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APPROACH FOR EVALUATION OF BUSINESS BY REQUIREMENTS OF *GREEN* DEVELOPMENT: A CASE STUDY OF KAZAKHSTAN IN COMPARISON WITH OTHER COUNTRIES

Dalė DZEMYDIENĖ[1], Guldana ASKAROVA[2*]

[1,2]Department of Business Technologies and Entrepreneurship, Faculty of Business Management, Vilnius Gediminas Technical University, Sauletekio av. 11, Vilnius, Lithuania

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Abstract. Our research area concerns the methods of evaluation of situations of countries according to the sustainable requirements which is named in literature as green business. Green business is a main way to sustainable development of economy of a country. The countries which are considered as a developing countries comparing to other countries, has a lot of issues in developing of green enterprises. The countries which have important amount of natural resources, such as oil, gas, uranium and most entrepreneurs are interested in non-environmentally friendly spheres. But using these resources became causes of many problems regarding ecology of a country. The approach provided by this research include some methods for multi-criteria decision support applying TOPSIS and AHP methods. On the case of this study we demonstrate the evaluation of Kazakhstan's level of eco-efficiency in comparison with other countries. Our aim is to show how evaluate countries by sustainability applying TOPSIS and AHP method.

Keywords: decision support methods, *green* business, sustainable requirements, multi-criteria evaluation.

Introduction

It became important to develop and invest into the *green* business nowadays, since ecosystem has faced with many issues such as inappropriate usage of resources and pollution in many areas. And this paper focuses on the requirements of the *green* business, which connected to sustainable development and combine the environmental, economic and social components (Gibbs, 2009). '*Green businesses are social activists, who aspire to restructure the corporate culture and social relations of their business sectors through proactive, ecologically oriented business strategies'* (Isaak, 1998). Ecological modernization created need for a form of business which works across two logics: the commercial and the environmental (Gibbs, 2009).

The problems arising in concrete country are different, but they have some similarities. We can extract several problems, which influence the constrains for development of *green* economy in Kazakhstan:

The deficiency of governmental support for sustainable development in the country, for instance financial funds for entrepreneurs to get modern types of equipment;

The deficiency of *Green* technologies and infrastructure in all cities;

The lack of scientists and developers, since its unpopularity in society and choices of young people;

The high prices for ecological products and services;

Investing in a cleaner environment and cleaning facilities is not enough.

Thus, the arising difficulties and policy issues became significant constraints to develop sustainable enterprises in many countries. The main problems of sustainable development of countries in the environment area are related with air quality, urban pollution, soil fertility, water resources and waste issues. The problems for achieving sustainability of business in developing countries are very complex. We restrict our research on the more common statistics, and some concrete parameters of air pollution, and utilization of wastes. For understanding the level of sustainable development of Kazakhstan, the indicators of pollution can be compared with same indicators of other developed

*Corresponding author. E-mail: *guldana.askarova@stud.vgtu.lt*

countries. We choose TOPSIS and AHP methods to evaluate the current conditions of *green* economy and enterprises by applying statistical data to these methods (Zavadskas et al., 2016; Hasson, Ibrahem, 2013). Thus, the main aim of this work is to develop evaluation model, which allow to extract data and make decisions about situations of business according to the development *green* economy in Kazakhstan in comparison with other countries. Investing in a cleaner environment and cleaning facilities is not enough. Thus, it is significant to develop sustainable enterprises.

1. Issues regarding *green* business development and sustainability

The requirements of sustainable development of business enterprises, organizations and corporations arise as nowadays issues and influence the development of economy in longer strategic perspectives. Many authors raise the requirements for sustainable development and look for new ways how to improve the functioning of business objects (Lozano, 2012; Lubin, Esty, 2010; Dzemydienė et al., 2016, Žulkas et al., 2015). Enterprises which follow by new *green* business models seek to reduce costs, wastage, and environmental impacts, while also creating value with superior products and new services. They redefine established production, logistics, and marketing methods, informed by *green* managerial practices (Haden et al., 2009). The innovations, functions of new business models, and policy initiatives can help for enterprises to emerge or go *green*. We are on the way for finding the best decisions and actions how to change situation in enterprises, districts and regions.

