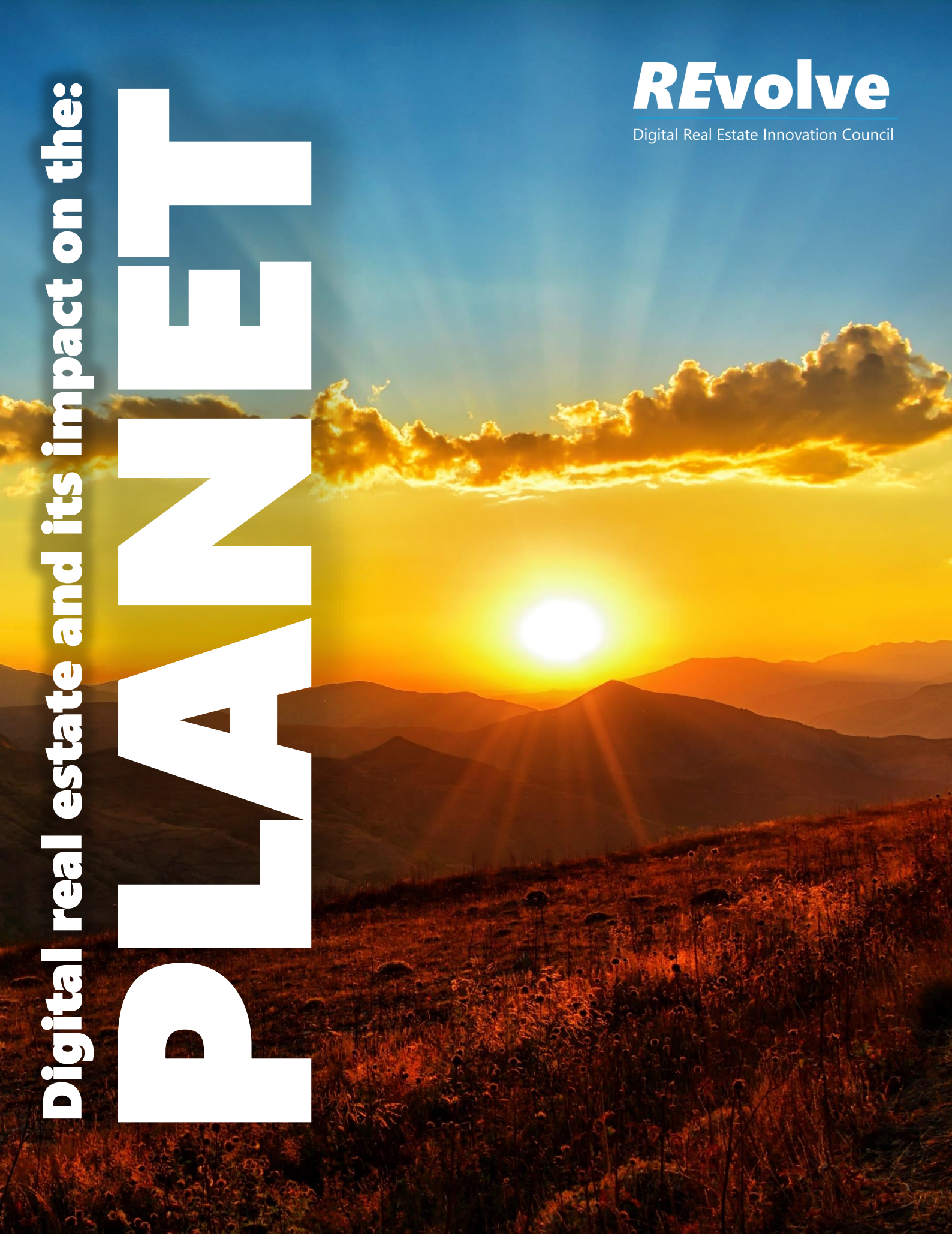
REvolve

Digital Real Estate Innovation Council

Digital real estate and its impact on the:

PLANET



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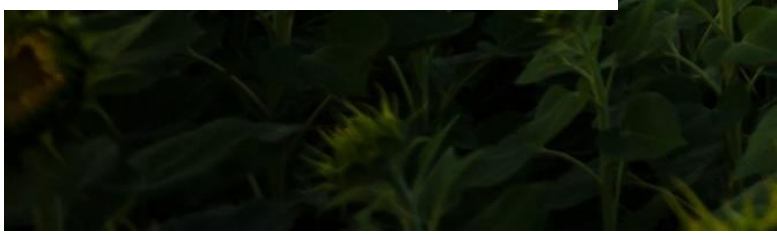
The declining health of our planet is well documented. Arguably the challenges that it faces from the growing human population was first highlighted in a Thomas Malthus essay, 'An Essay on the Principle of Population'[1] published in 1798. Whatever the genesis, the impact that humans have on the natural world has been long recognised and the part that buildings play in this is substantial.

Humanity holds aspirations to protect the environment, illustrated by the legally binding targets set out in the UN Paris Agreement adopted by 196 parties in December 2015. The UK Government has stated its commitment to reaching Net Zero greenhouse gas emissions by 2050. However, with the built environment being responsible for up to 40% of the world's energy consumption and emitting up to 30% of global greenhouse emissions[2], it is inconceivable that we will get close to these targets without the built environment playing an active role.[3]

When we consider the climate crisis today, the primary focus is on carbon emissions and energy usage – the latter in particular brought into focus by rapidly rising energy costs against the backdrop of the war in Ukraine. However, the impact humans have on the planet is much broader than this; we must consider biodiversity, mineral resources, water supply, air pollution and the impact of rising sea levels to mention just a few.

According to the UKGBC, aligning the UK Built Environment with the Paris Agreement will require energy consumption across commercial buildings to fall by 59% by 2050

Source: UKGBC Report



[1] An Essay on the Principle of Population - Wikipedia

[2] UNEP SBCI

[3] Impact of the COVID-19 pandemic on the environment - Wikipedia

EPC certificates are now widely in use. This legislation has imposed rising minimum levels of energy efficiency for the rental and sale of properties which has helped drive awareness and behaviour. However, whilst legislation has helped, the Government has not mandated detailed action with regards to buildings with responsibility broadly being left to the Real Estate sector.

The UK is making progress in this area. A growing number of organisations have dedicated commitments and resources for their own green agenda. Companies are signing up to the UK Green Building Council's (UKGBC) Advancing Net Zero[4] programme and the British Property Federation's (BPF) Net Zero pledge[5]. There is an increased awareness of the need to tackle embodied carbon within construction and we are seeing the growing influence of green leases and green finance on sustainability targets. Tenants are also demanding greener buildings both for environmental and wellbeing reasons.

However, the sector is learning day by day and there is no silver bullet. Everyone knows that change needs to happen, but how this can be achieved remains the sector's greatest challenge.

Technology can play a significant part in understanding and improving the impact of Real Estate on the planet, but technology also comes at a cost and this too needs to be considered in any future approach. There is little point in using technology to lessen the environmental impact of a building if that technology is actually increasing its carbon footprint.

This paper explores the impact that the built environment is having on the planet, the role that technology can play in minimising this and what needs to happen for the sector to accelerate change.

