Clusterization of the Countries by the Level of Achieving the Sustainable Development Goals for Economic Development

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Abstract. The study is devoted to the analysis of the level of achieving the sustainable development goals by different states. The goal set by the authors was to determine strategic guidelines for ensuring sustainable development of the global economy through finding the level of achieving the economic goals of sustainable development by various countries. In addition, the authors aimed to group the countries based on the level of achieving the goals using the clustering method, as well as study the cases of leading countries in this area. The research was conducted using the hierarchical cluster analysis. The results of the research revealed six clusters of the countries by their level of achieving the chosen goals in 2020 and 2021. According to the obtained results, Sustainable Development Goal 9 was chosen as the main goal of sustainable development in ensuring economic growth. The recommendations for ensuring sustainable development of the states based on circularization, digitalization and intellectualization were made.

Keywords: Clusterization · Sustainable development · Circularization · Digitalization · Intellectualization

1 Introduction

Ensuring the states' sustainable development is the main focus of the process of socio-economic global transformations in accordance with the plan "Transforming our world: the 2030 agenda for sustainable development" adopted in 2015 in New York at the UN Summit. In this document, 17 Sustainable Development Goals (SDGs) and 169 tasks were approved. Achieving the defined SDGs will ensure the development of the socio-economic sphere in the conditions of the Sixth Technological Mode, the Post-Industrial Era, the Knowledge Economy and the Fourth Industrial Revolution (Industry 4.0). Therefore, the study into the level of achieving SDGs by different countries is an interesting scientific and practical problem.

It is worth noting that a group of goals aimed at ensuring economic development deserves special attention of economist-researchers. These include Goal 8 "Decent work

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and economic growth", Goal 9 "Innovation and infrastructure", Goal 12 "Responsible consumption", Goal 17 "Partnerships for the goals". The selected group of goals plays a decisive role in ensuring other goals of sustainable development, especially those, which are aimed at solving social problems.

Each of the UN member states joined the global process of ensuring sustainable development, went through the process of adapting the set goals to the national needs and formed national tasks and indicators of achieving the goals of sustainable development. Ukraine is also actively working in this direction. As a result, it has developed the national SDG system (86 tasks of national development and 172 indicators for their monitoring), which will provide a solid basis for further planning of Ukraine's development and monitoring of the state of achieving the SDGs. National tasks, the indicators for monitoring their implementation and benchmarks for achievement until 2030 are reflected in the National Report "Sustainable Development Goals: Ukraine" from 2017 [1], and also studied in the Voluntary National Report [2]. It is obvious that the Russian military invasion of Ukraine has had a significant impact on the world economy and global plans to achieve the SDGs. At the same time, this necessitates strengthening cooperation between states to ensure economic and military security, which reinforces the importance of achieving SDG 17.

Therefore, the research into the level of achieving the economic SDGs by various states, their division into groups based on the level of achievement of the goals using the clustering method, as well as the study of the cases of leading countries in this area will make it possible to determine strategic guidelines for ensuring sustainable development of the global economy.

2 Material and Methods

Hierarchical cluster analysis was used in the study. In such analysis, each observation first forms a separate cluster; at the beginning of the analysis, two adjacent clusters are merged into one; this process continues until only two clusters remain; the distance between clusters is the average of all distances between all possible pairs of points from both clusters.

This study was carried out in the following stages:

(1) formulation of the problem. The problem of this study is to ensure the achievement of the SDGs in the field of economy. Four SDGs were chosen for the study. They relate to or have a positive impact on the economic growth and industrial development of the country, namely Goal 8 "Decent work and economic growth", Goal 9 "Innovation and infrastructure", Goal 12 "Responsible consumption", Goal 17 "Partnerships for the goals". The following countries were selected to analyse progress towards achieving the SDGs: Finland, the USA, France, Belgium, Canada, Austria, the Netherlands, Spain, Italy, the United Kingdom, Japan, Denmark, Germany, Sweden, Norway, the Czech Republic, Poland, Slovenia, Portugal, Estonia, Ireland, Slovakia, Lithuania, Latvia, Hungary, China, Moldova, Ukraine, Belarus, Romania, Bulgaria, the Russian Federation, Turkey. These countries were selected based on the following criteria: neighbouring countries, similar resource opportunities, countries with which Ukraine cooperates in various directions, countries with

a leading economy and a high level of GDP. It is important to systematise these countries according to similar characteristics in the process of achieving specific SDGs, which will make it possible to assess the level of economic development and opportunities for the implementation of a circular economy;

