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Article

Promoting Urban Health through the Green Building Movement in Vietnam: A Transdisciplinary Perspective

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Abstract: The health of urban citizens is defined by how their living environments are planned, built, and operated. These complex relations between health and the characteristics of built environments require system-orientated thinking and transdisciplinary interventions, yet have mainly been addressed using conventionally narrow sector-based approaches. This paper investigates the opportunities and challenges of the Vietnamese Green Building Movement (GBM) based on a transdisciplinary approach, with attention to additional health benefits of green buildings that are currently under-researched, while highlighting building users' perspectives. Focusing on the perspectives of high-rise building residents, the paper examines transdisciplinary insights collected from six thematic webinars, expert interviews, and, in particular, from a household survey conducted in Ho Chi Minh City, Vietnam. Among other findings on opportunities and challenges for the Vietnamese GBM, the paper points out a challenging mismatch between the high importance homebuyers place on green building health benefits, and the focus of GBM stakeholders on GB energy-saving benefits- which are not necessarily homebuyers' most pressing concerns. With this evidence-based inquiry, the paper concludes that improved health and well-being should be considered co-benefits of green buildings, along with energy efficiency. Importantly, this paper also brings attention to the necessity of a systemic and transdisciplinary approach in both academic and practical efforts toward the implementation of SDG3- to "ensure healthy lives and promote wellbeing for all ages"- and SDG 11- "to make cities and human settlements inclusive, safe, resilient and sustainable".

Keywords: Green building certification; green building movement; health co-benefits; sustainable buildings; SDG 3; SDG 11; transdisciplinary approach; users' perspectives; urban health.

1. Introduction

Urban populations currently account for more than half of the world's population and will account for three-quarters of it by 2050 [1]. As hubs of major physical and socio-economic structures and activities, cities pose risks to human health due to air pollution, noise, urban heat island effects, a lack of green spaces, etc. [2,3]. At the same time, cities provide innovative solutions for creating health and preventing disease and injuries [4]. This urban health mediating function is critically performed by residential built-environments, as clearly illustrated during the recent COVID-19 pandemic that fundamentally changed the ways people live, work, and communicate [5].

Since 1986, the World Health Organization (WHO) has promoted Healthy Cities, facilitating comprehensive health policy principles for cities globally. Those principles were integrated into the socio-ecological model of Gunnar Dahlgren and Margret Whitehead (1991) [6] - which relates health to the physical/social/economic environment - and were further elaborated on in the well-known Health Map of Barton and Grant (2006) [7]. The Health Map, also inspired by ecosystem theories and the principle of sustainable spatial development (see Barton et al., 1995) [8], offers a visual tool for communicating and analyzing the health-settlement relationship [9,10,7]. It highlights, among other things, the role of the built environment (i.e. housing) in shaping human health by providing

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conditions necessary for everyday life (drinking water, food, fresh air, and a healthy environment for learning, working, social interaction, etc.) [7]. The model additionally emphasizes that individuals, as the model's center, can both influence and be influenced by their environment [11]. Indeed, the multiple relationships between the diverse housing environment characteristics can influence the physical health, mental health, and social well-being of individuals, households, and population groups [12]. Such systemic complexities, therefore, require system thinking and a radical shift from disciplinary and multi-disciplinary contributions to a transdisciplinary approach. This approach must integrate the contextual knowledge/know-how of researchers, policymakers, professionals, and communities, shaped by local geography, politics, economy, and culture [12,13]. This shift equally necessitates revisiting the tacit relationship between SDG 3- to "ensure healthy lives and promote wellbeing for all ages"- and SDG 11- "to make cities and human settlements inclusive, safe, resilient and sustainable". While each SDG has been remarkably successful, the intertwined co-benefits of their implementation are still not elaborated on [14,4]. The literature of past decades has been dominated by conventionally narrow sector-based approaches and a lack of empirical findings that systematically analyze the dynamic, non-linear, and complex relations between health and built environments [15,12].

1.1. Problematic: Lack of Accounting for the Health Co-Benefits of Green Buildings

The building and construction sector accounts for around 37% of energy- and process-related CO2 emissions [16] and about 33% of total final energy consumption [17]. This poses serious threats to public health due to greenhouse gas emissions and consequent air pollution. In line with the sustainable development agenda, GBM has emerged globally, promoting sustainable building solutions, also called green buildings (GBs), with innovative and energy-efficient building designs, materials, technologies, and new forms of policies and business practices [18-20]. The movement operates a variety of international and national, commercial and non-mandatory rating schemes [20]. Some major schemes are Leadership in Energy and Environmental Design (LEED) in the United States, British Research Establishment Environment Assessment Methodology (BREEAM), Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB), Haute Qualité Environnementale (HQE) in France, BEAM Plus (Hong Kong), Green Mark (Singapore), and Green Star (Australia) [21,22]. Their crediting focus varies across markets but generally considers key criteria of Site, Energy, Water, Indoor Environment Quality (IEQ), Material, Waste and Pollution, and Management [23]. Energy, however, remains the most important criterion, followed by IEQ and Water [23].

In response to increasing public concerns about healthy built environments, several health-oriented GB rating tools have recently joined the market, distinguishing themselves by endorsing health and wellness factors. Examples include WELL and Fitwel. WELL claims to promote healthy buildings by applying physical and social environmental science, to improve users' health, well-being, and performance [24]. The tool is evaluated to exceed the scope of normal GB rating systems, as it demands efforts to evaluate criteria related to food, physical recreation, etc., which are not always prioritized by investors [21]. Fitwel makes known its vision for a healthier future of healthier occupants and healthier communities [25]. As of now, the total number of WELL and Fitwel certified and pre-certified projects globally is still comparatively low - only in the four-digit range. Other current rating tools have also developed specialized categories underscoring buildings' operational aspects (e.g., LEED O+M and the DGNB In-Use) [21]. These assessments extend beyond the initial stages of design and construction, offering more comprehensive health benefits for users [26].

Among the advocated tangible and intangible benefits (see [20,27]), health co-benefits have been reported due to optimized indoor environments (i.e., natural lighting, ventilation, reduced contaminants like VOCs, formaldehyde, allergens, ETS, NO2, and PM) and reduced local impacts to building sites (i.e., air and noise pollution, etc.) [28-30]. Empirical findings reveal reduced sick building symptoms (i.e., cardiovascular/respiratory

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symptoms and other illnesses) and mortality rates, and increased productivity of occupants in green buildings [30-33]. GB health co-benefits are also enhanced because they use recycled, non-toxic, long-life cycle, and ecologically friendly materials [30]. GBs with innovative design and engineering measures for improving built environments are asserted to contribute to SDG implementation, especially SDG 3 and SDG 11 [33].

Challenges in promoting GBM have been largely studied in both developed and developing contexts, yet with little insight from the building users' perspectives. Specifically, Ametepey et al. (2015) [34] report six groups of barriers: financial barriers, political barriers, management/leadership barriers, technical barriers, socio-cultural barriers, and knowledge/awareness barriers. Other studies further emphasize obstacles caused by the following: a lack of policy guidelines and governmental incentives [35, 36]; a lack of knowledge and technical skills (i.e., interdisciplinary cross-team collaboration, critical thinking, stakeholder engagement and communication, etc.) [37,38]; higher risks in project management (contracting, work scheduling, budgeting, communication, multiple stakeholder engagement, etc.) [38]; and a lack of financing schemes (e.g., bank loans, surety bonds) or insurance arrangements [35, 40]. Among these challenges, higher costs of GB projects are reported to remain a top barrier for the GB market in both developed and developing contexts [35].

The essential systemic approach and the intertwined relationships between health and the urban built environment nonetheless remain underrepresented in public and academic GBM discussions, which predominantly focus on energy efficiency and carbon reduction benefits [41]. Localized green building codes, especially in the developing world, tend to systematically not highlight health improvement as a crucial co-benefit [23, 42]. Additionally, health co-benefits are found to be largely omitted in the burgeoning literature evaluating sustainable buildings (for examples see [43-45,20]). Although health benefits are found to be nearly equivalent to energy savings of GBs in the United States, and up to 10 times higher in developing countries, health benefits have not been adequately examined alongside energy saving and reduced air pollution benefits [32]. The promotion of health-oriented GB rating tools is equally challenged. On one hand, the real estate sector's interest is seen in the increasing number of buildings following health-oriented rating schemes (see [30]). On the other hand, specific criteria concerning health- for example, healthy diet provision or physical recreation opportunities- are perceived to be time and effort-consuming, often going against investors' interests [21]. Further, health-oriented rating tools may be appropriate for certain countries but not for others, as they relate to specific national health regulations and require a clear understanding of a country's unique legislation before being adopted in the building market [21].

2. State of Green Buildings in Vietnam

Since the 1986 economic reform [46], Vietnam has undergone rapid industrialization and urbanization, putting extensive pressure on the country's infrastructure and environment. The booming building sector accounts for 43% of energy consumption and 30-40% of carbon emissions [47]. High-rise residential buildings (HRBs) have been a solution in recent decades to save land and house the increasing urban population [48,49]. Energy-efficient buildings have also been promoted along with national commitments toward global sustainable development, climate change agendas, and foreign assistance programs [47].

Along with other governmental efforts, market-based GB rating tools have been introduced in Vietnam, including the most popular ones like LOTUS, LEED, EDGE, and GREEN MARK (see [50,51]). These tools mainly originate internationally and follow building physics science to evaluate the environmental performance of a building [52]. Health-oriented tools like WELL and Fitwel are not yet applied in the Vietnamese GB market. Although the GBM has gained attention from both public and private sectors, it still struggling to penetrate "a market crowded with conventional buildings" [19,53]. While about 250,000 new housing units are added each year in Hanoi and Ho Chi Minh

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City alone, there are only 433 certified or registered GBs nationwide as of September 2022, mainly distributed in big cities [54].