[4] https://www.ukgbc.org/ukgbc-work/advancing-net-zero/

[5] https://bpf.org.uk/net-zero-pledge/

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15%

of species at risk of extinction from Great Britain - *NBN*

40%

of the world's energy consumption, the built environment is responsible for – *UNEP*

30%

of world's greenhouse emissions produced by built environment - *UNEP*

2%

of world's energy used by data centres – *J Witham*

1 in 6

properties in England at risk of flooding from rivers or sea - *EA*

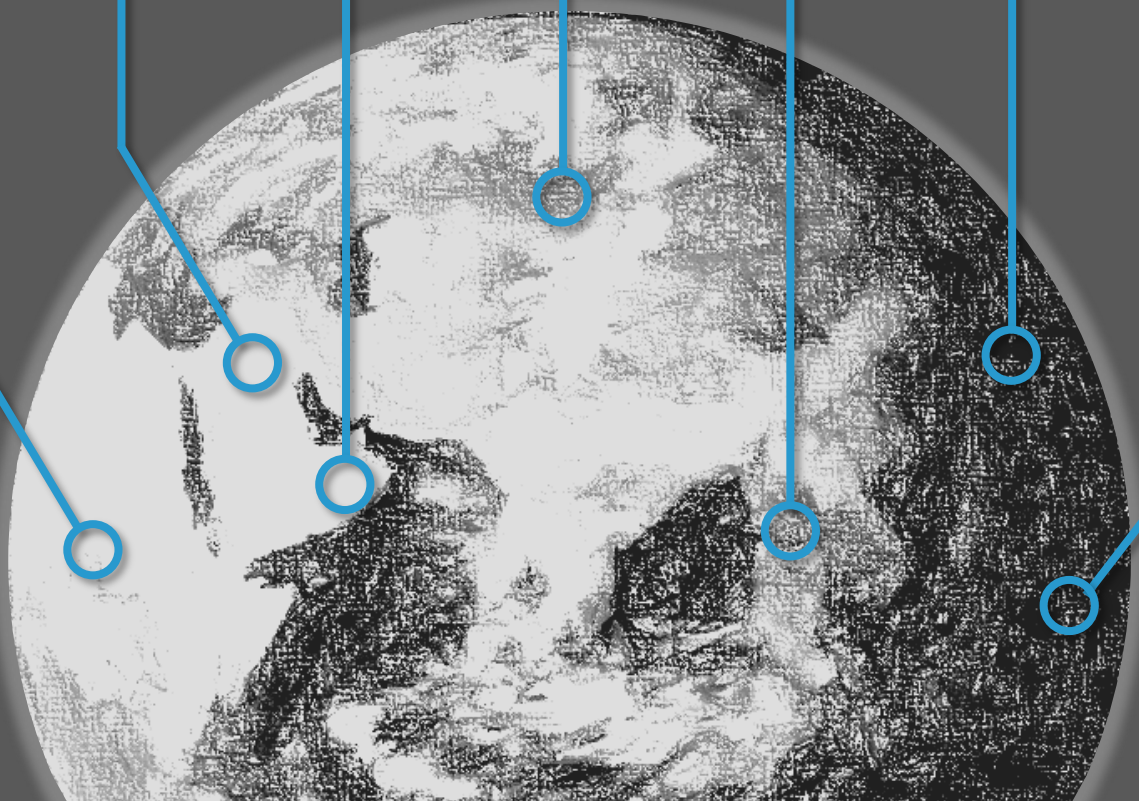
2.5m tonnes

of carbon dioxide produced each year from cement production – *Science Museum*

World's Mineral usage on track to at least

double

for clean energy requirements by 2040 - *IEA*



Section 1 - The role of Technology

Building performance

Technology brings transparency to the performance of a building that was not previously available. At its simplest level, technology, such as smart meters, provide clarity on how much energy a building is using in real time. Whilst a smart meter does not directly reduce energy use, it does change behaviour. Research on some of the first customers who had smart meters installed showed they reduced consumption by 3% for electricity and 2.2% for gas.[6]

Building sensors collect data and provide better insight into how a building is actually being used. Turning lights off in unused spaces, reducing heating or even restricting use in parts of a building, depending on demand, allows property managers to run buildings much more efficiently for both users and the environment.

Once data is established, the next step is to use this data to more proactively manage buildings. Data from around the building can be analysed in real time to automatically adjust the building to maximise efficiency. Elevators can be programmed to predict traffic in order to reduce the overall number of journeys needed. HVAC systems, responsible for up to 70% of an office building's base energy consumption[7], can be run more efficiently. When multiple, different platforms are coordinated, then even more gains can be achieved. Doors, blinds, windows and heating systems can all be aligned to achieve an optimum building performance rather than working in isolation.

In summary – an increased use of data and technology in buildings can help reduce their impact on the planet.

Energy

Modern technology is, in most cases, more efficient than its predecessors. A like for like LED bulb used in place of a traditional bulb uses 75% less energy.[8] However, beyond replacing old devices with more energy efficient versions and using those technologies more efficiently, buildings can leverage technology to better create and manage energy in other ways.

Solar panels on buildings are becoming more common. Solar panels used for residential property typically provide between 250 and 400 watts which means that a 30-panel installation would cover a typical annual energy use.[9] The cost, the appearance and the roof capacity are all barriers to the use of solar panels, however costs are reducing, design is becoming more discrete and panels are becoming more efficient. In addition to this, we are seeing innovative technologies being developed that allow a building to create its own energy. Wind power, floor tiles that generate energy from footsteps or films that convert windows into solar panels are all available.

However, generating energy is only half of the story, this energy also needs to be stored. Increasingly, we are going to need buildings to have some form of energy storage or battery. This would suggest incorporating batteries into the building to store the energy for when it is needed. However, as technology evolves, we are likely to see buildings become considered as energy systems themselves, connecting all of the batteries that we already have available to us. In particular, as we move towards electric cars when substantial batteries will be plugged into most buildings.

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6 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/893124/delivering-smart-system-post-2020-govt-response-consultation.pdf

7 HVAC factsheet - Energy breakdown | energy.gov.au

8 Choose: LED light bulbs vs traditional light bulbs | Energy Outlet

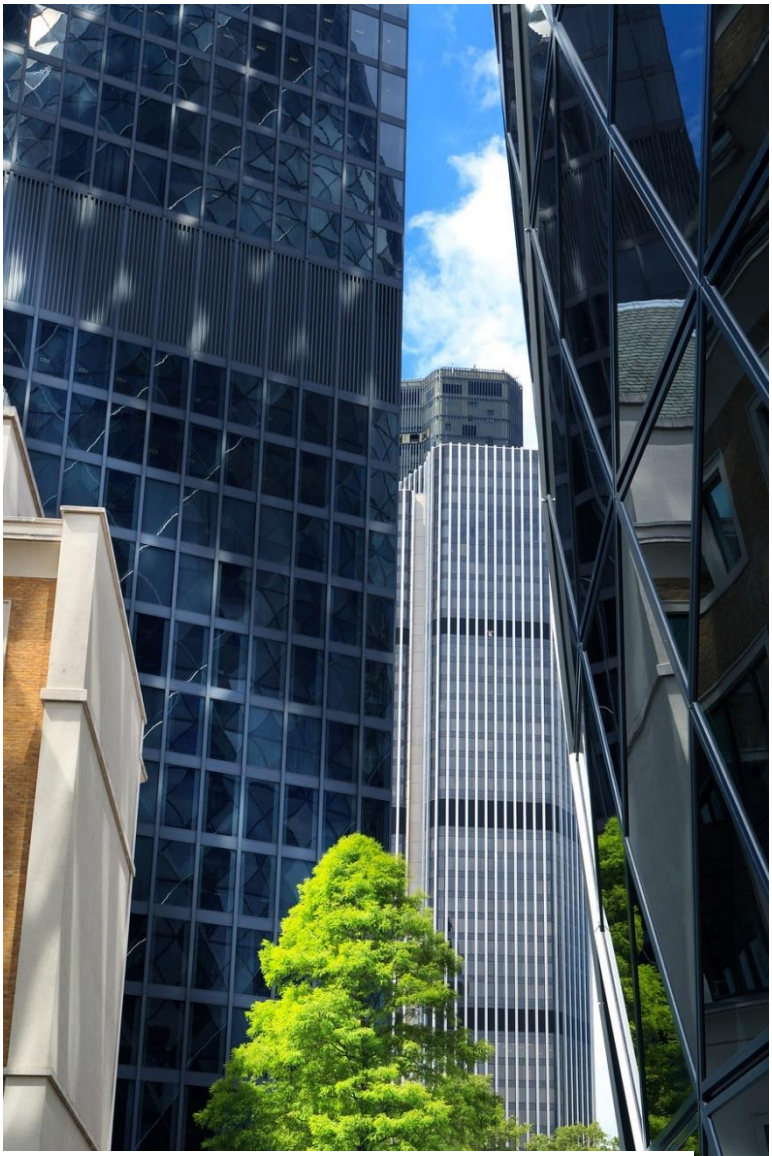
9 How Many Kwh Can A Solar Panel Produce Per Day - SolarProGuide.com

