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# ASSESSMENT OF THEORETICAL ASPECTS OF SUSTAINABLE COMPETITIVENESS OF AN INDUSTRY USING MULTIPLE CRITERIA DECISION MAKING TECHNIQUES

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**Abstract.** The purpose of the research is to evulate exisiting factors of the industry's sustainable competitiveness. Factors are valued using multiple criteria decision making techniques. The most important factors for sustainable competitiveness are determined and improvements are suggested. These factors were analyzed as social, economic and environmental. To achieve the goal of the research quantitative and qualitative research methods have been used: scientific literature review, qualitative content analysis, Analytic Hierarchy Process (AHP) Multi Criteria decision making method, The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) Multi Criteria decision making method. The results obtained have selected the most important factors in the industry's sustainable competitiveness, this helps to solve various economic and ecological problems. The results can be used as recommendations for industrial policy development.

**Keywords:** Sustainability, Competitiveness, Sustainable competitiveness, Industry, Environmental sustainability, Topsis, Analytic hierarchy process.

**JEL Classification:** O 14; O 25

## Introduction

In the process of globalization, competitiveness and sustainability is becoming more and more relevant and important. In today's society, competitiveness can no longer exist without sustainability, as various economic and ecological aspects have become very close to each other. The increasing use of resources in various economic sectors and the growing production in different sectors of industry increase global pollution. Scientists announce global temperature records every year, but carbon dioxide emissions from the industry continue to rise. It is a threat to humanity. The high numbers of people in whole world and even greater ecological problems require a mutual agreement that would prevent global tragedy or war. Competitiveness is fixed in the genes of every human being, people fight for social status, compete for satisfaction of resources or physical needs, and therefore the limits of competitiveness must determine sustainability.

The topic of sustainable competitiveness is becoming increasingly popular and relevant as a result of the growing competitive struggles between industry, companies and countries themselves. There is no single universally accepted definition of competitiveness, since this concept is quite broad and multifaceted (Lombana, 2011). The different environment in which the competitive analysis is conducted determines the variety of definitions of competition. The term of competitiveness is used to analyze the competition process and to describe its participants and ability to defeat a competitive struggle. The huge impact of globalization is felt in the industry. The growth of international trade unions, the elimination of borders between countries increases competition in different industrial sectors. Many manufacturers are developing new products with the help of innovation and other available resources, thus gaining a competitive advantage (Shaukat et al, 2013). No matter where the product is made, it can reach the consumer all over the world, so if an industry is small, it is difficult for her to withstand competitors around the world. In order for

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industry to be competitive, it is necessary to assess which factors of sustainable competitiveness make this industry the most competitive.

The long term focus on sustainable competitiveness of an industry helps to eliminate waste, promote efficiency and promote innovation. It includes the commitment to internalize the external effects of pollution and to manage natural resources (Esty & Charnovitz, 2013). If the industry wants to be competitive, it has to survive without state subsidies, while selling products or services. At the beginning of the new industry, they are supported by a state subsidy until they can start production at a certain price. For example the renewable energy industry, the state supports it differently until it grows, but after a while the subsidy will probably be discontinued.

*Research object.* Aspects of sustainable industrial competitiveness.

*Problem.* The choice of main aspects in the industry's sustainable competitiveness.

*Aim.* To assesss the most competitive aspects in the industry's sustainable competitiveness.

Tasks:

1. Study the theoretical aspects of this topic.
2. Study a methodology of TOPSIS model and the Analytic Hierarchy Process.
3. Determine the most competitive and sustainable aspects in the industry's sustainable competitiveness.

*Methods of the Research.* Two different multiple criteria decision making techniques: the Analytic Hierarchy Process and TOPSIS model. The Analytic Hierarchy Process allows to choose the most competitive factors in the industry's sustainable competitiveness and determine the weight of the different criteria. TOPSIS model allow to choose the most sustainable factors in the industry's sustainable competitiveness.