Major barriers for the GBM in Vietnam have been discovered, including a lack of legislative regulations (i.e., GB technical codes, standards, guidelines), a lack of competent consultants and general contractors to execute GB projects, and a limited market of sustainable materials and products [50,54]. Seven main barriers to GB growth in Vietnam are reported by Nguyen et al. [19] to consist of the low electricity price, lack of government incentives, limited supply of skilled employees with GB awareness, short-term thinking, misaligned incentives between building developers and users, low awareness, and price sensitivity discouraging property developers. Through the perspectives of general contractors, Nguyen et al. [55] identify a lack of owner determination, technical knowledge, and experience among designers and projects. Tran and Huang (2022) [56] point out four major obstacle groups concerning planning and organizational activities, onsite management, control activities, and the green supply chain. Among those, the non-readiness of the external GB supply chain is the most dominant. Pham et al. (2019) [53] emphasize the lack of knowledge and experience among general contractors for implementing sustainable building projects and highlight the need for professional training. Other challenges include project manager incompetence, unavailability of sustainable materials and technologies, and developer resistance to the change toward sustainability [57].

These studies have mapped out key challenges for the GBM in Vietnam, in general. However, they mainly address the questions using either highly technocrat indicator-based methods, or focus on professional groups, while overlooking the perspectives of building users. Specifically, although building users' low GB awareness is summarized as a challenge by Dung et al. [54], the cited studies (see [58, 19, 53]) hardly discuss this in detail or provide any empirical insights. What is known so far is: the uptake of GBM is explained by the benefits brought to building users [53]; building project developers consider cost efficiency, in order to meet users' satisfaction [53]; and while stakeholder involvement is statistically analyzed to be the most important factor in GB project preparation, building users are not specifically identified [58]. GBM is hindered by the ownership structure (e.g. developers pay for up-front costs, whilst operational cost savings benefit the occupants) and the behavior of occupants (e.g. occupants consume more electricity when using energy-saving equipment) [19]. In addition, little knowledge of the perceptions of health co-benefits of GBM in Vietnam is found in the current literature, at least to the authors' knowledge.

The following parts explain the paper's method and discuss empirical evidence, finishing with concluding remarks and acknowledgements.

3. Methodology

The paper examines the HausNeo GB project as a case study within the context of a larger survey in Ho Chi Minh City (HCMC) of 560 households, including 169 of the HausNeo GB project, 31 of other GB projects, and 360 conventionally-constructed building projects (not certified as green buildings) (Figure 1, 2). The traditional HRBs are categorized into buildings of high, mid, and low-range markets based on the selling price per square meter. Low-range market buildings have prices below 20,000,000 VND/square meter (sqm) (below 850 USD), mid-range market buildings sell for 20,000,000 to 35,000,000 VND/sqm (about 850 to 1,500 USD), and high-range market buildings are sold for more than 35,000,000 VND/sqm (more than 1,500 USD). The prices of building units are either reported by respondents or collected from each building project's website homepage. The main survey took place in February 2020 (see questionnaire in English language: Appendix B, in Vietnamese language: Appendix C), with an extra section surveyed in July 2021.

The paper is written based on both quantitative and qualitative materials. Quantitative data are analyzed with SPSS software, mainly based on descriptive statistics, crosstabs and Average Likert Values (ALV) analysis. Accordingly, the ALV has a negative relation with the most important or most concerning level of each factor. Qualitative data include materials collected from expert interviews, participant observations, and discussions of

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six thematic webinars. Interviews have been conducted with eleven experts- among them architects, construction engineers, GB consultants, GB developers, university researchers and lecturers. Each webinar had three keynote speeches, followed by panel discussions (featuring five panelists), and open exchanges with the online audience ranging from 100 to 500 online participants. Keynote speakers and panelists are regarded as experts active in the urban health, sustainable built-environment, and construction sectors, and include international scholars, national policymakers, researchers, professionals, private developers, and community organizations. The insights from each webinar presented in the result section are major points commonly raised by experts and the audience. They are coded with the capital W + the number of the specific webinar. For example, insights from webinar one are coded W1, from webinar three W3, etc. The detailed list of webinar topics and codes is mentioned in Table 1, Appendix A.

Table 1. List of survey samples of the survey in Ho Chi Minh City.

Number	Building type	Number of interviews in each building type	Share
1	EZ LAND HausNeo	169	30.2%
2	Other certified green buildings	31	5.5%
3	High-range non-certified buildings	94	16.8%
4	Mid-range non-certified buildings	92	16.4%
5	Low-range non-certified buildings	174	31.1%
	Total	560	100.0%

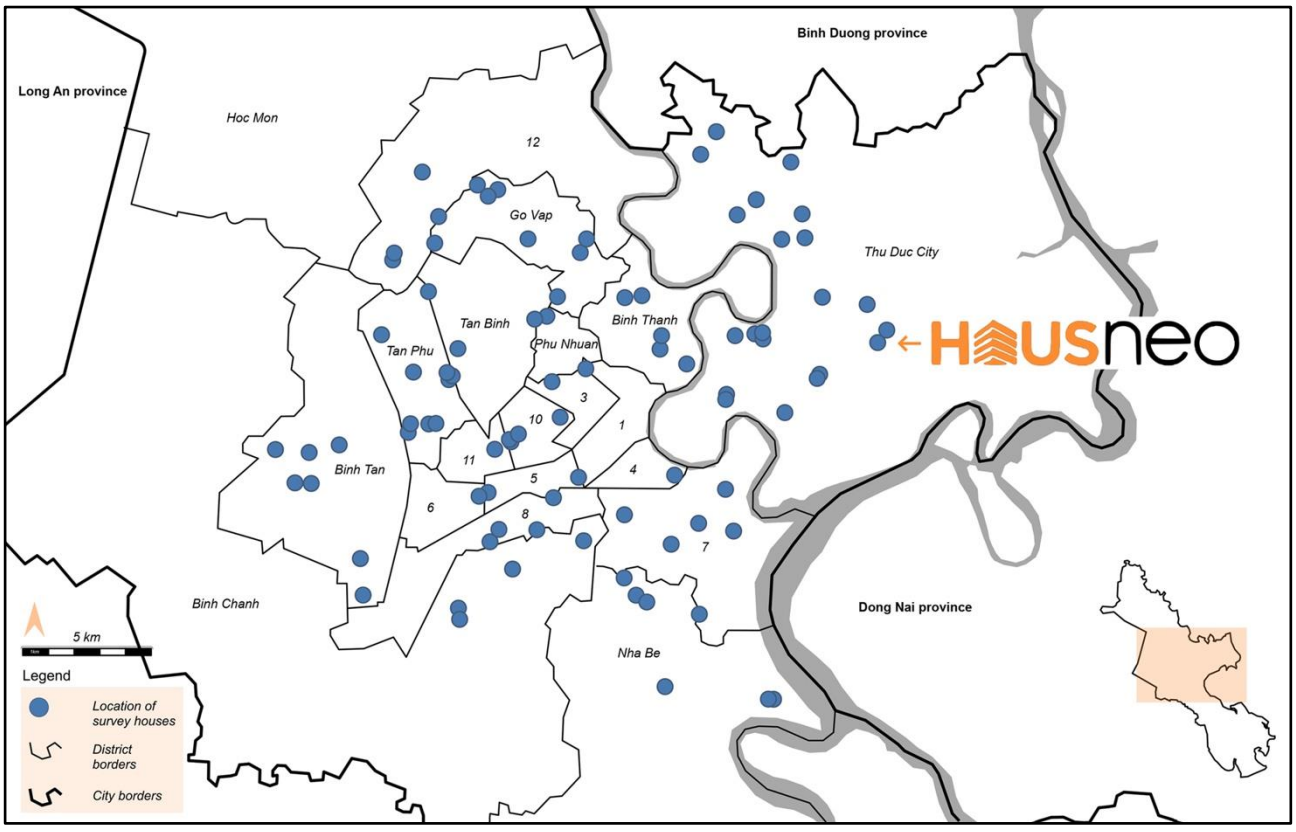

Figure 1. Location of survey buildings and HausNeo case study within the borders of Ho Chi Minh City.

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4. Results

Case study of HausNeo Green Building Project

HausNeo green building project (hereafter called in short HausNeo) has been developed by EZ Land Vietnam Development Joint Stock-Company (JSC), located in the rapidly urbanizing and newly founded Thu Duc sub-city (until the year 2020 part of District 9) of HCMC. HausNeo claims to follow the German Bauhaus style, offering two 18-story blocks of 568 European-styled, mid-range market condominiums from 45 to 67 m^2 in size. The project mainly targets middle-income young families and claims to advocate for environmentally friendly lifestyles. HausNeo received an EDGE certificate in 2019, describing itself to follow a strict procedure, from site selection, design, and construction to operation and maintenance. HausNeo apartments feature passive design solutions (i.e., reduced window-to-wall ratios, installed external shading devices, etc.), energy-efficient lighting, low-flow faucets, and lower embodied energy materials, with strict control in the process of construction and handover to optimize costs and raw material use. According to its specific EDGE certificate, HausNeo apartments save 29% in energy, 32% in water, and 47% in embodied energy in materials compared to conventionally constructed buildings of the same typology. During an interview, the CEO of EZ Land Vietnam told the authors that the investments to achieve the EDGE certification in the case of HausNeo only increased the total building expenses by about 1%.

HausNeo households' socio-economic conditions

HausNeo has younger and smaller-sized families, compared with those surveyed in other NCB projects (NCB). Most respondents (90%) are between 25 and 40 years old and live in families of less than 4 members. They have higher education and more professional backgrounds. Nearly 90% received a bachelor's degree or higher education, compared with 67% in non-certified HRBs. More HausNeo families have an average income of less than 45 million VND/month (about 1,920 USD) and own less high-value assets (cars or property for rent). The survey also showed that HausNeo households own significantly fewer air conditioning (A/C) devices, and the devices they do own usually possess a higher energy efficiency rating, which is evident through the energy consumption labelling system in Vietnam (see figures 2, 3, 4, 5, 6).