In summary – the future success of a building will in large part be influenced by how it manages energy. Not only improving efficiency, but also through using new technologies to generate, store and manage energy.

The changing role of buildings

Technology is changing the use of buildings which is changing their impact on the environment. The arrival of cloud computing has meant that energy hungry computer rooms are no longer necessary in buildings, instead everything can be stored 'in the cloud'. But that cloud still needs to be housed somewhere and as we have migrated across, so we have seen a growth in data centres around the world. Data centres are incredibly energy hungry and are estimated to use 2% of the world's total energy produced.[10]

We have also seen a significant increase in remote working, particularly accelerated by COVID 19. Technology platforms such as Zoom or Microsoft Teams allow staff to work effectively from different locations therefore reducing the use of transport. 'Planes, trains and automobiles' are responsible for large amounts of greenhouse emissions and energy use, and less commuting means lower carbon emissions. The COVID 19 lockdowns saw 2020 global carbon dioxide emissions fall by an estimated 6.4%, equivalent to 2.3 billion tonnes[11]; people noticed the sky becoming bluer [12] which starkly highlighted the pollution in the air.



"There is no company whose business model won't be profoundly affected by the transition to a Net Zero economy."
Larry Fink, Chairman and CEO, BlackRock

Source: 2021 Letter to CEOs

[10] Data centers are using two percent of the world's energy | TechSpot

[11] https://www.nature.com/articles/d41586-021-00090-3

[12] The Sky is a Deeper Shade of Blue, Thanks to Lockdown (countryliving.com)

There is growing evidence that environmental credentials are being 'priced in' by the property market. In simple terms, green buildings typically attract the best tenants, suffer lower voids, have a lower rate of obsolescence and attract advantageous funding through 'green loans'. However, the lack of a single set of credible and consistently applied metrics to compare assets remains a key challenge, as well as the difficulty in isolating and quantifying a 'green premium' or 'brown discount'. For example, more environmentally friendly buildings are often newer and tick other boxes that investors and occupiers are seeking in their flight to quality.

Whilst how we measure the value of environmental responsibility is still a priority debate for the sector, one thing that is clear is that there is ever-increasing scrutiny of sustainability credentials and a desire for transparency across all stakeholders – from regulators, lenders, investors and shareholders to tenants, building users and the general public. The green premium often gets the most attention, but a point sometimes missed is that today's green premium will be tomorrow's expected norm. We're hearing of buildings, including prime assets, requiring significant capex to get them up to specification – whether to meet regulatory requirements such as minimum EPC ratings or because their target tenant market expects a certain standard. We will increasingly see this as hard adjustments to the valuation, especially if RICS moves to a DCF valuation model following Peter Pereira Gray's report. Financers are also scrutinising businesses' strategies to address this.

Technology clearly plays a key role in enabling resources to be used more sustainably and efficiently, and there are a vast array of use cases throughout the building lifecycle. A valuable part of this is the ability to collect, analyse and respond to data. It helps firms to measure, and therefore manage, key metrics. It also enables important scenario testing to assess the benefit (both environmental and financial) of initiatives, particularly where some measures may look good on paper but have a counterintuitive impact in practice. Digital twins can support this, as well as their role in improving efficiencies in building management.

Data is also critical in enabling landlords and tenants to work together to reduce the environmental impact of buildings, and smart technology is helping to drive and automate more efficient use of resources. Furthermore, the ability to provide evidence to support environmental credentials will become increasingly important as organisations place greater scrutiny on this and standing out from the crowd becomes more competitive.

At face value, therefore, the use of cloud technology and the application of other technologies that allow us to remain productive away from the office means less commuting and more energy efficient buildings. This in turn must mean a reduction in carbon emissions. However, what if trains continue to operate with lower passenger numbers, people work from homes which tend to be less efficient than offices and we move energy use from a building's computer room to a data centre. On the face of it an individual building may appear to be performing better, but is this really reducing Real Estate's impact on the planet or just shifting it elsewhere and making it harder to measure?

One study that combined 39 empirical studies published by IOP Science suggests that ***"economy-wide energy savings are typically modest [from increased remote working enabled by technology], and in many circumstances could be negative or non-existent."***[13]

Another challenge with hybrid working is who takes responsibility for a worker's environmental impact or carbon footprint when they are working remotely. Employers can strive for an energy efficient and productive space for their business, but they can't control what happens in an employee's home. Employers will have to consider the implications of their organisation's carbon footprint more broadly than the office to truly understand its impact on the environment.

Carbon offsetting can be an effective way to manage the carbon impact of buildings and organisations. According to the Climate Change Committee, the global market for voluntary carbon offsets has grown rapidly (up over threefold in 2020-2021 to $2 billion).[14] However, whilst beneficial to the planet, offsetting should be used in parallel with, as opposed to an alternative to improvements in building performance.

In summary – technology is changing the role of buildings. Tasks are undertaken from multiple locations and so building owners and managers need to consider how they work with occupiers to balance managing the performance of an individual building with the wider impact of a person as they go about their tasks. This might include considering implications of buildings more holistically such as transport, working from home or data centres.

The downside of technology

There is little doubt that technology can significantly improve the performance of buildings and help make them more sustainable. However, it is certainly not without challenges. Many technologies require energy to operate so whilst a 'smart building' may run more efficiently, it will also require some additional energy.

Indeed, whilst views vary on the definitions and adoption time frames of technologies such as the Metaverse or Cryptocurrencies, they will inevitably use a growing amount of energy as they embed into society. Today, Bitcoin alone is estimated to use more electricity annually than Argentina or the Netherlands.[15] As technology becomes more widely adopted across all parts of Real Estate, the sector will need to consider the practical implications of their use and the knock-on effect on its green credentials.

[13] A systematic review of the energy and climate impacts of teleworking - IOPscience

[14] https://www.theccc.org.uk/2022/10/13/business-use-of-offsets-risks-delaying-net-zero/

[15] Bitcoin Energy Consumption | 2022 Guide (asktraders.com)

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It is clear that the real estate industry has a critical role in achieving net zero. With the built environment accounting for 40% of global emissions, decarbonising real estate is crucial to achieving the commitments in the Paris Agreement and the Government's net zero commitments in the Climate Change Act 2008. Change is coming, with a range of drivers pushing the sector towards net zero including policy and legislation targeting carbon and energy reductions; increased focus on ESG matters by owners, occupiers and investors; and the proliferation of building standards and benchmarks to measure and compare environmental performance (such as NABERS, REEB and GRESB).

