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MODELING THE IMPACT OF SOCIAL AND ECOLOGICAL DETERMINANTS ON THE QUALITY OF LIFE (ON THE EXAMPLE OF THE OBLASTS OF THE CARPATHIAN REGION OF UKRAINE)

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A B S T R A C T

The paper evaluates the quality of life and living standards of the population using the basic determinants of socio-economic, ecological, and socio-political environments (on the example of the Carpathian region of Ukraine). It expands a set of methodological tools for the analysis of ecological and social determinants' impact on the quality of life based on the complex analysis of the sensitivity of the quality of life (in the form of empirical parameter calculated based on the cost, resources, and innovative development approaches) to the change of the socio-ecological determinants as an integral quality-quantity characteristic of the environment. The results of the research allowed detecting the relationship and nature of joint variability of the quality of life and ecological and social indicators.

1. INTRODUCTION

The present existential challenges increasingly escalate and bring to the fore the problem of social stability and cohesion (EU social policy) and its combination with the priorities of the economy and society ecologization, resource management, and protection of biodiversity (EU4Environment launched for the Eastern Partnership countries for 2019-2022, European Green Deal for 2030 and 2050).

The social environment factors acquire increasing importance in current conditions, especially for Ukraine, including the Carpathian region. Lately, the quality of life has much declined, which is related to social and socio-economic consequences of the military conflict in the East of the country, internal forced movement of the population, socio-economic instability, growing inflation, falling disposable income, growing prices and tariffs, and the cost of transport and housing services, etc.

There is a range of environmental problems in the Carpathian region of Ukraine that should be considered in terms of their impact on the quality of life. It is about the contamination of surface and ground waters, release of pollutants into water, air pollution and the change of its composition due to industrial and other emissions, disruption of natural environment balance due to the

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depleting extraction of minerals and mineral waters, illegal logging in the Carpathians, the change of land resource's structure due to construction, negative physical-geographic processes, falling soil fertility, etc.
The results of modeling the impact of social and ecological determinants on the quality of life allow identifying the direction and strength of the relationship between various features of social and ecological environments and the indices of the quality of life expressed in GRP per capita, resources to expenditures ratio per a household, level of smart specialization development in a region. They serve as an essential information-analytical ground to develop the policy of improving the quality of life, including in employment, income, living conditions, social assistance and tension, coverage with social infrastructure, availability of land and water resources, pollution of the area, air quality, and investment framework of nature management.

The paper aims to substantiate and verify the methodological approach to the analysis of the quality of life and model the impact of social and ecological determinants on the quality of life in the oblasts of the Carpathian region of Ukraine.

The research hypothesizes that the quality of life is much influenced by a set of parameters of the social and ecological environment. Meanwhile, regarding the availability of resources, the determinants of employment, income, and living conditions have a stronger impact, about better opportunities of funding the household expenditures – social assistance and social tension, about fostering the innovative and smart-oriented development – labor market, income, living conditions, coverage with social infrastructure, and investment in the sustainable development of the region.

2.LITERATURE REVIEW

Humanization and sociologization are the mainstreams in current scientific research. A man is in the focus, and the quality of life serves as an integral feature of the society development level. Therefore, an essential share of scientific studies addresses the issues of the quality of life and its various aspects like health (Anjara et al., 2017), the demographic structure of the population (Cruz et al., 2011), medical support (Farias & Leite, 2021), and life expectancy (Webb et al., 2011). These and other studies determine the substantive characteristics of the quality of life, its structure, and development factors.

The component structure of the quality of life and the most reasonable approaches to its analysis are addressed in the studies on the methodology of analyzing the quality of life, including those related to emotional and cognitive evaluation (Diener, 2003; Ramos et al., 2018), monitoring of labor and family life conditions (Fiedler, 2012), calculation of the population's vulnerability index (Jones & Andrey, 2007; McLaughlin & Cooper, 2010; Rygel et al., 2006), and prices elasticity of consumption (Montgomery & Rossi, 1999).

The research of the social vulnerability problems is currently very relevant as it has substantially developed a range of classical theories, formed the fundamentally new theoretical ground in terms of the quality of life, and replaced the theory of social security. The quality of life is an important factor and indicator of the population's social vulnerability in terms of its resistance to various dangers (Bergstrand et al., 2015), including environmental (Cutter et al., 2003), social exclusion (Mulska et al., 2022), and hardships of rural life (Van Niekerk & Van Niekerk, 2009; Vasyltsiv et al., 2021).

Both current studies and practical experience increasingly shift the focuses in the research of the quality of life towards socio-environmental factors since the maintenance of environmental balance and social stability is the powerful factor of wellbeing and thus securing the sustainable development of territories. It is about the research of such aspects as wellbeing (Berenger & Verdier-Chouchane, 2007; Diamond, 2016; Rothbaum, 2015; Voznyak et al. 2022a), wealth (Hsieh & Moretti, 2019), and households' income and expenditures (Keys et al., 2020; Voznyak et al., 2022b).

The results of the analysis of the key studies on the subject show that modeling the impact of socio-ecological determinants of the quality of life should take into account such components as inequality of income and expenditures of the population (Aguiar & Bils, 2015; Couture et al., 2019; Ganong & Shoag, 2017; Sabelhaus & Groen, 2000), consumption and savings (Brummet & Reed, 2019; Meyer & Sullivan, 2017), coverage with housing (Broda et al., 2009), employment and unemployment (Ganong & Noel, 2019), and coverage with educational services (Moretti, 2004).

Current realities stipulate the need to determine the specifics and adjust the models in global crises and instability, namely the COVID-19. For that matter, certain attempts are made by Farias & Leite (2021), Wong et al. (2020) (COVID-19 impact on social vulnerability and resilience), Mogaji (2020) (COVID-19 impact on the financial capacity of households), Mulska et al. (2020), Semiv et al. (2021) (migration processes impact on social stability).

Yet, these and other studies do not provide the systemic and comprehensive modeling of the impact of social and ecological determinants on the quality of life in the country (firstly, in terms of combining social and ecological parameters; secondly, with regard to various approaches to evaluating the quality of life (resource-based, cost-based, and innovation-based); thirdly, in relation to the composition of used indicators (4 groups of social indicators, 31 parameters and 4 groups of ecological indicators, 20 parameters)).

