

PROPOSED GUIDELINES FOR A GREEN BUILDING RATING SYSTEM OF KAZAKHSTAN

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Abstract

Modern construction industry's main concern has been to meet building code requirements. But recently, mostly in developed countries, the industry has raised the question: "Is there a way to build more efficiently, with less harm to the environment?" In order to respond to this new challenge, new type of design was required. In relatively short period of time and with the help of the modern technology, great amount of "Green" innovations became a part of the construction industry. In order to establish performance criteria and to assess the results and the benefits of this new design, new types of rating, "green rating" systems were created.

There are several major global green rating systems worldwide. They differ from each other in the methods of evaluation they use and their structure. The leading "Green" countries are (alphabetically) Australia, Canada, France, Japan, UK, and USA.

This study analyzes two industry accepted and widely used green building rating programs: LEED (USA) and BREEAM (UK). There is no such a program in Kazakhstan, though there is a definite need for one. The study has been done through completing a thorough comparative study of the two programs, i.e. detailed analysis of every credit in each program in terms of applicability to Kazakhstan. The findings have been summarized into the proposed Kazakhstani Green Building Rating Program (KGBRP), and detailed spreadsheet of it has been created.

Introduction

The implementation of the high-performance green building delivery system is a complex process propelled by three major forces. First, there is growing evidence of accelerated destruction of planetary ecosystems, alteration of global biogeochemical cycles, and exponential increases in population and consumption. Second, increasing demand for natural resources is pressuring developed and developing countries such as China and India, resulting in shortages and higher prices for materials and agricultural products. Third, the green building movement is coinciding with similar transformations in manufacturing, tourism, agriculture, medicine, and the public sector, which have adopted various approaches toward greening their activities¹.

Building assessment systems score or rate the effects of a building's design, construction, and operation, among them environmental impacts, resource consumption, and occupant health. This is a complex process, as each aspect has different units of measurement and applies at different physical scales.

*Proceedings of the 2010 ASEE Gulf-Southwest Annual Conference, McNeese State University
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The United States Green Building Council² created LEED from 1994 to 1998. The first version, known as LEED 1.0 was issued in 1998 as a beta version. Twenty buildings were certified using LEED 1.0 to obtain a rating that originally was Platinum, Gold, Silver, or Bronze. LEED 2.0 was issued in 2000 as a dramatically changed version of the original LEED standard³. Subsequent versions were marked as to their application and, in the case of the version for new construction, the description NC was appended to the title. LEED-NC 2.1 issued in 2002, was virtually identical to LEED-NC 2.0, except it had greatly simplified documentation requirements. LEED-NC is the latest version of the LEED assessment standard for new construction⁴. One important new feature of LEED-NC 2.2 is that all paper-work required in the process is handled at the USGBC LEED-Online website².

BREEAM is by far the oldest building assessment system and, until the advent of LEED, easily the most successful. Its development was initiated in 1988 by BRE, the national building research organization of the United Kingdom, to help transform the construction of office buildings to high-performance standards. BREEAM has also been adopted in Canada and in several European and Asian countries.

BREEAM^{5, 6} covers primarily offices, homes, and industrial units, with assessment methods for each general type of building: BREEAM Office version 2002, BREEAM/New Industrial Units, and BREEAM EcoHomes. In 2003, a new version, BREEAM/Retail, was issued to address the design, construction, and operation of retail stores.

Kazakhstan (Figures 1 & 2), officially the Republic of Kazakhstan, is a country in Central Asia and Europe. Ranked as the ninth largest country in the world as well as the world's largest landlocked country, it has a territory of 2,727,300 km² (greater than Western Europe). It is bordered by Russia, Kyrgyzstan, Turkmenistan, Uzbekistan and China. The country also borders on a significant part of the Caspian Sea⁷.



Figure 1. Location of Kazakhstan in the World Map⁸



Figure 2. Map of Kazakhstan⁹.

According to Research and Markets: “As cities and infrastructures are completely rebuilt (figure 3), in some cases built from scratch, international investors, including construction companies, are busily making plans to expand their activities in Kazakhstan and take advantage of available opportunities in infrastructure development, housing expansion and industrial and commercial construction¹⁰.

However, the problem is that in Kazakhstan as well as in any other country of former USSR there is no such a thing as Sustainable Construction. This phenomenon is caused by the development stage of the country, in which the main issues regarding any project are “How cheap?” and “How soon?”



Figure 3. Construction in Kazakhstan¹¹

Moreover, because of the fact that Kazakhstan is one of the world's richest countries with regard to fossil fuels and land/water resources, sustainability is not an issue for "today" of Kazakhstan.