(2) choosing a method of distance measurement (determining the degree of similarity of the selected countries with achieving the SDGs). For the study, the measure of similarity was chosen–squared Euclidean distance:

$$d(x, y) = \sum_{i=1}^{n} (x_i - y_i)^2 \tag{1}$$

(3) choosing a clustering method. A clustering method is a method of calculating the distances between clusters. For the analysis, Ward's method [3; 4] was chosen, which consists in the fact that initially in both clusters for all observations, it is obligatory to calculate the mean values of individual variables–the indicators of achieving the defined SDGs. Secondary data from the "Sustainable Development Report" was used to determine the values of the variables. Then the squares of the Euclidean distances from the individual observations of each cluster were calculated relative to the calculated cluster mean value. All the distances were added up. Then, those clusters that give the smallest increase in the total amount of distances were grouped into one new cluster;

(4) deciding on the number of clusters;

(5) interpretation and profiling of clusters;

(6) assessing the reliability of the clusterization.

Hence, to conduct the cluster analysis with the goal to identify clusters of the countries with a close level of achieving the goals in the economic sphere, the following indicators were determined: G8–level of achievement of SDG 8 "Decent work and economic growth"; G_9–level of achievement of SDG 9 "Industry, innovation and infrastructure"; G_{12}–level of achievement of SDG 12 "Responsible consumption and production"; G_{17}–level of achievement of SDG 17 "Partnerships for the goals".

The cluster analysis was carried out on the basis of these indicators in accordance with the assessment in the "Sustainable Development Report" [5] for 2020 and 2021. The analysis characterises the countries' progress in achieving the SDGs and shows areas that need faster progress. According to the methodology of the reports, each country is assigned a corresponding SDG index, which is used to evaluate the overall score of the achievement of all SDGs for each country and rank countries based on the higher value of the index. The overall score of the SDG achievement index may differ significantly from the country's score for a specific goal. That is why we used the scores in accordance with individual goals and defined clusters within the goals 8, 9, 12, 17 because they are the main goals for the economy development. The initial data for conducting the cluster analysis are presented in Table 1.

The results of the cluster analysis using Ward's hierarchical method were obtained with the help of IBM SPSS Statistics 20.0. Software package.

Table 1. Initial data for conducting a cluster analysis of the countries for determining the clusters with a close level of achieving the SDGs in the field of economy in 2020 and 2021

