

IMPLEMENTATION OF THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT OF TERRITORIAL COMMUNITIES: DECISION MAKING

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ABSTRACT

The globalization of social production and the aggravation of the problems of poverty and the ecological state of the natural environment require coordination of national governments' efforts in implementing the principles of the concept of sustainable development as a further evolutionary development of the human community. The purpose of the research is to investigate modern patterns in the implementation of the principles of sustainable development concept of territorial communities of European countries and to substantiate the model of effective achievement of certain goals of sustainable development. The theoretical aspects of the sustainable development concept of territorial communities have been analyzed, and as a result, the basic and formative aspect of the trinity of economic, social, and environmental components through innovation and energy technologies has been highlighted. The viability of the implementation of sustainable development concept at the level of the territorial community has been mathematically proved. The model of comprehensive coverage of territorial communities of countries' territories in sustainable social-economic development through modern points of growth, technopolises, has been characterized. Groups of countries have been selected according to the dynamics of the introduction of sustainable growth of territorial communities there. The empirical results of the research can be used to study trends and develop tools and methods for implementing the concept of sustainable growth in government regulation of evolutionary changes in society.

Keywords: Concept of sustainable development; Territorial communities; Technopolis; Points of economic growth; Natural-based energetics; Demographic dependent needs.

INTRODUCTION

The global economic crises of 2008 and 2014, which were exacerbated by the quarantine measures of the coronavirus epidemic of 2019-2020, have led to an understanding of the search for ways to further social development of the human community. It becomes clear that the capitalist mode of production, which has been modernized into a market economy, is not only

exhaustive for the whole world economy, however, it poses a direct danger both to individual continents (Africa, Latin America) and to the regions of advanced countries. This danger is manifested in the intensification of urbanization, the reduction of rural settlements and their inhabitants, the deterioration of the ecological situation of the environment. By the way, the action of the market has led to the stratification of social strata in the world. A number of countries, focusing on market economy, have undergone radical changes in the social-economic model of the national economy; they seek to enter a number of developed countries, however, significant government efforts do not provide positive economic and social changes. Along with this, a biological aging of the population of the European community is observed as well as a complication of demography.

Such problems and contradictions require intensive study and research in various areas. One of the directions of the global problem of the world's social-economic development in the 21st century was to increase attention to local self-government in terms of the development of their territories, in ensuring future generations in full use of preserved natural resources and their transition to environmental technologies in production, consumption, life and leisure. Therefore, the development of models for the implementation of sustainable development at the level of territorial communities and their effectiveness determines further research and solutions.

The purpose of the research is to study consistent patterns in the implementation of the principles of sustainable development concept of territorial communities of European countries and to substantiate the model of effective achievement of certain goals of sustainable development.

LITERATURE REVIEW

The concept of "sustainable development" is proposed by the Brundtland Commission as a development that meets the needs of the present, but does not jeopardize the ability of future generations to meet their personal needs (Butlin, 1989). The basic principles of sustainable development are set out in the "Declaration on Environment and Development" (1992) and the "Agenda 21" (Agenda 21, 1992). The concept of sustainable development is the result of combining three main components: economic, social and environmental (Paul et al., 2015). The economic approach to the concept of sustainable development involves the use and protection of resources in order to create sustainable values through their optimal use and restoration (Polasky et al., 2019). From the point of view of the ecological component, the basic objective of sustainable development is to ensure the integrity of ecosystems, maintaining their viability (Inogwabini, 2019). The social component of sustainable development is human-oriented; it is aimed at maintaining the stability of social and cultural systems (Duran et al., 2015). Thus, the concept of sustainable development provides a balance between the economic, environmental and social status and the achievement of the optimal development option for countries.