The Republic of Kazakhstan is a young developing country having common "growing up" problems such as inefficient use of energy and natural resources, weak or almost non-existent ecology policies, lack of advanced industrial technologies and shortage of domestic engineering and science professionals. One of the main industries of Kazakhstan is construction that currently faces lack of domestic professionals, inefficient and unsustainable building practices, and sometimes shortage of domestic materials and tools. This situation can be changed through implementing green building practices that most developed countries already implement. The ultimate goal of the Green Building movement is to build energy-efficient and environment friendly buildings and structures. In order to build such structures there is a need for a rating system that will be used from the design process to help and assess buildings of such type. Developed countries of the world already have such programs, so should Kazakhstan in order to meet the future challenges.

The object of this paper can be outlined as follows:

- To investigate the most popular Green Building Rating Systems of the leading "green" countries such as USA and UK.
- To determine what parts of the programs (LEED and BREEAM) can and cannot be implemented in Kazakhstan.
- To create a foundation for the future development of Sustainable Construction in Kazakhstan, particularly the Kazakhstani Green Building Rating Program (KGBRP).

Review of Literature

The two programs (LEED and BREEAM) were thoroughly studied, mainly from the following sources: <http://www.usgbc.org/> and <http://www.breeam.org/>

The following consist of:

- A brief review of each program;
- Detailed description of Kazakhstan and its climate, energy and construction sectors.

Leadership in Energy and Environmental Design (LEED)

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria.

LEED is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. LEED promotes a whole-building approach to sustainability by

recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality³.

The following are the types of LEED rating system:

- New Construction;
- Existing Buildings: Operations & Maintenance;
- Commercial Interiors;
- Core & Shell;
- Schools;
- Retail;
- Healthcare;
- Homes;
- Neighborhood Development.

In this paper out of the above only LEED for New Construction and Major Renovations were considered.

LEED for New Construction and Major Renovations (LEED-NC 2.2)² is designed to guide and distinguish high-performance commercial and institutional projects.

LEED-NC 2.2 consists of the following sections²:

- Sustainable Sites (1 prerequisite and 14 possible points);
- Water Efficiency (5 possible points);
- Energy and Atmosphere (3 prerequisite and 17 possible points);
- Materials and Resources (1 prerequisite and 13 possible points);
- Indoor environmental Quality (2 prerequisite and 15 possible points);
- Innovation and Design Process (5 possible points).

Total amount of the possible points is 69. Rating scales based on these points are the following:

- Certified (26-32 points);
- Silver (33-38 points);
- Gold (39-51 points);
- Platinum (52-69 points).

Part of the LEED-NC 2.2 checklist (Figure 4) is shown below. Example of the LEED platinum certified building (Figure 5) – California Academy of Sciences in San Francisco is shown below.

Building Research Establishment Environmental Assessment Method (BREEAM)

BREEAM (Building Research Establishment's Environmental Assessment Method)¹² is the world's longest standing and most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable development and demonstrates a level of achievement⁵.

BREEAM covers a wide range of building types, the current BREEAM versions include⁵:

- BREEAM Bespoke;
- BREEAM Courts;
- BREEAM EcoHomes;
- BREEAM EcoHomes XB;
- BREEAM Industrial;
- BREEAM International;
- BREEAM Multi Residential;

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- BREEAM Offices;
- BREEAM Prisons;
- BREEAM Retail;
- BREEAM Schools.



LEED for New Construction v 2.2
Registered Project Checklist

Project Name: _____

Project Address: _____

Yes	?	No	Project Totals (Pre-Certification Estimates)				69 Points
			Certified: 26-32 points	Silver: 33-38 points	Gold: 39-51 points	Platinum: 52-69 points	

Yes	?	No	Sustainable Sites		14 Points
			Prereq 1 Construction Activity Pollution Prevention		Required
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1	Site Selection	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2	Development Density & Community Connectivity	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3	Brownfield Redevelopment	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.1	Alternative Transportation, Public Transportation	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.3	Alternative Transportation, Low-Emitting & Fuel Efficient Vehicles	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.4	Alternative Transportation, Parking Capacity	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 5.1	Site Development, Protect or Restore Habitat	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 5.2	Site Development, Maximize Open Space	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6.1	Stormwater Design, Quantity Control	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6.2	Stormwater Design, Quality Control	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 7.1	Heat Island Effect, Non-Roof	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 7.2	Heat Island Effect, Roof	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 8	Light Pollution Reduction	1

Yes	?	No	Water Efficiency		5 Points
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2	Innovative Wastewater Technologies	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.1	Water Use Reduction, 20% Reduction	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.2	Water Use Reduction, 30% Reduction	1