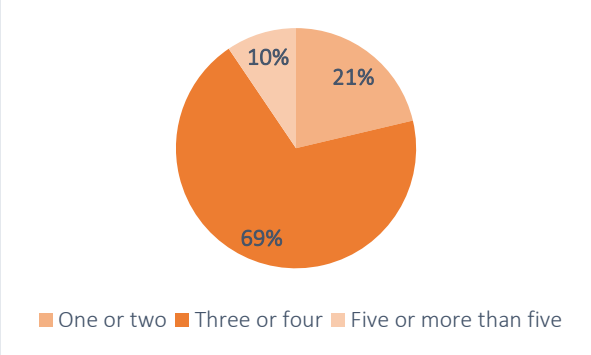

Figure 2. Percentage of HausNeo household size (N= 169).

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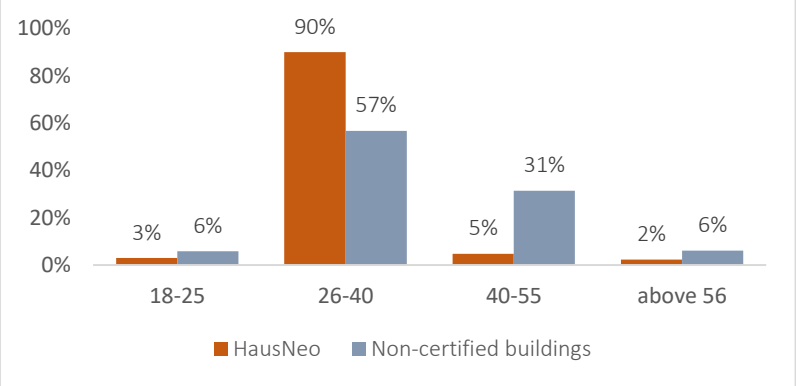

Figure 3. Percentage of age groups of HausNeo and NCB households (N= 534).

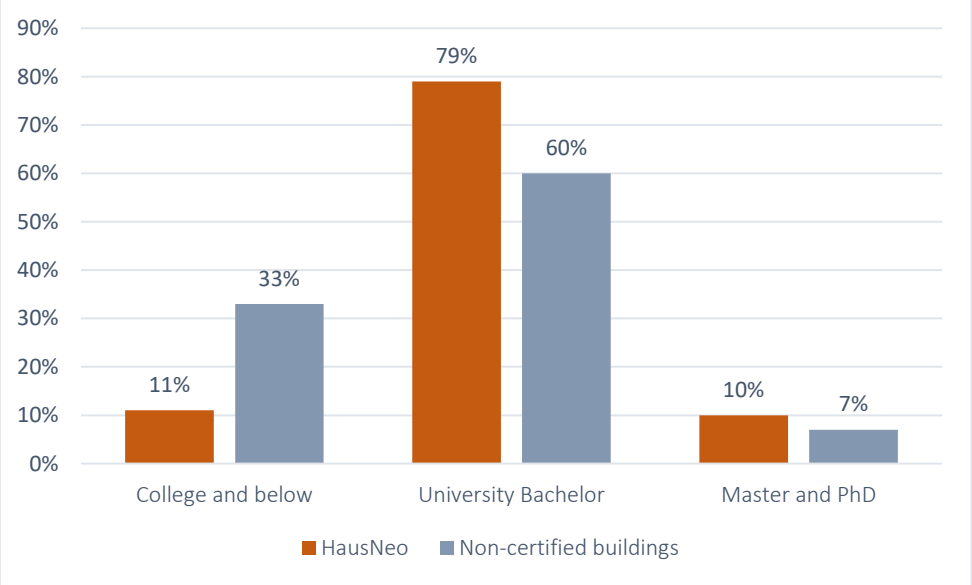

Figure 4. Percentage of education groups of HausNeo and NCB households (N= 534).

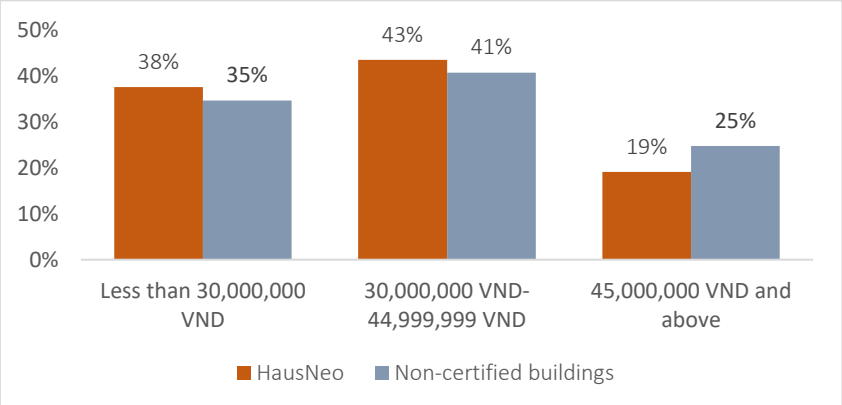

Figure 5. Percentage of income groups of HausNeo and NCB households (N= 516).

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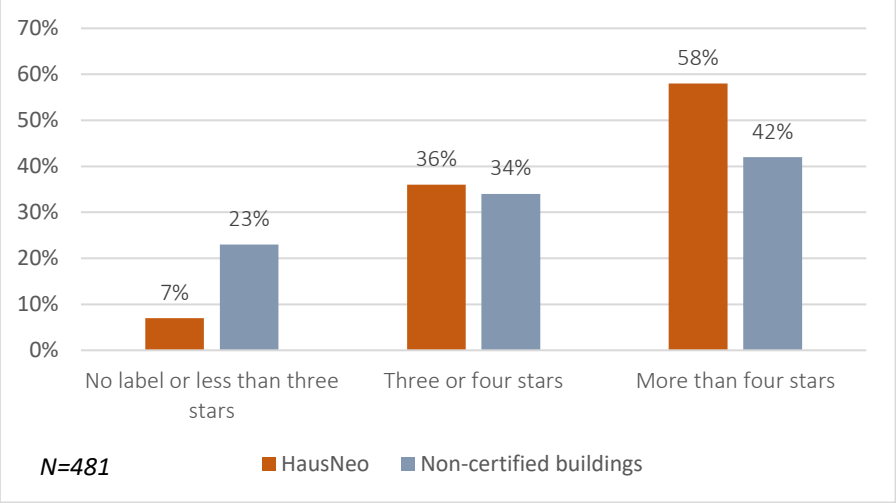

Figure 6. Ownership of A/Cs energy labelling stars (%) (N=481).

Power consumption

The HausNeo households tend to use less A/C for cooling but use more fans or natural ventilation, particularly during the dry season. They are also more sensitive to cool A/C temperatures. ALV scores show that HausNeo respondents agree more with non-A/C cooling methods, including a tendency to turn off A/C and switch to fans or windows whenever possible, using A/C with eco-mode enabled in both dry and humid seasons, and opening windows regularly in the dry season. At the same time, HausNeo residents disagree more with statements of using A/C the whole night, using A/C and fans in combination, closing windows to avoid noise and dust, and opening windows in the humid season (see figures 7 & 8, Table 2).

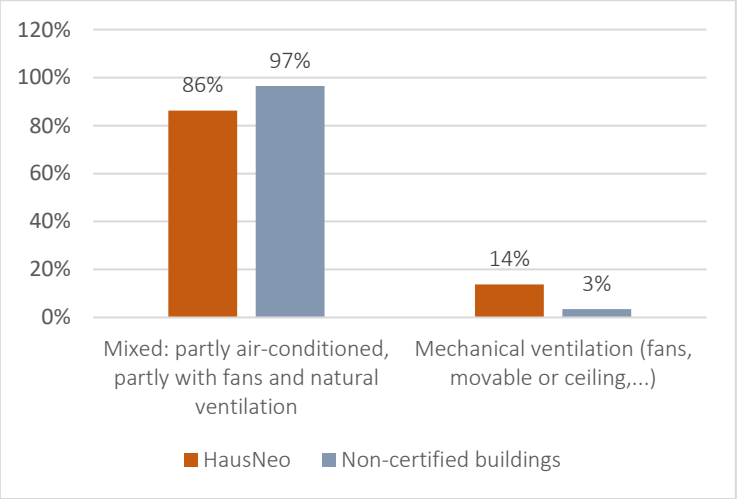

Figure 7. Households' cooling methods (percentage of respondents) (N=461).

Table 2. Cooling methods in dry and humid seasons (ALV scores).

	How often you turn on the A/C with Eco mode in the bedroom? -Dry season	How often you turn on the A/C with Eco mode in the bedroom? - Humid season	How often you open the window in the bedroom? - Dry season	How often you open the window in the bedroom? -Humid season
HausNeo	3.1 (N=98)	2.9 (N=98)	3.1 (N=91)	3.1 (N=91)

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Non-certified buildings	3.1 (N=315)	3.0 (N=315)	3.2 (N=247)	2.7 (N=247)
Total	**3.1 (N=413)**	**3.0 (N=413)**	**3.2 (N=338)**	**2.9 (N=338)**

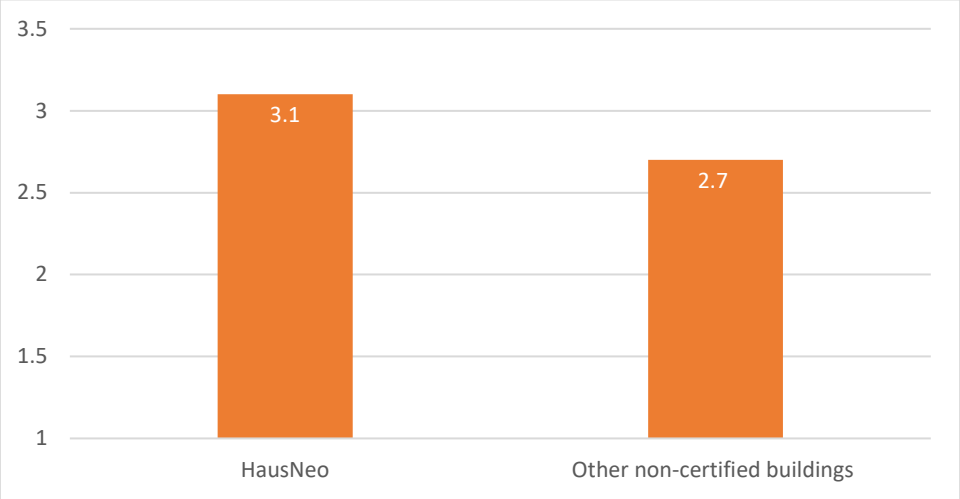

Figure 8. Frequency of window opening for cooling in HausNeo and NCB projects in humid season (ALV) (N=338).