The concept of sustainable development is understood differently, but the meaning is reconciling environmental problems by strategy of worldwide environment, resource management and of ecological innovations (Brand, 2012). Directives for sustainable development are important. The Agenda for Sustainable Development of Transforming our World until 2030 year (Agenda, 2015) includes 17 Sustainable Development Goals (SDGs) and 169 targets was adopted on 25 September 2015 by Heads of State and Government at a special UN Summit. *"The Agenda is a commitment to eradicate poverty and achieve sustainable development by 2030 worldwide, ensuring that no one is left behind. The adoption of the 2030 Agenda was a landmark achievement, providing for a shared global vision towards sustainable development for all"* (Agenda, 2015).

The one of the problems is that there is a lack of studies about *green* businesses in Kazakhstan, since sustainable enterprises are in initial level of developments and conditions of sustainability of companies are not good. This statement can be proved by analysing common statistical parametersof sustainable development of Kazakhstan (Figure 1) according to the studies which have been done into the area of sustainable development of Kazakhstan. We can see the slight grow of studies regarding this theme. It can be noticed that numbers of written studies on axis evolve, which means this theme started to interest researchers. However, the numbers of studies in each year are not enough to represent many problems in this field (Figure 1).

New structured approaches for deriving and explaining *green* business dynamics are very desirable. For example, the extension of productivity by applying renewable energy-based business models have the capacity to lay foundations for a sixth wave of innovation (Moody, Nogrady, 2010). The value from renewable energy technologies can be created and captured sustainably and innovatively by *green* business models. In seeking a clear description of *green* business models, we argue that innovation, flexibility, and sustainability are three basic enablers. We hope that new proposed frameworks will have implications for strategic decision making, for both firms that pursue *green* energy business models and policy makers.

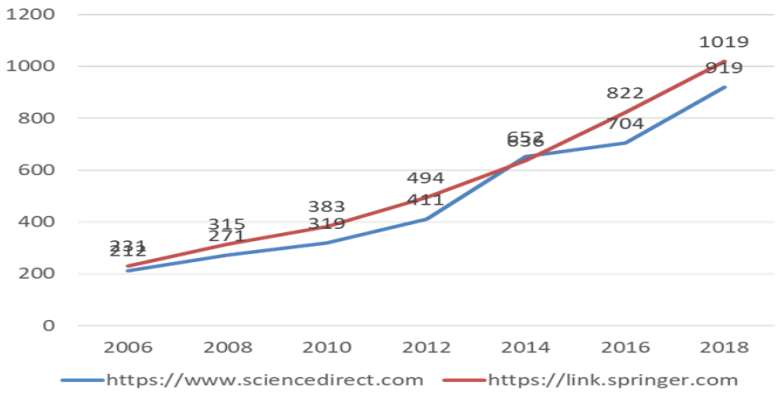

Figure 1. Numbers of written studies regarding sustainable development in Kazakhstan
Source: Official statistical data from www.sciencedirect.com and link.springer.com

The Government of Kazakhstan has declared that the purposes of the United Nation's Sustainable Development Goals are to bringing strong health for people, clean water and manage resources underwater and on the soil. Initially, the actual state of environment needs to be understood in order to set all goals, after find out where the most force is needed (Russell, 20018). Kazakhstan got its independence from Soviet Union in 1991, economy of country started to grow severely because of oil, gas and other natural resources. Nowadays GDP of the country is higher than in Russia, since energy exports were launched. Thus, it brought enormous issues to ecology, such as air and water pollution, problems with wastes and soil. New policy named 'Concept for transition of the Kazakhstan to the *Green* Economy' was published to accompany the Strategy Kazakhstan until 2025 year. This report proposes to use renewable and natural energy, such as wind and solar, instead of coal-related domestic energy. According to this report, the *Green* economy is a significant key, which can improve economic growth and human's security.

2. The theoretical bachground of using TOPSIS and AHP methods for decision support

In order to evaluate and reveal conditions of *green* business, the methods such as content analysis, data processing, secondary data analysis were used. We choosed two methods for evaluation of conditions of *green* business development in Kazakhstan with comparision with other countries, i.e. TOPSIS and AHP.