Figure 4. Part of the LEED-NC 2.2 checklist⁴



Figure 5. LEED Platinum certified building – California Academy of Sciences in San Francisco¹³

In this paper out of the above only BREEAM Offices 2008 was considered. BREEAM Offices is the world's most widely used means of reviewing and improving the environmental performance of office buildings⁶. BREEAM Offices 2008 consists of the following categories (Table 1):

BREEAM Section	Credits available	Weighting (%)
Management	10	12
Health & Wellbeing	14	15
Energy	21	19
Transport	10	8
Water	6	6
Materials	12	12.5
Waste	7	7.5
Land Use & Ecology	10	10
Pollution	12	10

Point needs to be mentioned is that in BREEAM unlike in LEED not all the category points are equal. After the project pursuing BREEAM status is done, all the credits with regard to category weighting are calculated, and the decision about its rating is made based on the following (Table 2):

BREEAM Rating	% Score
Unclassified	<30
Pass	≥30
Good	≥45
Very Good	≥55
Excellent	≥70
Outstanding	≥85

Part of the BREEAM Offices 2008 Assessor Manual checklist (Figure 6) is shown below. An example of the BREEAM Excellent certified building - Innovate Green Office at Thorpe Park, Leeds, UK is shown below (Figure 7).

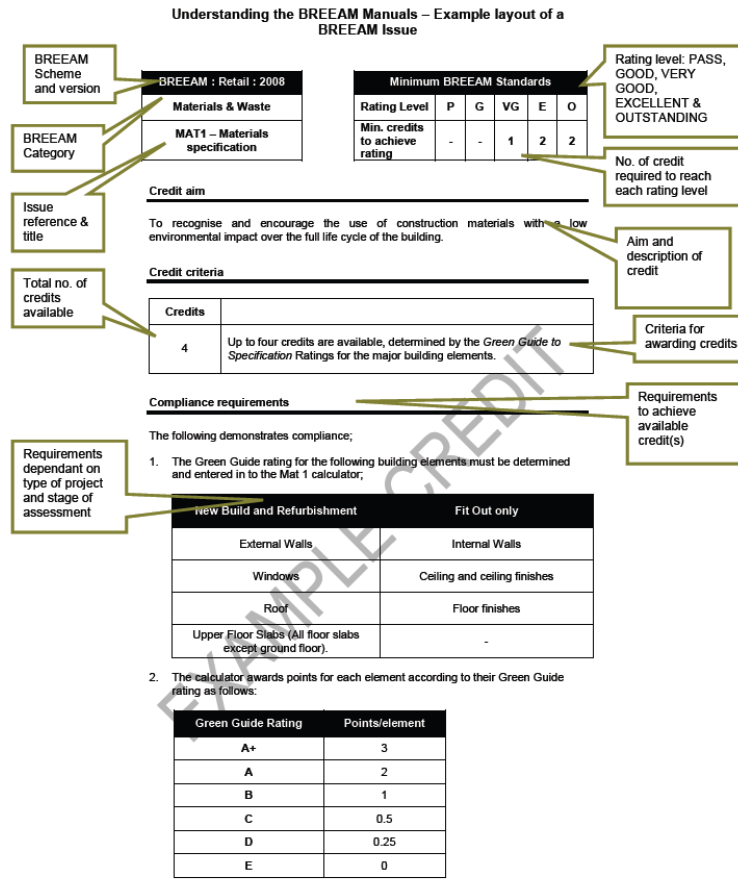


Figure 6. Part of the BREEAM Offices 2008 Assessor Manual¹²



Figure 7. BREEAM Excellent certified building – Innovate Green Office at Thorpe Park, Leeds, UK¹⁴

Kazakhstan - Energy and Construction Sectors¹⁵

Kazakhstan is a huge country covering a territory of 2,717,300 square kilometers. Kazakhstan borders with the Russian Federation in the north and west, Turkmenistan, Kyrgyz Republic and Uzbekistan - in the south, China - in the south-east. Borders also align the Caspian seashore on the southwest. The country has considerable mineral wealth and vast areas of arable land. Total population residing in the country is about 15 million people. That makes it largest country in Central Asia and one of the most sparsely populated in the world with density of 5.5 people per square kilometer. 56.4% of the population lives in urban areas.

By estimates of scientists of many countries Kazakhstan takes up the sixth place in the world by useful minerals reserves: 99 out of 110 elements of the periodic table are found in the subsurface of Kazakhstan, 70 of them are prospected, while deposits of only 60 elements are produced and used. Kazakhstan is the second largest producer of oil and coal among the CIS countries. Kazakhstan has considerable reserves of oil and gas concentrated in its western part, which makes it one of the largest oil producing countries in the world.