Country	2020				2021			
	G_8	G_9	G_{12}	G_{17}	G_8	G_9	G_{12}	G_{17}
	Goal 8 Score	Goal 9 Score	Goal 12 Score	Goal 17 Score	Goal 8 Score	Goal 9 Score	Goal 12 Score	Goal 17 Score
Sweden	83,60	96,91	55,90	91,13	83,27	97,43	56,88	88,40
Denmark	85,28	96,85	42,62	83,87	88,85	96,80	43,41	82,71
Finland	85,67	93,88	54,68	68,48	88,27	94,05	55,59	71,24
France	78,45	86,23	57,42	66,27	82,42	87,40	57,66	71,20
Germany	84,96	92,31	52,43	79,22	87,35	92,96	54,88	77,83
Norway	82,82	91,29	44,54	99,63	87,65	91,49	44,54	96,69
Austria	83,29	93,39	46,71	63,35	85,49	95,53	48,21	68,05
Czech Republic	85,98	78,44	69,28	50,11	85,14	80,30	69,42	54,94
Netherlands	84,08	89,90	47,71	61,55	86,88	91,93	49,06	63,17
Estonia	88,01	74,35	59,38	43,52	84,19	75,77	60,32	52,46
Belgium	82,41	89,04	55,77	64,14	85,49	92,19	56,33	64,86
Slovenia	88,12	73,20	57,32	54,51	88,14	73,30	58,06	62,25
United Kingdom	82,27	89,76	53,30	51,82	80,48	89,82	53,30	58,21
Ireland	86,47	81,56	44,30	41,75	87,32	82,01	45,17	51,30
Japan	86,83	90,41	69,09	65,52	86,81	89,53	66,61	71,48
Belarus	75,39	43,69	87,67	74,58	67,80	45,35	86,43	73,84
Canada	84,34	84,57	51,18	65,63	81,46	85,55	51,02	72,55
Spain	75,20	85,71	62,29	52,14	76,21	86,87	63,05	60,82
Poland	85,88	69,28	75,70	54,60	84,40	71,76	75,86	62,38
Latvia	85,81	59,98	63,49	36,14	84,28	62,11	63,76	46,34
Portugal	82,54	73,15	62,53	57,09	82,15	75,41	63,05	62,67
Slovak Republic	82,22	61,26	67,33	48,56	80,88	64,20	66,99	55,47
Hungary	83,16	62,99	72,96	38,78	80,64	66,50	73,08	51,37
Italy	80,90	83,04	62,61	58,18	76,57	83,60	63,60	62,95
United States	85,20	93,79	54,72	67,85	76,60	93,94	53,58	68,81
Lithuania	81,97	59,89	62,08	44,84	81,45	62,34	62,86	53,19

(*continued*)

Table 1. (*continued*)

Country	2020				2021			
	G_8	G_9	G_{12}	G_{17}	G_8	G_9	G_{12}	G_{17}
	Goal 8 Score	Goal 9 Score	Goal 12 Score	Goal 17 Score	Goal 8 Score	Goal 9 Score	Goal 12 Score	Goal 17 Score
Romania	82,73	53,25	76,18	60,64	82,72	55,02	76,29	48,53
Bulgaria	81,75	51,61	74,97	68,01	78,13	52,55	74,50	72,06
Moldova	73,11	26,67	81,65	75,25	69,31	27,36	80,07	72,64
Ukraine	72,51	34,45	82,73	75,42	71,70	39,00	81,84	74,25
China	87,47	72,15	88,55	44,36	71,63	72,95	87,09	42,07
Russian Federation	79,59	66,26	77,84	67,78	75,40	67,73	76,66	70,29
Turkey	69,71	59,34	81,46	71,90	59,06	60,30	79,81	71,96

Source compiled by the author using the data [5].

3 Results

The clustering results for 2020 and 2021 are presented in the form of a horizontal dendrogram of the similarity of individual countries according to the level of achieving the selected SDGs in the economic sphere (Fig. 1). The countries are displayed on the vertical axis, and the distance scale is on the horizontal axis. Based on the calculations made using the method of hierarchical cluster analysis, the countries were grouped into 6 clusters and some countries that were not included in these clusters were located separately. The states were clustered according to the chosen indicators in 2020–2021 (Fig. 1).

In 2020, the countries were grouped into the following clusters: the largest cluster No. 1, which includes Finland, the United States, France, Belgium, Canada, Austria, the Netherlands, Spain, Italy, the United Kingdom, Japan. Cluster No.2 includes countries such as Denmark, Germany, Sweden, Norway. Cluster No. 3 includes the following countries the Czech Republic, Poland, Slovenia, Portugal, Estonia. The Slovak Republic, Lithuania, Latvia, Hungary belong to cluster No.4. Moldova, Ukraine and Belarus are in cluster No.5. Cluster No.6 includes Romania, Bulgaria, Turkey, and the Russian Federation. Countries such as Ireland and China formed separate clusters.