3. METHODOLOGY

There are numerous approaches to evaluation of the quality of life in the global and domestic economic discourse that are based on both overcoming the negative trends in the socio-economic development of some regions and securing decent living conditions for different groups of the population, as well as creating the system of motivation for efficient labor activity, human development, and meeting individual needs and interests. Therefore, the lack of universal, valid, and consolidated empirical parameter represents the methodological vacuum of the research of the quality of life. Ukraine has selected the innovative economic growth vector and is implementing the direction of intensive economic capacity increase, while the Carpathian region is a territory with somewhat different features of socio-economic and environmental development with peculiar controversial signs of economic growth, including the migration activity intensification, informal employment increase, and high level of recreational development. It has stipulated the choice of several approaches to the calculation of the empirical parameter of the quality of life.

Resource-based approach. The quality of life is calculated as the GRP per capita.

Cost-based approach. The empirical parameter of the quality of life in a region constitutes the resources to costs ratio on average per month per a household in the region (formula 1).

$$QL_t^n = \frac{GR_t^n}{GV_t^n}\ , \qquad (1)$$

where QL_t^n is the quality of life in the n oblast of the region in the t-time period; GR_t^n is total resources on average per month per a household of the n oblast of the region in the t time period; GV_t^n is total resources on average per month per a household of the n oblast of the region in the t time period.

Innovative development approach. To calculate the empirical parameter of the quality of life based on the innovative development approach, a basis for the information-analytical framework of the evaluation was created following the principles of validity, universality, and comparability. The system of its indicators shows the progress of the smart-oriented development of a region (Table 1). The calculation methodology is grounded on the Principal Components method using the multiplicative approach.

The matrices of correlation and covariation for each oblast of the Carpathian region are constructed to detect the relationship and the level of joint variability of ecological and social determinants and the quality of life.

Table 1. The determinants of the quality of life in the Carpathian region: innovative development approach

Determinants	Quantification
New technological processes introduction level*	per an innovatively active industrial enterprise
The share of the population with access to Internet services	%
The concentration of innovatively active industrial enterprises in the regions	% of the total number of industrial enterprises
Number of employees engaged in research	per an innovatively active industrial enterprise, persons
The industrial enterprises' research cost efficiency ratio **	
The share of sold innovative products (goods, services)	%

Note: * the number of new technological processes introduced by industrial enterprises;
** the ratio of sold innovative products to innovative activity costs.

4. RESULTS AND DISCUSSION

4.1. The quality of life differentiation in the oblasts of the Carpathian region of Ukraine

Lvivska and Ivano-Frankivska oblasts had the best progress in the quality of life among the oblasts of the Carpathian region following the resource-based approach. In 2010-2019, the GRP increased here by € 1389.7 and € 778.01, respectively. Relatively small GRP growth occurred in Zakarpatska oblast (by € 521.9). The results of calculations of the quality of life across four oblasts of the Carpathian region following the cost-based approach show the upward trend in the improvement of living standards (Table 2). The empirical parameters of the quality of life in 2010-2019 substantially increased in all oblasts of the Carpathian region, excluding Chernivetska, indicating the increase in the households' saving capacity and thus the increase in the investment capacity as the foundation of regional economic growth.

Table 2. Empirical parameters of the quality of life in the Carpathian region: the resource-based and cost-based approaches, 2010-2019 ((MDCh; MDIv-F; MDLv; MDZ, 2010-2019)

Period	Oblasts							
	Zakarpatska		Ivano-Frankivska		Lvivska		Chernivetska	
	RB	CB	RB	CB	RB	CB	RB	CB
2010	1165.6	1.08	1406.4	1.05	1552.6	1.10	1038.5	1.11
2011	1303.1	1.07	1747.8	1.06	1847.3	1.12	1192.7	1.08
2012	1663.8	1.13	2276.3	1.09	2374.4	1.17	1414.6	1.11
2013	1606	1.09	2263.6	1.11	2349.8	1.15	1427.9	1.12
2014	1219.8	1.06	1732.7	1.10	1828.2	1.14	1053.2	1.09
2015	949.1	1.03	1369.3	1.08	1541.4	0.99	839.6	1.02
2016	909.4	1.03	1315.6	1.06	1601.9	1.06	825.9	1.02
2017	1136	1.12	1537.5	1.15	1932.8	1.14	1046.3	1.02
2018	1297.5	1.09	1774.3	1.18	2183	1.39	1164.9	1.06
2019	1687.5	1.27	2184.4	1.23	2942.3	1.27	1593.6	1.06

Note: RB is resource-based approach; CB is cost-based approach .

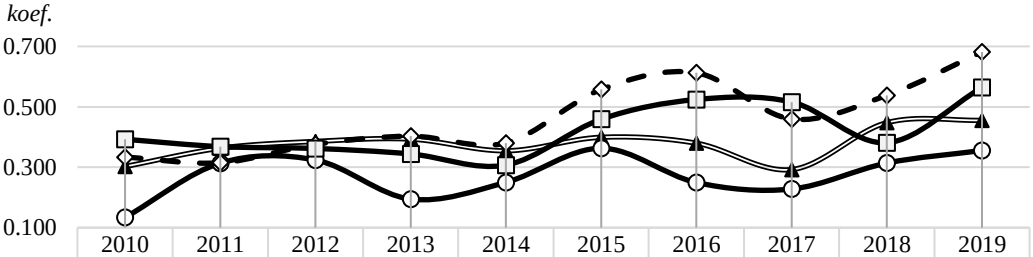
Considering the results of the normalization, the weight of indicators of the empirical parameter of the quality of life is determined following the innovative development approach for each oblast of the Carpathian region (Table 3). It shows that the share of sold innovative products has the strongest equal significance for all oblasts of the region (Lvivska – 20.29 %, Ivano-Frankivska – 21.32 %, Zakarpatska – 23.56 %, Chernivetska – 21.32 %), as well as the level of new technological processes introduction in the regions (23.80 %, 18.42 %, 22.66 %, and 18.95 %, respectively). The indicators of the concentration of innovatively active industrial enterprises were the least significant for the quality of life in Lvivska and Ivano-Frankivska oblasts (2.76 % and 6.77 %, respectively), the number of employees engaged in research – in Zakarpatska oblast (5.45 %), and the industrial enterprises' research cost efficiency ratio – in Chernivetska oblast (6.91 %).

Table 3. The weight significance coefficients of the indicators of the quality of life empirical parameter in the Carpathian region: the innovative development approach, 2010-2019

Indicators	Weight, %			
	Lvivska	Ivano-Frankivska	Zakarpatska	Chernivetska
New technological processes introduction level	23.80	18.42	22.66	18.95
The share of the population with access to Internet services	23.31	16.34	21.06	22.50
The concentration of innovatively active industrial enterprises in the regions	2.76	6.77	11.60	10.76
Number of employees engaged in research	21.24	21.91	5.45	19.56
The industrial enterprises' research cost efficiency ratio	8.61	15.24	15.68	6.91
The share of sold innovative products (goods, services)	20.29	21.32	23.56	21.32

The calculated empirical parameters of the quality of life following the innovative approach (Fig. 1) serve as the necessary criteria to verify the thesis regarding the progress of innovation environment to meet the needs of the population and develop human capacity.

