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SUSTAINABLE ECONOMIC DEVELOPMENT OF APEC COUNTRIES

Eglė Mockutė[1], Liucija Birškytė[2]

Department of Economic Engineering, Faculty of Business Management,
Vilnius Gediminas Technical University, Saulėtekio al., LT-10223, Vilnius, Lithuania
E-mails: [1]egle.mockute@stud.vgtu.lt (corresponding author); [2]liucija.birskyte@vgtu.lt

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Abstract. The article analyzes the sustainable economic development of all countries of Asia-Pacific Economic Cooperation (APEC). The Asia-Pacific Economic Cooperation, or abbreviated as APEC (Asia-Pacific Economic Cooperation), is an economic forum for 21 Pacific states aimed at boosting regional trade and investment, liberalizing markets, and deepening economic cooperation. Sustainable development is legitimized as a fundamental long-term ideology of societal development and is understood as a compromise between the environmental, economic and social goals of society, enabling the well-being of society for present and future generations. For the calculations of sustainable development, the indicators from the 8th Goal of sustainable economic development (Decent work and Economic growth) will be used and analyzed through years of 2014–2018. Sustainable development of APEC countries will be measured using TOPSIS method. The purpose of the article is to analyze and determine which members of APEC are the most economically developed and examine the change in the development of each country through the years of 2014–2018.

Keywords: sustainable economic development, TOPSIS, Asia-Pacific Economic Cooperation, Asia-Pacific Economic Cooperation, Sustainable Development Goal 8.

JEL Classification: B41, C22, E00, Q01.

1. Introduction

The importance of sustainable development, the need to achieve sustainable economic development that does not harm the environment, conserve natural resources or exacerbate tensions in society has been increasingly discussed over the last decade. Sustainable development is legitimized as a fundamental long-term ideology of societal development and is understood as a compromise between the environmental, economic and social goals of society, enabling the well-being of society for present and future generations. Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs and without causing significant damage to natural resources. In general, while analyzing the sustainable development, it is important to examine the goals of sustainable development. There 17 goals of sustainable development, but due to the required lenght of the article, only one goal will be presented. This goal is SDG 8 that is named as "Decent work and economic growth". The calculations will be made based on the SDG 8 for the Acia-Pacific Economic Cooperation (APEC) countries.

The problem: which members of APEC are the most developed.

The object − sustainable economic development goal 8.

The purpose of the article − analyze the sustainable economic development and determine which countries of APEC are more developed than others.

Tasks − analyze the concept of sustainable economic development; provide the methodology for the TOPSIS method; make the calculations with TOPSIS for the APEC countries using the sustainable development goal 8.

Methods − TOPSIS calculations, qualititative data analysis using scientific literature, Limitations- lack of data.

2. Theoretical aspects of economic development

This part of the paper will present the concept of sustainable economic development from a theoretical point of view. The concept of sustainable development and its significance in economic theory will be presented and explained. The sustainable development goals will be described as well. However, the most information will be

presented for the 8th goal of sustainable development because this goal will be further used for the calculations.

2.1. The origins and preconditions for the concept of sustainable development

The origins of modern local, regional and global environmental problems date back to the beginning of the industrial era when scientific and technical advances made it possible to replace manual labor with mechanized labor. With the rapid expansion of production and its concentration, the flows of raw materials and products intensified and transport distances increased (Zhang et al., 2015). This, in turn, encouraged the development and use of increasingly powerful and faster vehicles and the rapid development of transport infrastructure (roads, railways, etc.). Increasing demand for natural resources has stimulated the rapid development of mining and has led to an unprecedented anthropogenic landscape change and devastation (Strezov et al., 2017).

While the scale of the economic activity is relatively small compared to that of ecosystems, we have been able to ignore the fundamental fact that humanity is involved and dependent on the ecosystems of our planet, both in economic theory and in practice.

With the increase in human activity, no area remained untouched by people. Material well-being was created through the over-exploitation of natural resources and the creation of ecological problems and environmental risks which, by their technological nature, differed significantly from the former, natural and man-made risks, sphere (Bretos & Marcuello, 2017).

The balance of nature, achieved after thousands of millions of years of evolution, has been seriously altered in the last century (Morrison & Cusmano, 2015). In no other century of our relatively short existence have human beings learned so strongly and painfully from the scale and depth of their ignorance of nature (Yeh & Yang, 2017). Economic growth issues became particularly acute when, during the twentieth century, With the sharp rise in world production in less than a century, the contradictions between the growth of material goods and the unstoppable exhaustion of natural resources and environmental pollution have become clear. Production in all industrialized countries has acquired an increasingly destructive and destructive character, ultimately directed against people themselves (Hudon & Huybrechts, 2017).

The link between stagnant production formation, resource depletion, the spread of hunger in the poorest countries, population growth and the degree of pollution of the natural environment has become increasingly recognized. Undoubtedly, industrial development has improved the living conditions of hundreds of millions of people, especially those living in Western countries. But there is another side to this reality: poverty, not less, but rather more, has not only been reduced, but has grown faster than the world's gross economic product. People have become increasingly aware that it is wrong to think that the more advanced technology we are given and the more modern our lifestyles are, the happier we are, and the realization that living standards depend not only on material well-being but also on human relationships with the environment.

