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A Platform of Critical Barriers to Socially Sustainable Residential Buildings: Experts' Perspective

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Abstract: The concept of sustainable cities and communities is endorsed as one of the seventeen goals of sustainable development. Since buildings represent an essential element of the city, they play a primary role in achieving the social, economic, and environmental sustainability of cities. Previous studies have pointed to the lack of emphasis on the social aspect of buildings. Aiming to fill the gap, this research is focused on identifying barriers that hinder the adoption of social sustainability (SS) measures and practices in residential buildings, as a first step in overcoming these barriers and enabling faster achievement of SS goals. The initial platform of barriers was derived from a comprehensive review of the published literature, international reports, and green building rating systems. For the selection of critical barriers, the Delphi method was used with the participation of 60 international experts. Of 58 barriers initially identified from the literature and experts' suggestions, 29 were selected as important and classified into five groups. Further, in each of these groups three barriers were singled out, the overcoming of which would facilitate and speed up buildings' SS to the greatest extent. These results provide insight into barriers to SS for policy makers, developers, and planners, invite further studies on this topic, and provide a starting point for other researchers to identify the most relevant barriers in different contexts, i.e., countries and regions with their specific characteristics. This will further create the conditions for the elimination of barriers to SS by focusing on the most critical issues.

Keywords: barriers; Delphi study; residential building; social sustainability; socially sustainable building

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1. Introduction

The commonly accepted definitions of sustainable development, according to the report of the Commission for the Environment and Development ''Our Common Future'', which was later dubbed the Brundtland Report [1], focus on the use of resources by the current generations without compromising the ability of future generations to meet their own needs [1,2]. The built environment, as a huge determinant of sustainable development, hosts economic activities, protects life and health and the psychological and social welfare of its inhabitants, and sustains aesthetic and cultural values [3,4]. Generally, it delivers integral or holistic quality [5], including economic, ecological, social, and cultural benefits, and provides a suitable environment for humans to reside and work in. However, the definition of a built environment has changed over time and continues to undergo ever faster changes. According to the authors of [6–8], current sustainability practices related to the built environment, such as 'business as usual', 'green', or 'high performance', which aim to do 'less harm' in terms of energy, carbon, or waste, are not sufficient anymore to achieve a sustainable built environment with environmental, social, cultural, and economic

advantages. New concepts are coined and promoted, considering not only resources but also a need to produce more than consume, in order to achieve a fully sustainable built environment. Thus, according to leading professionals in the field, we are witnessing a restorative and regenerative shift in the sustainability concept, where ecological and community restoration or regeneration is endorsed as a new goal, and the success is measured by improvements in health and well-being for humans, other living beings, and ecosystems as a whole [9–13]. The United Nations Sustainable Development Goals (SDGs) are infusing sustainability with proactive, global, social goals, moving us away from the Brundtland paradigm [14]. All this indicates that the brunt of sustainability has shifted from the environmental–energy aspect only toward more human, i.e., social interests, considering also significant human-centric attributes.

Consequently, sustainability in buildings is increasingly becoming a key consideration for building owners and tenants with the 'triple bottom line' as a desired outcome [15]. Understanding the development of a sustainable building is of great significance for the sustainable development of the construction industry. With the rapid development of materials science and construction technology, the sustainable building concept has also evolved. It is assumed that there are three 'pillars'/'dimensions' [16–23] within the concept that integrate social, economic, and environmental concerns and that their interconnections are compatible and mutually supportive [24,25]. Yet, the well-known typology of sustainable buildings in the construction sector, also known as the three 'Ps' (Planet, Profit, and People) or the three 'Es' (Environment, Economy, and Equity), often emphasizes trade-offs between economic growth, environmental conditions, and the quality of life [26]. Sustainable buildings and regeneration projects should also significantly contribute to social well-being [4,27]. That is why some authors [28] argue, in contrast to a holistic integrated approach, that the three "types" of sustainability are "clearest when kept separate", and that "the disciplines best able to analyze each type of sustainability are different". On the other side, according to Boström [25], only full "integration and reconciliation" of the three dimensions, as well as a "balanced and holistic approach" could build a humane and equitable global society, plan new housing developments for present and future generations, and measure their success by factors which are tangible and easier to count and audit. However, all three aspects of sustainability are not equally represented in buildings. Previous researchers have found that when policy makers endorse sustainable building development, the social dimension garners less attention or is dismissed altogether [24,29–35], since it is particularly difficult to realize and operationalize [25].

Therefore, recent years have seen significant efforts among standard setters, planners, and practitioners in various sectors to address the often-neglected social aspect of sustainability. Likewise, over the past decade, efforts have been made to develop theoretical frameworks for defining and studying SS. Empirical investigations about sustainability projects, sustainability practices, and sustainability initiatives [25], as well as the ways SS is applied in practice by building industry stakeholders, particularly relevant to urban development and housing discourse [35–39], are part of a vast number of studies. There is no common definition and conceptualization of the term 'social sustainability', and it has been argued to be the vaguest and least explicit dimension [40]. SS is neither an absolute nor a constant, but, rather, a dynamic concept that changes over time and place [35,41]. It encompasses many other related concepts: social equity and justice, social capital, social cohesion, social exclusion, environmental justice, quality of life, and urban livability [42]. Within the holistic view, SS aims to respond to the needs of people at every stage of involvement in the construction process (from commissioning to demolition), provide high customer satisfaction, and work closely with clients, suppliers, employees, and local communities [43,44]. A sustainable construction project should have social considerations for the stakeholders and end-users, the project's influence on the surrounding community, and the health, safety, and education of employees. Integrating these factors will enhance both the long-term project efficiency and the quality of life of those impacted by the project [44,45]. Winston [46] presented a new definition and conceptualization of sustainable construction development

and regeneration in which the environmental and social aspects are intrinsically linked and accompanied by a framework of high-quality indicators to monitor progress. Thus, a fundamental question on whether and how SS can be measured and assessed in the construction or renewal of housing is also the subject of a number of studies that imply the development of indicators/attributes framework [25,36,44,47–54]. Further, such a framework could be integrated into the certification systems [55] or serve to develop the Building Sustainability Assessment Tool—BSAT [56]. For example, an assessment framework by prioritizing social sustainability criteria in residential building construction was proposed in the context of Iran [57]. It is for a reason that this aspect requires even more attention in residential buildings, since this sector can have a significant social impact on urban areas [57,58]. That showed that the establishment of an SS scheme with the consideration of priorities in a particular country could be a pivotal step forward in providing a responsive sustainability assessment for residential buildings, especially in developing countries.

Although sustainability is gaining increasing importance in building construction projects, barriers to its widespread adoption still exist. Various factors related to operations, financial capability, quality and quantity of human resources, experience, technology, regulations, and many other aspects are thought to be the barriers in implementing the concept of sustainable construction [59,60]. Studies in many parts of the world (e.g., in England [61]; in Canada [62]; in Ireland [63]; in Palestine [59]; in Ghana [64]; in Ghana [65]; in Kuwait [66]; in Brazil [67]; in Malaysia [68]; in Indonesia [60]; in Nigeria [69]; and in South Africa [70]) have investigated the transition to a more sustainable built environment, especially the barriers hindering the adoption of sustainability principles. The range and categories of identified critical barriers vary. Marsh et al. [70] identified the most significant barriers and drivers in the adoption and implementation of sustainable construction, grouping them under six key themes: socio-cultural, economic, stakeholder, political and technological barriers, and the environmental benefits of adopting sustainable construction. Another six aspects, economic/financial, regulatory, management, technical, social–cultural, and understanding, also have the potential to inhibit the implementation of sustainable construction [60]. Martek et al. [71] draw on discussions with leading sustainability experts and practitioners, revealing that barriers linked to the socio-spatial dimension of sustainability transition enable new and yet unidentified impediments to emerge. Clearly, the relevant factors/barriers that are hindering the shift towards adoption of sustainable buildings should be ascertained in a timely manner [71,72]. These barriers are largely affected by social dynamics [71,72]. Indeed, the social dynamics factors inhibiting wide-scale sustainability uptake remain under-researched [71,73–76].

Relying on defined barriers and categories in previous research, this article represents a contribution to identifying, from an expert perspective, the most urgent/critical barriers in the implementation of SS in the context of a very specific typological group, such as residential buildings. The paper consists of five sections: Section 1 Introduction, Section 2 Knowledge Gap, Section 3 Materials and Methods (the applied methodology includes three parts/phases with sub-phases), Section 4 Results and Discussion, and Section 5 Conclusions. At the end of the paper, the form of the conducted survey is given as Appendix A.

2. Knowledge Gap

Generally, the topic of SS barriers is not methodologically and systematically treated and remains insufficiently specified regarding residential housing. SS in residential housing development can be defined as development that is compatible with the harmonious evolution of civil society, fostering a built environment capable of providing privacy (make users feel comfortable, safe, and healthy), social contact, participation, freedom, choice, and autonomy, improving social interactions [77] and quality of life (emotional and physical well-being) for the population. In addition, SS highlights the just distribution and consumption of housing resources [78,79] and involves the overlapping concepts of social capital, social cohesion, and social inclusion [79,80]. Unfortunately, the majority of developing countries lack specific sustainability programs, which led to a mass construction

of residential buildings without paying attention to the social aspect of sustainability [57,58]. This necessitates the residential building sector to be assessed not only for its ecological and economic impacts, but also for its immense social value so that it can better suit human needs [57,81].