In 2019, Lvivska oblast had the highest values of the quality of life parameter (0.681). Its progress in 2010-2019 was 2.0 times. Meanwhile, the lowest coefficient values were in Ivano-Frankivska oblast with the 0.355 rate.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Zakarpatska	0.302	0.363	0.386	0.393	0.355	0.399	0.380	0.292	0.447	0.455
Ivano-Frankivska	0.134	0.314	0.324	0.195	0.250	0.363	0.250	0.228	0.314	0.355
Lvivska	0.334	0.315	0.376	0.403	0.380	0.557	0.612	0.460	0.538	0.681
Chernivetska	0.393	0.368	0.362	0.344	0.307	0.459	0.524	0.516	0.381	0.564

Figure 1. Empirical parameters of the quality of life in the Carpathian region: innovative development approach, 2010-2019

The differentiation of living standards of the oblasts of the Carpathian region is its intrinsic feature, while substantial gaps in the level of development cause the territories' socio-economic and environmental disintegration. The problem is especially urgent for border areas; however, they have better opportunities to implement the tools for the quality of life improvement through labor emigration.

4.2. The results of modeling the impact of social determinants on the quality of life: regional dimension

The disposable income of the population, the consumer price index, and the share of households' food expenditures have a moderate relationship with the quality of life (innovative approach) among the social determinants of the employment, income, and living conditions group in Chernivetska and Zakarpatska oblasts. Meanwhile, these indicators in Lvivska Ivano-Frankivska oblasts have a weak relationship (Table 4).

It is worth mentioning that employment and living conditions have a strong relationship with the quality of life (cost-based and resource-based approaches). There is a very strong relationship (by the Chaddock scale) between the average monthly nominal wages, employment at 15-70, disposable income of the population, and the quality of life (resource-based approach) in all oblasts of the Carpathian region. The employment had a weak relationship only in Ivano-Frankivska oblast, and the employees' dismissal level did not impact the quality of life at all. Such a situation is explained by a high level of the shadow labor market and informal employment in the oblast. The quality of life (cost-based approach) was determined by such indicators as disposable income and the share of food expenditures in Chernivetska oblast, the employees' dismissal level and informal employment in Lvivska oblast, average monthly wages y Zakarpatska oblast. Meanwhile, no indicator was found in employment and income to have a strong relationship with the quality of life in Ivano-Frankivska oblast (cost-based approach).

Table 4. The relationship between social determinants and the quality of life in the Carpathian region: employment, income, and living conditions and social assistance groups, 2010-2019

Determinants	Empirical parameter of the quality of life/Oblasts											
	Chernivetska			Lvivska			Zakarpatska			Ivano-Frankivska		
	I	R	C	I	R	C	I	R	C	I	R	C
Employment, income, and living conditions												
Employment at 15-70	+	+++	++	+	+++	+	+	++		+	+	++
Employment level	++		+	+	+	+	++	++	++	+	+	++
Dismissal level	++	++	++	++	++	+++	+	+	+	++		++
Average monthly nominal wages	+	+++	+	+	+++	++	++	+++	+++	+	+++	++
Disposable income of the population	++	+++	+++		+++	++	++	+++	+	+	+++	++
Consumer price index	++	++	++	+	++	+	+	++	++	+	++	+
The share of households' food expenditures	++	++	+++	+	+	+	+		++	+	+	++
The decile coefficient of the total income of the population	+	+	+	++	++	++		+	++	+	++	+
Wrecked housing	+		++	++	+	+	+	+		+		++
Coverage with Internet	+		++	+++	++	++	+		+	+		++
Number of individual entrepreneurs	+	++	++	++	+	+	+	++	+	+	++	
Informal employment	+	++	+	+	++	+++		+	++	+	+	+
Social assistance												
Average governmental assistance to low-income families	++	++	+++	++	+		+	++	+		++	+
Governmental expenditures on education	+	+++	++		+++	++	++	+++	++	+	+++	++
Governmental expenditures on health	++	+++	+++	+	++	+	+	+++	+		++	+
Governmental expenditures on social protection and social assistance	+	+	+		+	+	++	++	+		+	+
Average housing, electricity, and fuel benefits and subsidies	+	+	++	+		+		+	+		+	+

Note: I – innovative development approach; R – resource-based approach; C – cost-based approach. The gradation of pluses is based on correlation analysis by the Chaddock scale: «+++» – 0.80-0.99; «++» – 0.5-0.79; «+» – 0.1-0.49. Empty spaces indicate the absence of a relationship. The nature of indicators' impact was not considered in the analysis.

The situation with the impact of determinants in the social assistance group on the quality of life is quite controversial (innovative approach). There is a moderate relationship with average governmental assistance to low-income families in Chernivetska and Lvivska oblasts. Meanwhile, the relationship between the social assistance indicators and the quality of life is not observed in Ivano-Frankivska oblast. In Zakarpatska oblast, the relationship is weak, excluding the governmental expenditures on education determinant. It is worth emphasizing a very strong and strong relationship between the social assistance indicators and the quality of life (resource-based approach), which is understandable from the viewpoint of the region's high dependence on expenditures from the public budget and donations.

The quality of life (cost-based approach) in Chernivetska oblast depends on the average assistance to low-income families and housing benefits and subsidies. It shows the high poverty level in the region. Social assistance weakly determines the high quality of life parameters in Lvivska, Zakarpatska, and Ivano-Frankivska oblasts, which is explained by substantial remittances obtained by households. This investment generates total household resources directed at consumption and meeting the needs of the population. Therefore, the financial capacity of households that have labor migrants does not correlate with the amount and various forms/types of social assistance. Yet, there is an interesting moderate dependence between the quality of life in all oblasts of the Carpathian region and expenditures on education, indicating strong needs of the youth in the region for qualitative educational services as a component of their quality of life.

The strongest relationship between social determinants and the quality of life by three approaches is in the social tension group, namely by the resource-based approach that describes the living conditions, services, and capacity development (Table 5). There is a strong correlation between the quality of life and unemployment in all oblasts of the Carpathian region and a moderate relationship with wage arrears, number of detected crimes, number of retirees, and number of population with total monthly income below the subsistence level. The growth of the values of these indicators leads to social tension intensification in the region and thus falling quality of life. Meanwhile, the increasing values of some indicators – coverage with housing, coverage with preschool education institutions, and average life expectancy – reduce social tension in all oblasts of the region and foster the improvement of the quality of life (cost-based approach). It is worth noting that wage arrears, the morbidity rate (Zakarpatska oblast), number of retirees (Lvivska oblast), coverage with housing (Ivano-Frankivska oblast) do not have a relationship with the quality of life.