## 1. Theoretical aspects of SIC

Theory of competitiveness originated from the ideas of Mercantilism in the 16th and 17th centuries. They increased exports and tried to restrict imports, because in their view, only such countries were to become rich and powerful who increased their gold and silver resources. For the year, the definitions of this theory have changed and improved by different scholars. At this time, scientists agree that there is no single definition for competitiveness, but many agree that competitiveness can be analyzed from a different perspective, for example, from the country, industry, company levels. The World Economic Forum in its Global Competitiveness Report describes this as the set of institutions, policies and factors that determine the level of productivity of a country (Rusu & Roman, 2018). This report describes 140 countries by providing a Competitiveness Analysis, called the Global Sustainable Competitiveness Index, which is calculated taking into the pillars of competitiveness, the main macroeconomic indicators and other indicators. The pillars of competitiveness are grouped into 12 categories: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, innovation. Although the pillars of competitiveness are analyzed separately, they are all interlinked. A weak result in one area can have a negative impact on others. All the pillars of competitiveness are important, but their weights are not the same. There are three main stages and the most important stage is the first called factor-driven. Factor-driven stage consists of institutions, infrastructure, macroeconomic environment and health and primary education (Flejterski & Majchrzak, 2018). This split into three levels perfectly illustrates the importance of each factor and allows you to understand the weight of each factor and to determine the key competitiveness factors at the country level, but at the industry level the situation is different. Scientists disagree about which factors of competitiveness make industry more competitive. The World Economic Forum states that the link between sustainability and competitiveness is multifaceted. WEF has established channels, including efficient use of natural resources, better health, biodiversity and innovation, the impact of competitiveness on social sustainability, and how more socially sustainable states can create a more competitive business. The World Economic Forum system is designed to support a policy aimed at balancing economic prosperity and social inclusion and environmental protection. The elements of environmental and social sustainability contribute to the demonstration of synergies between sustainability and competitiveness, and are therefore used to adjust the competitiveness score obtained from the Global Competitiveness Index. The The World Economic Forum adjustment for environmental sustainability recognizes that the state of the natural environment affects competitiveness both at the state and at the firm level (Doyle & Perez-Alaniz, 2017). Initially, most of the theories were developed from the perspective of the assessment of the competitiveness of the state, and the World Economic Forum is a leader who annually evaluates different states of the world.

In the scientific literature, the industry concept is listed as a group of people that produce similar products or similar services. The industry is classified into different organizations of industrial groups that are linked by similar production processes, similar products or similar behavior in the financial market and based on different criteria (Peng, 2013). There is a large number of industry classification systems around the world, such as International

Standard Industrial Classification of All Economic Activities (ISIC) or Statistical Classification of Economic Activities in the European Community (NACE) and many more. The most commonly used criteria for industry classification systems are production and market. The industry's competitiveness can be characterized by innovation, improvement, product quality, novelty, corporate governance style, production capacity, and many other factors. Some of them are extremely important in a competitive struggle, others are less important, so it is important to decide which factors are most important. Talking about sustainable competitiveness of an industry the analysis of the concept covers three questions: What is the competitiveness of an industry? What is the sustainable industry? How to combine these two aspects together?

IEG defines competitiveness of an industry as the sustained ability of firms and industry to capture market share and grow the market through productivity improvements. Industry competitiveness can be enhanced through several different approaches including economy wide, industry specific, or a mix of economy wide with industry specific. Sustained success in international markets without protection or subsidies is the ability to match or beat the world's best firms in cost and quality of goods or services (IEG, 2016). Another industry competition assessment is developed by Porter and called the Five Forces Model. This model consists of five competitive environments: existing competitors, potential competitors, buyers, suppliers and substitutes. The model helps to assess the company's competitiveness and the surrounding environment. Porter argued that the profitability and success of a company, industry or country depends on the relationship between these five forces and the strengthening of each of them (Dobbs, 2014). In most cases, an enterprise, industry or country can't have all of the five strengths that are particularly strong, but if the research sector has very weak, underdeveloped forces, it will be difficult to survive on the market. In order to explore the different industries and the competitiveness among them, Porter created diamond model. Porter's model evaluates why particular nations have competitive advantage in global competition. The porter diamond model combines interconnected factors. The model consists of internal factors, demand conditions, production factors, corporate strategy, structure and competition, and related and service sectors. They work individually and all four as a system, and external factors affect the economic performance of companies. According to Porter, external factors include government roles and opportunities (Riasi, 2015). External factors can increase or decrease the advantage of competitors and affect internal factors. This model is used most often by analyzing industry's competitiveness.