Data shows that, compared with other NCB households, those living in HausNeo households exhibit significantly less monthly power consumption. HausNeo households also consume less power per sqm, showing that their relatively small apartment size is not a key influencing factor in this. Together, the survey could prove that residents living in environmentally certified buildings pay about 37% less for their monthly electricity bill compared to households living in non-certified conventionally constructed buildings (Figure 9 and Figure 10).

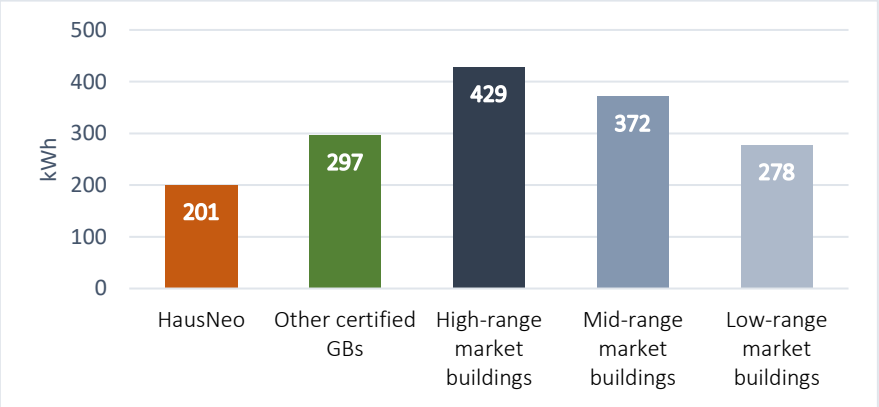

Figure 9. Average monthly power consumption (kWh) of different HRB categories (N= 295, including 217 certified households and 346 non-certified households).

According to the authors, the scientific evidence of these major savings should be strongly disseminated by multiple stakeholders in order to raise increased awareness of the benefits of sustainable buildings in Vietnam.

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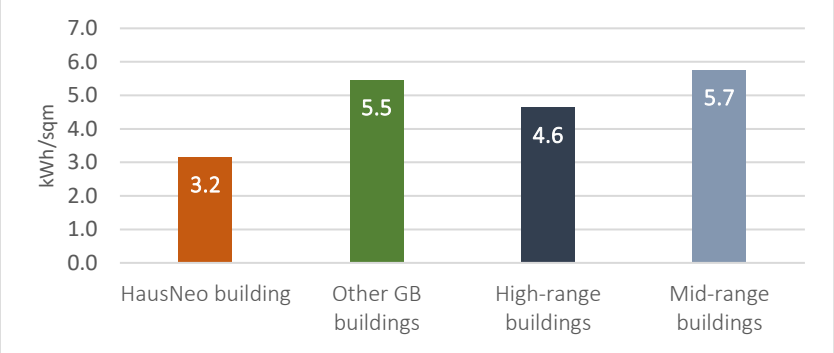

Figure 10. Average monthly power consumption (per sqm) between different HRB categories (N=126).

Within HausNeo, household power consumption is shown to have a clear *correlation with family size, family income, and education levels*. Specifically, power consumption increases by about 40%, 50%, and 70% between families of one or two, families of three or four, and families of more than five members, respectively (Figure 11).

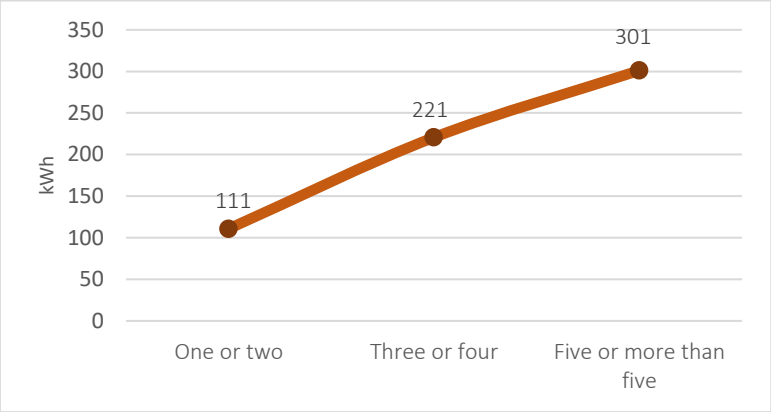

Figure 11. Family size and average monthly power consumption (N=94).

HausNeo households with higher education levels tend to consume more power. Although data shows that those in the university group consume less power than the college groups, their average is higher than those in the high school group (Figure 12).

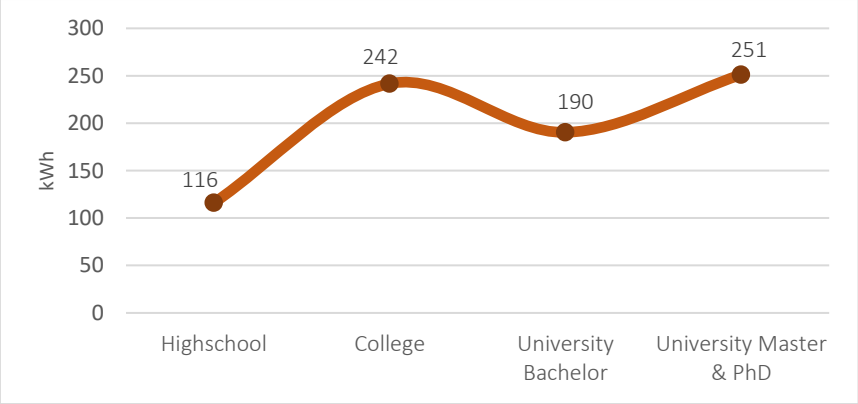

Figure 12. Education and average monthly power consumption (N=94).

Households with higher income consume more power. This trend is found to be similar in both HausNeo and NCB households (Figure 13).

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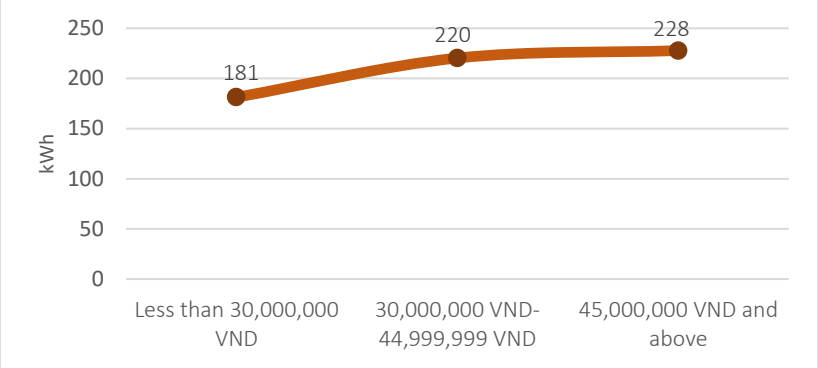

Figure 13. Income and average monthly power consumption (N=77).

Knowledge about GB certification

Surprisingly, our survey revealed that a large part (41%) of the interviewed HausNeo residents are unaware of the GB certification of the building they live in. This is an interesting finding, implying a lack of public awareness about GB concepts and certification schemes. Less surprisingly, the survey shows that less than half (only 45%) of the interviewees across all building categories know about GB certification, with 55% not knowing about it (see Figure 14). According to Figure 14, people living in GB buildings have a higher awareness of green building labels than those living in non-certified GB buildings. The reasons might be two-fold. Firstly, GB residents tend to have higher education and professional backgrounds, therefore likely having better environmental awareness and exhibiting more environmentally friendly lifestyles (illustrated in Figure 4). Secondly, GB knowledge might be influenced by the GB living environment itself. Thus far, the role of a GB living environment in raising GB awareness has not been well-studied in current literature, at least to the authors' knowledge (see for example [58]). This calls for more in-depth research and evidence-based findings to elaborate on the positive relationship between a GB living environment and its occupants' GB awareness.

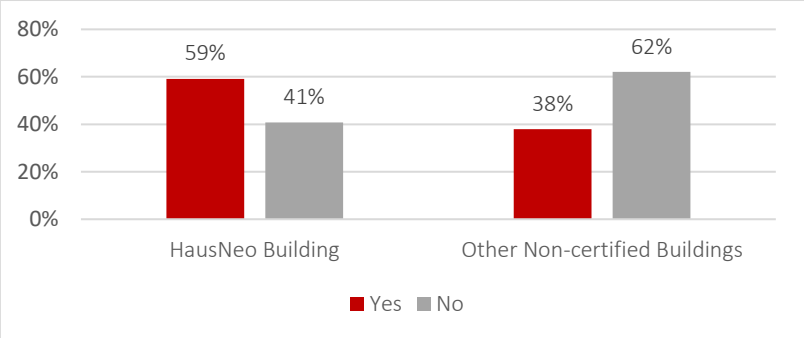

Figure 14. Awareness of GB certificates like EDGE, LEED, LOTUS (%) (N=514).

However, knowledge of GB certification is apparently influenced by the level of education. Figure 15 shows that people with higher education generally know more about GB certificates. About 80% of the group with Master's or PhD degrees know about GB certification, whereas about 80% of those without a college education are not aware of GB certification. The influence of education on knowledge about GB certification is consistent across all building types (see Figure 15). This finding is consistent with current literature that considers formal education an important parameter for sustainability awareness and practice [60]. The World Economic Forum (WEF) also points out the role of education in reshaping people's value systems and nurturing environmentally-conscious citizens, to support the transition to a prosperous and sustainable future [61].