2.1. Formal description of TOPSIS method

This part describes TOPSIS method (developed in 1981 by Hwang and Yoon). The main purpose of this method is to choose the most suitable option from other alternatives. In this method there is a matrix which consist from alternatives, criteria and weights which shows criteria's level of importance. Alternatives can be any choices, solutions or name of product, and all criteria are indicators, which evaluate the alternatives.

By following (Hasson, Ibrahem, 2013), the first step needs to evaluate the normalized decision matrix. The TOPSIS should use vector normalization. Calculating the normalized decision matrix using this formula by (Hasson, Ibrahem, 2013):

$$\mathrm{n_{ij}} = \frac{\mathrm{x_{ij}}}{\sqrt{\sum_{\mathrm{i=1}}^{\mathrm{m}} \mathrm{x_{ij}^2}}} (w_1 + w_2 + \cdots w_n = 1) \qquad (1)$$

where, n_{ij} – normalized criteria, X=($\mathrm{x_{ij}}$) – a decision matrix, W=($w_1; w_{2;} w_\Gamma$) – weight of criteria, $x_y \in R$ – all numbers.

By following (Hasson, Ibrahem, 2013), calculating the weighted normalized decision matrix:

$$v_{ij} = w_j n_{ij} \text{for } i = 1, \dots, m; j = 1, \dots, n \qquad (2)$$

where, w_j −the weight of the *j*-the criterion.

By following (Hasson, Ibrahem, 2013), determining the positive ideal and negative ideal solutions.

$$V^+ = (v_1^+, v_2^+, \dots, v_n^+) = \left(\left(\max_i v_{ij} \middle| j \in I \right), \left(\min_i v_{ij} \middle| j \in J \right) \right) \quad (3)$$

$$V^- = (v_1^-, v_2^-, \dots, v_n^-) = \left(\left(\min_i v_{ij} \middle| j \in I \right), \left(\max_i v_{ij} \middle| j \in J \right) \right) \quad (4)$$

where *I* is associated with benefit criteria and *J* with the cost criteria, *i* = 1, … , *m*; *j* = 1, … , *n*.

Calculating the separation measures from the positive ideal solution and the negative ideal solution:

$$S_i^+ = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_i^+ \right)^2}, \; i = 1, 2, \dots, m \qquad (5)$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_i^- \right)^2}, \qquad i = 1, 2, \dots, m.$$

Calculating the relative closeness to the positive ideal solution:

$$P_i = \frac{S_i^-}{S_i^- + S_i^+} \qquad (6)$$

Ranking by the order of solutions.

2.2. Using Analytic Hierarchy Process (AHP) method

Analytic hierarchy process (AHP) is a technique for organizing and analyzing complex decisions, created by Saaty. This method can be useful when large company requires best solution out of many choices (Dağdeviren, Yüksel, 2008; Zavadskas et al. 2016).

By (Dağdeviren, Yüksel, 2008), for construction of AHP analysis, the concrete steps have been followed:

Step 1. The structure of the AHP needs be constructed. One of the ways to do this step is by interviewing with domain experts.

Step 2. Suitable questionnaire must be designed. The questionnaire is specially designed to perform all of possible pair-wise comparisons among input factors. A nine-point scale is usually utilized to indicate the importance ratio of one factor to another. Table 2 demonstrates a simple AHP questionnaire with three factors: factors A, B, and C. In the table, the first row shows two factors for comparison (the leftmost cell and the rightmost cell) and the values of comparison result of the two factors.

Step 3. Using the questionnaire to collect the experts' opinions on the importance ratios among the factors and to build importance matrix.

Step 4. Calculate the weights. The weight of every level can be calculated as:

$$\bar{w}_i = \sqrt[n]{\prod_{j=1}^{n} a_{ij}} \qquad (1)$$

This weight must be standardized:

$$w_i = \frac{\bar{w}_i}{\sum_{i=1}^{n} \bar{w}_i} \qquad (2)$$

Find the largest Eigenvalue as:

$$\lambda_{max} = \sum_{i=1}^{n} \frac{\sum_{j=1}^{n} a_{ij} * w_j}{n * w_i} \qquad (3)$$

Step 5. A constituency test must be performed. Consistency Index (CI) must be computed using the following formula:

$$CI = \frac{\lambda_{max} - n}{n-1} \qquad (4)$$

Where, n - is the number of factors, λ_{max}- is the maximum eigenvalue of the importance matrix, CR - Constituency Ratio, is used to determine if a questionnaire passes the consistency test.