2.2. Theoretical evaluation of the impact of economic growth on sustainable development

First of all, the aim is to present the concept of sustainable development and the areas of the sustainable development model. This will later be needed in order to show the impact that economic growth can have on each area.

Sustainable development is associated with the temporal dimension and inconsistency is rarely associated with immediate existential threat. It may still seem that this threat is still in the distant future to be properly recognized, but sustainable development is one that preserves existence (Schroeder et al., 2019). There are several hundred definitions of sustainable development in the economic and environmental literature. And while the very essence of the concept of sustainable development is clear enough, the precise definition of the concept of sustainable development is problematic and leads to much debate (Casadella, 2018). Definition problems have to do with the complex (dual) nature of both development and sustainability. Therefore, the most suitable definition so far, which best expresses the idea of sustainable development, is given in the report of the Brundtland Commission (Radovanović & Lior, 2017).

Bagheri Hjorth argue that sustainable development cannot be defined as the ultimate goal, ie development where the consequences are not known in advance (Lim et al., 2018). Sustainable development is a complex and multifaceted concept that combines efficiency, equality and intergenerational equity on economic, social and ecological basis. R. Čiegis presented the negative aspects of social development, how they are

interrelated and can weaken each other (Čiegis & Pečkaitienė, 2013):

1. A damaged environment means a combination of a weakened basis for economic (natural) resources;
2. Poverty drives people to over-exploit the environment (the crucial long-term link between poverty and environmental degradation);
3. Poverty leads to conflict;
4. Conflict leads to poverty;
5. Conflicts also lead to environmental damage and the growth of its limitations;
6. Damaged environment and its limited size lead to severe social conflicts.

R. Čiegis presented three aspects of sustainable development, ie. y. what makes up all three areas (Zeleniūtė & Čiegis, 2008):

- Economic approach to sustainability includes economic growth, stable and low inflation, investment and innovation. It is also attributed to the correct nature of the distribution of resources between regions and time between present and future generations. Therefore there is a need to reconcile economic activities with ecosystem productivity due to limited natural resources (Hou et al., 2019);
- The social sphere includes the relationship between development and social norms prevailing in society, as well as seeking to maintain the stability of social systems. This system must include equality between people of different generations, ensuring the preservation of cultural diversity and seeking to reduce the risk of disastrous conflicts (Barthélemy, 2019);
- The stability of biological and physical systems is therefore attributed to the environment. In other words, biodiversity must be preserved in order to adapt to ever faster changes in the biosphere. This goal must be pursued in order to strike a balance in nature for future generations (Kodakanchi et al., 2006).

These three dimensions are fundamental. They represent the strong relationship between each other. However, further in this paper, the main focus will remain only on the economic aspects.

2.3. The dimensions of sustainable development

When considering the concept of sustainable development, the definition used in the Brundtland Commission report "Our Common Future" is the one that most closely reflects the concept of sustainable development. The definition states that sustainable development is development that meets current needs without depriving future generations of their own. At the heart of Brundtland's concept of sustainable development is the fair distribution of natural resources between the generations and between the current population of the developed and developing world, and the discovery of compatibility between the environmental, social and economic dimensions of development (World Commission on Environment and Development, 1987).

The Rio de Janeiro declaration outlined the guiding principles for sustainable development and set out a framework for action on sustainable development. The Sustainable Development Concept links two immediate objectives:

- Ensuring a decent, safe, good life for all is an objective of development;
- Living and working within the biophysical limits of the environment is the goal of sustainability.

However, sustainable development can be defined in different ways. These are:

- Development that meets today's needs without compromising the ability of future generations to meet their needs;
- Improving people's quality of life, while preserving the ecosystem;
- The development of environmental, economic and social well-being for all members of society without threat to the systems which guarantee that well-being;
- Development that promotes the economic and social progress of mankind and ensures that that progress is accompanied by advances in other areas (Collits, 2015).

It is important to note that coherence is a state that must be maintained indefinitely without qualitative loss (Huang & Quibria, 2015). In this case, the harmony of economic development means the preservation of the natural ecosystem that ensures the existence of mankind.

It is noteworthy that most scientists agree that the concept of ecological sustainability is much clearer and more accurate than the concept of sustainable development (Lauridsen, 2018). Sustainability could be described as "the interrelationship between dynamic economic systems in which" (Gallardo & Whitacre, 2018):

- human existence can continue indefinitely,
- human individuals can thrive,

- cultures can flourish; the effects of any human activity remain so restricted as not to impair the diversity, complexity and functioning of ecological life support systems.

The following main principles of sustainable development are distinguished in the scientific literature (see Table 1).

Table 1. The basic principles of sustainable development (made by the author based on Gallardo & Whitacre, 2018)

Basic principles of sustainable development		
No.	Principle	Description
1.	Partnership and Accountability	Collective responsibility creates alliances between stakeholder groups; each group is accountable for its decisions
2.	Active participation and transparency	Major groups in society are involved; all relevant information is easily accessible to each participant
3.	Systematic approach	Economic, ecological and societal problems must be understood in a complex way
4.	Relationships with the future	Short-term, long-term trends and needs must be assessed
5.	Equality and justice	Economic development must be sustainable, environmentally sound and socially right
6.	Ecological constraints	The rational use of natural resources must be ensured
7.	Relationship between local and global scale	The influence of local coherence on global sustainability must be understood
8.	Local importance	Local action must be realistic, workable and tailored to the needs of the local community

In Table 1, the key principles are partnership and accountability, active participation and transparency, a systemic approach, links to the future, equality and justice, ecological constraints, links between local and global and local relevance. Only by following all these principles the sustainable development can be ensured. Although the essence of the concept of sustainable development is clear enough, the interpretations and definitions of the concept have caused considerable controversy.