The organization for economic co-operation and development (OECD, 2020) has presented a consolidated report examining how cities and regions use sustainable development goals to develop and implement strategies, policies and plans, promoting synergies between sectors, and proving that sustainable development will not be achieved without proper involvement of national governments. The report proposes a localized system of indicators that measures the sustainable development of more than 600 OECD regions and 600 cities and

partner countries, as well as a checklist of public actions to implement a territorial approach in these countries.

The 20th century is characterized by the growth of cities, urbanization, and systemic resettlement; consequently, there is a need to implement the concept of sustainable development of territories (Grzebyk & Stec, 2015; Shen et al., 2015) and local communities (Moldovan & Cristina, 2017; Jones et al., 2019). In particular, Sobol (2008) on the basis of empirical expertise shows the problem of management barriers to sustainable development in terms of local self-government in Poland. Čiegis & Gineitiene (2008), on the example of Lithuania, have studied the impact of sustainable development principles on the development of local communities. Scholz et al. (2016) have analyzed the application of the principles of sustainable development at the local level in Germany.

The study of Ferova et al. (2019) are aimed at analyzing existing approaches and tools for the development of territorial communities, as well as the development of methodological and procedural frameworks for assessing the sustainability of territories in order to address social and economic issues. Bantash et al. (2020) point out that the lack of rational zoning and balanced administrative-territorial organization in Ukraine is due to the lack of effective regional governance, which should be based on the use of the principles of sustainable development.

Thus, the theoretical justification of the principles of sustainable development of territorial communities is widely reflected in scientific publications. However, the practical aspects of the impact of modern decentralization and local government reforms remain understudied.

This problem has identified the need to study an effective model for achieving certain goals of sustainable development of territorial communities, which will overcome socio-economic inequality of regions and territories and include them in a full-fledged economic process of the 21st century with the use of innovative environmental technologies.

METHODOLOGY

The present study utilizes both general and special methods of research. Among general scientific methods were used: systematization, generalization of scientific publications - in order to study the problems of implementation of sustainable development concept and territorial communities establishment and growth; method of comparative analysis - to analyze the concept of sustainable development of territorial communities of European countries; system and logical analysis, method of information synthesis - in the formation of the research-based assumptions, as well as generalizations, conclusions, and research proposals about the development of the European territorial communities. Special research methods were used for the analysis of territories sustainable development: method of mathematical modeling of economic processes and quantitative method - for grouping and studying of the countries ranking in the implementation of sustainable development of territories; differential and difference equations - in the study of deterministic behavior of territorial communities and exposition of the economic and social model of sustainable development of territorial communities, where the four basic components of the concept are unknown, but which are factors of community development. For modeling territorial community development and economic growth were used Ramsey-Cass-Koopmans model and Solow model. The analysis of sustainable development in the European

countries was determined through two indicators - GDP per capita, and the Sustainable Development Index (SDG Index and Dashboards, 2016).

The information base of the study was the data from Eurostat and information from the Organization for Economic Co-operation and Development (OECD).

RESULTS

From the viewpoint of economic approach, the sustainable development of territorial communities is determined by the income of the community. Modern statistics do not allow analyzing the level of household income by territorial territories. However, at the level of the national economy, the analysis of sustainable development can be analyzed through two indicators - GDP per capita, USD and the Sustainable Development Index (SDG Index) (Table 1).

According to these indicators, the level of sustainable development of the country's communities is quite difficult to analyze. Only Denmark, Finland and France have produced a growth in the sustainable growth index in four years, while GDP per capita has grown; consequently, these countries have become leaders in the ranking of sustainable development.

