THE "CIRCLES OF SUSTAINABILITY" MODEL AS A TOOL IN ASSESSING THE RESILIENCE OF LOCAL DEVELOPMENT POLICIES IN THE BLACK SEA REGION

Mykola POPOV[*], Ivan KOMAROVSKYI[**]

Abstract

It is proposed to put the concept of local economic development (LED) at the basis of the approach to solving the problem of ensuring resilience development of the territory. However, the insufficient theoretical basis of the concept limits its practical application. To determine the data characterizing the process, it is proposed to use the four domains of "Circles of Sustainability" interaction assessment methodology. The data obtained made it possible to prepare a forecast for the possible potential of the region's territorial resilient.

Keywords: LED, domains of "Circles of Sustainability", resilience development

Introduction

Ensuring the resilience of the territory in conditions of economic, military, and civilizational conflicts is an urgent task that has not received its final solution. For the countries of Eastern Europe, whose territory has become the object of military aggression with the participation of Russia, maintaining resilience is of particular importance.

Despite the participation of a number of EU countries, the USA and international organizations in resolving conflicts, the proposals that were received were insufficient and were not based on a deep analysis of the situation. Therefore, the results of considering the general provisions of the resilience of territories can become the basis for the subsequent development of plans to overcome the crisis.

[*] Mykola POPOV is professor of Public Administration and Regional Studies department of the Regional Institute for Public Administration of the National Academy for Public Administration under the President of Ukraine, Odessa, Ukraine, e-mail: popovmykola67@gmail.com.
[**] Ivan KOMAROVSKYI is PhD candidate of Public Administration and Regional Studies Odessa of the Regional Institute for Public Administration of the National Academy for Public Administration under the President of Ukraine, Odessa, Ukraine, e-mail: i.komarovskyi@oridu.odessa.ua.

Resilience in the narrow sense should be understood as the possibility of maintaining equilibrium during a disturbance with the subsequent restoration of the state that was before. This approach characterizes the ability of the territory to remain resilience in the face of change and continue to develop in an ever-changing environment (Folke, 2016).

The region must not only withstand external influences but also have the ability to adapt, making the necessary changes in the regional structure to ensure territorial resilience. For this, when considering the regional context, it is necessary to proceed from the broader sense of the institutional environment that determines the dynamics of conflict development and the adaptability of the region (Hassink, 2010).

In characterizing the concept of resilience, (Davoudi *et al*., 2012), propose to distinguish:

- resilience, that characterizes the ability to withstand negative external influences and react to them while maintaining the resilient and durability of the territorial system;
- resilience, that is characterized by the ability to adapt to constantly changing conditions, while making the choice of new ways of development.

The adaptability of the territorial system, its capacity for constant renewal, and self-improvement is the main characteristic of territorial resilience. In general, adaptability can be considered as the ability of a country, territory and nations to withstand and recover from shocks, transforming their structures and livelihoods in the face of change, and uncertainty (Mitchell, 2013).

The possibility of external influence is usually defined in terms of its "risk" (Bolis *et al*., 2014). But one should take into account the difference that exists between the "risk of the appearance of external influence" and "the consequences of external influence." Here risk implies probability, and the consequence is an event that happened (OECD, 2014).

It should also be noted such an important characteristic of resilience as its potential (resilience boosting), that characterizes the ability of a territorial system to respond to a negative external impact or provide for the risk of its occurrence, reduce the consequences of impacts or transform them in such a way so that they have less impact on the system (OECD, 2014, p. 13).

To counteract impacts, the resilience potential of a territory can be enhanced by three types of capabilities (OECD, 2014, p. 13):

- absorptive capacity: the ability of the system to prepare for, mitigate or prevent negative external influences using predetermined protective measures to preserve and restore the main basic structures and function;
- adaptive capacity: the ability of a system to regulate, modify, or change its characteristics and actions in order to mitigate potential damage. Adaptability allows avoiding qualitative changes in functional or structural identity;
- transformative capacity (ability to transform): the ability of the territorial system to move to a new quality in which negative external influences will not have an impact.

Thus, it is appropriate to use the term "territorial resilience" when it comes to the property, ability, potential of the structure, and not about its qualitative features and traits.

Empirical studies that are used to study the resilience of territorial systems are limited. An alternative approach is to conduct a study of the resilient of the territory through indicators of sustainable economic development.

This possibility was confirmed in the work presented by (Tanner *et al.*, 2017). This approach allows us to focus on issues such as structural, technical, and political challenges, which are significant for the analysis of processes in the conflict zone.

Considering the possibility of studying resilience based on the analysis of local economic development policies, one should dwell on the relationship between the concepts of "resilience" and "sustainable development". They are characterized by such common features for them as concentration on the qualitative characteristics of the territorial system, its properties, ability, and development potential of the structure of the system.

The complexity of the term "LED concept" makes it possible to link the territorial dimension with the economic, social, environmental, and institutional aspects of the development of the territory, which are among the factors that determine the potential of territorial sustainability. This makes it possible to resilience the use of methods for studying the resilience of the territorial system that have found their application in the analysis of processes of sustainable LED (Swinburn, 2006; World Bank, 2006; Bates, 2011; Wiewel *et al.*, 2011; Ascani *et al.*, 2012).

The relationship between the LED concept and the resilience of the territorial system is also confirmed by the fact that in both cases, the involvement of residents, local politicians, and authorities is imperative. The well-known definitions of LED support this thesis. For example, Canzanelli G. proposes to consider LED as a process of interaction of all stakeholders, which encourages and facilitates cooperation between all stakeholders who jointly define and implement the adopted development strategy, using available local resources (Canzanelli, 2001).

Thus, the possibility of determining sustainability based on the analysis of balancing forces inherent in local territorial systems makes the LED concept attractive for researchers and practitioners of territorial resilience. At the same time, this approach can find its application in the practice of reconciliation of the parties to the conflict, for whom the problems of the economy and social sphere are always significant.

Methods

There are different approaches to studying and measuring resilience (Giacometti and Teräs, 2019). Their distinctive feature is the use of interdisciplinary experience, understanding of current trends in regional development, and binding to time and place.

"Guidelines for resilience systems analysis" (RSA), can serve as a basis for developing a methodology for empirical and case studies of territorial resilience (OECD, 2014). The universality of the research methodology proposed in the manual is determined by the fact that it sufficiently takes into account the risks associated with natural, climatic, economic, and/or geopolitical shocks. This allows the guidance to be used to analyse resilience in relation to various forms of conflict.

The methodology proposed in RSA places particular emphasis on "Good governance: of the resilience research process. Involving not only "Government actors", parliamentarians, and Ministries in the analysis, but also all interested parties allows to develop a common vision of risks and opportunities to counter the impacts.

