# A green print for a resilient, sustainable built environment

# Contents

# Introduction

**The continued demand for sustainability and environmental regeneration in an unpredictable world**

## Climate change. Austerity. Resource scarcity. Mass urbanization. Inequality.

Built environment professionals are under constant pressure to streamline processes and manage resources more efficiently. In a post-COVID-19 world, they must protect their workers while adapting assets to changing needs and providing social value. Flexibility and innovation are vital. But building organizational resilience increasingly depends on a commitment to sustainability.

**Forward-thinking professionals who design, build, operate, remediate and decommission assets are already embracing the opportunities that a sustainable approach affords.**

**We are seeing an industry that is maturing quickly, increasingly driven by a social value approach. Thought during design and operation is being given to the well-being of those that will use the space. These requirements draw in change in the whole supply chain.**

**Circular principles are also being applied, with a shift towards more sustainable forms of economic growth, urban life and value creation.**

# What this report contains:

Drawing from insights gathered from BSI and global influencers, we recommend how you can adopt sustainable practices that will help to inspire consumer and business trust in your products and services. Whatever your role in the built environment, we can show how you can drive immediate and long-term change to create a safer, sustainable, and resilient organization. The report includes:

**Renewing a global goal focus:** The importance of a standards-based approach to implementing the United Nations Sustainable Development Goals (UNSDGs) and what defines organizational resilience.

**Collaborate**: Building relationships, advancing shared success: The relationships and technologies built environment professionals can use to enhance people's behaviours, ensure asset longevity, and create stability.

**Maximize:** Getting more from less, for longer: Methods for making better use of resources – saving time, money, and natural capital in the process and exploring the potential of digital technology, automation, and modern construction methods.

**Redesign:** Shaping a circular future: Longer-term, circular goals that represent the industry's future, including forward-thinking strategies and innovative projects that are driving excellence today.

**To achieve these goals, we have provided an actionable checklist outlining the sustainable practices you can implement to improve organizational resilience now and long term.**

"Together, we as professionals can inform, accelerate and support the changes we want to see, for a sustainable, resilient built environment."

Martin Townsend, Global Head of Sustainability and Circular economy, BSI



**Martin Townsend**
Global Head of Sustainability and Circular Economy, **BSI**



**Lara Young**
Group Carbon Manager, Costain Group Plc



**Tim Chapman**
Net Zero Carbon for Infrastructure, Arup



**Landson Li**
Head of Digital Innovation and Principle BIM Engineer Wanda Commercial Management Group

"In today's society, the trust that brands convey is built on competence and ethics. For organizations to survive and thrive, ethical drivers such as integrity, dependability, and purpose drive 76 percent of the trust capital of a company, whilst competence accounts for only 24 percent."

Edleman

# Section 1

## Renewing a global goal focus

Adopting best practice and embedding good governance is widespread in sustainable organizations, from top to bottom. As we'll explore throughout this report, good governance depends on many things, from collaboration to the use of cutting-edge technology. But it begins with guiding principles.

The 17 United Nations Sustainable Development Goals (UN SDGs) provide a shared vision for environmental, social, and economic prosperity. Over 1,000 organizations delivering services for the built environment are already signed up to the UN Global Compact, including BSI.

Organizations in the built environment can adopt this transparent, responsible approach to increase their sustainability and long-term resilience while becoming part of the worldwide force for good. This is particularly important as some organizations may lack clear direction; others may not realize they are already committed to the same objectives.

# The importance of a standards-based approach

**The UN SDGs are invaluable and visionary.**

The challenge remains getting organizations at scale to recognize the benefits of working with sustainability in mind and to begin implementing measures that will lead to significant, transformational change.

The key, therefore, is to help businesses better understand the SDGs, 'translate' these into a business context and introduce impactful measures to align with the SDGs. In other words, to encourage them to take action in a meaningful, consistent manner that supports their individual purpose, strategy, and sustainability experience/progress to date. Standards have a clear role to play in this process.

Standards are indispensable tools that underpin critical decision-making across the board and can make a fundamental difference to operations and workers. International standards form the backbone of effective sustainability strategies, enabling the global construction industry and all who manage assets in the built environment to adopt a common language which drives consistency, and gain a competitive edge. Standards also form the bedrock for benchmarking — allowing organizations to work to the same goals, measure performance against compliance, and continually raise the bar to drive consistency.

# The essentials of organizational resilience

Proactive advocacy for sustainability — including enhanced wellbeing, corporate social responsibility, ethical supply chain management, the prudent use of natural resources and mitigation of environmental degradation — is clearly driving the 21st century global agenda and prompting fitting responses from individuals, organizations and wider society.

Achieving enduring organizational resilience via sustainability has the potential to be a worldwide force for good. Meanwhile, it can also deliver immediate commercial benefits, advance the circular economy and open up new opportunities for longer-term growth.

"Sustainable development provides an enhanced customer experience, which attracts more customers and generates more revenue. Efficiency saves money now, and protects the environment, while upfront investment in sustainable business practices drives long-term ROI."

Landson Li, Head of Digital Innovation and Principle
BIM Engineer, Wanda Commercial Management Group

# By adopting best practice

1. **Operational resilience**

   A resilient organization has a full understanding of how it is run and the environment in which it operates. This includes identifying operational improvements across its products, services, and processes to meet its customers' needs over time, through to how an organization values its people and governs itself. With the next generation of workers joining the industry, it's no longer adequate to treat health, wellbeing, and equality as an afterthought. This new, diverse workforce has high expectations; they demand better worker rights and protection and want an employer that offers them support and development. For a sector suffering from a skills shortage, it's a challenge organizations can no longer ignore or delay. It requires demonstrable evidence that the organization is not complacent and is always challenging itself to improve performance and grow sustainably.

