“Assessment of the population’s social resilience environment (the case of the Carpathian region of Ukraine)”

AUTHORS	Olha Mulska Taras Vasyltsiv Yuliia Shushkova Lev Kloba Yevheniya Parfenyuk

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Olha Mulska (Ukraine), **Taras Vasyltsiv** (Ukraine), **Yuliia Shushkova** (Ukraine), **Lev Kloba** (Ukraine), **Yevheniya Parfenyuk** (Ukraine)

ASSESSMENT OF THE POPULATION'S SOCIAL RESILIENCE ENVIRONMENT (THE CASE OF THE CARPATHIAN REGION OF UKRAINE)

Abstract

The system of indicators of the population's socio-economic vulnerability is the determinant of regions' social resilience. The growth of these indicators leads to the emergence of new and aggravation of existing social risks and threats in different time periods. The paper aims to provide a comprehensive assessment of the population's social resilience environment in the Carpathian region of Ukraine. The environment of the population social resilience in the oblasts of the Carpathian region of Ukraine is assessed based on the theory of elasticity by calculating the temporal weight coefficients of 31 indicators (systematized in 4 groups) and integral empirical coefficient of the environment by multiplicative assessment. The results show that among the oblasts of the Carpathian region of Ukraine, the social resilience environment was the highest in Zakarpatska and Ivano-Frankivska oblasts (0.530 each) in 2019, and in Lvivska (0.540) and Chernivetska (0.585) oblasts in 2014. The growth of the social resilience environment rate was recorded in Lvivska (0.630) and Chernivetska (0.691) oblasts in the period of economic capacity recovery (2018). The average annual growth pace of the coefficient of deviation of the empirical social resilience environment rate from the national rate ranged from –1.29% to –0.26%. The study can serve as an information-analytical basis for developing the regional policy to secure the convergence of social standards of social resilience between the Carpathian region and neighboring EU countries (adherence to the principles of consumption safety and social responsibility, growing resistance of the healthcare system, balanced labor market and employment, development of clean and safe living spaces).

Keywords resilience, social vulnerability, Carpathian region, Ukraine, coefficient, determinants, regional policy

JEL Classification J17, I31, I38

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Olha Mulska, Doctor of Economics, Senior Researcher, Department of Social and Humanitarian Development of Regions, M. Dolishniy Institute of Regional Research of the National Academy of Sciences of Ukraine, Ukraine. (Corresponding author)

Taras Vasyltsiv, Doctor of Economics, Professor, M. Dolishniy Institute of Regional Research of the National Academy of Sciences of Ukraine, Ukraine.

Yuliia Shushkova, Doctor of Economics, Associate Professor, Ivan Franko National University of Lviv, Ukraine.

Lev Kloba, Ph.D. in Economics, Associate Professor, Department of Finance, Accounting and Analysis, Institute of Entrepreneurship and Advanced Technologies, Lviv Polytechnic National University, Ukraine.

Yevheniya Parfenyuk, Ph.D. in Economics, Associate Professor, Lviv Institute The Private Joint-Stock Company "Higher Education Institution "Interregional Academy of Personnel Management", Ukraine.

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INTRODUCTION

Social resilience, unlike social vulnerability, characterizes the capacity of the population and its groups to meet the needs and exercise social rights independently under the existing circumstances or in difficult socio-economic situations. The aggravated problems of deteriorating socio-economic conditions and growing differentiation of the population by living standards and social exclusion have drawn attention to the issue of social vulnerability and thus the development and implementation of the growing social resilience policy in terms of 2030 UN Sustainable Development Goals. Ukraine is among the countries with very high social vulnerability and economic instability, since it is a country with high poverty and informal economy share according to the International Labor Organization (ILO) criteria.

The Carpathian region of Ukraine as the area that borders the EU is characterized by its specifics and a wide range of social resilience prob-

lems with aggravated regional development divergence and lagging behind the neighboring European countries by the key social and economic parameters, growing external migration activity of the population, intensified social tension caused by the "outflow" of human resources (especially pupils and students, professional staff and workers), imbalances in regional labor markets, and other destructive impacts. Such conditions and factors generate the population's social resilience environment in the region. Moreover, a lower development level of some territories in the Carpathian region, compared to industrially developed territories of Ukraine and availability of a substantial share of mountain areas of Ukrainian Carpathians with inherent demographic, economic, environmental, and other problems, determines various social vulnerability levels in the region and thus the need to implement the proactive social resilience consolidation policy and differentiate its mechanisms.

The Carpathian region of Ukraine is defined as an area that has a high level of vulnerability in the social sphere, environmental economy, and economic system, given the significant divergence in the development of the social sphere and the economic system of the Carpathian region and Ukraine, which is the main determinant of deepening social vulnerability of the territory. This situation requires the construction of a comprehensive methodology for assessing the level of social vulnerability, which will serve as an information and analytical basis for a proactive policy of strengthening the sociality of resilience.

1. LITERATURE REVIEW

Social resilience is a fairly new concept that is far from being fully established. It generates difficulties in terms of its evaluation and stipulates the need to generalize already developed provisions and draw-up new approaches and methods of analysis on this basis. The first origins of intrinsic features and thus theoretical and methodological foundations of social resilience date back to the 1970–1980s. They were further developed by Birkmann (2014) and Burton et al. (2018). Their studies are essential for understanding the nature and structure of social resilience, its decomposition, factors of impact, and key etymological features, which is important in terms of selecting correct methods of analysis.

