

Architecture Competitions and Sustainability Criteria: The Example of eVolo Skyscraper Competition

Gizem Kuçak Toprak, Atilim University Fine Arts Design and Architecture Faculty Department of Architecture, gizem.toprak@atilim.edu.tr

Abstract

This study stems from the idea that, the ideas developed in architectural competitions, which address sustainability principles, will influence other acquisition methods, such as bidding and direct commissions, and design processes, and that they allow the emergence and dissemination of new ideas. Since the increasing numbers of high-rise buildings and skyscrapers around the world and their environmental, social and economic sustainability are gaining significance in our day, the study will examine projects that have been ranked in the Skyscraper Competition, which has been hosted since 2006 by eVolo -an architectural journal that identifies its focus as technological advancements, sustainability and 21st century innovative designs- in order to determine the way sustainability is addressed in architectural competitions. Then, the contributions made by projects ranked in this competition, which is hosted by an organization that is dedicated to popularizing the principle of sustainability, to the concept of sustainability will be discussed and a list of proposals to overcome the deficiencies, which are identified by the 2017 study conducted in Turkey, will be presented.

Keywords: sustainability, sustainable architecture, architecture competition, skyscraper competition, eVolo, eVolo skyscraper competition

1. Introduction

Skyscrapers date back to the Tower of Babel and the pyramids. Today, they are considered to be solutions to certain urbanization problems, occupying less urban space and green areas, offering various functions such as offices, housing and recreation within a single building etc. around the world and in Turkey on the one hand, while constituting an urbanization problem on the other. In the case of Istanbul, skyscrapers face heavy criticism, especially in recent years, for the damage they have done to Istanbul's silhouette (Figure 1). They can only be a solution to problems if they are designed at the right place, at the right time and with the right technology, materials and load-bearing systems.



Figure 1. Views from Istanbul's silhouette

a) Istanbul's silhouette 2016 [1] b) Istanbul's silhouette 2017 [2]

Building the highest skyscraper has been a global race, which is more intense in some countries than others. This race continues, especially in wealthy regions like the Emirates such as Dubai, not only against the rest of the world, but domestically too and they continue to break their own records (Figure 2).



Figure 2. A silhouette of the Address Hotel, Dubai [3].

20 of the 100 tallest completed buildings in the world by height to architectural top list prepared by the Skyscraper Center are located in Dubai [4]. The first building on the list, the Burj Khalifa building, is 828 meters tall. It has a combination of concrete and steel load-bearing systems and it is an important structure that contains office, residence and hotel functions as well as social activities, which makes it a tourist destination as well. In a documentary broadcasted by National Geographic in 2011, featuring architectural historian Prof. Andrew Dolkart, it is mentioned that the challenges that the Burj Khalifa building had to go through date back to the Equitable Building that was constructed in 1854. The most fundamental problems faced in skyscraper construction are carrying people vertically, preventing the structure from sinking into the ground and making lighter buildings, making the buildings resistant against natural elements such as sun, wind, desert sand, earthquakes and rain, and moving occupants to a safe area in emergency situations. The efforts to solve these problems date back to 1854, when Ernest R. Graham used the self-locking elevator system invented by Elisha G. Otis firm in his design for the Equitable Building. Then the Flatiron Building, Daniel Burnham and Frederick Dinkelberg designed which could not exist without a steel load-bearing system, and their design eliminated the problems of heaviness, sinking into the ground and the loss of floor space due to the load-bearing walls, which was experienced with the Monadnock Building, designed by Daniel Burnham and John Wellborn in 1891. Since the walls were not bearing any load anymore, glass facades became possible and improved the use of daylight, the view and the sun. The greenhouse effect created by glass façades was eliminated by the air conditioning system designed by Willis Haviland Carrier, which in turn increased floor areas in the United Nations HQ Building. The World Trade Center Buildings were designed by Minaru Yamasaki and Emery Roth&Sons and were built in 1973, where the problem of carrying materials vertically for the construction of upper floors was solved by the kangaroo crane and prefabricated building elements. Bruce Graham designed Sears Tower in 1970, with a new steel load-bearing system that was improved for wind resistance by moving the skeleton, which was conventionally located inside the building, to the outer surface. The problem of resistance against natural disasters such as earthquakes and other sways was overcome by a new technology that allowed flexible and rigid materials to exist together and the Taipei 101 building designed by C. Y. Lee & Partners that was completed in 2004 did endure an earthquake while it was under construction. All these efforts reached their highest level with the Burj Khalifa building [5].