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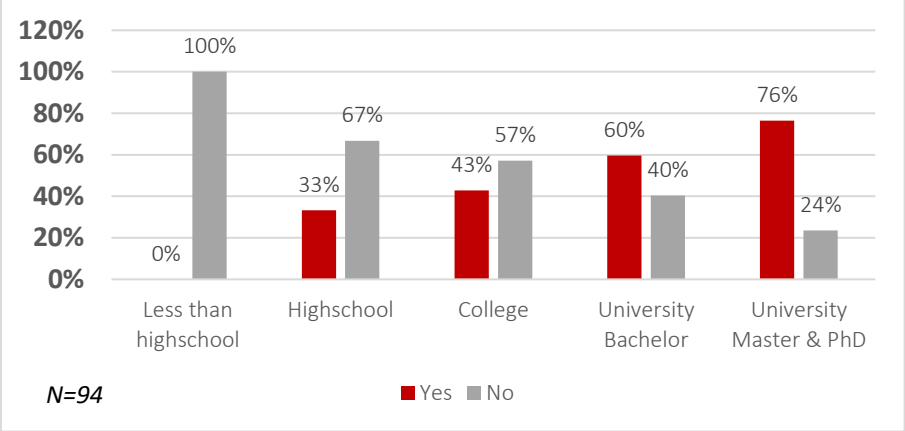

Figure 15. HausNeo households' knowledge about GB certificates among educational groups (%) (N=94).

The results show no clear correlation between income groups and GB certification knowledge. The lowest income group of less than 15.000.000 VND/month (about 640 USD) and the highest group of more than 45.000.000 VND/month (about 1,900 USD) know more about GB certification than the middle-income group (between 30.000.000 VND to 45.0000.000 VND/month [about 1,280 to 1,900 USD]). Working in less mainstream employment might influence people's GB awareness. Respondents who are skilled workers, freelancers, or professionals (i.e., lawyers or doctors) tend to have more GB knowledge than those who are unskilled workers (i.e., receptionists), medium or small businesses, and state employees.

Factors influencing homebuyers' decisions

Factors influencing households' homebuying decisions were evaluated based on Likert scales (1 being most important and 5 being least important). The perception of each factor's importance is examined based on ALV scores.

Sustainable building features

Among other things, a building's physical sustainable conditions are perceived as most important by HausNeo households, including: good construction quality (i.e., windows, walls, cooling insulation) (1.2), the natural ventilation system (1.22), and bright rooms with big windows (1.37). Home features for natural cooling and ventilation are also very important factors to NCB households (1.39 and 1.52 respectively). This finding positively reveals that households pay attention to GB features. However, the thematic webinars reveal the participants' shared view that there is a need to increase public awareness of green building features like environmentally friendly design, sustainable construction methods and materials, and energy sources or water usage (W1, W2, W3, W5, W6, W7). In their view, both homebuyers and businesses still misunderstand "green buildings", thinking that means planting many trees or having plant pots on the balcony.

Apartment price per sqm and energy-saving technical features

Apartment price per sqm is perceived as less important than green building features by HausNeo households (1.4). It is perceived as least important by NCB households (1.7). Technical features supporting energy saving are less important than apartment prices to HausNeo households (1.6), but more important than apartment prices to NCB households (1.6).

These findings are inconsistent with inputs of webinar participants from the corporate sector. Based on their market surveys, apartment price per sqm is perceived as the most important factor in homebuyers' decisions. Energy cost saving is also perceived by webinar participants to be an important benefit for homebuyers. This is reflected in the

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participants' statement: "Because homebuyers will benefit in saving future energy costs, they should be willing to pay higher to buy apartments…" (W2). To them, developers are hesitant to invest in more advanced environmentally friendly technology like low-emissive glass windows and solar panels, because homebuyers are still not willing to pay higher for GB projects (W1, W2, W5).

Other homebuying influencing factors

According to the results in Table 3, factors like Fengshui alignment, an apartment's good investment value, technical features for energy saving, and – surprisingly – apartment price are of the least concern for households in both GB-certified and non-certified buildings. Their ALV are respectively 2.1; 1.7; 1.6 for HausNeo and 1.7; 1.7; 1.6 for non-certified buildings. Homebuyers in general seem to be more pragmatic concerning spiritual Fengshui factors, and they are not highly concerned with apartment prices and energy costs. Instead, they pay the most attention to their home's features that are promoted by GB projects, like construction quality, natural ventilation, and lighting. Specifically, households in both GB-certified and non-certified buildings find the construction quality, a room's good natural ventilation, and bright rooms with big windows to be most important (ALV are respectively 1.2; 1.4; 1.4 for certified buildings and 1.4; 1.5; 1.6 for non-certified buildings). These results imply the high concern of homebuyers for features that are beneficial for human health and well-being. This implication is in line with the current literature. Accordingly, building's healthy structural features are found to be top driving factors in homebuyers' decisions- they are willing to pay for, as long as the structure provides them with a healthy, safe, and comfortable environment [62;63].

Table 3. Average Likert Value for important factors influencing homebuying decisions.

	Apartment price per sqm	**Bright rooms and big windows**	**Good natural ventilation of the rooms**	**Apartment investment value**	**Good construction quality**	**Fengshui alignment**	**Technical features for energy saving**
HausNeo	1.4 (N=169)	1.4 (N= 169)	1.2 (N=168)	1.7 (N=116)	1.2 (N=169)	2.1 (N=169)	1.6 (N= 169)
Non-certified buildings	1.7 (N= 363)	1.6 (N=345)	1.5 (N=363)	1.7 (N=358)	1.4 (N=363)	1.7 (N=345)	1.6 (N=362)
Total	1.6 (N=532)	1.5 (N=514)	1.4 (N=531)	1.7 (N=474)	1.3 (N=532)	1.9 (N=514)	1.6 (N=531)

Households' concerns

Households' concerning factors are also evaluated with ALV scores (1 for being most concerned and 5 for being least concerned). The consistent trend is that family health is perceived as most important by both HausNeo and NCB households (1.1 and 1.3, respectively). In HausNeo, 100% of respondents perceive family health as either very important (89%) or somewhat important (11%). The percentages vary, however, across age, education, and employment groups. Noticeably, higher age groups perceive health as more "very important" than younger groups, while higher education groups perceive it more as "somewhat important".

Table 4. Correlation between age groups and concern on family health in HausNeo (N=132).

	Age group 18-25 (%)	**Age group 26-40 (%)**	**Age group 41-55 (%)**	**Age group above 56 (%)**	**Total**
Very important	60 (N=3)	87 (N=86)	88 (N=7)	100 (N=4)	86 (N=100)

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Somewhat important	40 (N=2)	13 (N=13)	13 (N=1)	0 (N=0)	14 (N=16)

Family health is also perceived as most important in the general survey in HCMC (1.2 ALV), in which 80% of respondents perceive health as very important, 18% perceive health as somewhat important, and 2% perceive health as "so-so". The percentage of respondents who perceive health as more important is highest in certified GB buildings (88%) and higher market NCB projects (87%) (Table 5). This finding implies that households valuing health as more important are more willing to pay more for apartments. It is also consistent with the above results showing homebuyers' comparatively low concern about the apartment price. This willingness of homebuyers to pay a premium for green homes in order to enjoy a healthy living environment has also been confirmed in recent literature (see, for example [59]).

This means that consumers are willing to pay increased personal costs to pursue these goals. This finding added the fact that non-normative motivations- such as the benefits of a green home producing a healthier living environment, and potential future monetary return- may also explain their willingness to pay a premium for green homes.

Table 5. Correlation between building type & perception on family health in HCMC (N= 528).

	HausNeo	**High-range market buildings**	**Mid-range market buildings**	**Low-range market buildings**
Very important	88% (N=165)	87% (N=64)	79% (N=73)	68% (N=119)
Somewhat important	12% (N=23)	12% (N=9)	21% (N=19)	26% (N=46)
So so	0% (N=0)	1% (N=1)	0% (N=0)	5% (N=9)

According to the results of Table 6, family health is the most concerning factor for households in all building types (ALV of 1.1 and 1.3, respectively). This finding is consistent with the above results, confirming that households share a high concern for the health benefits of their living environment.

Interestingly, results in Table 6 show that there is not much difference between HausNeo and NCB households in their concern for environmentally conscious lifestyles and their families' education, time, and health. These results are relevant to data shown in Figure 3 and Figure 4, that families living in high-rise apartments are mainly young or middle-aged and educated. These families follow the popular movement pattern to high-rise apartments of the rapidly increasing middle class in Vietnam [64, 65]. Their concern for family factors somewhat reflects traditional family values in Vietnamese society [66]. The preference for an environmentally friendly lifestyle contributes to discussions on the rather high motivation of the Vietnamese urban middle class to live healthy lifestyles and protect the planet for future generations [67]. Such motivation, however, does not necessarily mean high awareness and knowledge of environmental issues or sustainable consumption [67].

For both groups of data, while family health is the most concerning factor, energy price is nearly the least concerning (ALV of 1.77 and 1.6). One reason for the low concern for energy prices might be that the energy price in Vietnam is relatively low compared with what people can afford. This assumption is consistent with the study of [68], which identifies that the current average retail electricity price in Vietnam is still low, about 8.1 US cents/kWh (subject to 10% VAT, as of 2019), and is among the lowest in the region.

Table 6. Average Likert Value of main concerns of HausNeo and NCB households.

	Family education	**Time with family**	**Energy price**	**Family health**	**Saving for high value products and services**	**Environmentally friendly lifestyle**
HausNeo (N=169)	1.2	1.3	1.8	1.1	2.2	1.6
NCB HHs	1.3	1.3	1.6	1.3	1.8	1.6

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(N=345)						
Total (N=415)	1.3	1.3	1.7	1.2	2.0	1.7

Experts' opinions on health co-benefits of green buildings

Health improvement is somewhat mentioned as a co-benefit of GB energy efficiency and carbon reduction features. According to the VGBC Chairperson, energy efficiency, carbon reduction, and health improvements are interconnected and form three pillars in the strategies of the World Green Building Council, of which Vietnamese VGBC is a member (W6). To webinar participants, although these tools are gaining global attention for prioritizing health-oriented criteria, they are not yet embraced in Vietnam due to higher investment demands. Participant observation in the webinars shows that health co-benefits, despite being implicitly understood to be co-benefits of certified GB features, have not been explicitly expressed by participants as a strategic benefit of GB projects.