However, the adoption of SS in residential housing has been hampered in many parts of the world by numerous barriers. Some very recent studies have attempted to put more effort into investigating the overall range of barriers which hinder the attainment of sustainability in multi-apartment housing, some of which are mostly focused on the individual country, particular type of buildings/housing, or perception and particular area of sustainability. For example, Adabre et al. [82] assessed the interactive effects among all-inclusive institutional, economic, social, and environmental barriers in addition to evaluating a predictive model between these categories of barriers and sustainable housing development in the specific context of Ghana. Through a questionnaire survey, data were solicited from professionals and analyzed using partial least squares structural equation modeling (PLS-SEM), as it is one of the most appropriate techniques for assessing interactive effects among groups of variables [82]. The results showed that both the institutional and environmental barriers have more significant impacts than social ones on sustainable housing, but the research used a relatively low sample size, and the applied method did not account for the dynamics of sustainable housing barriers. In the same area of sustainable housing, Adabre et al. [83] continued to investigate and evaluate sustainability challenges, but this time from the perspective of both professionals (i.e., providers of housing and services) and households (i.e., their consumers), in order to identify symmetries in the barriers. In order to analyze the priorities of barriers in the same context of Ghana, authors used other methods (fuzzy synthetic evaluation technique—FSE). The study findings revealed significant differences among some of the underlying barriers rated by the two groups of respondents, indicating barriers that require comprehensive and specific policies. The study included only five social barriers, evaluated as medium-important.

Furthermore, Kineber et al. [84] identified and assessed sustainability implementation barriers in residential building projects. They conducted a questionnaire survey among construction firms, and the results obtained by the exploratory factor analysis (EFA) showed that the barriers to implementing sustainability could be categorized under four main groups: management, standards, society, and knowledge. Additionally, they employed partial least squares structural equation modeling (PLS-SEM), already applied in previous research, to assess the linkages between each categorized barrier and sustainability implementation. The results showed that out of a total of 30 barriers (8 are social), management-related barriers are the most significant in affecting substantiality implementation, while the social issue is the second most significant construct, meaning that society has its way of life and standards regarding cultural values, which must be considered in order to successfully implement innovative ideas and sustainable parameters in residential buildings [84].

However, several previous studies have analyzed barriers in general without dividing them into main categories. Thus, Darko and Chan [85], through analyzing barriers in the area of green/sustainable buildings (GBs) around the world, provided a systematic review of the literature on barriers published in academic journals. The GB has emerged as the latest style of building that completely integrates building design and sustainability objectives in a healthier manner, with a view to protecting the ecosystem and human health [85]. They found that, among 37 defined barriers, the lack of information, education and research, knowledge, awareness, and expertise are some of the main barriers to green building adoption, in addition to cost, lack of incentives/support, lack of interest and demand, and lack of GB codes and regulations. Similarly, Lambourne [54] showed that the key barriers affecting the recognition of green residential building value in the United Arab Emirates are the availability of reliable market data, apparent client disinterest, lack of relevant technical skills, and initiatives that would encourage green residential buildings,

including financial incentives for the key stakeholders, raising and enforcing building standards, and higher energy prices.

Moreover, Olowosile et al. [69] reveals that the major barriers to achieving sustainable construction projects are clients' unawareness, overall management action, lack of funding, and contractual procedures, and recommends a platform for public awareness about sustainable construction, which would be incorporated into the standard building code in the context of Nigeria. Finally, Winston [63] found that barriers to achieving sustainable housing and regeneration include the lack of a shared vision of sustainable housing, inadequate building regulations and noncompliance with existing regulations, limited knowledge and expertise in green building methods, negative perceptions of higher-density housing, poor-quality designs, and negative attitudes to social mix, as well as the failure to recognize the need for social regeneration and limited resources. It is obvious that almost all of these barriers could also be defined as potential obstacles to socially sustainable residential housing.

On the other side, various barriers constrain the attainment of SS in different housing and construction projects. For example, the culture and attitude of a community could negatively affect the attainment of SS [86]. The authors Adabre et al. [79] provided an SS barriers framework, but in sustainable affordable housing (SAH), namely green-retrofit-related, land-market-related, incentive-related, housing-market-related, and infrastructure-related barriers. The study deals with the 26 critical barriers (CBs) which are identified from a comprehensive literature review and an empirical questionnaire survey conducted with 51 affordable housing experts from various countries. The analysis techniques employed were the Statistical Package for Social Science that included Cronbach's alpha technique (measures the internal consistency among a list of items in a questionnaire to determine the reliability of the questionnaire) [79,87] and Factor analysis (identifies a comparatively small number of factors) [79,88]. High agreement levels on incentive-related barriers and housing-market-related barriers were achieved between experts from both developing and developed countries, making this research more significant. Another study [89] discusses barriers to adoption of SS as well, but in building construction generally, based on a literature review and a questionnaire survey conducted from quantity surveyors' perspective and again in the specific context of the developing country of Ghana. Only 19 barriers selected from the literature and systematized in four categories (socio-cultural, political and technical, knowledge or awareness, and financial) were analyzed, using Cronbach's alpha technique and Factor analysis, like in the previous study, to determine the dominance of political and technical barriers.

However, the focus and varied results of these research studies, obtained in specific areas of the housing/building sector or different contexts, using different methods for the analysis, indicate that more effort needs to be invested in a better understanding of significant obstacles to the adoption of social sustainability in residential housing. There is no doubt, based on the previous literature review, that there are still significant barriers that prevent the successful achievement of socially sustainable goals in residential housing. In that respect, this study has its unique contributions.

3. Materials and Methods

The methodology applied in this study included three phases: (1) identification of barriers through literature review; (2) design and preparation of the Delphi survey; and (3) conducting the Delphi survey and data analysis. Selection and development of barriers were supported by the framework in Figure 1. A detailed explanation of these phases is given in the following sections.

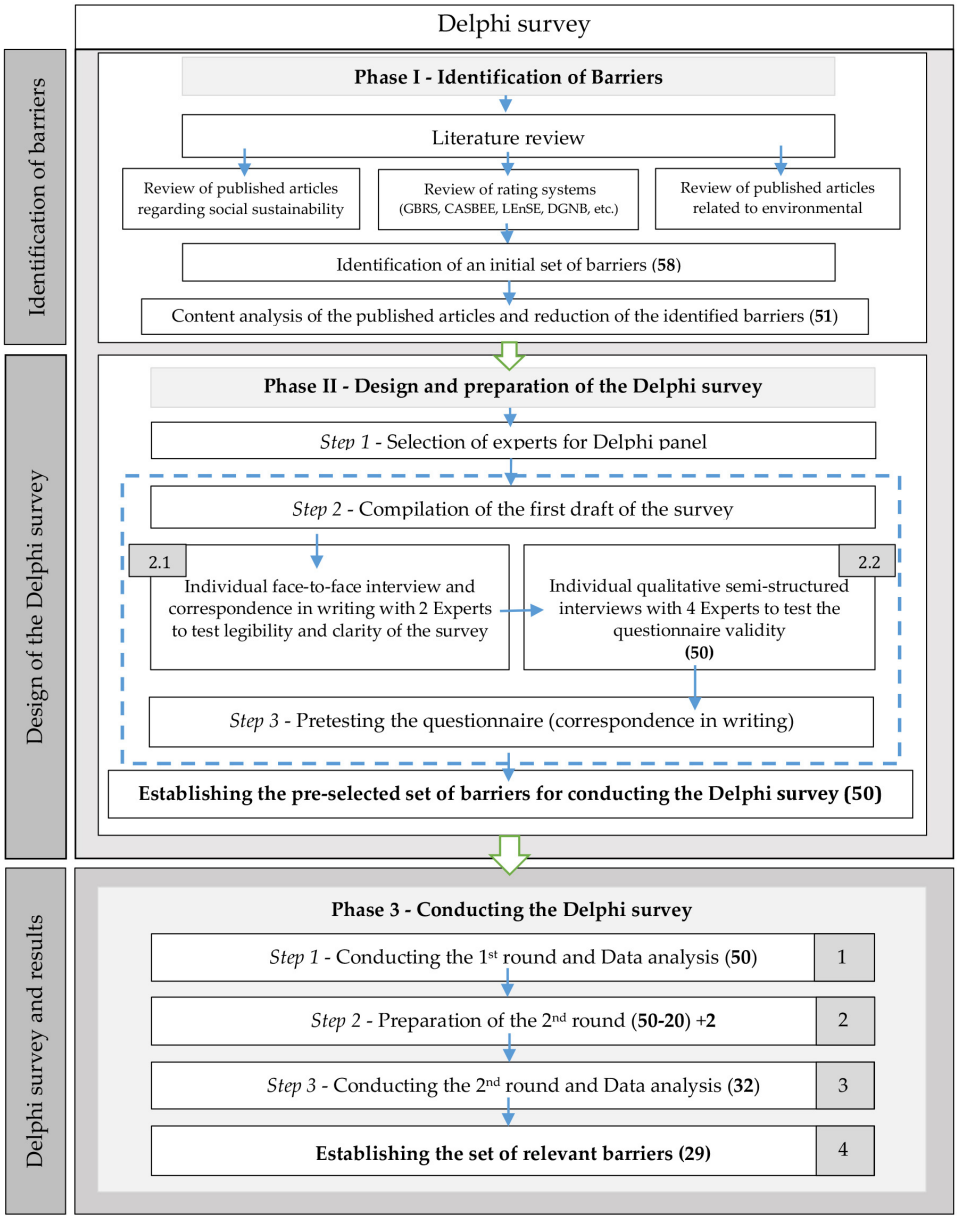

Figure 1. Research methodological flow.

