

FACTORS AFFECTING SUSTAINABLE DESIGN IN ARCHITECTURE: PERCEPTIONS FROM TURKEY

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ABSTRACT

A significant portion of the scholarly contributions to the sustainable architecture debate falls into the 'eco-technic' stream of thought with its considerable emphasis on efficiency and high-technology as the solutions of environmental problems. This perspective, however, can be criticised for ignoring the interaction of a large set of contextual factors that surround the ongoing debate. As part of a research study which aims to develop a prediction model for the pro-environmental behaviours of architects as practicing professionals, a questionnaire survey was designed and delivered to the members of Istanbul Chamber of Architects. The measurement instrument had an open question: What are the factors that influence (hinder or facilitate) the development of sustainable solutions in architecture? Around 120 architects responded and these responses were qualitatively analyzed to identify the factors that influence their sustainability-related decisions. The findings suggest that while the client-related, economic and legal factors are especially critical to achieve targets, the adoption and implementation of sustainable solutions in the building industry require a thorough understanding of the interactions of individual, organization, inter-organization, and country-level factors. Decision makers who are responsible for designing sustainability policies and steering mechanisms in the building industry can be the main beneficiaries from a better understanding of such interactions.

Keywords: Architects; Building Industry; Sustainable Architecture; Sustainable Design; Turkey.

1. INTRODUCTION

Sustainability concept may have different meanings for different stakeholders. However, it appears reasonable to highlight the common denominators of the concept (Berardi, 2013:73): It is *time dependent*; so the way we understand sustainability is flexible according to the availability of knowledge at any given time; it is *space-dependent*, so understanding the local context of sustainability discussion is indispensable; it is *domain-specific*, so people who behave environmentally at home may not be that sensitive, for example, in their purchasing or transportation decisions; and finally, sustainability concept has *interpretative flexibility*, so a pluralistic approach is needed to understand and address the perceptions of different stakeholders.

The sophisticated nature of the sustainability concept is one of the sources of conflicting perspectives and multiple interpretations of different stakeholders in the building industry, which tend to make sustainable building (SB) suit their peculiar needs. On a practical level, SB requires the use of innovative methods, tools and materials in building production; an improved interaction of stakeholders in an integrative way and the use of new management implementation tools, including also the new ways of certification and quality control procedures (Rekola *et al*, 2012:79-80). Green building certification systems such as the US Green Building Council's Leadership in Energy and Environmental Design (LEED) and the Building Research Establishment Environmental Assessment Method (BREEAM) accentuate the major goals of SB (Chong *et al*, 2009:144): reduced carbon footprints; ecological and environmental protection; creating a healthy indoor and outdoor

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environment; reduced water usage; achieving energy efficiency; eliminating environmentally harmful materials; improving resource efficiency, and conserving resources of land and raw materials. An overwhelming majority of the scholarly contributions to the sustainability debate appears to fall into this 'eco-technic' stream of thought with its considerable emphasis on efficiency and high-technology as the solutions of environmental problems. This perspective, however, can be criticized for ignoring the contextual factors that surround the sustainability-oriented initiatives. In Turkey, for example, while this paper is being written, there is a hot debate on many large infrastructure projects such as 'Kanal Istanbul', which has an ambitious goal of connecting The Black Sea to The Marmara Sea through a channel and The Yavuz Sultan Selim Bridge' - the third suspension bridge over the Bosphorus to the north of the present ones- which was taken into operation on 26th August, 2016. These gigantic projects are functioning as a political litmus paper in the Turkish society, between the right and left-wing politicians and citizens: The sharp discrepancy is between those who see these investments as the *sine qua non* for achieving economic growth, and those, including the Chamber of Architects (CAT) and many other professional organizations and NGOs, which are extremely concerned about the irreversible impacts of these investment projects on the natural and built environment in the long run. It is argued in this paper that the technical aspects of the sustainable architecture debate cannot be isolated from the surrounding factors.

Based on qualitative data from about 120 practicing architects, this paper aims to understand the factors that affect the ongoing debate on sustainability, from the perspectives of architectural designers, who deserve attention in terms of their special relationships with the clients and the associated capacity to specify the end-product with desired level of sustainable outcomes. After a review of the barriers to sustainability in the building industry and a short summary of the major streams of thought in the sustainable architecture debate, the paper presents the findings of the empirical study.