The issue of social resilience is also addressed in the studies outlining the classical foundations of human capital preservation and development (Kuzmin et al., 2020), socialization in the postindustrial economy (Esping-Andersen, 1999), and current practices of social cohesion in the context of overcoming the growing social vulnerability problems, namely in Europe (Ranci, 2010).

It is worth mentioning that social resilience used to be considered from the perspective of counteracting the growing social vulnerability of the population in conditions of risks and threats of natural and anthropogenic (technogenic) (Chakraborty et al., 2005; Frigerio & De Amicis, 2006; Parker et al., 2009), and ecological nature (Cutter et al., 2003; Rufat et al., 2015; Zahran et al., 2008) with the impact of emergencies on people, including natural disasters (Cutter & Finch, 2008; Flanagan et al., 2011; Gall, 2013; Yoon, 2012).

Today, due to growing negative social consequences of poverty, famine, unemployment, precariat, etc., the research of social resilience problems has scaled from natural-environmental domain to socio-economic area. It is about the impact of danger that increases due to the critical deterioration of social and economic circumstances. Therefore, social and economic indicators causing the change of social resilience of a person, group of persons, and the entire population are gaining increasing importance when analyzing social resilience.

For the most part, two aspects are important for developing the analysis methodology: the first one is the decomposition of the total system into its components and loading them with a set of indicators; the second one is the selection of the most correct methodological approaches to analysis. With regard to the first one, most studies on social resilience issues address the availability of a proper living environment for the population (Hamideh & Rongerude, 2018), employment, and decent labor conditions (Novikova & Shamileva,

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2020). Therefore, the structure of the social resilience system includes a group of indicators that show the protection of the social interests of the population in terms of employment, income, and living conditions.

Current realities objectively highlight a specific aspect of social resilience – protection of health and life and derived social interests of the population in a pandemic, namely COVID-19. Following the analysis of the research of Danylyshyn (2020), Farias and Leite (2021), and others, it is important to address the fair place of the group of indicators representing social assistance among the components of social resilience. The focus on the vulnerability of education and healthcare domains in such an environment is emphasized by Ribeiro et al. (2018).

For Ukraine and Carpathian region, in particular, the problem of high external labor migration intensity is among the most disturbing, both socially and economically. In fact, social resilience is the factor of migration containment. In turn, migration is one of the social resilience indicators. Therefore, the improvement of theoretical and methodological foundations of examining social resilience is addressed by Ukrainian and foreign researchers in terms of migration processes management to secure socio-economic stabilization of a country and its regions (Mulska et al., 2020, 2021). Vasyltsiv et al. (2021a) emphasize the importance of considering the social tension group indicators and developing an efficient social infrastructure.

In terms of the second aspect, the index approach is mostly used to analyze the social resilience of the population (Hagerty & Land, 2007; Tate, 2012, 2013; Vincent, 2004; OECD, 2008). It stipulates the compilation of a set of parameters that are the basis for the respective analysis and identification of the system's bottlenecks.

The development of index methods lies in its supplementation with factor analysis, including the consideration of both identification and strength of factors' impact and estimation of their significance (Lê et al., 2008; Lebart et al., 1984).

There are also other approaches to the analysis of the conditions and level of social resilience of the population, especially the comprehensive ones, since social resilience is a multidimensional concept with a wide range and variability of both dependent and independent variables. Therefore, the studies are based on a meta-analysis (Zou Le-Le & Yi-Ming, 2010), systematic review and synthesis of description (Ran et al., 2020), multidimensional analysis (Ilyash et al., 2021), quality of life analysis methods (Land et al., 2012), social minimum method (Shpak et al., 2017), and modeling the impact of technological development of the social development parameters (Vasyltsiv, 2021b).

However, unlike these and other methodological approaches to the analysis of social resilience of the population using the basic social development determinants, of higher theoretical-practical importance is the complex analysis (with the calculation of integral values of the social resilience environment level (as vulnerability antipode) of the population in the regions and its subindices) that allows the identification of structural and temporal features and divergence between the oblasts of the Carpathian region and Ukraine and calculating the parameters of weight significance of both groups and indicators of social resilience and thus the vulnerability of the population.

The paper aims to carry out a comprehensive assessment of the population's social resilience environment in the Carpathian region of Ukraine.

Summarizing the above, the following hypothesis is put forward:

H: *The growing social vulnerability of the population leads to a decline in the social resilience of the territory as a parameter of securing the proper quality of life.*

2. METHODS

31 determinants were selected to assess the population's social resilience environment in the Carpathian region. They were combined in four groups:

1) employment, income, living conditions;

2) social assistance;

3) social tension;

4) coverage with social infrastructure (Appendix A).

The following are the indicator selection principles:

1) *data accessibility* (according to the data of the State Statistics Service of Ukraine and Main Regional Statistical Offices);

2) *universality* (representation of the social resilience environment on national and regional levels by an empirical parameter);

3) *comparability* (carrying out comparisons by temporal and spatial approaches);

4) *validity (*objective approach to the representation of the social resilience environment subsystems);

5) *reproduction* (reproduction of the study by the panel method).