3.1. Identification of Barriers—Phase I

A thorough literature review was conducted to identify a pool of relevant barriers to socially sustainable residential (multi-apartment) buildings. In the first phase, the research started by gathering the most relevant studies on SS and green building appraisal tools, incorporating four primary sources: (a) research related to the barriers affecting the social aspect of building sustainability ([59–76,79,82–84,89–91], among others); (b) research related to the barriers influencing building environmental sustainability ([59,65–68,70,92–96], etc.) in order to identify those that might be common to both aspects; (c) SS reports published by international organizations, such as the United Nations Commission for Sustainable Development—UNCSD [97], United Nations Department of Social and Economic Affairs—UNDESA [98], Eurostat [99], and OECD [100]; (d) green building rating systems (GBRSs): LEED [101], USGBC [102], BREEAM [103–105], SBTool [106], CASBEE [107], Minergie-Label [108], and Swiss Sustainable Building [109–111], including more contemporary rating systems such as Green Star [112] and DGNB [113], which consider socio-cultural, technical, and economic aspects together with the environmental and energy aspect. The GBRS

study provides an indirect insight into potential challenges and barriers to the implementation of principles and indicators for successful design, construction, and management of sustainable buildings, which is the goal of this research.

The initial search of quoted sources identified a total of 58 barriers. In the next step, "Content analysis of the published articles and rating systems", shown in Figure 1, duplication of barriers arising from diverse formulations given from different authors for the same meaning of barriers was analyzed. In many cases, the meaning and similarity between the barriers was not so obvious at first glance, so further reading was undertaken to comprehend the context from which the barriers were selected. After this new round of reading and consultation with 4 experts, the number of barriers was reduced to 50, and that constituted a preliminary set of barriers for the application of the Delphi techniques. They were classified into the five following groups: Financial/Economic (FE) obstacles, Professional/Technical (PT) obstacles, Governmental/Regulatory (GR) obstacles, Market (MA) obstacles, and Cultural/Behavioral (CB) obstacles. They are listed and described in Section 4.

3.2. Design and Preparation of the Delphi Survey—Phase II

The second phase included preparation and tailoring of the Delphi method. The Delphi method is a qualitative method originally developed by Rand Corporation for the U.S. Air Force [114] in the 1950s and adapted a decade later in academia [95]. It is fully accepted by today's scientific community [115]. Qualitative methods are effective approaches in addressing issues within real-life context characterized by uncertainties [116]. The two prominent methods of collecting qualitative data comprise participant observation, typically in focus groups or through individual interviews [117]—the latter is characteristic of the Delphi method. Delphi methodology "constitutes an organized correspondence process with a gathering of specialists to address a complex phenomenon" [118,119]. It is conducted to collect experts' opinions (data) in a given field [120], as well as broaden perspectives [121].

The constant evolution of the technique [122] has led to variations, such as decision Delphi, prioritizing around a topic [123] and role changes [114]. It is "the most reasonable technic for inquiry when there is a lack of adequate information" [124] or when it is difficult to create sets of different types of indicators [48]. Thus, the gathering of information from experts with different ideas and perspectives is a means to achieve the goal [125]. Actually, the fundamental value of the Delphi technique stems from the fact "that the statistical aggregate of several experts is more relevant than the judgment of just one expert" [126]. According to the authors in [127], the use of the Delphi methodology is particularly suitable in new industries. To clarify, the growing amount of research related to the SS topics accompanied with the higher interest of the various stakeholders in the building sector implies that sustainable building focused on social aspects could be considered as an emerging (i.e., 'new') industry. Within this context, the Delphi survey represents an appropriate research methodology for evaluation of the newly proposed/adopted SS categories. For these reasons, the use of the Delphi methodology stands out above other forecasting techniques [128]. Therefore, it was considered appropriate to achieve relevant results in this study.

The Delphi survey consists of at least two rounds in which experts' opinions are collected and shared among all panelists (the experts involved in the survey) with the ultimate goal of reaching consensus opinions [129,130]. The choice of the type of the Delphi study, the number of rounds, the questionnaire structure, and the selection of participants are pivotal to any study [131], directly influencing the quality and impact of the results [132]. The authors in [133] consider that a three-round Delphi technique is the most appropriate in the case of a heterogeneous sample of panelists (for example graduate students) due to an increased uncertainty in reaching consensus among them. Further, the data (response) processing procedure is not standardized [95], which has been criticized

by some authors [123,134]. However, in most studies, consensus is reached within two rounds [124–136].

The Delphi method was chosen in this study as a suitable method for gathering experts' knowledge and experience related to complex problems [137], such as design and construction of socially sustainable residential buildings. Identifying obstacles that prevent the socially sustainable design and construction of buildings is the first prerequisite for overcoming those obstacles, which would enable better quality and healthier housing for a larger number of residents, and thus ensure a higher level of well-being for the entire society. The adopted Delphi technique is structured according to the combined approach suggested by authors in [118,124,138], characterized by the following steps: (i) selection of a set of sustainability categories and indicators through a literature review; (ii) using an initial preselected set of categories and indicators (barriers) to be analyzed by experts through the Delphi technique; and (iii) based on analyzed results, the experts assess the relevance of each indicator using a Likert scale. Figure 1 shows the above-mentioned procedure and distinctive steps.

3.2.1. Step 1: Selection of Participants—Delphi Panel

The Delphi technique "helps provide a group conclusive component that requires experienced professionals with a background of the target study" [139]. Therefore, selecting a panel of participants is of significant importance. Regarding the panel size, the authors in [133] argue that there is no standard range of sample size for the Delphi technique. For a homogeneous study, a smaller sample size is preferable and might yield satisfying results, and, conversely, for a heterogeneous study a larger sample size might be appropriate [140], while the authors in [141] consider that the number of experts depends solely on the research objective.

Therefore, starting from the conclusion that between 30 and 50 participants are sufficient to achieve comprehensiveness and relevance of various opinions [142], an initial panel of 65 international experts in the field of sustainability was selected, taking into account that probably part of them would not have time to participate in the survey. The panelists were selected to gain a comprehensive view of barriers related to SS buildings, covering different aspects in planning, design, construction, urban planning, project management, and real estate sales. They were searched by the authors' chain of contacts to include experts with a balance of skills, knowledge, and experience, able to contribute meaningfully to the study. Thus, they were chosen from both the academic sector (51%, i.e., 33 experts), with expertise in the field of sustainable development, and the practice sector (49%, i.e., 32 experts), with expertise in design/planning/construction/urban planning/project management/real estate. Since experts' time constraints usually influence their decisions to participate in a Delphi survey [115], they were informed in advance that the current Delphi survey was two-round. The composition of experts also meets the contextual criterion [143], i.e., the balanced distribution of experts from all over the world (e.g., Europe, Middle East, Indonesia, New Zeeland, and Cuba), and particularly in Europe (European Union and Eastern Europe countries), was provided in order to ensure an international perspective. The time duration for the first round was limited to three months, and one and a half month for the second round. During that period, a number of reminders were sent to the panelists asking them to complete the questionnaire.

3.2.2. Step 2: Compilation of Questionnaire

Before launching the survey questionnaire, two intermediate steps were employed. The first draft of the questionnaire was discussed with two experts (an architectural designer and a professor) during a face-to-face interview and correspondence in writing (Figure 1), to confirm legibility, clarity, and precision of the questionnaire. The second intermediate step involved two professors and two design professionals with considerable years of experience in the construction industry. Based on their experience and knowledge, they were asked to assess whether the questionnaire covered all potential barriers and whether

new barriers could be added/removed from the survey (semi-structured interviews). The feedback received resulted in the reformulation of three barriers and removal of one barrier. The total number of preselected barriers in the final version of the Delphi questionnaire was 50, divided into five groups (Table 1). They were listed and described in the second part of the Delphi questionnaire, while in the first section of the questionnaire professional data about the respondents were collected (Appendix A).

Table 1. The list of barriers to socially sustainable residential buildings: preselected barriers and eliminated barriers after 1st and 2nd round of the Delphi survey.

Group		Individual Social Sustainability Barriers	Preselected	Added by Experts	1st Round Mean SD		Elimin. 2nd Round Barriers Mean SD 1st 2nd Round				Urgent
1	2	3	4	5	6	7	8	9	10	11	12
Finanacial/ Economic Barriers	FE1	Fear of higher investment cost	√		4.03	0.99	4.20	0.66			U2
	FE2	High cost of sustainable building materials and technology	√		3.77	0.97	3.54	0.73		X	
	FE3	Increased maintenance and operation cost	√		3.30	1.06			X		
	FE4	Lack of economic incentives; lack of financing for SS projects, including those focused on socio-cultural aspects	√		4.25	0.99	4.30	0.92			U1
	FE5	Investment risks	√		3.40	1.08			X		
	FE6	Long payback periods	√		3.35	0.86			X		
	FE7	Difficult access to financing	√		3.58	1.09			X		
	FE8	Financial limitations of investors/developers	√		3.48	1.05			X		
	FE9	Lack of designers' motivation (no extra reward or negative consequences)	√		3.02	1.17			X		
	FE10	High costs of specialized courses and seminars focused on SS	√		2.57	1.11			X		
	FE11	Difficulty of translating social benefits into monetary/financial values	√		4.03	0.96	3.90	0.84			U3
	FE12	Difficulties of implementing public–private partnerships	√		3.53	0.96			X		
	FE13	High costs of participatory engagement	√		3.32	1.07			X		
	FE14	Lack of funding helping to link all four pillars of sustainability (i.e., link cultural to other three sustainability pillars)	√		3.53	1.02			X		
Governmental/ Regulatory Barriers	GR1	Inefficient (inadequate) codes/regulations/standards on SS	√		4.25	0.84	4.40	0.74			U1
	GR2	Complex certification procedures	√		3.77	0.83	3.87	0.82			
	GR3	Policies do not address financial implications	√		3.63	0.99			X		
	GR4	Lack of knowledge on SS measures among legislators and regulators (resulting in inadequate regulations, policies, etc.)	√		4.30	0.93	4.33	0.84			U2
	GR5	Lack of inclusive and participatory urban planning and management	√		4.23	0.81	4.20	0.66			
	GR6	Inefficient dissemination of codes/regulations	√		3.83	0.91	3.90	0.84			
	GR7	Lack of support from the government (lack of government policies and support)	√		4.22	0.72	4.07	0.58			