2.4. Sustainable development goal 8: decent work and econominc growth

In general, sustainable development has 17 goals. However, because of the extent of the article, only one goal will be further described. The goal 8 is decent work and economic growth. This goal was chosen because it represents the topic more than other goals and includes the targets that will be further analyzed in this paper. The goal 8 represents the promotion of sustainability, inclusice and sustainable economic development and helps to ensure full and productive employment and decent work for all.

Although most countries in the world have long recognized the need to pay greater attention to environmental, social and economic issues, the fight against poverty and lack of education, countries have in fact been slow to tackle. Attitudes and agendas have changed, and many goals and measures have been negotiated many times, but the results are not as great.

The last revision of the Sustainable Development Goals was in 2015, when three years of negotiations endorsed the United Nations 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals and 169 targets, replacing the Millennium Development Goals established fifteen years ago. These goals, which have made a major contribution to reducing poverty worldwide through the joint efforts of many countries, have been directed towards developing countries and lacked a common strategy for implementation.

The new Sustainable Development Goals, or their new agenda, are, according to the draftsmen, far more ambitious and relevant not only to poor countries but also to rich countries. The Sustainable Development Goals, which cover almost all social, economic and environmental fields and have as many as 169 targets, can be individualized according to the areas or goals each state wants to focus on.

The targets analyzed in the goal of decent work and economic growth will be further described in this article. The 8th goal of sustainable development helps to promote sustainable, inclusive and sustainable economic development, ensuring full and productive employment and decent work for all. The targets that are described in the Table 2 represent the tasks of this goal together with the indicators that are used for the measurement of each task.

Table 2. Targets and indicators for decent work and economic growth goal (made by the author based on the International Labour Organization, 2018)

Target	Indicator
Maintain per capita economic growth according to national circumstances and above all at least 7% annual GDP growth in the least developed countries	Annual growth rate of real GDP per capita
Achieve a higher level of economic productivity through diversification, technological modernization and innovation, including focusing on high value added and labor intensive sectors	Annual growth rate of real GDP per employed person
Promote development-oriented policies in support of productive activities, decent work, entrepreneurship, creativity and innovation and support the formalization and growth of micro, small and medium-sized enterprises, including access to financial services	Proportion of informal employment in non-agriculture employment
Progressively improve the efficient use of global resources in consumption and production in 2030 and strive to decouple economic growth from environmental degradation through a ten-year framework of sustainable consumption and production programs under the guidance of developed countries	Material footprint indicator and/or domestic material consumption indicator
By 2030 achieve full and effective employment and decent work for all women and men, including young people and people with disabilities, and equal pay for work of equal value	Average hourly earnings indicator and umeployment indicator
To substantially reduce the share of young people not in employment, education or training by 2020	Proportion of youth (15–24) not in education, employment or training

The table above describe the targets and represent the indicators for each target for the 8th goal of sustainable development. One of the hardest targets to achieve is the annual GDP growth rate of 7 percent for the least developed countries. However, if this target will be achieved, the result and the effect of it would positively influence other targets and it will make it easier to achieve some of other targets easier. The other target that is very significant and became even more important nowadays is the improvement of the efficient use of global resources in consumption and production. This target has a high importance due to the fact that these days, the resources are not as effectively used as they should and also because of the ecological issues. The Table 3 represents the rest of the targets and idicators for the goal of decent work and economic growth.

Table 3. Targets and indicators for decent work and economic growth goal (made by the author based on the International Labour Organization, 2018)

Target	Indicator
Take immediate and effective measures to eradicate forced labor, combat modern slavery and trafficking in human beings, prohibit and eliminate the worst forms of child labor, including the recruitment and exploitation of children and eliminate all forms of child labor by 2025	Proportion and number of children aged 15–17 years engaged in child labour
Protecting labor rights and promoting a safe and secure working environment for all workers, including migrants, in particular migrant workers and part-time workers	Frequency rates of fatal and non-fatal occupational injuries indicator and increase in national compliance of labor rights indicator
By 2030, develop and implement policies for the development of sustainable tourism that help create jobs, as well as local culture and products	Tourism direct GDP indicator and Number of jobs in tourism industries indicator
Strengthen the capacity of national financial institutions to promote and expand access to banking, insurance and financial services for all	Number of commercial bank branches and ATMs indicator and The proportion of adults with an account at a bank indicator
Increase aid for trade to developing countries, in particular to LDCs, including through an improved integrated framework for trade-related technical assistance to the least developed countries	Aid for trade commitments and disbursements
Develop and implement a global youth employment strategy by 2020 and implement the International Labor Organization Global Jobs Pact	Total government spending on social protection and employment programmes

The table above represent the targets and indicators for the 8th goal of sustainable development, decent work and economic growth. Each target has a significant importance. However, some of these targets are planned to achieve sooner than the others. While analyzing the targets of this goal, it is important to highlight the idea that with the achievement of this tasks, it would be possible to eliminate slavery, child labor, unequal or bad work conditions, salary discrimination, eradicate poverty and improve the business improvement together with the increase of the economy and sustainable development.