The Burj Khalifa building, designed by With Skidmore, Owing & Merrill and completed between 2004-2010, is considered an architectural and engineering marvel due to its newly developed elevator systems, its load-bearing system and weight, its relationship with factors such as desert sand, the facade material and the relationship of this material with temperature, heat, desert sand and the load of the articles near the facade, the problem of sinking into desert sand, emergency exit problems and the work on the relationship between the ground relationships between the building and the desert sand (Figure 3) [5].



Figure 3. Burj Khalifa and the other side of Burj Khalifa, Dubai [6].

As demonstrated by the Burj Khalifa example, challenges of the architectural problem change when it comes to skyscrapers. Especially from the beginning of the design process through the completion of the design, uninterrupted construction, completion of the construction, the beginning of the building's life time and during the processes of ensuring sustainability, a series of complex problems will be confronted. For skyscrapers many factors, such as project and construction management, material types and amounts, operation costs of the building after construction and the energy to be consumed gain considerable importance due to the sheer volume and height of the building. Therefore, the sustainability of skyscrapers is considered to be a separate topic for discussion.

Sustainability as a concept became widely used and a major agenda item in the field of architecture in the 1970's and the 1980's. In the Brundtland Report, sustainability is addressed in terms of economic, social and environmental sustainability [7]. When it comes to sustainable architecture, it is found that environmental values are prioritized and concepts such as ecological design or ecodesign are in the foreground. Ayşin Sev defines sustainable architecture as " all activities that prioritize the use of renewable energy sources, which are sensitive to the environment, use energy, water, materials and the area effectively, protect the health and comfort of people while taking future generations into consideration, in every period of its existence," and lays out its principles; resource management, Life Cycle Design and Human-Oriented Design [8]. The strategies for implementing these principles are resource management, life cycle design and human oriented design. Resource management principles are using energy efficiently, using water efficiently, using building materials efficiently, using building sites efficiently; life cycle design phases are preconstruction period, construction period and post-construction period; human oriented design principles are protecting the natural environment, urban design site planning and designing for human comfort.

Jason F. McLennan defines sustainable architecture as design philosophy [9].

Ken Yeang explains the purpose of ecodesign as harmonious integration with the environment. Basically, ecodesign is the process of carefully and harmoniously integrating human designs with the extensive patterns, flows, processes and physical conditions of nature. To put it simply, it is the harmonious and perfect integration of the built environment with the natural environment, from source to production, use to demolition and eventually to assimilation within ecosystems and the biosphere. Effective integration of artificial systems with natural systems and processes is the primary and principal problem in ecological design or ecodesign [10].

The common association of the concept of sustainable design with ecological design and green design becomes more striking when it comes to skyscrapers. Because, as Ken Yeang states in his book, skyscraper is not an ecological design [11].

In this sense, it is possible to use different design criteria for the designs that will be developed. An examination of studies conducted in this context (the number of studies can be increased) [8,11-15] it is observed that many design criteria are used together and different criteria are developed for specific buildings due to the unique conditions of each. Environmental and economic sustainability seem to dominate in the examples [8,11-15] that are examined.