Many authors describe the sustainable industry differently, but most of the descriptions analyze these areas: health and safety, eco efficiency, growing energy waste. Tvaronavičienė ant other authors describe sustainable competitiveness in the industry as an ecological and economic rational interdependence that allows the economy to grow and manage environmental health. This makes it possible to achieve increased energy availability and industrial development. In the long term, this does not cause environmental degradation and improves the economic performance of the industry. The presence of this compatibility between ecology and industry improves ecological rational development and allows the industry to develop without negative consequences (Tvaronavičienė et al, 2015).

Liu ir Zhang describe sustainable competitiveness in the industry as a set of dynamism and stability. "Dynamism" means that sustainable competitive advantages in the industry are constantly changing. It is not possible to gain a competitive advantage forever, only for success or secret technology or skill. No matter what the market structure is, competitive advantages are always temporary and relative. Only the creation of new conditions, self-renewal and self-riding can maintain competitive advantages. "Stability" shows that an absolute competitive advantage is in fact derived from a comparative competitive advantage. It is a long-term advantage, which consists of many short-term advantages in the industry. Sustainable competitive advantages are the continuous accumulation of small and short-term competitive advantages in the industry (Liu & Zhang, 2003).

Zhang & London argues that in order to adopt sustainability strategies in the industry, companies may need to develop new technologies, including: using more environmentally friendly materials and improving welfare of workers. These initiatives can increase costs, but can also increase the critical value in a competitive environment compared to other companies that do not use their resources for sustainability. However, by improving industry standards and introducing new policy measures, all companies should be required to act in accordance with certain established standards. Also, industries that do not comply with standards should be sanctioned (Zhang & London, 2013). The Table 1 describes the main aspects of each theory.

Table 1. Definition of SIC

| Definition of SIC | Main aspects | Author, year |
|---|---|---|
| The SIC is an ecological and economic rational interdependence. | To achieve increased energy availability and industrial development. | Tvaronavičienė et al, 2015 |
| The SIC is the content of abilities. | Ability of firms and industry to capture market share and grow the market through productivity improvements. | IEG, 2016 |
| The SIC is the improvement of industry standards and the introduction of new policy tools, based on 2 aspects. | To use more environmentally friendly products in the industrial production and improve the welfare of workers. | Zhang & London, 2013 |

| | | |
|---|---|---|
| The SIC is a combination of dynamism and stability. | Dynamism means that sustainable competitive advantages in industry are constantly changing. Stability shows that an absolute competitive advantage is in fact derived from constant competitive pride in the industry. | Liu & Zhang, 2003 |
| The SIC of five competitive environments. | Existing competitors, potential competitors, buyers, suppliers and substitutes | Dobbs, 2014 |
| The SIC of interconnected factors | The model consists of internal factors, demand conditions, production factors, corporate strategy, structure and competition, and related and service sectors. | Riasi, 2015 |

By summing up the various descriptions of the scientists, the industry's sustainable competitiveness can be understood as observance of a certain competitive standard that states must determine. These standards can be identified by various factors that should combine the needs of industrial organizations and the needs of states. The needs of industry organizations relate to various opportunities for profit, and the needs of the states are to tackle the current global challenges. Therefore, harmonization of the needs of industrial organizations with the state needs can be understood as the industry's sustainable competitiveness. This means that sustainability competitiveness of industry depends on sustainability and competitiveness factors. According to literary review, the key factors of competitiveness are:

- Profit without subsidies (Berenguer, Feng, Shanthikumar, & Xu, 2017).
- Green Growth Indicators.
- Global carbon ($CO_2$) emissions.
- Ability to adapt to the market.