In 2021, six clusters of the countries were also observed but there was only one country separated into a cluster – China. In 2021, Spain and Italy dropped out of the group of the countries in cluster No. 1, i.e. the cluster contains the following countries Finland, the United States, France, Belgium, Canada, Austria, the Netherlands, the United Kingdom, and Japan. Germany was also included in it; however, in 2020, it was in cluster No. 2. With the exception of Germany, in 2021 the same countries remained in cluster No. 2 – Denmark, Norway and Sweden. Instead, in 2021, Spain and Italy, which were in cluster No. 1 in 2020, joined a cluster with the countries like Slovenia, Portugal, the Czech Republic, Estonia, and Ireland, which was separated into an individual cluster in

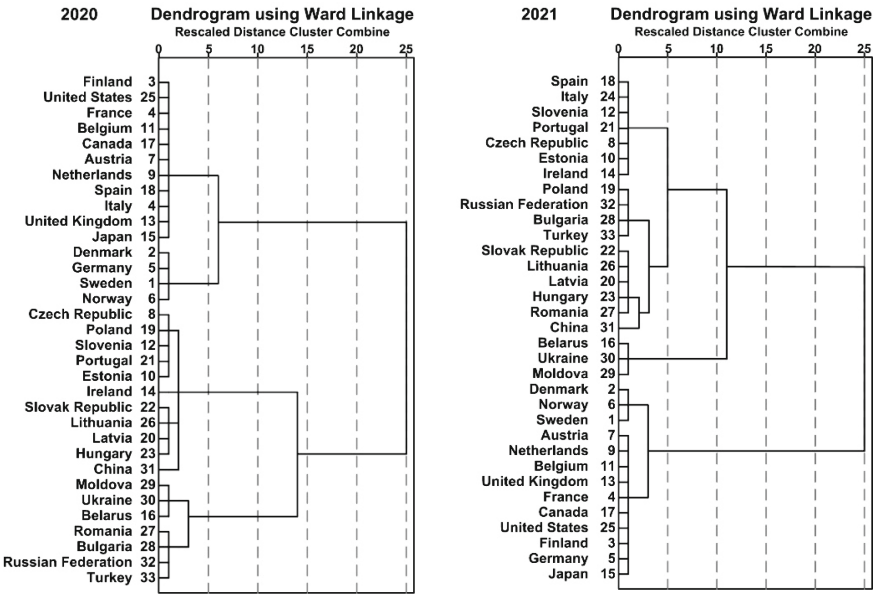

Fig. 1. A dendrogram showing the results of the cluster analysis of the level of achieving the SDGs in the sphere of economy in 2020 and 2021 (using Ward's method)

2020 and they together formed cluster No. 3. Such countries as the Slovak Republic, Lithuania, Latvia, and Hungary remained in cluster No. 4 and Romania joined them. Such countries as Belarus, Ukraine, and Moldova remained in cluster No. 5. Poland was added to the countries in cluster No. 6, Romania left the cluster, but the Russian Federation, Bulgaria and Turkey remained there. Of all the studied countries in 2022, China formed a separate cluster.

A group of economically and socially developed countries that make up cluster 1 and cluster 2 stands out among other groups. They have high indicators of the achievement of the selected SDGs, and the highest indicators of the achievement of Goals 8 and 9 on average among the clusters. Moreover, Cluster 1 is formed from the largest number of countries – 10, and cluster 2 consists of three countries according to the calculations for 2021. When comparing clusters 1 and 2 in 2021, on average, the highest indicator of achieving Goals 8 and 9 is observed in the association of the countries in cluster 2 −95.24 and 86.59, respectively. In cluster 1, the level of the achievement of Goal 9 in 2021 is 4% lower and amounts to 91.92, for Goal 8 it decreased by almost 3% and is 84.13. That is why it is advisable to take into account the experience of the countries of cluster 2 and cluster 1 in terms of directions and measures to achieve goals 8 and 9.

The experience of the countries from cluster 1 and 2 shows that the basis for the introduction of innovation is *digitalization and intellectualization of all spheres of the economy*. Currently, the advanced technologies of Industry 4.0 (in particular, cloud technologies, biotechnologies, Big Data collection and analysis tools, 3D printing, crowdsourcing, Blockchain technologies) are radically changing most sectors of the economy. Digital transformation contributes to the growth of the quality of industrial goods and

services thus significantly reducing costs. In addition, digitalization promotes the development of innovations, transforms value creation chains and opens up new opportunities for increasing value added [6].