2. BARRIERS TO SUSTAINABILITY IN THE AEC INDUSTRY

A diverse set of barriers to sustainable building (SB) have been reported in the literature, where many researchers agree that the fragmented structure of the building industry where stakeholders have different priorities, visions, ideas and technical knowledge base, makes it difficult to develop a shared sustainability agenda and achieve targets in an integrated way. This hinders the successful delivery of the sustainability-oriented projects because they are generally more complex relative to the traditional projects due to the level of collaboration, networking and knowledge exchange they require in the process (Klotz and Horman, 2010:595; Hakkinen and Belloni, 2011:244), where interpersonal skills (Magent *et al*, 2009:62), and the coercive interplay between technical subsystems may become critical (Kendall, 1999:5). However, the traditional project delivery system, rooted in the rise of specialized disciplines in the 1970s (Magent *et al*, 2009:62), does not allow an early collaboration among the stakeholders, resulting in a loss of possibilities and right design options (Hakkinen and Belloni, 2011:244). Consequently, AEC professionals encounter difficulties to access critical value-added sustainability knowledge. For example, design and construction know-how is left to the construction phase, while maintenance and replacement of building elements are left to the facility managers (Chong *et al*, 2009:144). Construction organizations cannot share their expertise on the planning and cost estimation processes (Hakkinen and Belloni, 2011:244). There are signs that the new project delivery systems (e.g., the Integrated Project Delivery) and the associated collaboration platforms (e.g., the Building Information Modeling) can provide valuable opportunities to achieve an integrated project process with complex design analyses and material/system selection (Hakkinen and Belloni, 2011:244).

Environmental and social concerns rarely counterbalance cost factors in the industry since the building projects demand a huge financial commitment, which makes it difficult for companies and clients/owners to divert attention from the risks of cost and time overruns (Chong *et al*, 2009:151). Fear of additional costs, expensive design and construction, long payback periods (Dong and Wilkinson, 2007:278) and the methodological difficulties to quantify positive outcomes (e.g. increased market value or reduced operation costs) from sustainable building prevent clients from using their influence on the development of sustainable solutions (Hakkinen and Belloni, 2011:242). Low demand pushes the prices of sustainable products and make them less attractive in the short run. High costs of buildings raise the perceived risk of sustainable solutions, which often have innovative aspects, and lead to a phenomenon often referred to as conservatism by many scholars. According to Hakkinen and Belloni (2011:240-247), lack of experience and comprehensive information about new solutions result in a resistance to new technologies, which necessitate additional effort on the suppliers' side to provide reliable information to the market to reduce uncertainty.

Implementation of sustainable solutions requires a significant shift in the knowledge base of the building industry, as they generally require innovation, new knowledge and learning effort (Hakkinen and Belloni, 2011:244). From curriculum revisions in higher education and continuing professional development programs to revisions/development of codes and standards, and to a better collaboration between academia and industry, the building industry needs to explore more efficient means to convert the sustainability-related knowledge into industrial practice (Chong *et al*, 2009; Dong and Wilkinson, 2007; Hakkinen and Belloni, 2011:240). Access to this knowledge can be especially critical in the residential building sector (Hakkinen and Belloni, 2011:245), which is dominated by small and medium enterprises (SMEs) with relatively limited resources and management capacity. The lack of or wrong types of policies, steering mechanisms and the associated instruments can hamper the dissemination of sustainable practices (Chong *et al*, 2009:152; Hakkinen and Belloni, 2011:242).

There appears a consensus on the dominant role of clients: They are the actors who demand innovative solutions, take financial risks, and facilitate the transformation of supply chain towards better collaboration and integration. To be able to fulfill such roles, however, their general level of knowledge on sustainability should be increased significantly. Governmental and local authority organizations are thought to have additional responsibilities in this transformation process not only as the clients of exemplary building projects, but also as the developers and disseminators of sustainability norms, methodologies, metrics, specifications and reliable information via the public procurement and tendering systems for both new buildings and the existing building stock (Hakkinen and Belloni, 2011:240-249). The following section will narrow the topic to the role of architectural designers.