3. TOPSIS method

The TOPSIS method is called the determination of rationality of variants by the method of proximity to an ideal point. Alternative prioritization methodology based on the concept that the optimal option has the shortest distance to the most desirable option and the maximum distance to the undesirable option.

In other words, Yoon and Hwang developed a methodology for prioritizing variants based on the concept that the optimal alternative has the shortest distance from the ideal solution and the largest distance from the "negatively ideal" solution. This method is called TOPSIS (Technique for Order Preference by Similarity to Ideal Solution).

Suppose the values of each indicator are constantly increasing or decreasing. It is then possible to determine the "ideal" solution that consists of the best indicator values and the "negatively ideal" solution that consists of the worst indicator values. To apply the proximity point approach, it is necessary to construct a decision matrix X.

Step 1. In order to perform a TOPSIS analysis and calculate the weights of the criteria. It is important to perform a methodology or analysis of application of expert reviews and opinion on the weights of the given matrix.

In various scientific sources the authors defines an expert evaluation as the generalized opinion of a team of experts, which is based on the knowledge, experience and intuition of specialist experts. An expert is called a specialist who has knowledge and experience in a particular field. The peer review method improves the quality and rationality of decision making. The peer review method is the procedure for evaluating the opinions of individual experts and for reaching a joint decision. Expert consists of the following steps: – Purpose formulation; – formation of a team of experts; – organization of the survey; – processing and analysis of expert information. The aim of the expert survey is to verify the significance of the indicators chosen according to the analysis of scientific literature in assessing the standard of living in different countries of the European Union. Also, based on the results of the expert survey, give the weights to be used in the multi-criteria decision-making methods. The professional competence of an expert is important for solving the problem in question. The experts participating in the study were selected according to the field in which they work or according to the field of science they are investigating.

Step 2. Construct the decision matrix and determine the weight of criteria.

$$X = \left(x_{IJ}\right), \tag{1}$$

$$W = \left[w_1, w_2, \ldots, w_n\right], \tag{2}$$

where: X – decision matrix; W – weight vector, $x_{ij} \in \Re$ and $w_1 + w_2 + \ldots + w_n = 1$.

Criteria of the functions can be: benefit functions (more is better) or cost functions (less is better).

Step 3. Calculate the normalized decision matrix. The study of the influence of normalization consists of two steps: Analysis of the normalization rules I for a sequence of even pseudo-random numbers. Normalizations were performed for this sequence of numbers and the scattering characteristics of the normalized sequences were monitored; II – By changing the normalization rules in the TOPSIS method, the results obtained are subjected to statistical analysis.

The second step that is the calculation of the normalization of matrix transforms different criteria dimensions into non-dimensional. This allows to create a comparison across criteria. Various criteria are usually measured in various units, the scores in the evaluation matrix have to be transformed to a normalized scale. The normalization of values can be carried out by one of the several known standardized formulas. The normalized value n_{ij} is calculated as follows:

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}. \tag{3}$$

Step 4. Consists of the calculations. Calculations will be made in order to weigh the normalizeed decision matrix. The weighted normalized value v_{ij} is calculated as follows:

$$v_{ij} = w_j n_{ij} \text{ for } i = 1, \ldots, m; j = 1, \ldots, n, \quad (4)$$

where: w_j – the weight of the $j^{\text{-th}}$ criteria.

Step 5. Includes the analysis and calculations of positive ideal that is labeled as (V^+) and a negative ideal that is labeled as (V^-) solutions. The ideal positive solution is the solution that maximizes the benefit criteria and minimizes the cost criteria whereas the negative ideal solution maximizes the cost criteria and minimizes the benefit criteria.

$$V^+ = \left(v_1^+, v_2^+, \ldots, v_n^+\right) = \left(\left(v_{ij} \mid j \in I\right), \left(v_{ij} \mid j \in J\right)\right), \quad (5)$$

$$V^- = \left(v_1^-, v_2^-, \ldots, v_n^-\right) = \left(\left(v_{ij} \mid j \in I\right), \left(v_{ij} \mid j \in J\right)\right), \quad (6)$$

where: I is associated with benefit criteria and J with the cost criteria, $i = 1, \ldots, m; j = 1, \ldots, n$.

Step 6. Calculate the Euclidean distance from the ideal best (V^+) solution and the anti-ideal best (V^-) solution. The separation measures of each alternative from the ideal best (V^+) solution and the anti-ideal (V^-) solution, respectively, are as follows:

$$S_i^+ = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_i^+\right)^2}, \quad i = 1, 2, \ldots, m, \quad (7)$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_i^-\right)^2}, \quad i = 1, 2, \ldots, m, \quad (8)$$

Step 7. Calculate the relative closeness to the positive ideal solution. The relative closeness is defined as follows:

$$P_i = \frac{S_i^-}{S_i^- + S_i^+}, \quad (9)$$

where: $0 \le P_i \le 1$, $i = 1, 2, \ldots, m$.

Step 8. Rank the preference order.

In order to calculate all the TOPSIS method. All the steps that were described above should be performed and analyzed.

The methodology part of this paper was analyzed above. TOPSIS method the concept of it was decribed. As it was mentioned above, this method was used in order to analyze which countries are economically more and less developed in APEC countries. The calculations and the analysis of the method that was described in this part will be made in the following part of this project.