The experience of the countries from the identified clusters that should be mentioned is the introduction of support for innovative technologies of Industry 4.0 [7] by forming strategies and plans for the development of the economy taking into account the world programmes and global initiatives, in particular: the EU Industrial Strategy 2021–2024, European initiatives regarding ICT innovation for manufacturing SMEs (I4MC), Marshall Plan 4.0 "Priority measures for the economic redeployment of Wallonia" (Belgium), The New Industrial France programme, Produktion2030 – a strategic innovation programme supported by the Swedish Agency for Innovation Systems (Vinnova), the national platform MADE in Denmark etc. The study published within the framework of the World Economic Forum [8] states that many companies of leading countries are trying to introduce Industry 4.0 technologies into production, but few manage to do it on a scale that allows a significant financial and economic effect to be achieved. At the same time, the main directions of production transformation are determined by three global technological trends: network integration, intellectualization and flexible automation. It should be noted that those advanced enterprises, which managed to successfully use these trends (according to the study [8]), reaching a new level of efficiency, are located in the countries with high indicators of value added of production and ICT. Among the studied countries, China (39%), the Czech Republic (32%) and Norway (29%) are the leaders by the share of value added of industrial production in GDP. By the share of value added of medium and high-tech production in the total volume of industrial production, the leaders are the following countries with a share of more than 50%: Germany (61%), Denmark (58%), Hungary (54%), Sweden (52%), the Czech Republic (52%) and France (50%). At the same time, high indicators of the ICT subindex are observed in Germany, Sweden, Norway, Germany, France, and the United Kingdom.

In terms of the level of achieving the selected SDGs, all the countries in cluster No. 5 remained unchanged. In our opinion, this situation results from a very low level of achieving the same 9th SDG "Industry, innovation and infrastructure" (G9), which is 34.45 and 39.00 in Ukraine, and 26.67 and 27.36 in Moldova in 2020 and 2021, respectively. According to the indicators of 2021, Ukraine demonstrates a low position in the main indicators of the ICT infrastructure. By the ICT sub-index within the Global Innovation Index, Ukraine took 70th place (among 152 countries) with a score of 64.9 out of 100 maximum scores, which is lower than that of Romania, the Czech Republic, Belarus, Lithuania, Poland. The top 20 are South Korea, Great Britain, Japan, Denmark, the Netherlands, Estonia, the USA, etc. The Network Readiness Index ranking is also indicative – for example, in 2021, Ukraine took 53rd place with an index value of 55.7 and fell behind such countries as Brazil, Turkey, Uruguay, Malaysia, Hungary, and Poland.

The scientists [9; 10; 11] emphasize that a completely new type of industrial production is emerging; it is based on full automation of production processes, augmented reality technologies, big data sets and the Internet of Things. That is why, in the current conditions, scientists, economists-practitioners and government officials regard digitalization as an important driver of socio-economic development of both the country, the economic sector, and an individual enterprise. When digital platforms began to develop,

it was expected that they would reduce transaction costs for platform participants and create conditions for business scaling. The reduction of transaction costs is ensured due to such advantages as mobility, convenience, speed, low cost of service, visualization. The issue of digitalization became the subject of discussion by world leaders at the G20 summit in Osaka (Japan), where the main priorities were defined, including support for digitalization of micro, small and medium-sized enterprises.

It is imperative to ensure the manufacture of high-tech products in the defence industry. Today, in the conditions of military aggression of the Russian Federation against Ukraine and its threat throughout the world, *the industrial innovative development* will also ensure the effective functioning of the military complex. For example, the Scandinavian countries, which, according to the results of the calculations formed cluster 2, are now developing a joint military infrastructure for defence against the Russian Federation.

Some enterprises are implementing revolutionary innovative technologies, which according to the study [8] are called "beacons", i.e. leading enterprises in the implementation of Industry 4.0 technology. Geographically, they belong to the following countries from clusters 1, 2, 3 and 7: Germany (BMW, Phoenix Contact), China (Bosch Automotive, Danfoss, Foxconn Industrial Interne, Haier, Siemens Industrial Automation Products), the Czech Republic (Procter & Gamble—Rakona), France (Schneider Electric), Italy (Rold), Sweden (Sandvik Coromant). To improve industrial production, it is advisable to form a favourable infrastructure for the development of innovative enterprises in the countries of clusters 4, 5 and 6.