Around 80% of the anticipated commercial building stock in 2050 has already been built, much of the improvements will have to come from retrofitting this existing stock if the real estate sector is to meet net zero by 2050. For these buildings in particular, the ability to achieve net zero is contingent on the availability and quality of environmental data. Environmental data is critical to understanding a building's existing environmental performance and deficiencies as well as the development and monitoring of building improvements. However, access to environmental data can be hindered by the traditional landlord-tenant relationship, with the tenant normally holding the majority of the data relating to "in-use" performance of a building. Without access to this data, it is impossible for building owners to design effective solutions necessary to decarbonise their portfolios.

Green leases are one mechanism that owners and landlords can use to secure access to the critical environmental data needed to transition their assets towards net zero. Green leases encourage transparency and alignment between landlords and occupiers by:

- providing a framework where environmental data of buildings can be collected and shared between the parties;
- creating working groups to facilitate data collection and setting of shared targets; and
- enabling effective measuring of improvements and comparison with baseline data and other performance benchmarks.

Green leases are a tangible step for landlords and tenants to address the current data gap and to support the real estate sector in transitioning to net zero. Whilst real estate will be subject to increasing legal requirements designed to drive a transition to net zero, we expect this will be in parallel with the continued uptake of green leases as landlords and tenants see mutual benefits in working together to improve the environmental performance of their buildings.

Energy consumption is not the only factor here. The world is at risk of running low on crucial natural resources, many of which are used within the production of technologies. For example, some mobile phones can contain up to 42 minerals including some precious metals[16]. Clean energy also comes at a price in terms of mineral usage. According to a report by the International Energy Agency (IEA), solar photovoltaic plants, wind farms and electric vehicles generally require more minerals to build than their fossil fuel-based counterparts; and a typical electric car requires six times the mineral inputs of a conventional car[17].

According to a recent IEA report "Today, the data shows a looming mismatch between the world's strengthened climate ambitions and the availability of critical minerals that are essential to realising those ambitions."[18]

In summary – for all the benefits of technology, its use has the potential to increase energy consumption and deplete natural resources. Decisions about the use of technology in buildings and across the Real Estate sector must consider these wider implications to ensure balanced decisions.

[16] https://www.giffgaff.com/blog/what-minerals-are-in-my-phone/

[17] https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-energy-transitions

[18] https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

There is a great deal of overlap between what is good for people, and what is good for the planet. While the real estate industry has traditionally viewed environmental sustainability and health as two distinct areas, the sector is increasingly seeing this overlay and the various synergies that exist. At the International WELL Building Institute (IWBI), we believe that human health is inextricably linked to the health of our planet. IWBI recognizes these connections through its WELL Building Standard, which offers an integrated framework of strategies that, while focused on supporting the health of individuals within buildings, also enables the wider community and surrounding environment to thrive.

As the world continues to face the rising threat of climate change, we can expect to see many of the harmful consequences, including increased extreme weather events, like floods and wildfires, as well as worsening air quality. These impacts exacerbate chronic illnesses, increase the risk of diseases such as COVID-19 and displace vulnerable communities.

However, confronting climate change represents a major, economy-wide opportunity. As we find ways to tackle rising carbon emissions, we can also improve air quality and other health outcomes, as a result of switching from combustion-engine vehicles to cycling, or further investment into clean, renewable energy. The same is true of the building sector. When a building or organisation adopts a holistic approach to health and well-being through design, operations and policy-based strategies, we often see a ripple effect. Whether it's through walking to work, or selecting the fresh, locally-sourced option in the canteen, people who have access to healthy choices make better decisions for themselves, and the planet.

Looking ahead, we see a real shift in how people consider the factors that impact their health, and what real estate and organisations are doing to attract and retain staff, clients and other stakeholders. More and more people are asking, "What does a healthy space look like for my family? How do I know that I am returning to a healthy work environment? What is my organisation doing to support my well-being?"

There is now a real demand for accountability and transparency to support building occupants in differentiating between organisations that promote health and those that do not. To be true market leaders, organisations will increasingly focus on planetary health and people's health, together.

New materials

The construction of new buildings has come under increased scrutiny since the UK's commitment to achieving Net Zero. To construct a building, materials are needed and two of the most common used are steel and concrete. Both are energy intensive. Cement production generates around 2.5 billion tonnes of carbon dioxide every year which is about 8% of the global total[19]. Construction and demolition waste also accounts for more than a third of all waste generated in the EU.[20]

For buildings to become more sustainable, especially new buildings, the sector will need to invest in new materials. This might include the increased use of renewable materials such as wood or changing to alternatives such as Ferrock[21], an environmentally friendly substitute for cement, created largely from waste materials.

Graphene [22] is a recently discovered structure of carbon that holds incredible properties and could be another option for the future. Graphene is highly electric and heat conductive and ten times stronger than steel meaning that its potential applications are far and wide. Whilst not yet widely commercially available, it is believed that Graphene could have multiple uses including within the production of solar panels, batteries, sensors and electronics.

We are also seeing new building materials that instead of improving the carbon impact of the property when built, brings benefits to the environment whilst the building is in use, such as paint that absorbs pollutants or self-healing concrete.[23]

In summary – the Real Estate sector needs to explore and adopt new materials to improve the sustainability of buildings at both the construction and operational stages of its life.

The Global Graphene Market was valued at USD 725.8 Million in 2021 and is set to surpass USD 2,525.7 Million by 2028.

Source: Yahoo Finance

[19] https://www.sciencemuseum.org.uk/objects-and-stories/everyday-wonders/building-modern-world-concrete-and-our-environment

[20] https://environment.ec.europa.eu/topics/waste-and-recycling/construction-and-demolition-waste_en

[21] https://theconstructor.org/concrete/ferrock-characteristics-applications/565525/

[22] https://en.wikipedia.org/wiki/Graphene

[23] https://en.wikipedia.org/wiki/Self-healing_concrete

Knight Frank

Climate change risks include both the physical risks of climate change, yet also transition risks which include – energy security, cost of energy, supply chain shortages, regulatory risks, reputational risks, and technological risks. Landlords and occupiers are expressing urgency to improve their environmental performance to mitigate these risks across a backdrop of growing regulatory pressures and a drive to reach net zero and decarbonise. Decarbonisation requires a large amount of capital expenditure as gas (fossil-fueled) related plant and pipework must be stripped out and replaced with entirely new electric alternatives. Often these upgrades cannot be placed through the building's service charge due to the nature of the replacements – service charge recoverable expenditure largely covers like-for-like replacements. These decarbonisation projects do eventually pay-back however landlords need to adopt a longer-term view. The need to decarbonise the built environment is more pressing than ever and failure to act in mitigating climate risk will result in stranded assets.

Research has demonstrated that sustainable buildings command higher rents and purchase prices. Knight Frank Research shows this link is stronger in the commercial sector. Within commercial property, particularly offices, BREEAM certified buildings have shown increased rental values of 3-13% and increased sales values of 8-18%. The BREEAM certification methodology considers health, wellbeing, transport, and proximity to amenity as well as energy and carbon, so it's possible that this value uptick is due to a better user experience rather than better environmental performance.

The understanding of decarbonisation varies among investor types, with European institutional investors proving to be the most literate on ESG matters. Institutions are increasingly aligning their assets to voluntary frameworks and benchmarking tools such as the EU Taxonomy and the Carbon Risk Real Estate Monitor (CRREM) which look at environmental performance exclusively. We are seeing clients dispose of assets which fall short of meeting these framework requirements and undertaking rigorous energy and carbon analysis prior to asset acquisitions. The relationship between price and these frameworks continues to be investigated. Data health (availability and quality) is paramount to facilitating these high value transactions. Data is the key to unlocking decarbonisation within the real estate sector and it has been widely stated that digital technology has the potential to cut carbon emissions by 20%. Lack of data quality and data accessibility are presenting real challenges to portfolios managers. Asset managers who have prioritised data health are gaining invaluable insight into how their assets are used which has assisted long-term decarbonisation strategy, supported the newly evolved hybrid working model and defined future capital investment plans. Occupiers and Landlords must collaborate more now than ever to accelerate the transition to a greener cleaner economy; driving the presence of sustainable, net zero buildings.