3. DEBATE ON SUSTAINABLE ARCHITECTURE

Hopwood *et al* (2005:41) differentiate between three broad views on sustainable development: that it can be achieved within the present structures by maintaining *status quo*; that a fundamental reform is necessary to achieve sustainability without disrupting existing arrangements (the *reformist* approach); and that a radical transformation is needed to change the economic and power structures in the society to achieve sustainability (the *transformative* approach). After a comprehensive synthesis, Guy and Farmer (2011) identify various streams of sustainability thought (or "typologies of environmental logic") in the architecture literature, which can be distinguished from each other according to the level of emphasis they place on technology; culture and values; aesthetics; health and social factors. Based on Guy and Farmer's typologies, it seems reasonable to contend that the majority of the scholarly contributions to the sustainable architecture debate in the building industry put significant emphasis on efficiency, innovation and high-technology as the solutions of environmental problems. Researchers from this eco-technic stream of thought have addressed different aspects of sustainable design such as the building management systems; energy and water efficiency; material usage; recycling, amongst others (Bunz *et al*, 2006:34).

Overemphasis on technology, however, may sometimes be at the expense of an adequate assessment of the contextual factors that surround the sustainable architecture debate. Keitsch (2012:142-143) highlights that "*the call to examine practices and methods as well as values and norms is growing louder...*" accompanied by a call for interdisciplinary cooperation and teamwork to address the complexity of problems. Sustainable solutions require a "*thorough understanding of the connections between interconnected subsystems to create innovative solutions*" (Rekola *et al*, 2012:78) and an exchange of functional competencies among various stakeholders (Magent *et al*, 2009:63). Emerging project delivery systems of the day (e.g., the Integrated Project Delivery) point not only to a paradigm shift in terms of doing business in the industry, but also to the reshaping of power relationships in a new era, to which the architects need to adapt themselves. Hakkinen and Belloni, (2011:245) argue that designers' self-confidence is significantly reduced when they are expected to develop sustainable solutions. This might be partly related to the fact that "*the dominant ideology in architectural circles and in architectural education continues to follow the emphasis on the singular building expressing the architect's and client's wills rather than on the 'cultivating of ordinary buildings in a continuous urban fabric that serves as a setting for the special building*" (Kendall, 1999:2). Additionally, the difficulties concerning the access to sustainability-related data and the lack of automatic calculation procedures and tools, especially in the early design stage, are often highlighted among the barriers to sustainable design solutions (Hakkinen and Belloni, 2011:245-246).

4. METHOD

A research was designed to investigate the factors that influence the pro-environmental behaviors of architects as professional individuals considering that an adequate understanding of these factors could be a valuable input for the design of efficient intervention programs aimed at behavior changes via structural and/or informational strategies. As part of this larger research study, a questionnaire was designed and delivered to the members of Istanbul Chamber of Architects (CAT) in collaboration with CAT. In addition to the closed questions related to the pro-environmental behaviors of architects, the questionnaire included an open question: “What are the factors that influence (hinder or facilitate) the development of sustainable solutions in architecture?” So that the authors aimed to describe the local environmental context of the sustainability debate in Turkey and compare it to the general literature to achieve a sound interpretation of the quantitative evidence. The authors initially considered choosing a stratified sampling strategy, however, the CAT did not have a full and up-to-date list of architects with detailed demographic characteristics such as the marital status; education level; employment status; and others. Consequently, the link of the digital questionnaire was sent by the CAT to around 18,000 members in Istanbul, and those interested were invited to fill out. 123 architects, out of 280 who filled out the questionnaire, were responsive to the open question and they provided qualitative feedback. Table 1 presents the composition of the respondents. Although this composition was not an outcome of a stratified sampling strategy, the survey respondents appeared reasonably balanced in number according to their gender, marital status, formal education and income levels. Qualitative content analysis was conducted to analyze their responses to code the textual material to provide a meaningful reading of the content.

Table 1. Composition of Sample

Variables		Number of respondents	%	Mean	Median	Standard deviation
Gender	female	78	63	-	-	-
	male	45	37			
Age				35.51	31.00	11.68
Marital status	single	66	54	-	-	-
	married	57	46			
Formal education level (degree)	undergrad	66	54	-	-	-
	grad	57	46			
Income (Turkish Lira – TL)	<2,000	6	4.87	-	-	-
	2,000-3,999	56	45.52	-	-	-
	4,000-5,999	36	29.26	-	-	-
	6,000-9,999	18	14.64	-	-	-
	>10,000	7	5.70	-	-	-
Position in the company	employee	98		-	-	-
	employer	25		-	-	-
Company size (No. of employees)				25.00	10.00	172.33

5. FINDINGS

Following a qualitative content analysis, which included several rounds of coding effort by the authors, a total of 36 themes (factors) from the textual material were classified into four levels of analysis, including the *individual* level; the *organizational* level; the *industry/inter-organization* level; and the *country* level. Although the frequencies of the responses of the architectural designers may not be the primary focus of interest in a qualitative content analysis, Figure 1 below gives an idea about where the majority of the concerns of the designers tend to cluster. Figure 1 suggests that the demand for sustainable solutions from the

environmentally sensitive clients, who are ready to bear/share the cost of these solutions; governmental/legal factors which may correspond to various barriers or facilitators; and the level of access to knowledge and expertise concerning sustainable solutions at various levels are perceived as the major factors that shape the sustainable architecture agenda in Turkey.

