Pupil®

Understanding real estate DNA: the importance of accurate data in pursuit of net zero

The contribution of global real estate towards climate change has reached a tipping point in the face of growing global demands for action

> 70% of carbon emissions come from cities, 40% from buildings

An estimated 40% of global energy related carbon emissions currently come from buildings, with around 70% emanating from cities. Real estate, therefore, has a central role to play in achieving the aims set out in the Paris Agreement and the UN Sustainable Development Goals.

In response, the wider considerations of ESG in real estate are rapidly expanding, right across the lifecycle of a property. There is an increasing focus from investors and owners on sustainable practices, from construction to acquisitions, operations and asset management. Scrutiny is also extending to third party services and suppliers to ensure that they operate in line with the growing list of ESG considerations.

This places significant onus on decision makers within real estate, who are the most influential in committing to creating a more sustainable industry. They are responsible for the harnessing of new technologies that will be vital for ambitious net zero targets to be achieved.

The scale of the challenge

The use and operations (including improvements) of buildings contribute to 69% of CO2 emissions from the real estate industry[1]. Furthermore, roughly 80% of the buildings that will be in use by 2050[2] have already been built. This is a sobering statistic given their collective lack of energy efficiency, and it is estimated that it will cost USD$1.7 trillion per year between 2020 and 2050 to meet net zero goals. Therefore, developing energy efficient solutions for existing buildings will be key to addressing some of the world's most important environmental, social and economic concerns.

Furthermore, the IEA estimates that until 2060, new floor space equivalent to the size of Paris will be added every five days. This presents two significant challenges for the real estate industry, both ensuring the sustainability of construction practices and operations of new developments as well as addressing the high proportion of existing buildings that currently lack the efficiency to facilitate real change.

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The latter requires action on a transformative scale. In the UK alone, an estimated 26 million homes will require retrofitting by 2050[3]. Roughly 75% of buildings in the European Union are not energy efficient, 85-95% of which will still be in use in 2050[4].

With fabric-first retrofitting bills averaging £30,000 to £40,000 per residential property, data-driven, user-friendly sensor technology that can be tailored to the specific use case will help to drive the connection of homes around the world to smart tech solutions.

In order to know where to start, the accuracy of information, and specifically measurements, related to these buildings requires a drastic overhaul. Accurate data will be the single most important factor underpinning the strategy to retrospectively improve building efficiency through technology.

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The role of technology

Technology in real estate has the capacity to drive substantial efficiency gains, streamline operations and, ultimately, reduce energy usage and carbon emissions. The overarching, collective aim is to be able to accurately plan, track and report carbon emissions and energy usage.

A far greater adoption of sustainable practices is required if net zero commitments are to get back on track, let alone be met within the stipulated time frames. The most effective way to achieve this will be the introduction, and implementation, of technologies developed to drive change.

