

*Review*

# Bringing the user back in the building: An analysis of ESG in Real Estate and a framework to guide future research

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**Abstract:** Investors are currently obliged to take ESG (Environment, Social, Governance) issues into consideration as part of their fiduciary duty. As such, it becomes increasingly important to identify sustainable investments that hold financial value as well. A sector where this is especially underdeveloped is real estate. This has a lot to do with the obfuscated conceptualization of ESG. The article identifies key gaps in literature and practice, and provides a framework to further the understanding of how ESG factors can add societal and financial value in the real estate sector. A key premise of the article is that the user in the building is grossly overlooked. Drawing on insights from behavioral social science and environmental psychology, the paper explains the role of the user in improving buildings' ESG, also taking into account the investment value. To conclude, the article makes the case that the transition to user-centered smart real estate is the solution to improving both the environmental (E) and social (S) sustainability of buildings, as well as their investment value. Therefore, practitioners and academics are encouraged to critically evaluate and contextualize the ESG framework they are using, as well as the extent to which users are considered and smart technology is employed.

**Keywords:** ESG; Sustainable Finance; Smart Real Estate; Sustainable Real Estate; User wellbeing; Social Sustainability; Environmental Sustainability

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## 1. Introduction

In the last two decades, promulgated by the financial crisis and the Paris Climate Agreement, global concerns about climate change and business ethics have fueled the interest in environmental, social, and governance (ESG) issues and their associated risks [1]. However, interest in non-financial information, and notions of socially responsible investment (SRI) and corporate social responsibility (CSR) have been around much longer, gaining momentum due to historical events such as civil and women's rights movements [2]. The term ESG was coined in a 2004 United Nations (UN) report titled 'Who Cares Wins', aimed at raising awareness about the importance of environmental, social and corporate governance issues for financial markets. A year later, the UN Environmental Program's Finance Initiative (UNEP-FI) provided evidence on the financial relevance of ESG issues and promulgated the use of ESG information in investment decisions. Moreover, UNEP-FI's 2019 report on 'fiduciary duty in the 21st century' describes how ESG issues are increasingly integrated into regulatory and legal requirements for institutional investors, warning that investors who fail to take ESG into account will likely face legal challenges [3].

As such, a dual purpose can be identified in the use of ESG. Initially, investors focused on the value of ESG issues in and of themselves, stressing the environmental and social costs and benefits. Over time, other investors became interested in ESG from a more financially focused position, where sustainability is taken into account more rationally in

function of its material costs and benefits. Eccles, Lee & Stroehle (2020) call these two respectively the values-based, and value-based approach. Though analytically distinct, the two approaches often coincide in practice, where both the societal and financial benefits of sustainable investment are deemed important. Today, regardless of more altruistic or pure financial motives, investors increasingly have no way around incorporating ESG considerations in their investment decisions, as it has become an almost global legal prerequisite [3]. As such, investors and their clients are increasingly interested in finding profitable sustainable investments.

Over the past years, a substantial body of research has focused on understanding the relationship between financial and nonfinancial investment performance. The consensus so far is that paying attention to ESG issues can generally lead to better financial performance [4]–[8], though this body of literature is rife with uncertainty. A sector where this relationship is particularly unclear is real estate. When it comes to real estate investments and asset management, there are many mixed and contradictory findings. Conclusions range from finding no correlation at all between ESG and financial performance [9]–[11], to mixed results [12]–[14], with several cases even showing an inverse relationship [5], [15], [16]. Though, some studies do give evidence of a positive relationship, often emerging in the long run [17], [18]. To complicate the matter further, it is in many cases still unclear what it means to improve ESG factors in the first place.

This is for a large part due to a lacking universal conceptualization of ESG, and a divergence in ESG measurement practices among rating agencies, practitioners, and academics [19], [20]. This divergence can be traced back to the diverging value and values-based philosophies mentioned earlier. Depending on the indicator selection, measurements, and weights applied, different assessments of the same company's ESG performance may diverge [2]. As such, a better contextualization of findings is necessary. Rather than the catchall statement that improving all and any aspect of ESG would somehow automatically lead to added financial value, more sector-specific research is necessary to determine which interventions can improve ESG factors in the first place, and secondly which of those hold additional financial benefits for investors. This is the knowledge gap that this paper fills.