In the event that a crisis situation has already arisen, the research should be aimed at overcoming the crisis with the least losses. For this, it is necessary to consider and assess the degree of impact on the territorial system of external and internal negative factors, using the following sequence of actions: 1) context analysis; 2) forecast of scenarios of future changes; 3) assessment of the evidence of future changes (OECD, 2014, p. 16).

The study proposes to use the model of interaction four domains ("politics", "economics", "ecology" and "culture") of "Circles of Sustainability" to establish a connection between negative factors of influence and data characterizing economic, social or environmental qualities territory (James, 2014; James, 2015; James *et al*., 2015). According to this model, the territorial system will be considered sustainable provided that the balance between the domains of "Circles of Sustainability" is maintained in the process of their interaction. The influence of external and internal factors will be taken into account when determining the environment (functional fields) in which the domains interact in "Circles of Sustainability" (James *et al*., 2015).

In order to link the territorial dimension with the factors that determine the potential for resilience, the proposed indicators should characterize its qualities such as economy, environment, social sphere, institutional environment, and politics. This will make it possible to establish causal relationships between the influence of external and internal negative factors on the local territory and the potential of its resilience, which is necessary to maintain resilient and adapt to external influences.

Conceptualization of the term of territorial systems resilience

The possibility of changes (in relation to the territorial system) that will lead to a violation of its resilience is determined by a number of factors, among which the following should be highlighted:
a.   the process of evolutionary development;
b.   cyclical development of socio-economic systems;
c.   political confrontation, the presence of a military conflict;
d.   natural disasters;
e.   the negative impact of the activities of the human community on the environment;

f. the nature of market relations, which are based on a combination of competition and risk, potentially turning into a confrontation.

The definition of "territorial resilience" always represents the ability of a territorial system to maintain a dynamic balance, provided its security, resilient, reliability, and integrity are ensured (Hassink, 2009; Giannakis and Bruggeman, 2019). The possibility of its preservation is based on such a quality of the territorial system as an adaptation to changes in the external environment, which in the event of military or ethnic conflicts, natural disasters is the main condition for overcoming the crisis.

The overall resilience of the territorial system, its ability to recover, largely depends on the type of external impact, its nature, and intensity. The risk of exposure is determined by a combination of negative external and internal factors when:
- internal and external factors can act simultaneously;
- internal factors oppose the negative influence of external ones;
- external factors oppose negative internal changes in the territorial system.

To clarify the possible nature of the impact, the proposed OECD classification should be adopted: covariate impacts (episodic events that do not have a systemic nature); unique impacts (events that are specific to a given area); seasonal impacts (events of a systemic nature in their appearance) (OECD, 2014).

Taking into account social, economic, political and geopolitical, as well as natural and environmental factors, will determine the degree of resilience of the territorial system (Campbell-Lendrum *et al*., 2005; Martin, 2012).

Based on the foregoing, it should be concluded that the combination of resilience, security, and adaptability forms the specific qualities of any territorial system. The development of the concept of territorial resilience should be considered dynamic resilience, which should be understood as the ability to operatively self-regulate under the influence of external and internal destructive factors. This includes the ability of the system and its elements to heal itself. The level of dynamic resilience is determined by the aggregate adequate response of both individual elements and the entire territorial system to any changes in internal and external factors.

The dynamic resilience of the territorial system is relative; the result of overcoming crisis situations can be various options for subsequent development. The system can react to ongoing changes by restructuring its structure, using its available adaptive capabilities. At the same time, its integrity remains original. In the case when the available opportunities are not enough to adapt to new conditions, the system moves to a completely different path of development, to a new quality, which requires the search and replacement of its characteristics with new ones (Bonß, 2016; Muštra, 2016).

A possible example of the transition of the territorial system to a new quality is the development of conflicts in Georgia, Moldova, and Ukraine. When the integrity of the territory changed as a result of external military aggression, the system passed into a state of dynamic inresilient. At the same time, the crisis itself

will persist in the long term. But the end result (when the conflict is over) will be the transition of the territorial system to a new quality.

While maintaining the original integrity, the territorial system after the crisis passes to the evolutionary path of development. But for this, it must have the ability to self-organize and self-regulation.

Considering this option, a number of researchers note that even if the territorial system retains its functions, structure, and identity, its ability to withstand external factors requires a certain degree of reorganization and changes (Muštra *et al*., 2016). It should be borne in mind that the resilience of the territorial system is complex and multifaceted (Martin and Sunley, 2015; Sensier *et al*., 2016).

The definition of how to assess the nature of the development of the territory after overcoming the crisis can also be different. For example, the collapse of the Soviet Union, as a territorial system, is assessed by some as a geopolitical catastrophe (Russia), by others as an opportunity to move to an evolutionary path of development (the Baltic countries, Eastern Europe).

Only the attitude of residents of the territory to the problem of overcoming the crisis and the choice (or acceptance) of the direction of its subsequent development can be of decisive importance here. As the experience of the countries of Eastern Europe has shown, many factors that are essential for a stable system (economy, politics, or the environment) can acquire a secondary character.

Thus, the determination of the level of resilience of the territorial system should be based on an assessment of those factors that are key for the target group of residents of the territory.

An integral indicator of territorial resilience is its potential. In general, the potential for resilience can be represented by functional dependence, including factors that characterize: economy, policy, and institutional environment, ecology and environment, cultural and social environment:

$$R_D = f\left(\sum F, D_{\text{politics}}, D_{\text{economics}}, D_{\text{ecology}}, D_{\text{culture}}\right); \qquad (1)$$

where:
- R_D – factor of sustainable development of the territory;
- f – function;
- $\sum F$ – external and internal factors of influence;
- D – domain "politics", "economics", "ecology" and "culture".

A practical determination of the potential for resilience is possible at any stage of development of external influence, including the study of the possibility of overcoming the crisis and restoring the territorial system.

An assessment of individual indicators of the potential of territorial resilience, according to the research methodology under consideration, can be obtained on the basis of an analysis of the values of indicators characterizing the domains "politics", "economics", "ecology" and " culture" of "Circles of Sustainability". Further, the results obtained should be reduced to one integral indicator of resilience. The need for a preliminary determination of the resilience of individual domains is debatable

since the unstable of an individual domain does not allow us to conclude that the entire territorial system is also unstable.

When defining and analysing the values of the domains of "Circles of Sustainability" indicators, it is important to systematize the indicators, since different indicators should characterize the processes occurring in three different systems (man, economy, nature) with different spatial and temporal scales of measurement. Additionally, the indicators should reflect not only the dynamics of the interaction of domains of "Circles of Sustainability", but also the causal relationship between them and the factors that determine the resilience of the territory.