Following independence in 1991, Kazakhstan was one of the earliest and most vigorous reformers among the countries of the former Soviet Union. In the early years of transition prices were liberalized, trade distortions reduced, and small- and medium-scale enterprises privatized. Real GDP grew by 9.1% in 2003 and 9.3% in 2004. The growth of GDP can be explained firstly, by the favorable situation on the world market, in particular, high prices for the main exports from Kazakhstan: oil, ferrous and non-ferrous metals. Secondly, there have been quite high industrial growth rates, especially in construction. These high rates are also typical of transport and communications, and other service sectors.

Energy resources

Due to its vast primary energy resources, Kazakhstan is one of the countries, which is not only able to meet domestic energy demands, but also to export energy resources in significant amounts.

Kazakhstan is one of the ten largest countries of the world with excess energy and mineral resources. 1,200 types of mineral resources in 2,806 registered deposits have been identified.

Kazakhstan is one of the ten countries with largest resources of uranium, coal, manganese, tungsten, molybdenum, gold, phosphorites and iron including the largest resources of uranium and lead in the world, the second largest resources of zinc and chromate ores, the fourth largest resources of copper, and the seventh of gold.

About 0.5% of world's mineral resources are located in Kazakhstan; that is equal to 90 billion tones of oil equivalent (toe). This amount includes 70% of coal, 22% of oil and oil condensate and 8% of gas.

In addition, the largest uranium reserves that amount to 29% of the world reserves are located in Kazakhstan and 1.6 thousand tons of uranium is annually extracted.

Prospective oil- and gas-bearing areas comprise 62% of the entire country's territory, and only roughly half of them have been explored. 197 oil and gas deposits have been discovered with explored resources of hydrocarbons amounting to more than 2 billion tons of oil, 0.7 billion tons of oil gas and some 2,000 billion m³ of natural gas. Forecast extractable resources of the Kazakhstan continental part are estimated at 10 billion tons of oil and oil gas, and more than 7,000 billion m³ of natural gas. The Kazakhstan's sector of the Caspian Sea is extremely promising with estimated resources of about 13 billion tons of oil equivalent.

The hydro-energy potential of Kazakhstan is estimated at 163 billion kWh, production of 62 billion kWh is technically feasible, and that of 27 billion kWh is economically expedient.

Energy resources are unevenly distributed over the territory of the Republic: major coal deposits are located in the northern and central regions; oil and gas deposits are located in the western region and minor resources of gas and coal are in the southern region; hydro-energy resources are located in the eastern and south-eastern regions.

The total value of already explored and forecast subsoil resources of Kazakhstan is estimated at US\$ 10,400 billion including US\$ 8,000 billion for solid and US\$ 2,400 billion for hydrocarbons.

Energy using sectors

Due to the economic reform, changes in the structure of electricity consumption took place during the period 1990-2003. Despite a fall in industrial production rates, the share of industrial sector in the total electricity consumption remains high, with major shares of the fuel industry (owing to increased oil and gas production) and metallurgy. The inadequately equipped power plants consume more electricity for own needs, although power production decreased by 43% during this period. With increased electricity production and more full loading of the equipment of the power plants, there was a decrease of the current consumption for own needs of the power industry after 1999. The current consumption of the population and services is within the limits of 18-22%.

Residential Sector

In Kazakhstan three types of heat supply to the residential sector have been developed: heating systems from co-generation power plants (TETs), centralized heat supply from district, block and grouped heat boilers, and decentralized heat supply from individual heat boilers and furnaces.

As mentioned above, the share of rural consumers of the overall heat demand of Kazakhstan is around 30%. The demand is covered by burning of various fuels in heating furnaces and small independent heating systems.

Of the overall heat demand of urban consumers, 43% are provided by co-generation power plants (TETs), around 14% - by district heat boilers, and 43% - by independent heating systems and heating furnaces.

At present the prevailing fuels used for heat supply in towns and urban-type communities are coal (55-56%) and fuel oil (mazut) (26%). The share of gas being burnt to produce heat is not big and does not reach 20%.

At present, Kazakhstan practices extensive construction of new residential houses, meeting the established regulations and standards. Due to improving the well-being of the population, household appliances (refrigerators, TV sets, washing machines, microwave ovens, etc.) are being replaced with new low-energy equipment.

On the whole, energy consumption in the residential sector decreased during the last 10 years (1993 – 2003) by 30%, while the population lowered by 10%.