The remainder of this paper will first review the general conceptualization of ESG factors, discussing the diverging measurement practices of ESG issues, and strides made towards standardization. In the third section, the paper looks at ESG in real estate, a sector grossly understudied so far, and lays bare an important lacuna in ESG considerations for real estate investment, namely that the user of the building is not at all taken into consideration. The paper draws on behavioral social science and environmental psychology to explain the role of the user in achieving environmentally and socially sustainable buildings, also taking into account the financial value this may hold for investors. For instance, environmental improvements in buildings are currently mainly sought through technical means. However, behavioral social science shows that the extent to which these technical means can improve building performance is highly dependent on user behavior [21]. As such, this paper suggests incorporating user-wellbeing in the conceptualization of the social component of ESG for real estate, rather than simply looking at compliance with labor laws and human rights. More broadly, the paper will argue that social and environmental sustainability are intricately intertwined and cannot be dealt with separately. The third section concludes by making the case that the transition to smart real estate that is user-centered is the solution to improving both the environmental (E) and social (S) sustainability of buildings (ESG factors), as well as the investment value of real estate. It concludes with suggestions for future research and key recommendations for real estate professionals. Governance aspects of ESG criteria are not further taken into explicit consideration in this paper, although often implicitly included.

## 2. The current state of ESG measurement

Environmental, Social and Governance measurements have significantly increased in usage due to growing concerns for environmental and societal problems. They increasingly influence financial decisions, with potentially far-reaching effects on asset prices and corporate policies [5], [10]. ESG rating agencies offer investors a way to screen companies for ESG performance in a similar way to how credit ratings allow investors to screen companies for creditworthiness. Yet despite this similarity there are important differences between ESG ratings and credit ratings. The key difference is that while creditworthiness is relatively clearly defined as the probability of default, there are no commonly agreed-upon measurement criteria for ESG ratings yet. Moreover, research suggests that rather than using generic criteria, ESG ratings should be sector-specific, as key ESG concerns are bound to differ over sectors such as real estate, healthcare, finance, telecommunications and others [22]. This lack of conceptual validity leads to divergences in ratings, creating confusion both at the investor and company level, raising a call for more conceptual clarification [23], [24].

### 2.1 Aggregate confusion

Transparency and disclosure are fundamental to sustainable finance. That is why, for thirty years already, information gathering and reporting is a priority. Some very known initiatives include the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), the Carbon Disclosure Project (CDP), the International Integrated Reporting Council (IIRC) and the Task Force on Climate-related Financial Disclosures (TCFD). All the initiatives have the intention to provide a framework by which it becomes possible to measure externalities, internalities and the level of sustainability of a particular investment [25]. However, disclosure is only useful when one can make sense of the information disclosed. This is hampered by the divergence in ESG measurement practices.

Divergence in ratings is driven by three distinct measurement causes: divergence in scope, divergence in indicators, and divergence in aggregation rules. First, divergence in scope refers to the situation where ratings or measurements are based on different sets of attributes, such as labor practices or lobbying activities. One rating agency may include both, another may include neither, causing ratings to diverge. Secondly, divergence in indicators means that different rating firms use different indicators to measure the same attribute, such as labor practices, again leading to different scores. Finally, divergence in aggregation rules appears when firms attribute different weights to attributes. As these are all intertwined, it makes it difficult to interpret ratings and understand divergence in scores. For instance, Berg et al. (2019) show the category 'environmental reporting' is included in ratings from Sustainalytics, RobecoSAM, Asset4, and Vigeo Eiris, but not taken into account by MSCI and KLD. Moreover, Sustainalytics uses two indicators to measure this category, while the others use only one. Finally, Sustainalytics and RobecoSAM attribute a higher weight to this category than the others.