Determining the potential for resilience using the concept of interaction domains of "Circles of Sustainability"

According to the above, to determine the resilience potential of the territorial system in the study it is proposed to use the model of interaction of domains of "Circles of Sustainability" (James, 2014; James *et al.*, 2015). The current values of indicators characterizing the state of domains will be used as initial data: "politics", "economics", "ecology" and " culture". The influence of internal and destructive factors will be considered at the level of interaction of domains in the environment of "functional fields" of "Circles of Sustainability"- F_s^r (Komarovskyi, 2019).

The first step in developing a methodology for determining the level of resilience of the territorial system based on the concept of interaction domains of "Circles of Sustainability" should be to define the concept of "domain" and indicators that characterize its current state and properties (Komarovskyi, 2019).

According to the general approach, the term "domain" in the study is proposed to mean the center of influence of the territorial system, the subjects of which have common properties. To assess the current state of the domain of "Circles of Sustainability" D in the study, it is proposed to use the indicator of the state of the domain $x_{n,m}$. Their values are calculated on the basis of quantitative or qualitative assessment of individual characteristics of the current state of the territorial system. Each indicator has a normal distribution of its values in the coordinate system (n, m). A limited set of evaluation indicators $x_{n,m}$, that related to a specific "domain" - D, is defined in the paper as the potential of the domain $D\left(x_{n,m}\right)$.

Definition 1.

The potential of the "domain",- $D\left(x_{n,m}\right)$ is determined by a limited set of its indicators $\left\{x_{n,m}\right\}$

$$\boldsymbol{D}\left(x_{n,m}\right) = \{x_{n,m} \neq \emptyset\} \in \mathrm{D}, \tag{2}$$

whose value $\left\{x_{n,m}\right\}$ в is determined by its current state.

Definition 2.

A limited set of indicators related to $(x_{n,m}) \in$ **D** is determined by properties that are characteristic only for a given "domain" D.

According to "Definition 2", when analysing the process of overcoming the crisis, individual indicators $x_{n,m}^r \in D\left(x_{n,m}^r\right)$, where r – is the domain number that has common properties, should be grouped in relevant groups. These groups must be assigned to a specific domain.

Generalization of the results of a qualitative and quantitative assessment of the values of indicators $\left\{x_{n,m}\right\}$ allows, taking into account the conditions of the interaction of individual "domains" with each other, to analyse the preconditions for the crisis and determine the beginning of the crisis. Renewal of the territorial system.

The interaction of domains of "Circles of Sustainability" is regulated by the institutional environment, traditions, social practice, private interests, etc., which is reflected by the corresponding "functional fields" of "Circles of Sustainability" - F_s^r, where s – is the type of functional field, r is the domain number.

The functional fields of the interaction of the domains of "Circles of Sustainability" in the context of the study of the resilient of the territorial system have the following characteristics (James, 2015; Komarovskyi, 2019).

1. The field of identification of the subjects of interaction. Each participant in the interaction process identifies himself in the partnership according to his expectations, needs, and available resources. The parameters according to which the participants of the interaction are identified are:
- strategic vision of approaches to overcoming the crisis;
- mission - the purpose of the subjects of interaction on a local and global scale, their socially significant role;
- system of values in the territorial dimension;
- attitude to the sources of the conflict, the conditions for overcoming it, and the type of further development, evolutionary or adaptive.

2. Field of mutual expectations. When overcoming a conflict, there is usually a problem of mutual expectations on the part of the parties involved in the process.

3. An important prerequisite here is the nature of the conflict and how local residents perceive it. It depends on how the territorial system will transition to a state of dynamic resilient, according to which it will adopt a new quality or the crisis will persist in the long run.

4. The field of resources and opportunities includes the whole set of tangible and intangible resources of the parties to the interaction needed to overcome the crisis.

5. The field of mechanisms of interaction reflects the ways of influence of the domain "institution" on the state of resilient of the territorial system.

6. The communication field includes the representing information space necessary for the application of mechanisms of interaction of domains of "Circles of Sustainability".

The management of the crisis exit process by the government or local authorities is reflected in the domain of the "politics". The relationship between the

control mechanisms, the values of the indicators $x^r_{n,m} \in D\left(x^r_{n,m}\right)$, which characterize the state of the domains of "Circles of Sustainability" and $\sum F$ is realized in the environment of functional fields - F^r_s. In their multidimensional variation, one or another variant of the process of dynamic resilient of the territory is formed and realized.

Thus, the representation of the dynamic resilient of the territorial system by a limited set of indicators $x^r_{n,m} \in D\left(x^r_{n,m}\right)$, is essentially a qualitative characteristic of the process of overcoming the crisis, given the constraints imposed by the conditions of interaction between domains in the environment of functional fields F^r_s (Komarovskyi, 2019).

Each process of beginning, overcoming, and exit from the state of crisis has its initial - $\mathcal{V}_{n,m}$ and final - $\mathcal{W}_{n,m}$, variants of the current state. In the general case, the set of variants of dynamic resilience $\{\mathcal{W}_{n,m}\}$ can be characterized by the distribution of the conditional probability $p\left(\mathcal{W}_{n,m}\big/\alpha, \tau, \varphi, \theta\right)$, where the possibility of obtaining $\mathcal{W}_{n,m}$ is determined by the functional dependence on a number of indirect external and internal factors α, τ, φ, θ that affect the process of emergence and overcoming the crisis:

α - the main factors of influence. The set of conditions that characterize the preconditions for the crisis;

τ - is the adaptation potential. These should first include the adaptive capabilities of the system necessary for the transition to the evolutionary direction of development;

φ - destructive factors. Systemic or non-periodic events that led to the crisis and are able to largely determine the directions of further development of the crisis overcoming process, evolutionary or state of dynamic resilient;

θ - random factors. Events that occur by chance and have a normal distribution.

If $\mathcal{W}_{n,m}$ is a function of the listed influencing factors

$$\mathcal{W}_{n,m} = f(\alpha, \tau, \varphi, \theta) , \tag{3}$$

then to reduce the dependence of $\mathcal{W}_{n,m}$ on θ it should be assumed that the influence of the random factor θ on the process $\mathcal{W}_{n,m}$ should be much weaker than the influence of factors such as α, τ and φ, the variance of the random factor $\sigma\theta \cong 0$

Under such conditions (3) can be reduced to the form

$$\mathcal{W}_{n,m} = \Phi_{n,m}(\alpha, \tau, \varphi) + \theta, \tag{4}$$

where:

- $\varphi_{n,m}(\alpha, \tau, \varphi)$ multidimensional function, which describes the process of transition from the initial state of crisis $\mathcal{V}_{n,m}$ to a specific variant of development of the territory (evolutionary or dynamic inresilient) $\mathcal{W}_{n,m}$;

- θ event, the probability of which is determined by the law of normal distribution p (θ).