Table 5. The relationship between social determinants and the quality of life in the Carpathian region: social tension and coverage with social infrastructure, 2010-2019

Determinants	Empirical parameter of the quality of life/Oblasts											
	Chernivetska			Lvivska			Zakarpatska			Ivano-Frankivska		
	I	R	C	I	R	C	I	R	C	I	R	C
Social tension												
Unemployment at 15-70	+	+++	+	++	+++	++	++	++	+		+++	++
Wage arrears	+	++	+	++	+	+	+	+		+	++	++
Detected crimes	++	++	+++	+++	+	+	+	+	+		+	+
Number of retirees	+	++	+		++	++	++	++	++	+	+	++
Coverage with housing	++	+	++	+++	++	++	+	+	++	+		++
Coverage with preschool institutions	+	+	++	++	++	++	+			+		+++
Number of the population with average monthly per capita income below the subsistence level	+++	++	+++	++	++	++	+	++	+	+	+	+
Morbidity of the population	++	+	++	++	+	++	+	+		+		++
Average life expectancy at birth	+	++	++	++	+	+	+	+	+	+	+	++
Coverage with social infrastructure												
Number of hospital beds	+		++	+++	++	++	+		+	++	+	+++
Number of places in nursing homes for the elderly and disabled	+	+	+	+					+	++	+	++
Number of general secondary education institutions	+	+	+	++	++	++	+			+		+++
Number of higher education institutions	+		++	++	+		+	+		++	+	++
Housing stock	+		++	+++	++	++	+	+	++	+		+++

Note: I – innovative development approach; R – resource-based approach; C – cost-based approach. The gradation of pluses is based on correlation analysis by the Chaddock scale: «+++» – 0.80-0.99; «++» – 0.5-0.79; «+» – 0.1-0.49. Empty spaces indicate the absence of a relationship. The nature of indicators' impact was not considered in the analysis.

The availability of developed social infrastructure is the necessary condition for improving the quality of life. Human development and human capacity development through the creation of a set of benefits necessary for the extended reproduction of the workforce are the key objectives of the functioning of social infrastructure. The analysis reveals the substantial relationship between the coverage with social infrastructure determinants with the quality of life (cost-based approach) in all oblasts of the Carpathian region. There is a strong relationship between infrastructure and the quality of life in Lvivska oblast (innovative approach), indicating a high correlation between the living standards and innovative development of the region and scientific-educational progress. It is worth mentioning that there isn't a relationship between social infrastructure and the quality of life (resource-based approach) and there is a moderate relationship by innovative and cost-based approaches in Zakarpatska oblast.

The covariance study of data sets was carried out to detect the level of joint variability of socio-economic

determinants and the quality of life in the Carpathian region. Higher values of social and ecological determinants correspond to higher values of the empirical parameter of the quality of life and vice versa. If the covariance is positive, the variables show similar behavior. On the contrary, if higher values of determinants correspond to lower values of the quality of life parameter, the variables demonstrate the reverse impact (covariation is negative).

The coverage with the Internet, number of individual entrepreneurs, and informal employment shows the positive trend in a linear relationship with the quality of life (innovative approach) in the employment, income, and living conditions group in Chernivetska oblast. Meanwhile, employment at 15-70, employment and dismissal levels, decile coefficient of income differentiation, nominal wages, wrecked housing, coverage with Internet, and number of individual entrepreneurs positively impact the quality of life in Lvivska oblast (Table 6).

An interesting trend was detected in Zakarpatska oblast, namely the quality of life falls with the increase of informal employment, consumer price index, and employment level. Ivano-Frankivska oblast shows a direct relationship in a positive trend of the quality of life with nominal wages, decile coefficient of income differentiation, and coverage with Internet. It is worth emphasizing the direct relationship of the quality of life with indicators stimulating employment and fostering income growth in all oblasts of the Carpathian region (cost-based, resource-based approaches).

Table 6. The nature of joint variability of social determinants and the quality of life in the oblasts of the Carpathian region, 2010-2019

Determinants	Empirical parameter of the quality of life/Oblasts											
	Cherni-vetska			Lvivska			Zakar-patska			Ivano-Frankivska		
	I	R	C	I	R	C	I	R	C	I	R	C
Employment, income, living conditions												
Employment at 15-70	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑	↑	↑
Employment level	↓	↑	↓	↑	↑	↑	↓	↓	↓	↑	↓	↑
Dismissal level	↓	↑	↓	↑	↑	↑	↓	↓	↓	↑	↓	↑
Average monthly nominal wages	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑	↑	↑
Disposable income of the population	↓	↑	↓	↓	↑	↓	↑	↑	↑	↓	↑	↓
Consumer price index	↑	↓	↑	↑	↓	↓	↓	↓	↓	↑	↓	↑
The share of households' food expenditures	↑	↓	↑	↓	↓	↓	↑	↑	↑	↑	↓	↑
The decile coefficient of the total income of the population	↑	↑	↑	↑	↑	↑	↓	↑	↓	↑	↑	↑
Wrecked housing	↓	↑	↓	↑	↓	↑	↓	↑	↓	↓	↑	↓
Coverage with Internet	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Number of individual entrepreneurs	↑	↓	↑	↑	↓	↑	↓	↓	↓	↓	↓	↓
Informal employment	↑	↓	↑	↓	↓	↓	↓	↓	↓	↑	↓	↑
Social assistance												
Average governmental assistance to low-income families	↓	↑	↓	↓	↑	↓	↑	↑	↑	↓	↑	↓
Governmental expenditures on education	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑	↑	↑
Governmental expenditures on health	↓	↑	↓	↓	↑	↓	↑	↑	↑	↓	↑	↓
Governmental expenditures on social protection and social assistance	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑	↑	↑
Average housing, electricity, and fuel benefits and subsidies	↑	↓	↑	↑	↓	↑	↓	↓	↓	↓	↓	↓
Social tension												
Unemployment at 15-70	↑	↓	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓
Wage arrears	↓	↓	↓	↑	↑	↓	↓	↑	↓	↑	↑	↑
Detected crimes	↑	↓	↑	↓	↓	↑	↑	↓	↑	↑	↓	↑
Number of retirees	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Coverage with housing	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Coverage with preschool institutions	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Number of the population with average monthly per capita income below the subsistence level	↑	↓	↑	↑	↓	↑	↓	↓	↓	↑	↓	↑
Morbidity of the population	↓	↑	↓	↓	↓	↓	↓	↑	↓	↓	↓	↓
Average life expectancy at birth	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Coverage with social infrastructure												
Number of hospital beds	↓	↓	↓	↓	↓	↓	↓	↑	↓	↓	↓	↓
Number of places in nursing homes for the elderly and disabled	↑	↑	↑	↓	↓	↓	↑	↓	↑	↓	↑	↓
Number of general secondary education institutions	↓	↓	↓	↓	↓	↓	↓	↑	↓	↓	↓	↓
Number of higher education institutions	↓	↑	↓	↓	↓	↓	↓	↑	↓	↓	↑	↓
Housing stock	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

Note: The nature of impact is interpreted following the results of covariation analysis: «↑» – direct impact; «↓» – reverse impact.