Methodology for examining the population's social resilience environment consists of five stages:

1. Development of homogeneous time series. To construct the commensurable times series, the parameters for each group are normalized within the selected set of areas (oblasts of the Carpathian region) by the formula (1) for stimulating indicators and formula (2) for destimulating indicators:

$$a_{it}^{sn} = \frac{x_{it}^{n}}{k_{nor}}, \quad k_{nor} \geq x_{\max t}^{N}, \tag{1}$$

$$a_{it}^{dn} = \frac{k_{nor}}{x_{it}^{n}}, \quad k_{nor} \leq x_{\min t}^{N}, \tag{2}$$

where a_{it}^{sn}, a_{it}^{dn} – normalized values of *i* stimulating and de-stimulating indicators of the *n* oblast in the *t* time period; k_{nor} – reference value of indicators; x_{it}^{n} – the base value of the *i* indicator of the *n* oblast; $x_{\max t}^{N}$, $x_{\min t}^{N}$ – the maximum and minimum values of the *i* indicator in the *t* time period within the *N* set of areas.

2. Given the changing socio-economic, political, and foreign economic situation that leads to structural changes in the economy and empirical estimates of econometric relationships, the weight coefficients determined based on the resilience principle in the time period do not represent the reality. To eliminate this shortcoming, the temporal weight coefficients are determined based on the theory of elasticity that allows considering the sensitivity of the integral social resilience environment parameter to the change in respective social indicators. The dynamic weight coefficients of the indicators within each group of parameters for the selected set of areas can be calculated as follows:

$$w_{it}^{nk} = \frac{\left|\mu_{i}^{kn}\Delta x_{it}^{n}\right|}{\sum_{i=1}^{j}\left|\mu_{i}\Delta x_{it}^{n}\right|}, \tag{3}$$

where μ_{i}^{kn} – the sensitivity coefficient of the *i* indicator in the *k* group of the *n* oblast; Δx_{it}^{n} – the coefficient of the change of the *i* indicator of the *n* oblast in the *t* time period; w_{it}^{nk} – the weight coefficient of the *i* indicator in the k group of the *n* oblast in the *t* time period; *j* – the number of *i* indicators in each group of parameters.

3. The weight coefficients of indicators within the *k* group of parameters of the population's social resilience environment are calculated as follows:

$$\beta_{it}^{nk} = a_{it}^{w_{it}^{nk}}, \tag{4}$$

where β_{it}^{nk} – the weight coefficient of the *i* indicator in the *k* group of the n area in the *t* time period.

4. The weight coefficients of subsystems (groups) of the population's social resilience environment are constructed based on the multiplicative approach:

$$Koef_{kt}^{n} = \prod_{i=1}^{j}\beta_{it}^{nk}, \tag{5}$$

where $Koef_{kt}^{n}$ – the coefficient of the *k* group of indicators of the *n* area in the *t* time period.

5. The integral coefficient of the population's social resilience environment is determined based on the additional calculation of dynamic weight coefficients by the multiplicative method.

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3. RESULTS AND DISCUSSION

The homogenous time series is the basis for calculating the dynamic weight coefficients of the indicators within each group for the oblasts of the Carpathian region and Ukraine. Determinants such as the disposable income of the population (11.07%) and average monthly wages (10.65%) are most significant, and informal employment (6.3%) and coverage with Internet (6.51%) are the least significant in Ivano-Frankivska oblast in 2010. In 2014, the indicators of the number of individual entrepreneurs (13.56%) and the share of total food expenditures acquired significance, indicating the revival of economic activity of the population and the improvement of the business environment in the region. In 2019, the significance of wage determinants increased to 12% and employment – to 9.53%.

The financial and systemic crisis in Ukraine has caused a substantial change in the socio-economic environment of the population's social resilience. The significance of average governmental social assistance to low-income families increased from 21.05% in 2010 to 30.45% in 2015, same as housing, electricity, and fuel benefits and subsidies increased from 21.94% in 2010 to 34.25% in 2019, indicating a high correlation between the population's social resilience environment and financial capacity of households to meet basic needs. It is worth emphasizing that the decline in the significance of budgetary funding of education and healthcare was observed in Ivano-Frankivska oblast, which is the consequence of the administrative reform. For instance, the weight coefficient of governmental expenditures on social protection reduced from 15.46% in 2010 to 13.22% in 2016.

In the social tension group, Ivano-Frankivska oblast shows substantial changes in weight coefficients by labor remuneration (5.96% and 10.54% in 2010 and 2019, respectively), the number of the population with below subsistence level income (10.63% in 2010 and 28.45% in 2015), and the number of detected crimes (9.11% in 2012 and 10.78 in 2019) indicators. In 2010, the housing stock (20.72%) and the number of hospital bed (20.67%) indicators had the highest values of weight significance coefficients in the social infrastructure group. Meanwhile, in 2019, the number of general secondary education institutions (20.45%) and the number of higher education institutions (21.07%) had high values.

In Zakarpatska oblast, the wrecked housing and the share of total households' food expenditures determinants had the highest weight coefficients values in the employment, income, and living conditions group of parameters in 2010 and 2019 (9.67%, 9.33%, and 9.72%, 9.88%, respectively). In 2010, the employment determinant had the lowest weight significance (6.82%), and in 2019, the average monthly nominal wages (6.19%) and the average number of full-time employees (6.58%).

In the social assistance group, the weight of the average assistance to low-income family indicator increased from 23.96% in 2010 to 30.27% in 2017. Meanwhile, the weight significance coefficients of the government expenditures on education and healthcare determinant declined from 19.78% and 23.45% in 2010 to 14.53% and 19.9% in 2019. The weight coefficient of the housing, electricity, and fuel benefits and subsidies increased from 12.56% in 2010 to 28.59% in 2019, indicating a high significance of social assistance in the process of developing the environment and implementing social stabilization and cohesion tools in Zakarpatska oblast.