2. **Information resilience**

   In today's world, organizations must be trusted to safeguard sensitive information. A resilient organizations must manage its information (such as intellectual property) throughout its lifecycle, from source to destruction.. Information stored digitally has the potential to help reduce waste, providing consistent and up-to-date financial and project information, access to forecasted models which prepare for all potential outcomes, and visibility on what factors are impacting profitability. Information can also provide near-instant alerts when specific situations occur, so that decisions can be made faster and more accurately. Improved planning, near-instant project updates, predicted project outcomes, better decision making and reduced risk of rework and delays by predicting errors in build are significant in driving sustainable construction and, consequently, increased productivity and profitability. Embracing digitalization also unlocks new efficiencies, from saving paper to reducing air miles, that bring significant environmental benefits.

   With greater use of technologies to support collaboration and information exchange brings to the fore the importance of understanding how to protect information and operations in cyberspace to the fore.  Cyber security threats could be external, internal, or systems and business failures. This requires adopting information security-minded practices that allow stakeholders to gather, store, access, and use information securely and effectively.

### 3.    Supply chain resilience

As supply chain networks increasingly span continents and become more complex, the ability to quantify and mitigate supply chain risks throughout the the procurement and management stages of design, build, operate and decommission is paramount. From the adoption of digital technologies, to greater collaboration in order to improve knowledge and collectively solve problems and ensuring that future training is high-quality, transferable and relevant for a digitalized industry. Organizations need to identify the critical risks to minimize disruption and protect operational, financial, and reputational exposures.

### 4.    Sustainability pays (on time)

One of the best ways to improve your supply chain's resilience is to pay everyone as soon as possible  – particularly given that the global built environment has been among the hardest hit by COVID-19.

In Europe, during the pandemic, 41% of businesses in the real estate and construction sector have accepted longer payments to avoid bankruptcy, compared to an average of 35%. Another study shows that in Australia, 72% of architectural, engineering, and construction subcontractors received late payments on 40% of the invoices they sent out.

Prompt payment is an ethical decision that also makes sound business sense, helping avoid unnecessary delays and procurement challenges that follow when suppliers go bust. Many countries, from the US, to the UK and Japan, have measures to encourage prompt payment and penalize late payment.
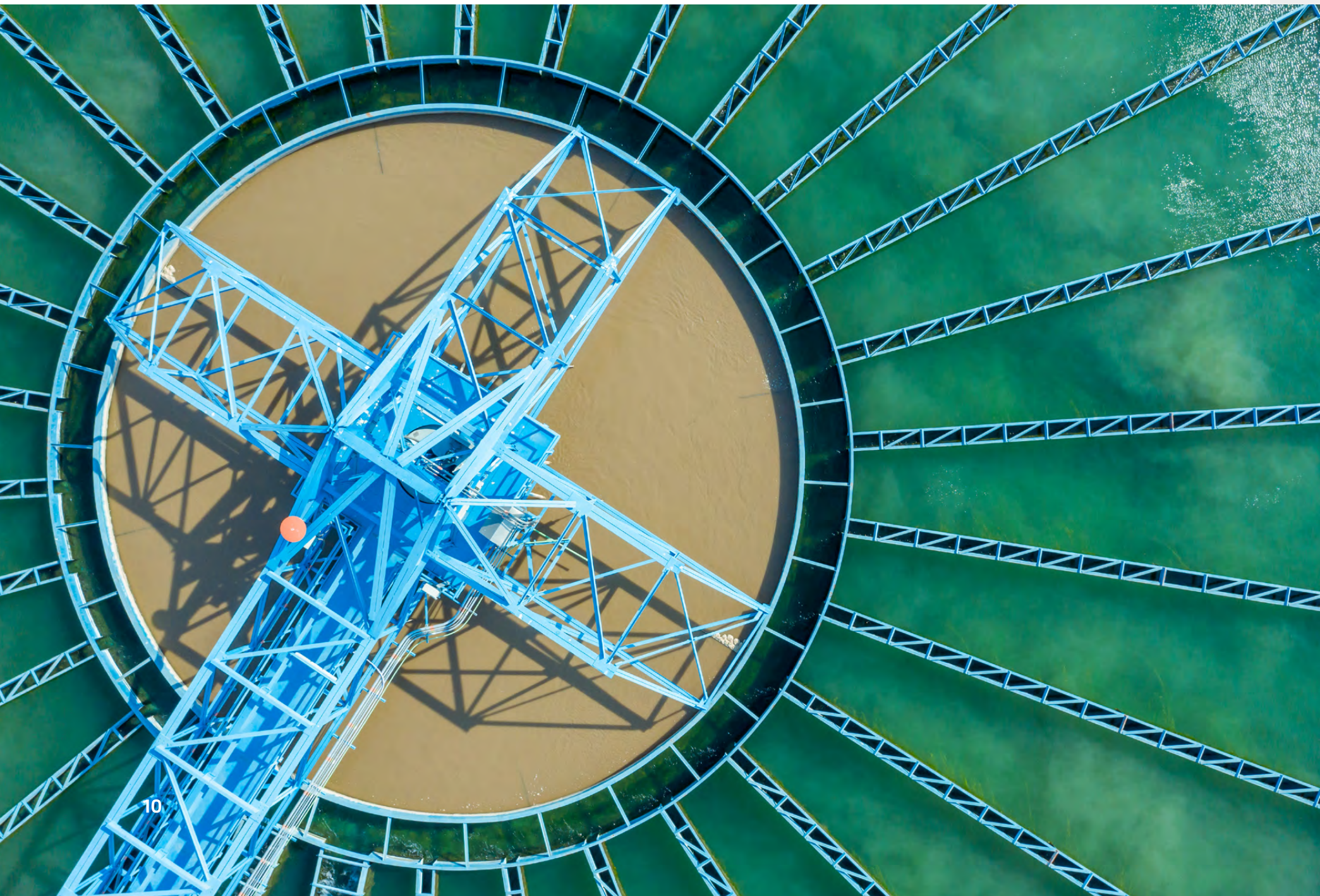
# Section 2

## Collaborate: Building relationships, advancing shared success

**The relationships and technologies that professionals across the built environment can use to enhance people's behaviours, ensure asset longevity, and create stability.**

"We have a shared responsibility to the planet — and each other. You can't operate in silos and call it 'sustainability'. We must work together to assure our collective resilience, using the built environment to create happier, healthier, and more productive communities."