Different authors describe the essential elements that belong to the sustainability of the industry. These elements help to avoid violations of environmental sustainability criteria. Weak sustainable competitiveness in industry is defined as the increase in carbon intensity. Strong sustainability is defined as the absolute absence of emissions. One of the key drivers of sustainable competitiveness is to mitigate climate change, which result from low carbon dioxide emissions. Successful sustainable competitiveness requires balancing three aspects of sustainability: social, economic and environmental, which includes economic development, low carbon development, sustainable development and climate compatible development. These aspects are often referred as green energy and innovation. The green economy is one that generates revenue and employment growth through public and private investment to reduce carbon emissions and pollution, increasing energy and resource efficiency and preventing biodiversity and ecosystem loss. The United Nations Environment Program created a Green Economy Initiative, where the promotion of sustainability and greening in industry was identified as a key policy (Luukkanen et al, 2019). The creators of this initiative and other authors are setting the elements that depend on the sustainability of the industry:

- Green energy and innovation.
- Use of greener products in industrial production and improvement of employee welfare.
- Implementation of cycled economy.
- Greater energy availability and industrial development.
- Welfare of surrounded environment.

These elements reinforce and sustain the wellbeing of industry and are focused on the impact of sustainable development on decision and policy making. Difficult problems in the sustainable competitiveness of industry in relation to the link between unsustainable environmental and economic development require identifying which factors of sustainable competitiveness are most relevant.

By combining the key factors of sustainability and competitiveness, the main indicators can be proposed, which can be referred to as social, economic and environmental factors that must combine the ability to compete and conduct business in industry without harming people and nature.

## 2. Model to choose the most competitive factors in the industry's sustainable competitiveness

This part of the research describes methodology of TOPSIS model and the Analytic Hierarchy Process. Practical part will allow to choose the most competitive factors in the industry's sustainable competitiveness.

### 2.1. Methodology

Analytic Hierarchy Process (AHP) is one of Multi Criteria decision making method, which helps to determine the significance of a different indicators. The method of the AHP was proposed by T. Saaty in 1980 (Simanavičienė & Cibulskaitė, 2015). It is a method to derive ratio scales from paired comparisons. Units can be obtained from

subjective opinions or actual measurements. To perform a complete AHP analysis, the following steps must be followed. At the first phrase the structure of the AHP model must be determined. One ways to do this is by analyzing scientific literature and selecting criteria that are described in scientific sources. At the second phrase suitable questionnaire must be designed. The questionnaire is specially designed to perform all of possible pair-wise comparisons among input factors (or dimensions). A nine-point scale is usually utilized to indicate the importance ratio of one factor to another. It shows a nine-point scale used for AHP. AHP helps in the conversion of qualitative judgments into cardinal values. At the third step the questionnaire to collect the experts opinions on the importance ratios among the factors and to build importance matrix. At the fourth step weights should be calculated. At the fifth phrase a constituency test must be performed. Consistency Index (CI) must be computed using the following formula:

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

Where n is the number of factors, $\lambda_{max}$ is the maximum eigenvalue of the importance matrix. Constituency Ratio (CR) is used to determine if a questionnaire passes the consistency test (Hasson, Ibrahem 2013).

$$\mathrm{CR} = \frac{\mathrm{CI}}{\mathrm{RI}} \qquad (2)$$

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 $\lambda_{max}$. If CR is greater than 0.1, the questionnaire fails (Hasson & Ibrahem, 2013).