It is also possible to use different methods to improve, popularize and encourage these criteria. This study focuses on competitions as one method. The main result of the studies conducted in 2017 [16-18] is that architectural competitions is an effective method for developing, testing and disseminating new ideas and it is found that that the concept of sustainability has become an important factor in architectural competitions in Turkey in the 2000's. However, a study conducted in Turkey in 2017 concluded that [17]; the concept of sustainable design generally remains only in the contest specifications. The main subject to be examined here is the way the projects awarded by the eVolo Skyscraper Competition -which was associated with the subject of sustainability and competitors were more independent since it was for conceptual projects- approached this subject, and the intellectual and formal innovations they offered. With this examination, the aim is to propose a solution for the conclusions reached above, specifically for Turkey.

2. Methodology

As a project acquisition method, architectural competitions offer a number of advantages over other methods like bidding or direct commissioning. The most notable advantages include freedom to experiment with new ideas, creation of a platform that includes competitors, jury members, host of the competition and all other participants in a discussion on evaluating various alternatives, and publication of competition results digitally, which allows them to access different platforms. A study conducted in Turkey in 2017 [16] revealed that various political and military administrations that ruled the country from 1930 to 2000 have acquired a portion of the building types that reflected their ideology through architectural competitions. Architectural competitions are not only an opportunity for independent ideas to flourish but also a tool for popularizing ideologies. With their potential to lead the dissemination of an idea, architectural competitions seem to be able to spearhead the search and transfer of how the principle of sustainability can be used in the architectural context, development of available alternatives and expanding ways of use. Another study conducted in Turkey in 2017 [17] reveals that the concept of "sustainability" is only addressed superficially in competition

specifications and in competing submissions, and that it is thoroughly discussed only in competitions that are specifically about this concept. Yet the concept of sustainability has become one of the issues that need to be addressed thoroughly with its environmental, social and economic aspects in the building production process and it should be imperatively addressed at every competition and not only the ones that include sustainable design as a subject.

In this context, eVolo Skyscraper Competition and the award-winning projects between 2006-2018 will be examined in terms of sustainable design decisions that are effective in design. Therefore, examination tables have been developed and various keywords describing projects have been identified.

3. Case Study

eVolo defines itself as an architecture journal that focuses on technological advancements, sustainability and innovative designs of the 21st century and has been organizing skyscraper competitions every year since 2006.[19].

Below are Table 1-13 that examine the intellectual and formal innovations brought by the awarded projects by the competition, thanks to the more liberal environment due to the conceptual nature of the projects. Table 1-13 examine the projects that were ranked first, second and third, providing project name, name of designer and sustainable design decisions that influenced the design. Sustainable design decisions are described with keywords from project reports, as well as certain critical definitions and descriptions from these reports when keywords are not sufficient. Information on these projects were obtained from eVOLO's official website [20]. As a result of this examination, the aim is to create a conclusion to discover the intellectual and formal innovations that can be offered by the projects and the hope is that these discoveries will reflect on skyscraper design as an added value.

Table 1. Examination of 2018 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2018 eVOLO SKYSCRAPER COMPETITION | | | |
|---|---|---|--|
| Gradation | First Award | Second Award | Third Award |
| Project Name | Skysheiter.zip: Foldable Skyscraper for Disaster Zones | Shinto Shrine / Urban Rice Farming Skyscraper | Waria Lemuy: Fire Prevention Skyscraper |
| Participants | Damian Granosik, Jakub Kulisa, Piotr Pańczyk / Poland | Tony Leung / Hong Kong | Claudio C. Araya Arias / Chile |
| Sustainable design decisions | Key Words: Natural disasters; crisis-management; serve as multi-purpose hub for any relief operation; easy transportation; smaller footprint; instant deployment; scalability and repurposing; large external surface area; nanomaterial based on ETFE foil; solar cell; clean energy; rainwater. | Keywords: Restore the traditional interactions between Jinja (Japanese Shinto Shrine a vertically organized Jinja cum rice-farming complex. | Keywords: Forest; face the reconstruction from a new perspective; recover the lost housing and infrastructure; added to a restoration of the flora and biodiversity, through a system that prevents and mitigates future catastrophes. |