Industrial Sector

The industrial base in Kazakhstan is directed towards heavy industry and processing of raw materials, which require significant amount of energy. The industrial branches in Kazakhstan, including the energy sector, are highly power consuming and cause considerable environmental pollution. The share of energy consumed by industry in the total energy consumption in the country in 2003 amounted to 45% (in 1992 – 51%). Compared to the year 1992, energy consumption by industry decreased by 55%, but since 1999 there is a steady growth of energy consumption by industry (during 1999 through 2003 the growth was 30%).

Services Sector

Commercial services sector experiences rapid development, and the number of service companies (small and medium-size businesses) grows every year. Under such conditions new companies use the best scientific achievements and the most advanced equipment available currently in the world. However, the development of this sector is still insufficient and this can explain its small share in the overall energy consumption as compared to developed countries.

In 2003 the share of energy consumption in the services sector amounted to 1.7% of the country total. The share of electricity consumption in 2003 was 8.6%. As compared to 1992, energy consumption in the services sector decreased by 57%.

Since 1999 there is a steady growth of energy consumption in the services sector (during the period 1999 through 2003 the growth was 43%).

Transport Sector

The transport infrastructure in the Republic of Kazakhstan is represented by the developed network of railroads, as well as by air and motor transport. During the years of Kazakhstan independence the aircraft fleet has been renewed considerably (due to purchase of new Western airliner), and electricity has been provided to certain sections of railroad where diesel traction had been used earlier. Fleet of motor vehicles increased significantly both due to the raised volume of cargo transportation via motor roads and improved well-being of citizens. The country does not produce automobiles, and therefore the fleet of those is being increased through purchasing of motor vehicles made in Japan, the European Union and USA.

In 2003 the share of energy consumption in the transport sector in the total volume of energy consumption in the country amounted to 10.4% (12.3% in 1992). The share of electricity consumption in the total volume of electricity consumed in 2003 was 6.7%. As compared to 1992, energy consumption in the transport sector decreased by 56%.

Energy and Environment -General trends and objectives

Transition to environmentally safe and sustainable development is becoming one of the priority directions of the Kazakhstan Development Strategy. Starting from 1989-1990, a new environmental policy of the transition period was formed in Kazakhstan, oriented towards the development of economic instruments for regulating natural resources use, and expanding the rights and authority of local governments. A large-scale experiment on implementing the economic mechanism of payment for pollution has been carried out. The work on an inventory of polluting emission sources has been made more active, the role of territorial bodies in efficient energy resources management has increased, the attitude of enterprises to planning their activities has changed, and formation of an economic incentive mechanism for environmental activity has been started.

Despite the economic difficulties, the government of Kazakhstan and local authorities pay more and more attention to environmental issues. Work on implementation of priority actions is going on in the country, and development of large-scale umbrella projects and programs is implemented jointly with international organizations and donor countries.

The Republic of Kazakhstan signed the United Nations Framework Convention on Climate Change (further – the UNFCCC or the Convention) in June 1992, and ratified it in May 1995. Currently Kazakhstan does not belong to any Annex of the Convention.

Climate change issues are considered important in Kazakhstan. In Kazakhstan, as in any transition country, climate change is a priority only to the extent that it is related to the main national concept for environmental protection and sustainable development.

Climate of Kazakhstan

Diversity of geological, geomorphologic, climatic, soil and vegetation conditions on the territory of the Republic of Kazakhstan implies variety of landscapes. With increase of sun heat from the north to the south and reduction of precipitation there is a gradual change of natural zones: forest steppes, steppes, semi-deserts and deserts. Their latitude extent to thousands of kilometers in combination with variety of rocks of geological structures and differentiation of the lay of the ground causes formation in each of them of different landscapes.

Very many summer days are accounted in the country, more than on the southern shore of Crimea and Black Sea shore in Caucasus. Average temperature of January, the coldest month, ranges from -50 C in the southernmost areas to -200C in the north. On the plain part of Kazakhstan average July temperature ranges from $+180\text{C}$ in the north to $+290\text{C}$ in the south.

In the process of development of the National Environmental Action Plan for sustainable development of the Republic of Kazakhstan by territorial distribution of priority environmental problems and analysis of sections, to which sources of these problems can be referred, 3 provisional zones have been distinguished, climatic peculiarities of which determine the different course of bio-and geo-chemical processes.

Zone A – pre-Caspian, is represented by oblasts, specialized in oil production and processing. A priority problem here is respectively being oil pollution of environment.

Zone B – eastern, is one of the highly developed regions of the Republic of Kazakhstan with concentration of large enterprises of non-ferrous and ferrous metallurgy, energy sector. Here are prevailing problems related to environment pollution by industrial solid waste, air pollution in urban areas, lack of forests and especially protected natural territories.

Zone C – southern, is characterized, mainly, by agricultural specialization of the region, requiring sustainable water supply.