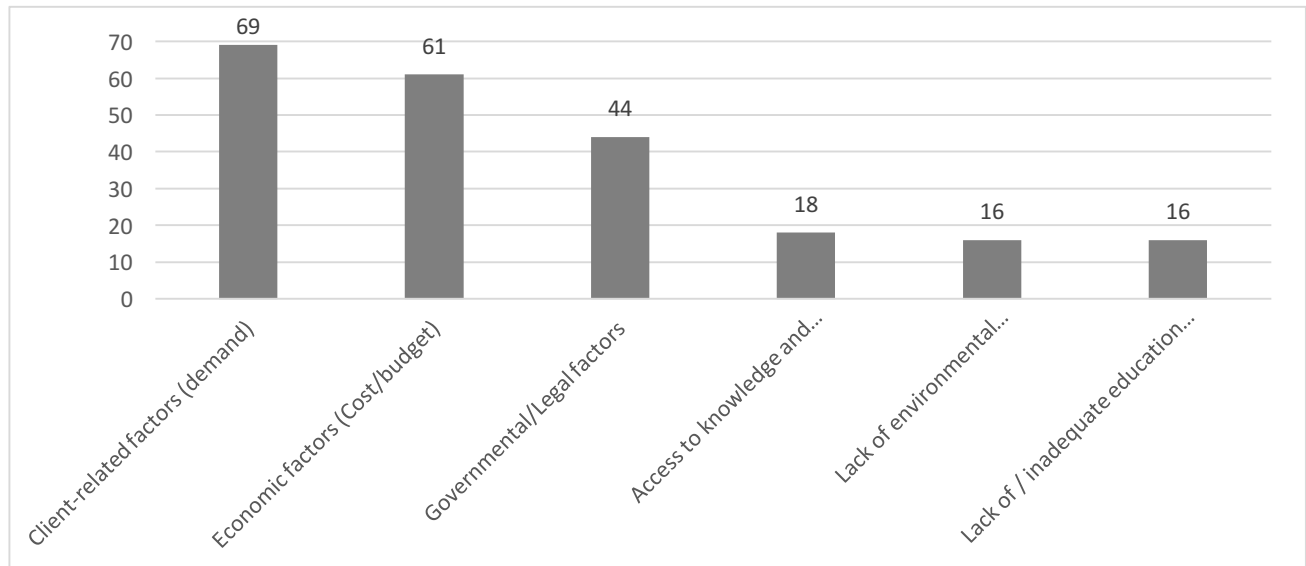


Figure 1: Frequency of Factors that Affect Sustainable Design Solutions

“The vertical axis shows the number of respondents

Table 2 presents a more inclusive summary of the qualitative evidence. As Table 2 shows the designers place considerable emphasis on the industry and country-level factors, while less emphasis is placed on the individual and organization-level factors. Although many of the factors in Table 2 have many commonalities with the globally shared concerns of the building industry, various factors with strong local context deserve particular attention, recalling that 'spatial dependence' (local interpretation) is amongst the common denominators of the sustainability concept (Berardi, 2013:73).

Many architects argue that the main character of the sustainability debate in Turkey is significantly shaped by a set of country-level factors (sub-items under 4.1 and 4.2 in Table 2). The lack of a political will to develop a national sustainability agenda, coupled with the short-term governmental policies especially in the housing and energy sectors, which fuel overconsumption patterns, and the prevailing development models which merely focuses on economic growth at the expense of social rights and in favor of special interest groups, are amongst the obstacles that hinder the adoption and dissemination of sustainable practices in the building industry. According to designers, factors such as the incompetence of public officials to inspect design projects which incorporate innovative elements; the conservativeness of the development law plan which favors individual building solutions, rather than their coherence in an urban fabric; the lack of national standards and building codes which could ease the contemporary use of traditional building techniques and materials, are amongst the intrinsic results of the lack of a sustainability-oriented political agenda.