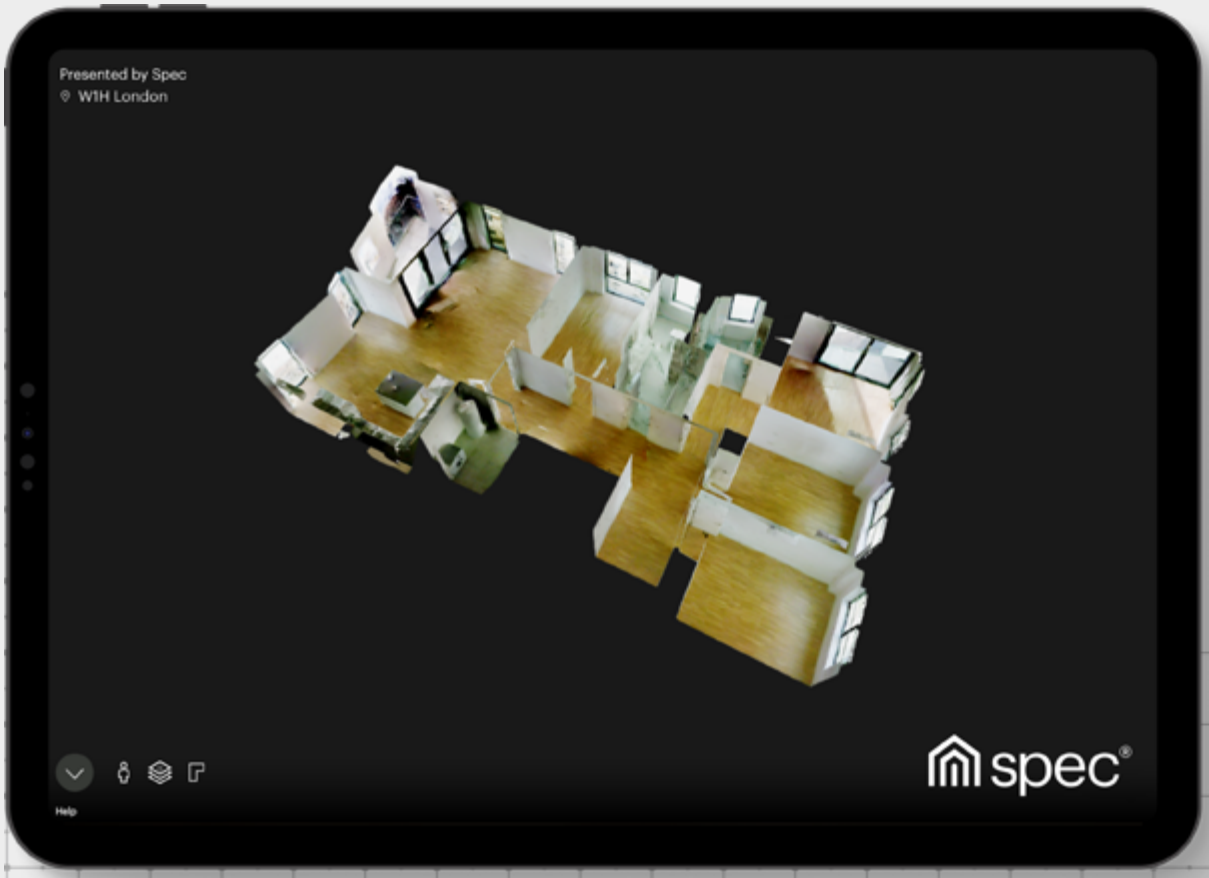
Smart buildings, districts and even cities underpinned by digital twins are being planned and developed in a number of regions, which provides a look into the future of the built environment. This is cause for great optimism and represents the path to ultimate energy efficiency for new developments.

Without embracing technology capable of delivering accurate spatial data, the global real estate industry will not achieve its net zero target

The digital twin model is a critical component in successfully reducing the operational footprint of buildings and even cities. However, its value depends on the use of accurate spatial data, without which incorrect assumptions, inaccurate measurements and ill-informed decisions will negate even the best implementations of smart functions.

For existing buildings, this is further complicated by the inaccuracy, or complete lack, of data that is currently available on them. This requires a significant attitudinal shift across the industry to adopt technology solutions that can accurately document the spaces, enabling smart functions, applications and retrofitting strategies to be as effective as possible in reducing carbon emissions.

Without embracing technology capable of delivering accurate spatial data, the global real estate industry will not achieve its net zero target. In fact, it will fall a long way short, continuing to rely on estimations with significant margin for error that fail to address the root cause of real estate energy inefficiency worldwide.



Applications of Pupil's technology in real estate

Establishing a baseline of accurate data on an existing portfolio of assets will drive improved insights and directly inform actionable strategies. The market consensus[5] is to start with gathering the most accurate data and facts on a building. This enables owners and managers to establish a baseline for the building's energy performance, study alternative scenarios, recommend approaches and outcomes, implement solutions, and track and monitor improvements. Measurement data is at the core of this and is the building block for all setting a baseline. However, as we have detailed in our white paper on the risks and costs of mismeasurement, the basic measurements often cannot be trusted. Furthermore, as we have discovered, measurement standards can vary by market, and there is a wide range of approaches from prescriptive (machine readable) to interpretative. This results in unreliable assessments of baseline conditions and impacts of any improvements.