Table 2. Examination of 2017 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2017 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|--|--|--|
| Years | About the Design | First Award | Second Award | Third Award |
| 2017 | Project Name | Mashambas Skyscraper | Vertical Factories in Megacities | Espiral 3500 |
| | Participants | Pawel Lipiński, Mateusz Frankowski / Poland | Tianshu Liu, Linshen Xie / United States | Javier López-Menchero Ortiz de Salazar / Spain |
| | Sustainable design decisions | Key Words: Bring the green revolution to the poorest people; modular elements and system; construct, deconstruct, transport. | Key Words: Bring factories to the city; Sustainable waste management; Bring nature back to the city. | Key Words: Condenser tower; alternative urbanism; fundamentals of territory; public and private; vertical structure; public floorplans (tomato festival, agriculture park, productive agriculture, exchanger; catering; artificial beach; culture; leisure; exchanger; energy production); reinterpretation of elements. |

Table 3 Examination of 2016 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2016 eVOLO SKYSCRAPER COMPETITION |
|---|
|---|

4th International Sustainable Buildings Symposium (ISBS2019)

18-20 July 2019 / Dallas, Texas-USA

| Years | About the Design | First Award | Second Award | Third Award |
|-------|------------------------------|---|--|--|
| 2016 | Project Name | New York Horizon | The Hive: Drone Skyscraper | Data Skyscraper: Sustainable Data Center In Iceland |
| | Participants | Yitan Sun, Jianshi Wu / United States | Hadeel Ayed Mohammad, Yifeng Zhao, Chengda Zhu / United States | Valeria Mercuri, Marco Merletti / Italy |
| | Sustainable design decisions | Keywords: reverse the traditional relationship between landscape and architecture In this case | Key Words: Drone Technology | Key Words: Investigate a new morphological solution; represent both the complexity and the importance of the building into which we keep our data; maximize the use of the available renewable energies; allow the re-use in a sustainable way." |

Table 4. Examination of 2015 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2015 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|--|--|---|
| Years | About the Design | First Award | Second Award | Third Award |
| 2015 | Project Name | Essence Skyscraper | Invisible Perception: Shanty-Scaper | Cybertopia: Future of an Architecture Space, Death of Analogous Cities |
| | Participants | Ewa Odyjas, Agnieszka Morga, Konrad Basan, Jakub Pudo / Poland | Suraksha Bhatla, Sharan Sundar / India | Egor Orlov / Russia |
| | Sustainable design decisions | Key Words: Nonarchitectural phenomena in an urban fabric; overlapping landscapes like an ocean, a jungle, a cave or a waterfall will stimulate a diverse and complex range of visual, acoustic, thermal, olfactory, and kinesthetic experiences. " | Key Words: a unique solution for the fishermen; The vertical squatter structure; comprised of post-construction debris such as pipes and reinforcement bars that crucially articulate the structural stability; Recycled corrugated metal sheets, regionally sourced timber & thatch; vernacular language. | "A complex space structure of the future megapolis combines the physical and digital worlds." |

Table 5. Examination of 2014 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2014 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|--|---|--|
| Years | About the Design | First Award | Second Award | Third Award |
| 2014 | Project Name | Vernacular Versatility | Car And Shell Skyscraper: Or Marinetti's Monster | Propagate Skyscraper: Carbon Dioxide Structure |
| | Participants | Yong Ju Lee / United States | Mark Talbot, Daniel Markiewicz / United States | YuHao Liu, Rui Wu / Canada |
| | Sustainable design decisions | Key Words: Contemporary adaptation of Korean traditional architecture; wooden structure. | Key Words: a city in the sky; a vertical suburban neighborhood equipped with recreational and commercial areas; traditional and contemporary houses and other diverse programs plug in the structure. | Key Words: Carbon capture; transform carbon dioxide into solid construction material; air capture of carbon dioxide and the resultant production of a solid construction material capable of supporting load; an alternative mode of occupation and ownership, and possibly a distinct organization of social relationships. |