The root cause of these differences can be explained by multiple factors. Agencies may use different metrics because of different ideologies, as mentioned earlier. More pragmatically, they could simply focus on different factors because processing all the information contained in disclosures may be too costly [26], [27]. The underlying issue here is that it is in many cases unclear which interventions benefit ESG factors to which extent, and as such which attributes, indicators, and weights to apply. This makes it nearly impossible to decide which rating agency or measurement procedure is "the right one". Take Tesla, which was given a top ESG score by MSCI, ranking the company best in the global car industry. But simultaneously made the bottom of the FTSE's list, and ended up somewhere in the middle on Sustainalytics ESG ranking. All acclaimed rating agencies, all with a different outcome [28].

### 2.2 A road to standardization

Although 'disclosing ESG issues' is increasingly seen as part of the fiduciary duties of investors, it is not at all clear what exactly should be disclosed. The plethora of existing (national) labelling schemes and requirements use different criteria to determine which

economic activities qualify as sustainable, confusing investors and discouraging them from investing across borders due to difficulties in comparing different investment opportunities. This has led to wide-spread calls for standardization of ESG measurement to combat the inefficient proliferation of rating agencies and measurement standards.

The European Union (EU) has recently answered this call, publishing a new EU taxonomy classification system to start closing this gap, to be implemented by January 2022/2023 [29]. This process started in December 2016, when the Commission mandated a High-Level Expert Group to develop an overarching and comprehensive Union strategy on sustainable finance and ESG, to help reach the sustainable development goals and implement the European Green Deal. By providing EU-wide appropriate definitions to companies, investors and policymakers on what is considered sustainable, the EU hopes to enable and shift investments towards more sustainable ones.

It is important to note that 'sustainable finance' is predominantly interpreted as environmental sustainability, with the current taxonomy focusing exclusively on six environmental goals. To be sure, there is a cursory mention that economic activities must comply with minimum international human and labor rights and standards, to qualify as environmentally sustainable (which can be seen as a social element). Additionally, it is stated that other sustainability goals, including social objectives, will be developed at a later stage (EU/2020/852) - even noting a report is planned for December 31st 2021 describing the provisions required to extend the scope of the Regulation to include social objectives. Still, the Social dimension of ESG and sustainability remains grossly neglected.

### 3. Gaps in literature: Bringing the user back in the building

The linkage between corporate commitment to environmental, social and governance (ESG) issues and investment performance has generated a substantial body of research outside the real estate sector [30]. For real estate investors, it is still quite unclear which interventions can improve ESG factors in the first place, and secondly which of those hold additional financial benefits for investors. Improving ESG is predominantly seen as matter of reducing the carbon footprint of buildings, and making real estate more 'green' [13], [31]. A key element that is pertinently overlooked in ESG considerations is the role of the user in the building (Seyler & Mutl, 2019). This section discusses the impact of the user on the ESG rating of the building, as well as the investment value. It does so by particularly discussing the impact of user behavior on environmental sustainability (3.1), as well as the concept of user-wellbeing in buildings and social sustainability (3.2), arguing that environmental and social sustainability go hand in hand (3.3), concluding that ESG factors and investment value can be improved through smart real estate that is user-centered (3.4).

#### 3.1 The environmental dimension and user behavior

Environmental and energy optimizations seem to be the main drivers for the ESG evaluation of an investment. This is because energy and environmental impact has become a clear business case which is easily expressible in monetary values [33]. The six main rating systems for real estate, the Building Research Establishment Environmental Assessment Methodology (BREEAM), the Comprehensive Assessment System for Built Environment Efficiency (CASBEE), the Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB), the Haute Qualité Environnementale (HQETM), the Leadership in Energy and Environmental Design (LEED), and the Sustainable Building Tool (SBTool), all focus predominantly on 'green' buildings and environmental impact [33], [34].