Table 1. *Cont.*

Group		Individual Social Sustainability Barriers	Preselected	Added by Experts	1st Round Mean	1st Round SD	2nd Round Mean	2nd Round SD	Elimin. Barriers 1st Round	Elimin. Barriers 2nd Round	Urgent
	GR8	Failure of the government in defining and enforcing an overarching framework that directs and governs all attempts in the field and prioritizes the tasks with a definite timeline and milestones	√		3.95	0.85	3.93	0.78			
	GR9	Lack of government support for social and environmental links between urban, peri-urban, and rural areas	√		3.70	1.05			X		
	GR10	Lack of safe, inclusive, green, and public spaces, in particular for women and children, older persons, and persons with disabilities	√		4.02	0.99	4.17	0.58			
	GR11	Many similar but incompatible certification systems		√			3.77	0.77			
	GR12	Lack of specification of mandatory measures that support SS		√			4.17	0.59			U3
Professional/ Technical Barriers	PT1	Lack of awareness among designers (disbelief and incredulity on designers' part on the value and merits of SS building design and construction)	√		3.75	1.16				X	
	PT2	Lack of technical competence of important stakeholders	√		4.08	0.94	4.20	0.66			U3
	PT3	Lack of skilled workers	√		3.75	0.99	3.57	1.17		X	
	PT4	Limited number and types of materials that meet the criteria of sustainable construction	√		3.52	1.07			X		
	PT5	Lack of time—in general, during the planning and design process	√		3.85	0.98	3.80	0.89			
	PT6	Additional efforts for collaboration and communication among stakeholders are too time consuming to be applied during design process	√		3.73	0.97			X		
	PT7	SS is not an obligatory part of the architectural design process	√		4.40	0.81	4.43	0.68			U1
	PT8	Lack of research and development of new sustainability materials, construction processes, technology, and techniques	√		3.65	1.09			X		
	PT9	Lack of collaboration and information exchange between various stakeholders	√		3.90	0.90	4.27	0.74			
	PT10	Poor urban planning (a short-sighted process of urban planning has led to difficulties in implementing social sustainability measures)	√		4.18	1.05	4.50	0.86			U2
	PT11	Lack of easily accessible (technical) guidance	√		3.63	0.90			X		
	PT12	Lack of SS measurement tool software to support SS design	√		3.72	1.01			X		
	PT13	Lack of open-source information and support	√		3.47	0.83			X		
	PT14	Lack of sustainable construction projects for reference	√		3.72	0.94			X		

Table 1. *Cont.*

Group		Individual Social Sustainability Barriers	Preselected	Added by Experts	1st Round Mean	1st Round SD	2nd Round Mean	2nd Round SD	Elimin. Barriers 1st Round	Elimin. Barriers 2nd Round	Urgent
	PT15	Lack of competent management and leadership of new and innovative strategies (processes)	√		4.08	0.85	4.17	0.65			
Market Barriers	MA1	Limited knowledge about market potential	√		3.90	0.93	3.93	0.94			
	MA2	Lack of demand/market for SS apartment buildings due to low social–conomic status of end-user	√		4.05	0.97	4.20	0.96			U3
	MA3	Lack of investors in socially sustainable multi-apartment buildings	√		4.43	0.79	4.37	0.85			U2
	MA4	Lack of good marketing strategies	√		3.75	0.89	3.87	0.73			
	MA5	Lack of clear evidence and indications of the benefits of SS buildings compared to traditional buildings	√		4.45	0.67	4.27	0.64			U1
Cultural Barriers	CB1	Consumerism as a prevalent cultural model that promotes lifestyle of "excessive materialism and overconsumption" as a means for personal satisfaction and well-being	√		4.02	0.97	4.17	0.87			U3
	CB2	End-user behavior prevents the achievement of SS goals, as SS is a dynamic and ongoing process, which depends on end-users' attitudes and their interaction with the built environment	√		4.03	0.99	3.97	1.13		X	
	CB3	Lack of consensus on sustainability values among stakeholders	√		3.92	0.87	3.83	0.83			
	CB4	Overall stakeholders' resisting culture (and hard changing/adapting mindset) toward sustainability design and construction	√		3.88	0.98	3.80	0.89			
	CB5	Lack of awareness among end-users and other stakeholders about the benefits of socially sustainable building design and construction	√		4.45	0.79	4.57	0.82			U2
	CB6	Focusing on maximizing of profits and minimizing the return time on investments	√		4.75	0.51	4.73	0.52			U1

3.2.3. Step 3: Pretesting the Questionnaire

Before it was finally sent to the selected list of panelists (experts), the questionnaire was sent to two more experts (one designer and one researcher) to finally test the readability and the time required to answer the questions. Since positive responses were received from both of them, the process of testing was concluded, and the third phase was ready to be launched (Section 3.3). The final version of the questionnaire was also translated into German because a certain number of participants were from German-speaking areas (Switzerland, Germany, Austria, etc.), and that helped to reduce language misunderstanding to the minimum possible extent (especially for the participants/practitioners who are not required to speak perfect English).

3.3. Conducting the Delphi Survey—Phase III

3.3.1. Step 1—Conducting the 1st Round of the Delphi Survey

The research team contacted the panelists (respondents) by direct invitation (email, telephone, and/or Linkedin network), informing them of the aims of the study and the confidential treatment of the data to encourage their engagement from the beginning and ensure their commitment to completing the survey. They were also asked to forward the survey to their colleagues whom they considered competent to participate in the survey. The final version of the questionnaire was sent directly to each panelist who accepted the participation, via email. The experts were asked to rate the relevance of the barriers using a five-point Likert scale [144,145], ranging from 1 to 5, where 5 indicates extremely relevant, 4 highly relevant, 3 medium relevance, 2 low level of relevance, and 1 irrelevant. Subsequently, the experts were given the opportunity to add potential new barriers to each group of barriers that they considered to be relevant and had not been included in the list.

After sending several reminders to the panelists to answer the survey, a total of 60 experts out of 71 (of which 65 were invited by direct invitation from the researchers and 6 by the panelists' chain contacts), i.e., 84.5%, completed the Delphi survey in the first round. Responses were received from 56 experts invited by the researchers and from 4 in the panelists' chain. This percentage of questionnaire completion (84.5%) is quite a high percentage thanks to personally addressed invitations to the experts to participate in the survey and the persistence of the researchers in reminding them to fill out the questionnaire.

The aim of the questionnaire in the Delphi first round was to validate the hypothetically derived set of barriers and possibly add new ones in case they were overlooked (3 bars for each group of barriers were left blank so that panelists could add new ones as they deemed necessary, Appendix A), and the first round confirmed the purpose. At the end of the first round, the recommendations, comments, and new barriers (two of them) were considered and integrated in the second round of Delphi procedure. The mean values were set at 75% (>3.75) as the cutoff value for each barrier using a 5-point Likert scale and standard deviation (SD) < 1. The results are given in Table 1 and discussed in detail in Section 4.

3.3.2. Steps 2 and 3: Preparation and Conducting the 2nd Round of Delphi Survey

The results obtained from the 1st round were analyzed and the mean and SD for each barrier were calculated. The detailed descriptions and analyses of the results are given in Section 4. The outcome of the 1st round was sent back to the panelists to review the results and to rank the barriers again. In addition, they were asked to mark 3 barriers that require the most urgent intervention, i.e., the barriers whose overcoming would have the greatest positive effects on the implementation of SS measures. After the completion of the 2nd round, the mean score and SD of each barrier were again determined. The minimum acceptable rate for a barrier mean score was from 3.75 and for the SD below 1 [48,146,147]. In the event that the panelists eliminated a barrier in this round, the barrier would be omitted from the final set of barriers. The results are shown in Table 1, and a detailed analysis is presented in the following Section 4.

4. Results and Discussion

Of the 65 experts initially invited by the researchers to join the panel and the 6 invited by the panelists' chain, 60 experts ultimately completed the first round of the Delphi questionnaire, i.e., 84.5% of the invited experts finished the first round. In the second round, 43 of them participated, for which the final response rate was 71.6%. Typically, participation in a Delphi survey depends on the type of the study and size of the panel of experts [95].

Some authors [148] recommend a 70% final response rate to preserve the rigor of the method. Since the panel of experts, in this study, was formed via direct invitation, the response rate in the first round is significantly above the mean for web surveys (34%) [149], while the final response rate of 71.6% surpasses the recommended 70%. The dropout rate in the second round was expected. Although there was a great desire among the panelists to contribute to the research, and, in this particular case, almost all of them explicitly said

that the survey was meaningful and interesting, time is always a limiting factor for the experts, given their various business commitments. Thus, some dropouts were inevitable. The resulting response percentages (84.5% in the first round and 71.6% in the second) are quite high and testify the commitment of the panelists to contribute to the study. Individual monitoring and follow-up is another factor that contributes to panelist engagement, as personal involvement gives an impression and confirmation of the importance of their participation [48,150].

The composition of the panelists who finally participated in the first round was characterized by a fairly balanced ratio between experts currently employed in academia and practice, i.e., 27 (45%) in academia and 33 (55%) in practice (Table 2). The added value of this panel is that most of the academic experts (81.5%, i.e., 22 members out of 27 in the first round, and 91.67%, i.e., 22 out of 24 in the second round) had previous experience in practice, which contributed to the opportunity to consider the problem in more detail and in a wider perspective. Furthermore, all of the selected panelists (100%) had experience in the sustainability of the built environment in practice and/or in research, and 86.7% of them also had experience in SS—the areas of particular interest for this study (Table 2). In addition, 85% of them had experience in the design or construction of residential buildings. The vast majority of them (81.7%) had more than 10 years of experience in the profession, which also significantly contributes to the credibility and reliability of the survey.

Table 2. Data on participants' experience in sustainability and profession.