The weight coefficients of the social tension group are of consistent dynamic nature in Zakarpatska oblast. In particular, unemployment, the number of detected crimes, the coverage with housing, the coverage with preschool institutions, the morbidity of the population, and average life expectancy indicators showed constant high weight values. In 2010–2019, the weight of the number of the population with average per capita income below the subsistence level determinant increased from 8.35% in 2010 to 22.57% in 2015, and in 2019 it declined to 4.92%. Meanwhile, the number of retirees' determinant declined from 6.47% in 2010 to 5.36% in 2015 and increased to 6.09% in 2019.

The lowest values of weight coefficients in 2010–2019 in the social infrastructure group were observed for the number of places in nursing homes for the elderly determinant, 7.6-7.8%. The situation is the same in Lvivska oblast, where the weight of the indicator did not exceed 9%. Namely, the hous-

ing stock determinant had the highest weight significance with an average value of 24.5% in the period under research. Since Lvivska oblast is among the labor gravitation centers in western Ukraine, the growing present population number causes the growing demand for real estate and increases the weight significance of the parameter in terms of developing the social resilience environment.

The highest values of weight coefficients in 2019 in Lvivska oblast in the employment, income, and living conditions group accounted for the decile coefficient of total income differentiation (14.6%) and informal employment (10.69%), indicating significant differentiation of living standards in the oblast and expansion of the shadow labor market. Compared to other oblasts of the Carpathian region, the lowest value of the share of total food expenditures (4.29%) and wrecked housing determinants (6.09%) were observed in Lvivska oblast.

The role of social assistance as the population's social resilience environment determinant in Lvivska oblast and other oblasts of the Carpathian region increased in the crisis years (2014–2015). The weight of assistance to low-income families and housing benefits and subsidies increased from 21.39% and 19.31% in 2010 to 32.14% (2015) and 26.66% (2014), respectively. The trend is the result of the decline in social resilience following the reduced financial capacity of households and their growing dependence on various forms of governmental assistance, namely subsidies and grants.

The labor remuneration determinant had the highest weight in the social tension group in 2019 (20.59%). Its value increased almost twice in the period under research. The high weight significance was observed for the morbidity of the population (12.79%) and coverage with preschool institution (12.93%) indicators. Instead, the number of retirees and unemployment determinants had the lowest weight significance (6.42% and 7.55%, respectively).

The high values of weight coefficients for the average number of full-time employees (11.78%) and employment (9.94%) indicators in the employment, income, and living conditions group are peculiar to Chernivetska oblast. The situation with informal employment determinant is quite interesting because Chernivetska oblast used to be the leader by informal employment rate in 2019, but the weight significance of the parameter is the lowest (7.03%) among all oblasts of the Carpathian region and Ukraine as a whole. The same is true for the decile coefficient of the total income differentiation determinant.

The trends regarding the weight significance of the indicators in the social assistance group in Chernivetska oblast differ from those peculiar to other oblasts of the Carpathian region. Namely, the weight of average housing benefits and subsidies substantially increased (from 18.69% in 2010 to 54.64% in 2019), and the weight of governmental expenditures on social assistance and education declined from 15.77% and 22.32% in 2010 to 11.97% and 12.23% in 2019, respectively.

The coverage with housing and with preschool education institutions' determinants had the highest weight coefficient values (13.36% and 12.76%, respectively), confirming the emergence of substantial social tension by these components in Chernivetska oblast. In particular, the weight of the wage arrear indicator increased substantially from 10.38% in 2010 to 70.23% in 2014. In crises, considerable social tension was caused by indicators such as unemployment, average life expectancy, and the share of the population with average per capita income below the subsistence level, with the weight of the latter increasing to 29.84% in 2015. However, a significant decline in the significance of some determinants is peculiar to Chernivetska oblast in crisis years. For instance, the weight of the number of retirees' indicator declined four times in 2010–2014, while that of the number of detected crimes, five times.

The trend of the weights in the social infrastructure group in Chernivetska oblast was consistent, and the coefficients weight ranged from 19% to 21%. The situation is the same in Ukraine. The weight of the social infrastructure determinants for Ukraine did not exceed 21%. It is worth emphasizing that only the group of the social infrastructure availability had the optimal equal weight structure among all groups of social resilience environment indicators. Meanwhile, substantial differentiation of weight coefficients in crises was observed in the employment, income, and living

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conditions group where the income and informal activity determinants had the highest values. In 2019, the consumer price index (9.43%) and the share of households' total food expenditures (9.81%) had the lowest weight coefficients.

Financial decentralization in Ukraine has reduced the burden on the public budget by delegating some part of social assistance liabilities to local budgets. Starting from 2016, the weight coefficients of the governmental expenditures on education and healthcare have declined from 23.38% and 26.49% to 12.51% and 17.66%, respectively. The dynamics of weight coefficients of housing, fuel, and electricity benefits and subsidies acquired sigmoidal features and had an upward trend in times of socio-economic crisis aggravation and a downward trend in times of economic recovery (2016–2017).

Over the entire study period, the population's social resilience environment in Ukraine was influenced the most by the determinant of wage arrears and coverage with housing, the weight coefficient of which ranged from 9.3% to 12.0%. The coverage with preschool education institutions (5.77% in 2010 and 6.01% in 2019) and the average life expectancy (about 9.7% in 2010–2019) had the lowest weight significance.

