE PIPES SELF-HEALING

By preventing sludge from entering landfill, this innovative repair method also reduces CO2 emissions

Sewage pipe maintenance is costly and time-consuming, with most repairs failing after 10 years. Mainland Australia's 400 drinking water treatment plants each spend millions of dollars disposing of sludge in landfill every year. And, for every tonne of that sludge that is delivered to a dump site, more than 29 tonnes of carbon dioxide are released into the atmosphere, presenting a potential hazard to the health of waterways if chemicals leach into the ground.

Finding ways to turn waste products into something useful, in ways that do no further damage to the environment, is becoming increasingly common as innovators and scientists get creative with the waste created by global production processes. One such scientist, Professor Yan Zhuge, a Professor in Structural Engineering at the University of South Australia, has developed a way to put water treatment sludge to use and prevent it from entering landfill.

Combining sludge from wastewater treatment plants with calcium hydroxide powder and encapsulating it all in a pH-sensitive shell creates a material that is highly resistant to microbially induced corrosion and also acts as a healing agent, repairing cracks. Bacteria found in most wastewater produce corrosive acids that eat away at the pipes, but by embedding these microcapsules in concrete sewer pipes, repairs and new piping should remain far stronger and more effective for a longer period.

The new material will also prevent many tonnes of sludge from entering landfill, thus reducing the volume of polluting emissions released by the water treatment industry.

TOURISM AND THE URBAN ENVIRONMENT

Many of the world's iconic tourist destinations are located in cities, so urban heat is an important topic for the travel industry. And the relationship between tourism and the urban environment goes both ways.

One study conducted in Macao found that tourism led to an increase in urban temperatures due to the additional energy consumed and heat released by tourists. At the same time, changing weather patterns are influencing people's choice of holiday destination.

For example, in one UK survey, two-thirds of respondents said their experience of last year's summer heatwaves would influence when and where they go on holiday this year. Some tourist destinations are already adapting.

For example, Venice has developed an online map of drinking fountains to make it easier for tourists to top up their water bottles. But broader efforts to tackle urban heat will be essential to ensure the attractiveness of tourism in the world's hotter regions.

KEY TAKEAWAYS

Recent heatwaves have shown that sustainable urban development is not just about net-zero buildings, it's about adapting the entire urban environment to the new climate reality. And smart urban greening is emerging as a key trend. For example, the C40 Cities Climate Leadership Group – a network of nearly 100 mayors of the world's leading cities – this month announced new support for 22 projects creating green neighbourhoods.

Heat, air pollution, water scarcity, and biodiversity loss are all interlinked in the urban environment. While this adds complexity and raises the stakes when it comes to climate change, it also means that many of the solutions covered in this report tackle several of these issues together. Green infrastructure is therefore a smart investment that can improve residents' lives in multiple ways.

Truly sustainable cities employ the principles of a circular economy, where waste is converted into useful new products. Innovations such as Ceye's recycled tyre roof panels and the use of sludge to create self-healing sewage pipes embody this principle in practice. Meanwhile, initiatives, such as the Circular Cities Declaration – which has signed up cities across Europe – are promoting commitment to the underlying principles of circularity.

INNOVATORS FEATURED

1. BioShade
bioshade.net

2. Greencity Solutions
greencitysolutions.de

3. ECOTEN Urban Comfort
urban-comfort.eu

4. Respyre
gorespyre.com

5. Eixverd
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9. Shower Stream
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10. Self-healing pipes
unisa.edu.au

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