In the southern areas there is a significant lack of water resources. There are also problems related to water pollution by wastewaters and degradation of pastures.

(http://www.cac-biodiversity.org/kaz/kaz_climate.htm, 2003)

Research Methodology

This study analyzes two widely used green building rating programs- LEED (USA) and BREEAM (UK) in the context of Kazakhstan. The study has been done through completing a thorough comparative study of the two programs, i.e. detailed analysis of every credit in each program in terms of applicability to Kazakhstan (Table 3). The findings have been summarized into the proposed Kazakhstani Green Building Rating Program (KGBRP), and detailed spreadsheet of it has been created (Table 4).

Section name	Abbr.	Credit name	Suggestion	Reasoning
Sustainable Sites (SS)	P	Construction Activity Pollution Prevention	Yes	The prerequisite should be transformed to a credit, and is achievable.
		1 Site Selection	Yes	The intention of the credit is good, but the regulations of LEED can not be applied to Kazakhstan; hence there is a need for defining inappropriate sides in the Kazakhstani building code.
		2 Development Density & Community Connectivity	Yes	The credit can and should be applied with the same (or slightly modified) required values.
		3 Brownfield Redevelopment	Yes	The local codes needs to be updated with the definition of Brownfields, and then the credit should be utilized in the KGBRP.
		4.1 Alternative Transportation: Public Transportation Access	Yes	The requirements of the credit are realistic for Kazakhstan, and should be utilized in the KGBRP.
		4.2 Alternative Transportation: Bicycle Storage & Changing Rooms	No	Based on the fact that there is no bicycle community in Kazakhstan, the credit should not be considered. It might be used in the

				future with the development of the infrastructure.
	4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	No	Again there is a negligible amount of hybrid/low emission cars in Kazakhstan, hence for now the credit should be neglected. Proposed requirements are very strict; BREEAM's approach regarding this matter should be employed in KGBRP. People in Kazakhstan are not ready to sacrifice the convenience of a close by parking yet.
	4.4	Alternative Transportation: Parking Capacity	Yes	The intention and achievability of the credit are good, and must be included in the KGBRP.
	5.1	Site Development: Protect or Restore Habitat	Yes	The intention and achievability of the credit are good, and must be included in the KGBRP.
	5.2	Site Development: Maximize Open Space	Yes	The intention and achievability of the credit are good, and must be included in the KGBRP.
	6.1	Storm water Design: Quantity Control	Yes	The intention and achievability of the credit are good, and must be included in the KGBRP.
	6.2	Storm water Design: Quality Control	Yes	The intention and achievability of the credit are good, and must be included in the KGBRP.
	7.1	Heat Island Effect: Non-Roof	Yes	With some modest modifications (for example, neglect SRI requirements) the credit should be utilized in the KGBRP.
	7.2	Heat Island Effect: Roof	Yes	With some modest modifications (for example, neglect SRI requirements) the credit should be utilized in the KGBRP.
	8	Light Pollution Reduction	Yes	The credit's requirements for internal and external lightings are reasonable and achievable in Kazakhstan; hence it should be utilized in the KGBRP.
Water Efficiency (WE)	1.1	Water Efficient Landscaping: Reduce by 50%	Yes	Intention and means of achieving this credit are realistic for Kazakhstan, hence the credit should be utilized in the KGBRP.
	1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	Yes	Intention and means of achieving this credit are realistic for Kazakhstan, hence the credit should be utilized in the KGBRP. The credit requires reduction of a potable water use by 50% or treatment of 50% of wastewater, it doesn't seem to be applicable to Kazakhstan (because of current non-existent practices), so for the pilot version of the KGBRP the
	2	Innovative Wastewater Technologies	Yes	

				credit should dramatically decrease the values above or neglect it for now.
		3.1 Water Use Reduction: 20% Reduction	Yes	This credit, as well as the credit below are realistic for Kazakhstan and have a good logic on it, hence the credit should be utilized (maybe with decreasing the values to 10%-20%) in the KGBRP.
		3.2 Water Use Reduction: 30% Reduction	Yes	
Energy & Atmosphere (EA)	P.1	Fundamental Commissioning of the Building Energy Systems	Yes	<p>The requirements of the prerequisite are realistic for Kazakhstan, and should be utilized in the KGBRP.</p> <p>Though the prerequisite refers to some ASHRAE standards, the credit should be utilized through the update of the local codes. Here is the shocking part: most of the buildings in Kazakhstan don't have HVAC systems in the common sense. The buildings are heated by pipes around the buildings, and cooled by conditioning apparatus (portable units fixed on the walls or ceilings). Hence, the prerequisite with its requirements are not applicable to Kazakhstan. The credit should be one of the fundamental - mandatory of the KGBRP (both logic and applicability to Kazakhstan are good).</p> <p>The credit offers 3 points for achieving savings of annual building energy through different types of renewable energy. The credit can be implemented in Kazakhstan, and should be utilized in the KGBRP.</p> <p>The credits intentions are logic and totally applicable to Kazakhstan.</p> <p>As in the case of the EAp3 the credit should be omitted by now. The credit calls for a plan to measure and check the building's energy consumption and must be utilized in the KGBRP.</p>
	P.2	Minimum Energy Performance	Yes	
	P.3	Fundamental Refrigerant Management	No	
	1	Optimize Energy Performance	Yes	
	2	On-Site Renewable Energy	Yes	
	3	Enhanced Commissioning	Yes	
	4	Enhanced Refrigerant Management	No	
	5	Measurement & Verification	Yes	