Pupil has built its technology platform on the basic tenet that accurate and transparent measurement data is at the core of making decisions in real estate, driving better outcomes. Anyone looking to have a material impact in moving towards Net Zero should, therefore, ensure they start with accurate measurement data on their assets.

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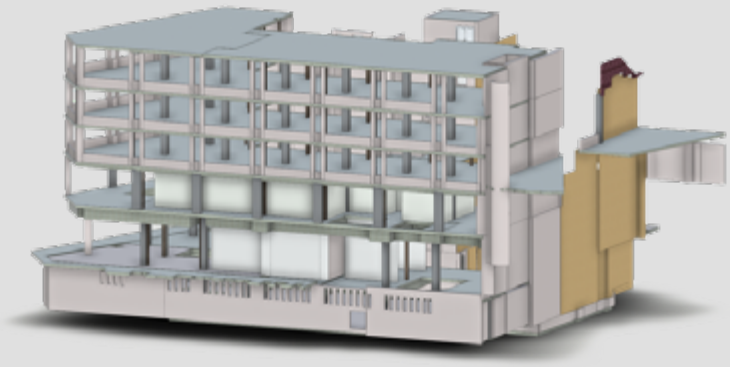
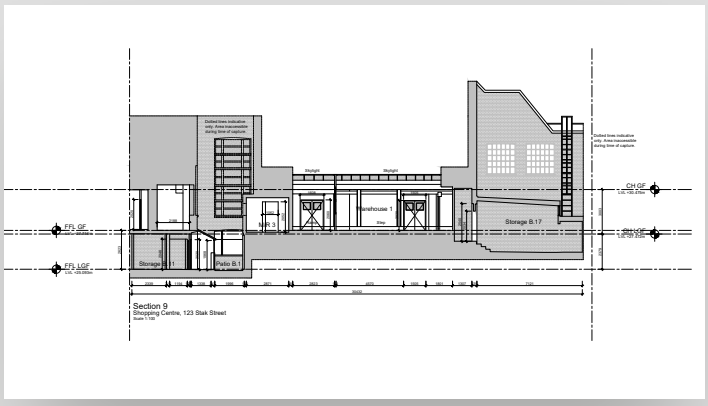




Pupil has further developed its offering to support the needs of the industry by establishing the first of its kind Building Insights team which helps clients improve their understanding of their assets and drive more value from the accurate measurement data captured by Pupil's teams of Digital Surveyors. Considering both 2D and 3D measurements helps to fully understand a building's DNA, the vital starting point in achieving in-depth knowledge of its carbon footprint.

All in all, Pupil's proprietary technology and end-to-end processes have already assisted with improvements and transactions on over $50bn and more than 50m square feet of residential real estate.

Below we outline five use cases of how Pupil's accurate measurements and overall technology can be used to help the industry drive towards Net Zero goals:

Remote due diligence and review

Airflow modelling

Facilities management

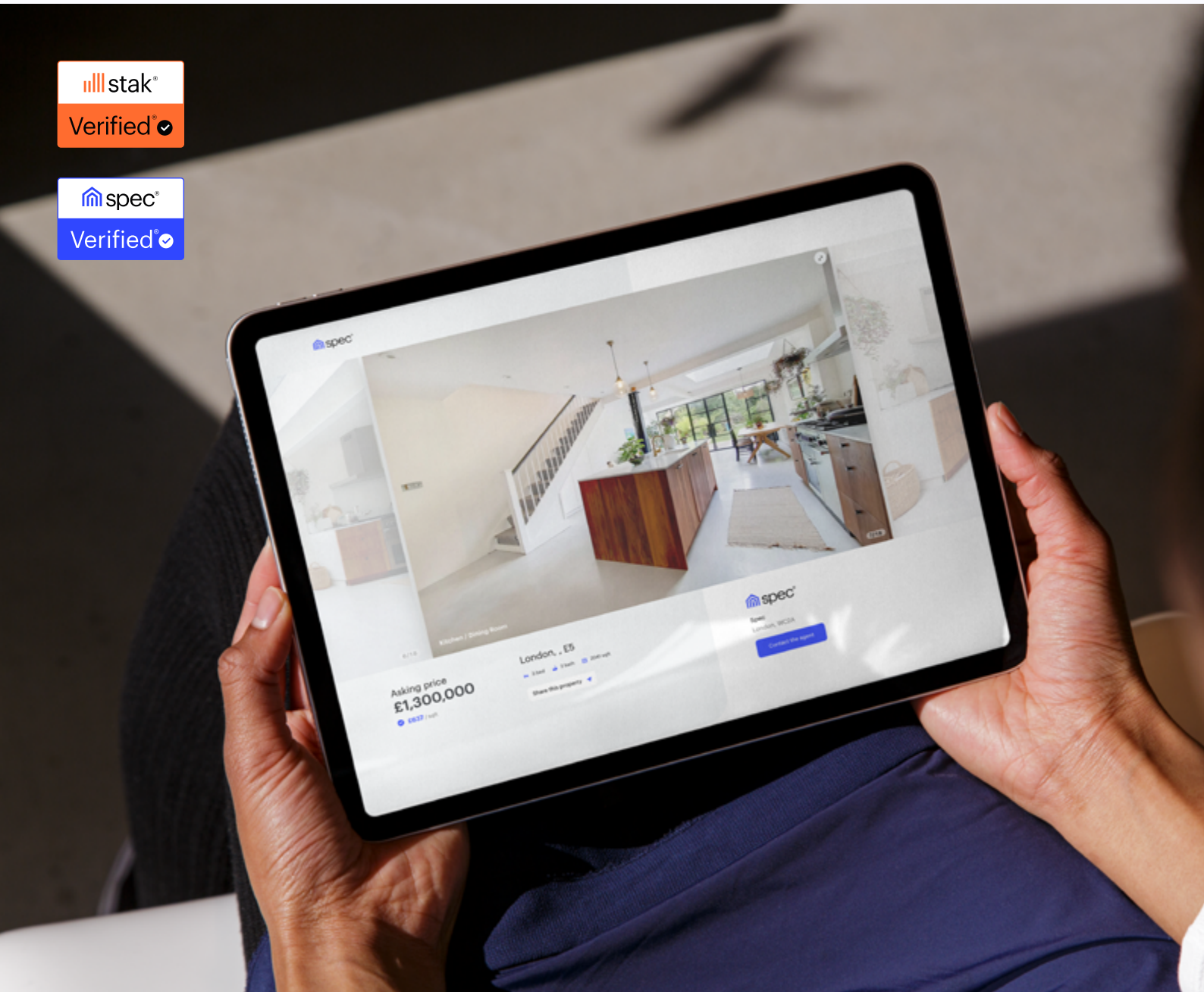
Design and planning of building retrofits

Construction audit

Pupil has already helped to improve over 50m square feet of residential real estate through digital twin technology

Remote due diligence and review

As detailed in our white paper on how virtual viewings drive down carbon emissions, Pupil's technology enables remote viewing of properties to conduct due diligence on an asset. Providing Spec Verified® and Stak Verified® certifications (including measurement accuracy) gives owners, managers, and occupiers the peace of mind to know that they are reviewing accurate information on the building.



Airflow modelling

A direct impact of climate change and COVID-19 are the new requirements on how HVAC systems must be designed to support different space configurations. Filter replacement (Airborne diseases), the increased frequency of extreme weather conditions, and ageing HVAC systems lead to systems performing inefficiently and consuming more. Further, the calculus on retrofit is not straightforward. Do you need the same size system? Do you need multiple systems?

By having accurate 3D spatial measurement data of the assets, owners and operators can:

- Model how the current system performs under future conditions
- Test how different systems and configurations could affect performance and space utilisation, and forecast energy demands

Facilities management

Pupil's scan-To-BIM process delivers digital twins that can be integrated with facilities management platforms through industry standards. The accurate measurements provided can be integrated in applications such as space planning, monitoring, inventory management. The accurate digital twins created can be used to model the building systems and help owners and managers with maintenance forecasting. Coupled with sensors, they can further support predictive maintenance modelling.