Knowledge of the type of distribution of factors influencing α, τ, φ, and θ will allow to draw a conclusion about the degree of their influence on the process of emergence and overcoming the crisis and to classify them (see Figure 1).

Determination of conditions that affect the course of the process of overcoming the crisis and the final state of the territorial system $\mathcal{W}_{n,m} \in \{\mathcal{W}_{n,m}\}$, according to the type of distribution $p\left(\mathcal{W}_{n,m}/_{\alpha, \tau, \varphi, \theta}\right)$, which characterizes the functional dependence $\varphi_{n,m}(\alpha, \tau, \varphi)$ of the implementation $\mathcal{W}_{n,m}$, is possible only on the basis of quantitative and qualitative research not only $\mathcal{V}_{n,m}$, but also the factors of influence α, τ, φ. Their result should be to determine the type of function $\varphi_{n,m}(\alpha, \tau, \varphi)$, which represents the process of transition from the initial conditions $\mathcal{V}_{n,m}$ to a specific state $\mathcal{W}_{n,m}$:

$$\varphi_{n,m}(\alpha, \tau, \varphi): \mathcal{V}_{n,m} \mapsto \mathcal{W}_{n,m} \in \{\mathcal{W}_{n,m}\}. \tag{5}$$

Figure 1. Interaction between size and heterogeneity of clusters over the life cycle.
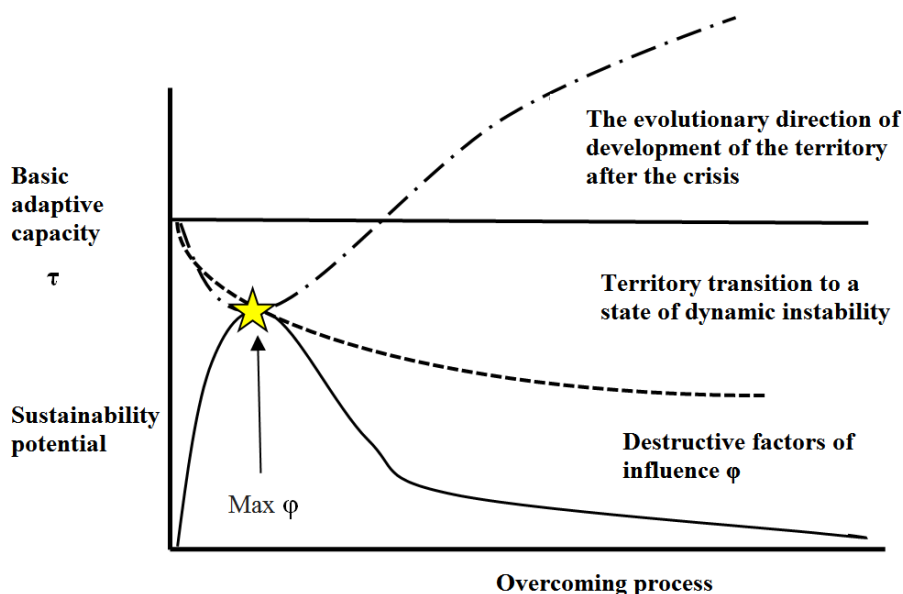
Source: authors' representation

As noted, the system will either respond to change by restructuring its structure, using its existing adaptive capabilities, or the existing capabilities will be insufficient to adapt to new conditions, which will lead to a transition to a state of dynamic inresilient.

In practice, determining the distribution $\left(\mathcal{W}_{n,m} \middle/ \alpha, \tau, \varphi, \theta \right)$, as a factor in obtaining a specific implementation of $\mathcal{W}_{n,m}$ and preparing on its basis a forecast of the way out of the crisis is a rather difficult task. Its solution is due to the need to simultaneously take into account numerous and independent factors influencing (α, τ, φ, θ) on quantitative or qualitative indicators $x_{n,m}^r \in D\left(x_{n,m}^r \right)$, where r is a separate domain.

Under such conditions, a possible approach may be to present the crisis exit process in separate stages, which will significantly reduce the dimension of the distribution $\left(\mathcal{W}_{n,m} \middle/ \alpha, \tau, \varphi, \theta \right)$ and the number of influencing factors that need to be investigated (Komarovskyi, 2019).

In the process of interaction of domains of "Circles of Sustainability" in the environment of functional fields F_s^r is a limited set of indicators domains $x_{n,m} \in \{ x_{n,m}^{\mathcal{V}} \}$ in the set of new values of these indicators, which are characteristic for the final version of the process of overcoming the crisis $\{ x_{n,m}^{\mathcal{W}} \}$. This mapping, which is the result of the interaction of indicators representing the corresponding domains of "Circles of Sustainability" in the environment of functional fields $F_s^r \in D\left(x_{n,m}^r \right)$, can be described as the result of applying the interaction operator $\mathcal{H}_f$ to multidimensional functions $\phi_{n,m}(\alpha, \tau, \varphi)$. It should also be borne in mind that the values of each of the indicators will be functionally determined by the initial conditions of response to the crisis.

According to this approach, the process of overcoming the crisis $\mathcal{W}_{n,m}$ can be described as the result of applying the interaction operator $\mathcal{H}_f$ to an array of values $\{ x_{n,m}^{\mathcal{V}} \}$:

$$\{ x_{n,m}^{\mathcal{W}} \} \in \{ \mathcal{W}_{n,m} \} = \mathcal{H}_f \left(\{ x_{n,m}^{\mathcal{V}} \} \in \{ \mathcal{V}_{n,m} \} \right) \tag{6}$$

Each of the implementations $\{ \mathcal{W}_{n,m} \}$, is characterized by its unique multidimensional k - distribution of indicators (quantitative and qualitative values of indicators), the set of which ultimately determines the resulting version of the process $\mathcal{W}_{n,m}^k$.

According to (6), the methodology of analysis of the process of formation of dynamic resilience of the territory is proposed to represent the process of crisis development as a sequence of two main stages determined by the respective operators: generating or initiating crisis - $\mathcal{H}_{f\text{ген}}$ and overcoming it - $\mathcal{H}_{f\text{под}}$:

$$\mathcal{H}_f = \mathcal{H}_{f\text{ген}} + \mathcal{H}_{f\text{под}} \tag{7}$$

A practical determination of the crisis is possible based on the results of a qualitative or quantitative assessment of indicators of domains of "Circles of Sustainability", presented in the space $D\left(x_{n,m}^r\right)$, functional fields F_s^r and taking into account the factors α and τ.

In turn, the stage of overcoming is characterized by the process of crisis development and its end result $\mathcal{W}_{n,m}$. Accordingly, it will be determined:

1. direct process of interaction of domains of "Circles of Sustainability $D\left(x_{n,m}^r\right)$ in the environment of functional fields;
2. directions of territory development (evolutionary or dynamic inresilient), - $\mathcal{W}_{n,m}$, which is characterized by a limited set of indicators $\left\{x_{n,m}^{\mathcal{W}}\right\} \in \left\{\mathcal{W}_{n,m}\right\}$;
3. conditions and current state of development of the crisis process, characterized by the factors of influence τ, φ, and θ;
4. the influence of management mechanisms by state and local authorities.