Section 2 - The role of Data

Standards and ratings

The global interest in sustainability has led to a large number of standards and certifications; there are believed to be around 400 sustainability standards[24] in use throughout the world, cutting across industries. In terms of Real Estate, there are also several green ratings systems that can be applied to buildings to demonstrate their environmental performance credentials.

In the UK, there is a legal requirement for EPC certificates and there are a range of more detailed ratings available. For example, BREEAM, 'a science-based suite of validation and certification systems for the sustainable built environment[25]' or LEED, 'a globally recognised symbol of sustainability achievement which provides a framework for healthy, efficient, carbon and cost-saving green buildings[26]'. Whilst these ratings systems are not mandatory, they help demonstrate sustainability commitments and help tenants compare buildings based on how green they are.

With the increased use of technology, the sector is collecting vast amounts of data, from meter readings of energy usage to air quality information. However, when data sets are compared, the owners of the data are often not comparing like for like, preventing meaningful insights being drawn. For example, an operationally efficient building with low carbon emissions, but a significant amount of embodied carbon, might be considered eco-friendly by some and eco-unfriendly by others. Beyond energy and carbon, if a building is highly efficient, yet destroys local natural eco-systems, this too could be correctly described as having both a positive and negative impact on the environment depending on different perspectives. Agreed and adopted data standards are vital to provide consistency in the definition, collection and measurement of sustainability data.

Some well used property standards have been adapted to incorporate environmental considerations. For example, the International Cost Measurement Standard (ICMS[27]) introduced ICMS 3 in 2021, to assist the sector's efforts to decarbonise the construction sector and provides a globally consistent method for carbon life cycle reporting across construction projects. New sustainability standards are also in the pipeline. The UKGBC has launched a cross-industry initiative to develop the UK's first Net Zero Carbon Buildings Standard[28] providing a methodology for measuring how a building can get to Net Zero. Further detail is expected in 2023.

In summary – Real Estate is making progress with measuring environmental performance, but agreed standards, especially around the use of data, will be vital to harness the positive impact of data and technology.

[24] https://en.wikipedia.org/wiki/Sustainability_standards_and_certification

[25] https://bregroup.com/products/breeam/

[26] https://www.usgbc.org/leed

[27] https://icms-coalition.org/

[28] https://www.nzcbuildings.co.uk/

Data sharing

The data required to manage the environmental performance of a building is often held by different parties, in particular the landlord and the occupier. By bringing this data together, improved insights can be created to help with the sector's journey to Net Zero.

One way to encourage data sharing is the use of green leases. The UK has seen an increase in their use in commercial buildings. They help landlords and occupiers collaborate to achieve the best environmental outcomes for their building. They can also be used to help encourage the sharing of environmental data between both parties. A lease would typically include provisions for sharing all environmental data, such as utilities and waste consumption. However, green leases are only usually relevant when a lease comes up for renewal so improvements will be slow to filter through.

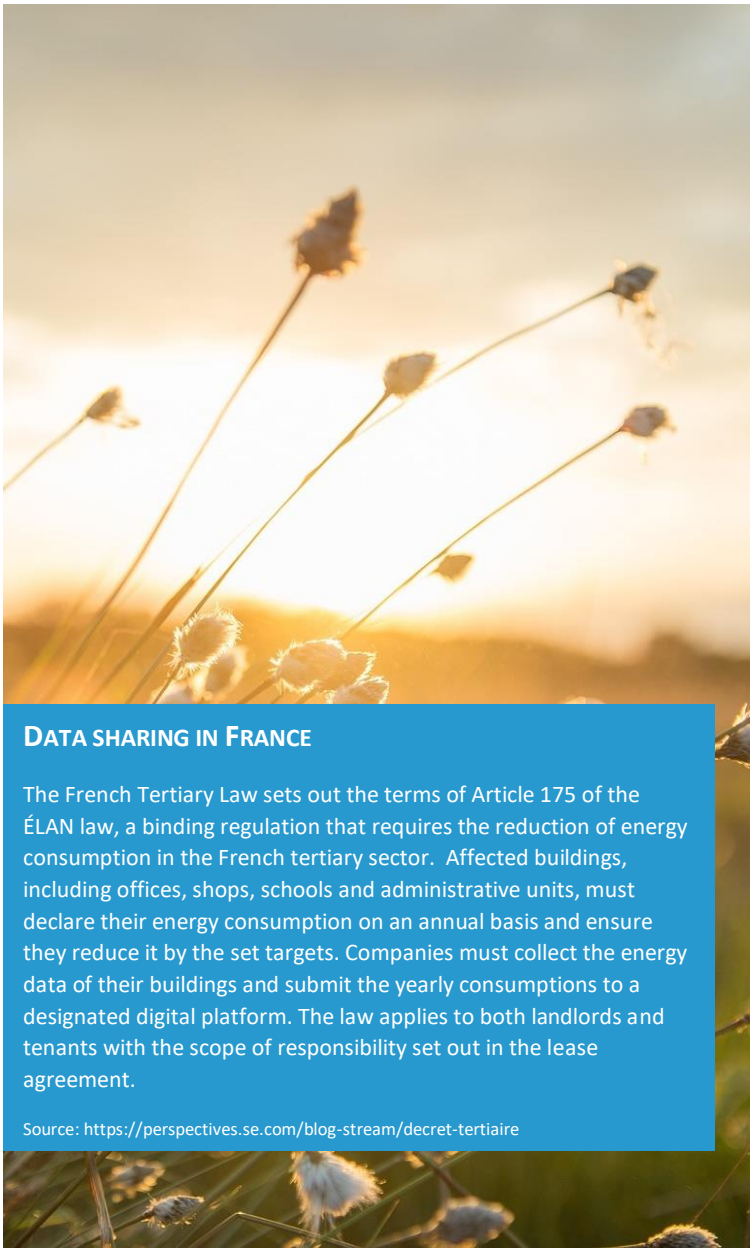
Whilst sustainability insights on individual buildings can be achieved, many of the insights that are possible rely on a high volume of data. However, in relation to the whole market, most organisations only deal with a relatively small number of buildings and therefore data. Increasing the volume of data available in the market for analysis will increase the quality and impact of the insights that can be gained and allow improved benchmarking and reporting of performance. To do this, the sector must become more effective and open to sharing data.

There is a natural tendency to avoid sharing information in the property market; culturally, the data owner wants to hold onto it.

Certainly, there are data sets that will provide competitive advantages and some personal data that should not be shared. However, for Real Estate to improve both its performance and to demonstrate this to a wider audience, data will need to be shared and where better to start than with a building's impact on the planet? In France, the Government has introduced legislation to drive the sharing of energy data between landlord and occupier, an approach that the UK could follow.

Real Estate may be taking significant steps to improve its green credentials, but without market wide data, it cannot accurately measure the impact of this, nor demonstrate it to the outside world.

In summary – the sector must come together to share appropriate data in a secure and trusted manner. This should be at both a building and a market level.



DATA SHARING IN FRANCE

The French Tertiary Law sets out the terms of Article 175 of the ÉLAN law, a binding regulation that requires the reduction of energy consumption in the French tertiary sector. Affected buildings, including offices, shops, schools and administrative units, must declare their energy consumption on an annual basis and ensure they reduce it by the set targets. Companies must collect the energy data of their buildings and submit the yearly consumptions to a designated digital platform. The law applies to both landlords and tenants with the scope of responsibility set out in the lease agreement.