				The idea and requirements of the credit are unrealistic for the modern Kazakhstan. It may possibly be considered in the future (not a near one).
	6	Green Power	No	
Materials & Resources (MR)	P.1	Storage & Collection of Recyclables	Yes	The prerequisite's intention and requirements are achievable in Kazakhstan, and though there is not much of a recycling practice it should be utilized in the KGBRP. The credit calls for reuse of 75% of existing walls, floors & roof. Based on the fact that the buildings in Kazakhstan that about to be demolished (for a new construction) are very old, the credit becomes very controversial. Two options: either dramatically reduce the 75% requirement or neglect it for now.
	1.1	Building Reuse: Maintain 75% of Existing Walls, Floors & Roof	Yes	
	1.2	Building Reuse: Maintain 95% of Existing Walls, Floors & Roof	Yes	Same as the above.
	1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements	Yes	Same as the above. This credit, as well as the credits below are realistic for Kazakhstan and have a good logic on it; and though the recycling industry is currently only being developed the credit should be utilized with substantial decrease of the values.
	2.1	Construction Waste Management: Divert 50% from Disposal	Yes	
	2.2	Construction Waste Management: Divert 75% from Disposal	Yes	Same as the above.
	3.1	Materials Reuse: 5%	Yes	Same as the above.
	3.2	Materials Reuse: 10%	Yes	Same as the above.
	4.1	Recycled Content: 10% (post-consumer + ½ pre-consumer)	Yes	Same as the above.
	4.2	Recycled Content: 20% (post-consumer + ½ pre-consumer)	Yes	Same as the above.
	5.1	Regional Materials: 10% Extracted, Processed & Manufactured Regionally	Yes	Use of regional materials should be encouraged, hence the credit should be utilized in the KGBRP.
	5.2	Regional Materials: 20% Extracted, Processed & Manufactured Regionally	Yes	Same as the above. Use of rapidly renewable materials should be encouraged, hence the credit should be utilized in the KGBRP.
	6	Rapidly Renewable Materials	Yes	

				There is no forest management program in Kazakhstan yet, hence for now the credit can be neglected.
	7	Certified Wood	No	
Indoor Environmental Quality (EQ)	P.1	Minimum IAQ Performance	Yes	The prerequisite refers to some ASHRAE standards and can not be imported to the KGBRP. Solution would be to make changes to the building and local codes.
	P.2	Environmental Tobacco Smoke (ETS) Control	Yes	The prerequisite should definitely be utilized in the KGBRP (too many smokers in Kazakhstan). The credit's logic and applicability are good; and can be implemented in the KGBRP.
	1	Outdoor Air Delivery Monitoring	Yes	The implementation of the credit requires meeting some ASHRAE standards; hence in order to utilize the credit changes to the current codes in Kazakhstan has to be made.
	2	Increased Ventilation	No	Some parts of the credit refer to some professional US standards; only the parts where no reference needed can be used towards the credit in the KGBRP.
	3.1	Construction IAQ Management Plan: During Construction	Yes	The credit's logic and applicability are good; and can be implemented in the KGBRP.
	3.2	Construction IAQ Management Plan: Before Occupancy	Yes	The credit, as well as below credits of the same group are not applicable in Kazakhstan, because there is no ratings of such kind and no agency that assesses them.
	4.1	Low-Emitting Materials: Adhesives & Sealants	No	
	4.2	Low-Emitting Materials: Paints & Coatings	No	Same as the above.
	4.3	Low-Emitting Materials: Carpet Systems	No	Same as the above.
	4.4	Low-Emitting Materials: Composite Wood & Agrifiber Products	No	Same as the above.
	5	Indoor Chemical & Pollutant Source Control	Yes	The credit should be utilized in the KGBRP and should have a mandatory status.
	6.1	Controllability of Systems: Lighting	Yes	This credit can and should be utilized in the KGBRP.
	6.2	Controllability of Systems: Thermal Comfort	No	Based on the EAp3 explanation the credit can be neglected for now.
	7.1	Thermal Comfort: Design	No	Same as the above.
	7.2	Thermal Comfort: Verification	No	Same as the above.
8.1	Daylight & Views: Daylight 75% of Spaces	Yes	The credit's intention is reasonable and it is achievable in Kazakhstan.	