Table 6. Examination of 2013 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2013 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|--|--|--|--|
|---|--|--|--|--|

4th International Sustainable Buildings Symposium (ISBS2019)

18-20 July 2019 / Dallas, Texas-USA

| Years | About the Design | First Award | Second Award | Third Award |
|-------|------------------------------|---|--|--|
| 2013 | Project Name | Polar Umbrella Buoyant Skyscraper Protects and Regenerates the Polar Ice Caps | Phobia Skyscraper Revitalizes Paris Suburbs | Light Park Floating Skyscraper |
| | Participants | Derek Pirozzi / United States | Darius Maikoff, Elodie Godo / France | Ting Xu, Yiming Chen / China |
| | Sustainable design decisions | Key Words: A statement for the prevention of future depletion of our protective arctic region; a floating metropolis equipped with National Oceanic and Atmospheric Administration research laboratories, renewable power stations, dormitory-style housing units, eco-tourist attractions, and ecological habitats for wildlife; reduction of heat gain on the arctic surface; polyethylene piping system that pumps brackish water. | Key Words: a new form of modular suburban residential development; recycled industrial materials; prefabricated units; green spaces; water collection equipment; solar power panels. | Key Words: No pollution; no traffic jam; no ruined ancient building; more O2; more public space; more socializing; more time for life; using solar energy; water recycling; atmospheric pressure adjustment. |

Table 7. Examination of 2012 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2012 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|--|---|--|
| Years | About the Design | First Award | Second Award | Third Award |
| 2012 | Project Name | Himalaya Water Tower | Mountain Band-Aid | Monument to Civilization: Vertical |
| | Participants | Zhi Zheng, Hongchuan Zhao, Dongbai Song / China | Yiting Shen, Nanjue Wang, Ji Xia, Zihan Wang / China | Lin Yu-Ta, Anne Schmidt / Taiwan |
| | Sustainable design decisions | Keywords: Collect water in the rainy season, purify it, freeze it into ice and store it for future use | Key Words: Mountain disruption; lean on the mountain surface; recover both Hmong people's living tradition and mountain environment; a win-win relationship, benefiting both human community and the natural environment. | "Every city should has one garbage skyscraper to solve landfill shortage, to feed one's vanity of height, and to remark mankind's icronic civilization." |

Table 8. Examination of 2011 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2011 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|---|--|---|
| Years | About the Design | First Award | Second Award | Third Award |
| 2011 | Project Name | LO2P: Delhi Recycling Center | Flat Tower | Re-imagining the Hoover Dam |
| | Participants | Atelier CMJN Julien Combes, Gaël Brulé / France | Yoann Mescam, Paul-Eric Schirr-Bonnans, Xavier Schirr-Bonnans / France | Yheu-Shen Chua / United Kingdom |
| | Sustainable design decisions | Keywords: Recycle the old cars and use them as building material for the new structure giant lung that would clean New Delhi's air through a series of large-scale greenhouses that serve as filters; rotating filters; the waste heat and carbon dioxide from the recycling center are used to grow plants that in turn produce bio-fuels. | Key words: a medium-height dome structure that covers a large area; solar energy and rainwater collection; layered design. | Keywords: a viewing platform, a bridge, and a gallery scattered around the entire site. |

Table 9. Examination of 2010 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2010 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------|-------------|--------------|-------------|
| Years | About the Design | First Award | Second Award | Third Award |

4th International Sustainable Buildings Symposium (ISBS2019)