$$CR = \frac{CI}{RI}$$

If CR is less than or equal to 0.1, the questionnaire passes the consistence test. The weights in an AHP model are the elements of the normalized eigenvector associated with λmax. If CR is greater than 0.1, the questionnaire fails (Dağdeviren, Yüksel, 2008)

3. Evaluation of possibilieties of *green* economy in Kazakhstan in comparison with other countries

We would like to compare six countries in according to the level of sustainable development. Some statistical parameters are choosing, which indicate very common possibilities to evaluate the level of sustainable development in such countries, i.e.:

Energy conversion efficiencyEnergy efficiency (GDP per unit of energy) – is the index of efficiency of system in relation to conversations and the inputs of energy;

The share of fossil fuels (% of total) – is the proportion of fossil fuels in the world's supply;

Carbon dioxide emissions per capita (Tones) - the amount of greenhouse gases produced to maintain human activities;

Urban pollution (mg\m3) – is a number which shows how polluted air in a city areas is very common parameter;

Exhaustion of natural resources (% of GNI), measured by (percentage of Gross National Income) - the amount of net forest depletion, mineral resources and energy depletion;

Satisfaction with the actions for protection of the environment (%) –– the level of measuring individuals' satisfaction with environmental conditions in the country (by persentage).

An amount of weights choice as same, since every category has significant role in this statistic of recent year. But "Energy efficiency" and "Satisfaction with the actions for protecting of the environment" are beneficiary, since it has to be in a high level to show level of development, and another criterias are cost-beneficiary demonstrating pollutions in a country.

At first stage the TOPSIS method was used to compare and find out the level of economic growth of Kazakhstan in comparison with other countries. We follow the steps of TOPSIS method by (Zavadskas et al., 2016; Hasson, Ibrahem, 2013).

Step 1: We construct the primary data provided for evaluationmatrix (Table 1), in according to the official statistical data provided by (Eurostat, 2014).

Table 1. Data of parameters in evaluated countries in 2014

Countries	Energy conversion efficiency (GDP per unit of energy)	The share of fossil fuels (% of total)	Carbon dioxide emissions per capita (Tones)	Urban pollution (mg\m3)	Exhaustion of natural resources (% of GNI)	Satisfaction with the actions for protection of the environment (%)
Weight	0,170	0,170	0,170	0,170	0,170	0,170
United Kingdom	10,100	90,200	8,500	13,000	1,200	66,800
Poland	6,800	93,800	8,300	35,000	1,000	43,600
Belarus	4,100	92,100	6,500	7,000	0,900	50,600
Russia	3,000	90,900	12,100	16,000	14,500	18,300
Kazakhstan	2,500	98,800	15,300	15,000	22,000	37,400
China	3,700	86,900	5,200	66,000	3,100	73,000

Source: according to (Statistical data of EUROSTAT, 2014)

Step 2: Calculate the normalized decision matrix. The matrix of normalized values is presented in Table 2.

Table 2. The normalized decision matrix

Countries	Normalization of					
	Energy conversion efficiency	The share of fossil fuels	Carbon dioxide emissions per capita	Urban pollution	Exhaustion of natural resources	Satisfactions with the actions for protection of the environment
weight	0,170	0,170	0,170	0,170	0,170	0,170
United Kingdom	0,725	0,399	0,350	0,164	0,045	0,528
Poland	0,488	0,415	0,341	0,442	0,038	0,345
Belarus	0,294	0,408	0,267	0,088	0,034	0,400
Russia	0,215	0,403	0,498	0,202	0,545	0,145
Kazakhstan	0,179	0,438	0,629	0,189	0,827	0,296
China	0,266	0,385	0,214	0,833	0,117	0,577

Source: according to (Statistical data of EUROSTAT, 2014)

Step 3: Calculate the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as follows (Table 3):

Table 3. The weighted normalized decision matrix

Countries	Energy efficiency (GDP per unit of energy)	The share of fossil fuels (% of total)	Carbon dioxide emissions per capita (Tones)	Urban pollution (mg\m3)	Exhaustion of natural resources (% of GNI)	Satisfaction with the actions for protection of the environment (%)
Weight	0,170	0,170	0,170	0,170	0,170	0,170
United Kingdom	0,123	0,068	0,059	0,028	0,008	0,090
Poland	0,083	0,071	0,058	0,075	0,006	0,059
Belarus	0,050	0,069	0,045	0,015	0,006	0,068
Russia	0,037	0,068	0,085	0,034	0,093	0,025
Kazakhstan	0,031	0,074	0,107	0,032	0,141	0,050
China	0,045	0,065	0,036	0,142	0,020	0,098

Step 4: Determine the ideal (V+) and negative ideal (V-) solutions (Table 4).