The GB market in Vietnam is still at its initial stage and mainly focuses on energy-saving solutions, instead of more advanced health-impacting and carbon emission-reduction solutions. Specifically, a participant emphasized: "Vietnam's GB market is not quite there yet, at the stage of passing the energy efficiency part to promote material embodied carbon reduction or environmental product declaration part" (W2). To address this, participants commonly recommended the critical role of the government in reinforcing building codes and enabling a higher market level.

5. Discussion

The above survey findings, in combination with expert interviews and webinar discussions, shed light on the following implications for the opportunities and challenges of the GBM in Vietnam.

Green buildings' low energy consumption versus households' complex perspectives

The HausNeo case study provides initial evidence of the lower average power consumption and higher environmental awareness of its households. While the lower power consumption might be explained by the smaller family sizes, it clearly relates to the buildings' passive design solutions and physical structures (i.e., the installation of energy-efficient lighting systems, as per individual interviews with HausNeo leadership and technical staff). The low power consumption might also result from people's higher environmental awareness. This awareness probably stems from their existing education or professional background, but also increases due to their GB environment. This, if true, is consistent with webinar participants' perceptions that social awareness is increased by the green building environment because homebuyers are attracted to the unique green building features. Such relations between the living environment and home users, indeed, have also been suggested by Barton and Grant (2006).

The power consumption within HausNeo households is, however, defined by the households' diversified socio-economic conditions (i.e., age, education, family sizes, income groups, employment). Interestingly, people with higher education tend to consume more power. Although these correlations need to be verified by more in-depth studies, they underline the complexity resulting from households' diversified demographic socio-economic conditions and levels of environmental awareness and habits. Such complexity requires greater attention from policymakers and developers to achieve commitments toward the sustainability of the building sector.

High attention to GB features versus low awareness about GB certification

Although sustainable building features are most influential in the homebuying decisions of both HausNeo and NCB households, there is unexpectedly low social awareness of GB certification, as revealed in the survey data and experts' discussion. Homebuyers seem to value building features that are environmentally friendly and health-beneficial, but they are shown to be unfamiliar with the GB term. These findings are remarkable. On

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one hand, they imply a positive potential for the GB market in Vietnam. On the other hand, they reveal homebuyers' resistance towards GB projects and persisting social and cognitive barriers for the Vietnamese GBM. Public awareness-raising programs are, therefore, urgently needed from the government, developer companies, and professional organizations. Knowledge-building and communication programs should not only be about the types of GB rating tools but also about specific GB features which highly attract homebuyers.

Health concern versus low priority for apartment price and energy savings

Both HausNeo and NCB households are most concerned about family health. In contrast, apartment price and energy cost savings are perceived as less important by all survey respondents. Together with the above, these findings suggest that households prioritize well-being and health benefits more than purely cost issues. This general finding contrasts with the views from the webinar discussions.

According to the webinar participants, a significant obstacle is the well-known paradox between investors' higher investment costs and homebuyers' unwillingness to pay more, despite their future lower operation cost benefits. They emphasize that "GB investment cost is undoubtedly the question of the future and green buildings should be more affordable" (W2, W4, W5, W6). However, the case of HausNeo revealed that additional investment costs for EDGE certification were only about 1% of the total cost.

This shows that there are still incorrect perceptions, even among local experts in the field. Such contradictions need to be further investigated. Our survey indicated that homebuyers might be willing to pay higher prices if they understand that the apartments meet their expected sustainable building conditions and health benefits. Additionally, because saving energy and energy costs are not homebuyers' most concerning issues, reduced energy bills should not be the most important benefit communicated to homebuyers. Instead, the health co-benefits of GB features should be given significantly higher attention for both developers and homebuyers. More focus on health benefits in the context of green building promotion schemes might therefore justify a premium on the side of the developer company and achieve greater acceptance from the buyer side. In addition, public GB awareness-raising programs should therefore target not only homebuyers but also developers and professionals who play an important role in driving the GB market.

The need for consideration of health co-benefits in Vietnamese GBM

Together, the findings of the household survey and the experts' opinions show that there is a lack of consideration of the health co-benefits of the GBM in Vietnam, which, like other ongoing sustainability efforts, primarily target environmental and economic efforts instead of health. This mismatch between health and the GBM in Vietnam can be clearly seen through the lack of health-related topics in reviewed academic literature, the focus of webinar participants on cost and energy issues rather than on GB's health co-benefits, the paradox between homebuyers' high concern for health and low interest in GB certifications, and the paradox between investors' high concern for investment cost and homebuyers' low concern for apartment price per sqm. In addition to the reviewed challenges of the Vietnamese GBM, the paper uncovers that the country's GBM is challenged by the lack of consideration of health co-benefits by GBM stakeholders, which are proved to be of high concern for homebuyers.

The mismatch between concepts of health and built environments investigated in this paper emphasizes the need for a system governance approach prioritizing advancing health and health equity in urban settings. Indeed, as suggested by Lawrence (2017) [12], housing and health should be considered fundamental societal challenges rather than disciplinary subjects of professional expertise. They require coordinated research agendas to achieve collective understanding and action across practitioner professions [7]. This will be critical in research and practice to address the complex challenges of SDG implementation and promotion of the New Urban Agenda [12,3].

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6. Conclusion

The influence of built environment policies on health and well-being has been acknowledged as a result of the global increase in non-communicable diseases and improved understanding of the social determinants of health in the past decades [59]. However, there is still a lack of effective consideration of health's formative role in urban discussions and urban public health policy questions, as pointed out by Herrick (2016) [14]. This paper responds to this call, investigating opportunities and challenges of the Vietnamese GBM in relation to the urgent Urban Health paradigm.

With a focus on building users' perspectives, the paper examines a GB case study with 169 households, within the context of a larger 560-household sample survey in HCMC, and transdisciplinary insights from six thematic webinars attended by renowned scholars, policymakers, professionals, experts, practitioners, and developers active in the Vietnamese GBM and construction sectors.

Among others, our findings illustrate that there is an apparent mismatch within GB awareness- building health benefits are of strong concern for homebuyers, but have been largely overlooked in favor of factors like apartment price and reduced energy costs, which are not necessarily homebuyers' biggest concerns. This mismatch requires attention from relevant stakeholders (i.e., policymakers, professionals, developers, etc.) if the Vietnamese GBM is to take off. For example, in terms of policies, the health benefits of GBs should be identified as an essential criterion for the evaluation of a GB project with an established measurable indicator system. For the market, developers should emphasize the evidence-based health co-benefits of GB projects in their marketing and customer communication strategies to improve public understanding of the health impacts of a GB living environment.

With this evidence-based inquiry, the paper concludes that the aspects of health and well-being should be highlighted more strongly as essential co-benefits of green buildings – alongside well-known aspects like energy efficiency. Furthermore, this paper increases attention to the need for a more systemic and transdisciplinary approach in efforts, both academic and practical, to ensure these intertwined co-benefits, within the implementation of SDG3- to "ensure healthy lives and promote wellbeing for all ages"- and SDG 11- "to make cities and human settlements inclusive, safe, resilient and sustainable".

This paper is, however, still of an exploratory nature- limited to a single case study and limited information from a relatively small number of webinars and expert interviews. Future research should provide more empirical evidence from a larger number of certified GB projects and respondents. Health co-benefits of GB features (i.e., thermal comfort, lower air pollution levels, carbon emission reductions, etc.) should be further studied. There is also a crucial need to understand the extent to which health and well-being are covered within the national legislation and the regulatory framework on all administrative levels, particularly concerning the built environment.

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Complementary acknowledgements in order of addition

Appendix A

Table A1. List of transdisciplinary thematic webinars.

Order	Webinar title	Date	Code
1	Presentation on primary research analysis results with the Developer Company of HausNeo, EZ Land, Ho Chi Minh City, Vietnam	05.04.2021	W1
2	Challenges and Opportunities of Green Building Movement in Vietnam, collaboration with Green Sector Business Committee of European Chamber of Commerce, Ho Chi Minh City, Vietnam	26.09.2021	W2
3	Challenges and Opportunities of promoting green buildings in the coastal areas of Central Vietnam, collaboration with Central University of Civil Engineering (MUCE), Tuy Hoa, Vietnam	16.12.2021	W3
4	HOPE 1: Policies and Practices to engage with building users in creating well-being and sustainable living environment in Vietnamese cities, collaboration with the Competence Center for Sustainable Buildings in Vietnam (CCSB-VN) and Konrad Adenauer Foundation, Hanoi, Vietnam	20.04.2022	W4
5	HOPE 2: Health Governance to promote inclusive urban planning approaches targeting the quality of life for citizens in Vietnam collaboration with the Competence Center for Sustainable Buildings in Vietnam (CCSB-VN) and Konrad Adenauer Foundation, Hanoi, Vietnam	30.06.2022	W5
6	HOPE 3: Green building design and sustainable neighborhood development towards public health in the built environment of Vietnam collaboration with the Competence Center for Sustainable Buildings in Vietnam (CCSB-VN) and Konrad Adenauer Foundation, Hanoi, Vietnam	18.08.2022	W6
7	HOPE 4: Health governance to promote comprehensive life cycle assessment of materials in regard of sustainable construction in Vietnam collaboration with the Competence Center for Sustainable Buildings in Vietnam (CCSB-VN) and Konrad Adenauer Foundation, Hanoi, Vietnam	28.09.2022	W7

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Appendix B: Household Questionnaire (English)

1 INTERVIEW DATE AND CONTACT

This section helps (1) to identify the interviewer for eventual check-backs and (2) to link the questionnaire to the building fact sheet.