TOPSIS method is constructed to offer one or more choices among some alternatives with many attributes (Singh, Kumar & Singla, 2014). It is a simple and useful technique for ranking a number of possible alternatives according to closeness to the ideal solution (Srikrishan, Reddy, & Vani, 2014). The TOPSIS procedure is based on an intuitive and simple idea, which is that the optimal ideal solution, having the maximum benefit, is obtained by selecting the best alternative which is far from the most unsuitable alternative, having minimal benefits. The ideal solution should have a rank of "1" (one), while the worst alternative should have a rank approaching "0" (zero) (Srikrishan, Reddy, & Vani, 2014). Mathematically the application of the TOPSIS method involves the following steps.

At the first phrase the decision of matrix must be constructed and the weight of criteria must be determined. The first step of the TOPSIS method involves the construction of a Decision Matrix (DM).

$$DM = \begin{array}{c} \\ \mathrm{L_1} \\ \mathrm{L_2} \\ \vdots \\ \mathrm{L_3} \end{array} \begin{array}{c} \begin{array}{cccc} \mathrm{C_1} & \mathrm{C_2} & \cdots & \mathrm{C_n} \end{array} \\ \begin{bmatrix} \mathrm{x_{11}} & \mathrm{x_{12}} & \cdots & \mathrm{x_{1n}} \\ \mathrm{x_{21}} & \mathrm{x_{22}} & \cdots & \mathrm{x_{2n}} \\ \vdots & \vdots & \ddots & \vdots \\ \mathrm{x_{m1}} & \mathrm{x_{m2}} & \cdots & \mathrm{x_{mn}} \end{bmatrix} \end{array} \qquad (3)$$

Where "i" is the criterion index (i = 1...m); m is the number of potential sites and "j" is the alternative index (j = 1...n). The elements C1, C2..., Cn refer to the criteria: while L1, L2..., Ln refer to the alternative locations. The elements of the matrix are related to the values of criteria "i" with respect to alternative "j". At the second step the normalized decision matrix must be calculated. The normalized values denote the Normalized Decision Matrix (NDM) which represents the relative performance of the generated design alternatives. At the third phrase the weighted normalized decision matrix must be calculated. Not all of the selection criteria may be of equal importance and hence weighting were introduced from AHP (Analytical Hierarchy Process) technique to quantify the relative importance of the different selection criteria. The weighting decision matrix is simply constructed by multiply each element of each column of the normalized decision matrix by the random weights (Srikrishan, Reddy, Vani 2014).

$$v_{ij} = w_j r_{ij} \text{ for } i = 1, \dots, m; j = 1, \dots, r. \qquad (4)$$

$$w_j - \text{the weight of the } j\text{-th criterion} \qquad (5)$$

At the fourth step the positive ideal and negative ideal solutions must be determined. The positive ideal (A+) and the negative ideal (A-) solutions are defined according to the weighted decision matrix via equations below.

$$PIS = A^+ = (v_1^+, v_2^+, \dots, v_n^+) = \left( \left( \max_i v_{ij} \middle| j \in I \right), \left( \min_i v_{ij} \middle| j \in J \right) \right) \qquad (6)$$

$$NIS = A^- = (v_1^-, v_2^-, \dots, v_n^-) = \left( \left( \min_i v_{ij} \middle| j \in I \right), \left( \max_i v_{ij} \middle| j \in J \right) \right) \qquad (7)$$

Where, J is associated with the beneficial attributes and J' is associated with the non-beneficial attributes. At the fifth phrase the separation measures from the positive ideal solution and the negative ideal solution must be calculated. At the sixth step the relative closeness to the positive ideal solution must be calculated. For each

competitive alternative the relative closeness of the potential location with respect to the ideal solution is computed (Srikrishan, Reddy, & Vani, 2014).

$$P_i = \frac{s_i^-}{s_i^- + s_i^+} (8)$$

At the seventh step the preference order must be ranked.