Average governmental assistance to low-income families, governmental expenditures on education, health, social protection, and social assistance determine the positive impact on the quality of life (resource-based approach) in all oblasts of the Carpathian region. Meanwhile, these indicators have the reverse impact on the quality of life in Chernivetska oblast because wages constitute the main part of total household resources in the oblast and food expenditures – the main part of household expenditures. For instance, a substantial share of total expenditures is directed at savings in Lvivska oblast, while migration capital constitutes the total resources of households in Zakarpatska oblast.

The determinants of the social tension group have the existential impact from the viewpoint of impact on the quality of life in all oblasts of the Carpathian region (resource-based approach), namely unemployment at 15-70, wage arrears, number of detected crimes, and number of retirees, indicating the low level of implementation of progressive social domain development tools in the region. For instance, the reverse impact of the morbidity of the population on the quality of life in Lvivska oblast shows the immaturity of healthcare development programs. It is worth mentioning that average life expectancy at birth had positive dynamics with the quality of life by three approaches in all oblasts of the Carpathian region. Unemployment as an independent variable of the quality of life had the reverse impact on the quality of life in Lvivska, Zakarpatska, and Ivano-Frankivska oblasts, yet, the trend was the opposite in Chernivetska oblast.

The number of hospital beds and the number of general secondary and higher education institutions in the coverage with social infrastructure group demonstrated the reverse impact on the quality of life, indicating the weak causal relationship between the quantitative parameters of social infrastructure and the quality of life. Therefore, high living standards are determined by the high quality of medical and educational services, available competitive advantages of higher education institutions, and modern technical maintenance of the educational process in secondary education institutions. There is a direct impact of the number of places in nursing homes for the elderly on the quality of life in the oblasts of the Carpathian region because it is the mean to meet their needs and security conditions.

4.3. The results of modeling the impact of ecological determinants on the quality of life: regional dimension

The availability of water resources and availability of land resources groups had the strongest relationship with the quality of life among the considerable number of ecological determinants. The use of fresh water had a very strong relationship with the quality of life (innovative, cost-based approaches) in Chernivetska and Lvivska oblasts. Meanwhile, the relationship was absent in Zakrpatska and Ivano-Frankivska oblasts, which is explained by the fact that the population doesn't face the problems with drinking water in these regions (Table 7). Yet, a considerable relationship between the quality of life and the discharge of contaminated return waters into the surface waters (innovative and cost-based approaches) and the capacity of treatment facilities (resource-based and cost-based approaches) was observed in Ivano-Frankivska oblast. It is worth mentioning that there was strong relationship between the quality of life and volumes of circulating and reused water (resource-based and cost-based approaches) and general water disposal (cost-based approach) observed in Zakarpatska oblast. In Lvivska oblast, the quality of life (innovative approach) had a significant (by the Chaddock scale) relationship with the group determinants, excluding the discharge of contaminated return waters into the surface waters. The quality of life is largely determined by the availability of water resources in Chernivetska oblast, which is confirmed by the results of the correlation analysis.

Contamination of the territory and air quality are among the main components of the quality of life in the Carpathian region. 2010-2019 faced a substantial increase in the emission of pollutants from stationary sources into the atmosphere. The volumes of pollutants emitted into the air basin from stationary sources in 2019 reduced by 20.4 % in Lvivska oblast and 35.7 % in Chernivetska oblast compared to 2010, according to main statistical offices. Yet, the waste accumulated during exploitation in the designated places or facilities increased in 2010-2019, e.g. the increase was 8.11 % in Chernivetska oblast and 1.82 % in Ivano-Frankivska oblast in 2019. These trends complementarily determine the strength of the relationship of some ecological determinants of the territory's contamination with the quality of life. There is a moderate relationship between the quality of life and I-III hazard class waste generation and IV hazard class waste treatment in Chernivetska oblast. The relationship is moderate with all group determinants in Lvivska oblast, excluding the emission of pollutants from stationary sources into the atmosphere, IV hazard class waste treatment, and waste accumulated during exploitation in the designated places or facilities. A weak relationship or no relationship between the quality of life and ecological determinants of the contamination of the territory and air quality group are observed in Zakarpatska oblast since outdated equipment, preventive repairs at compressor stations, and inefficient operation of outdated gas handling equipment at asphalt plants are the main air pollution causes in the region. Ivano-Frankivska oblast had a moderate relationship of the quality of life with emission of pollutants from stationary sources into the atmosphere, IV hazard class waste generation and treatment (innovative and cost-based approaches), and III hazard class waste generation (resource-based approach).

Table 7. The relationship between ecological determinants and the quality of life in the Carpathian region, 2010-2019

Determinants	Empirical parameter of the quality of life/Oblasts											
	Chernivetska			Lvivska			Zakarpatska			Ivano-Frankivska		
	I	R	C	I	R	C	I	R	C	I	R	C
Availability of water resources												
Water extraction from natural sources	+++	+	+++	+++	+	+	+		+		++	+
The use of fresh water	+++	+	+++	+++	+	+		+			++	+
The volume of circulating and reused water	++	++	+++	++	+	+	+	++	++	++	++	++
General water disposal	+++	+	+++	++	++	++	+	+	++	+	+	+
The discharge of contaminated return waters into the surface waters	+	+	++	+	+	+	++	+		++	+	++
Treatment facilities capacity	++	+	++	+++			+	+	+		+	+
Contamination of territories and air quality												
Emission of pollutants from stationary sources into the atmosphere	+	+	+	++			+		+	++		+
I-III hazard class waste generation	++	++	++	++	++	+	+	+	+	+	++	+
IV hazard class waste generation	+	+	+	++	+	+		+	+	++	+	++
I-III hazard class waste treatment coefficient	+	+	+	+	+	+	+	+		+	+	
IV hazard class waste treatment coefficient	++	+	++	++				++	+	++	+	++
Index of wastes accumulated during exploitation in the designated places or facilities	+	+	+	+					+	+	+	+
Investment framework of nature management												
Capital investment in environmental protection	++	+	++	+	++	++	+	+	++	+	+	++
Operating cost of environmental protection	+	+	++	+++	+	++	+	+	++	++	+	+++
Share of operating cost of environmental protection in GRP	++	+	++	++	++	+			++	+	+	+
The share of capital investment in environmental protection in capital investment	++	+	++	+	+	+	+	++	++	+	+	+
Availability of land resources												
The share of built-up areas	+	+	+	++	++	++			+	++		+++
The share of agricultural land areas		++	+	+	+	+	+	+	+++	++	++	+++
The share of nature reserve fund areas	+	+	+	++	+	+	+	+	+++	++	++	++
Forests, forest-covered areas, and land under water areas		+	+	++	++	+	+	+	+++	++	++	++