Tim Chapman, Director, Infrastructure Design, Arup



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We're stronger when we work together. This section explains the growing importance of collaboration within organizations and across supply chains in the built environment and beyond. Collaboration underpins organizational resilience and sustainability in multiple ways:

- Ensures consistency — establishing a culture that exemplifies your values and a shared approach that increases process reliability

- Saves money — bringing the right people together from the outset to agree on priorities and identify — and avoid — costly stumbling blocks

- Saves time — completing projects faster when everyone is communicating effectively across the supply chain

- Injects fresh ideas — attracting a diverse workforce that brings new energy, ideas, and skills

- Drives positive legacies — ensuring new skills are retained and reapplied for future projects.

## Working together for well-being

Collaboration is also about assuming collective responsibility for protecting your workforce's Health, safety and wellbeing (HSW) particularly in a post-COVID-19 environment. Organizations with mature HSW programmes have navigated the complexity and speed of this changing landscape. Standards like ISO/PAS 45005 have helped them embed safe working practices during COVID-19 — while the standard ISO 45003 will set the benchmark for psychological health and safety in the workplace.

"It's estimated that the cost of mental health-related illnesses to the construction industry alone is £2.25 billion to £2.86 billion, with £544m of that related directly to absence costs alone."

Workplace Mental Health in the Construction Industry, Laing O'Rourke

# BIM enables effective governance and project coherence

Building Information Modelling (BIM) is perhaps the most powerful collaborative innovation available to the built environment and a key driver of information resilience. BIM enables efficient, consistent, and transparent communication throughout an asset's entire lifecycle. How? By giving the right people shared access to the right information. Without the control, checking, and reviewing that BIM provides, significant issues — and opportunities—may otherwise go unnoticed until construction or even operation. With BIM, the insights collaborators derive frequently improve commercial performance, health, safety, and wellbeing, quality, and sustainability. Unsurprisingly, BIM is a prerequisite for many tenders and an important innovation to create a more skilled and engaged workforce.

BIM is the leading exponent of the virtualization trend sweeping the built environment. It's not alone. WikiHouse, for example, is an open-source design platform that "aims to make it simple for anyone to design, manufacture and assemble beautiful, high-performance homes that are customized to their needs." Virtualization includes everything from switching to digital storage and collaborating via cloud-based systems to exchanging products via digital marketplaces using video conferencing to communicate more effectively and ensure employee safety during COVID-19.



**Discover how CIMIC Group use collaborative digital technologies to enable more efficient methods of design, construction and operation: watch video.**

# Embed collaboration across your organization

The following standards, training and certification solutions provide the foundation for collaborative organizations that nurture the health, safety and wellbeing of their workers and the communities in which they operate:

**Collaborative business relationship management systems. Requirements and framework. ISO 44001**

Explains how to establish and nurture collaborative business relationships

**Occupational health and safety management systems. Requirements with guidance for use. ISO 45001**

The world's first global health and safety management system

**Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM). Information management using building information modelling. ISO 19650**

**Occupational health and safety management. General guidelines for safe working during the COVID-19 pandemic. ISO/PAS 45005**

Helps organizations embed safe working practices during the COVID-19 pandemic

**Occupational health and safety management. Psychological health and safety at work. Guidelines for managing psychosocial risks. ISO 45003**

The new standard for psychological health and safety in the workplace

**Discover our current suite of sustainability standards, training, certification and consultancy solutions here.**

# Driving supply chain resilience

Your organization is only as resilient as its supply chain. Flexible sourcing helps to avoid stalling or project breakdown, something which has been thrust into the spotlight during COVID-19. Responsible sourcing, such as the use of sustainable timber, is an ethical imperative that reduces risk and reassures stakeholders. It also lays the foundations for compliance with future regulations.

"How are we going to coordinate all these people with different expertise, experience, and motivations? By speaking their language. For example, you don't need to make everyone an expert in carbon accounting. What you do need to do is to translate carbon reduction into their world and make it tangible for them. Excite engineers with innovative materials and designs. Engage project managers with the time and cost savings of more efficient methods of construction."

Lara Young, Group Carbon Manager, Costain

# The rise of green finance

Financial markets have a key role in supporting sustainability and positive environmental, social, and corporate governance (ESG) outcomes. In his recent Reith Lectures series, former Bank of England Governor Mark Carney argues for learning lessons from the financial crash and prioritizing human values over financial ones. He champions green finance in driving the sustainability essential to survive and thrive.

Green finance is any structured activity that has been created to ensure a better environmental outcome. It is high on the agenda. The G20 launched The Sustainable Finance Study Group (SFSG) to "identify institutional and market barriers to green finance, and based on country experiences, develop options on how to enhance the ability of the financial system to mobilize private capital for green investment". The Paris Agreement broadens this to include developed countries providing financial assistance to developing countries to mitigate their emissions.

For a great example of collaboration and green finance, look no further than The Coalition for the Energy Efficiency of Buildings (CEEB). Bringing together 200 stakeholders from across the finance, property, and energy sectors, the CEEB aims to "develop the market for financing a net-zero carbon and climate-resilient built environment in the UK", with the wide-scale retrofitting of residential buildings as its first priority. The CEEB has also recently published guidance identifying "specific initiatives where finance and government can bridge investment gaps to drive systemic change." [1]

[1] https://www.bbc.co.uk/programmes/articles/43GjCh72bxWVSqSB84ZDJw0/reith-lectures-2020-how-we-get-what-we-value

# Building a sustainable supply chain

BSI provides standards, tools, training, certification, and consultancy services to help you establish systems to manage risk across the supply chain, make informed choices when selecting suppliers, and achieve supply chain sustainability:

**Sustainable procurement - guidance. ISO 20400**

Sustainable procurement to improve the performance of your supply chain and reduce risk