## 2.2. Applying TOPSIS model and the AHP to choose the most competitive factors in the industry's sustainable competitiveness.

To choose the most competitive factors in the industry's sustainable competitiveness, it is necessary to analyze the four main weights associated with industry competitiveness. In the analysis of the theoretical aspects of SIC, these weights were chosen as the main ones: profit without subsidies, green growth indicators, global carbon ($CO_2$) emissions, ability to adapt to the market.

### 2.2.1. The Analytic Hierarchy Process.

At the first step the decision vector (Saaty's nine-point scale) must be constructed.

Table 2. Decision Vector.

| | | | | |
|---|---|---|---|---|
| Green Growth Indicators | | 1 | 5 | Ability to adapt to the market |
| Green Growth Indicators | | 1 | 6 | Profit without subsidies |
| Green Growth Indicators | 2 | 1 | | Global carbon ($CO_2$) emissions |
| Ability to adapt to the market | | 1 | 3 | Profit without subsidies |
| Ability to adapt to the market | 5 | 1 | | Global carbon ($CO_2$) emissions |
| Profit without subsidies | 7 | 1 | | Global carbon ($CO_2$) emissions |

At the second step the weights for the criteriamust be developed.

Table 3. Weights for the criteria.

| Decision Matrix | Green Growth Indicators | Ability to adapt to the market | Profit without subsidies | Global carbon ($CO_2$) emissions |
|---|---|---|---|---|
| Green Growth Indicators | 1,00 | 0,20 | 0,17 | 2,00 |
| Ability to adapt to the market | 5,00 | 1,00 | 0,33 | 5,00 |
| Profit without subsidies | 6,00 | 3,00 | 1,00 | 7,00 |
| Global carbon ($CO_2$) emissions. | 0,50 | 0,20 | 0,14 | 1,00 |
| SUM | 12,50 | 4,40 | 1,64 | 15,00 |

At the third step the Ratings for Each Decision Alternative for Each Criterion must be developed. At the fourth step the Weighted Average Rating for Each Decision Alternative must be calculated and the one With the Highest Score must be chosed.

Table 4. Ratings for Each Decision, priority and rank.

| | Green Growth Indicators | Ability to adapt to the market | Profit without subsidies | $CO_2$ emissions | Priority | Rank |
|---|---|---|---|---|---|---|
| Green Growth Indicators | 0,08 | 0,05 | 0,10 | 0,13 | 0,091 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Ability to adapt to the market | 0,40 | 0,23 | 0,20 | 0,33 | 0,291 | 2 |
| Profit without subsidies | 0,48 | 0,68 | 0,61 | 0,47 | 0,559 | 1 |
| Global carbon ($CO_2$) emissions. | 0,04 | 0,05 | 0,09 | 0,07 | 0,059 | 4 |

The research results show that the most important weight is Profit without subsidies with priority level of 0,559. The least important weight is global carbon (C) emissions with priority level of 0,059. These results will be used in the TOPSIS method.

### 2.2.2. TOPSIS

To choose the most sustainable factors in the industry's sustainable competitiveness, it is necessary to analyze the five main factors associated with sustainability. In the analysis of the theoretical aspects of SIC, these weights were chosen as the main ones: green energy and innovation, use of greener products in industrial production and improvement of employee welfare, implementation of cycled economy, greater energy availability and industrial development and welfare of surrounded environment.

At the first step the decision of matrix and determine the weight of criteria must be constructed.

Table 5. Decision of matrix and weght of criteria.

| | Non. Benf. | Benf. | Benf. | Benf. |
|---|---|---|---|---|
| Weights | 0,091 | 0,291 | 0,559 | 0,059 |
| | Green Growth Indicators | Adapt to the market | Profit without subsidies | $CO_2$ emissions |
| Welfare of surrounded environment | 4 | 4 | 112 | 8 |
| Use of greener products | 2 | 1 | 21 | 8 |
| Cycled economy | 10 | 0,3 | 18 | 5 |
| Greater energy availability | 6 | 0,3 | 8 | 6 |
| Green energy and innovation | 8 | 0,3 | 5 | 4 |

At the second step the normalized decision matrix must be calculated. At the third step the weighted normalized decision matrix must be calculated.

