Investigating the application of LEED and BREEAM certification schemes for buildings in Kazakhstan

Serik Tokbolat[1] and Farnush Nazipov[2]

[1,2] Department of Civil and Environmental Engineering, School of Engineering, Nazarbayev University, Nur-Sultan, Kazakhstan, 010000
stokbolat@nu.edu.kz

Abstract. Kazakhstan is one of the leading economies of the Central Asian region. With the ambitious goal of being among the fifty most developed countries in the world, Kazakhstan is rigorously attempting to boost its infrastructure development. Among others, significant resources are invested in the construction of both residential and non-residential buildings. As a proponent of sustainable development, the government of Kazakhstan is seeking ways of reducing both energy use and greenhouse gas emissions. As a part of this agenda, Kazakhstan hosted EXPO2017 «Future Energy» exhibition which triggered the integration of sustainability principles into all areas of the economy including the construction sector. Among others, the construction industry started adopting widely recognized environmental assessment certification schemes such as the Leadership in Energy & Environmental Design (LEED) and the Building Research Establishment Environmental Assessment Method (BREEAM). Up to this day, more than 50 buildings, especially from rapidly expanding cities such as Nur-Sultan and Almaty, have obtained LEED and BREEAM certificates and were recognized as green buildings. This study investigates the nature of adopting these methods in the context of Kazakhstan with the aim of understanding the driving factors of such application, characteristics of the certified buildings, and potentials of promoting the certification schemes at a wider scale.

Keywords: LEED · BREEAM · Green building

1 Introduction

Buildings account for significant energy consumption globally and cause considerable impact on the planet's ecosystem by emitting greenhouse gases, consuming tremendous amounts of resources and producing wastes sent to landfills [1]. The status quo in this regard is not acceptable and requires dramatic paradigm change towards sustainability in all sectors including construction industry. The philosophy and practice of sustainable construction are not as advanced in developing countries such as Kazakhstan as in developed ones like Scandinavian states, Canada, South Korea [2]. In Kazakhstan, challenges associated with energy deficit and carbon emissions could be resolved, among others, by modernization of existing infrastructure, designing and constructing low energy buildings, integrating renewable

energy related technologies, strengthening existing and developing new building codes and standards [3]. In addition, a strong impetus towards construction sustainability, in general, and green buildings, in particular, could be created by introducing rating and certification schemes to assist guide, demonstrate, and document efforts to provide environmentally and socio-economically high-performance buildings. The aim of this study is to look into such rating and certification schemes and to investigate some of the first "pioneering" buildings that undergone certification process in Kazakhstan.

2 Background

At a global scale, certification efforts were significantly advanced in the 1990-2000s with the creation of a number of voluntary rating programs that have been recognized by governments, construction industries and professionals around the world [4]. One of them is the first and most popular green building rating systems in the UK - Building Research Establishment's Environmental Assessment Method (BREEAM). BREEAM is a system of evaluating, rating, and certifying a range of sustainability parameters of buildings, including their energy performance. In BREEAM, the project performance is assessed against best practices in following categories: (1) management; (2) health and well-being; (3) energy; (4) transport; (5) water; (6) materials; (7) waste; (8) land use and ecology; (9) pollution [5].

Another widely recognized rating system, Leadership in Energy and Environmental Design (LEED), was developed by the US Green Building Council (USGBC) to set criteria for assessment of environmental performance of new and existing buildings as well as entire neighborhoods. LEED certified buildings are considered as the ones that generate less emission compared to standards buildings, reduce energy consumptions, promote water efficiency, etc. In LEED, Performance and parameters of projects are compared against best practices in 9 main areas: (1) location and transport; (2) sustainable sites; (3) water efficiency; (4) energy and atmosphere; (5) materials and resources; (6) indoor environmental quality; (7) innovation; (8) regional priority; (9) integrative process [6].

In the last decade many countries started to develop so-called "domestic building environmental assessment methodologies" in correlation to their climatic conditions and culture [7]. However, global trend goes to standardization of assessment methods and tends to establish some global ranking systems such as LEED and BREEAM. Both LEED and BREEAM certification take into account many parameters when assessing energy performance of the building, hence globally recognized as a leading and widely imported rating system [8]. According to Kawazu if both systems are compared by six common categories: 'Indoor Environment' category, 'Quality of Service' category, 'Energy' category, 'Resource and Materials' category, and 'Off-site Environment' category, output results show identical trend and same qualitative, comprehensive rating [9].

First building attempted to get LEED certification in Kazakhstan was KBTU institute mixed use complex in January 2012. Until 2016 only few buildings were attempting to get LEED certification and none of them was able score more than 40 in order to get at least registered certification. However, after 2016 many buildings got silver and gold certification. Moreover, this trend keeps ascending.