18-20 July 2019 / Dallas, Texas-USA

| | | | | |
|------|------------------------------|--|---|--|
| 2010 | Project Name | Vertical Prison | Water Purification Skyscraper in Jakarta | Nested Skyscraper in Tokyo |
| | Participants | Chow Khoo Toong, Ong Tien Yee, Beh Ssi Cze / Malaysia | Rezza Rahdian, Erwin Setiawan, Ayu Diah Shanti, Leonardus Chrisnantyo / Indonesia | Ryohei Koike, Jarod Poenisch / United States |
| | Sustainable design decisions | Keywords: A vertical prison in the sky, agricultural fields, factories, and recyclable plants that will be operated by the offenders as a way to give back to the community. | Keywords: Collect the garbage of the riverbank; purify its water through an ingenious system of mega-filters; the equilibrium tubes." | Keywords: Adapt to climatic, urban, and programmatic conditions with the use of advanced materials and robotic construction; carbon sleeves and fiber-laced concrete performance; multiple layers of louvers which thicken and rotate according to solar and wind exposure." |

Table 10. Examination of 2009 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2009 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|---|---|---|
| Years | About the Design | First Award | Second Award | Third Award |
| 2009 | Project | Neo-Arc | Living Bridge | Vertical Farm |
| | Participants | Kyu Ho Chun, Kenta Fukunishi, JaeYoung Lee / United States | Nicola Marchi, Adelaide Marchi / France | Eric Vergne / United States |
| | Sustainable design decisions | Key words: a possible solution to the multiple environmental problems we might have in the year 2050; integrate the latest green technologies; solar panels; filtering systems for air and water; artificial landscape that provides shelter to plants and people; own transportation system. | Keywords: 400 m. high building; fully integrated into the bridge itself vertical growing; the historic city can still develop and grow its density vertically, respecting and highlighting the existing context." | Keywords: Mixing of politically opposing classes, social and cultural confrontations; biomass into the city use of surfaces to orchestrate the dynamic programmatic interactions and the multiplicity of spatial organization they suppose. |

Table 11. Examination of 2008 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2008 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|--|---|---|
| Years | About the Design | First Award | Second Award | Third Award |
| 2008 | Project | Layered Interiorities | Skyscraper in Singapore | Coastal Fog Skyscraper |
| | Participants | Elie Gamburg / United States | Rugel Chiriboga, Ted Givens / United States | Alberto Fernández, Susana Ortega / Chile |
| | Sustainable design decisions | Key words: 720m tall skyscraper; integrated city; 'interiorization' of multiple climactic zones; passively conditioned air; passive ventilation and cooling. | Key words: Double skin facade; energy conservation systems; modular construction; rainwater reclamation; interior gardens; exterior green roofs; daylights illumination; natural ventilation systems with open windows; culture specific; gain inspiration from the Wah Kim orchid. | Key words: A design proposal for lack of water; 400 m. height; collect water from the clouds. |

Table 12. Examination of 2007 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2007 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------|---------------------|-----------------------|-----------------------------|
| Years | About the Design | First Award | Second Award | Third Award |
| 2007 | Project | Para-City | Inverted Skyscraper | Euroscrapers |
| | Participants | Somnath Ray / India | Yi Cheng Pan / United | José Muñoz-Villers / Mexico |

| | | | | |
|--|------------------------------|--|--|---|
| | | | Kingdom | |
| | Sustainable design decisions | Keywords: Programmatically neutral habitats; proliferate in the varied and complex geometrical and cultural constructions of the present Metropolis. | Keywords: cultivation of difference, through the coexistence and participation of multiple types and stakeholders. | Key words: Isolating the area; urban interventions, potentiality; energy void; vertical flows through urban attractors; mutation of floor areas; defining space with space; structural skin; natural ventilation. |

