Guest editorial

Real estate and decarbonization

This special of the *Journal of European Real Estate Research* on decarbonization and real estate investment is a specific deliverable of the project, Carbon Risk Real Estate Monitor (CRREM) funded by the European Commission under the Horizon 2020 framework programme. Central to CRREM is the reduction of carbon-risk factors associated with premature obsolescence and potential depreciation due to changing market expectations and legal regulations. CRREM aims at supporting the industry to tackle these risks and foster investments in energy efficiency, as the alternative is that many properties become "stranded" assets, fail to meet future energy efficiency standards and embark on energy upgrades that will not be financially viable. One of the biggest challenges in the reduction of GHG emissions is the poor energy efficiency of existing buildings and low refurbishment rates of property in virtually all member states of the European Union. Indeed, the reduction of the EU carbon footprint requires a significant increase of energetic retrofits in the existing property stock.

The CRREM research consortium consists of five well-known institutions, all with years of experience in the field of carbon research, from various European countries: IIÖ Institute for Real Estate Economics (Austria), University of Alicante (Spain), Ulster University (UK), GRESB (the Netherlands) and Tilburg University's TIAS Business School (the Netherlands).

The opening paper by Spanner and Wein, *Carbon Risk Real Estate Monitor – Making Decarbonization in the Real Estate Sector Measurable*, discusses the CRREM tool and location and building type-specific science-based decarbonization pathways. The paper articulates how a partnership consisting of institutional investors, asset managers and other corporate partners as well as industry bodies and scientists collaborated in the development of the tool and its testing under real conditions, with over 4 million m^2 of lettable space analyzed in the pilot phase. For institutional investors, asset managers and other stakeholders, the tool provides a basis for investment decision making and is adaptable for different locations, buildings and use type-specific features. The paper demonstrates how the CRREM tool is a valuable basis for assessing carbon intensity and the assessment of stranding risks and provides guidance for the decarbonization of the commercial real estate.

Also drawing in part upon the CRREM project, the paper by Brounen et al., *The Value Effects of Green Retrofits*, is concerned with disentangling various sources of value capture mechanisms that can be attained through green retrofit actions and profiles the extent to which green retrofit solutions can be effectively capitalized. The paper develops both a conceptual framework that theorizes the different value components of a deep retrofit and through empirical analysis identifies the value effects of retrofits and the associated gains in energy efficiency, using the example of the Munich residential real estate market. The framework proposed by Brounen et al. disentangles total retrofit value effect into three components: capitalization of energy savings, exposure to value discount due to stricter standards and the value uplift due to indirect benefits.

Warren-Myers et al. in their paper, *Advancing Capacity to Adapt to Climate Change in the Australian Property Industry – Addressing Climate Change Information*, explore the sources of climate change information used by key stakeholders in the Australian property industry, their information needs and their capacity to translate that information into decision-making. Drawing upon interviews with a diverse range of property/real estate companies, the research identified a wide range of information sources used by key stakeholders,

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ranging from reliance on unsophisticated mass media reporting to a detailed analysis of scientific research. The paper indicates that there is great potential to increase and strengthen the information provided to industry, through development of better communication channels for climate change by supporting science–practice collaborations in timely and effective dissemination of research. The authors argue that facilitating this through industry-trusted sources is particularly important and suggest that climate change scientists should partner with such organizations to disseminate relevant information in formats that would be most useful to industry and facilitate the capacity to translate this information into practice and everyday decision-making.

Leskinen et al. utilize a more practical example in their consideration of the extent to which building-specific renewable energy (on-site energy) investments are part of the property and thereby affect the ability to produce a (net) cash flow. In this regard, their paper, *The Impact of Renewable On-site Energy Production on Property Value*, shows the value-influencing mechanism of on-site energy production from the perspective of property investors using a case study of a prime logistics property located in the Helsinki. The value-creation opportunities, based on the capitalization of the savings generated by a building's own energy production, is supported by a survey of real estate professionals in Finland with benefits seen to extend beyond decreased operating expenses to factors such as enhanced image and better saleability. Although the paper suggests that valuers act more conservatively when transferring these additional benefits to cash flows, it is argued that property investors should consider on-site energy production and the potential to evolve new investment products within the real estate industry. The authors suggest that the energy industry has an opportunity to offer services related to on-site energy production to property investors.