4. TOPSIS method calculations for sustainable development goal 8 of APEC countries

This part of the article, presents the calculations for the TOPSIS method for APEC countries. The calculations will be made using statistical data for the years of 2014–2018. The indicators that were used for TOPSIS method were identified by the Sustainable Economic Development Goal 8. However, due to the lack of statistical information, not all the targets for SDG8 will be analyzed. Another issue that appeared during the collection of the data was that there was no enough information about Taiwan for the TOPSIS calculations and due to this issue, this country was not included for the final calculations.

In order to perform correct calculations for TOPSIS method, all the statistical information for all the APEC countries and their indicators should be available. However, as it was mentioned above, the lack of statistical data made the calculations not as accurate as it should be. In order to perform TOPSIS method calculations, the weights for each indicator should be determined. The chosen weights were determined by the significance of each indicator compared to each other. Although, after calculations of weights, the consistency index (CI) should also be calculated and analyzed in order to determine whether the chosen weights were correct and whether the ratio of each indicator is consistent.

For the determination of weights, it is important to compare the significance of each indicator to each other. The measurement of significance is calculated by the opinion of an individual, public, or an expert. In this case, the weights were calculated by the personal opinion. The Appendix 1 represents the significance comparison of each target. After, the final calculations with matrix were performed, the weights were determined. GDP growth had a weigh of 0.3347, annual growth rate of real GDP per employed person had a weigh of 0.2858. Unemployment had a weight of 0.1679. The indicator of share of youth not in education, employment or training had a weigh of 0.11. Domestic material consumption indicator was determined by the weight of 0.0599. Commercial bank brances had a weight of 0.0414.

In order to analyze and confirm that the weights were appointed correctly, it is important to calculate consistency ratio (CR). After the calculations were made, the result showed that the consistency ratio is equal to 3.6%. If the CR value is lower than 10 percent, this means that the

weights were calculated correctly and are consistent.

The Table 4 represent the final result for the TOPSIS calculations for the 20 countries of APEC. The analysis was made using the targets of the SDG8. The examined targets were:

- GDP growth (annual %);
- Annual growth rate of real GDP per employed person (%);
- Unemployment, total (% of labor force);
- Share of youth not in education, employment or training, total (% of total youth population);
- Domestic material consumption (tonnes per capita);
- Commercial bank branches (per 100.000 adults).

Other targets for SDG8 (decent work and economic growth) were not included due to the lack of statistical data. Even though, in total there are 17 goals for the sustainable development, others were not described because of the length of the article. The goal 8 specifically was chosen due to the connection to the topic.

Table 4. Result of calculations of TOPSIS using SDG8 targets for APEC countries (2014–2018) (calculated by the author)

Country	Result	Rank
China	0.806299	1
Vietnam	0.794896	2
Peru	0.650913	3
Indonesia	0.631818	4
Philippines	0.616168	5
Thailand	0.614252	6
Papua New Guinea	0.589763	7
Korea, Rep.	0.560715	8
Hong Kong SAR, China	0.54523	9
Malaysia	0.539234	10
New Zealand	0.53374	11
Singapore	0.500414	12
Mexico	0.486139	13
United States	0.465341	14
Japan	0.45012	15
Chile	0.435217	16
Canada	0.424991	17
Russian Federation	0.415881	18
Australia	0.350114	19
Brunei Darussalam	0.321577	20

Decent work and Economic growth goal was analyzed becauase it specifically describes the economic growth and uses indicators according to the topic. The Table 4 represent the final result of TOPSIS calculations for APEC countries. All the annual statistical information for the analyzed countries and targets can be found in Appendixes 2–6.

The table above represent the final result of TOPSIS method calculation for APEC countries using sustainable development goal of decent work and economic growth. The results shown in the table only includes six targets of one goal of sustainable development and due to this fact, it is important to mention that the final answer of which APEC country is the most developed cannot be answered. For the more accurate analysis, all the goals of sustainable development and their targets should be analyzed and calculated using TOPSIS method. As it is seen in the table above, the final results for the TOPSIS calculations show that China had a highest sustainable development result through the years of 2014–2018. The country with the lowest result for sustainable development belongs to Brunei. The annual result of TOPSIS method for each APEC country through the years of 2014–2018 can be seen in Appendixes 7–11.

5. Conclusions

Sustainable development has been defined in a variety of ways, but in practice it has three dimensions – economic, environmental and social ones. The word “sustainability” has become a global buzzword as a potential solution for many international, regional, and local problems facing society today: overpopulation, diseases, political conflicts, infrastructure deterioration, pollution, and unlimited urban expansion under limited resources’ availability. The United Nations World Commission on Environment and Development coined a definition of sustainable development, which is probably the most well-known in all of sustainability literature: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

The TOPSIS method used for the calculations for the APEC countries of Sustainable Development Goal 8 (decent work and economic growth) were also represented in this article. However, the final result showed that China was the leader for the sustainable development for the years of 2014–2018. The second most developed nation was Vietnam, Peru then followed the lead and ranked third. However, the countries with the

lowest result for the TOPSIS calculations was Brunei, that ranked in the last place.