Table 6. Weighted normalized decision matrix.

| | Green Growth Indicators | Adapt to the market | Profit without subsidies | $CO_2$ emissions |
|---|---|---|---|---|
| Welfare of surrounded environment | 0,0245 | 0,2801 | 0,5409 | 0,0330 |
| Use of greener products | 0,0123 | 0,0700 | 0,1014 | 0,0330 |
| Cycled economy | 0,0614 | 0,0210 | 0,0869 | 0,0206 |
| Greater energy availability | 0,0368 | 0,0210 | 0,0386 | 0,0247 |
| Green energy and innovation | 0,0491 | 0,0210 | 0,0241 | 0,0165 |

At the fourth step the positive ideal and negative ideal solutions must be determined.

Table 7. Positive ideal and negative ideal solutions.

| | | | | |
|---|---|---|---|---|
| V+ | 0,0123 | 0,2801 | 0,5409 | 0,0330 |
| V- | 0,0614 | 0,0210 | 0,0241 | 0,0165 |

At the other steps the separation measures from the positive ideal solution and the negative must be calculated, also the relative closeness to the positive ideal solution must be calculated and the preference order must be ranked.

Table 8. Separation measures with the relative closeness to the positive ideal solution and rank.

| | S+ | S- | P | Rank |
|---|---|---|---|---|
| Welfare of surrounded environment | 0,01227 | 0,579464 | 0,979264 | 1 |
| Use of greener products | 0,487101 | 0,105138 | 0,177526 | 2 |
| Cycled economy | 0,525139 | 0,062917 | 0,106992 | 3 |
| Greater energy availability | 0,565737 | 0,029666 | 0,049825 | 4 |
| Green energy and innovation | 0,579464 | 0,01227 | 0,020736 | 5 |

After applying the TOPSIS model, it became apparent that the best rank got welfare of surrounded environment (first place). It means, that the most sustainable factor in the industry's sustainable competitiveness is Welfare of surrounded environment. Lowest rating got green energy and innovation and this is the least suitable factor in the industry's sustainable competitiveness.

After applying AHP and TOPSIS models, it was clarified that the most competitive factor in the industry's sustainable competitiveness is profit without subsidies and the most sustainable factor is welfare of surrounded environment. It can therefore be concluded that the ability to combine surrounding environmental improvements and be profitable without subsidies is the most important factor in the industry's sustainable competitiveness.

## Conclusions

1. The state's competitiveness can be described as the set of institutions, policies and factors that determine the level of productivity of a country. The industry's competitiveness can be characterized by innovation, improvement, product quality, novelty, corporate governance style, production capacity, and many other factors. In most cases, an enterprise, industry or country can't have all of the five strengths that are particularly strong, but if the research sector has very weak, underdeveloped forces, it will be difficult to survive on the market. According to literary review, the key factors of competitiveness are: profit without subsidies, green growth indicators, global carbon ($CO_2$) emissions, ability to adapt to the market. The key factors of sustainability are: green energy and innovation, use of greener products in industrial production and improvement of employee welfare, implementation of cycled economy, greater energy availability and industrial development, welfare of surrounded environment.

2. Two methods TOPSIS model and the Analytic Hierarchy Process were used for the research. The goal of the Analytic Hierarchy Process was to choose the most competitive factors in the industry's sustainable competitiveness and determine the weight of the different criteria. The criteria weights obtained was used in TOPSIS model. The goal of the TOPSIS was to choose the most sustainable factors.

3. After applying AHP and TOPSIS models, it became apparent that the ability to combine surrounding environmental improvements and be profitable without subsidies is the most important factor in the industry's sustainable competitiveness.

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