Source: https://perspectives.se.com/blog-stream/decret-tertiaire

esri UK

When we discuss data and the environment within a real estate context, the focus is often on energy usage or air quality information. However, geospatial data also has a role to play here, from modelling flood damage to understanding the impact of environmental impacts.

Predicting flood damage

Geospatial technology is ever increasingly being used to combine information from maps, aerial photographs, satellite images, and digital elevation models (DEM). Input parameters such as flood data, land use, socioeconomic data, and rainfall values are used to estimate flood damage. The insurance industry is leading the use of flood models to predict losses more accurately which are providing more realistic and competitive pricing, learning how insurers have adapted to major catastrophes could help forge new collaborations in the built environment.

Future of environmental impacts

Geospatial information has significantly increased in recent years. Its importance has been magnified by several legislative frameworks, such as the Water Framework. The Geospatial Commission's national land data program for targeting land use supports the inclusion of geographic information and seeks to enhance environmental planning processes, empowering rapid and objective analysis of environmental issues. It also supports the UK in meeting its challenging carbon net zero and biodiversity targets.

Proposed developments

The introduction of geospatial technologies is enabling the industry to create effective management of the entire life cycle of every UK land and property parcel through single platforms. Authoritative data at the land parcel level is now becoming normal. Location data can then support site evaluation including open market value, gross development value, residual land value, 3D visualisation, portfolio management with financial modelling including Environmental Social Governance, Internal Rate of Return, and Net Present Value metrics for responsible investment.

The ethics

If the Real Estate sector accepts that the collection of data is important, then it needs to be clear that the data that it is accumulating is actionable - that something can be done about the insights it brings. But it must also consider the ethics of the data that is collected. One example is when buildings use smart meters to measure their energy consumption. This provides the building occupier with transparency over how much energy is being used and when. However, that data could be analysed and used to accurately infer the behaviours of employees or residents who are using that energy which, in the wrong hands, may be used for nefarious purposes.

According to Kevin Zhang from Royal Holloway, University of London, the use of most appliances within a building can be identified from analysis of the smart meter data alone if the data resolution is sufficient.[29]

This is where moral lines can be crossed and whilst the sharing and analysis of data might lead to improved environmental performance, it may also start to breach an individual's privacy.

Furthermore, as the environmental performance of a building becomes more important to investors and occupiers and the data on it becomes more transparent, we will see this being more systematically considered as part of the valuation process. However, as this occurs, there will be an increasing incentive to only release positive data or even to manipulate it to suggest better performance and hence value. The ethics around the collection and sharing of sustainability data is therefore increasingly likely to come under the spotlight.

In summary – Real Estate must build data ethics into its decisions around the use of data. The well-intentioned use of data to reduce the impact of a building on the planet may bring its own risks that must be considered.

Short feedback loops

For much of the data used in Real Estate today, it takes a long time for insights gained to be available for property owners or employers to take actions or make improvements. Property has grown up with decision timeframes being taken every few years, and the feedback loops used reflect this. Property needs to collect increasingly granular levels of data, but also significantly reduce the times between an event happening and it being identified in the data and action taken on it.

In summary – Real Estate needs to continue its evolution to become more data driven, however data for data's sake is not beneficial. Insights established from data must be actionable and the feedback loops should be as short as possible.

29 https://www.theredfoundation.org/post/preserving-privacy-how-do-you-protect-smart-meter-data

At Legal & General Investment Management (LGIM), our purpose is to create a better future through responsible investing and sustainability. We strive to achieve this through a strong sense of partnership with our clients and partners, working together to achieve positive long-term outcomes. We draw on industry-leading expertise to innovate constantly across public and private assets, index and active strategies. As a responsible investor, we are continuously rising to the challenges of a rapidly changing world.

At LGIM Real Assets (LGIM RA) we believe the transition to net-zero carbon emissions requires a fundamental transformation of the built environment as well as substantial investment, in both retrofitting existing assets and capital spend on social infrastructure. That's no easy task. The UK Green Building Council (UKGBC) estimates that 80% of the buildings that will exist in 2050 have already been built, therefore the cost of retrofitting buildings to align with net zero is an increasingly important differentiator of investment returns.

Implementing responsible investing at the portfolio level

As a result, we believe the users of real estate will increasingly select their spaces based on the environmental and social outcomes that are aligned with key themes around environmental benefits and health and wellbeing. At the portfolio level, we believe those that position towards the highest net-zero standards will see benefits to both occupier demand and investment performance, as well as risk reduction.

We believe there is likely to be an early-mover advantage to positioning real estate portfolios to capture this additional value through the future-proofing of our assets. But it is not only down to us. Occupiers procure their own energy and control all site operations across more than 90% of our portfolios and, therefore, play a central role in how efficiently buildings are used and energy is consumed. This will continue to be one of the biggest challenges for us in strengthening our occupier relationships to drive action on the environment.

Plugging the data gap

Although the industry appears to be moving from once promising net-zero commitments to measurable actions, more needs to be done to remove barriers, in our view. Asset performance data is becoming increasingly important in the buying and selling of properties in understanding risks associated with achieving net-zero. However, getting more detailed information on this can be very difficult. Cross-industry and greater government-level engagement will be required to unlock this and many other data-related challenges. As important as it is, we don't have the luxury of waiting for perfect data. As a result, we need to keep identifying opportunities and solutions, using innovative technology where possible, to develop real world outcomes. One example of how we are working at Legal & General to move forwards is through the installation of new metering systems to gather energy data from our occupiers and making that data easily available for them to view on a new occupier engagement platform.

PLEASE NOTE : This expert view is subject to LGIM disclaimer that may be found on page 33.

Section 3 – Making change happen

Real Estate sector

Whilst huge, the Real Estate sector is also highly fragmented and so there is often a temptation to wait for others to take the lead. With regards to the planet, however, this is not an option. The Real Estate sector must act now to reduce its impact on the environment and must do so collaboratively. The call for collaboration is not new and there are numerous examples of the sector doing so, but it will need to be accelerated and strengthened.

Many individual workstreams exist and some industry initiatives have been established, but more collaboration is required across the whole building lifecycle. Agreeing principles and standards, promoting best practice, funding R&D and in particular sharing data will lead to significant market benefits.

In summary – the Real Estate sector must redouble its efforts around sustainability and its impact on the planet. Whether investment, data sharing or defining best practice - collaboration is key.

Government

Sustainability is a key driver of much of the Government's activity. In the 2021 Spending Review, the Treasury estimated that Net Zero spending would rise to £7.7 billion in 2024-25.[30] However, this just scratches the surface of public expenditure when we consider factors such as the Government's spend on Infrastructure being over £20bn in 2020.[31]

The private sector can be reluctant to invest or act. Against the backdrop of many years of political uncertainty and change in direction, it is easy for individual companies to sit on their hands and wait for someone else to take the lead. Whilst the private sector needs to proactively collaborate, the Government also has at its fingertips substantial levers that it could pull to drive change.

In the UK, Minimum Energy Efficiency Standards (MEES) are making a difference by restricting the rent or sale of buildings that do not meet a minimum energy efficiency level; a level that is gradually increasing until 2030. Whilst this legislation is helping to change behaviour, further legislation may also drive change more rapidly, but whether this will be fast enough remains to be seen.

With Real Estate and sustainability both at the heart of the Government's agenda, the public sector can play a much more active role in accelerating change. This could include supporting sector wide R&D around sustainability, encouraging increased investment through tax policy or mandating change through new legislation. All of which needs to correspond with the adoption of technology to improve the way that buildings are built and managed and crucially, the standardisation and sharing of data.