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APPENDIX

Appendix 1. Measurement of significance of targets

	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
GDP growth (annual %)									x									"Annual growth rate of real GDP per employed person (%)"
GDP growth (annual %)							x											Unemployment, total (% of total labor force) (modeled ILO estimate)
GDP growth (annual %)						x												Share of youth not in education, employment or training, total (% of youth population)
GDP growth (annual %)					x													Domestic material consumption (tonnes per capita)
GDP growth (annual %)				x														Commercial bank branches (per 100,000 adults)
"Annual growth rate of real GDP per employed person (%)"								x										Unemployment, total (% of total labor force) (modeled ILO estimate)
"Annual growth rate of real GDP per employed person (%)"							x											Share of youth not in education, employment or training, total (% of youth population)
"Annual growth rate of real GDP per employed person (%)"						x												Domestic material consumption (tonnes per capita)
"Annual growth rate of real GDP per employed person (%)"				x														Commercial bank branches (per 100,000 adults)
Unemployment, total (% of total labor force) (modeled ILO estimate)								x										Share of youth not in education, employment or training, total (% of youth population)
Unemployment, total (% of total labor force) (modeled ILO estimate)						x												Domestic material consumption (tonnes per capita)
Unemployment, total (% of total labor force) (modeled ILO estimate)						x												Commercial bank branches (per 100,000 adults)
Share of youth not in education, employment or training, total (% of youth population)							x											Domestic material consumption (tonnes per capita)
Share of youth not in education, employment or training, total (% of youth population)							x											Commercial bank branches (per 100,000 adults)
Domestic material consumption (tonnes per capita)									x									Commercial bank branches (per 100,000 adults)

Appendix 2. Statistical data for APEC countries of the year of 2014

	max	max	min	min	max	max
	0.334781	0.285823	0.167931	0.110047	0.059956	0.041462
2014						
	GDP growth (annual %)	"Annual growth rate of real GDP per employed person (%)"	Unemployment, total (% of total labor force) (modeled ILO estimate)	Share of youth not in education, employment or training, total (% of youth population)	Domestic material consumption (tonnes per capita)	Commercial bank branches (per 100.000 adults)
1	2	3	4	5	6	7
Australia	2.568707	1.9	6.078	7.7	38.6466	29.11
Brunei Darussalam	–2.34975	–4.1	6.965	17.1963	22.6757	20.16
Canada	2.868454	2.3	6.914	13.8981	29.3258	23.94
Chile	1.76674	0.6	6.665	18.6402	40.4474	17.01
China	7.299519	7.1	4.6	8.6	22.5206	8.01
Hong Kong SAR, China	2.762394	2.2	3.3	6.62	7.9	22.57
Indonesia	5.006668	3.4	4.049	22.3542	6.9267	17.92
Japan	0.374719	–0.4	3.6	3.69	9.4657	33.89

End of Appendix 2

1	2	3	4	5	6	7
Korea, Rep.	3.341448	2.7	3.5	18.9	11.6527	10.66
Malaysia	6.006722	1.7	2.88	12.77	15.7134	14.86
Mexico	2.80434	0.5	4.809	20.2758	8.2232	29.55
New Zealand	3.715533	13.5	5.752	11.44	24.624	1.66
Papua New Guinea	13.5	1.4	2.637	24.7	10.4475	8.01
Peru	2.381938	3	2.962	16.7903	14.8368	8.64
Philippines	6.145299	1.2	3.6	23.3483	3.8661	17.21
Russian Federation	0.699999	0.8	5.16	12.03	15.3913	37.02
Singapore	3.900573	0.6	3.74	3.71	33.9198	9.32
Thailand	0.984414	1.7	0.576	13.3243	11.9475	12.53
United States	2.451973	0.8	6.168	16.7879	20.361	32.38
Vietnam	5.983655	4.5	1.256	9.7268	9.6027	3.8

Appendix 3. Statistical data for APEC countries of the year of 2015

	max	max	min	min	max	max
	0.334781	0.285823	0.167931	0.110047	0.059956	0.041462
2015						
	GDP growth (annual %)	"Annual growth rate of real GDP per employed person (%)"	Unemployment, total (% of total labor force) (modeled ILO estimate)	Share of youth not in education, employment or training, total (% of youth population)	Domestic material consumption (tonnes per capita)	Commercial bank branches (per 100.000 adults)
Australia	2.336075	0.5	6.056	7.52	38.4333	28.69
Brunei Darussalam	–0.566815	–1.4	7.756	17.7	23.7258	20.71
Canada	0.689907	0.2	6.906	13.8186	28.9513	23.64
Chile	2.303767	0.8	6.508	19.1712	40.4297	16.33
China	6.905317	6.8	4.6	8.76	23.0683	8.49
Hong Kong SAR, China	2.387808	1.7	3.32	6.61	7.9	22.17
Indonesia	4.876322	4.2	4.514	22.9189	7.1612	17.75
Japan	1.222921	0.9	3.4	3.61	9.2626	34.14
Korea, Rep.	2.790236	2.5	3.6	18	11.4096	10.51
Malaysia	5.091516	0.6	3.1	12.3	16.0893	14.1
Mexico	3.287992	2.9	4.313	19.7477	8.2149	28.96
New Zealand	3.584705	3.3	5.365	11.29	24.3157	1.61
Papua New Guinea	9.5	3.1	2.576	24.6	10.2577	8.13
Peru	3.25589	3.9	3	18.4522	14.9018	8.79
Philippines	6.066549	1.8	3.026	22.8427	3.9101	16.78
Russian Federation	–2.307734	–2.1	5.571	12.03	15.6694	32.91
Singapore	2.892499	–0.7	3.79	3.72	33.4014	9.26
Thailand	3.133897	3.3	0.597	13.5911	12.1695	12.54
United States	2.88091	1.3	5.28	15.4868	19.7586	33.02
Vietnam	6.679289	6.1	1.859	9.884	10.1605	3.72