Table 4. The ideal positive and negative solutions

v+	0,123	0,065	0,036	0,015	0,006	0,098
v-	0,031	0,074	0,107	0,142	0,141	0,025

Step 5: Calculate the separation measures using the m-dimensional Euclidean distance (Table 5).

Table 5. The separation measures

Si+	Si-
0,028	0,214
0,085	0,170
0,080	0,201
0,152	0,120
0,186	0,112
0,149	0,159

Step 6: Calculate the relative closeness to the ideal solution (Table 6).

Table 6. The relative closeness

Pi
1,028
1,085
1,080
1,152
1,186
1,149

Step 7. We follow the recommendation of ranking of the choose countries (Table 7).

Table 7. Ranking of countries

5,000	United Kingdom
4,000	Poland
5,000	Belarus

2,000	Russia
1,000	Kazakhstan
3,000	China

According to the results of such comprehensive analysis, Kazakhstan and Russia have the weakest g*reen* economy. Also it can be found that the scientific works of Kazakhstan about stages of development and establishment of a g*reen* economy are virtually absent. There are six countries, which have similar stage of g*reen* economy, except United Kingdom and Poland.

4. Recommendations of priority actions of *Green* business development in Kazakhstan

At this stage of our research we apply AHP method. The first step needs to compare two alternatives by giving them points from 1 to 9. The questionnaire is specially designed to perform all of possible pair-wise comparisons among input factors. A nine-point scale is usually utilized to indicate the importance ratio of one factor to another. The expert as environment protection specialist help us to construct such matrix.

We demonstrate a simple AHP questionnaire with important factors helping us to reveal the influence of one factor to another. In the Table 8, the first row shows two factors for comparison (the leftmost cell and the rightmost cell) and the values of comparison result of the two factors following by (Hasson, Ibrahem, 2013).

All criteria and statistics from previous part influenced to the giving points to types of business. Also points were given by its popularity an importance in Kazakhstan. For example, the evaluation by point 3 (in 1 row of Table 8) correspond to the evaluation of “water conversation” in comparison with the influencing of ”energy efficiency”. This rational evaluation is not high, because South Kazakhstan still has not solved this problem. Number 6 in second row of Table 8 correspond to evaluation of recycling the waste in comparison with energy efficiency, because of lack of important implications and investments in these area. By analogy, the next number 2 correspond to energy efficiency, because organic farming is quite developed than other, 4 - to green construction because of unpopularity and lack of quite qualitative investments in this field, 8 - to waste as a fuel since issues about harm types of fuel are not enouhgt supported, and is used widely.

Table 8. The pairwise comparison matrix of factors influencing development of green business

Factors	**Pairwise comparison evaluations**									**Factors**
energy efficiency	9	7	5	3	1	3	5	7	9	water conversation
energy efficiency	9	7	5	3	1	3	6	7	9	recycling the waste
energy efficiency	9	7	5	2	1	3	5	7	9	organic farming
energy efficiency	9	7	5	3	1	4	5	7	9	green construction
energy efficiency	9	7	5	3	1	3	5	8	9	waste as an fuel
water conversation	9	7	5	3	1	3	5	7	9	recycling the waste
water conversation	9	7	5	4	1	3	5	7	9	organic farming
water conversation	9	7	5	3	1	3	5	7	9	green construction
water conversation	9	7	5	3	1	3	5	7	9	waste as an fuel
recycling the waste	9	7	5	3	1	3	5	7	9	organic farming
recycling the waste	9	7	5	2	1	3	6	7	9	green construction
recycling the waste	9	7	5	3	1	3	5	6	9	waste as an fuel
organic farming	9	7	5	3	1	3	5	7	9	green construction
organic farming	9	7	5	3	1	2	5	7	9	waste as an fuel

green construction	9	7	5	3	1	3	5	7	9	waste as an fuel

Step 1: Construct the pairwise comparison matrix (Table 9).