Panelists	No. from Academia	No. from Practice	Experience of Panelist						
			In Practice from Academia	In Practice from Other Profession	In Sustainability	In Social Sustainability	In Design and Construction	In Profession >10 years	In Profession <10 years
Participation in the 1st round	27 (45%)	33 (55%)	81.5%	100%	100%	86.70%	85.00%	81.70%	18.30%
Participation in the 2nd round	24 (55.8%)	19 (44.2%)	91.60%	100%	100%	83.10%	78.21%	82.60%	17.40%

The initial search of the literature identified a total of 58 barriers. After the content analysis, the number was reduced to 51 due to duplication of barriers arising from diverse formulations for the same meaning given by different authors. During the consultation process with four experts who had considerable experience in the sustainability of the built environment, 3 barriers were reformulated and 1 was eliminated, so the total number of barriers that made up the preselected list of barriers in the first round of the Delphi method was 50. Table 3 shows the number of barriers within each of the five groups in the considered phases of barrier selection.

During the first round of the Delphi method, 20 out of the 50 barriers were eliminated due to a low mean score or that which was below the 75% threshold or an SD greater than 1 (Table 1). Ten of them were from the Financial/Economic group, two were from the Governmental/Regulatory group, and eight were from the Professional/Technical group (Table 1). However, two new barriers were suggested by the experts to be incorporated into the second round. Both of them were from the Governmental/Regulatory group: "Many similar but incompatible certification systems" (barrier GR11) and "Lack of specification of mandatory measures that support social sustainability" (barrier GR12). They are presented in Table 1 and marked in the fifth column as added by experts. Finally, the total number of selected barriers for the second round of the Delphi survey was 32 (Table 3).

Table 3. Number of barriers by groups—preselected from literature, added by experts, and selected during 1st and 2nd round of the Delphi method.

Group	Economic/ Financial Barriers	Governm./ Regulatory Barriers	Profess./ Technical Barriers	Market Barriers	Cultural/ Behavior Barriers	Total Preselected	Total 1st Round	Total 2nd Round	Total Final Barriers
Preselected from literature	16	13	18	5	6	58	-	-	-
After content analysis	15	10	15	5	6	51	-	-	-
After consultation with experts	14	10	15	5	6	50	-	-	-
After consultation + added by experts during 1st round	14	10 + 2	15	5	6	50 + 2 = 52			
After 1st round	4	10	7	5	6	-	52 − 20 = 32	-	-
After 2nd round	3	10	6	5	5	-	-	32 − 3 = 29	-
Final barriers per group	3	10	6	5	5	-	-	-	29

The Delphi questionnaire in the second round was sent to the same number of experts from the first round (60 experts), of which 43 (i.e., 71.6%) responded. The information about the results given in the report sent to the panelists in the subsequent round is the key factor in any Delphi survey. It provides panelists with the feedback that allows them to revise their opinions in light of the opinions of others [48]. After calculating the mean values and SD in the second round, another two barriers were eliminated due to a low mean score (below 75% threshold and/or SD >1): one from the Professional/Technical group (barrier PT3) and another one from the Cultural/Behavioral group (barrier CB2) (Table 1). As a result, after the second round of the Delphi survey 29 barriers were selected, and they represent the final list of barriers (with the mean score above 3.75 and SD < 1, Table 1). The means and SDs after the first and second rounds are also given in Table 1, while a comparison between the number of barriers within the groups in the first and second rounds is presented in Table 3.

4.1. Financial/Economic Barriers

This group includes barriers related to economic and financial issues, i.e., investments needed to implement SS measures in the design and construction of multi-apartment buildings, costs, profits, etc. (Figure 2). Table 4 presents the final list of barriers within this group, followed by a brief description, and the values of means and SDs calculated from the first and second rounds of the Delphi survey. Out of a total of 14 barriers preselected from the literature, 3 were selected as significant barriers, which are also the most urgent barriers that this group should face in order to speed up the implementation process of SS measures to the greatest extent (Figure 3). They are as follows: "Lack of economic incentives"; "Fear of higher investment cost"; and "Difficulty of translating social benefits into monetary/financial values" (barriers FE4, FE1, and FE11, respectively, Table 4). Due to the lack of a clear body of evidence regarding economic feasibility and predictions related to the implementation of sustainable practices (barrier FE11, Table 4), contractors are reluctant to implement SS measures [151–153]. These findings are congruent with the studies in other areas of sustainability, i.e., the contractors often prioritize profit over sustainability [154–156].

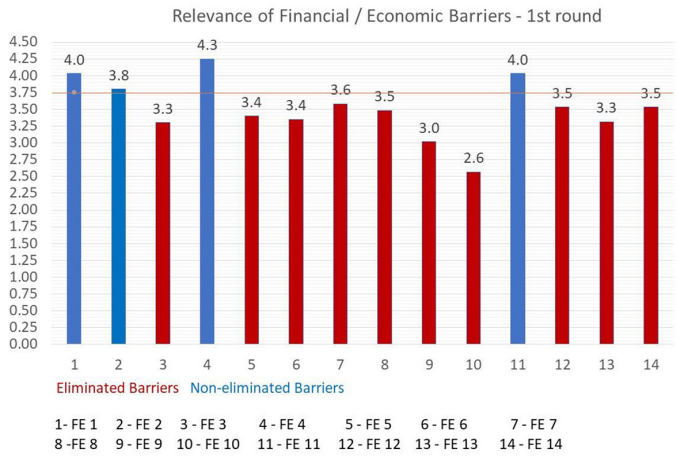

Figure 2. Financial/Economic barriers in the 1st round: preselected (14) and eliminated (10).

Table 4. Number of barriers by groups—preselected, added by experts, 1st and 2nd round, and final.

Index	Definition of Barriers	1st Round		2nd Round		Urgent
		Mean	SD	Mean	SD	
FE1	Fear of higher investment cost	4.03	0.99	4.2	0.66	U2
FE4	Lack of economic incentives; lack of financing for SS projects, including those focused on socio-cultural aspects	4.25	0.98	4.3	0.92	U1
FE11	Difficulty of translating social benefits into monetary/financial values	4.03	0.96	3.90	0.84	U3

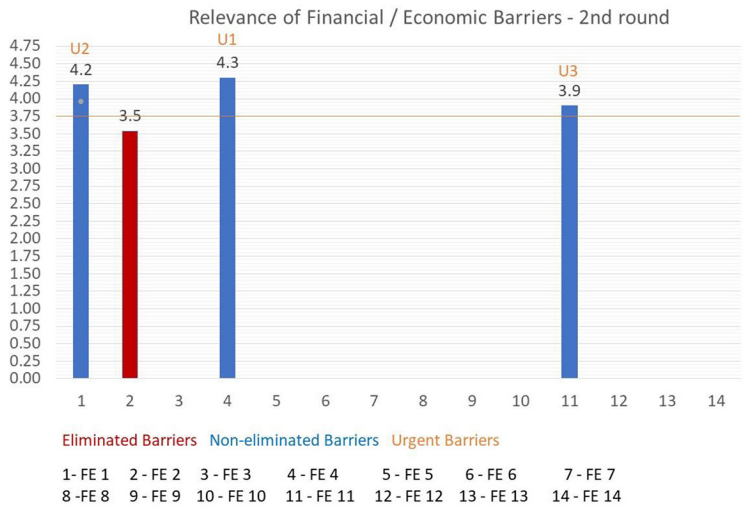

Figure 3. Financial/Economic barriers in the 2nd round: eliminated (1) and urgent (3).

4.2. Governmental/Regulatory Barriers

This group includes barriers that prevent the spread and development of the SS of residential buildings due to issues concerning governmental institutions and their policies (Figure 4). Insufficient or inadequate regulations and policies create significant challenges for attaining sustainability in construction works [157–159]. The final list of Governmental/Regulatory barriers along with their definitions are listed in Table 5 and Figure 5.

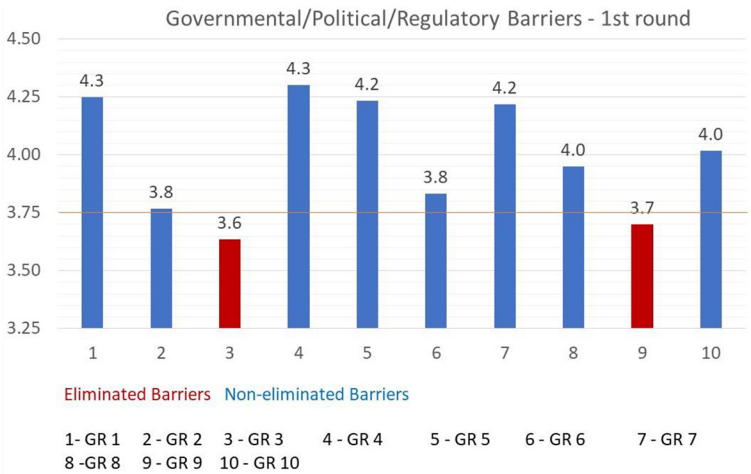

Figure 4. Governm./Regulatory barriers in the 1st round: preselected (10) and eliminated (2).

Table 5. List and description of the barriers from the Governmental/Regulatory group: preselected from literature and after 1st and 2nd round.