Both of the considered stages of the analysis of the process of beginning and overcoming the crisis can be presented as a common functionality from a set of indicators representing domains. Accordingly, (7) can be reduced to the functional (8), where to a limited set of indicators representing the initial state $\{x_{n,m}^{\mathcal{V}}\}$, the generation operator $\mathcal{H}_{f\text{ген}}$, is applied, and to the indicators that determine the process interaction domains of "Circles of Sustainability" operator $\mathcal{H}_{f\text{под}}$:

$$\mathcal{H}_f \{x_{n,m}^{\mathcal{V}}\} = \mathcal{H}_{f\text{под}} [\mathcal{H}_{f\text{ген}} (\{x_{n,m}^{\mathcal{V}}\}, (\alpha, \tau)) + \varphi + \theta] \tag{8}$$

Qualitative values of indicators can be obtained as a result of expert assessments of their significance and level of influence on the studied process in the form of qualitative indicators characterizing domain - $D\left(x_{n,m}^r\right)$.

Any result of the process of overcoming the crisis can be represented by its implementation $\mathcal{W}_{n,m} \in \left\{\mathcal{W}_{n,m}\right\}$, which is characterized by a multidimensional function $\phi_{n,m}(\alpha, \tau, \varphi)$ depending on external and internal factors impact. Thus, (8) can be reduced to the form (9):

$$\mathcal{W}_{n,m} \in \left\{\mathcal{W}_{n,m}\right\} \equiv \phi_{n,m}(\alpha, \tau, \varphi) (\{x_{n,m}^{\mathcal{V}}\}) \tag{9}$$

In its content, the functional (9) is an indicator that can consider (which characterizes) the resilience potential of the territorial system.

Indirect qualitative assessment of influencing factors is reflected in the definition of indicators representing the potential of individual domains $D\left(x_{n,m}^r\right)$. The difference between the initial values $\{x_{n,m}^{\mathcal{V}}\}$ and the indicators of the achieved level of development $\left\{x_{n,m}^{\mathcal{W}}\right\} \in \left\{\mathcal{W}_{n,m}\right\}$ is a characteristic of the achieved level of development. It is clear that uncoordinated interaction of functional fields F_s^r, the

conditions of which are determined by current factors of influence (α, τ, φ, θ) and influence on the process of overcoming the crisis of random factors can lead to a mismatch of the obtained state of the predicted variant (evolutionary or dynamic inresilient) . This deviation can be estimated through the value of the deviation $\mathfrak{S}_{\text{реал}}$.

According to (9), if after the transition from $\{\mathcal{V}_{n,m}\}$ to $\{\mathcal{W}_{n,m}\}$ the value of the decisive function $\phi_{n,m}\,(\alpha, \tau, \varphi)$ is preserved

$$\phi_{n,m}\,(\alpha, \tau, \varphi)\,(\{x_{n,m}^{\mathcal{V}}\})\,\Longmapsto (\mathcal{W}_{n,m}^{\text{прог}}), \quad \text{то} \quad \mathfrak{S}_{\text{реал}} = 0 \tag{10}$$

Under such conditions, the influence of existing factors will not disrupt the process of overcoming the crisis. Otherwise, when there is a discrepancy between the result of applying the decisive function $\boldsymbol{F}_{\text{p}}\,\{\mathcal{W}_{n,m}\}$ and the actual implementation $\mathcal{W}_{n,m}$,

$$(\mathcal{W}_{n,m}^{k})\,\notin (\mathcal{W}_{n,m}^{\text{прог}})\,\text{та}\,\mathfrak{S}_{\text{реал}} > 0, \tag{11}$$

then it can be concluded that the process of overcoming the crisis has moved to a state of dynamic inresilient.

The calculation of the values of the indicators for substitution in (10) is a problem that may not always have a complete solution. In this regard, the study proposes an approach in which min $\mathfrak{S}_{\text{p}}$ is carried out by reducing the dimensionality of the space of indicators $\{x_{n,m}^{\mathcal{V}}\}$, (measures to overcome the crisis). Such operations can be carried out in two ways: at the stage of developing plans to overcome the crisis (formation of $\mathcal{W}_{n,m}$) or by imposing restrictions on the potential of individual domains of influence $D\,(x_{n,m}^{r})$. This approach will reduce the number of possible options for overcoming the crisis at the stage of transition from $\mathcal{V}_{n,m}$ to the implementation $\mathcal{W}_{n,m}$.

An additional measure to reduce the dimension of the space of indicators $\{x_{n,m}^{\mathcal{V}}\}$ may also be to reduce the number of development options by reducing or even eliminating indicators that may lead to conflict in the interaction of domains of "Circles of Sustainability".

The results of the generalization of the above, taking into account the proposed OECD sequence of actions: context analysis; forecast of scenarios of future changes; evaluation of evidence of future changes, allows us to propose a block diagram of the analysis of the process of emergence and overcoming the crisis (OECD, 2014), (see Figure 2).

Figure 2. Block diagram of the analysis of the territorial system crisis process
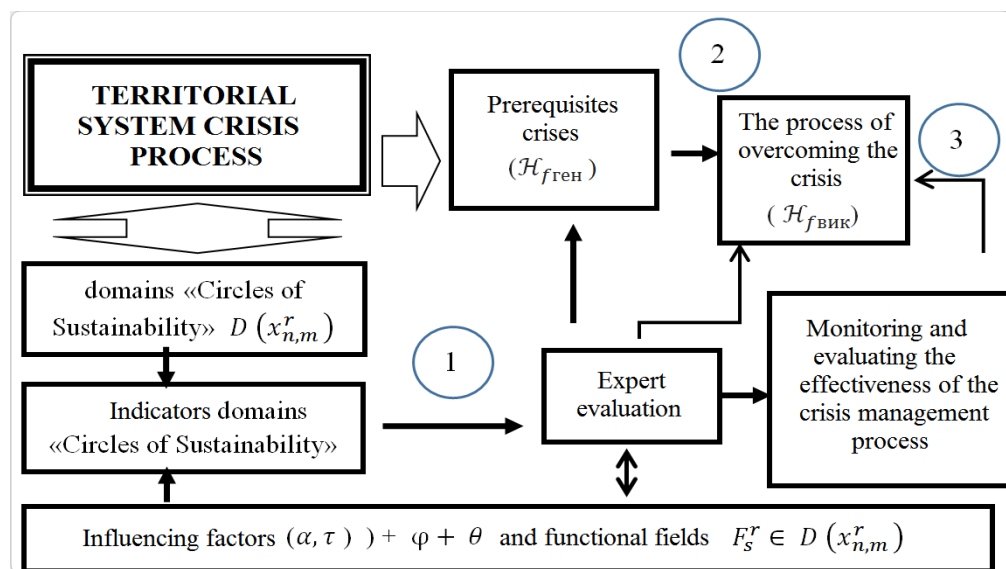
Source: Komarovskyi, I. (2019)

According to Figure 2, the analysis of the territorial system crisis process:

① context analysis, which includes the definition and analysis of types of domains $D\left(x_{n,m}^r\right)$, indicators $\{x_{n,m} \neq \emptyset\} \in \mathbf{D}$, influencing factors $(\alpha, \tau)) + \varphi + \theta$, conditions of the interaction of factors of influence with functional fields $F_s^r \in D\left(x_{n,m}^r\right)$. The results of the analysis serve as the basis for conducting an expert assessment and determining the causes of the crisis in the territorial system.