First introduction of BREEAM certification was in 2015 and during 2 years until 2017 more than 55 buildings and complexes received Pass, Good, Very good and Excellent rating. However, after 2017 no buildings were applied for BREEAM certification.

It can be seen, that Kazakhstan's certification trend mostly inclines towards getting LEED certification as opposed to BREEAM certification. Possible reasons for this could be the brand name since LEED is slightly more recognized in the world. Another reason is motivation of other owners to make their certification globally accepted where LEED is more established in comparison to BREEAM. Since, Kazakhstan is only at the beginning of wide implementation of green building certification and this trend have started to expand relatively recently, LEED certification seems to be better start.

3 Results and discussion

This paper provides an overview of the first implementation of LEED and BREEAM certification schemes in Kazakhstan. Most of the buildings are located in two major cities of the country: Nur-Sultan, capital city, and Almaty, the largest city in Kazakhstan. The types of certified buildings can be divided into two categories: (1) commercial buildings (office buildings/business centers) and (2) residential buildings. Most of the certified buildings were built prior to or after EXPO2017 «Future Energy» exhibition. Among reasons of certification could be desire to attract foreign companies which tend to rent "green" offices/buildings, incentives from the government to create a "green" image of the country in the lead up to the EXPO exhibition, and, finally, willingness of construction companies to increase market competitiveness. It is not clear whether the ultimate goal was to build sustainable buildings in the first place. Nevertheless, it is certain that having several dozens of certified buildings will create new trends and practices in the construction sector. The quality and performance of certified buildings might change the construction standards and norms as other companies will have examples to follow. Most of the building covered in this review were LEED certified. Data collection was mainly done online [10].

3.1 Talan Towers (Gold)

Talan Tower is a luxury structure which consists of two towers. The first tower is 26-storey Ritz-Carlton hotel and the second one is 30-storey high class office complex. Towers are bridged by a three level podium building. Totally, building occupies 1.05

million sq. ft. Construction duration is 5 years. Considering the harsh climate conditions of Nur-Sultan city ranging from -35 to +40 degrees Celsius, it is notable that the building uses 20 percent less energy compared to similar buildings in the city. LEED certification for this structure was issued in 2018. The building scored the highest score in Kazakhstan (70 out of 110) and received LEED Core & Shell 2009 Gold Rating Level. In Energy and Atmosphere category it scored 23 out of 37. In Indoor Environmental Quality category it scored 9 out of 12. In Sustainable Sites category it scored 23 out of 28. In Water Efficiency category it scored 12 out of 10. In Innovation Design category it scored 2 out of 6.

3.2 Esentai Tower, Almaty (Silver)

Esentai Tower is one of the first high-rise buildings in Almaty with 162 meter high. Construction of tower was started in 2006 and successfully finished in 2008. Totally, building occupies 667,368 sq. ft. LEED certification for this structure was issued in March 9, 2016. Building scored 53 out of 110 possible points and took LEED for Existing Buildings 2009 Silver Rating Level. In Energy and Atmosphere category it scored 16 out of 35. In Indoor Environmental Quality category it scored 4 out of 15. In Sustainable Sites category it scored 17 out of 26. In Materials and Resources category it scored 6 out of 10. In Water Efficiency category it scored 6 out of 14. In Innovation Design category it scored 4 out of 6. In addition to this, in terms of Energy and Atmosphere structure has 81 Energy Star Performance Rating; in terms of Materials and Resources the structure has 40% sustainable purchasing of electric equipment, 50% reuse, recycle or compost of ongoing consumables, 75% reuse or recycle of durable goods, 90% sustainable purchasing of reduced mercury lamps, 70% diversion of waste from facility alteration and additions; in terms of Sustainable Sites, the structure has 75% reduction in conventional commuting trips and in terms of Water Efficiency, the structure has 20% reduction in indoor potable water use.

3.3 Wilo Kazakhstan, Almaty (Gold)

The Wilo Campus is a Swedish HVAC manufacturer which is the first “green” factory in Kazakhstan. The Wilo campus was officially opened and started functioning in 2017. Totally, building occupies 26,177 sq. ft. LEED certification for this building was issued in 2018. Building scored 63 out of 110 possible points and gained LEED Core & Shell 2009 Gold Rating Level. In Energy and Atmosphere category it scored 19 out of 37; Indoor Environmental Quality - 8 out of 12; Sustainable Sites - 18 out of 28; Water - 10 out of 10; Innovation Design - 5 out of 6. In addition to this, in terms of Energy and Atmosphere, the building has 22% improvement. In terms of Indoor Environmental Quality, the structure has 90% of occupied space has high-quality views. In terms of Water Efficiency, the structure has 40% reduction in baseline indoor water use and 100% reduction in potable landscape water use.