Index	Definition of Barriers	1st Round		2nd Round		Urgent
		Mean	SD	Mean	SD	
GR1	Inefficient (inadequate) codes/regulations/standards on social sustainability	4.25	0.84	4.40	0.74	U2
GR2	Complex certification procedures	3.77	0.83	3.87	0.82	
GR3	Policies do not address the financial implications	3.63	0.99			
GR4	Lack of knowledge on SS measures among legislators and regulators (resulting in inadequate regulations, policies, etc.)	4.30	0.93	4.33	0.84	U1
GR5	Lack of inclusive and participatory urban planning and management	4.23	0.81	4.20	0.66	
GR6	Inefficient dissemination of codes/regulations	3.83	0.91	3.90	0.84	
GR7	Lack of support from the government (lack of government policies and support)	4.22	0.72	4.07	0.58	
GR8	Failure of the government in defining and enforcing an overarching framework that directs and governs all attempts in the field and prioritizes the tasks with a definite timeline and milestones	3.95	0.85	3.93	0.78	
GR10	Lack of safe, inclusive, green, and public spaces, in particular for women and children, older persons, and persons with disabilities	4.02	0.99	4.17	0.58	
GR11	Many different, similar, but incompatible certification systems	-	-	3.77	0.77	
GR12	Lack of specification of mandatory measures that support social sustainability	-	-	4.17	0.59	U3

The results in this study demonstrating that the main obstacles from this group concern "the lack of knowledge of the legislators and regulators related to the SS aspect of buildings" (GR4 in Table 5). It directly reflects the development of inappropriate legislation, regulations, standards, etc., which is the second most urgent barrier (GR1) to be counteracted regarding the experts' perception. The barrier "Lack of specification of mandatory regulations supporting social sustainability" (GR12) is the third most critical barrier and

could also be interpreted as a consequence of the legislators' lack of knowledge and understanding about the importance of the SS of buildings for tenants and community well-being. In addition, the lack of competence of legislators directly influences the creation of complex certification procedures and inefficient distribution of regulations/codes (barriers GR2 and GR6 in Table 5, respectively), together with issues related to government policy, support, and management of the implementation of SS measures (GR5, GR7, and GR8 in Table 6). Moreover, the lack of safe, inclusive, green, and public spaces, in particular for women and children, older persons, and persons with disabilities (GR10) is considered one of the significant obstacles that prevents the successful adoption of SS measures. The root of this problem partially lies in inadequate urban planning in the past, especially in densely populated areas; thus, overcoming it is a challenge that requires multi-layered consideration in the future.

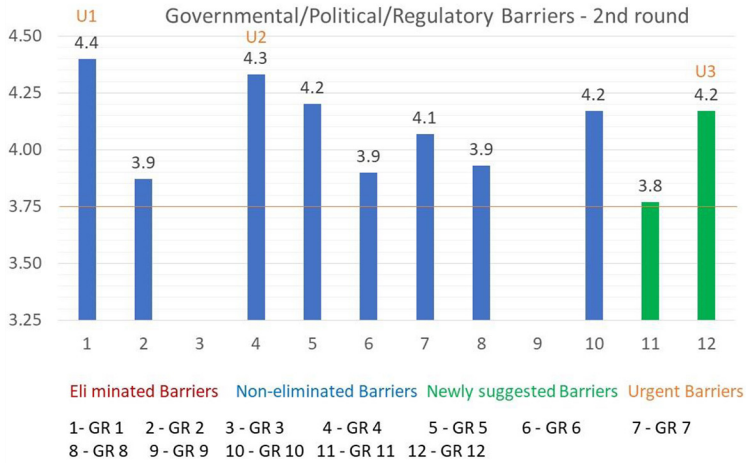

Figure 5. Govern./Regul. barriers in the 2nd round: added in the 1st round (2), eliminated (0), and urgent (3).

Table 6. List of final barriers from the Professional/Technical group and the three most urgent ones.

Index	Definition of Barriers	1st Round		2nd Round		The Most Urgent
		Mean	SD	Mean	SD	
PT2	Lack of technical competence of important stakeholders	4.08	0.94	4.20	0.66	U3
PT5	Lack of time—in general, during the planning and design process	3.85	0.99	3.80	0.89	
PT7	It is not an obligatory part of the architectural design process	4.40	0.81	4.43	0.68	U2
PT9	Lack of collaboration and information exchange between various stakeholders	3.90	0.90	4.27	0.74	
PT10	Poor urban planning (a short-sighted process of urban planning has led to difficulties in implementing social sustainability measures)	4.18	1.05	4.50	0.86	U1
PT15	Lack of competent management and leadership of new and innovative strategies (processes)	4.08	0.85	4.17	0.65	

4.3. Professional/Technical Barriers

Professional and technical attributes include some key elements, such as human resources and expertise involved in building design and construction. These elements are essential factors, as they influence all other project activities to achieve sustainability

goals [154]. Thus, professional and technical weaknesses are significant sources of obstacles related to sustainability [94] and should be thoroughly considered. Out of the 15 preselected barriers in this group (Figure 6), after the completion of the second round of the Delphi survey, 6 of them were considered significant from the experts' point of view (Table 6 and Figure 7). The three most urgent barriers from this group are the following: (1) "Poor urban planning—a short-sighted process of urban planning has led to difficulties in implementing SS measures"; (2) "It is not an obligatory part of the architectural design process"; and (3) "Lack of technical competence of important stakeholders", (PT10, PT7, and PT2, respectively, Table 6).

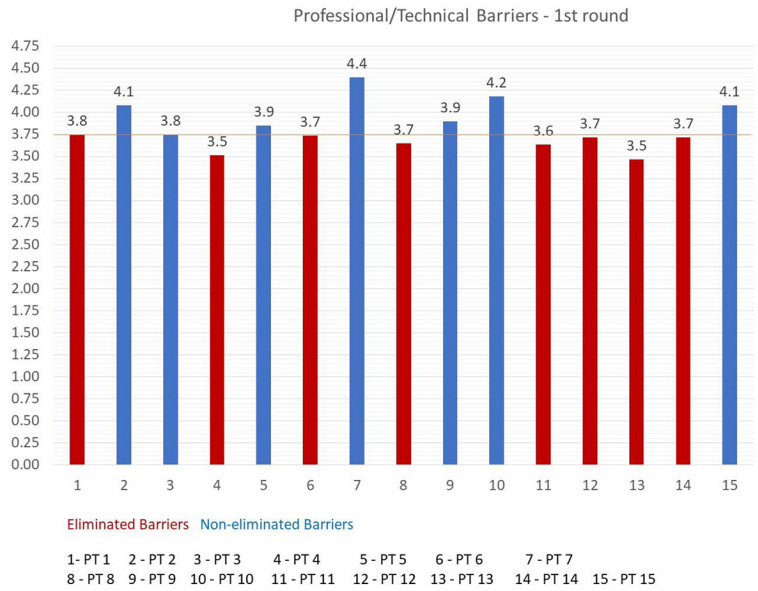

Figure 6. Professional/Technical barriers in the 1st round: preselected (15) and eliminated (8).

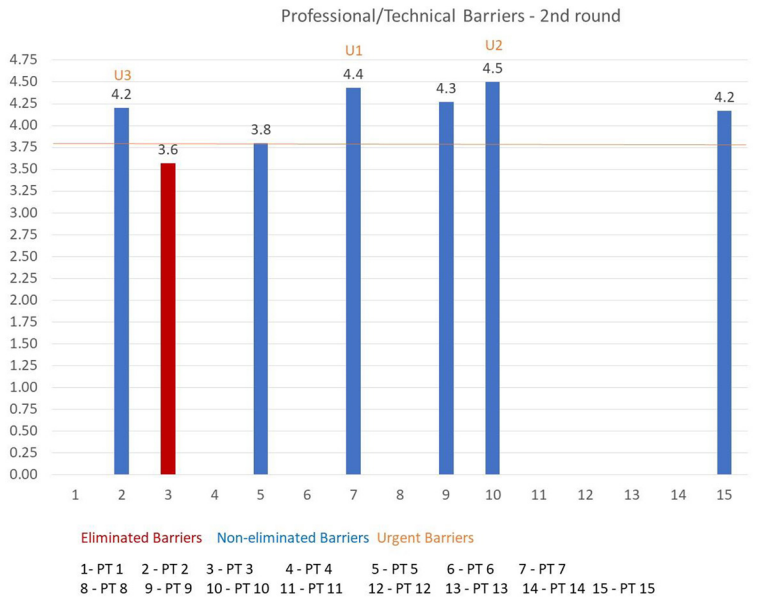

Figure 7. Professional/Technical barriers in the 2nd round: eliminated (1) and urgent (3).

The lack of technical competence of important stakeholders (PT2) may be a consequence of the fact that SS measures are not the obligatory part of building design; that is, key actors are reluctant to learn and acquire new knowledge if it is not mandatory or does not clearly contribute to the profit. Moreover, the lack of time required for adequate

planning and designing of buildings (PT5) and lack of cooperation and exchange of information between different stakeholders (PT9) are also seen by the experts as important barriers. Commonly, the time allocated for planning and designing of buildings is usually very limited and insufficient for a comprehensive and detailed consideration of all factors influencing the design on different levels. The cooperation and communication between the interested parties (necessary for proper implementation of SS measures) could be long-lasting and laborious, so it represents a complementary challenge for designers and other interested parties.

It can be concluded that one of the main reasons for non-implementation of SS measures in the design and construction of residential buildings stems from the absence of mandatory applications of SS measures, as well as inadequate planning of urban areas in the past. The lack of managerial competence and management of new and innovative processes in addition to the lack of time for cooperation between designers and key stakeholders is partly a consequence of the above-mentioned causes; that is, stakeholders are reluctant to learn new skills and knowledge if it is not obligatory or does not contribute clearly to their profit.

4.4. Market Barriers

Market aspects play a prominent role in the successful sale of residential properties and, in general, are mainly related to buyers' demand. The reasons for low requests can be different. In the field of sustainability, many end-users (occupants) in general do not care about sustainable building performance, which makes the market reluctant to adopt SS measures [92,93,160].

The results of the survey show that all five preselected barriers are significant according to the experts' perception (Figures 8 and 9). Table 7 summarizes the proposed critical barriers. The key barrier in this group is the "lack of clear body of evidence on the benefits of SS buildings over conventional buildings", barrier MA5 in Table 7. It reflects "the lack of investors in SS residential buildings", which is the second most urgent barrier, MA3 in Table 7. This type of barrier is related to the investors' sensitivity to the economic feasibility of the building as a primary factor in decision making.