However, when assessing the actual impact of environmental optimizations, one important factor is often underexposed, namely user behavior. Several studies hint towards an important link between user behavior and environmental performance, raising critical questions about the faith being placed in technology to reduce emissions [35], [36]. While many technical solutions have been developed to enhance the energy efficiency in buildings, the actual effectiveness and sustainability of these solutions often do not correspond to expectations because of the missing perspective of the user's real needs, and unconsidered negative side effects of their use [37]–[39]. Lifestyle choices make up an important

part of energy usage, and as such the relationship between behavioral patterns and energy consumption requires more attention [40]. In order to effectively reduce the environmental impact of buildings, human behavior needs to be better understood [41].

The relationship between human behavior and sustainability can be understood as a 'tragedy of the commons' [42]. This means that although people might value sustainability in general, they do not always realize the impact of their own actions, reasoning that their behavior is insignificant and has no real contribution to the problem. When everyone acts in such a way, this collective action is detrimental for the common good, in this case the environment. As noted by Parviainen, Hansen & Lagerström [43, p. 155]: 'There is a gap between people's attitudes and feelings toward sustainability, the environment, and their own contribution.'. In a speech for the Bank of England, Mark Carney [44, p. 4] supplements this 'tragedy of the commons' with the 'tragedy of the horizon', stating: 'The catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix. That means beyond the business cycle, the political cycle and the horizon of technocratic authorities, like central banks.'. Both refer to the fact that if people will not act rationally and are not truly convinced about the long term benefits, the system will fail and there is no technology that can prevent that from happening.

Behavioral social science blends psychology and economics to understand how human behavior can be steered in a certain direction, without limiting choices or intervening in an overly intrusive way. This is called nudging [45]. The underlying idea is that people have 'bounded rationality', meaning that when they make decisions they do so under cognitive limitations [46]. People do not have the time and energy to gather all available information and weigh all the costs and benefits when making decisions. So too when it comes to environmentally friendly behavior. This means that even when humans would like to act sustainably, they do not always do so, for a myriad of reasons. The idea of nudging is that humans' choice architecture can be designed in such a way that it nudges people in a given direction, one that would presumably make their lives better. There are examples abound of environmentally friendly nudges such as flamboyant garbage cans to combat littering and brightly colored stairs to discourage elevator use [47]. But also more data-driven and personalized informational nudges like real-time feedback on water and energy use [48]. Yet, large gaps remain in our understanding of how particular nudges can influence people's choices, especially in the realm of real estate [49], [50], and even more so when it comes to the use of technology to personalize nudges based on user-behavior [51], [52]. In a recent experiment Peeters [53] showed that in an emergency situation people tend to follow the information that they receive when escaping a real estate object. The research concludes that the integrity of the information is of crucial importance as to avoid misguiding people and leading them towards unwanted behavior. More well-designed experiments are necessary that measure the impact of smart real estate on user behavior, environmental sustainability and cost-effectiveness over time.

### 3.2 The social dimension and user wellbeing

Though sustainable investment has predominantly focused on environmental sustainability for the past two decades, the social dimension is slowly gaining more attention. While this started out with prominent ESG rating agencies (such as KLD, Sustainalytics, Vigeo Eiris, RobecoSAM, Asset4 and MSCI) including basic social rights such as labor rights, safety, and human rights, increasingly indicators for wellness, satisfaction, and productivity are discerned [23], [54]. Moreover, indicators related to environmental justice, such as the equal and affordable access to energy efficient buildings and social housing, could be taken into account as well [55], [56]. Though diverging measurement practices are an overall concern for ESG measurement and rating systems, conceptualizing 'occupant health' or 'occupant wellbeing' proves especially problematic.

To gain an overview of health and wellbeing indicators considered in current rating systems, McArthur and Powell [57] reviewed eleven global health-related rating systems. It is interesting to note that the most prominent health factors included in rating systems were building-focused themes such as indoor air quality, thermal comfort, acoustics, and

ergonomics. A great deal of research evidence specifically links these more physically tangible topics to economic and health benefits. For instance, good indoor air quality (which is consistently addressed across all reviewed rating systems) has long been proven to have a significant impact on office workers and school children, decreasing sickness absence and increasing work performance [58].