Country	2016			2020			The average value of the group	Ranking of countries
	GDP per capita, USD	The SDG Index	GDP per capita, USD per unit of index	GDP per capita, USD	The SDG Index	GDP per capita, USD per unit of index		
Luxembourg	104,278	76,7	1,3596	101,054	74,3	1,3601	1,1315	A
Switzerland	80,172	80,9	0,991	81,867	79,4	1,0311		
Ireland	63,197	76,7	0,824	79,669	79,4	1,0034		
Norway	70,46	82,3	0,8561	67,989	80,8	0,8414	0,7567	B
Iceland	61,757	78,4	0,7877	57,189	77,5	0,7379		
Denmark	54,664	83,9	0,6515	58,439	84,6	0,6908		
The Netherlands	46,008	78,9	0,5831	49,623	80,4	0,6172	0,6047	C
Austria	45,238	79,1	0,5719	48,634	80,7	0,6027		
Sweden	51,974	84,5	0,6151	50,339	84,7	0,5943		
Finland	43,777	81	0,5405	48,461	83,8	0,5783	0,5629	D
Germany	42,098	80,5	0,523	45,466	80,8	0,5627		
Belgium	42,012	77,4	0,5428	43,814	80	0,5477		
The United Kingdom	41,074	78,1	0,5259	39,229	79,8	0,4916	0,4809	E
France	36,962	77,9	0,4745	39,257	81,1	0,4841		
Italy	30,936	70,9	0,4363	35,96	77	0,467		
Lithuania	14,999	72,1	0,208	28,587	75	0,3812	0,3513	F
Malta	25,151	72	0,3493	28,469	76	0,3746		
Spain	26,505	72,2	0,3671	26,832	78,1	0,3436		
Hungary	12,992	73,4	0,177	26,536	77,3	0,3433		
Slovenia	21,622	76,6	0,2823	25,039	79,8	0,3138		
Estonia	18,237	74,5	0,2448	22,986	80,1	0,287	0,2815	G
The Czech	18,463	76,7	0,2407	22,627	80,6	0,2807		

Republic									
Romania	9,567	67,5	0,1417	20,933	74,8	0,2799			
Portugal	19,978	71,5	0,2794	21,608	77,6	0,2785			
Greece	18,116	69,9	0,2592	18,168	74,3	0,2445	0,2427	H	
Slovakia	16,506	72,7	0,227	18,669	77,5	0,2409			
Montenegro	7,028	62,5	0,1124	16,057	70,2	0,2287			
Latvia	14,153	72,5	0,1952	17,23	77,7	0,2218			
Poland	12,432	69,8	0,1781	15,304	78,1	0,196	0,2018	I	
Serbia	5,756	68,3	0,0843	13,79	75,2	0,1834			
Croatia	12,36	70,7	0,1748	14,033	78,4	0,179			
Russia	8,745	66,4	0,1317	9,972	71,9	0,1387	0,1351	G	
Bulgaria	7,469	71,8	0,104	9,826	74,8	0,1314			
North Macedonia	5,129	62,8	0,0817	6,019	71,4	0,0843			
Bosnia and Herzegovina	4,995	59,9	0,0834	5,762	73,5	0,0784	0,1203	K	
Belarus	5,022	73,5	0,0683	6,134	78,8	0,0778			
Albania	4,124	60,8	0,0678	4,898	70,8	0,0692			
Moldova	2,272	66,6	0,0341	5,054	74,4	0,0679	0,0611	L	
Ukraine	2,188	66,4	0,033	3,425	74,2	0,0462			

During the same period, Switzerland's GDP per capita has lost the dynamics of sustainable growth by 1,5. Norway foresees a drop in GDP per capita and a drop in the index by 2,5 points. However, Sweden is the only country in Europe that shows the dynamics of increasing sustainable development with a relative decrease in GDP per capita for 4 years and occupies the first position. Whilst in 2016 there were 6 European countries with a sustainable development index value of more than 80, namely: Sweden, Denmark, Norway, Finland, Germany, Switzerland, then in 2020 there were 11 countries: Sweden, Denmark, Finland, France (SDG Index - more than 81), and SDG Index for Germany, Norway, Austria, the Czech Republic, the Netherlands, Estonia, Belgium was in the range from 80 to 80, 8.