1,1 date of interview (dd/mm/yyyy)

1,2 Name of the interviewee

If interviewee is under 18 years, ask another person in the household; if there is none, end the interview.

1,3 Phone number of interviewee (optional)

2 INFORMATION ABOUT THE BUILDING

2,1 Name and address of the building

2,2 Name of investor / developer

2,3 Date of opening after completion of construction in month and year

2,4 Type of buildings (Single HRB of multi-purposes/complexed urban center/KĐTM

2,5 Geographical condition (city core center/city sub-core center/newly developed peripheral area)

2,6 Average price range per m^2

2,7 Total number of floors (excluding basements), apartments, construction density

2,8 Select the type of green certification, the building has:

2,9 Do the building have any solution to increase EE/reduce energy consumption (e.g. window materials/window-wall ratio/shading solution/renewable energy generation

2.10 Does the building have any distinguished facilities, compared with other HRB

3 INFORMATION ABOUT THE APARTMENT

3,1 **Room number**

3,2 **Floor**

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3,3 **Size**

3,4 **Orientation**

3,5 **Energy Efficiency Solutions (Window material, Window-to-wall ratio,etc.)**

4 INFORMATION ABOUT THE INTERVIEWEE

4,1 **Gender:**

male / female / other

4,2 **What is your age?**

If interviewee is under 18 years, ask another person in the household; if there is none, end the interview.

4,3 **Are you a decision maker in your household? E.g. you know details about the spending of the household and the maintenance of the apartment.**

If not, ask for another person in the household; if there is none, end the interview.

5 HOUSEHOLD PROFILE

We would like to know more about the comfort in your apartment and your satisfaction with it. But before, we would like to ask you some general questions about your household situation and apartment.

5,1 **How many people live in your apartment permanently, you included? Mark the number of adults and children.**

Adults

1 / 2 / 3 / 4 / 5

Individuals below the age of 18 years

0 / 1 / 2 / 3 / 4 / 5

5,2 **What is your household's monthly income (total in VND)? Of course, you can refuse to give this information.**

below 5,500,000 / 5,500,000 – 6,499,999 / 6,500,000 – 7,499,999 / 7,500,000 – 8,499,999 / 8,500,000 – 9,499,999 / 9,500,000 – 10,499,999 / 10,500,000 – 11,499,999 / 11,500,000 – 12,499,999 / 12,500,000 – 13,499,999 / 13,500,000 – 14,999,999 / 15,000,000 – 29,999,999 / 30,000,000 - 44,999,999 / 45,000,000 - 74,999,999 / 75,000,000 - 149,999,999 / 150,000,000 and higher

Tick, if interviewee **refuses** to answer this question

5,3 **What is the highest educational level within your household?**

less than highschool / highschool / college / university Bachelor / university Master & PhD

5,4 **Did someone in your household got education abroad ?**

Master abroad

PhD abroad

5.5. **How many cars and/or motorcycles does your household own? 0 means, your household does not own cars/motorcycles.**

cars

motorcycles

5,6 **Do you own and rent out real estate?**

5,7 **How much do you pay for the building management fee per month (without parking) in VND?**

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5,8 **Could you please provide us the power consumption records of the year 2019 and 2020. (The data can be accessed via evnhanoi.com.vn with your household's customer number and password)**

Tick, if interviewee **refuses** to give the information

After giving information about your household's energy consumption, would you tell us about the high-energy domestic appliances your household owns?

5,9 **How many of these items owns your household? 0 means, you don't own the article.**

e-car

e-bike

microwave

TV

fridge

baking oven

washing machine (with and without drying option)

water heater (privately owned)

A/C

6 HOUSEHOLDS' HABITS/BEHAVIOUR AND ATTITUDE

We are interested in your satisfaction with the temperature, humidity and general air quality with your apartment. Before we ask you about that, we would like to understand better, what kind of climate regulation you use and how.

6,1 **What is the type of cooling system that you use in your apartment? Select one of the options given below.**

completely air-conditioned apartment / mixed: partly air-conditioned, partly with fans and natural ventilation / mechanical ventilation (fans, movable or ceiling) / completely naturally ventilated (windows) in all rooms / I am not sure

6,2 **When you buy electric appliances, how important are price, brand, and energy label for your decision? Please rate with very important, important, so-so, less important, not important.**

How important is the **price** of electric appliances, e.g. air-conditioner, fridge, or water boiler, for you?

very important / important / so-so / less important / not important

How important is the **brand** of electric appliances, e.g. air-conditioner, fridge, for you?

very important / important / so-so / less important / not important

How important is the **energy star label** of electric appliances, e.g. air-conditioner, fridge, for you?

very important / important / so-so / less important / not important

6,3 **Now, we would like to know more about the energy-efficiency of your A/C.**

Have you **bought** the A/Cs in your apartment yourself?

How many energy stars have your A/Cs? If you own more than one A/C with several energy star ratings, please select the **energy star rating** with the lowest rating.

no certificate / 1 star / 2 stars / 3 stars / 4 stars / 5 stars

What is the **brand** of your A/C?

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We would like to know more about how exactly you use the A/Cs in the living room and your sleeping room. We will ask you about how you use them in springtime, in summer, in autumn and in winter. Please have a look with me at the matrix (matrix 2)

6,4 **How do your household use the A/Cs in the sleeping room (when, mode, temperature setting and temperature change)**

6,5 **How much do you agree to the following statements? Please rate with I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree.**

Whenever possible, I **turn off the A/C** and switch to window and electric fan.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

In the hot season, I let the A/C **run the whole night** in the sleeping room.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

I use an A/C temperature and A/C mode that helps me to **save energy costs**.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

I turn off the A/C after a while, because the **climate gets uncomfortable**, e.g. too cold, or too dry.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

I keep the windows closed, because the **high noise level** outside disturbs me.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

I keep the windows closed to protect my home from **dust and outdoor pollution**.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

6,6 **When you decided to buy the apartment, how important were the following factors for your decision? Rate with very important / somewhat important / so-so / somewhat unimportant / unimportant**

the **services offered** within the building (swimming pool, shops, playground, gym, etc.)

very important / somewhat important / so-so / somewhat unimportant / unimportant

apartment is on the "cooler", **sun- and weather-protected** side of the building

very important / somewhat important / so-so / somewhat unimportant / unimportant

the **location** of the building, e.g. proximity to workplace, family members, schools

very important / somewhat important / so-so / somewhat unimportant / unimportant

good **price/ sq. m** of the apartment

very important / somewhat important / so-so / somewhat unimportant / unimportant

Bright rooms and **big windows**

very important / somewhat important / so-so / somewhat unimportant / unimportant

Good **natural ventilation** of the rooms

very important / somewhat important / so-so / somewhat unimportant / unimportant

Apartment is a **good investment** and its value develops positively

very important / somewhat important / so-so / somewhat unimportant / unimportant

A good **construction quality** (e.g. of windows, walls, cooling system, insolation)

very important / somewhat important / so-so / somewhat unimportant / unimportant

A good **noise protection** by sound insolation

very important / somewhat important / so-so / somewhat unimportant / unimportant

Apartment suits to **feng shui**

very important / somewhat important / so-so / somewhat unimportant / unimportant

Technical features of the apartment and building support **energy-saving**

very important / somewhat important / so-so / somewhat unimportant / unimportant

A **great view**

very important / somewhat important / so-so / somewhat unimportant / unimportant

6,7 **Please answer the following questions about energy-saving, health, and certifications.**

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I would like to know more about **solutions that help me to save energy** in my home.

I would like to know more about how the indoor **climate of my apartment affects the health** of my family

I trust the **energy certification** of electronic devices, e.g. energy star.

6,8 **Do you know green building certificates like Lotus, EDGE, LEED?**

If yes, how much do you agree with the following statements?

I trust Green Building certificates, such as Lotus, EDGE, LEED.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

when buying my apartment, a green building certificate was important to my decision.

I strongly agree / I somewhat agree / so-so / I somewhat disagree / I strongly disagree

6,9 **What are the main concerns for your household? Please rate from very important / somewhat important / so-so / somewhat unimportant / not important at all for each item.**

education and career

very important / somewhat important / so-so / somewhat unimportant / not important at all

leisure and vacation

very important / somewhat important / so-so / somewhat unimportant / not important at all

spending time with my family

very important / somewhat important / so-so / somewhat unimportant / not important at all

the energy prices

very important / somewhat important / so-so / somewhat unimportant / not important at all

family health

very important / somewhat important / so-so / somewhat unimportant / not important at all

saving for high-value products and services (a car, a travel abroad etc.)

very important / somewhat important / so-so / somewhat unimportant / not important at all

to live environmental-friendly (e.g. save water and energy, eat less meat, etc.)

very important / somewhat important / so-so / somewhat unimportant / not important at all

END OF QUESTIONNAIRE - THANK YOU FOR YOUR TIME

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Appendix C: Household Questionnaire (Vietnamese)

NỘI DUNG BẢNG HỎI	
1	**THỜI GIAN VÀ NGƯỜI PHỎNG VẤN**
1,1	Ngày phỏng vấn (ngày/tháng/năm)
1,2	Tên người được phỏng vấn
	Nếu người phỏng vấn phải trên 18 tuổi. Nếu không có ai trên 18 tuổi, không thực hiện phỏng vấn.
1,3	Số điện thoại liên hệ của người được phỏng vấn
2	**THÔNG TIN VỀ TOÀ NHÀ**
2,1	Tên và địa chỉ toà nhà
2,2	Tên chủ đầu tư/đơn vị phát triển nhà
2,3	Ngày khởi công/hoàn thành dự án nhà chung cư
2,4	Loại dự án chung cư (Toà nhà phức hợp nhiều mục đích/Tổ hợp khu đô thị mới)
2,5	Vị trí địa lý (Trung tâm lõi thành phố/Khu vực kề trung tâm thành phố/ Khu ngoại vi mới đô thị hoá
2,6	Khung giá trung bình/m2.
2,7	Số tầng (không tính tầng hầm), số căn hộ, mật độ xây dựng
2,8	Loại chứng chỉ công trình xanh của dự án (nếu có)
2,9	Toà chung cư có áp dụng giải pháp nào để tăng cường tiết kiệm năng lượng/giảm sử dụng điện (e.g., vật liệu cửa sổ/tỉ lệ giữa tường và cửa sổ/giải pháp tạo bóng râm/năng lượng tái tạo)
	Dự án chung cư có dịch vụ/cơ sở vật chất nào khác biệt so với các chung cư thông thường khác
3	**THÔNG TIN VỀ CĂN HỘ**
3,1	**Số phòng**
3,2	**Tầng**
3,3	**Diện tích**

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3,4 **Hướng**

3,5 **Giải pháp tiết kiệm năng lượng (vật liệu cửa sổ, tỉ suất giữa tường và cửa sổ, vv)**

4 THÔNG TIN VỀ NGƯỜI ĐƯỢC PHỎNG VẤN

4,1 **Giới tính**

Nam/Nữ/Khác

4,2 **Tuổi**

4,3 **Bác/Cô/Chú/Anh/Chị có phải là chủ hộ gia đình không? Ví dụ, Bác/Cô/Chú/Anh/Chị có biết mức độ chi tiêu trong gia đình và việc bảo trì căn hộ không?**

Nếu người phỏng vấn cần phải là chủ hộ. Nếu không cần dừng cuộc phỏng vấn.