However, 'softer', less tangible topics such as diet and water, movement, social well-being and psychological wellbeing are much less consistently addressed, sometimes even despite strong scientific evidence. For instance, the health and economic benefits of drinking clean water and eating health food have long been demonstrated [59], [60]. Yet, only four out of the eleven rating systems under study considered this in some regard (such as free and close access to water or nudges to increase water consumption), which seems like a missed opportunity.

Including themes like psychological and social well-being is more of a challenge, as there is less direct evidence for health and economic benefits. From a social science perspective, much research has been done to measure the user satisfaction of facilities management, though proven causal relationships are scarce [61]. Schweiker et al [62] recommend multi-dimensional field experiments to research true causality, rather than big number studies in lab-settings. The field of environmental psychology is also helpful in this regard, studying how restorative environments can be designed that promote people's health and wellbeing. The systems that do include social and psychological wellbeing focus predominantly on 'biophilic' design, which has been found to have significant health benefits including improved cognition, stress reduction and reduced mortality rates [63]. This typically means incorporating plants and natural lighting in buildings (which is often a by-product of energy reduction and as such not a strictly 'social' intervention). Although it seems likely that there is investment value in designing facilities that make users feel good, as this might lead to increased use of these facilities. Overall, more research is necessary regarding economically viable ways to improve user satisfaction in buildings.

### 3.3 Sustainability as a broader concept

Environmental psychology touches on another important point, namely that environmental and social considerations are intricately connected in a broader conceptualization of sustainability. In its early days, environmental psychology was mainly concerned with the impact of the natural, and later built, environment on humans' welfare. However, since the 1970's, the field has become increasingly focused on the interaction between humans and their environment [64]. For instance, the impact of stressors caused by human behavior towards the environment, such as noise and pollution [65]. The psychology of sustainability emerged as a study of how the quality of life of inhabitants, and their physical and mental health, relates to their own attitudes towards the environment. The claim is that humans who develop a positive attitude towards the environment, will also experience higher levels of wellbeing [66]. Kobal Grum writes [66, p. 4]: "It is therefore not sufficient for people to be aware of the negative impact on the environment brought by technological advancement nor is it sufficient for us to feel good in the environment in which we live. We need to know, through our behaviour, how to provide for the preservation of a healthy, safe and pleasant environment."

What is missing in the field is a focus on the built environment, which is currently neglected by researchers, planners and users alike [64]. Sustainable psychology could create a reorientation towards designing real estate that protects users against environmental stress factors. There are three dimensions to this approach. First of all, designers should communicate more with potential users for whom the environment is being built [67]. Secondly, the earlier mentioned biophilic design of the built environment, meaning that the most basic natural elements should be incorporated in built spaces. This is not only shown to be beneficial for subjective experiences, but has also been proven to have a favorable impact on child development, creativity and productivity. Finally, an evidence-based design of the built environment [68]. This rejects fashionable, image-based design, which often leads to non-functionality, inapplicability and thus dissatisfaction of users.

Instead, more research is suggested on how environmental stress can be prevented and pro-environmental behavior can be promoted. As such, more research is necessary on how the built environment can be designed to promote pro-environmental behavior that removes stressors and increases user wellbeing.

The premise of the psychology of sustainability is that humans can feel empathy towards the environment. When we develop feelings of empathy towards other human beings, we care for them, and consequently feel more satisfied and happier in doing so. Similarly, Kobal Grum [69] argues that empathy towards the environment will cause people to care for the environment more, which will subsequently improve their own quality of life and wellbeing. The impact of this behavioral change on ESG ratings and investment value needs further investigation.

### 3.4 Smart as a Solution

In order to improve ESG value (environmental and social sustainability of buildings) and investment value in real estate, the user needs to be given a more central place in the building. This can be done through a transition to smart real estate (indirectly indicated in eg. [70], [71]. Though there is no agreed upon definition of smart real estate, the one provided by Ullah et al. [72, p. 4], is especially helpful: "A property or land that uses various electronic sensors to collect and supply data to consumers, agents and real estate managers that can be used to manage assets and resources efficiently. The key features are user-centeredness, sustainability and the use of innovative and disruptive technologies in such a way as to attain holistic benefits that are otherwise not attainable". Key in this definition is the user-centeredness, which is demarcated as a necessity for smart real estate. 'Smart' is not just about incorporating disruptive technology in design, but using technology to serve the user and elicit behavioral change [73].