Overconsumption patterns in the country is an obstacle to sustainability (29 years old; male; single; master’s degree; 5 years of sector experience)

Current governmental strategy on energy is an obstacle to developing sustainable design solutions (29 years old female with an undergraduate degree and 5 years of professional experience)

Especially in the public projects, officials without adequate [technical] knowledge intervene the process and they negatively influence the projects by putting forward cost issues (45 years old female with a master’s degree and 25 years of professional experience)

We can develop true solutions by developing a national strategic plan [on sustainability] as early as possible (72 years old male with a master’s degree and 43 years of professional experience)

Current building regulations and floor area ratios in Turkey are creating dense architectural spaces which give way to overconsumption [of resources] and which are too far from being sustainable. It is difficult to talk about

sustainability [under these circumstances]. We can easily observe that green certification systems of many buildings are the means to cover rent seeking [behavior] (28 years old female with master's degree and 3 years of professional experience)

A relatively small number of survey respondents accentuate the lack of a participative and decentralized decision making culture (item 4.2.13 in Table 2), which inevitably results in an inadequate number of local initiatives that are targeted at sustainable design solutions.

The political will is against the participation of professional organizations in [sustainability-related] decision making processes. Non-governmental organizations should counterbalance those who enjoy abnormal profits. Those who live in urban areas should have a voice in the management (56 years old male with an undergraduate degree and 56 years of professional experience)

In the face of a campaign to discredit architects, we should tell the society that architecture is important. The government sees architects as barriers to its political targets and tries to efface its influence on the society (43 years old male with a master's degree and 20 years of experience)

The respondents point also to the role of various country-level factors that are drivers for a positive change. Amongst these are the awareness building/raising campaigns through the mass media and the governmental initiatives (items 4.1.2 and 4.1.3 in Table 2); the legal arrangements which mandate sustainable solutions – such as the energy efficiency law which was put into effect in 2007 (item 4.2.5 in Table 2); and the procurement of public buildings via design competitions which facilitate the development of sustainable solutions (item 4.2.9 in Table 2). Architectural designers put also a significant emphasis on the positive influence of a steadily expanding knowledge base regarding sustainable solutions both at industrial/inter-organizational and individual levels, which help reduce the perceived risk of sustainable building (SB) practices with technologically innovative elements (items 1.2 and 3.1 in Table 2). The sustainable products portfolio that is expanding steadily in recent years; the ease of access to the technical consultancy services of suppliers and the digital corpus of SB solutions (items 1.2.3 and 3.1.1 in Table 2); the increasing number of exemplary projects in the building market ('trial-by-others') (item 1.2.2 in Table 2) are amongst the factors that enhance the industrial and individual knowledge base. While 'trial-by-other' is a critical mechanism for the dissemination of SB practices, 'failures of others' may have an opposite effect:

There are misguided clients who could not get satisfactory results from sustainable practices. I think some of the [leading?] architecture companies which perceive sustainable design only as a marketing strategy, without an understanding of sustainability principles, are responsible for this (29 years old male with an undergraduate degree and 6 years of professional experience)

However, SB debate has a systemic nature in a project-based industry, where business and social networks are quite influential on the adoption and implementation of SB solutions:

...lack of knowledge of business partners such as mechanical, electrical and structural designers (29 years old female with a master's degree and 8 years of experience)

At the organizational level, especially the early-career architects have pointed to the role of involvement in organizational decision making, as a factor which may facilitate or hinder their capacity to implement the SB solutions (item 2.2 in Table 2).

Sustainable design solutions are not valued in my work environment. The only way to put ideas into practice is to be a managing partner in the company...Developing sustainable solutions and putting them into practice could be easier in a companies which have supportive [organizational] climate. What really matters however is to have [decision making] authority in such organizations (27 years old female with an undergraduate degree and 2 years of professional experience)

In addition to the factors listed in Table 2, majority of the respondents agree on the decisive role of the knowledgeable, open-minded and environmentally sensitive clients. Overall, qualitative evidence suggests that sustainable design solutions in the AEC industry are shaped by the multiple configurations of many factors which continuously interact with each other at different levels of decision making. Accordingly, it seems reasonable to contend that the sustainable architecture debate cannot be isolated from the surrounding context.