5 THÔNG TIN VỀ HỘ GIA ĐÌNH

5,1 **Có bao nhiêu người sống trong hộ gia đình Bác / Cô / Chú / Anh / Chị**

Người lớn

1 / 2 / 3 / 4 / 5

Người dưới 18 tuổi

0 / 1 / 2 / 3 / 4 / 5

5,2 **Tổng thu nhập của hộ gia đình là bao nhiêu (bằng VNĐ). Người được phỏng vấn có thể không cần chia sẻ thông tin này**

below 5,500,000 / 5,500,000 – 6,499,999 / 6,500,000 – 7,499,999 / 7,500,000 – 8,499,999 / 8,500,000 – 9,499,999 / 9,500,000 – 10,499,999 / 10,500,000 – 11,499,999 / 11,500,000 – 12,499,999 / 12,500,000 – 13,499,999 / 13,500,000 – 14,999,999 / 15,000,000 – 29,999,999 / 30,000,000 - 44,999,999 / 45,000,000 - 74,999,999 / 75,000,000 - 149,999,999 / 150,000,000 and higher

Tích vào ô nếu người được phỏng vấn từ chối

5,3 **Trình độ học vấn cao nhất trong hộ gia đình**

Dưới mức trung học phổ thông/ Trung học phổ thông / Cao đẳng/ Đại học/ Thạc sỹ & Tiến sỹ

5,4 **Trong gia đình có ai được đào tạo ở nước ngoài không?**

Thạc sỹ
Tiến sỹ

5.5. **Hộ gia đình Bác/Cô/Chú/Anh/Chị có bao nhiêu xe ô tô và xe máy?**

Ô tô
Xe máy

5,6 **Gia đình Bác/Cô/Chú/Anh/Chị có bất động sản cho thuê không?**

5,7 **Hộ gia đình Bác/Cô/Chú/Anh/Chị phải trả bao nhiêu phí quản lý dịch vụ căn hộ một tháng?**

5,8 **Bác/Cô/Chú/Anh/Chị có thể chia sẻ thông tin về chỉ số điện sử dụng của hộ gia đình trong năm 2019 và 2020 không? Thông tin cần được truy cập qua tài khoản với mã số khách hàng trên website của Điện lực Việt Nam (evnhanoi.vn)**

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Tích vào ô nếu người được phỏng vấn từ chối

Sau khi chia sẻ thông tin về chỉ số điện, Bác/Cô/Chú/Anh/Chị có thể cho biết thiết bị điện nào sử dụng nhiều điện nhất trong gia đình

5,9 **Gia đình Bác/Cô/Chú/Anh/Chị có bao nhiêu phương tiện/thiết bị nào sau đây?**

Ô tô điện

Xe đạp điện

Lò vi sóng

TV

Tủ lạnh

Lò nướng

Máy giặt (có hoặc không có máy sấy)

Bình nước nóng (riêng trong căn hộ)

Điều hoà

Quạt điện

Máy rửa bát

Khác

6 THÔNG TIN VỀ THÓI QUEN/THÁI ĐỘ CỦA HỘ GIA ĐÌNH

6,1 **Gia đình Bác/Cô/Chú/Anh/Chị làm mát căn hộ bằng cách nào?**

hoàn toàn bằng máy điều hoà/kết hợp giữa máy điều hoà, thông gió tự nhiên và quạt/chỉ bằng quạt (quạt cây, quạt tràn)/ hoàn toàn thông gió tự nhiên ở tất cả các phòng/không chắc chắn.

6,2 **Khi Bác/Cô/Chú/Anh/Chị mua thiết bị điện, các yếu tố sau đây có tầm quan trọng như thế nào? Bác/Cô/Chú/Anh/Chị hãy chọn một trong các phương án.**

Giá thiết bị điện có tầm quan trọng như thế nào (như điều hoà, tủ lạnh, bình nước nóng, vv) ?

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Thương hiệu thiết bị điện có tầm quan trọng như thế nào (như điều hoà, tủ lạnh, bình nước nóng, vv) ?

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Nhãn dán năng lượng có tầm quan trọng như thế nào (như điều hoà, tủ lạnh, bình nước nóng, vv) ?

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

6,3 **Bác/Cô/Chú/Anh/Chị có thể chia sẻ thông tin về điều hoà trong gia đình không?**

Hộ gia đình có tự lắp điều hoà không?

Nhãn dán năng lượng của máy điều hoà của hộ gia đình có mấy sao? Lấy số sao cao nhất trong hộ gia đình

Không có nhãn dán năng lượng / 1 sao / 2 sao / 3 sao / 4 sao / 5 sao

Thương hiệu máy điều hoà

6,4 **Gia đình Bác/Cô/Chú/Anh/Chị sử dụng điều hoà như thế nào? (khi nào, chế độ, nhiệt độ, việc thay đổi nhiệt độ)**

6,5 **Bác/Cô/Chú/Anh/Chị đồng ý như thế nào với các mệnh đề sau? Hãy chọn một trong các phương án: rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.**

Khi nào có thể, tôi **tắt điều hoà** và chuyển sang mở cửa sổ và dùng quạt

rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

Vào mùa nóng, tôi bật **điều hoà suốt đêm** trong phòng ngủ

rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

Tôi bật chế độ và nhiệt độ điều hoà theo **chế độ tiết kiệm điện**

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rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

Tôi tắt điều hoà sau một thời gian vì **nhiệt độ trong phòng** trở nên quá lạnh/quá nóng

rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

Tôi đóng cửa sổ vì **tiếng ồn bên ngoài** làm tôi khó chịu

rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

Tôi đóng cửa sổ để **tránh bụi và ô nhiễm** bên ngoài

rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

6,6 **Khi mua căn hộ chung cư, các yếu tố sau đây tác động như thế nào đến quyết định của Bác/Cô/Chú/Anh/Chị. Xin chọn một trong các phương án rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng**

Dịch vụ đi kèm trong toà nhà (Bể bơi, cửa hàng, sân chơi, phòng tập gym, vv)

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Căn hộ ở **hướng mát,** không bị ảnh hưởng bởi mặt trời, và thời tiết.

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Vị trí chung cư, gần nơi làm việc, gia đình, trường học

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Giá căn hộ/m2

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Phòng sáng và cửa sổ to

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Thông gió tự nhiên của các phòng trong căn hộ

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Giá trị căn hộ tăng để làm **tài sản đầu tư**

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Chất lượng xây dựng và vật liệu trong căn hộ (cửa sổ, tường, vv)

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Căn hộ được **chống ồn tốt**

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Phong thuỷ của căn hộ

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Đặc tính kỹ thuật của căn hộ và chung cư **giúp tiết kiệm năng lượng**

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Một cái nhìn tuyệt vời

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

6,7 **Xin Bác/Cô/Chú/Anh/Chị cho ý kiến về các mệnh đề sau**

Tôi muốn tìm hiểu các giải pháp giúp tôi tiết kiệm năng lượng cho căn hộ của mình

Tôi muốn biết điều kiện vi khí hậu trong căn hộ ảnh hưởng đến sức khoẻ của gia đình tôi như thế nào

Tôi tin tưởng nhãn dán năng lượng phản ánh đúng chất lượng tiết kiệm điện của các thiết bị

6,8 **Bác/Cô/Chú/Anh/Chị có biết các chứng chỉ công trình xanh như Lotus, EDGE, LEED không?**

Nếu có, Bác/Cô/Chú/Anh/Chị đồng ý như thế nào với các mệnh đề sau

Tôi tin các chứng chỉ công trình xanh

rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

Khi mua căn hộ chung cư, việc dự án có chứng chỉ công trình xanh ảnh hưởng đến quyết định của tôi

rất đồng ý/cũng đồng ý/bình thường/không đồng ý lắm/phản đối.

6,9 **Mối quan tâm của gia đình Bác/Cô/Chú/Anh/Chị là gì. Xin Bác/Cô/Chú/Anh/Chị lựa chọn một trong các phương án sau: rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng**

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Giáo dục và sự nghiệp

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Vui chơi, kỳ nghỉ

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Dành thời gian cho gia đình

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Chi phí sử dụng năng lượng

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Sức khoẻ gia đình

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Tiết kiệm tiền để mua phương tiện đắt tiền (xe ô tô) hoặc đi du lịch

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

Sống thân thiện với môi trường (tiết kiệm nước, điện, giảm ăn thịt, vv)

rất quan trọng / cũng quan trọng / bình thường/ không quan trọng lắm/ hoàn toàn không quan trọng

KẾT THÚC PHỎNG VẤN - CẢM ƠN SỰ THAM GIA CỦA Bác / Cô / Chú / Anh / Chị

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