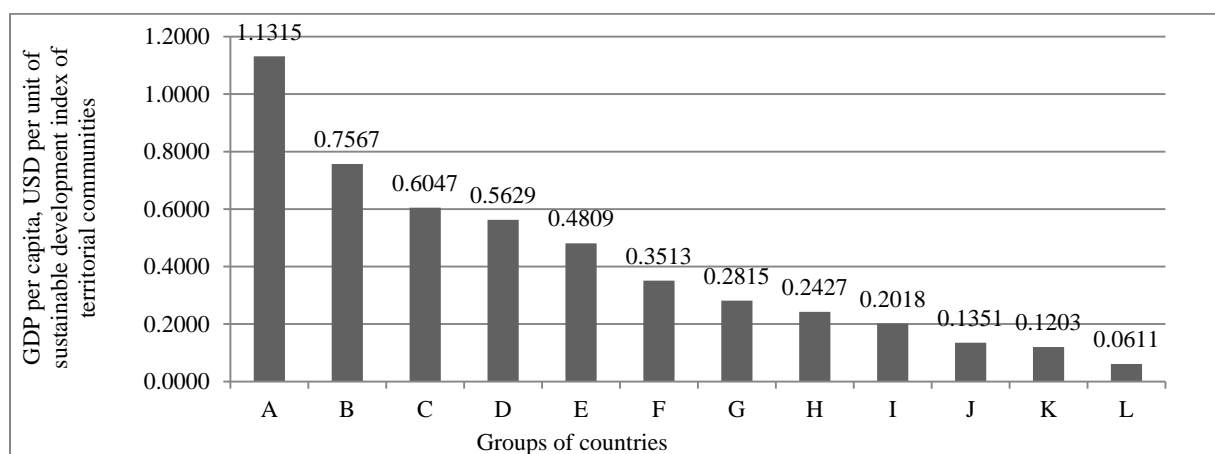


FIGURE 1

RATING OF GROUPS OF EUROPEAN COUNTRIES IN THE IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT OF TERRITORIAL COMMUNITIES IN 2020

In order to conduct a qualitative analysis, let's introduce a coefficient calculated by the ratio of GDP per capita per unit of sustainable development index. According to this approach, groups of countries are identified for sustainable development (Figure 1).

A group of leading countries (A) is highlighted, namely: Luxembourg, Switzerland, Ireland, which are small in territory and population, and are relatively isolated from the rest of the European community, primarily, territorially (island, mountain area). However, they are united by the fact that expenditures on the army are very meager, from 0,49% to 0,9% of GDP; that is why such high rates of sustainable development of territorial communities are observed. The second group (B) also consists of small countries in the area, namely: Norway, Iceland, Denmark. The third and the fourth groups of countries (C, D) with an average value of 0,6 and 0,56 include: the Netherlands, Austria, Sweden, and, respectively, Finland, Germany, Belgium. These countries occupy leading positions only in terms of sustainable development, and, according to this index, they are significantly inferior to the leading group. A group of countries (L) with the lowest rating of sustainable community development (0,06) include: Albania, Moldova and Ukraine. These countries have the lowest GDP per capita among European countries, however, the sustainable development index is high - more than 70,8. This situation is due to the fact that the countries of Moldova and Ukraine are in a state of military conflict and border uncertainty. And Albania, although recognized by European experts as the country with the best model of territorial communities, is economically quite poor; by the way, it suffers from natural disasters. In particular, the earthquake of 2019 has caused damage amounting to 1,1 billion euros (most affected rural areas of the country). Thus, the outlined approach in the evaluation of sustainable development of territorial communities indicates a better assessment of the implementation of these processes and has made it possible to identify groups of countries close in the course of implementation and achievement of sustainable development goals of European regions. Small European countries, where military spending is very meager, cope best with such challenges.

As it has been noted above, economic growth and sustainable development differ in the dynamics of economic processes. Sustainable development in a logical sense should form the same increase in economic growth ΔVPP per capita ($GDPT - GDPT - 1 / GDPT = const$) over any equal period of time ΔT . And economic development should provide an increase in growth of GDP per capita ($< GDPT + 1$) per capita. That is, the economy must simultaneously produce GDP as a constant value and at the same time ensure a constant increase in this value over a period of time. And this is physically impossible to be achieved.