Industry, as the main component of the real economy, defines one of the priority directions for achieving the 9th SDG "Industry, innovation and infrastructure". However, the experience of the countries from the clusters with a high level of achieving the 9th goal shows that the acceleration of economic growth of this particular component is largely dependent *on the processes of circularization of production and the economy*. This is because a circular economy provides value creation mechanisms that do not recognize the use of limited resources. This is a system model in which each part of the product is viewed as a valuable resource that can be reused to create value added. In a circular economy, resources circulate repeatedly.

In 2020, EU countries organized the new Incubation Forum for Circular Economy in European Defence (IF CEED), which is managed by the European Defence Agency (EDA) with a total financial contribution of €784,000 from the European Commission (EU LIFE Programme) and Luxembourg's Directorate of Defence. Austria, Belgium, Bulgaria, the Czech Republic, Estonia, Germany, Spain, Finland, France, Hungary, Italy, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovenia, and Sweden are among the member states we are examining in this article. The goal of the IF CEED is the development of transnational projects in the circular economy, its application in the defence sector of the European Union. This will lessen the negative impact on the environment, as well as improve the autonomy of the EU by increasing the share of resource recycling, reducing the level of waste and, most importantly today, reducing Europe's dependence on imported resources, including in the energy sector. According to the results of our

research, all the mentioned countries are in different clusters, so this proves the unity of all the countries regarding the vision of security and ensuring Europe's sustainable development in the future. Currently, two incubation clusters "Materials and Innovative Designs" and "Processes and Digitalisation" have been created with nine working areas, including critical raw materials, circular additive manufacturing, circular materials for textiles, sustainable eco-design, EU waste regulation, green public procurement, eco-management audit strategies, circular data and spare parts management. It is appropriate to note that such cooperation contributes to the achievement of SDG 17, and the circularization of economies contributes to the development of smart consumption, and, therefore, to the achievement of SDG 12.

The countries in cluster No 3 show a relatively high level of achieving Goal 12 in 2021; on average, in cluster 3, the value is 60.38, for comparison in cluster 2 it is 48.28, and in cluster 1 – 54.62. However, the indicators for the achievement of Goals 8 and 9 are lower than those in cluster No 2 and No 1. Indeed, by the Eco-Innovation Index in 2021, which demonstrates the level of implementing eco-innovations in the member countries, Slovenia, Portugal, the Czech Republic, Estonia, and Ireland are included in the category of Eco-I performers with the values of 113, 115, 111, 97 and 109 respectively. On the one hand, this testifies to the possibilities of further realizing the potential and reaching the level of the countries in the Eco-I Leader category. On the other hand, according to the indicators from the Sustainable Development Report it reflects good progress in the development.

Hence, taking into account the experience of the countries of this cluster when carrying out the tasks to achieve Goal 12 is vital for the countries located in other clusters.

With regard to Goal 17, relatively high indicators are observed in cluster No 2 and cluster No 5, which includes Ukraine. It is obvious that the chosen political vector and the Association Agreement between Ukraine and the EU, which came into force on September 1, 2017, open up opportunities for political association and economic integration with the EU, which creates opportunities for the development of new European sales markets, contributes to the liberalization and development of trade conditions with EU countries, and has a positive effect on the indicators of goals 12 and 17. For instance, it stimulates enterprises to introduce the principles of responsible production and consumption and increase the quality of products so that they meet European requirements.

The studied indicators do not refer to the period after the start of the war in Ukraine. On the one hand, the war has changed Ukraine's priorities in the direction of ensuring its military security. On the other hand, ensuring sustainable development in the field of the economy and energy will make it possible to form the necessary ecosystem of innovations for the recovery of the economy. Industry, as one of the most important components of the real economy, relies, as a rule, on exhaustive resources. Consequently, in order to accelerate the economic growth of this particular component in modern economic and security conditions and taking into account the experience of the countries we have studied, it is essential to rely on the provisions of the circular economy concept.

