ILLUSTRATION

BUILT ENVIRONMENT

The Built Environment, Disrupted

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Climate change, an ageing workforce, resource scarcity and the COVID-19 pandemic are some disruptions challenging the built environment sector, but new technologies, designs and innovations are turning traditional approaches on its head to help the sector build back stronger. See how the built environment sector is adapting in the face of disruption to build cities that are more sustainable and resilient.

Solar panels suspended over a canal in Gujarat.
Image: Sam Panthaky / Getty Images

Maximising Synergies in Infrastructure – Gujarat, India

Creative placement of solar panels can help cities maximise limited land resources while maximising synergies between water supply and energy generation: The solar panels provide shade, reducing the evaporation of water from the canal and leaving more for nearby residents and crops. The water beneath in turn lowers the temperature of the solar panels, making them more efficient.

Net-positive Sustainable Energy Buildings – Trondheim, Norway

Through the solar panels on its sloped roof, Powerhouse Brattørkaia can generate twice as much energy as it consumes daily. The excess energy is fed into the electrical grid and used by neighbouring buildings, electric buses, cars and boats. As solar panels become more efficient, cities can consider how buildings can go beyond self-sufficiency in sustainable energy to benefitting adjacent energy consumers.

Powerhouse Brattørkaia, the world's northernmost energy-positive building, harvests solar power in challenging conditions.
Image: Ivar Kvaal

Applying Circular Economy Principles – Eindhoven, The Netherlands

Circularity principles in the built environment were demonstrated in the construction and subsequent disassembly of the People's Pavilion for Dutch Design Week 2017. Built with borrowed or recycled materials, such as recycled plastic for the colourful shingles on the cladding, the building's materials were dismantled and returned to the respective suppliers, effectively closing the loop in the value chain. Incorporating such circularity principles upstream in the planning and design of buildings can help cities close the resource loop and reduce waste in the built environment.

The People's Pavilion during Dutch Design Week 2017. *Image: Filip Dujardin*

An aerial view of Sanya Mangrove Park.
Image: Kongjian Yu / Turenscape

Restoring Nature Through Design – Sanya, China

At Sanya Mangrove Park, designers successfully rehabilitated the mangroves previously destroyed by rapid urban development, through an innovative design of “interlocking fingers” that channeled sea tides into the park while mitigating strong storm currents that could damage new mangrove plantings. Aside from high technology, design strategies and nature-based solutions can be equally effective in resolving urban environment challenges such as urban flood risks, while creating public spaces for communities to enjoy.

Robotic Delivery Services – Fairfax, United States of America

Autonomous robots allow for contactless delivery, an increasingly sought-after service to reduce disease transmission risk between people during the COVID-19 pandemic. Robotic delivery may provide a more sustainable and affordable alternative to traditional delivery vehicles in the long run, reducing a city's traffic congestion and vehicular carbon emissions, while enhancing the provision of on-demand delivery services.

A Starship Technologies delivery robot on delivery in George Mason University, Fairfax, Virginia.
Image: Starship Technologies

Automation to Address Labour Constraints – Mie Prefecture, Japan

Robotics and automation are heavily used in a trial project by the Japan Water Agency to construct a dam in Mie Prefecture. Greater automation reduces the strain on an ageing workforce by reducing manpower needs, speeding up repetitive work, taking on dangerous tasks and even working through the night. This potentially boosts overall productivity and makes the construction industry more attractive to younger workers.

A dam in Japan is being built almost exclusively with automation and robots.
Image: Obayashi Corporation

Innovative Construction Materials – Singapore

The Wave, a sports hall in the Nanyang Technological University, is the first large-scale building to be constructed in Southeast Asia using Mass Engineered Timber (MET). MET is from Forest Stewardship Council-certified sources only and also serves as a carbon sink via the carbon sequestered in the wood. Innovative construction materials like MET allow for faster and greener construction as its high strength-to-weight ratio makes it easier to handle, and it has a far smaller environmental footprint than traditional building materials like reinforced concrete or steel.

The Wave sports hall at the Nanyang Technological University can host three full-sized basketball courts or 13 badminton courts. *Image: TODAY*