From these considerations, it is clear that territorial communities will develop only in the course of economic growth of the country. However, such growth should meet domestic demand, which is able to consume the goods produced. After all, the sustainable development is the result of a well-functioning system of state regulation of the economy, the primary task of which is to prevent economic downturn, and much more, the economic collapse of the country. In this sense, the negative effects of economic growth (environmental pollution, increasing poverty, use of manual labor) should be blocked by the system of state regulation. China is the latest example of such approach. Whilst at the initial stages of the country's industrial development the social and environmental consequences have not been taken into account by the government, today the state administration focuses on the use of environmental technologies, closure of hazardous industries and relocation to arid and mountainous areas. Thus, local communities are unable to initiate

economic growth and guarantee sustainable development due to the lack of a full set of resources and management system. After all, the land and subsoil resources of the territorial community do not automatically achieve sustainable development of the region. Only the state is able to initiate economic growth and further maintain sustainable development.

Sustainable development should implement a simple idea: to solve the knot of contradictions that have accumulated and imbalance in public relations. In fact, sustainable development indicates the achievement of harmony between people, nature and various social communities. Sustainable development points to three mandatory principles, namely: protecting the environment, following social-evolutionary progress and guaranteeing economic development for all sections of the population and communities. At the same time, the conceptual solution of the ecological component is possible only through a new construction of scientific and technological progress on the basis of unfolded scientific and historical dogmas of the basic sciences, and the study and implementation of new worldviews of science. It is from this the understanding follows concerning the main factor in the implementation of sustainable development - technological.

In the mathematical dimension, this is the solution of a system of equations, which at each point in time t is given by the corresponding indicators:

$$\left\{ \begin{array}{l} \text{Technological: } T_e - i = T_e - i(t); \\ \text{Economic: } E_d - o = E_d - o(t); \\ \text{Social: } E_o - \pi = E_o - \pi(t); \\ \text{Ecological: } E_b - e = E_b - e(t). \end{array} \right. \quad (1)$$

This system at a certain point in time will be determined by the vector of phase coordinates:

$$k(t) = (T_e - i(t), E_d - o(t), E_o - \pi(t), E_b - e(t)) \quad (2)$$

Then the equations of motion of this model are differential equations that reflect the change in the rate of change of a single phase through the function of phase coordinate and time for each of the four equations. We have the following differential equations:

$$\left\{ \begin{array}{l} \frac{d(T_e - i)}{dt} = T_e - i(t) = f(T_e - i(t), E_d - o(t), E_o - \pi(t), E_b - e(t), t) \\ \frac{d(E_d - o)}{dt} = E_d - o(t) = f(T_e - i(t), E_d - o(t), E_o - \pi(t), E_b - e(t), t) \\ \frac{d(E_o - \pi)}{dt} = E_o - \pi(t) = f(T_e - i(t), E_d - o(t), E_o - \pi(t), E_b - e(t), t) \\ \frac{d(E_b - e)}{dt} = E_b - e(t) = f(T_e - i(t), E_d - o(t), E_o - \pi(t), E_b - e(t), t) \end{array} \right. \quad (3)$$

For this model, the initial state k_0 at ($t=0$ time reference point) is determined by the values of phase coordinates at time t_0 . Therefore, the system at this initial time state will be an equation:

$$\begin{aligned}
 k_0 = k(t_0) &= ((Te - i)_{t_0}, (E_d - o)_{t_0}, (E_o - \lambda)_{t_0}, (E_b - e)_{t_0}) = \\
 &= ((Te - i)_0, (E_d - o)_0, (E_o - \lambda)_0, (E_b - e)_0)
 \end{aligned} \tag{4}$$

And the final state will be determined by the reference value of these components of the system:

$$k_n = k(t_n) = ((Te - i)_n, (E_d - o)_n, (E_o - \lambda)_n, (E_b - e)_n) \tag{5}$$

Thus, the economic and social model of sustainable development of territorial communities is a system of differential equations, where the four basic components of the concept are unknown, which are both factors of community development.