Appendix 4. Statistical data for APEC countries of the year of 2016

	max	max	min	min	max	max
	0.334781	0.285823	0.167931	0.110047	0.059956	0.041462
2016						
	GDP growth (annual %)	"Annual growth rate of real GDP per employed person (%)"	Unemployment, total (% of total labor force) (modeled ILO estimate)	Share of youth not in education, employment or training, total (% of youth population)	Domestic material consumption (tonnes per capita)	Commercial bank branches (per 100.000 adults)
Australia	2.846755	1.4	5.711	7.7	38.0787	27.7
Brunei Darussalam	–2.46551	–3	8.559	18	23.3938	19.43
Canada	1.107099	0.8	6.999	13.4952	28.8247	23
Chile	1.67054	0.5	6.738	17.1039	40.4412	16.03
China	6.736675	6.6	4.5	8.65	23.8887	8.78
Hong Kong	2.176392	1.7	3.39	6.1	7.7	21.46
Indonesia	5.033069	3.8	4.301	22.4792	7.3124	17.39
Japan	0.609093	0	3.1	3.52	9.1002	34.1
Korea, Rep.	2.929305	2.6	3.7	17.7	11.147	10.26
Malaysia	4.22341	0.7	3.44	11.69	16.3735	14.15
Mexico	2.921615	0.5	3.859	19.553	8.2499	29.71
New Zealand	3.645799	–0.8	5.1	11.98	24.2016	1.57
Papua New Guinea	4.1	3.7	2.481	24.7	10.0854	7.96
Peru	3.955882	5	3.535	16.869	14.9918	8.87
Philippines	6.884055	2	2.708	22.1998	3.9311	16.26
Russian Federation	0.329282	0	5.559	12.41	15.8945	30.14
Singapore	2.962327	1.3	4.08	3.95	32.9747	8.98
Thailand	3.356489	4.1	0.688	14.9658	12.4348	12.38
United States	1.567215	–0.1	4.869	15.0012	19.1535	32.64
Vietnam	6.210812	5.7	1.851	9.4699	10.632	3.8

Appendix 5. Statistical data for APEC countries of the year of 2017

	max	max	min	min	max	max
	0.334781	0.285823	0.167931	0.110047	0.059956	0.041462
2017						
	GDP growth (annual %)	"Annual growth rate of real GDP per employed person (%)"	Unemployment, total (% of total labor force) (modeled ILO estimate)	Share of youth not in education, employment or training, total (% of youth population)	Domestic material consumption (tonnes per capita)	Commercial bank branches (per 100.000 adults)
1	2	3	4	5	6	7
Australia	2.342582	0.2	5.594	6.54	37.7188	29.61

End of Appendix 5

1	2	3	4	5	6	7
Brunei Darussalam	1.328751	0.7	9.316	19.9662	23.0931	18.18
Canada	2.978566	1.4	6.34	12.5816	28.708	21.48
Chile	1.279183	0.2	6.958	16.5302	40.4049	15.19
China	6.757008	6.8	4.4	8.5	24.7013	8.78
Hong Kong SAR, China	3.838406	3.1	3.09	6.1	7.7	21.05
Indonesia	5.067406	2.1	4.185	21.4487	7.4533	16.89
Japan	1.928757	0.8	2.8	3.27	8.9398	34.03
Korea, Rep.	3.062768	3.9	3.7	17.5	11.2911	10.06
Malaysia	5.897009	0	3.41	11.5	16.6468	14.13
Mexico	2.069715	0.5	3.42	18.7317	8.2861	27.3
New Zealand	3.128461	–0.5	4.702	11.75	24.0996	1.53
Papua New Guinea	1.549821	–1.2	2.352	24.3	9.929	7.55
Peru	2.519089	8.8	3.46	17.6772	15.0491	9.05
Philippines	6.677554	2	2.552	21.6986	3.953	15.45
Russian Federation	1.630196	2.3	5.212	12.5	16.1244	29.22
Singapore	3.699782	1.7	3.907	4.29	32.5975	8.49
Thailand	4.024086	3.6	0.632	15.5852	12.7016	11.88
United States	2.21701	0.7	4.355	13.8379	18.5679	31.46
Vietnam	6.812246	5.6	1.886	9.7019	11.0944	3.41