**Risk management. ISO 31000**

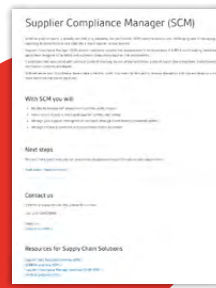The international standard for risk management

**SCREEN country risk intelligence**

Identifies threats to the supply chain in 203 countries

**Verifeye**

Supplier profile verification database

**Supplier Compliance Manager (SCM)**

Make managing and reporting business partner risk data simple

**Framework for responsible sourcing. BES 6001**

Ensure and prove your construction products are responsibly sourced products

**Anti-bribery management system. ISO 37001**

Protect and preserve your organizational integrity with the anti-bribery management system

**BSI Identify**

The unique digital identification service for construction manufacturers

# Creating collaborative communities

Collaboration extends beyond the supply chain. By consulting with local communities and building strong relationships, collaboration delivers projects that meet customers' and users' needs and maximises the positive impact on peoples' lives during construction and operation. The built environment is also empowering communities to live and work together seamlessly. As more people move to cities and population density increases, the incidence of co-living and co-working has surged.

Mixed-use developments are taking inspiration from Roman market squares, where retail, residential, public, and government buildings were intermixed. These are practical approaches to optimize resource use, increase value and maximize asset usage – while providing more living spaces and facilities for people in a smaller footprint. They can also make your organization more robust – in the recent lockdown situation, flexible buildings have found new uses. WSP, for example, has explored how to increase the flexibility of hospitals in a post-COVID-19 world.

# Section 3

## Maximize: Getting more from less, for longer

**How more efficient use of materials, time, and people — and better-quality products — can mean a smaller footprint and big strides forward.**

"The volume of construction waste generated worldwide every year will nearly double to 2.2 billion tons by the year 2025."[2]

Transparency Market Research

**You can deliver commercial success without compromising on the quality, conservation, and sustainability of resources. This section explores how taking greater responsibility — and professional pride — across the supply chain helps organizations achieve resilience and operational success.**

## Fewer resources, smarter choices

Everything begins with responsible sourcing. Drawing from an ethical, flexible, and, where possible, localized catalog of materials anticipates future regulations and drives long-term business efficiency – while building toward a more sustainable urban environment. It's not just using fewer resources, but being more selective and creative with what you use. For example, cement accounts for around 8% of global carbon emissions. Why not explore lower carbon, alkali-activated alternatives? (**See: PAS 8820**.) Organizations can also reduce their reliance on raw materials by using non-toxic, high-grade recycled products, as well as bio-based or biodegradable alternatives. Where nature can't help, advanced products, such as energy-efficient LEDs, can help nature. Sharing platforms and value can overcome underutilization or overcapacity, finding new homes for various items, including construction materials, fit-out products, flooring, furniture, and office equipment.

You can do more than claim that your business is carbon neutral by adopting the internationally applicable **PAS 2060** Specification for the demonstration of carbon neutrality, and going one step further with PAS 2060 verification. You can use it to demonstrate the carbon neutrality of your entire business or to any uniquely identified subject, such as specific activities, products, services, buildings, projects, or events.

**The asymmetrical design of China's tallest building, The Shanghai Tower, saved $58 million in material cost compared to a conventional angular build – while reducing wind loads by 24%.**

"Our buildings reverse climate change; the net carbon contribution of our buildings is substantially negative (-75 $kgCO_2$ per $m^2$ per annum), compared to industry benchmark data of +66 $kgCO_2$ per m2 per annum"

(Source: Independent Arup Report 2017).

**Net Zero Buildings**

# Cutting through carbon complexity

Carbon has never been higher on the agenda. From major public engineering projects like the UK's Thames Tideway Scheme to private-sector-led initiatives such as Lidl's 'carbon negative' distribution center in Finland.
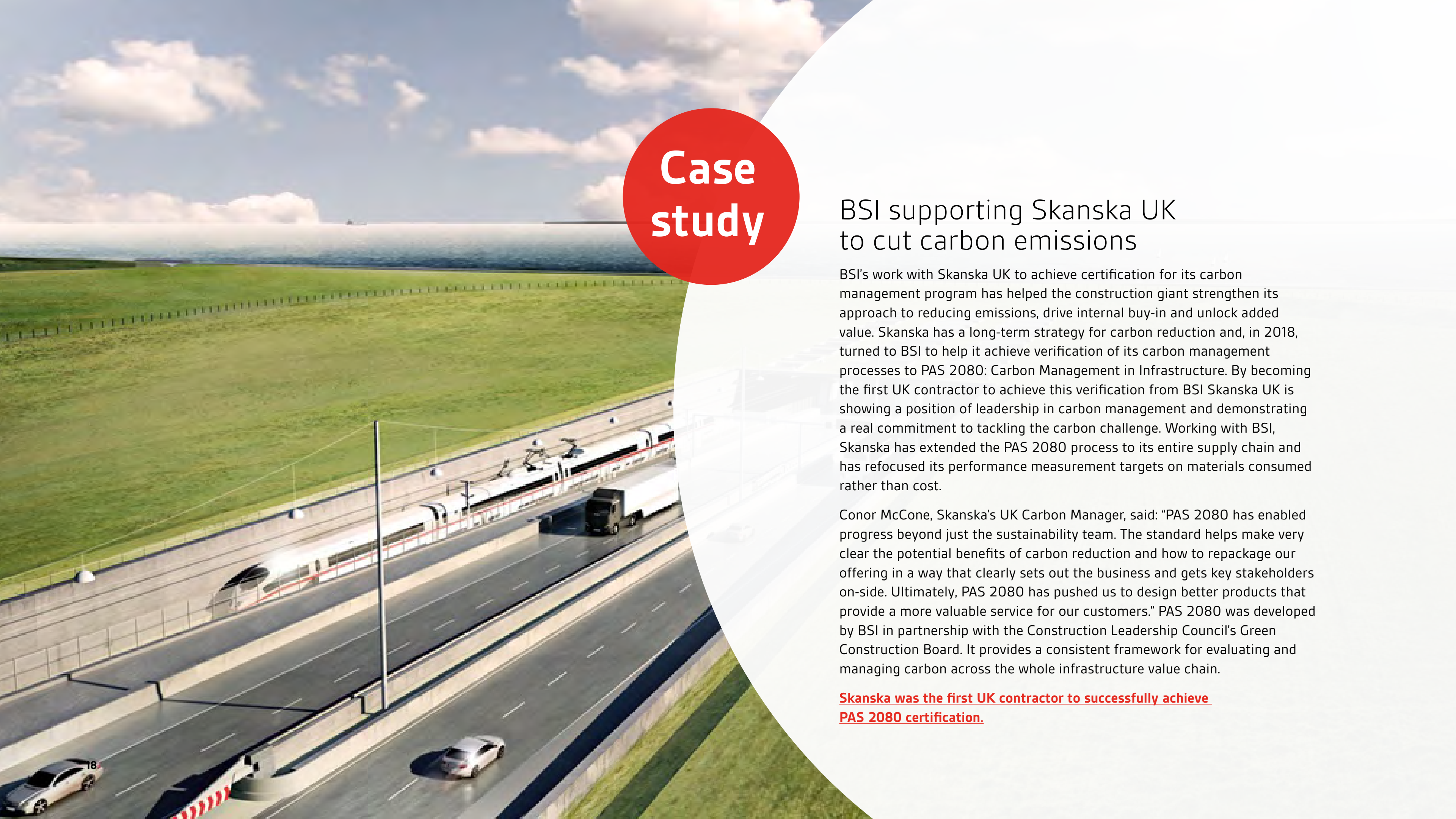
The urgency is unquestionable, and the commitment is clear. However, there remains much debate and confusion, particularly around how to measure and reduce embedded carbon (the carbon released in the manufacturing, production, and transportation of building materials) and operational carbon (the carbon created to heat and power a building).