Design and planning of building retrofits

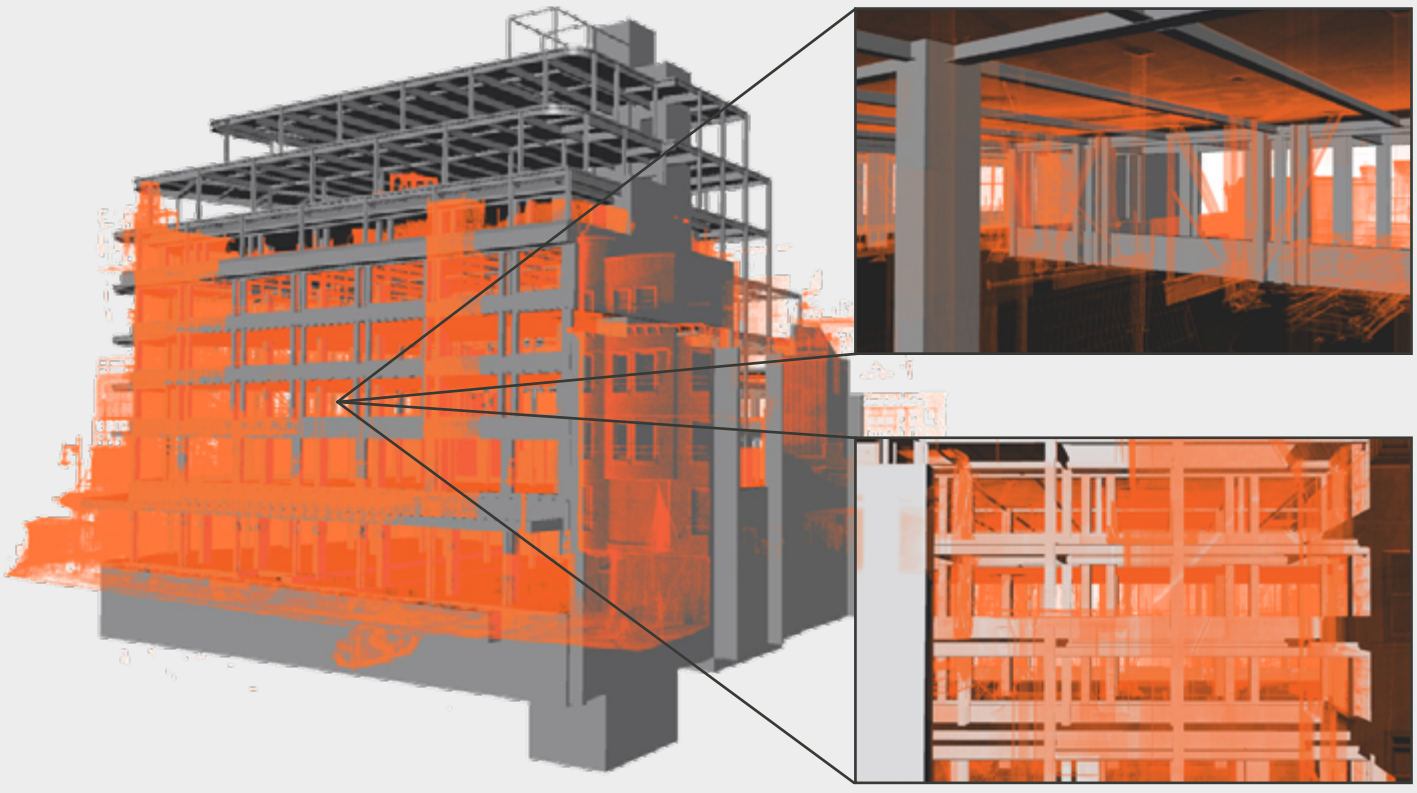
Using the baseline of accurate measurements, Pupil's digital twins can be used to consider different design ideas and study the impact that these have on heating, cooling, space planning and allocation. Further, as we've seen with some clients, the digital twins can help find new cubic feet of space to reuse and repurpose for greater efficiency.

Construction audit

Stak, Pupil's brand for commercial real estate, is working alongside global development firms to increase quality, drive efficiency and reduce cost of construction audits. With rapid milestone-based surveys and turn around of comparisons and analyses,

Stak helps all project stakeholders get actionable data and accurate measurements fast. These audits simulate accurate information for all stakeholders to assess the impact of any variances at an early stage and reduce waste and unnecessary travel to site.