However, over time, this system will enter a mode that can be described by the limit value (for $t \rightarrow \infty$, and the initial values $((Te - i)_0, (E_d - o)_0, (E_o - \lambda)_0, (E_b - e)_0)$):

$$\begin{cases}
 \lim_{t \rightarrow \infty} E_{(d-o)}(t, (E_d - o)_0) = E_{(d-o)}^*(t) \\
 \lim_{t \rightarrow \infty} E_{(o-\lambda)}(t, (E_o - \lambda)_0) = E_{(o-\lambda)}^*(t) \\
 \lim_{t \rightarrow \infty} E_{(b-e)}(t, (E_b - e)_0) = E_{(b-e)}^*(t)
 \end{cases} \tag{6}$$

where: $T_{(e-i)}^*(t), E_{(d-o)}^*(t), E_{(o-\lambda)}^*(t), E_{(b-e)}^*(t)$ - limit value functions.

Therefore, the system of sustainable development of territorial communities has an attractor in the form of a boundary cycle.

Summing up, it can be stated that there will always be a value of $t < \infty$ at which the limit value function $(T_{(e-i)}^*(t), E_{(d-o)}^*(t), E_{(o-\lambda)}^*(t), E_{(b-e)}^*(t))$ will achieve indicators of the set ideal value of the components of sustainable community development identified by us. Thus, the system of sustainable community development can be implemented in a certain finite time. For such reasons and conclusions, the achievement of sustainable development of territorial communities is possible under the condition of centralized management with the objective of minimizing the time in order to achieve the system.

It is simple in the mathematical dimension; however, everything is much more complicated in the economic and social environment. The first difficulty is determined by the conduct of modern wars, which irrevocably consume most of the resources (primarily human ones). Secondly, the system of capitalist development of the society remains antagonistic, although, in recent decades it has been disguised as a market economy. Thirdly, it is necessary to implement innovative projects for the introduction of natural energy, which would not depend on the political pressure of hydrocarbon and fuel hegemony and the authoritative state dictate in favor of millennial fuel and energy technologies. In modern conditions, the development of territorial communities is traced in the improvement of a synergistic social-economic model in the form of technopolises. However, the direction of such a model has the economic market nature of the implementation of innovative implementations.

At present time, the global trend indicates that the higher the economic development of the country is, the more these growth points are formed and they combine a single national

cluster, which makes it possible to connect different territorial communities. In fact, technopolises attract the resources of local communities and, thus, determine revenues to local budgets (Figure 2).