② forecast of scenarios of future changes: depending on the magnitude of the deviation $\mathfrak{S}_{\text{реал}}$: **the evolutionary direction of development** $\mathfrak{S}_{\text{реал}}. = 0$; **transition to the state of dynamic inresilient** $\mathfrak{S}_{\text{реал}}. > 0.$

③ assessment of evidence of future changes: the state of resilience depending on the ratio of adaptive potential and the level of destructive factors of influence

As evidenced by the above, the use of the concept of interaction domains of "Circles of Sustainability" "allows not only to improve the efficiency and potential of crisis management but also to determine the effectiveness of the process of overcoming the crisis.

As established in the paper, each of the domains has its own set of indicators $\{x_{n,m}^v\}$, the set of which reflects the features and priorities of plans to overcome the crisis and determines the conditions of interaction domains of "Circles of Sustainability". Therefore, the study of indicators $\{x_{n,m}^v\}$ should be the first step in the methodology to study the process of overcoming the crisis.

The calculation of the values of the indicators $\mathcal{W}_{n,m}$ в (11) is a problem that may not always have a complete solution. In this regard, the paper proposes an approach in which $\min \mathfrak{S}_p$ is carried out by reducing the dimension of the space of

indicators $\{x_{n,m}^{\mathcal{V}}\}$ (crisis generation). Such operations can be carried out in two ways: at the stage of establishing the fact of the crisis and developing plans to overcome the crisis (formation of $\mathcal{W}_{n,m}$) and by imposing restrictions on the potential of individual domains of influence $D\left(x_{n,m}^{r}\right)$. This approach will reduce the number of possible options at the stage of transition from $\mathcal{V}_{n,m}$ to its implementation $\mathcal{W}_{n,m}$.

An additional measure may be to forecast the highest probability of the option, which will also reduce the number of indicators that characterize the crisis. Adoption of such an option provided that $(\mathcal{W}_{n,m}^{k}) \notin (\mathcal{W}_{n,m}^{\text{прог}})$, allows you to optimize plans to overcome the crisis in this way

$$\text{Arg}\,(\mathcal{W}_{n,m}^{\text{прог}}) = \ min_{k \to 1}\,(\mathcal{W}_{n,m}^{1}, \mathcal{W}_{n,m}^{2} .., \mathcal{W}_{n,m}^{k}) \qquad (12)$$

Implementation (12) will minimize the risk of the crisis management process and its effectiveness.

Data. Assessment of territorial resilience of the Black Sea region of Ukraine (Odessa region)

A number of countries in the Black Sea region in recent decades have become territories of conflict and military confrontation. Particularly significant in this regard are Russia's aggressive actions against Ukraine, military actions in the Donbas, and attempts to destabilize in the south, which pose a threat to the adjacent territories of Moldova and Romania.

To determine the level of resilience of the Black Sea region of Ukraine (Odessa region), it is proposed to use the previously considered concept of interaction domains of "Circles of Sustainability". Its practical application will be based on the recommendations of the OECD, which suggest the following order of research on territorial resilience, Step 1-3 (OECD, 2014):

Step 1. Analysis of the context.
The basis of the study of territorial resilience is the data characterizing the domains of "Circles of Sustainability". The list of domains that will adequately meet the objectives of the study was obtained on the recommendation of a group of experts. It includes:
- Domain 1 "Economic Aspects of Resilience".
- Domain 2 "Social Aspects of Resilience".
- Domain 3 "Environmental Aspects of Resilience".
- Domain 4 "Institutional Aspects of Resilience".

The optimal list of domain indicators was established based on the results of a survey of residents of the Odesa region. Examples of questionnaires presented in (James *et al.*, 2015), "Table 3: Questionnaire designed to collect existing and lacking assets/capital that are relevant for the regional resilience analysis", "Table 4" were

also taken into account: Questionnaire designed for collecting information about regions' 'capacities'», (Giacometti and Teräs, 2019, pp. 22-23).

Expert assessment methods, rating assessment of statistical data, and sociological survey data were used for data collection. For a preliminary assessment of the data obtained in the context of the study of territorial resilient, there were involved experts as representatives of domains, whose activities are related to ensuring the resilience of the region and its sustainable development:

- Domain 1: representatives of business, investors, and international experts, financial institutions.
- Domain 2: representatives of public organizations working in these areas.
- Domain 3: representatives of public organizations operating in these areas).
- Domain 4: officials of PU bodies, state organizations, whose activities are related to territorial development programs.

The generalization of the results of processing the obtained data and their reduction to specific domains allowed to establish the relative value for each of the indicators in balls (1-100), (see Table 1).

Table 1. Indicators domains of "Circles of Sustainability" in the study of the resilient of the territory

Domain	Indicator (question of the questionnaire)	Score in balls
Domain 1 "Economic Aspects of Resilience"	1. availability of business development infrastructure;	65
	2. in the region there are branches of production attractive for investments	80
	3. there is an opportunity to sell assets in which financial resources are invested;	40
	4. the strategy of economic development corresponds to its competitive potential	65
	5. the possibility of integration into foreign markets is provided by the existing economic potential	70
Domain 2 "Social Aspects of Resilience"	1. the presence of a familiar social and cultural environment;	80
	2. the general level of education of the population and the possibility of training;	60
	3. availability of affordable housing and the level of development of the service sector	85
	4. the ability to promptly receive qualified medical care;	70
	5. lack of discrimination based on religious beliefs, cultural traditions	90
Domain 3 "Environmental Aspects of Resilience"	1. environmental pollution;	55
	2. natural and environment corresponds to the usual habitat;	70