As Pupil continues to scale and serve clients across the globe, we are finding further use cases of how Pupil's accurate measurements and digital twins support the industry.



A government call-to-action

The Net Zero imperative is clear: Governments worldwide are implementing goals and developing strategies to support owners and operators in the real estate industry to reduce their carbon footprint. Beyond implementing these goals, governments must ensure a baseline of highly accurate data on buildings to demonstrate impact and enable the industry to move towards Net Zero. Falling short of this could lead to Net Zero initiatives being perceived as nothing more than greenwashing and empty promises.

New York City, as an example, has introduced the first of its kind Local Law 97 (LL97) as an outcome of the previous mayor's goal to achieve Net Zero by 2050. The law introduces caps and fines on carbon emissions for buildings over 25,000 sqft[6] starting in 2024. The cap is based on the gross square footage of the building and looks for gradual improvements in emissions over time. It leaves the specific decisions on how to reach those goals to the owners. New York City has very directly linked the targets based on the measurement of the buildings and spaces, validating how critical measurement, and therefore measurement accuracy, is to driving Net Zero goals.

New York City is not alone, Boston has taken a similar approach and developed BERDO which includes buildings as small as 20,000 sqft, and sets a far more granular target, making the need for accurate measurement that much more important. Washington DC has built its model on the US EPA's Energy Star model for buildings which also includes the gross floor area.

In the UK, on the other hand, the EPC model is used to assess the energy performance of buildings. Pupil's White Paper and many others, including the UK Government[7] have identified issues with the EPC model. The UK Government's Net Zero strategies for the building industry rely on EPCs and have already been criticised for being unachievable and lacking actionable steps[8].

Seeing the contrast between specific and actionable policies that consider measurement and those that don't, we can only come to the conclusion that the stage is set: measurement accuracy will be the basis on which buildings are able to achieve Net Zero.

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To achieve Net Zero goals will require all parties to work together

Governments can set the stage, and some already have[9], by creating incentives for the public, asset owners, and other participants in the industry to take action.

However, there is an imperative for governments to take further action by tying these incentives to property taxes and ensuring that accurate measurement is being used. In many geographies, size of property is already one of the factors in determining property tax; ensuring that this information is accurate and consistently captured will lead to accurate carbon emission baselines, clearer assessment of impact, and consequently more measurable improvements on impact to Net Zero.

References

[1] https://www.mckinsey.com/industries/engineering-construction-and-building-materials/our-insights/call-for-action-seizing-the-decarbonization-opportunity-in-construction

[2] https://www.mckinsey.com/business-functions/sustainability/our-insights/sectors-are-unevenly-exposed-in-the-net-zero-transition

[3] 'Scaling Up Retrofit 2050,' The Institution of Energy and Technology and Nottingham Trent University, 2020

[4] Climate-neutral building stock by 2050: A highly ambitious goal, Deutsche Bank, March 2021

[5] https://www.us.jll.com/en/solutions/sustainability-services/strategies
https://www.weforum.org/agenda/2021/11/10-green-building-principles-real-estate-net-zero/
https://www.cushmanwakefield.com/en/insights/the-edge/all-about-carbon

[6] NYC LL97 details: 1 - Buildings that exceed 25,000 gross square feet; 2 - Two or more buildings on the same tax lot that together exceed 50,000 square feet; 3 - Two or more buildings are owned by a condo association that are governed by the same board of managers and that together exceed 50,000 square feet.

[7] https://www.building.co.uk/comment/epcs-should-be-updated-not-ditched/5111190.article
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/922653/EPC_Summary_of_Responses.pdf
https://www.gov.uk/government/publications/improving-energy-performance-certificates-action-plan-progress-report/improving-energy-performance-certificates-action-plan-progress-report
https://ww3.rics.org/uk/en/journals/property-journal/why-an-updated-epc-is-vital-to-hitting-net-zero.html

[8] https://www.theguardian.com/environment/2022/jul/18/court-orders-uk-government-to-explain-how-net-zero-policies-will-reach-targets

[9] US & UK Net Zero goals

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