Table 13. Examination of 2006 eVolo Skyscraper Competition awarded projects in terms of sustainability principles

| AWARDED PROJECTS OF 2006 eVOLO SKYSCRAPER COMPETITION | | | | |
|---|------------------------------|---|--|---|
| Years | About the Design | First Award | Second Award | Third Award |
| 2006 | Project | Reciprocal Conjugation | Continuous Vertical City | Peristal City |
| | Participants | Changhak Choi / United States | Gonzalo Pardo, Susana Velasco, Victoria González / Spain | Neri Oxman, Mitchell Joachim / United States |
| | Sustainable design decisions | Keywords: Reciprocal system; single geometric unit; growing upwards and downwards; vertical landscape; vertical lifeline. | Keywords: new psycho-geographic map; a vertical three-dimensional network; an intensified vertical landscape emerges; a new urbanism; more open; more pragmatic. | Keywords: Starting point of design: Peristalsis; Ideation: Circulation=Space; Technology: Fluidic Muscle Tectonics; Environment: Sky-Surface as Community Realm; Perspective: Urban Window. |

4. Conclusions

As mentioned in the introduction, architectural competitions is a project acquisition method that nourishes the intellectual realm by disseminating and discussing ideas and allowing them to be used in other projects. Thus, it is a valuable method for popularizing the use of sustainability principles and allowing various ideas that are discussed to lead other designs. In this study, the following conclusions were reached by examining the results of the Skyscraper Competition held annually by eVOLO journal since 2006 in order to disseminate different ideas on how sustainability can be addressed:

- The primary focus of the submissions have been social and economic sustainability. We find proposals developed for solving social problems. Proposals include reinterpreting vernacular architecture, using natural materials, revitalizing production, bringing it back into the city, alternative property concepts, and organizing social relations.
- Certain social groups with distinct problems (such as rice producers, fishermen etc.) have been addressed through skyscrapers that are designed to enable their sustenance.
- Towers have been designed to reverse or protest the damage done by humanity to itself, to nature and the city (recycling carbon dioxide, waste tower design etc.)
- Some projects aimed to address problems such as natural disasters, drought and forest fires.
- Some proposals suggested combining urban functions in a vertical city structure due to space scarcity in cities.
- Some projects focused on anticipated future technological necessities such as drone towers or data centers.
- There were new formal approaches that utilize the opportunities of new futuristic technologies or potential future advancements, reproducible, progenitive forms, use of biomimicry, and the formal effects of geometric deconstruction and the concept of differentiation.
- Some proposals addressed function and flexibility, in addition to height, as a consideration in the global skyscraper race.
- The idea of horizontal skyscrapers was developed, questioning the existence of skyscrapers and the fact that they cannot exist in smaller cities.
- In addition to these main ideas, in many of the submissions, principles such as reduction of carbon emissions, using natural energy sources, recycling water and convergence of building and green areas, which can be considered ecological design principles, were included as integral parts of the design and not as afterthoughts.

As a result of the examination of the eVolo Journal's Skyscraper Competition, it is determined that the concept of sustainability is not merely related to ecological architecture and environmental values, and that addressing economic and environmental sustainability together, developing new systems that will contribute to the sustainability of the building in the light of technological advancements, form, shape and geometric enquiries, and investigating flexibility, functionality and transformability as well as height will create an added value, that it is important to support and promote these values through conceptual competitions, which offer an environment of experimentation.