	8.2	Daylight & Views: Daylight 90% of Spaces	Yes	Same as the above.
Innovation in Design	1-1.4	Innovation in Design	Yes	The credit should be included in the KGBRP as means of motivation of design teams. Considering the fact that there is in existing KGBRP yet, and consequently no KGBRP AP's the credit should be omitted. Though in the future, with the development of green practice it might be included.
	2	LEED Accredited Professional	No	

Summary of the LEED analysis:

- Sustainable Sites: out of one prerequisite and fourteen credits two credits were omitted;
- Water Efficiency: all five credits have been approved;
- Energy & Atmosphere: out of three prerequisite and six credits one prerequisite and one credit has been omitted;
- Materials & Resources: out of one prerequisite and eleven credits one credit has been omitted;
- Indoor Environmental Quality: out of two prerequisites and fifteen credits seven credits were omitted;
- Innovation in Design: One credit has been omitted.

Summary of the BREEAM analysis:

- Management: three credits out of five have been omitted;
- Health & Wellbeing: two credits out of twelve have been omitted;
- Energy: all seven credits have been approved;
- Transportation: two credits out of six have been omitted;
- Water: one credit out of four has been omitted;
- Materials: three credits out of seven have been omitted;
- Waste: all four credits have been approved;
- Land Use & Ecology: all six credits have been approved;
- Pollution: all seven credits have been approved.

Proposed Kazakhstani Green Building Rating Program (KGBRP)

Based on the analysis above a spreadsheet containing applicable credits (with modifications) has been developed (Table 4). The spreadsheet is a proposed version of the future KGBRP, it can and should be developed more with the help of industry members and local authorities. The KGBRP, as well as all other “green” rating tools, is a voluntary program to be used to build buildings in Kazakhstan more efficiently and more environmentally friendly.

The structure of the KGBRP:

- Construction Site & Ecology – 15% (of all points achievable);
- Materials & Waste – 15%;
- Water – 10%;

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- Internal Comfort & Lighting – 20%;
- Energy – 30%;
- Transport – 5%;
- Commissioning – 5%.

Table 4 Spreadsheet of the Proposed KGBRP

Table 4 Spreadsheet of the Proposed KGBRP									
Section	CONSTRUCTION SITE & ECOLOGY								
Credit name	Pollution Control	Site Selection	Protection of EcoValues	Enhancing site Ecology	Long term impact	Stormwater MGMT	Heat Island Effect		
Credit amount									
Status									
Section	MATERIALS & WASTE								
Credit name	Reuse of External Materials	Reuse of Internal Materials	Waste MGMT	Recyclables	Regional Materials	Finishes			
Credit amount									
Status									
Section	WATER								
Credit name	Landscaping	Innovations	Reduction of Use	Leak detection	Metering				
Credit amount									
Status									
Section	INTERNAL COMFORT & LIGHTING								
Credit name	Day-lighting	View out	Glare control	Levels of Light (Int & Ext)	Natural Ventilation	Air quality	Thermal comfort	Acoustic comfort	Controls
Credit amount									
Status									
Section	ENERGY								
Credit name	Reduction of CO2	Efficient fixtures	Consumption Optimization	Refrigerant MGMT	Efficient design	Renewable energy			
Credit amount									
Status									
Section	TRANSPORT								
Credit name	Public Access	Community Connectivity	Travel Plan	Parking Capacity					

Credit amount									
Status									
Section	COMMISSIONING								
Credit name	Enhanced Commissioning	Building User Manual							
Credit amount									
Status									

Conclusions

The analysis of each and every credits of two (LEED & BREEAM) has been performed, and based on the realities of the modern construction industry of Kazakhstan proposed version of the Kazakhstani Green Building Rating Program with the list of credits and probable allocation of the credits has been created. This work is just an attempt to familiarize Kazakhstan with the Sustainable Construction practices that world’s most developed countries are already utilizing. Recognizing that the current construction practice in Kazakhstan is unsustainable is one of the first necessary steps for a change. Recognition (by the industry, local authorities, and ultimately by people all over the country) followed by the education and modernization of the current building codes and infrastructure should be the locomotives of the growth of Sustainable movement in Kazakhstan.

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