	3. flora and fauna have retained their natural originality;	60
	4. minerals and energy resources;	75
	5. infrastructure and industrial facilities harmonize with the environment;	80
Domain 4 "Institutional Aspects of Resilience"	1. participation of public administration bodies in the creation of infrastructure necessary for the implementation of development projects;	80
	2. guarantees of preservation of conditions of financial activity, irrespective of change of the political and economic legislation;	65
	3. the level of corruption in local public administration bodies that provide administrative services;	60
	4. respectful attitude and non-interference in doing business by civil servants (officials, customs officers, tax inspectors, fire inspectorate, etc.);	60
	5. participation of public administration bodies in the creation of infrastructure necessary for the implementation of development projects;	75

Source: authors' representation

As it has been established that the risk of an impact is determined by a combination of external and internal impact on the territorial system. With the involvement of experts, a list of the most significant factors that could lead to a crisis in the Black Sea region was established. Qualitative assessment was performed using to clarify the value of the indicator coefficients, the choice of which was carried out in accordance with the conditions: constant resilient (0.9); dynamic resilient (0.8); good (0.7); very satisfactory (0.6); satisfactory (0.5); unsatisfactory (0.4); extremely unsatisfactory (0.3); bad (0.2); critical condition (0,1), (see Table 2).

Table 2. Factors influencing the territorial system of the Black Sea region

Factor type	Determination of the factor	Score in balls
The main factor	1. low level of competitiveness of local production, goods, and services;	0,2
	2. restrictions on entering foreign markets;	0,4
	3. isolated cases of confrontation on a linguistic and ethnic basis;	0,9
	6. labor outflow	0,4
	7.crisis of the public administration system	0,7
	8 permanent political crisis	0,6
Adaptive potential	1. natural resources;	0,8
	2. developed infrastructure;	0,8
	3.acceptance of European integration priorities	0,9

	4. availability of a sales market for technological products;	0,3
	5.Visibility of discrimination for religious changes, cultural traditions	0,9
Destructive factors	1. military conflict in the east of Ukraine;	0,1
	2. political and institutional crisis;	0,3
	3. economic crisis;	0,4
	4. hybrid policy of Russia;	0,3

Source: authors' representation

Step 2. Forecast of scenarios of future changes.

The set of data presented in Table 1 and Table 2, representing the territorial dimension, in the study is considered as a basis for assessing the resilience potential of the study area. According to the model of balance between domains of "Circles of Sustainability", the criterion of a sufficient level of resilience is the balance between the values of the indicators of each of the domains.

To determine this equilibrium, the data obtained are presented in the form of a petal diagram, (see Figure 3).

Figure 3. Resilience analysis for the Black Sea region of Ukraine (Odessa region)
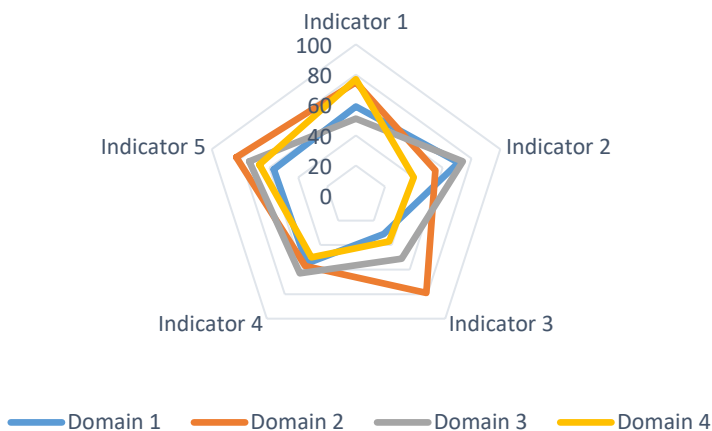
Source: authors' representation

From the diagram presented in Figure 4, it is seen that the positioning of the circles representing the individual domains is not in a single plane. Thus, it is possible to draw a reasonable conclusion that the region is in dynamic inresilient.

3) Step 3. Assessing evidence of future changes.

The survey established not only the list of evaluation indicators but also the level of their significance for ensuring the sustainability of the region, according to which it is evaluated by experts.

The data correction made it possible to determine the range of values characterizing the territorial resilient of the Black Sea region of Ukraine (Odessa region), depending on the possible variants of external influences.

Using the example of the development of military conflicts in Ukraine, Georgia, and Moldova, one can show how their nature changes over time. The beginning of the conflict is a unique event that has a specific form due to the participation of Russia and the place of its beginning. Its development is a sequence and combination of covariant and seasonal influences.

Extending the main provisions of territorial resilient to the situation in the conflict zones in Georgia, Moldova and Ukraine, it should be noted that in the event of external military aggression, their potential for territorial resilience has the following features:

- the emergence, development, and spread of the conflict led to significant changes in the ecology, economy, social sphere, not only in the region where it arose but also in the deep crisis of the conflict countries;
- the existing ability of the countries of conflict to adapt, allowed them to implement the necessary qualitative changes in the regional structure;
- in the event of a military conflict, there is no potential for territorial resilience that can maintain the resilient and durability of the territorial system;
- in conditions of long-term preservation of the state of conflict, the possibility of increasing the potential for the resilience of the territory should be based on the following provisions: a military conflict excludes absorptive capacity; the use of adaptive capacity is a real opportunity for the territorial system to mitigate potential damage; transformative capacity, due to the local nature of the conflict, has a limited character.

Conclusions

The possibility of studying the resilient of the territorial system in some cases is limited by situations that have arisen in the crisis zone. Natural disasters, epidemics, or military conflicts often make it impossible to conduct any empirical research. A possible way out is to obtain an indirect assessment, which will be based on the degree of influence of the crisis situation on adjacent territories.

A reliable study of the resilience of the territorial system is possible on the basis of a comparative analysis of quantitative and qualitative data linking the territorial dimension with external and internal factors of influence. But the nature of these data is different, which in some cases does not allow obtaining a final integral estimate of the resilient potential.

The study shows that the inconsistency arising from the combination of qualitative and quantitative data of a different nature can be solved by applying the domains of the "Circles of Sustainability" interaction model.

Wherein:

- the use of the model of interaction and balance of domains of "Circles of Sustainability" corresponds to the accepted definition of the concept of "territorial resilience", according to which the dynamic balance of the characteristics of the territorial system is a condition for ensuring its security, resilience, reliability and integrity;
- using the LED concept to establish cause-and-effect relationships between the influence of external and internal negative factors on a local territory and the potential of its resilient, to allow determining the level of its resilience and the possibility of adaptation to external influences;
- involvement of "Government actors", parliamentarians, and Ministries, as well as all stakeholders in the process of analyzing the characteristics of territorial resilience, is a prerequisite in order to develop a common vision of risks, resilience and development priorities for the territory for the future;
- the condition of balance between domains reduces the contradiction between their interests, priorities, and goals, which is a potential source of conflict, destructive forms of interaction and may ultimately lead to a decrease in the level of territorial resilience;
- qualitative and quantitative data characterizing domain indicators allow for a detailed examination and determination of the degree of impact on the territorial system of external and internal negative factors of influence, to obtain an objective assessment of the crisis situation and to prepare a forecast of its development for the future;
- evaluation indicators representing the relevant "domains" have different significance from the point of view of the participants in the process of implementation of development programs and in each case should be evaluated separately using the appropriate significance factors.