Appendix 6. Statistical data for APEC countries of the year of 2018

	max	max	min	min	max	max
	0.334781	0.285823	0.167931	0.110047	0.059956	0.041462
2018						
	GDP growth (annual %)	"Annual growth rate of real GDP per employed person (%)"	Unemployment, total (% of total labor force) (modeled ILO estimate)	Share of youth not in education, employment or training, total (% of youth population)	Domestic material consumption (tonnes per capita)	Commercial bank branches (per 100.000 adults)
1	2	3	4	5	6	7
Australia	2.834948	1.3	5.387	6.83	37.4	28.19145
Brunei Darussalam	0.052347	6.5	9.224	19.9	23.213	17.17597
Canada	1.878564	0.6	5.92	12.8366	28.6534	20.04663
Chile	4.024653	2.9	7.223	15.8564	40.323	14.02665
China	6.6	6.7	4.417	8.59	24.543	8.848383
Hong Kong SAR, China	3.021402	2.7	2.778	6.1	7.8	21.19338
Indonesia	5.17127	3.8	4.3	21.7076	7.425	16.24306
Japan	0.787965	1.6	2.445	2.94	8.856	34.07003
Korea, Rep.	2.668311	3.1	3.795	17.3	11.193	15.4
Malaysia	4.723634	0.2	3.36	11.4	16.345	10.2466
Mexico	1.994207	0.6	3.322	18.4284	8.193	14.4311

End of Appendix 6

1	2	3	4	5	6	7
New Zealand	2.781079	0.9	4.522	11.92	23.964	26.78314
Papua New Guinea	0.427556	0.9	2.367	23.4	9.854	1.515603
Peru	3.976502	4.2	2.844	17.2	15.463	7.358045
Philippines	6.243738	2.3	2.515	19.8902	3.856	9.088311
Russian Federation	2.25484	2.3	4.744	12.7	16.256	26.22971
Singapore	3.139465	1.4	3.768	4.14	32.534	8.361754
Thailand	4.129226	3.1	0.665	14.7818	12.692	11.68674
United States	2.856988	2.1	3.933	13.653	18.254	30.89876
Vietnam	7.075789	5.6	1.891	8.7	11.002	3.908416

Appendix 7. Result of the TOPSIS method of the year of 2014

2014		
Country	Result	Rank
New Zealand	0.66697	1
China	0.648821	2
Papua New Guinea	0.604589	3
Vietnam	0.571368	4
Indonesia	0.502842	5
Malaysia	0.493269	6
Philippines	0.477786	7
Korea, Rep.	0.456633	8
Peru	0.449665	9
Hong Kong SAR, China	0.440324	10
Singapore	0.422442	11
Thailand	0.41991	12
Canada	0.409022	13
Mexico	0.387653	14
United States	0.373875	15
Russian Federation	0.35604	16
Chile	0.349058	17
Japan	0.34896	18
Australia	0.330069	19
Brunei Darussalam	0.229909	20

Appendix 8. Result of the TOPSIS method of the year of 2015

2015		
Country	Result	Rank
Vietnam	0.835315	1
China	0.826894	2
Papua New Guinea	0.759245	3
Indonesia	0.677398	4
Philippines	0.634942	5
Peru	0.623985	6
Thailand	0.620969	7
New Zealand	0.595324	8
Mexico	0.580867	9
Malaysia	0.565844	10
Korea, Rep.	0.556913	11
Hong Kong SAR, China	0.526046	12
United States	0.502074	13
Japan	0.469022	14
Singapore	0.459586	15
Chile	0.447915	16
Canada	0.382566	17
Australia	0.352865	18
Russian Federation	0.30645	19
Brunei Darussalam	0.30221	20

Appendix 9. Result of the TOPSIS method of the year of 2016

2016		
Country	Result	Rank
Vietnam	0.90601	1
China	0.8935	2
Peru	0.771613	3
Indonesia	0.749914	4
Thailand	0.734811	5
Papua New Guinea	0.726179	6
Philippines	0.711911	7
Korea, Rep.	0.636131	8
Malaysia	0.598957	9
Hong Kong SAR, China	0.582617	10
Singapore	0.581852	11
Mexico	0.547424	12
New Zealand	0.507406	13
Australia	0.502158	14
Japan	0.476692	15
United States	0.474306	16
Chile	0.472909	17
Canada	0.466905	18
Russian Federation	0.434815	19
Brunei Darussalam	0.258174	20

Appendix 10. Result of the TOPSIS method of the year of 2017

2017		
Country	Result	Rank
China	0.811047	1
Vietnam	0.77731	2
Peru	0.728179	3
Thailand	0.626474	4
Philippines	0.583055	5
Korea, Rep.	0.581973	6
Hong Kong SAR, China	0.581691	7
Indonesia	0.540572	8
Singapore	0.504475	9
Malaysia	0.491738	10
Russian Federation	0.465593	11
Japan	0.460947	12
Canada	0.436827	13
Mexico	0.436813	14
United States	0.432327	15
New Zealand	0.406593	16
Papua New Guinea	0.401655	17

End of Appendix 10

2017		
Country	Result	Rank
Chile	0.35479	18
Brunei Darussalam	0.325433	19
Australia	0.224553	20

Appendix 11. Result of the TOPSIS method of the year of 2018

2018		
Country	Result	Rank
Vietnam	0.884477	1
China	0.851232	2
Indonesia	0.688362	3
Peru	0.681123	4
Philippines	0.673145	5
Thailand	0.669094	6
Hong Kong SAR, China	0.595471	7
Korea, Rep.	0.571924	8
Chile	0.551414	9
Malaysia	0.546362	10
United States	0.544123	11
Singapore	0.533717	12
Russian Federation	0.516506	13
Japan	0.494981	14
New Zealand	0.492405	15
Brunei Darussalam	0.492161	16
Mexico	0.477938	17
Papua New Guinea	0.457146	18
Canada	0.429635	19
Australia	0.340925	20