3.4 Commercial building T5, Expo village (Gold)

The main concept of EXPO2017 exhibition was “future green energy” in the context of sustainable development. The Expo City has a dozen of buildings which earned LEED certification of different ranking levels. The case study office building in Expo

City occupies 342,052 sq. ft. LEED certification for this building was issued in 2019. Building scored 61 out of 110 possible points and obtained LEED for New Construction 2009 Gold Rating Level. In Energy and Atmosphere category it scored 17 out of 35; Indoor Environmental Quality - 12 out of 15; Sustainable Sites - 15 out of 26; Water Efficiency - 10 out of 10; Innovation Design - 5 out of 6. In addition to this, in Energy and Atmosphere category, the structure has 26% improvement; Indoor Environmental Quality - 90% of occupied space has quality views; Water Efficiency - 100% reduction in potable landscape water use and 40% reduction in baseline indoor water use.

3.5 Commercial building T4, Expo village (Gold)

It is office building which totally occupies 384,559 sq. ft. LEED certification for this structure was issued in January 29, 2019. Building scored 62 out of 110 possible points and took LEED for New Construction 2009 Gold Rating Level. In Energy and Atmosphere category it scored 18 out of 35. In Materials and Resources category it scored 2 out of 14. In Indoor Environmental Quality category it scored 8 out of 12. In Sustainable Sites category it scored 15 out of 26. In Water Efficiency category it scored 10 out of 10. In Innovation Design category it scored 5 out of 6. In addition to this, in terms of Energy and Atmosphere structure has 28% improvement on baseline building performance rating; in terms of Indoor Environmental Quality, the structure has 90% of occupied space has quality views; in terms of Water Efficiency, the structure has 100% reduction in potable landscape water use and 40% reduction in baseline indoor water use; in terms of Materials and Resources, the structure has 75% diversion of construction and demolition debris.

3.6 Commercial building B11, Expo village (Gold)

It is office building which totally occupies 120,977 sq. ft. LEED certification for this structure was issued in January 4, 2019. Building scored 60 out of 110 possible points and took LEED for New Construction 2009 Gold Rating Level. In Energy and Atmosphere category it scored 19 out of 35. In Materials and Resources category it

scored 2 out of 14. In Indoor Environmental Quality category it scored 10 out of 15. In Sustainable Sites category it scored 15 out of 26. In Water Efficiency category it scored 9 out of 10. In Innovation Design category it scored 5 out of 6. In addition to this, in terms of Energy and Atmosphere structure has 30% improvement on baseline building performance rating; in terms of Indoor Environmental Quality, the structure has 90% of occupied space has quality views; in terms of Water Efficiency, the structure has 100% reduction in potable landscape water use and 40% reduction in baseline indoor water use; in terms of Materials and Resources, the structure has 75% diversion of construction and demolition debris.

3.7 Residential B4-B7, Expo village (Certified)

It is a Multi-family residential building which totally occupies 373,194 sq. ft. LEED certification for this structure was issued in 2019. Building scored 45 out of 110 possible points and obtained LEED Core & Shell 2009 Certification. In Energy and Atmosphere category it scored 12 out of 37. In Indoor Environmental Quality category it scored 4 out of 12. In Sustainable Sites category it scored 16 out of 28. In Water Efficiency category it scored 10 out of 10. In Innovation Design category it scored 3 out of 6. In addition to this, in terms of Energy and Atmosphere, the structure has 16% improvement; in terms of Indoor Environmental Quality, the structure has 90% of occupied space has quality views; in terms of Water Efficiency, the structure has 100% reduction in potable landscape water use and 40% reduction in baseline indoor water use.

3.8 Residential B1, Expo village (Certified)

It is Multi-family residential building which totally occupies 177,904 sq. ft. LEED certification for this structure was issued in November 8, 2018. Building scored 47 out of 110 possible points and took LEED Core & Shell 2009 Certification. In Energy

and Atmosphere category it scored 14 out of 37. In Indoor Environmental Quality category it scored 4 out of 12. In Sustainable Sites category it scored 16 out of 28. In Water Efficiency category it scored 10 out of 10. In Innovation Design category it scored 3 out of 6. In addition to this, in terms of Energy and Atmosphere structure has 20% improvement on baseline building performance rating; in terms of Indoor Environmental Quality structure has 90% of occupied space has quality views; in terms of Water Efficiency structure has 100% reduction in potable landscape water use and 40% reduction in baseline indoor water use.