User satisfaction can be improved through technology on three levels: physical, functional, and psychological. Physical satisfaction includes the physically tangible topics, discussed by McArthur and Powell [57], such as temperature, lighting, and air quality, which can be optimized, automated and tailored through technology. Technology can also be used to improve functional satisfaction, by facilitating users' interactions with the built environment through the intelligent design of space and technology [72]. Finally, the smart integration of technology and space with users' every-day lives can support and enhance their lifestyle and needs on a psychological level. Key disruptive technologies, known as the 'Big9', are the use of clouds, software, big data, IoT, drones, 3D scanning, wearable tech and gadgets, VR and AR and AI and robotics.

Despite its potential to revolutionize the way the built environment interacts with users, smart real estate has not reached the main stream of real estate research or practice yet [72], [74]–[77]. Though technology is increasingly used to improve user satisfaction on the physical and perhaps functional level, the true integration between user and building through technology has not yet been achieved. Lecomte (2019) uses the term of Cyberdasein, modelled after Heidegger's phenomenology, to describe the user that is one with the building through technology, and is thus able to reach beyond the physical boundaries of the space s/he is in. The objective of smart real estate should be the seamless integration of physical and virtual worlds. This way, a smart building can become an active organism that engages users' senses and adapts to individualized needs and experiences. In the words of Chtcheglov "Everyone will live in his own personal cathedral" [77]. Similarly, Ihde [78] describes smart buildings as 'fully enclosed mini-cocoons'.

To engage meaningfully with users Heidegger's phenomenology, the study of how phenomena are experienced, can prove helpful for real estate. Smart real estate is about user experience, and in the words of Weiser & Brown [79] the smart real estate experience will be to 'dwell with computers'. This means technology, though disruptive in its effects, should have a quiet material presence in the background, without drawing too much attention. McCullough [80] suggests an 'architecture of periphery' when designing smart real estate. Users should not be disturbed by technology, but immersed in it. Of course designing such 'calm' technology is no mean feat, as tech often malfunctions drawing unnecessary attention and disturbing the user experience. Technology and real estate should

be made to merge seamlessly and form the user's new perception of the world (and activities as intended in the digital and virtual economy). This way, the physical boundaries of space can be overcome and smart real estate can accommodate new forms of digital spatiality: smart space (Lecomte, 2015). Possibilities are endless in this smart space, and all the user's needs (physical, functional and psychological) can be met. Lecomte (2019) calls this perfect harmony between user and smart space 'flow'. It is the phenomenological account of what people experience when they are fully immersed in an activity, without distractions. Flow builds on the idea that successful adoption of technology is dependent on the perceived ease of use and usefulness to a user of a technology that might elicit behavioral change [72]. Flow can thus be seen as a measure of how well technology is absorbed in space, from the center of attention to the periphery. Achieving 'flow' is the main challenge for real estate in the future.