"Net-zero carbon is a venerable aim for any organization. But it must be approached in good faith and viewed on a planetary level. Can an airport call itself 'net zero' if it ignores the actual flights? It's similar if your first instinct is just to offset carbon only rather than reducing your own emissions too."

Tim Chapman, Director, Infrastructure Design, Arup

Reducing carbon emissions is a complex goal that calls for a systematic approach. PAS 2080 Carbon Management in Infrastructure Verification promotes reduced carbon, reduced cost infrastructure delivery, and a culture of challenge and innovation across the infrastructure value chain.

**Case study**

# BSI supporting Skanska UK to cut carbon emissions

BSI's work with Skanska UK to achieve certification for its carbon management program has helped the construction giant strengthen its approach to reducing emissions, drive internal buy-in and unlock added value. Skanska has a long-term strategy for carbon reduction and, in 2018, turned to BSI to help it achieve verification of its carbon management processes to PAS 2080: Carbon Management in Infrastructure. By becoming the first UK contractor to achieve this verification from BSI Skanska UK is showing a position of leadership in carbon management and demonstrating a real commitment to tackling the carbon challenge. Working with BSI, Skanska has extended the PAS 2080 process to its entire supply chain and has refocused its performance measurement targets on materials consumed rather than cost.

Conor McCone, Skanska's UK Carbon Manager, said: "PAS 2080 has enabled progress beyond just the sustainability team. The standard helps make very clear the potential benefits of carbon reduction and how to repackage our offering in a way that clearly sets out the business and gets key stakeholders on-side. Ultimately, PAS 2080 has pushed us to design better products that provide a more valuable service for our customers." PAS 2080 was developed by BSI in partnership with the Construction Leadership Council's Green Construction Board. It provides a consistent framework for evaluating and managing carbon across the whole infrastructure value chain.

**Skanska was the first UK contractor to successfully achieve PAS 2080 certification.**

"Why just focus on what you do with waste?
Design waste out from the start!"

Lara Young, Group Carbon Manager, Costain



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# Adopting lifecycle assessment

How do you get more from less, for longer? Think long term. Consider the whole lifecycle of an asset and its constituent products and materials. Go beyond minimizing the overall adverse environmental impact of a product and embrace a search for innovation, opportunity and environmental regeneration — across the whole supply chain.

1. **Be prepared to revisit cherished ideas**

   A study might reveal you're merely shifting an environmental burden from one part of the lifecycle to another — rather than removing it. Similarly, opportunities to use a supply chain's cumulative power to realize material or energy cost savings, optimized processes, or even innovation can be hidden under layers of overlapping but limited viewpoints.

2. **Design for longevity**

   Creating assets that endure is not just a point of professional pride — it also opens up possibilities for new revenue opportunities and cost savings. By combining robust construction standards with conscious material selection, you can increase durability, lower maintenance costs, and add more value.

3. **Design waste out**

   Mitigating waste is essential. But it's better to get rid of it entirely. For example, in the UK, Arup initiated a series of collaborative designing out waste (DoW) workshops involving HS2 Ltd team members — including the technical directorate, designers, rail system specialists, environmental consultants, architects, and construction contractors. The workshops identified cost savings of "approximately £30m from reducing the ten most common materials by 1%. Reusing excavated material resulted in cost savings of between £1.2 and £1.8bn." (**See: BS 8895** for best practice on designing for material efficiency.).

**4. Use more efficient processes**

Offsite modular construction saves time and money while improving health and safety (**See: ISO 21723**). Additive manufacturing, known as 3D printing, reduces waste by designing precise components. Drones and automated vehicles offer numerous advantages to speed up construction, from surveys to transporting materials and plans (**See: PAS 1881** for guidance on using autonomous vehicles safely).

**5. Design for maintenance**

Buildings should be designed for efficient maintenance and repairs, dismantling, upgrades, adaptations, renovations, and high-value recycling. Consider the relative lifespans of different materials and anticipate when they are likely to fail. This will help you schedule maintenance and also reaffirm it's rarely worth compromising on material selection. SMART buildings take this concept to the next level. By leveraging IoT devices, asset managers can continuously and automatically assess the performance of properties and direct maintenance where it's most needed.