Developing this theme further, Gabrielli et al. in their paper, *Automatic Energy Demand Assessment in Low-Carbon Investments: A Neural Network Approach for Building Portfolios*, develops a flexible forecasting tool for the automatic assessment of both environmental and economic benefits resulting from low-carbon investments in the real estate sector, especially building portfolios. A set of four artificial neural networks is created in the paper to provide a fast and reliable estimate of the energy consumption in buildings arising from heating, hot water, cooling and electric equipment and specific building characteristics, such as geometry, orientation, climate or technologies. A small portfolio of residential properties in Bologna is analyzed to test for all possible combination of retrofit interventions and identify the optimal configuration in terms of both energy and monetary savings. The research verifies that the set of neural networks speeds up energy retrofit programmes, especially when applied to a large stock of buildings and provides crucial support for the decision-making. The development of a methodology that is not excessively data demanding and the flexibility of the networks in comparing numerous design scenarios for different building stock are key outcomes from this paper that may help portfolio managers and public/private investors in making decisions about the energy upgrade of their building stocks.

The paper by Wilkinson and Sayce, *Decarbonising Real Estate*, moves the discussion back to the residential sector and seeks to develop a deeper understanding of the relationship between energy efficiency and the value of residential property in Europe and, by so doing, to determine whether stronger policies are required to realize decarbonization. The paper reviews the current academic literature and large-scale quantitative studies conducted in Europe, mostly using hedonic pricing analysis

to seek a relationship between energy performance certificates (EPCs) and either capital or rental values and compares these to the reported findings of three case study projects. Wilkinson and Sayce highlight how the results generally show a positive relationship between observed market prices and EPCs; however, outcomes are variable with the case study projects, revealing a more nuanced set of arguments in terms of the relationship between energy efficiency and market behaviours. The authors conclude that whilst there is some evidence that energy efficiency is beginning to impact on value, it is small compared to other value drivers, including health, well-being and private sector finance deals, that may prove more powerful market drivers. Furthermore, the findings point towards the emergence of a brown discount being more likely to be the long-term trend than a green premium and that more action is required to realize decarbonization in new and existing residential property given that the sector offers potential for substantial reductions.

The paper by McCord et al. on *Energy Performance Certificates and House Prices: A Quantile Regression Approach* continues the theme regarding whether EPCs impact upon house prices and the extent of any impact. Using data from the Belfast housing market, the paper measures the dynamic effects of EPCs on house prices across the price spectrum as well as improving understanding of the potential contribution of EPCs in the mobilization of cost-effective retrofit improvements which enable householders to optimize energy efficiency within clearly defined financial frameworks. The results show that the impact of EPCs vary across the price distribution and appear to be differently capitalized into the higher-priced segment of the housing market. However, it is apparent that the premium may not always be straightforward - where the market is pricing energy efficiency and where behaviour or sentiment is accounting for a brown discount implying that energy performance is a complex feature that is not easily "averaged" for valuation effect purposes.

Cradduck et al. widen the debate in their paper, *Courts' Views on Climate Change Inundation Risks for Developments: Australian Perspectives and Considerations for Valuers*, by assessing the courts' views of climate change risk in planning matters as related to inundation. The research suggests that valuers, and others involved, need to be aware of the implications on property matters, valuation processes and reporting. The research reported in the paper is based on a legal doctrinal analysis of primary law sources, Australian case law, and analyses decisions from Queensland, New South Wales and Victorian courts and tribunals, to establish their views of climate change risk of coastal area developments, who bears the risk and responsibility, and if the risk is shared. The analysis reflects that developers bear the onus of proving their proposal meets relevant planning requirements, including management and mitigation of climate change risks. However, the paper emphasizes that local government authorities are responsible for appropriately assessing applications, thereby indicating a shared burden. The research informs valuers of climate change risk issues and the importance of court decisions as an additional information consideration to inform valuations and concludes that the impact for valuers and valuation, and the market values of development projects and existing properties, cannot be underestimated.

This special issue of *Journal of European Real Estate Research* finishes with a policy briefing paper in which Pike in an opinion piece *The Future of Sustainable Real Estate Investing in a Post-COVID-19 World*, draws interesting parallels between the Covid-19 crisis and global warming. The author argues that the one lesson learnt from COVID-19 is that governments need to be better prepared. In this respect, Pike

expresses the hope that the damaging effects of global warming will not be lost on governments and stresses that there is still a chance to mitigate these and accelerate towards a lower-carbon world. It is argued that in real estate, whilst there are many good initiatives, these tend to be in siloes and that what the industry needs is more engagement with governments and global leadership from the investment community.

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