Therefore, in this aspect it is necessary to consider the six-month war experience and stress the importance of such a component of the real economy as infrastructure and the direction of achieving the 9th SDG. During the war, the whole world became aware of the importance of infrastructure in ensuring the development of the economy. As the practice of 2022 showed, the lack of developed infrastructure, in particular, its transport and logistics component in the west of Ukraine, caused significant problems in ensuring the sustainable development of the world economy. The existing problems raised doubts about the plans to ensure the achievement of the 2nd SDG "Zero hunger" due to a sharp drop in the volume of export of Ukrainian grain and other agricultural products. It is clear that the main cause of the threat of famine in the world is Russian aggression against Ukraine. Moreover, the military actions, the blocking of ports, the lack of transit through the territory of Belarus have significantly changed the logistics of export transportation, causing the rapid development of transport infrastructure on the western borders and a radical change in logistics routes. Neither Ukraine nor the countries of Western Europe were ready for such changes, so, in the first months of the war, the volume of transportation was reduced to a minimum. Due to the reconfiguration of logistics from the capitals of many European countries, in particular, the Baltic States, basic food products disappeared, and due to the impossibility of exporting 20 million tons of Ukrainian grain, such countries in Africa like Egypt, Yemen, Syria and Lebanon can face the threat of famine.

Consequently, the war in Ukraine has proved that the real sector of the economy i.e. industry, transport and the agricultural sector is of crucial importance. Therefore, in the current conditions of the destabilization of the entire world economy, the threat to global security and geopolitical transformations, we consider the achievement of Goal 9 to be decisive among those we have chosen to ensure sustainable development in the economic sphere.

4 Conclusions

In the process of conducting the cluster analysis, the 33 studied countries were divided into 6 clusters according to the achievement of the goals of sustainable development in the economic sphere, namely: Goal 8 "Decent work and economic growth", Goal 9 "Innovation and infrastructure", Goal 12 "Responsible consumption", Goal 17 "Partnerships for the goals". It was determined that the directions and measures to achieve goals 8 and 9 should take into account the experience of the countries united in clusters 1 and 2. This experience includes support for innovative technologies of Industry 4.0 by forming strategies and plans for the development of the economy, taking into consideration the programmes and global initiatives of these countries in the direction of network integration, intellectualization and flexible automation of production. It is advisable to pay attention to the experience of the countries from cluster 3 in achieving Goal 12 and the countries from clusters 2 and 5 in achieving Goal 17. Taking into account the modern needs of the economy, as well as the growing needs of ensuring military security, the achievement of Goal 9 is a high priority.

The successful experience of the studied countries suggests that business should be more oriented towards ecological cyclic production rather than linear one. This kind of production can be created if enterprises use marketing communications effectively, which will help change the culture of consumption. Emphasis should be placed on the environmental friendliness of products, reliability and cost savings in the process of using. The purpose and importance of marketing in the sphere of the circular economy is the dissemination of information and the appeal of society to use resources correctly, the possibility of increasing well-being without excessive use of natural raw materials. Thus, thanks to the introduction of ecological cyclic production into the industry, the level of achieving the 12th SDG "Responsible consumption" will increase.

It is clear that at present the development of innovation can be ensured only on the basis of digitalization and intellectualization of all spheres of the economy, which is confirmed by the successful experience of the leading countries in achieving SDG 9. Furthermore, it is extremely important for both Ukraine and Ukraine's European neighbouring countries to implement these processes specifically in the defence industry for ensuring its innovative development.

Regarding the third infrastructural direction of ensuring the achievement of SDG 9, in our opinion, the decisive way is the partnership between various market participants (farmers, carriers, ports, terminals, etc.) and various states to create unified transport corridors, unified information infrastructure for supporting business development, which will contribute to the acceleration of the European integration of the Ukrainian economy.

That is, innovation based on digitization and intellectualization of industry, the infrastructure based on partnerships and a circular economy for sustainable development of industry in the conditions of resource exhaustion should become the basis of the real economy. In addition, now they are important vectors of the development of the economic security of the EU and Ukraine.

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