In summary – the impact that we have on the planet is central to the nation and Government should consider more proactively pulling levers that it has at its disposal to drive change.

Owners and occupiers

Whatever the definition of a 'sustainable' building, it is hard to see how the built environment's Net Zero ambitions can become reality without both building owner and building occupier playing a significant role. Both parties have an interest in working together to make their building more environmentally friendly. A common

[30] https://obr.uk/box/climate-related-measures-in-the-budget-and-spending-review/

[31] https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/articles/developingnewmeasuresofinfrastructureinvestment/may2022

sustainability goal will help with the operation of the building; a well-insulated building may look energy efficient, but if the doors and windows are all left open whilst the heating is on, then the apparent efficiency is not realised.

Sharing data between owners and occupiers is also vital. In most cases, a property's environmental performance would be improved through the proportionate sharing of sustainability data. This will require collaboration, about what data can be collected, what should be shared and about the benefits this could bring.

In summary - owners and occupiers must work together to improve the sustainability of the buildings they own and use.

Bottom up

Whilst individual companies, industry bodies and Government have a responsibility to drive change, the voice of the typical building user is rapidly growing and we are starting to see change being driven from the bottom up. For example, the performance of corporate offices has become vital in the recruitment of graduates who are attracted to companies with strong green credentials. As a result, most large employers are likely to dismiss out of hand any office building that does not have a clear roadmap to Net Zero.

People care about climate change and how their work and lifestyle contribute towards it. They want to live and work in a space that is beneficial to both their own health and the health of the planet and now more than ever can access their own evidence on this. Data about a building's environmental performance is much more readily available to the point where detailed information can now be easily accessed. Should they so desire, it is now easy for users to find the EPC certificate for any building, determine the building's risk from flood or the level of air pollution in the area without ever visiting the building and, portable sensors are allowing individuals to measure factors such as air quality in real time. Employers need to be on the front foot with this to attract and retain staff and as more building specific data becomes available, this is a trend that will only grow.

In summary – building users are becoming more aware of sustainability issues, more able to access data on it and more open to acting on it. Building owners and employers must get on the front foot if they do not want to be left behind.

Valuation

As investors and occupiers make decisions based on the impact of a building on the environment, it follows that this will be reflected in the value of the property – whether in rents or capital value. A recent study by MSCI found that offices with a sustainability rating such as BREEAM, LEED or HQE, command a 25% premium.[32] However, sustainability data is often not systematically built into the valuation process today. This needs to change as it becomes a driving factor of income whether through rents paid or more generally from the ability of the building to generate revenue, for example from generating and selling energy.

In summary – valuation professionals and valuation solution providers must start to demonstrably use data and information to support the valuation process and decisions.

[32] https://www.msci.com/www/quick-take/london-and-paris-offices-green/03510893060

smartspaces.

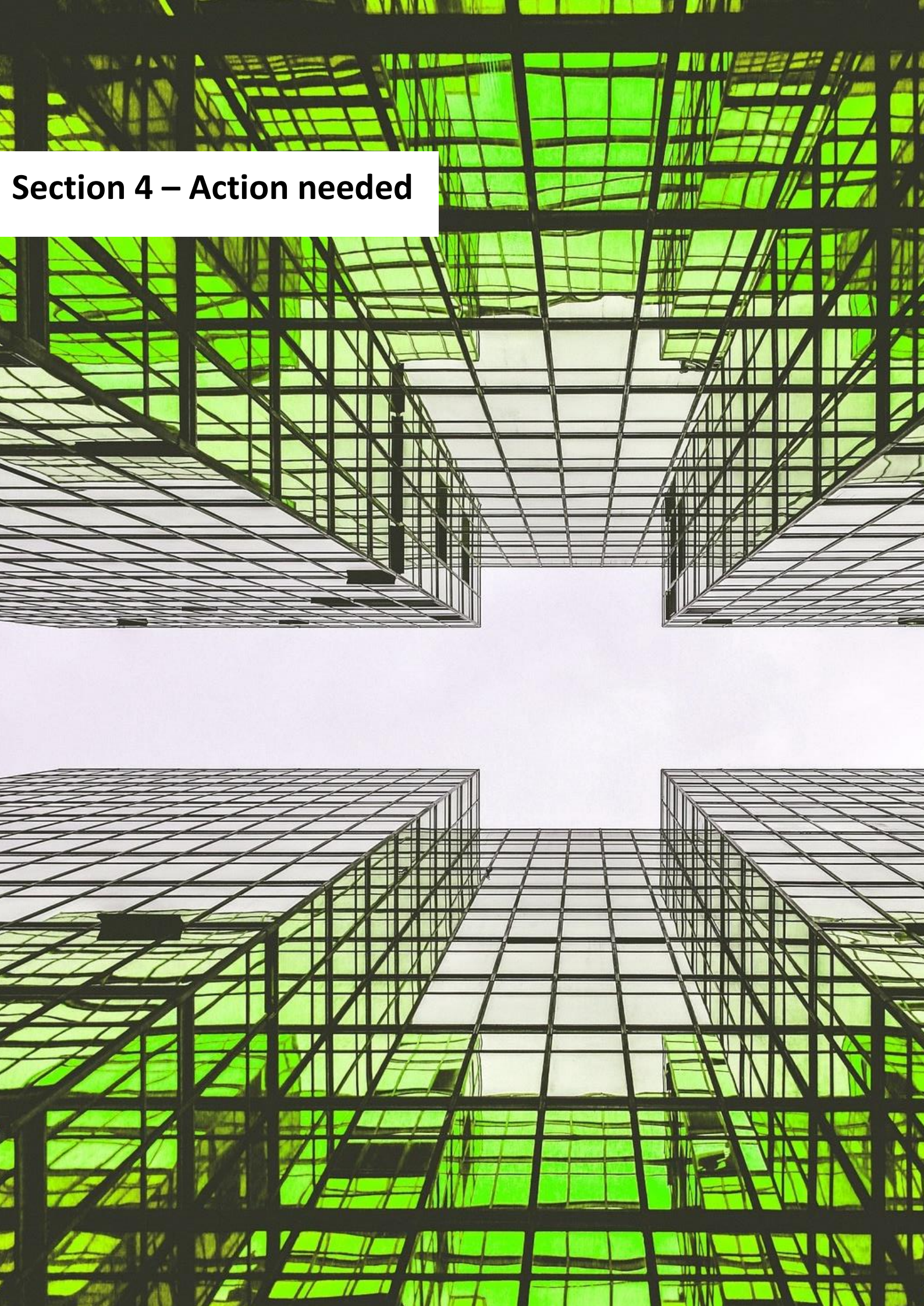
Smart building technology helps unearth the true energy demand of office occupation and services, allowing owners and occupiers to understand the environmental impact of their buildings. This has never been more important than now, in the post-pandemic era. As staff come back to the office and the war for talent spurs a race among employers to deliver the highest-quality space, it is the buildings which showcase the smartest, greenest tech which are in the highest demand.

When considering how smart tech can improve the environmental performance of a building, it is important first to recognise the role smart building platforms are already playing today before identifying the areas in which tech providers can continue to add value in the long term. For example, the recent period of accelerated smart building platform adoption has shown their operational benefits; the emphasis has been placed both on user experience and the average 30% savings in workplace running costs which the platforms enable. Added to this is the idea of intelligent buildings, which can learn from past performance to become ever smarter and greener; one can imagine a world of self-optimising, self-healing buildings delivering demonstrable positive benefits for occupiers and the planet. Today, businesses that are joining up intelligent building software with customer experience apps are seeing the fastest and biggest gains in environmental performance.