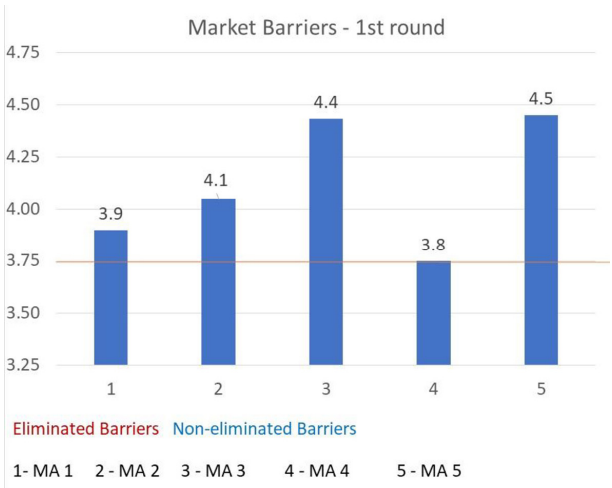

Figure 8. Market barriers in the 1st round: preselected (5) and eliminated (0).

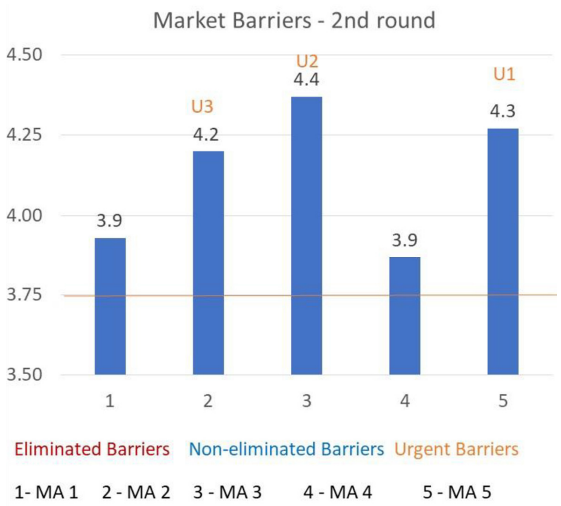

Figure 9. Market barriers in the 2nd round: eliminated (0), final (5), and urgent (3).

Table 7. List and description of final barriers from Market group.

Index	Definition of Barriers	1st Round		2nd Round		Urgency
		Mean	SD	Mean	SD	
MA1	Limited knowledge about market potential	3.90	0.93	3.93	0.94	
MA2	Lack of demand/market for SS of residential buildings due to low social–economic status of end user	4.05	0.97	4.20	0.96	U3
MA3	Lack of investors in socially sustainable multi-apartment buildings	4.43	0.79	4.37	0.85	U2
MA4	Lack of good marketing strategies	3.75	0.89	3.87	0.73	
MA5	Lack of clear evidence and indications of the benefits of SS buildings compared to traditional buildings	4.45	0.67	4.27	0.64	U1

Moreover, the limited knowledge of market potential by important stakeholders (MA1) as well as the lack of good marketing strategies to promote SS buildings (MA4) make investors unaware of the economic and social benefits of adopting SS measures. On the other hand, "the diverse and low socio-economic status of the occupants further limits the demand for SS residential buildings" is the third most urgent barrier in this group (MA2 in Table 7), because the sustainable performance of a building is not the priority attribute of the building for low-income buyers [92,160].

4.5. Cultural/Behavioral Barriers

The main obstacles within this group relate to the cultural, social, and behavioral attitudes of the main stakeholders, which affect the successful implementation of SS measures in building design and construction of residential buildings. The resulting barriers within this group are listed in Table 8, along with their definitions. Cultural/Behavioral barriers are issues that characterize the behavior of key stakeholders and their attitudes towards the SS aspect of residential buildings [96]. The key obstacle from the experts' perspective is focusing on profit maximization and minimization of investment return time (CB6 in Table 8) as the most important determinants of the main stakeholders when making a decision to invest in the construction of residential buildings. In addition, the lack of information and education on the values of building SS aspects prevents the main stakeholders from adopting SS measures in building design and is the second most critical barrier to counteract (barrier CB5 in Table 8). Moreover, consumerism as a prevailing cultural model that promotes a lifestyle of "excessive materialism revolving around reflex-

ive, wasteful or conspicuous overconsumption" [161] as a means of personal satisfaction and well-being (CB1) prevents end-users as well as other important stakeholders from recognizing more enduring values and giving up immediate pleasures for the sake of more valuable and lasting ones. The overall culture of stakeholders' resistance (resistance to changing/adapting mindsets towards sustainable design and construction, CB4 in Table 8) and lack of consensus on sustainability values among the key stakeholders (CB3 in Table 8) further complicate and slow down the implementation of SS measures (Figures 10 and 11).

Table 8. List and description of final barriers from Cultural/Behavioral group.

Index	Definition of Barriers	1st Round		2nd Round		Urgency
		Mean	SD	Mean	SD	
CB1	Consumerism as a prevalent cultural model that promotes lifestyle of "excessive materialism and overconsumption" as a means for personal satisfaction and well-being	4.02	0.97	4.17	0.87	U3
CB3	Lack of consensus on sustainability values among stakeholders	3.92	0.87	3.83	0.83	
CB4	Overall stakeholders' resisting culture (and hard changing/adapting mindset) toward sustainability design and construction	3.88	0.98	3.80	0.89	
CB5	Lack of awareness among end users and other stakeholders about the benefits of socially sustainable building design and construction	4.45	0.79	4.57	0.82	U2
CB6	Focusing on maximizing of profits and minimizing the return time on investments	4.75	0.51	4.73	0.52	U1

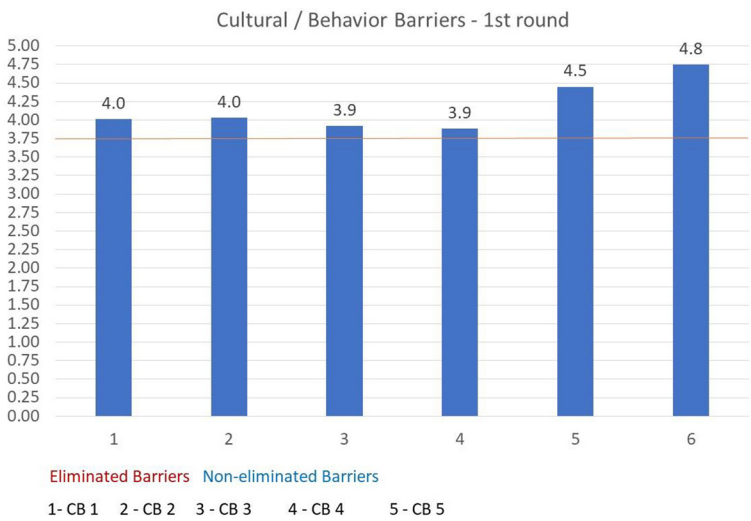

Figure 10. Cultural/Behavioral barriers in the 1st round: preselected (6) and eliminated (0).

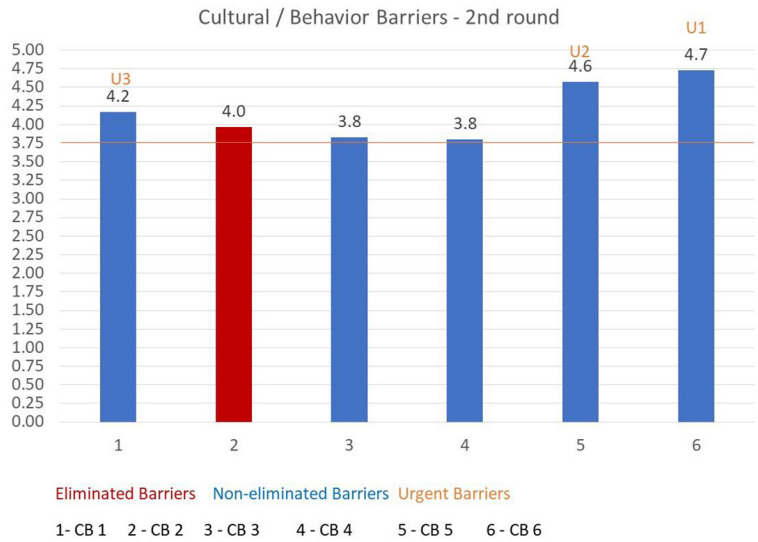

Figure 11. Cultural/Behavioral barriers in the 2nd: eliminated (1) and urgent (3).

5. Conclusions

Although SS has attracted considerable academic attention in recent decades, it is still less considered in relation to environmental and economic aspects. In order to fill the gap, the aim of the study was to identify critical barriers to the SS of residential (multi-apartment) housing from experts' perspectives. To this end, an extensive literature review was conducted to collect the initial pool of barriers followed by a two-round Delphi survey to reach consensus among a specially selected international professional panel for this purpose. Out of 58 barriers initially identified from the literature review and 2 from panelists' suggestions, 29 were adopted as important and classified into five groups. In addition, the three most urgent barriers from each group were determined, the overcoming of which would enable the fastest and most efficient achievement of building SS objectives. Among the most important are the following: "Investors' fear of higher investment cost"; "Lack of economic incentives for investors"; "It is not an obligatory part of the architectural design process"; "Inefficient codes/regulations on social sustainability"; "Lack of clear evidence and indications of the benefits of SS buildings compared to conventional buildings"; and "Investor's focus on maximizing profit and minimizing investment return time". In addition, the "Low economic status of an increasing number of end users" further reduces the demand for sustainable buildings, and therefore, investors' interest in their construction.