Given economic shocks, socio-political instability, and social transformations, the social resilience environment has been developing complementary under the impact of a significant number of determinants. Yet, there is a substantial differentiation of the impact of some social determinants in time (Appendix B). In 2010–2019, only the weight significance of the decile coefficient of total income differentiation increased in the employment, income, and living conditions group in the Carpathian region and Ukraine, while it declined for the disposable income indicator (average pace of 0.2%).

The downward dynamics of weight coefficients was observed for average governmental social assistance to the low-income families and governmental expenditures on education and healthcare, while the upward one, for average housing, electricity, and fuel benefits and subsidies (non-cash). It shows substantial dependence of the population's social resilience on governmental assistance to vulnerable groups. High social tension was generated by the wage arrear determinant in all oblasts of the Carpathian region and Ukraine and the morbidity of the population, the average growth pace of the weight coefficients was increasing by 1% on average. Growing values of weight coefficients are observed for the number of general secondary and higher education institutions determinant.

The weight coefficients served as necessary criteria to examine the population's social resilience environment in Ukraine and the Carpathian region in 2010–2019. The oblasts of the Carpathian region lag behind the average national rates by the employment, income, and living conditions component (Table 1). In 2010, Ivano-Frankivska oblast was the leader by the value of this group coefficient among the oblasts of the Carpathian region with 0.630, and in 2015 and 2019, Lvivska oblast (0.623 and 0.719, respectively). Chernivetska oblast was the outsider by the employment and living conditions component, lagging behind the average Ukrainian rate by 0.161 points by the group coefficient.

The social resilience environment by the social assistance component was the highest in Ivano-Frankivska (0.444) and Lvivska oblasts (0.436) in 2019. In 2014–2015, the lowest values of social assistance were observed in all oblasts of the Carpathian region.

By the social tension component, the environment was the most favorable in 2019 in Zakarpatska and Lvivska oblasts and in Ukraine as a whole (0.779). The level of social tension was much higher in 2019 in Chernivetska oblast due to growing unemployment and wage arrears. In 2014–2015, the oblasts of the Carpathian region had a moderate social tension level, indicating the reducing social resilience in the 2014–2015 crisis (Table 2). The top values of social tension in Ukraine were in 2015 (0.580), which is 20% more than in 2010. Among all the components of the population's social resilience environment in the Carpathian region and Ukraine, the group values of the coverage with social infrastructure determinants were not characterized by peaks and declines. The highest values were in 2018–2019 in all oblasts of the region and in 2011–2013, in Ukraine.

Table 1. The population's social resilience environment of Ukraine and the Carpathian region: by employment, income, and living conditions and social assistance groups, 2010–2019

Source: Developed based on the authors' calculations.

Oblasts	Years									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Employment, income, living conditions										
Chernivetska	0.624	0.593	0.633	0.659	0.575	0.533	0.565	0.610	0.616	0.635
Lvivska	0.592	0.622	0.670	0.698	0.637	0.623	0.646	0.701	0.715	0.719
Zakarpatska	0.619	0.671	0.662	0.659	0.539	0.549	0.580	0.616	0.642	0.658
Ivano-Frankivska	0.630	0.627	0.681	0.691	0.657	0.591	0.603	0.620	0.665	0.701
Ukraine	0.754	0.744	0.774	0.776	0.798	0.695	0.783	0.765	0.799	0.796
Social assistance										
Chernivetska	0.373	0.442	0.464	0.443	0.384	0.474	0.448	0.582	0.569	0.230
Lvivska	0.378	0.374	0.508	0.420	0.392	0.394	0.432	0.571	0.557	0.369
Zakarpatska	0.420	0.527	0.605	0.669	0.236	0.453	0.472	0.540	0.553	0.436
Ivano-Frankivska	0.344	0.371	0.368	0.405	0.267	0.412	0.426	0.574	0.521	0.444
Ukraine	0.499	0.559	0.707	0.639	0.509	0.483	0.505	0.670	0.673	0.465

Each group of determinants impacts the development of the population's social resilience environment with different degrees of force. In 2019, the employment, income, and living conditions component was most significant for Zakarpatska oblast (25.76%) and the least significant for Ivano-Frankivska oblast (12.87%). Meanwhile, the social assistance component was the most important for the social resilience environment in these oblasts (29.70% and 42.54%, respectively). It is worth noting that the weight significance of the social tension group grows complementarily with the social assistance group. Instead, the growth of the social infrastructure weight coefficients was in reverse to the employment, income, and living conditions group (Table 3).

The integral coefficients of the population's social resilience environment calculated based on the sensitivity theory allowed determining the living standards of the population (Table 4). It is worth noting that among the oblasts of the Carpathian

Table 2. The population's social resilience environment in the Carpathian region and Ukraine: social pressure and infrastructure, 2010–2019

Source: Developed based on the authors' calculations.

Oblasts	Years									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Social tension										
Chernivetska	0.516	0.801	0.794	0.741	0.256	0.531	0.493	0.537	0.805	0.796
Lvivska	0.389	0.433	0.376	0.453	0.381	0.331	0.373	0.410	0.444	0.237
Zakarpatska	0.383	0.378	0.437	0.460	0.655	0.408	0.607	0.527	0.453	0.417
Ivano-Frankivska	0.562	0.570	0.542	0.586	0.627	0.562	0.554	0.312	0.541	0.441
Ukraine	0.721	0.776	0.794	0.808	0.740	0.580	0.749	0.757	0.795	0.779
Coverage with social infrastructure										
Chernivetska	0.899	0.886	0.886	0.881	0.881	0.882	0.862	0.857	0.850	0.857
Lvivska	0.867	0.860	0.862	0.857	0.854	0.839	0.837	0.821	0.801	0.798
Zakarpatska	0.817	0.797	0.791	0.751	0.758	0.755	0.754	0.752	0.748	0.756
Ivano-Frankivska	0.912	0.904	0.850	0.857	0.781	0.784	0.789	0.774	0.771	0.760
Ukraine	0.993	0.984	0.976	0.968	0.840	0.837	0.825	0.820	0.810	0.801

Note: The growth of the coefficient shows the deterioration of the social resilience environment, and vice versa.