Smart real estate thus has the potential to completely redefine how the user sees real estate and how the user is influenced by the real estate object and amenities of it. In smart environments, buildings merge with technology to form 'cognitive assemblages' [80], which affect users' perception of the world and their behavior. As such, this 'smart space' becomes real estate's main productive component, whereas its physical characteristics move to the periphery of space users' attention. Consequently, Lecomte (2019) suggests adding 'digital' as a fifth dimension to Graaskamp's [81] seminal framework next to height, width, length and time. The value of real estate is no longer simply determined by square footage or cost per year, but additionally by the digital 'flow' a building is able to produce. Differences in ability to produce flow are likely to become a key value indicator for future real estate. Not in the least through its effect on ESG factors when performing an investment analysis. Making real estate user centered, and thus a consumer product, could lead to hedonic pricing. In this scenario, the user's behavior will determine the value of the object from its utility. Measuring this experienced utility is often seen as an important obstacle. However, Kahneman et al. [82] suggest deriving utility from reports of experience or psychological indices. Alternatively, Ullah et al. [72] advocate following the Technology Adoption Model (TAM) that measures the use and acceptance of technology through factors such as perceived usefulness, perceived ease of use, user satisfaction, behavioral intention to use and actual use. Furthermore, smart technologies can not only be adapted to create utility for users, but also help collect and analyze data to measure utility. To be sure, besides being a source of opportunity, user centricity may also be a source of challenges. Real estate players will have to figure out how to capture value from space users' dual experiences of physical and digital space in smart real estate (Lecomte, 2019). Moreover, though the value of disruptive technology is widely acknowledged, their adoption and usage remain limited in practice [72].

#### 4. Conclusions & Discussion

Investors are increasingly required to report on Environment, Social, and Governance (ESG) issues as part of their fiduciary duty. As such, finding sustainable investments that also present a good business case is paramount. A substantial body of research has focused on understanding the relationship between financial and nonfinancial investment performance, though findings regarding real estate investment carry mixed and contradictory findings [5], [9]. Not in the least because there is no clear definition of ESG. One important oversight in most ESG conceptualizations is the complete neglect of user behavior, which is especially relevant for sustainable real estate investments. As such, the user needs to be brought back into the building.

This article has shown that firstly it is important to factor in user behavior when trying to reduce the environmental impact of buildings. Behavioral social science teaches us that users can be nudged in subtle ways to act in more environmentally conscious ways [45]. Yet, more research out of lab settings is warranted to explore which nudges can steer behavior effectively, while also presenting a sound business case. Especially data-driven technological nudges present an interesting case for further exploration. Secondly, the social dimension of ESG is strongly underconceptualised and should include more elements

of user-wellbeing. This will not only lead to improved user satisfaction, but early research tentatively suggests that interventions to improve wellbeing might also increase investment returns. However, this remains to be tested. Moreover, social and environmental wellbeing are intricately linked, though they are typically treated separately. Current literature on environmental psychology suggests that in order to feel good we need to engage in environmentally sustainable behavior and create a healthy environment [66]. Yet, environmental psychology focused on the built environment is still in its early stages and much is left to be understood about these interrelations in real world situations.

To bring the user back in the building, the article suggests a transition to smart real estate. To be sure, making a building 'smart', is not just about incorporating disruptive technology in design, but using technology to serve the user and elicit behavioral change [48], [73]. However, there is a gap with respect to real business cases and in field experiments on the impact of digitalization on sustainability in real estate, and its effect on real estate investments. Data-driven informational nudging holds a strong potential here [48], though the field remains largely underdeveloped. Alternatively, much work remains in finding ways to introduce 'disruptive' (innovative) technology that does not disrupt user experience. Early research findings suggest that technology must remain at the periphery of built spaces in order to create an enjoyable 'flow' for users [77]. It is precisely this 'flow' that is suggested to be a key predictor of real estate value in the future.

Literature shows an apparent link between smart and sustainable real estate and the digital economy. However, in practice today, digitalization is not being explicitly considered when evaluating real estate and its ESG factors. A seminal question for future research and practice in real estate will be how sustainable real estate can be facilitated through technology, with key questions being: what kind of technology, who as a stakeholder is affected directly by it and how are these stakeholders affected in terms of processes and dissemination mechanisms? Related questions that are bound to surface will inevitably include ethical and regulatory challenges in using data to improve user-wellbeing and steer user behavior.

Given the diverging measurements of ESG factors, as well as their important shortcomings, especially in the social realm and with regards to technological innovation, practitioners and academics are encouraged to critically evaluate and contextualize the ESG framework they are using, as well as the extent to which users are considered and smart technology is employed.

**Supplementary Materials:** The following are available online at [www.mdpi.com/xxx/s1](http://www.mdpi.com/xxx/s1), Figure S1: title, Table S1: title, Video S1: title.

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