The main findings of the research have both theoretical and empirical implications. Theoretically, the study results can provide a model for social sustainability barrier assessment through the Delphi method. Practically, the results can help in prioritizing barriers to SS in residential housing, which is important for policy makers, developers, and planners. This provides a starting point for other researchers to identify the most relevant barriers in different contexts, i.e., countries with their specific characteristics, and to create the conditions for the elimination of those barriers by focusing on the most critical issues. Moreover, the checklist of barriers to SS presented in this paper, especially the critical ones, can be useful to scholars in further empirical studies. Finally, this study provides a valuable reference for both industry practitioners and policy makers in the residential building sector—it facilitates the development of socially sustainable solutions by understanding which strategies would lead to an increase in the adoption of SS in residential buildings and faster achievement of sustainability goals.

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Appendix A. Survey on Social Sustainability of Residential Buildings

Social sustainability could be defined as follows: "Concerning how individuals, communities and societies live with each other and set out to achieve the objectives of development models which they have chosen for themselves, also taking into account the physical boundaries of their places and planet earth as a whole. At a more operational level, social sustainability stems from actions in key thematic areas, encompassing the social realm of individuals and societies, which ranges from capacity building and skills development to environmental and spatial inequalities. In this sense, social sustainability blends traditional social policy areas and principles, such as equity and health, with emerging issues concerning participation, needs, social capital, the economy, the environment, and more recently, with the notions of happiness, well-being and quality of life. . . . A process for creating sustainable, successful places that promote well-being, by understanding what people need from the places they live and work. Social sustainability combines design of the physical realm (Figure A1) with design of the social world—infrastructure to support social and cultural life, social amenities, and systems for citizen engagement and space for people and places to evolve." [36].

Figure A1. Residential buildings.

Appendix A.1. Informative Questions

1. Your profession?

   (E.g., Architect, Engineer, Project Manager, Researcher, University professor, etc.)

2. Which sector do you work in?

   (E.g., Design, Planning, Engineering, Project management, Construction, Academic–Research, Consulting, Other, etc.)

3. How many years of professional experience do you have?

   (E.g., 1–5, 5–10, 10–15, 15–20, over 20)

4. Do you have any experience in planning/design/building of (new) apartment buildings? (YES or NO)

   If yes, please specify the number of years of working experience.

5. Do you have any experience in renovation of (existing) apartment buildings? (YES or NO)

   If yes, please specify the number of years of working experience. (1–5, 5–10, 10–15, 15–20, Over 20)

6. Do you have experience in practice and research in sustainability of built environment (e.g., buildings, green areas, public places, etc.)?

   If yes, please specify the number of years of working experience. (1–5, 5–10, 10–15, 15–20, Over 20)

7. Do you have experience in research or practice in social aspects related to built environment?

Appendix A.2. Survey Questions

In the following 5 tables, the barriers are divided into five groups: (A) Financial/Economic, (B) Governmental/Regulatory, (C) Market, (D) Professional/Technical, and (E) Cultural/Behavioral barriers.

1. Please assign grades 1–5 to each of the BARRIERS that prevent widespread application of SOCIAL SUSTAINABILITY design process and construction of apartment buildings.

Level of relevance—It answers the question of the relevance/suitability of observed barriers for the problem under consideration (Table A1).

Table A1. Level of relevance.

5	**4**	**3**	**2**	**1**
Extremely suitable/relevant	Highly suitable/relevant	Medium level of relevance	Low level of relevance	Not suitable/relevant

2. For each of five groups of barriers select three (3) barriers that require the most urgent intervention in order to eliminate their highly negative impacts.

Appendix A.2.1. Survey Questions Related to Financial/Economic Barriers (Table A2)

- Please assign grades 1–5 to each of the BARRIERS proposed in Table A2.
- Please select three (3) barriers that require the most urgent intervention.

Table A2. Financial/Economic barriers.

	Financial/Economic BARRIERS	**Level of Relevance (1 to 5)**	**3 Urgent Interventions (X)**
1	Fear of higher investment cost		
2	High cost of sustainable building materials and technologies		
3	Increased maintenance and operation cost		
4	Lack of economic incentives; lack of financing for socially sustainable projects, including projects focused on socio-cultural aspects		
5	Investment risks		
6	Long payback periods		
7	Difficult to access to financing		
8	Financial limitations of investors/developers		
9	Lack of motivation of designers (there is no extra reward or negative consequence)		
10	High costs of specialized courses and seminars focused on social sustainability		
11	Difficulty of translating social benefits into monetary/financial values		
12	Difficulties of implementing public–private partnerships		
13	High costs of participatory engagement		
14	Lack of funding helping to link four pillars of sustainability (for example, to link cultural to other three sustainability pillars)		
	Add a new one if any: 1. 2.		

Appendix A.2.2. Survey Questions Related to Governmental/Regulatory Barriers (Table A3)

- Please assign grades 1–5 to each of the barriers proposed in Table A3.
- Please select: three (3) barriers that require the most urgent intervention.

Table A3. Governmental/Regulatory barriers.

	Governmental/Regulatory Barriers	**Level of Relevance (1 to 5)**	**3 Urgent Interventions (X)**
1	Inefficient (inadequate) codes/regulations/standards on social sustainability		
2	Complex certification procedures		
3	Policies do not address the financial implications		
4	Lack of knowledge on social sustainability measures among legislators and regulators (resulting in inadequate regulations, policies, etc.)		
5	Lack of inclusive and participatory urban planning and management		
6	Inefficient dissemination of codes/regulations		

Table A3. *Cont.*

	Governmental/Regulatory Barriers	Level of Relevance (1 to 5)	3 Urgent Interventions (X)
7	Lack of support from the government (lack of government policies and support)		
8	Failure of the government in defining and enforcing an overarching framework that directs and governs all attempts in the field and prioritizes the tasks with a definite timeline and milestones		
9	Lack of government support for social and environmental links between urban, peri-urban, and rural areas		
10	Lack of safe, inclusive, green, and public spaces, in particular for women and children, older persons, and persons with disabilities		
	Add a new one if any: 1. 2.		

Appendix A.2.3. Survey Questions Related to Market Barriers (Table A4)

- Please assign grades 1–5 to each of the BARRIERS proposed in Table A4.
- Please select: three (3) barriers that require the most urgent intervention.

Table A4. Market barriers.

	Market Barriers	Level of Relevance (1 to 5)	3 Urgent Interventions (X)
1	Limited knowledge about market potential		
2	Lack of demand/market for socially sustainable apartment buildings—diverse and low social–economic status of end-users limits the demand for socially sustainable apartment buildings		
3	Lack of investors in socially sustainable multi-apartment buildings		
4	Lack of good marketing strategies to promote SS and lack of sensitized experts, institutions, tenants, other stakeholders, etc.		
5	Lack of clear evidence and indications of the benefits of socially sustainable buildings compared to other buildings		
	Add a new one if any: 1. 2.		

Appendix A.2.4. Survey Questions Related to Professional/Technical Barriers (Table A5)

- Please assign grades 1–5 to each of the BARRIERS proposed in Table A5.
- Please select: three (3) barriers that require the most urgent intervention.

Table A5. Professional/Technical barriers.

	Professional/Technical Barriers	Level of Relevance (1 to 5)	3 Urgent Interventions (X)
1	Lack of awareness among designers (disbelief and incredulity on designers' part on the value and merits of socially sustainable building design and construction)		
2	Lack of technical competence of important stakeholders		
3	Lack of skilled workers		

Table A5. *Cont.*

	Professional/Technical Barriers	Level of Relevance (1 to 5)	3 Urgent Interventions (X)
4	The limited number and types of materials that meet the criteria of sustainable construction		
5	Lack of time—in general, during the planning and design process		
6	Additional efforts for collaboration and communication among stakeholders are too time consuming to be applied in design		
7	It is not an obligatory part of the architectural design process		
8	Lack of research and development about new sustainability materials, construction processes, technology, and technology		
9	Lack of collaboration and information exchange between various stakeholders		
10	Poor urban planning (a short-sighted process of urban planning has led to difficulties in implementing social sustainability measures)		
11	Lack of easily accessible (technical) guidance		
11	Lack of social sustainability measurement tools and tools/software to support socially sustainable design		
13	Lack of open-source information and support		
14	Lack of sustainable construction projects for reference		
15	Lack of competent management and leadership of new and innovative strategies (processes)		
16	Social sustainability is not an obligatory part of the architectural design evaluation process		
	Add a new one if any: 1. 2. 3.		

Appendix A.2.5. Survey Questions Related to Cultural/Behavioral Barriers (Table A6)

- Please assign grades 1–5 to each of the BARRIERS proposed in Table A6.
- Please select: three (3) barriers that require the most urgent intervention.

Table A6. Cultural/Behavioral barriers.

	Cultural/Behavioral Barriers	Level of Relevance (1 to 5)	3 Urgent Interventions (X)
1	Consumerism as a prevalent cultural model that promotes lifestyle of "excessive materialism that revolves around reflexive, wasteful, or conspicuous overconsumption" as a vehicle for personal satisfaction and well-being		
2	End-user behavior prevents the achievement of social sustainability goals, as social sustainability is a dynamic and ongoing process that depends on end-users' attitudes and their interaction with the built environment		
3	Lack of consensus on sustainability values among stakeholders		
4	Overall stakeholders resisting culture (and changing/adapting mindset) toward sustainability design and construction		
5	Lack of awareness among end-users and other stakeholders about the benefits and value of socially sustainable building design and construction		

Table A6. *Cont.*

	Cultural/Behavioral Barriers	Level of Relevance (1 to 5)	3 Urgent Interventions (X)
6	Focusing on maximizing profits and minimizing the return time on investment as the main and most important determinants of the main stakeholders when making a decision on investing in construction of residential buildings Add a new one if any: 1. 2. 3.		

Thank you very much for taking the time to complete our survey! Your answers are important to us and will help us better understand where change is needed to break down the obstacles to socially sustainable multi-family buildings!

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