Note: I – innovative development approach; R – resource-based approach; C – cost-based approach. The gradation of pluses is based on correlation analysis by the Chaddock scale: «+++» – 0.80-0.99; «++» – 0.5-0.79; «+» – 0.1-0.49. Empty spaces indicate the absence of a relationship. The nature of indicators' impact was not considered in the analysis.

Capital investment and the share of operating cost of environmental protection in GRP are the most significant by the strength of relationship with the quality of life among the ecological determinants of the investment framework of nature management group for all oblasts of the Carpathian region. The operating cost of environmental protection in the region has a moderate relationship with the quality of life (cost-based approach). The share of capital investment in environmental protection in capital investment had a significant relationship with the quality of life in Chernivetska and Zakarpatska oblasts. Meanwhile, the relationship is weak in Lvivska and Ivano-Frankivska oblasts. It is worth mentioning that there is no relationship between the share of operating cost of environmental protection in GRP and the quality of life in Zakarpatska oblast (innovative, resource-based approach). Ivano-Frankivska oblast demonstrates a very strong relationship with the quality of life in the availability of land resources group, namely by the share of built-up areas and agricultural land areas (cost-based approach), and a moderate relationship with the share of nature reserve fund areas and forests, forest-covered areas, and land under water areas.

Meanwhile, there is a very strong relationship with all determinants in Zakarpatska oblast, excluding the share of built-up areas (cost-based approach), and a weak relationship with ecological components (innovative, resource-based approaches). In Lvivska oblast, the determinants of availability of land resources have a moderate relationship with the quality of life, excluding the share of agricultural land areas because Lvivska oblast is the center of domestic labor and educational migrants' gravitation. Their quality of life is mostly determined by housing area and thus the share of built-up areas in the region. A weak relationship with ecological determinants of this group and no relationship of the share of agricultural land areas and forests, forest-covered areas, and land under water areas with the quality of life was observed in Chernivetska oblast (innovative approach).

The nature of joint variability of ecological determinants with the quality of life in the Carpathian region is different in different groups. The water extraction from natural sources, the use of fresh water, general water disposal, and treatment facilities capacity impact the improvement of the quality of life in Chernivetska oblast (resource-based approach); meanwhile, the growth of all

determinants except for the volume of used fresh water leads to declining quality of life (cost-based approach) (Table 8). In Lvivska oblast, all determinants had the reverse relationship with the quality of life, excluding the volumes of circulating and reused water and treatment facilities capacity (resource-based approach). The positive dynamics of all ecological determinants in the group, excluding the discharge of contaminated waters into the surface waters, reproduces direct dynamics with the quality of life (resource-based approach) and reverse dynamics by innovative approach in Ivano-Frankivska and Zakarpatska oblasts.

Naturally, the I-III hazard class waste treatment coefficient and IV hazard class waste treatment coefficient in the contamination of territories and air quality group had a direct impact on the quality of life in all oblasts of the Carpathian region. Therefore, the emission of pollutants from stationary sources into the atmosphere indicator had a reverse impact. The index of wastes accumulated during exploitation in the designated places or facilities had the reverse impact on the quality of life in the oblasts where it grew and vice versa, indicating the relationship between high living standards and opportunities of waste treatment according to European standards.

Table 8. The nature of joint variability of ecological determinants and the quality of life in the Carpathian region of Ukraine, 2010-2019

Determinants	Empirical parameter of the quality of life/Oblasts											
	Cherni-vetska			Lvivska			Zakar-patska			Ivano-Frankivska		
	I	R	C	I	R	C	I	R	C	I	R	C
Availability of water resources												
Water extraction from natural sources	↓	↑	↓	↓	↓	↓	↓	↑	↓	↓	↑	↓
The use of fresh water	↓	↑	↓	↓	↓	↓	↑	↑	↑	↓	↑	↓
The volume of circulating and reused water	↑	↓	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
General water disposal	↓	↑	↓	↓	↓	↓	↓	↑	↓	↓	↑	↓
The discharge of contaminated return waters into the surface waters	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Treatment facilities capacity	↓	↑	↓	↓	↑	↓	↑	↓	↑	↓	↑	↓
Contamination of territories and air quality												
Emission of pollutants from stationary sources into the atmosphere	↑	↓	↑	↓	↓	↓	↓	↑	↓	↑	↑	↑
I-III hazard class waste generation	↓	↑	↓	↑	↑	↑	↓	↑	↓	↑	↑	↑
IV hazard class waste generation	↑	↑	↑	↓	↓	↓	↓	↑	↓	↑	↑	↑
I-III hazard class waste treatment coefficient	↑	↑	↑	↓	↓	↓	↑	↑	↑	↑	↓	↑
IV hazard class waste treatment coefficient	↑	↑	↑	↑	↑	↑	↓	↓	↓	↓	↑	↓
Index of wastes accumulated during exploitation in the designated places or facilities	↓	↑	↓	↓	↑	↓	↑	↑	↑	↑	↑	↑
Investment framework of nature management												
Capital investment in environmental protection	↑	↑	↑	↑	↑	↑	↑	↑	↑	↓	↓	↓
Operating cost of environmental protection	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Share of operating cost of environmental protection in GRP	↓	↑	↓	↓	↓	↓	↑	↓	↑	↑	↑	↑
The share of capital investment in environmental protection in capital investment	↑	↓	↑	↓	↑	↓	↑	↑	↑	↓	↓	↓
Availability of land resources												
The share of built-up areas	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
The share of agricultural land areas	↑	↑	↑	↑	↑	↑	↓	↓	↓	↓	↓	↓
The share of nature reserve fund areas	↑	↑	↑	↑	↑	↑	↓	↓	↓	↑	↓	↑
Forests, forest-covered areas, and land under water areas	↑	↑	↑	↑	↑	↑	↑	↓	↑	↑	↓	↑

Note: I – innovative development approach; R – resource-based approach; C – cost-based approach. The nature of impact is interpreted following the results of covariation analysis: «↑» – direct impact; «↓» – reverse impact.