Table 2. Summary of Qualitative Content Analysis

1. Individual-level factors	List of factors	Influence (+ / -)
1.1. Habitual Behaviour/ Conservatism	1.1.1. Architects' reluctance to leave conventional solutions/ practices	-
1.2. Professional knowledge base	1.2.1. Previous professional experience with SB (e.g., involvement in overseas projects)	+
	1.2.2. Trial-by-others (access to the experience of others)	+
	1.2.3. Access to information on sustainable practices (e.g., Internet; digital databases and publications; information on best practices; dissemination activities such as conferences and seminars)	+
	1.2.4. Academic work (e.g., post-graduate study on sustainable solutions)	+
	1.2.5. Professional development activities	+
2. Organization-level factors	List of factors	Influence (+ / -)
	2.1. Environmental awareness and consciousness of decision makers in companies	+
	2.2. Involvement in decision making	+
	2.3. Inadequate time left to designers to engage in professional development regarding sustainable design solutions	-
3. Industry-level factors /	List of factors	Influence (+ / -)
3.1 Industrial knowledge base	3.1.1. Access to technical consultancy services (e.g. Individual experts or manufacturers)	+
	3.1.2. Technical know-how in the market (e.g., availability of qualified labour and the competency of contractors)	+
	3.1.3. Existence of innovative companies which demonstrate the benefits from sustainable practices (Trial-by-others) and reduce the perceived risk of sustainable solutions.	+
	3.1.4. Systematic approach of green building certification systems	+
	3.1.5. Collaboration between industry and academia	+
3.2 Structural characteristics of the building industry	3.2.1. Cost-based nature of competition in the building industry	-
	3.2.2. Fragmentation of the industry (e.g., lack of cooperation among business partners/stakeholders; lack of agreement on the definition of sustainability)	-
	3.2.3. Short design processes which hinder the development of sustainable solutions	-
3.3 Economic factors	3.4.1. Inability to demonstrate the tangible benefits from adopting sustainable practices (i.e. Cost benefit analysis, LCA, raising sales prices)	-
	3.4.2. Declining costs of sustainable solutions in relation to expanding portfolio of sustainable products in the market	+
4. Country-level factors /	List of factors	Influence (+ / -)
4.1. General knowledge base	4.1.1. Lack of emphasis placed on sustainability and the way it is taught in the education system at all levels (e.g., the lack of innovative methodologies to teach sustainable solutions)	-

	4.1.2. Media channels and campaigns that focus on environmental problems and build/raise sensitivity in the society (e.g., they ease the marketing of sustainable solutions to the clients)	+
	4.1.3. Governmental initiatives which build/ raise environmental awareness	+
4.2. Policies and steering mechanisms	4.2.1. Lack of environmentally-sensitive urban planning policies and implementation tools for highly populated urban areas	-
	4.2.2. Lack of intervention strategies which are specifically targeted at clients/end-users	-
	4.2.3. Lack of a national strategic agenda on sustainability	-
	4.2.4. Low level of investment on infrastructure for waste management and recycling facilities	-
	4.2.5. Governmental policies and legal arrangements which mandate sustainable solutions (e.g. Energy efficiency)	+
	4.2.6. Lack of support of municipalities and the complicated bureaucratic processes	-
	4.2.7. Lack of national standards on sustainable practices	-
	4.2.8. Lack of building codes which support sustainable practices	-
	4.2.9. Design competitions held by public clients that facilitate the development of sustainable solutions as part of procurement systems	+
	4.2.10. Lack of/inadequate use of financial instruments (sanctions and incentives), especially in the residential building sector, where the clients are relatively more conservative	-
	4.2.11. Inadequate research and development budgets for the development of sustainable solutions	-
	4.2.12. Governmental policies that fuel capitalist overconsumption patterns	-
	4.2.13. Nature of decision making regarding environmental policies (e.g., lack of decentralized and participative decision making, resulting in inadequate number of local initiatives)	-
	4.2.14. Government's negative attitude towards professional organizations (e.g., campaigns to discredit architectural profession)	-

6. CONCLUSIONS

Sustainable solutions in the building industry are often the outcomes of the complex interactions between individual, organizational, industrial and country factors. Although the dissemination of technical knowledge regarding sustainable solutions at different levels has a positive impact in terms of reducing the risk perception of individuals, organizations, as well as of the building industry as a whole, we need a better understanding of the role of the contextual factors that surround the technical aspects of the sustainable architecture debate. This debate cannot be isolated from 'The Big Picture', in Turkey or elsewhere, since the success of various types of structural intervention strategies, targeted at 'changing the circumstances under which sustainability-oriented choices are made', is dependent on our collective ability to reach a consensus on the urgency of environmental problems, take political action to strength participative decision making at all levels, and build/raise awareness in the clients and the general public about the massive impact of the building industry on the natural and built environment.

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