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Table 3. Weight significance coefficients of the components of the population's social resilience environment in the Carpathian region and Ukraine, 2010–2019, %

Source: Developed based on the authors' calculations.

Components	Regions	Years									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Employment, income, and living conditions	Ukraine	24.20	23.20	24.97	23.60	23.24	23.49	23.92	23.94	23.81	20.96
	Lvivska	26.05	25.54	25.64	24.73	26.35	25.60	26.55	26.58	25.72	19.76
	Chernivetska	26.64	31.73	25.62	25.06	6.83	39.41	24.54	27.22	28.91	19.43
	Zakarpatska	28.46	27.95	30.80	29.33	24.56	26.61	30.47	26.92	26.51	25.76
	Ivano-Frankivska	15.13	15.57	13.64	15.76	13.57	17.88	14.98	12.82	15.69	12.87
Social assistance	Ukraine	24.47	23.46	20.66	26.49	26.87	21.81	26.06	20.16	24.90	31.95
	Lvivska	25.82	26.85	20.14	30.92	25.50	24.72	24.88	21.64	26.67	29.70
	Chernivetska	22.91	21.93	22.39	23.48	5.92	25.50	23.62	19.49	25.71	42.54
	Zakarpatska	23.82	20.21	22.14	22.08	47.70	11.82	25.83	20.89	22.61	27.97
	Ivano-Frankivska	30.91	29.34	30.51	29.70	40.04	21.26	30.19	19.99	37.93	32.50
Social tension	Ukraine	29.66	29.86	31.04	28.55	28.04	36.33	25.56	32.08	28.87	27.31
	Lvivska	20.63	19.07	25.14	16.98	22.65	22.80	19.39	20.75	19.21	29.45
	Chernivetska	27.78	20.28	28.74	29.14	82.18	4.03	29.21	28.16	20.33	21.13
	Zakarpatska	27.76	30.03	25.59	27.04	13.79	42.46	21.10	32.10	31.39	27.94
	Ivano-Frankivska	29.22	29.53	30.07	28.61	23.26	34.65	29.98	45.22	18.73	32.13
Coverage with social infrastructure	Ukraine	21.67	23.48	23.34	21.36	21.85	18.38	24.46	23.83	22.42	19.78
	Lvivska	27.50	28.54	29.08	27.37	25.49	26.88	29.17	31.03	28.40	21.08
	Chernivetska	22.66	26.07	23.25	22.32	5.07	31.06	22.63	25.14	25.05	16.90
	Zakarpatska	19.96	21.81	21.47	21.55	13.96	19.10	22.60	20.09	19.49	18.32
	Ivano-Frankivska	24.74	25.55	25.78	25.94	23.13	26.21	24.84	21.97	27.64	22.51

Table 4. Integral coefficients of the population's social resilience environment in the Carpathian region and Ukraine, 2010–2019

Source: Developed based on the authors' calculations.

Years	Ukraine	The oblasts of the Carpathian region							
		Lvivska		Chernivetska		Zakarpatska		Ivano-Frankivska	
	IC	IC	D	IC	D	IC	D	IC	D
2010	0.742	0.537	–0.205	0.571	–0.171	0.522	–0.220	0.554	–0.188
2011	0.803	0.555	–0.248	0.656	–0.147	0.558	–0.245	0.574	–0.229
2012	0.864	0.590	–0.274	0.682	–0.182	0.606	–0.258	0.558	–0.306
2013	0.832	0.586	–0.246	0.663	–0.169	0.617	–0.215	0.595	–0.237
2014	0.726	0.540	–0.186	0.585	–0.141	0.391	–0.335	0.472	–0.254
2015	0.622	0.522	–0.100	0.605	–0.017	0.503	–0.119	0.579	–0.043
2016	0.699	0.567	–0.132	0.566	–0.133	0.589	–0.110	0.566	–0.133
2017	0.777	0.630	–0.147	0.635	–0.142	0.593	–0.184	0.470	–0.307
2018	0.789	0.630	–0.159	0.691	–0.098	0.573	–0.216	0.607	–0.182
2019	0.691	0.435	–0.256	0.455	–0.236	0.530	–0.161	0.530	–0.161
2019/2010	0.931267	0.810	–	0.797	–	1.015	–	0.9567	–
2019/2014	0.951791	0.806	–	0.778	–	1.355	–	1.123	–

Note: IC – the values of integral coefficients; D – the values of the divergence of the social resilience environment in the oblasts of the Carpathian region from the average national rate.

Source: Developed based on the authors' calculations.