Table 9. Normalized decision matrix

	energy efficient production	water conversation	recycling the waste	organic farming	green construction	waste as an alternative fuel
energy efficient production	1	0,33333333	0,16666667	2	0,25	0,125
water conversation	3	1	0,33333333	4	3	0,2
recycling the waste	6	3	1	3	2	0,17
organic farming	0,5	0,25	0,33333333	1	0,333333333	0,5
green construction	4	0,33333333	0,5	3	1	0,33333333
waste as an alternative fuel	8	5	6	2	3	1

Step 2*:* Construct normalized decision matrix (Table 10).

Table 10. The weighted and normalized decision matrix

	energy efficient production	water conversation	recycling the waste	organic farming	green construction	waste as an alternative fuel
energy efficient production	0,04444444	0,03361345	0,02	0,13333333	0,026086957	0,05376344
water conversation	0,13333333	0,10084034	0,04	0,26666667	0,313043478	0,08602151
recycling the waste	0,26666667	0,30252101	0,12	0,2	0,208695652	0,07168459
organic farming	0,02222222	0,02521008	0,04	0,06666667	0,034782609	0,21505376
green construction	0,17777778	0,03361345	0,06	0,2	0,104347826	0,14336918
waste as an alternative fuel	0,35555556	0,50420168	0,72	0,13333333	0,313043478	0,43010753

Step 3. Construct the weighted, normalized decision matrix (Table 11).

Table 11. Eigenvector and Row matrix

Total	Average	Ranking	consistency measure
0,31124162	0,0518736	5	6,79263049
0,93990532	0,15665089	3	6,94516818
1,16956792	0,19492799	1	7,62343902
0,40393535	0,06732256	6	6,56593195
0,71910822	0,11985137	4	6,80386275
2,45624157	0,4093736	2	7,99119443

Step 4: According to the calculated Eigenvector and Row matrix; we calculate the maximum Eigenvalue; Calculate the consistency index and consistency ratio (Table 12).

Table 12. Consistency index and consistency ratio

Ci	5,9203711
Ri	1,24
Cr	4,7744929

CI index shows that it failed, but all these fields are not researched nowadays. And Kazakhstan needs to support investigations in these areas to improve *green* economy and establish *green* business.

Conclusions

There are many approaches to develop *green* economy, and one of them is the promotion of *green* business. *Green* business is a type of ecologically friendly entrepreneurship that eliminates environmental problems and find benefits in protecting natural resources. The requirements of sustainable development influence the strategy of changes in all the countries of the world. In this research we analyze Kazakhstan business development possibilities. At first stage of our approach the TOPSIS method was used to compare and find out the level of economic growth of Kazakhstan in comparison with other countries. The indicators were different. For example when one country had worst energy efficiency, another had low level of urban pollution. Regarding the results, it can be observed that the *green* economy of Kazakhstan is left behind other countries and is at lower level than Russia and China, considering the fact that these both countries have big number of population and infrastructure. Thus, Kazakhstan needs many improvements in all areas of business development. Most types of *green* businesses are not developed and country needs to alter all non-environmentally friendly enterprises.

According to the experiences of *green* business of developed country, the areas of businesses were compared with each other. The AHP method help us to evaluate and extract the most suitable factors for Kazakhstan. Moreover, from the results of the procedure, the most successful business can be 'recycling the waste' and 'waste as an alternative fuel'. Kazakhstan have not solved important issues with waste yet. Long term strategic actions in this fields require stronger supports and investments.

This requires the Government of Kazakhstan to make conditions with taxation and laws. Following the experience of other countries in the area of developing of *gre*en economy, it can be noticed that Kazakhstan needs to support and develop environmentally friendly enterprises and follow by investing in *green* business. According to the results of foreign green enterprises, there are the most needed entrepreneurships: energy efficient production, water conversation, recycling the waste, organic farming, green construction, and waste as an alternative fuel. The most important criteria to Kazakhstan is *green* businesses as the smallest footprints to ecology and aim to resolve social issue.

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