Capital investment and operating cost of environmental protection had a direct impact on the quality of life in all oblasts of the Carpathian region (excluding Ivano-Frankivska oblast). Meanwhile, the reverse impact on the quality of life was observed for the share of operating cost of environmental protection in GRP in Chernivetska and Lvivska oblasts. Naturally, the quality of life in Zakarpatska and Ivano-Frankivska oblasts as the recreation-touristic areas correlated with foreign and domestic investment in the nature reserve fund.

The group of availability of land resources had the strongest direct impact of ecological determinants on the quality of life in the Carpathian region. Only Zakarpatska and Ivano-Frankivska oblasts faced the reverse impact of the share of agricultural land areas on the quality of life. It is worth mentioning that Ivano-Frankivska oblast showed the reverse dynamics of the quality of life (resource-based approach) with all ecological determinants in the group, excluding the share of built-up areas.

The environmental situation in the Carpathian region formed due to the neglect of objective development patterns and reproduction of natural geosystems is characterized by excessive techno- and anthropogenic load on the environment and a high level of contamination. Therefore, the quality of life in the Carpathian region depends on the condition and development paces of environmental protection, improvement of ecological situation, increase of environmental security level in oblasts, achievement of the condition of ecological environment safe for human health, cut of biological and landscape diversity losses, and improvement of environmental awareness of the population.

The identified features should be considered when framing the policy of improving the quality of life in the region. Therefore, the measures oriented on the improvement of social environment parameters will be more efficient in Lvivska and Chernivetska oblasts, namely about reduction of unemployment, improvement of coverage with housing, crime reduction, improvement of the system of social assistance to low-income families, increase of funding of educational and healthcare institutions. In Zakarpatksa and Ivano-Frankivska oblasts the increase of income, improvement of the purchasing power of the population, sustainable development of economy and society, and environmental protection will have better effect.

5. CONCLUSIONS

The quality of life is comprehensively evaluated following the resource-based, cost-based, and innovative approaches. The resource-based approach shows a substantial growth of the quality of life in 2010-2019 in Lvivska and Ivano-Frankivska oblasts (GRP per capita increased by € 1389.7 and € 778.01, respectively). The cost-based approach demonstrates the upward trend in the improvement of living standards and the growth of total household resources in all oblasts of the region. The application of the innovative development approach reveals that the quality of life is the highest in Lvivska oblast (in 2019, the integral index of an innovative environment for meeting the needs of the population and human capacity development calculated by the multiplicative method was 0.681. In 2010-2019, it increased twice).

To carry out the complex analysis of the impact of socio-ecological determinants on the quality of life in the Carpathian region, the methodological approach to the detection of their relationship and joint variability level is developed and tested. Overall, a high level of impact of socio-ecological determinants on the quality of life in the Carpathian region of Ukraine was identified. Yet, the highest level of impact of social determinants on the quality of life is observed by the cost-based approach, while the lowest – by the innovative approach. The level of impact of social determinants on the quality of life is much higher in Chernivetska and Lvivska oblasts and the lowest – in Zakarpatska oblast. The impact of social assistance (Chernivetska and Zakarpatska oblasts), social tension (Lvivska oblast), and availability of social infrastructure (Ivano-Frankivska oblast) on the quality of life prevails in the regional structure.

Ecological determinants have the highest level of impact on the quality of life by cost-based and innovative approaches, and the lowest by resource-based approach. The level of impact on ecological determinants on the quality of life in Zakarpatska oblast is significantly lower. The impact of contamination of territories and air quality (Chernivetska and Ivano-Frankivska oblasts) and availability of land resources (Lvivska, Zakarpatska, and Ivano-Frankivska oblast) on the quality of life prevails in the regional structure.

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References:

Aguiar, M., & Bils, M. (2015). Has consumption inequality mirrored income inequality? *American Economic Review*, *105*(9), 2725–2756. https://doi.org/10.1257/aer.20120599

Anjara, S. G., Nellums, L. B., Bonetto, C., & Van Bortel, T. (2017). Stress, health and quality of life of female migrant domestic workers in Singapore: A cross-sectional study. *BMC Women's Health*, *17*(1), 98. https://doi.org/10.1186/s12905-017-0442-7

Brummet, Q., & Reed, D. (2019). *The effects of gentrification on original neighborhood residents: Evidence from longitudinal Census microdata*, Working Paper 19-30, Federal Reserve Bank of Philadelphia.

Bérenger, V., & Verdier-Chouchane, A. (2007). Multidimensional measures of well-being: Standard of living and quality of life across countries. *World Development*, *35*(7), 1259–1276. https://doi.org/10.1016/j.worlddev.2006.10.011

Bergstrand, K., Mayer, B., Brumback, B., & Zhang, Y. (2015). Assessing the relationship between social vulnerability and community resilience to hazards. *Social Indicators Research*, *122*(2), 391–409. https://doi.org/10.1007/s11205-014-0698-3

Broda, C., Leibtag E., & Weinstein, D. E. (2009). The role of prices in measuring the poor's living standards. *Journal of Economic Perspectives*, 23, 77-97. DOI: 10.1257/jep.23.2.77

Couture, V., Gaubert, C., Handbury, J., & Hurst, E. (2019). Income growth and the distributional effects of urban spatial sorting. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3435825

Cruz, L., Polanczyk, C., Camey, S., Hoffmann, J., & Fleck, M. (2011). Quality of life in Brazil: normative values for the whoqol-bref in a southern general population sample. *Quality of Life Research*, 20, 1123-1129. https://doi.org/10.1007/s11136-011-9845-3

Cutter, S., Boruff, B., & Shirley, W. (2003). Social vulnerability to environmental hazards. *Social science quarterl*y, 4(2), 242-261. https://doi.org/10.1111/1540-6237.8402002.

Diamond, R. (2016). The determinants and welfare implications of US workers' diverging location choices by skill: 1980-2000. *American Economic Review*, 106, 479-524. DOI: 10.1257/aer.20131706.