**6. Design for renewal**

Adaptability is a crucial asset for organizational resilience, particularly during COVID-19. And the same is true for the built environment. Design dynamic buildings that are always ready for retrofits and upgrades. Flexible cores, and demountable and reconfigurable façade systems, will allow structures to be switched quickly, e.g., from commercial to residential.

"With a lifecycle mindset, a building is a blank canvas. Why should an office be an office forever? What's to stop it becoming a hotel or multi-residential development?"

Martin Townsend, Global Head of Sustainability and Circular Economy, BSI

**7.   Embrace environmental regeneration.**

Singapore has been known as a city in a garden ever since the government coined the vision and term "garden city" in 1967. It has pursued policies to expand new green infrastructure and replace any that is lost due to urban development – taking advantage of its tropical environment; and they have been successful. In 2020 46.5% of Singapore's land was covered in green space, with a tree canopy percentage of almost 30%, one of the greenest cities in the world; with over 300 km of green corridors as part of the city state's 'Park Connector Network'.

**8.   Demolition… or disassembly?**

Demolition is often cheaper than disassembly, but it doesn't have to be. The built environment should be seen as a repository of future value, as much as present value. Design assets that make it easier to unlock. As with preemptive maintenance, IoT devices can monitor components and materials and update their Digital Product Passport (DPP) ("A digital representation of a physical product that stores all relevant information, from production and use to recycling"). This information can be recorded in cloud-based lifecycle asset information models, which can be used to govern residual value, redesign existing structures, or reconceive new ones.

Stakeholders can collaborate to determine each product's best use, including the potential environmental and social value. The intention is that at the handover stage, the operator or facilities management company will have complete visibility of all building or infrastructure components and suppliers. This visibility could be explored further if the operator looks at the suppliers of these materials from a sustainable and ethical perspective for long-term maintenance and supply. Disassembly can also support job creation. Brian Milani estimated that 'If deconstruction were fully integrated into the US demolition industry, which takes down about 200,000 buildings annually, the equivalent of 200,000 jobs would be created'.

# Use standards, training and certification solutions to get more from less, for longer



**Framework for responsible sourcing. BES 6001**

Ensure the responsible sourcing of construction products



**Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM). Information management using building information modelling ISO 19650**



**Energy management systems. Requirements with guidance for use. ISO 50001**

Manage the risks surrounding your future energy supply



**Environmental management systems. Requirements with guidance for use. ISO 14001**

Implement the world's most recognized environmental management system



**Sustainability in buildings and civil engineering works. General principles. ISO 15392**

Adopt general principles for sustainability in buildings and civil engineering works
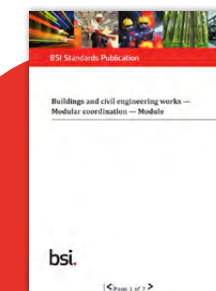


**Environmental management systems. Requirements with guidance for use. ISO 21723**

Understand and apply modular construction



**Assuring the safety of automated vehicle trials and testing. Specification. PAS 1881**

Assure the safety of automated vehicle trials and testing

## bsi. connect

BSI Connect, BSI Connect Plus and BSI Connect Custom — A suite of BSI tools to help record incidents, near misses, risks or non-conformities, and effectively manage audits, from ready-to-use internal audits to configurable solutions designed to manage audits, incidents and compliance.

# Section 4

Redesign: Shaping a circular future

**How a circular approach can benefit your business in the long term.**

"A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems."

Ellen Macarthur Foundation

"Adopting circular economy principles could significantly enhance global construction industry productivity, saving at least US$100bn a year."

World Economic Forum

**You're collaborating effectively and getting more from less, for longer. Now it's time to apply those principles to realize the ultimate goal for all truly sustainable, resilient organizations: the circular economy.**

**The circular economy offers an alternative to the prevailing 'take, make, dispose' economic model. By decoupling economic growth from resource consumption, organizations can pursue commercial advantage while creating employment opportunities and improving our collective relationship with the environment. It's a way of working that shows genuine promise in a post-COVID-19 world and which leading organizations — and several cities — are already adopting in many forms. Below we highlight some circular practices to help you embed sustainable resilience into your organization.**

## Understanding the circular economy

The circular economy is complex, and there's a lot of technical and theoretical information about it already in existence. What's been missing is the practical framework to help organizations simplify and identify what is relevant to them. **BS 8001** is the first practical framework and guidance of its kind for organizations to implement circular economy principles and has been written so that it can be used wherever they are in the world.

# Why sell products when you can sell services?

'Product-as-a-service' breaks linear consumption cycles while creating new revenue streams. Here's how it works: A producer can sell products bundled with additional services, such as maintenance, or retain ownership of the products and lease them on a pay-per-use or pay-for-output basis. The customer may then return the products at the end of their useful lifecycles for repair, reuse, or recycling.

Almost anything can be a product-as-a-service, including electrical appliances, energy generation, carpets, lifts, water systems — even entire buildings. Retaining ownership incentivizes the producer to design the product for longevity and easy repair, minimizing resource usage and maximizing residual value. Users get a better experience, and the producer receives predictable cash flow from lease payments and a long-term relationship with the client.

Product-as-a-service is rising in popularity across the built environment. Philips provides lighting as a service to Amsterdam's Schiphol Airport, instead of charging for maintenance and ownership. Trane provides residential heating on an outcome-based model — if you don't get the desired temperatures at the correct times, you get a refund. Interface offers flooring as a service, using sensors to detect when tiles need replacing automatically.

(The carbon created to heat and power a building).

# The promise of coexistence

More and more of us are living in cities. But we don't have to leave nature behind. Learning from the past while applying modern methods can enable the urban environment to nurture humans and nature alike. Here are some of the principles of coexistence that you can apply to your own projects:

"68% of the world population is projected to live in urban areas by 2050."