3.9 Residential B12, B13, Expo village (Certified)

It is Multi-family residential building which totally occupies 141,421 sq. ft. LEED certification for this structure was issued in October 18, 2018. Building scored 45 out of 110 possible points and took LEED Core & Shell 2009 Certification. In Energy and Atmosphere category it scored 12 out of 37. In Indoor Environmental Quality category it scored 4 out of 12. In Sustainable Sites category it scored 16 out of 28. In Water Efficiency category it scored 10 out of 10. In Innovation Design category it scored 3 out of 6. In addition to this, in terms of Energy and Atmosphere structure has 16% improvement on baseline building performance rating; in terms of Indoor Environmental Quality structure has 90% of occupied space has quality views; in terms of Water Efficiency structure has 100% reduction in potable landscape water use and 40% reduction in baseline indoor water use.

Except from construction projects which earned particular LEED Rating Level there are 7 buildings which are registered. Additionally, there are 50 buildings in Kazakhstan which passed and earned BREEAM certification

3.10 MEGA Silk Way Shopping and Entertainment Center (In-Use)

MEGA Silk Way shopping mall is a newly built BREEAM certified center of shopping and entertainment. It was designed by English architects from Chapman Taylor Company. The total floor area of the building is 140 000 sq. m, with the length of 500 m. and width of 160 m. The sizes and the space is quite remarkable. It has the height of 8 floors building, 9 entrances and parking for 2100 cars outdoors and 400 indoors. The building obtained BREEAM In-Use International certification. There was no available data in terms of energy, water and resources efficiency. However, the fact that the building has a “green” certification can be felt considering various parameters

It should be mentioned that these buildings have various features that make them more sustainable than other typical buildings of the same class. For example, public transportation has good accessibility. The certified residential buildings have very safe and pedestrian-oriented yards. Cars are allowed to park only in underground parking areas. Parks, shops and amenities are in a close proximity. Various sustainable measure can be observed in and around the buildings such as, for example, solar panels, greenery, passive design elements, etc. Certified business centers and office buildings have various sustainability elements incorporated into architectural elements as well as the way indoor environments are designed. Considering the provided limited information regarding the energy and water use as well as the points the certified buildings obtained can be a strong indication that these buildings are successful in meeting sustainability requirements. In the country with construction norms and practices based on outdated Soviet-era construction standards, having LEED and BREEAM certified buildings is a strong signal that the policies, standards and norms as well as construction practices should be upgraded and made "green". The construction industry, associated governmental agencies, academics and all other related stakeholders could benefit from having certified buildings in the country to use this fact as a driver for making construction industry more sustainable. The limitation of this study can be linked to the fact that the economic aspect of obtaining certification is not considered. All these buildings are new and assumed to have considerable resources invested both from the government and affiliated organizations. Future study should take this aspect into consideration.

4 Conclusion

This paper has found that Kazakhstan, in total, has about 50 LEED and BREEAM certified buildings. Most of them are located in Nur-Sultan and Almaty. Majority of the certified buildings are commercial or residential. The case study buildings performed very well and obtained certifications with some of them being of the

highest level. The construction industry and government should use the certified buildings to upgrade the existing standards and norms to the level of “green” buildings. The financial aspect should be considered at a deeper level to understand possible barriers to certifying more buildings in the future.

References

1. Portnov, B.A., Trop, T., Svechkina, A., Ofek, S., Akron, S., Ghermandi, A.: Factors affecting homebuyers’ willingness to pay green building price premium: Evidence from a nationwide survey in Israel. Build. Environ., 137, 280–291 (2018).
2. Tokbolat, S., Karaca, F., Durdyev, S., Nazipov, N., Aidyngaliyev, A.: Assessment of Green Practices in Residential Buildings: A Survey-Based Empirical Study of Residents in Kazakhstan. Sustainability 10 (12), 4383 (2018).
3. International Environmental Agency (IEA).: Energy statistics of OECD countries (2016).
4. Vierra S.: Green Building Standards and Certification Systems. National Institute of Building Sciences, (2014).
5. BRE Global Ltd.: BREEM UK New Construction. Non-Domestic Buildings. Technical Manual. Draft 0.1, (2014).
6. U.S. Green Building Council (USGBC).: Profile. (2016).
7. Roderick, Y., McEwan, D., Wheatley, C., & Alonso, C.: Comparison of energy performance assessment between LEED, BREEAM and Green Star. In Eleventh International IBPSA Conference, 27-30 (2009).
8. Cole, Raymond J., and Maria Jose Valdebenito.: The importation of building environmental certification systems: international usages of BREEAM and LEED. Building Research & Information 41.6, 662-676 (2013).
9. Kawazu, Y., Shimada, N., Yokoo, N., & Oka, T.: Comparison of the assessment results of BREEAM, LEED, GBTool and CASBEE. In Proc. of Int. Conf. on the Sustainable Building 1700-1705 (2005).
10. The Green Building Information Gateway. GBIG. (2018).