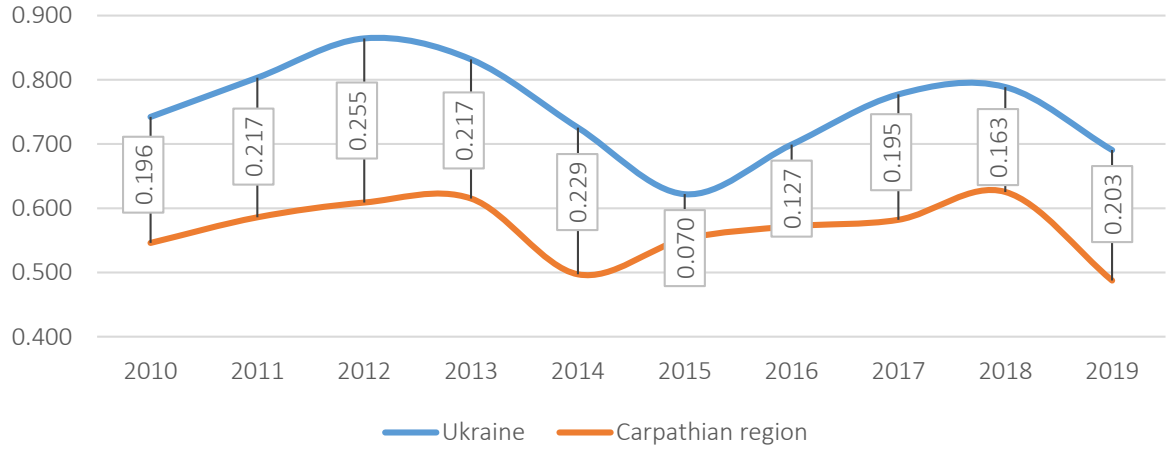

Figure 1. The variable scope of the population's social resilience environment in Ukraine and the Carpathian region, 2010–2019

region of Ukraine, the social resilience environment was the highest in Zakarpatska and Ivano-Frankivska oblasts (0.530 each) in 2019 and in Lvivska (0.540) and Chernivetska (0.585) oblasts in 2014. The growth of the social resilience environment parameter in the economic recovery (2018) was observed in Lvivska oblast up to 0.630 and Chernivetska oblast (0.691).

The differentiation of the integral coefficients' values of the population's social resilience environment in the Carpathian region and Ukraine increased in 2011–2013 and 2019, while the social resilience gaps in Ukrainian regions reduced in the crisis periods (Figure 1).

In 2010–2019, the divergence in the values of the population's social resilience environment in the Carpathian region increased substantially compared to Ukraine, in particular, for Zakarpatska and Ivano-Frankivska oblasts. Therefore, the average annual growth pace of the coefficient of deviation of the social resilience environment empiric indicator in the oblasts of the region from the national rate ranged from –1.29% to –0.26%. It is worth noting that only Zakarpatska oblast showed the positive dynamics of reduction of the population's social resilience environment deviation from the average national rates.

The public policy of overcoming the social vulnerability problems and strengthening the social resilience of the population of the Carpathian region of Ukraine should be developed based on regional specifics of the significance of certain social resilience components. In particular, Lvivska, Ivano-Frankivska, and Zakarpatska oblasts should direct their efforts to increase the impact of social assistance and social tension determinants, and Chernivetska oblast – social assistance. In Zakarpatska oblast, reducing the population's social vulnerability also requires additional measures aimed at the improvement of employment and living conditions, as well as the increase of income, in Ivano-Frankivska oblast – the social infrastructure development.

Summing up the results, it is noted that the growing social vulnerability of the population of the Carpathian region of Ukraine led to a decline in the social resilience of the territory as a parameter of securing the proper quality of life. Ensuring the social resistance of a country is a fundamental prerequisite not only for improving the quality of life of the population and improving its well-being, but also minimizing the social vulnerability of certain categories of the population and territories, reducing social tension, and increasing the level of satisfaction of citizens' interests. It is stated that the dominant role among the irrational determinants of containing the processes of ensuring social resistance of territories is occupied by negative trends in the growth of migration activity of the population, polarization of societies, uncontrolled movement of wealth and poverty, accompanied by problems of inequality, stratification of societies, spread of unemployment, growth of all types of dangers.

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CONCLUSION

The Carpathian region of Ukraine is defined as a territory with the low level of social resilience and growing population's social vulnerability. This study was motivated to find out the level of social resilience environment in the Carpathian region of Ukraine. A hypothesis was formulated and tested using the multiplied integrated assessment. The result shows that low values of integral coefficients of the population's social resilience environment in the oblasts of the region compared to average national rates have been observed in the entire period under study with consistently high divergence level (the coefficient was 0.203 in 2019, while it amounted to 0.221 on average in the pre-crisis 2010–2013). The constructed time series of integral indices allow determining the level of the population's social resilience environment based on the sensitivity theory (dynamic parameters of weight significance) and show that in 2019 Zakarpatska and Ivano-Frankivska oblasts were the leaders for the indicator of social resilience environment (0.530 each, on a 0 to 1 scale). In 2014, the situation was different, Lvivska and Chernivetska oblasts had the highest values of social resilience (0.540 and 0.585, respectively).

It follows from the conclusion that there is a need to create a proactive policy of improving the conditions of the socio-economic environment to improve the quality of life, which will reduce the level of social vulnerability of the territory and strengthen the social resistance of the population to economic concerns and conditions of the environmental economy.