The United Nations

1. **Buy local**

   Sourcing locally can offer numerous economic, social and environmental benefits, including reducing transportation costs and carbon emissions while helping to funnel investment towards under-developed areas. Using local raw materials can imbue developments with a sense of place and cohesion that is often lacking in an increasingly globalized world. It can also empower communities. The MASS design group trained village residents in the Democratic Republic of Congo to use local materials for 95% of the Ilima Primary School. Since 2015, 12 buildings have been constructed using MASS's methods. Changing suppliers can be complex — and many things cannot be sourced locally. However, construction companies have more information than ever at their disposal to help develop local sourcing strategies and improve the transparency of their supply chains.

2. **Retain heat and generate energy**

   All assets should be designed to high energy efficiency standards. But why not go further? To achieve net-zero carbon goals, buildings can leverage smart climate control systems to reduce energy consumption. They can also incorporate renewable power generation to become energy self-sufficient — or even net producers of energy. Fortunately, as battery technology and solar power continue to drop in price, this is becoming more financially viable. Indeed, it also brings the possibility of selling surplus energy to balance the grid. As well as creating potential revenue streams, this would help lower our dependence on fossil fuels and improve air quality across the urban environment. Of course, assets should also be retrofitted to improve energy efficiency (**See: PAS 2035/2030** for domestic and forthcoming PAS 2038 for non-domestic buildings).

3. **Don't waste waste**

   There is untapped value in what we throw or flush away. In Austin, USA, the [Re]Verse Pitch Competition challenges participants to pitch a sustainable, commercially viable business or service using waste material from local businesses. In Norway, the city of Oslo converts organic waste into biogas and biofertilizer for use in municipal waste trucks and buses, and farmers. In Vancouver, Canada, the city installed a heat recovery system under the Cambie Street Bridge to transfer heat from sewage and re-circulate it to houses.

"Much progress can be made by integrating 'smart' technology such as responsive heating, ventilation, and air conditioning (HVAC) systems, and smart meters that provide greater transparency on energy consumption and cost. Solutions for retrofitting existing buildings by improving insulation and incorporating smart meters are estimated to reduce energy consumption in Europe by 20-30%."

Cities and the Circular Economy, Ellen MacArthur Foundation

"Applications such as pay-as-you-throw digital tracking can reduce solid waste volume per capita by 10 to 20 percent. Overall, cities can save 25 to 80 liters of water per person each day and reduce our recycled solid waste by 30 to 130 kilograms per person annually."

Smart cities: Digital solutions for a more livable future, McKinsey, 2018

4. **Conserve water**

Carbon may get most of the headlines, but water is critical. About 4 billion people experience severe water scarcity during at least one month of the year. And climate change will only bring more extreme water events. It's time for more countries to pre-empt and avert future crises by looking to those who face perpetual water shortages, such as the Gulf Cooperation Council (GCC). The built environment has an important role to play; Australia, for example, recycles blackwater effluent from buildings for reuse in toilets or to water gardens. Even rainy countries should take note. In the UK, for example, the South East is already classified as water-stressed and is expected to face major water shortages by 2050. **ISO 14046** helps organizations to reduce the environmental impacts of water use and prepare for future risks to supply.

6. **Grow your own**

Urban farming exemplifies the principle of coexistence. In 2019, IKEA debuted 'Gardening Will Save the World' at the Chelsea Flower Show in London, painting a future where people grow food in kitchens and on rooftops with minimal energy consumption and near-zero carbon footprint. The Swedish retailer is now trialling small-scale urban farms, exploring whether they can become self-sufficient in some of the fresh produce used in their IKEA restaurants. The potential benefits of healthier food are significant, from fewer emissions to less waste.

# Smart cities, communities, and the digitized environment

Urbanization, industrialization, and consumption are causing a dangerous imbalance in how we interact with nature and each other. Smart cities apply circular economy principles, from individual components to buildings and transport networks, to improve public health, the economy, and the environment. Organizations who adopt these grounding principles now can expect to see long-term commercial success.

Information and sensors offer a compelling way to reduce consumption and waste. According to McKinsey, "applications such as building-automation systems, dynamic electricity pricing, and some mobility applications could combine to cut emissions by 10 to 15%." [5] Beijing reduced airborne pollutants by around 20% in less than a year by tracking pollution sources and regulating construction and traffic. Smartphone apps can give the public near-instant information on air quality and help individuals take protective measures, which can reduce adverse health effects by 3 to 15%, depending on current pollution levels.

**Smarter shopping malls**

The more you know about how your assets are used, the more effective and efficient you can make them. Wanda Group uses IoT devices and Artificial Intelligence (AI)/ Machine Learning (ML) to improve service and sustainability across its shopping malls portfolio. Anonymized facial recognition technology collects information on when individuals arrive and depart, how they move around sites, and even if they buy anything. This helps Wanda's retail tenants develop better services to attract consumers and enables Wanda to leverage near-instant analysis — in conjunction with weather information and other variables — to preempt and adjust climate control, optimizing resources to deliver a consistent customer experience.

[5] https://www.mckinsey.com/business-functions/operations/our-insights/smart-cities-digital-solutions-for-a-more-livable-future

Urban planners also have the power to facilitate mobility, reduce congestion and improve public health. Cities like London and Moscow prioritize walking and cycling while Helsinki shows the future of multimodal, app-driven transportation. One area that holds significant promise for cleaner, more sustainable cities is the rise of electric vehicles (EVs). Built environment professionals and businesses and energy suppliers should include EV charge points into their plans now or risk time-consuming, expensive retrofits and energy shortages.

**More infrastructure… or innovation?**

Technology holds the promise of reducing the massive infrastructure investments required to expand transport networks. The European train control system, for example, is a digital signalling solution that enables more trains to run safely on the same track. Looking ahead, autonomous vehicles could increase road capacity in cities by up to 40% and by up to 80% on highways.