Of course, the possible approach presented in the article to solving the problem of resilience of spatial development of a territory is not a complete study. The urgency of the problem of regional development remains.

References

Ascani, A., Crescenzi, R. and Iammarino S. (2012), *Regional Economic Development: A Review,* Department of Geography and Environment London School of Economics and Political Science, WP1/03 Search Working Paper, January 2012, 27 p.

Bates, T. (2011), Theories of Entrepreneurship, in: Bingham, R.D. and Mier, R. (Eds.), *Theories of Local Economic Development, Perspectives from Across the Disciplines*, Sage Publications, pp. 48-62.

Bonß, W. (2016), The notion of Resilience: Trajectories and Social Science Perspectives, in: Mauer, A. (Ed.), *New Perspectives on Resilience in Socio-Economic Spheres*, Springer VS. E-book. pp. 9–24.

Bolis, I., Morioka, S. and Szneiwar, L. (2014), When sustainable development risks losing its meaning. Delimiting the concept with a comprehensive literature review and a conceptual model, *Journal of Cleaner Production,* 83, pp. 7–20.

Canzanelli, G. (2001), Overview and learned lessons on local economic development. *Human Development and Decent Work*, Geneva, ILO and Universitas Working Paper (retrieved from http://www.ilo.org/public/english/universitas/publi.htm).

Campbell-Lendrum A., Holloway, T. and Foley, J. (2005), Impact of regional climate change on human health, *Nature*, 438(7066), pp. 310–317.

Davoudi. S, Shaw. K., Haider, L. J., Quinlan, A. E., Peterson, G. D., Wilkinson, C., Fünfgeld, H., McEvoy, D., Porter, L. and Davoudi, S. (2012), Resilience: A Bridging Concept or a Dead End? "Reframing" Resilience: Challenges for Planning Theory and Practice Interacting Traps: Resilience Assessment of a Pasture Management System in Northern Afghanistan Urban Resilience: What Does it Mean in Planning Practice? Resilience as a Useful Concept for Climate Change Adaptation?, *The Politics of Resilience for Planning: A Cautionary Note, Planning Theory & Practice,* 13(2), pp. 299-333.

Folke, C. (2016), Resilience (Republished), *Ecology and Society,* 21(4), p. 44.

Giannakis, E. and Bruggeman, A. (2019), Regional disparities in economic resilience in the European Union across the urban–rural divide, *Regional Studies*, 54(9), pp. 1200-1213.

Giacometti, A. and Teräs, J. (2019), Regional Economic and Social Resilience: An Exploratory In-Depth Study in the Nordic Countries, *Nordregio Report*, 2019(2), Prepared on behalf of the Nordic Thematic Group for Innovative and Resilient Regions 2017–2020, 94 p. (retrieved from http://norden.diva portal.org/smash/get/diva2:1292899/Full Text 01.pdf).

Hassink, R. (2010), Regional Resilience: A Promising Concept to Explain Differences in Regional Economic Adaptability?, *Cambridge Journal of Regions, Economy and Society*, 3(1), pp. 45–58 (retrieved from https://www.researchgate.net/publication/ 46512981_Regional_Resilience_A_Promising_Concept_to_Explain_Differences_ in_Regional_Economic_Adaptability).

Hassink, R. (2009), Regional Resilience: A Promising Concept to Explain Differences in Regional Economic Adaptability?, *Cambridge Journal of Regions Economy and Society,* 3(1), pp. 45-58.

James, P., Magee, L., Scerri, A. and Steger, M. B. (2015), *Urban Sustainability in Theory and Practice,* London: Rutledge.

James, P. (2014), Urban Design for the Global South: Ontological Design in Practice, Eleni Kalantidou and Tony Fry, *Design in the Borderlands,* Routledge, London, 2014.

James, P. (2015), Urban Sustainability in Theory and Practice: Circles of Sustainability. (retrieved from: http://www.circlesofsustainability.org/wp-content/uploads/2014/10/Ch-08-Circles-Questionnaire-2015.pdf.)

Komarovskyi, I. (2019), Quality assessment methodology of interaction of «domains of influence» in the process of local economic development, *Public Administration and Local Government*, 1(40), pp. 65-73.

Martin, R. (2012), Regional economic resilience, hysteresis and recessionary shocks', *Journal of Economic Geography,* 12(1), pp. 1–32.

Martin, R. and Sunley, P. (2015). 'On the notion of regional economic resilience: conceptualization and explanation', *Journal of Economic Geography*, 15(1), pp. 1–42.

Martin, R., Sunley, P., Gardiner, B. and Tyler, P. (2016), How Regions React to Recessions: Resilience and the Role of Economic Structure, *Regional Studies,* 50(4), pp. 561-585.

Mitchell, A. (2013), Risk and Resilience: From Good Idea to Good Practice, *OECD Development Assistance Committee Working Paper* 13/2013, OECD Publishing.

Muštra, V., Šimundić, B. and Kuliš, Z. (2016), *Effects of smart specialization on regional economic resilience in EU,* First SMARTER Conference on Smart Specialisation and Territorial Development: Changing Patterns of Territorial Policy: Smart Specialisation & Innovation in Europe.

OECD (2014), *Guidelines for resilience systems analysis,* (RSA), OECD Publishing, 2014.

Sensier, M., Bristow, G. and Healy, A. (2016), Measuring Regional Economic Resilience across Europe: Operationalizing a complex concept, *Spatial Economic Analysis,* 11(2), pp. 128–151.

Swinburn, G. (2006), Local economic development (LED), LED Quick Reference, *Prepared by Urban Development Unit,* The World Bank Washington, DC (retrieved from: https://www.shareweb.ch/site/EI/Documents/PSD/Topics/Local%20Economic%20Development/Worldbank%20-%20Quick%20Reference-%20Local%20Economic%20Development%20-%202006%20(en).pdf).

Tanner, T., Bahadur, A. and Moench, M. (2017), *Challenges for resilience policy and practice*, London: Overseas Development Institute (retrieved from: https://www.odi.org/sites/odi.org.uk/files/resource-documents/11733.pdf).

Wiewel W., Teitz M. and Gilot R. (2011), The Economic Development of Neighborhoods and Localities, *Theories of Local Economic Development. Perspectives from Across the Disciplines,* in: Richard, P. B. and Robert M. (Eds.), Sage Publications, pp. 16-25.