AUTHOR CONTRIBUTIONS

Conceptualization: Taras Vasyltsiv, Olha Mulska.
Data curation: Yuliia Shushkova, Lev Kloba.
Formal analysis: Olha Mulska, Taras Vasyltsiv, Yuliia Shushkova.
Funding acquisition: Lev Kloba, Yuliia Shushkova.
Investigation: Olha Mulska.
Methodology: Olha Mulska, Taras Vasyltsiv, Lev Kloba.
Project administration: Taras Vasyltsiv.
Resources: Yuliia Shushkova, Lev Kloba.
Supervision: Taras Vasyltsiv.
Visualization: Olha Mulska, Taras Vasyltsiv, Yuliia Shushkova.
Validation: Yevheniya Parfenyuk, Lev Kloba.
Writing – original draft: Olha Mulska, Taras Vasyltsiv, Yuliia Shushkova, Yevheniya Parfenyuk.
Writing – review & editing: Olha Mulska, Lev Kloba, Yevheniya Parfenyuk.

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APPENDIX A

Table A1. The determinants of the population's social resilience environment

Source: Author's interpretation.

Determinants	Quantification	Nature of impact
Employment, income, living conditions		
Employment at 15-70	% of the entire population of the age	+
Employment level	% of the average number of full-time employees	+
Dismissal level		–
Average monthly nominal wages	On average per employee, EUR	+
Disposable income of the population	Per capita, EUR	+
Consumer price index	% of the previous year	–
The share of households' food expenditures	Per a household a month,%	–
The decile coefficient of the total income of the population	Coef.	–
Wrecked housing, total housing area	m^2	+
Coverage with Internet	% of the total population	+
Number of individual entrepreneurs	Per 1,000 of the population	+
Informal employment	% of employed	-
Social assistance		
Average governmental assistance to low-income families	EUR	+
Governmental expenditures on education	Per capita, EUR	+
Governmental expenditures on health		+
Governmental expenditures on social protection and social assistance		+
Average housing, electricity, and fuel benefits and subsidies	Per a household, EUR	+
Social tension		
Unemployment at 15-70	% of the entire population of the age	–
Wage arrears	Per an employee, EUR	–
Detected crimes	Per 1,000 of the population	–
Number of retirees	Per 1,000 of employed	–
Coverage with housing	Per capita, m2	+
Coverage with preschool institutions	% of children of the age	+
Number of the population with average monthly per capita income below the subsistence level	% of the total population	–
Morbidity of the population	The number of first registered cases per 1,000 of the population	–
Average life expectancy at birth	Years	+
Coverage with social infrastructure		
Number of hospital beds	Per 1,000 of the population	+
Number of places in nursing homes for the elderly and disabled	Per 1,000 of the population	+
Number of general secondary education institutions		+
Number of higher education institutions		+
Housing stock	Per capita, m^2 of the total area	+

Note: The indicators were divided into stimulators ("+") and destimulators ("–") by the expert method.

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APPENDIX B

Table B1. Average growth paces of the weight coefficients of social resilience environment determinants in the Carpathian region, 2010–2019, %

Source: Author's calculation.

Determinants	Ukraine	Chernivetska	Lvivska	Zakarpatska	Ivano-Frankivska
Employment, income, living conditions					
Employment at 15-70	0.021	0.013	–0.134	0.007	0.016
Employment level	0.074	0.101	0.072	0.159	–0.033
Dismissal level	0.072	0.124	–0.013	–0.068	0.017
Average monthly nominal wages	–0.164	–0.181	–0.240	–0.163	0.150
Disposable income of the population	–0.126	–0.230	–0.240	–0.065	–0.116
Consumer price index	–0.011	–0.004	–0.031	–0.048	0.009
The share of households' food expenditures	0.021	0.020	0.005	0.061	–0.043
The decile coefficient of the total income of the population	0.086	0.043	0.613	0.077	0.066
Wrecked housing, total housing area	0.021	0.111	0.022	0.006	–0.009
Coverage with Internet	–0.033	–0.063	–0.139	–0.057	0.071
Number of individual entrepreneurs	–0.057	0.014	–0.044	0.040	–0.040
Informal employment	0.095	0.051	0.130	0.051	–0.088
Social assistance					
Average governmental assistance to low-income families	–0.766	–1.219	–0.828	–0.934	–0.412
Governmental expenditures on education	–0.868	–1.232	–0.864	–0.583	–0.644
Governmental expenditures on health	–0.616	–1.121	–0.676	–0.394	–0.513
Governmental expenditures on social protection and social assistance	0.072	–0.423	0.087	0.131	0.202
Average housing, electricity, and fuel benefits and subsidies	2.178	3.994	2.280	1.781	1.367
Social tension					
Unemployment at 15-70	–0.107	–0.120	–0.107	–0.140	–0.076
Wage arrears	0.486	0.181	1.062	0.596	0.509
Detected crimes	–0.120	–0.055	–0.061	0.053	0.036
Number of retirees	–0.045	–0.068	–0.063	–0.043	–0.085
Coverage with housing	–0.044	–0.030	–0.123	–0.108	–0.081
Coverage with preschool institutions	0.026	0.087	–0.033	0.037	–0.036
Number of the population with average monthly per capita income below the subsistence level	–0.310	0.005	–0.538	–0.381	–0.242
Morbidity of the population	0.130	0.009	–0.057	0.017	0.005
Average life expectancy at birth	–0.015	–0.010	–0.081	–0.031	–0.030
Coverage with social infrastructure					
Number of hospital beds	0.011	–0.025	0.076	0.042	0.034
Number of places in nursing homes for the elderly and disabled	–0.037	0.008	–0.006	0.028	–0.083
Number of general secondary education institutions	0.011	0.026	0.008	0.019	0.022
Number of higher education institutions	0.084	0.015	0.027	0.004	0.119
Housing stock	–0.069	–0.023	–0.105	–0.093	–0.091