References

- [1]. Güvemli Ö. İstanbul'un katledilen silüetine ayar verilecek – Sözcü Gazetesi [Internet]. 2016. Available from: <https://www.sozcu.com.tr/2016/emlak/istanbulun-katledilen-siluetine-ayar-verilecek-1047449/> [Accessed: 2019-01-02] (In Turkish)
- [2]. Anonymous. İstanbul'da Yeni Gökdelene İzin Verildi [Internet]. Available from: http://www.yapi.com.tr/haberler/istanbulda-yeni-gokdelenlere-izin-verildi_161839.html [Accessed: 2019-01-02] (In Turkish)
- [3]. Kuçak Toprak G. A silhouette of The Address Hotel, Dubai. 2017.
- [4]. The Skyscraper Center. 100 Tallest Completed Buildings in the World by Height to Architectural Top [Internet]. 2018. Available from: <http://skyscrapercenter.com> [Accessed: 2019-01-02]
- [5]. National Geographic. En Büyük Dizaynlar: Burj Dubai Kulesi. 2011. (In Turkish)
- [6]. Kuçak Toprak G. Burj Khalifa, Dubai. Dubai; 2017.
- [7]. United Nations WC on E and D. The Brundtland Report: Our Common Future. 1987.
- [8]. Sev A. Sürdürülebilir Mimarlık. İstanbul, Türkiye: YEM Yayın; 2009. 9, 31, 38 p. (In Turkish)
- [9]. McLennan JF. The Philosophy of Sustainable Design: The Future of Architecture [Internet]. Kansas City: ECOtone Publishing Company; 2004. Available from: [https://books.google.com.tr/books?id=-Qjadh_0leMC&pg=PA1&hl=tr&source=gbs_toc_r&cad=4#v=onepage&q=sustainable Design is a design philosophy that seeks to maximize &f=false](https://books.google.com.tr/books?id=-Qjadh_0leMC&pg=PA1&hl=tr&source=gbs_toc_r&cad=4#v=onepage&q=sustainable%20Design%20is%20a%20design%20philosophy%20that%20seeks%20to%20maximize%20&f=false) Accessed: 2018-01-02]
- [10]. Yeang K. Ekotasarım: Ekolojik Tasarım Rehberi (çev. S. Eryıldız, D. Eryıldız). İstanbul, Türkiye: YEM Yayın; 2008. 25 p. (In Turkish)
- [11]. Yeang K. Eco Skyscrapers I [Internet]. 3rd ed. Richards I, editor. Australia: Images Publishing; 2007. Available from: https://books.google.com.tr/books?id=QitFFq7Ybg0C&pg=PA10&hl=tr&source=gbs_toc_r&cad=4#v=onepage&q=&f=false [Accessed: 2019-01-02]
- [12]. Safarik D; Council on Tall Buildings and Urban Habitat Highlights : Shanghai 2014 Conference :Towards Sustainable Vertical Urbanism Highlights : Highlights : Shanghai 2014 Shanghai Conference 2014 Conference Towards Sustainable Vertical Urbanism. CTBUH J. 2014;(3):22–32.
- [13]. Wood A. Sustainability: A new high-rise vernacular? Struct Des Tall Spec Build. 2007;16(4):401–410.
- [14]. Al-Kodmany K, Mir MA. The Future of the City: Tall Buildings and Urban Design. WIT Press. 2013. p. 67.
- [15]. Ali MM: Sustainable urban life in skyscraper cities of the 21st century. WIT Trans Ecol Environ. 2010;129:203–214.
- [16]. Kuçak Toprak G. Ideological Readings on Architecture Competitions. In: 28 Uluslararası Yapı ve Yaşam Kongresi. Bursa, TURKEY: TMMOB Mimarlar Odası Bursa Şubesi; 2017. p. 97–116.
- [17]. Kuçak Toprak G. Disseminating The Use Of Sustainable Design Principles Through Architectural Competitions. In: 4th International Sustainable Buildings Symposium. Dubai: Springer; 2017. p. 272–279.
- [18]. Kuçak Toprak G. 1930 Yılından Günümüze Yarışma Projeleri İçinde Konut Mimarisine Yönelik Projelerin Yeri ve Değerlendirilmesi [M.Sc.Thesis]. Gazi University; 2013. (In Turkish)
- [19]. eVolo. 2019- eVolo | Architecture Magazine [Internet]. 2019. Available from: <http://www.evolo.us/category/2019/> [Accessed: 2018-11-02]
- [20]. eVolo. eVolo | Architecture Magazine [Internet]. 2019. Available from: <http://www.evolo.us/> [Accessed: 2018-11-02]