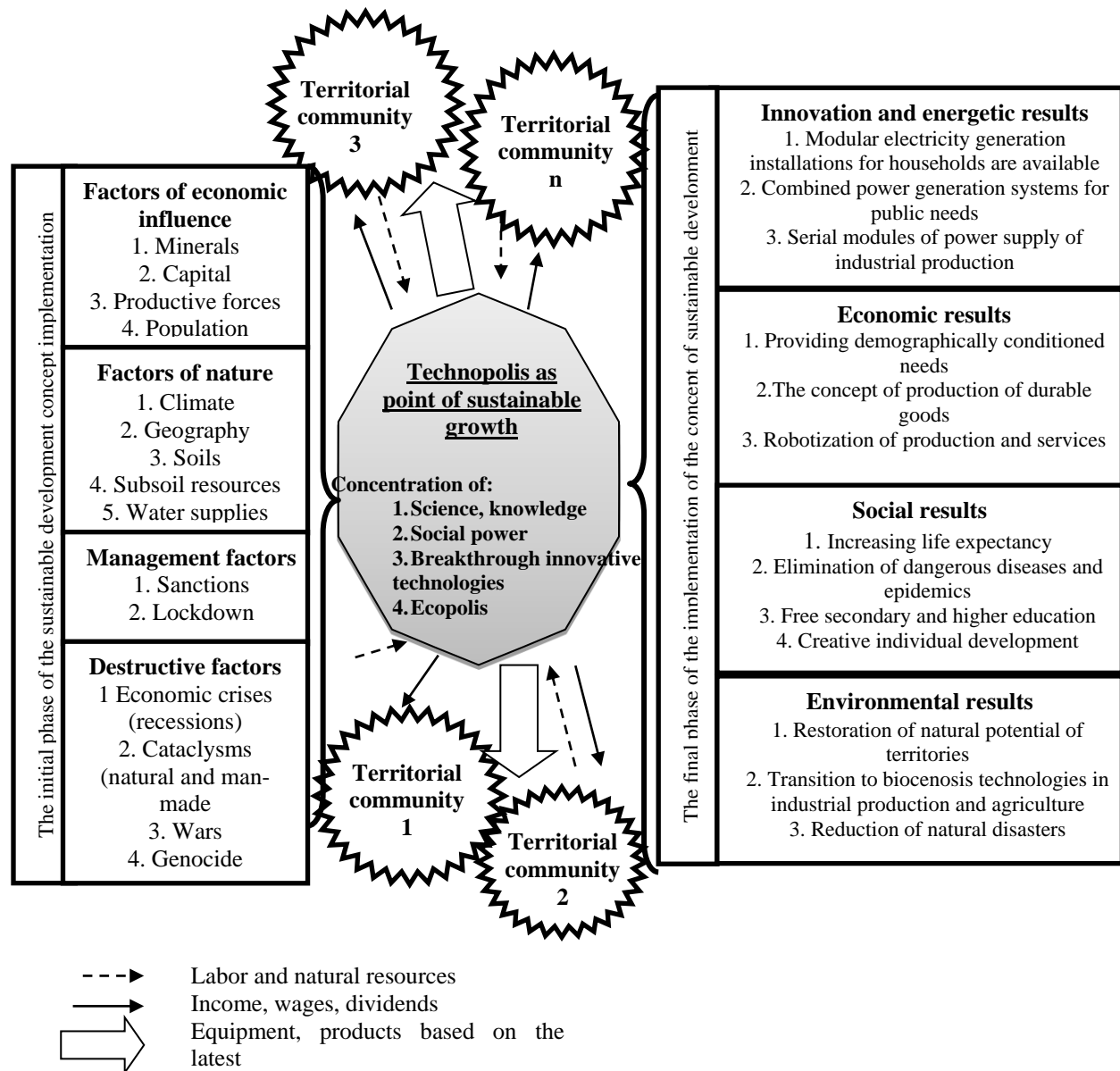


FIGURE 2

MODEL OF IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT CONCEPT OF TERRITORIAL COMMUNITIES IN A CYCLICAL APPROACH

Herewith, solving some social-economic conditions of areas close to the center of the technopolis, they form other socially dangerous phenomena and processes that will eventually exacerbate social contradictions. Consequently, they will eventually cause exacerbation of social contradictions, which will lead, on the one hand, to the desire of all territories to become part of the technopolis, on the other hand, the leadership of the technopolis will be “fenced off” from such an influx of communities.

Manifestations of such contradictions are already observed in China, where rural residents are prevented from moving to financial and industrial centers, as well as the eviction of 140 million people from cities to rural areas. It should be borne in mind that the development of technopolises is located in areas of foreign influence. Therefore, they have been organically assimilated into the economy of the neighboring country, thereby destroying the economic potential of the national economy; they get out of control of public administration and become supranational governance structures outside the territorial communities. Consequently, the system of public administration should form technopolises more or less evenly throughout the country, which will ultimately improve the welfare of the population of territorial communities, as well as include a significant working population in modern information and production processes and implement the principles of economy, sociality and environmental sustainability.