Mobile connected buildings are the way forward and are increasingly becoming aligned with landlords' global workspace strategies. New rating standards like NABERS and certifications like SmartScore are helping to focus the industry, but further regulation is needed.

Excitingly, it's not just the newest buildings which are embracing investment in smart building technology; as the cost to retrofitting decreases older assets are also capable of being upgraded to market-leading standards. Old or new, once set-up, the data collected by a smart building platform is key to unlocking hidden savings. Through the integration of digital twins, for example, one can learn exactly how much energy is consumed within an asset and which elements of a property are the most energy-intensive.

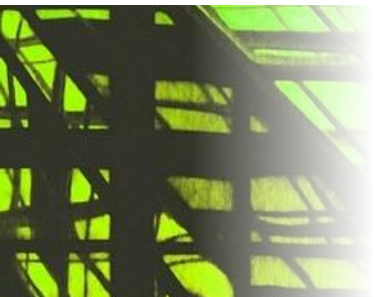
We also know how to correlate these data sets with real-time demand. This is important because smart tech can power down systems when the demand is reduced, while retaining the ability to spin back up as required, rather than running all systems 24/7 on a set timer. When bringing the two data sets together, a building's management system can be optimised to only provide power to spaces in use, and at a level commensurate with actual number of people in the space.



Section 4 – Action needed

Analysis of 42 studies on the 'value of green' showed green certifications yielded a rent premium of 6.0% and a sales premium of 7.6%

Source: Dalton and Fuerst, Cambridge University , 2018



There is a clear recognition and need for the built environment to lessen its impact on the planet. Similarly, there is a huge opportunity for technology to play a part in this journey. Real Estate has taken giant strides in its sustainability ambitions, however there is no silver bullet to achieve Net Zero collectively. For Real Estate to move forward with technology to better meet the needs of the planet, a number of areas require immediate attention.

Leadership

There is no single individual, company or organisation that is able to drive the step change needed in the sector. Multiple organisations are addressing the issue of climate change and their own journey to Net Zero but they are often rowing in a different direction. The sector must continue to come together to lead on this topic in a collaborative manner. This means agreeing and adopting more granular and defined targets, running coordinated actions, joint investment and an agreed approach to data.

Legislation

Leadership and collaboration in the private sector alone are unlikely to drive change fast enough to meet national targets. Government departments must also speak with a consistent voice and apply targeted legislation to drive change. MEES is a good example of this, but legislation needs to be more prescriptive around the wider topic such as the collection and sharing of data and the application of technology to drive real change. This should bring together policy around planning, construction, operation, tax and investment.

Industry

Whilst Government needs to become more proactive in the topic, industry also needs to be much clearer in its own 'ask' to Government and specify exactly what they

need Ministers and legislation to deliver to focus efforts across the sector.

Market wide standards and definitions

Both the private and public sector must collaborate to agree clear standards and definitions, in particular around the collection, storage and sharing of data. Best practice guidelines for application across the whole sector about what to capture, what to share and how to do it would be a beneficial starting point.

Building data

Building specific data should be more widely shared between building stakeholders, in particular, between owners and occupiers. Buildings can operate more effectively for the planet if data is collected by both owner and occupier and therefore industry best practice should be established to identify what data should be shared and how.

Market data

At the heart of change is transparency and the ability to measure performance and identify opportunities for improvement. The platform for this should be robust and standardised data that is shared in a trusted format. The property sector must identify minimum levels of sustainability data that should be shared and a mechanism for this to be shared securely. This must be proportionate and in line with commercial, technological and privacy considerations.

"It's a collective endeavour, it's collective accountability and it may not be too late."

Christine Lagarde, President of ECB, on climate change

Experimentation

The Real Estate Sector must get better at both testing and investing in new technologies and methodologies and sharing these insights across the sector. Individual organisations rarely have the resources to carry out R&D at scale and where they do, this is considered a competitive advantage. Therefore, the sector should join forces to research new technologies which can help achieve its Net Zero targets. This shares costs and increases communication for individual organisations. It may also be matched with government investment which builds on existing initiatives to further accelerate advances and ultimately benefit the nation. Experimentation should consider both the application of existing technology and the development of longer-term new technologies.

Valuation

The value of an eco-friendly building is clear, but how this is systematically considered within the valuation process needs to be more widely considered with clear guidance about what data should be used and how. The availability of standardised, market wide data is key to this.

By addressing the above points and making progress on each one, the UK built environment can play a more effective and positive role in the future of our planet.

About REvolve

ABOUT REVOLVE

REvolve is an Alpha Property Insight initiative. Members of REvolve consist of leading names in the Real Estate sector which come together to provide unique perspectives on a particular topic. Membership of REvolve demonstrates the members' thought leadership and willingness to explore some of the most pressing challenges that the Real Estate sector faces in a collaborative way.

Membership does not imply agreement with or endorsement of all of the views expressed in the report. Members provide their own 'Expert View' on the topic.

Each paper is written by Alpha Property Insight and is based on both extensive desk research and a round table discussion with members.

REVOLVE MEMBERS

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The International WELL Building Institute (IWBI) is a public benefit corporation and the world's leading organization focused on deploying people-first places to advance a global culture of health. IWBI mobilizes its community through the administration of the WELL Building Standard (WELL) and WELL ratings, management of the WELL AP credential, the pursuit of applicable research, the development of educational resources, and advocacy for policies that promote health and well-being everywhere. More information on WELL can be found here.

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Knight Frank

At Knight Frank, we provide innovative property solutions for our clients that add tangible value, across a variety of sectors and services.

By the nature of being a partnership, our decisions are made by and for our people and we focus on long-term outcomes. We know, that to achieve great results, we need to collaborate effectively and communicate clearly.

Our purpose is to work responsibly, in partnership, to enhance people's lives and environments. For our people, this means that we empower everyone to have autonomy in their role and encourage them to think differently about how we can make a positive impact as a firm. For our clients, this means that we provide innovative property solutions to add tangible value, across a variety of sectors and services.

KPMG

KPMG is a leading provider of professional services, with nearly 16,000 partners and staff across the UK and an international network of independent member firms operating in 144 countries and territories. Our real estate professionals draw on experience from a variety of backgrounds, including accounting, tax, advisory, banking, regulation, strategy and corporate finance, to provide informed perspectives and clear solutions throughout the asset and investment lifecycle. Our client focus, commitment to excellence, global mindset and consistent delivery build trusted relationships that are at the core of our business and reputation.

LGIM Real Assets

LGIM is one of Europe's largest institutional asset managers and a major global investor. LGIM manages £1.3 trillion* in assets, working with a range of global clients, including pension schemes, sovereign wealth funds, fund distributors and retail investors. LGIM Real Assets has assets under management of £39 billion* and is one of the largest private markets investment managers in the UK. Investing in both debt and equity and across the risk/return spectrum, LGIM Real Assets actively invests in and manages assets across commercial, operational, and residential property sectors, as well as infrastructure, real estate, corporate and alternative debt. Taking a long-term view to future proof our investments, LGIM Real Assets continues to lead the industry in ESG performance, considering all environmental, social and governance issues at asset level as well as portfolio level.

** at 30 June 2022*

Smart Spaces

Founded in 2010, Smart Spaces now powers over 60 million sq ft of UK real estate, over 20 million sq ft of which is located in London. The London based user-experience and software development team, which has 44 members of staff, has an extensive software development portfolio and delivers a number of smart workplace solutions for industry leading real estate clients including: AXA IM Alts, Aviva, Columbia Threadneedle, GPE, Helical, AshbyCapital, Three Mobile, Workspace Group, Sellar and 22 Bishopsgate – the worlds smartest skyscraper.

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