Diener, E. (2003). Personality, culture, and subjective well-being: emotional and cognitive evaluations of life. *Annual Review of Psychology*, 54, 403-425. DOI: 10.1146/annurev.psych.54.101601.145056

Fiedler, K. (2012). Owlet caterpillars of eastern north America by d. L. Wagner, d. F. Schweitzer, j. B. Sullivan & r. C. Reardon, 2011. *The Journal of Research on the Lepidoptera*, *45*, 25-26. https://doi.org/10.5962/p.332184

Hsieh, Ch., & Moretti, E. (2019). Housing constraints and spatial misallocation. *American Economic Journal: Macroeconomics*, 11 (2), 1-39. DOI: 10.1257/mac.20170388

Farias, M., & Leite, J. (2021). Social vulnerability and Covid-19: considerations based on social occupational therapy. *Cadernos Brasileiros de Terapia Ocupacional*, 29, 20-99. https://doi.org/10.1590/2526-8910.ctoEN2099.

Ganong, P., & Shoag, D. (2017). Why has regional income convergence in the US declined? *Journal of Urban Economics*, 102, 76-90. DOI: 10.1016/j.jue.2017.07.002

Ganong, P., & Noel, P. (2019). Consumer spending during unemployment: Positive and normative implications. *American economic review*, 109, 2383-2424. DOI: 10.1257/aer.20170537

Jones, B., & Andrey, J. (2007). Vulnerability index construction: Methodological choices and their influence on identifying vulnerable neighbourhoods. *International Journal of Emergency Management*, 4(2), 269. https://doi.org/10.1504/IJEM.2007.013994

Keys, B. J., Mahoney, N., & Yang, H. (2020). What determines consumer financial distress? place and person-based factors. *SSRN Electronic Journal*. DOI: 10.2139/ssrn.3547707

Main Department of Statistics in Chernivtsi region (MDCh), 2010-2019. Retrieved from http://www.cv.ukrstat.gov.ua

Main Department of Statistics in Ivano-Frankivsk region (MDIv-F), 2010-2019. Retrieved from http://www.ifstat.gov.ua

Main Department of Statistics in Lviv region (MDLv), 2010-2019. Retrieved from https://www.lv.ukrstat.gov.ua

Main Department of Statistics in Zakarpattia region (MDZ), 2010-2019. Retrieved from http://www.uz.ukrstat.gov.ua

McLaughlin, S., & Cooper, J. (2010). A multi-scale coastal vulnerability index: a tool for coastal managers? *Environmental Hazard*, 9 (3), 233-248. DOI: 10.3763/ehaz.2010.0052

Meyer, B., & Sullivan J. (2017). Consumption and income inequality in the U.S. since the 1960s. *SSRN Electronic Journal.* DOI: 10.2139/ssrn.3037000

Mogaji, E. (2020). Financial vulnerability during a pandemic: insights for coronavirus disease (COVID-19). *Research Agenda Working Papers*, 5, 57-63. https://dx.doi.org/10.2139/ssrn.3564702.

Montgomery, A., & Rossi, P. (1999). Estimating price elasticities with theory-based priors. *Journal of Marketing Research*, 36, 413-423. https://doi.org/10.1177%2F002224379903600402

Moretti, E. (2004). Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data. *Journal of Econometrics*, 121, 175-212. https://doi.org/10.1016/j.jeconom.2003.10.015

Mulska, O., Levytska, O., Panchenko, V., Kohut, M., & Vasyltsiv, T. (2020). Causality of external population migration intensity and regional socio-economic development of Ukraine. *Problems and Perspectives in Management*, 18(3), 426-437. http://dx.doi.org/10.21511/ppm.18(3).2020.35.

Mulska, O., Vasyltsiv, T., Shushkova, Yu., Kloba, L., & Parfenyuk, Ye. (2022). Assessment of the population's social resilience environment (the case of the Carpathian region of Ukraine). *Problems and Perspectives in Management*, 20(1), 407-421. DOI:10.21511/ppm.20(1).2022.33

Ramos, D., Azevedo, R., Rodrigues, M., & Loureiro, I. (2018). Employees' views about the impact of the economic crisis on occupational safety and quality of life: A pilot study in the North of Portugal. *International Journal for Quality Research*, 12(4) 941-950. DOI: 10.18421/IJQR12.04-10

Rothbaum, J. (2015). Comparing Income Aggregates: How do the CPS and ACS match the national income and product accounts, 2007-2012, US Census Bureau, SEHSD Working Paper, 1.

Rygel, L., O'Sullivan, D., & Yarnal, B. (2006). A method for constructing a social vulnerability index: an application to hurricane storm surges in a developed country. *Mitigation and Adaptation Strategies for Global Change*, 11, 741-764. https://doi.org/10.1007/s11027-006-0265-6

Sabelhaus, J., & Groen J. (2000). Can permanent-income theory explain cross-sectional consumption patterns? *Review of Economics and Statistics*, 82, 431-438.

Semiv, S., Berezivskiy, Y., Baranyak, I., Mulska, O., & Ivaniuk, U. (2021). Priorities and tools of regulation of external migration in the Carpathian region of Ukraine. *Agricultural and Resource Economics: International Scientific E-Journal*, 7(2), 160-181. https://doi.org/10.51599/are.2021.07.02.09

Van Niekerk, L., & Van Niekerk, D. (2009). Participatory action research: Addressing social vulnerability of rural women through income-generating activities. *JAMBA: Journal of Disaster Risk Studies*, 2(2), 127-144. https://doi.org/10.4102/jamba.v2i2.20.

Vasyltsiv, T., Mulska, O., Levytska, O., Kalyta, O., Kohut, M., Biletska, I. (2021). External migration and endogenous development nexus: Challenges for the sustainable macroeconomic policy. *Estudios de Economia Aplicada*, 39(8). https://doi.org/10.25115/eea.v39i8.4770

Voznyak, H., Mulska, O., Bil, M., Patytska, K., Lysiak, L. (2022a). Financial well-being of territorial communities and the economic growth of the regions of Ukraine: assessment and modeling of interrelation. *Agricultural and Resource Economics: International Scientific E-Journal*, 8(2), 141-157. https://doi.org/10.51599/are.2022.08.02.08

Voznyak, H., Mulska, O., Bil, M., Radelytskyy, Y. (2022b). Financial wellbeing of households in instability. *Investment Management and Financial Innovations*, 19(1), pp. 135-144. http://dx.doi.org/10.21511/imfi.19(1).2022.10

Webb, E., Blane, D., McMunn, A., & Netuveli, G. (2011). Proximal predictors of change in quality of life at older ages. *Journal of Epidemiology and Community Health*, 65(6), 542-547. DOI: 10.1136/jech.2009.101758

Wong, M., Teoh, J., Huang, J., & Won S. (2020). The potential impact of vulnerability and coping capacity on the pandemic control of COVID-19. *The Journal of Infection*, 81(5), 816-646. https://doi.org/10.1016/j.jinf.2020.05.060.

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