DISCUSSION

Foreign criticism of scientists (Swain, 2017; Eisenmenger et al., 2020) is justified, however, only from the standpoint of market understanding of the economic process and private investment. However, from the viewpoint of global conceptual development of the world community, such criticism is imperfect in understanding the objectivity of deep social transformations of the world. Therefore, there are misunderstandings in the search for sources of financial resources and investment for the comprehensive implementation of the concept of sustainable development (Winkler & Williams, 2017).

There is no objection that sustainable development is based on three components (economic, social and environmental) (Paul et al., 2015), and such position was proven in the present research. Along with this, we agree with scientists about defining the ecological component as the optimal use of natural resources, the possibility of their restoration (Polasky et al., 2019) and preserving the integrity of the ecosystem of territorial communities (Inogwabini, 2019). Therefore, the conceptual vision of ecological transformations of some scientists is limited; what, consequently, can explain the ecological component of sustainable development as narrow and unpredictable in terms of seeing the potential of innovative technologies. The human social system in the European dimension is focused on maintaining the stability of values of the social and cultural dimensions (Duran et al., 2015). At the same time, it does not indicate the possibility of moving to a new higher level without the introduction of certain prohibitions and incentives in the legal system.

Foreign scholars conduct their investigations in highly specialized areas, namely the factor of management barriers to the implementation of sustainable development (Sobol, 2008), the features of the implementation of the principles in EU (Scholz et al., 2016). Thus, there are no comprehensive studies in the implementation of methods and means of implementing sustainable development of territorial communities. Our results mark a system of multilevel trends in the implementation of sustainable development in Europe. By the way, it has been

noted that there is a model of introduction of changes in guaranteeing achievement of the purposes of sustainable development of territorial communities through use of modern innovative points of growth - technopolises.

The limitations of this study are that the development of territorial communities based on the concept of sustainable development and the model of socio-economic development through technopolises is impossible without government support and external financial resources.

CONCLUSION

Despite the national features of the formation and functioning of territorial structures of rural settlements, the possibility of implementing the concept of sustainable development in any country has been mathematically proved. Along with this, the basic economic condition becomes mass introduction of breakthrough technologies of reception of the electric power on the nature-based principles. It is the shift away from traditional hydrocarbon and fuel energy that will ensure high-quality energy consumption and lead to a revision of the economic foundations of management and industrial production.

The analysis of the index of sustainable development of European countries has proven significant achievements in the implementation of the principles of sustainable development of those countries, in which budget expenditures for the maintenance of the armed forces are small (less 1%). After all, countries that have armed conflicts on their territory are not able to implement this concept. Groups of countries on dynamics of introduction of sustainable development of territorial communities are allocated.

It has been noted that the comprehensive implementation of the principles of sustainable development is possible due to the formed points of sustainable growth, which in the modern conditions have been reflected in technopolises. They accumulate natural and labor resources of territorial communities and become the economic basis of their existence through the receipt of funds in local budgets. Along with this, the concentration of education and science there requires an automatic increase in the level of social and environmental security. The end result of such a symbiosis is the implementation of breakthrough - innovative technologies in the area of operation of the technopolis. The problems of attracting investments are moving into the state of operational activity of the technopolis, while the role of public administration is focused on the uniform formation of these growth points throughout the country.

The empirical results of the present research can be used by governments and territorial communities of different countries to develop substantive models of effective achievement on the basis of sustainable development and the trinity of economic, social, and environmental components.

Further research of the problems of implementation of sustainable development concept and principles should be conducted in the following directions: certain groups of countries, forasmuch as they have their own specifics; the expediency of the number of territorial communities in the technopolis; legal substantiation of the process of socialization and greening of the technopolises' territories and prevention of increasing social imbalance in the implementation of sustainable development in the regions of the country.

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