**BS ISO 37101:2016** The smart cities and communities standards, including ISO 37101 provide guidance and frameworks to create smarter, resilient sustainable communities. These standards reflect the idea that each city has a different vision for a smart, sustainable transformation.

**Seoul's smart city**

In South Korea, around $1.2 billion has been invested to transform Seoul into the capital of 'Big Data'. The Seoul Metropolitan Government has installed over 50,000 IoT sensors throughout its public spaces to create its very own Smart City, with plans to provide all citizens with access to the internet.

Across the city, sensors will collect information about urban problems such as traffic movement, pollution, light intensity, and population to improve citizens' quality of life. Seoul will also provide its citizens with access to services including smart parking sensors, connected street lighting, geolocation citizen safety applications and a text message service that automatically answers citizens' questions through AI.

As Mayor Park Won-Soon said: "We will do our best to make Seoul the most advanced smart city in the world, going beyond the world's best e-government."



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# Your greenprint to sustainable resilience

**Now:** **Immediate actions that can be taken to encourage business survival**

Ensure the health, safety, and well-being of your workforce, celebrate diversity and inclusivity, use governance to ensure project coherence, invest in digital innovation like BIM to achieve consistent, efficient, and visible communication throughout an asset's entire lifetime.

Relevant standards, training, certifications:
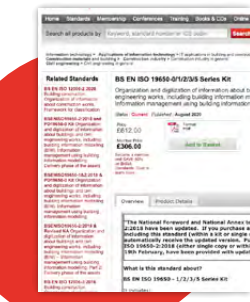
**Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM). Information management using building information modelling**
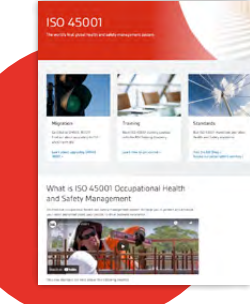
**BIM training and qualifications**

**Environmental management systems. Requirements with guidance for use. ISO 14001**

Implement the world's most recognized environmental management system

**Collaborative relationship management systems above the number. ISO 44001**

Collaborative Business Relationships

**Occupational health and safety management systems. Requirements with guidance for use. ISO 45001**

The world's first global health and safety management system

**Occupational health and safety management. General guidelines for safe working during the COVID-19 pandemic. ISO/PAS 45005**

Safe working practices during the COVID-19 pandemic

**Occupational health and safety management. Psychological health and safety at work. Guidelines for managing psychosocial risks. ISO 45003**

Standard for psychological health and safety in the workplace

**Standards for all construction and building materials**

# Short-term: Plans to stabilize and galvanize a business in the short term

Embrace ethical supply chain, source responsibly, establish supportive supply chain relationships, pay suppliers promptly, manage resources efficiently, leverage green finance.

Relevant standards, training, certifications:

**Sustainable procurement. Guidance. ISO 20400**

Sustainable procurement

**Standards for all construction and building materials**

**BSI Supply chain services and solutions**

**Anti-bribery management systems. Requirements with guidance for use.ISO 37001**

Anti-Bribery Management System

**Framework for responsible sourcing. BES 6001**

Responsible sourcing of construction products certification

**Environmental performance evaluation. Green debt instruments. Part 2. Process for green loans ISO 14030-2**

Environmental performance evaluation, green debt instruments and process for green loans

**BSI Connect Screen**

Integrated platform that employs a risk-based approach to supply chain risk management programmes

**Risk management. Guidelines ISO 31000**

Risk Management
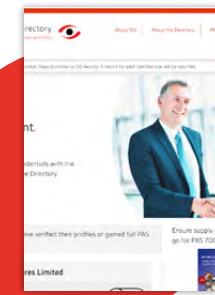
**Verifeye**

Supplier profile verification database

**BSI Connect, BSI Connect Plus and BSI Connect Custom**

A suite of BSI tools to help record incidents, near misses, risks or non-conformities, and effectively manage audits, from ready-to-use internal audits to configurable solutions designed to manage audits, incidents and compliance

# Mid-term: Revised plans for rebuilding within the new environment.

Design waste out, design for maintenance, repair, and reuse, design for social value, explore product-as-a-service, reduce carbon emissions (understand embedded and operational carbon), adopt lifecycle assessment, explore cohabitation, multi-use, and virtualization, incorporate IoT to improve monitoring of assets, design for mobility, introduce more efficient methods of construction, like modular construction and flexible buildings.
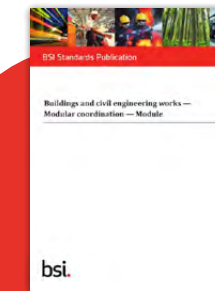
Relevant standards, training, certifications:

**Carbon Management in Infrastructure.**

**PAS 2080**

**Sustainability in buildings and civil engineering works. General principles**

**ISO 15392**

**Buildings and civil engineering works. Modular construction. Module**

**ISO 21723**

**Energy management systems. Requirements with guidance for use.**

**ISO 50001**

**Environmental management systems. Requirements with guidance for use.**

**ISO 14001**

**Standards for all construction and building materials**

**Assuring the safety of automated vehicle trials and testing. Specification**

**PAS 1881**

**Environmental management. Water footprint. Principles, requirements and guidelines**

**ISO 14046**

# Long-term: **Plans for becoming sustainably resilient.**

Consistently achieve low- or zero-carbon objectives, apply circular economy principles holistically, use BIM lifecycle models and IoT to track and monitor projects and reclaim and incorporate high-value recycled products in all projects.

Secure funding from multiple revenue sources, coexistence; create self-sufficient, intelligent buildings that generate and store energy and food, conserve and reuse resources (e.g., water) and use IoT sensors to assist predictive maintenance and enhance HSW, become a vital part of the network and smart cities.

Relevant standards, training, certifications:



**Framework for implementing the principles of the circular economy in organizations. Guide.**

**BS 8001**



**Sustainable development in communities. Management system for sustainable development. Requirements with guidance for use**

**ISO 37101**



Specification for the demonstration of carbon neutrality

**PAS 2060**

# bsi.

To find out more
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