Global J. Environ. Sci. Manage. 6(4): 481-496, Autumn 2020

Global Journal of Environmental Science and Management
(GJESM)

Homepage: https://www.gjesm.net/

ORIGINAL RESEARCH PAPER

Impact of forced migration on the sustainable development of rural territories

V. Shcherbak[1*], I. Bryzhan[2], V. Chevhanova[3], L. Svistun[3], O. Hryhoryeva[3]

[1]*Department of Entrepreneurship and Business, Kyiv National University of Technologies and Design, Kyiv, Ukraine*

[2]*Office of the Project, Integrated Development in Ukraine, Poltava, Ukraine*

[3]*National University, Yuri Kondratyuk Poltava Polytechnic, Poltava, Ukraine*

ARTICLE INFO

Article History:
Received 05 February 2020
Revised 24 April 2020
Accepted 25 May 2020

Keywords:
Cluster analysis
Local community
Refugees
Rural resources
Socio-economic mechanism

ABSTRACT

This study provides a comprehensive scientific analysis of contemporary problems resulted from the forced migration of the Ukrainian population and its impact on the sustainable development of 47 host communities of Poltava region. By means of cluster analysis 4 clusters of 26 rural territories were identified. They differ in the size of local budgets and the involvement level of forcedly displaced population into the local economy. Factor analysis showed that the involvement level of forcedly displaced population in the region's economy is determined by 2 groups according to 10 indicators. 8 indicators of the first factor determine 2/3 of the dispersion of refugees' impact on rural economy. The first factor reduces the gross regional product by 61.75%. The indicators of the second factor shows a positive impact and determines 15% of the dispersion. The use of game theory to identify conflicts of interest between refugees and host communities was justified. The reasonability to use the taxonomy method to construct a map of positioning rural areas according to the size of local budgets and the degree of integration of refugees is justified. The use of the created map identified the "growth points" in particular clusters. As a result of the implementation of the proposed conflict resolution mechanism between refugees and host communities, the budget of the rural areas of the first cluster increased by 18%, the second cluster by 14.5%, the third cluster by 13%, the fourth by 8%, refugee participation by 30%.

DOI: 10.22034/gjesm.2020.04.05

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
39	9	5

*Corresponding Author:
Email: *valery_shcherbak@i.ua*
Phone: +38(099) 9687135
Fax: +38044-280 05 12

Note: Discussion period for this manuscript open until January 1, 2021 on GJESM website at the "Show Article.

INTRODUCTION

Important factors in the achievement of a sustainable socio-economic development of any country include demographics and the quality of human resources potential of the rural areas. Most of the world's population resides in rural areas. Migration processes have always played a decisive role in the human development, having an influence on the creation of states and cities, formation of races, ethnicities and nations (Demirdjian, 2005; Panizzon *et al.,* 2019). The history of civilization was marked by the great migration of peoples and great geographical discoveries. For example, USA, Canada and Australia are migrant based countries (Bil *et al.*, 2018). Today, over 190 million people (3% of the Earth's population) do not live in their countries of origin. There are several social reasons for the migration, particularly economic, political, religious, national and environmental (Greussing *et al.,* 2017). From this perspective, migration flows can be classified according to the term of displacement (seasonal, temporary, permanent, or one-way) (Aleshkovski, 2017), size (single and numerous); range (intercontinental and inland) (Castles, 2002); directions (external and internal); motives (forced and voluntary) (Arandarenko *et al.*, 2020); organization principles (organized and initiative) (Adamson, 2006); legal status (legal and illegal) (Nitschke, 2019). The reasons and forms of migration processes in Ukraine today are mostly conditioned by the war conflict (Balueva *et al.*, 2018). Social reality of the hybrid war in Ukraine defines the necessity to study migration processes within the Ukrainian society (Stukalo *et al.*, 2018) and the impact of forced migration on the economy of different regions (Shymanska *et al.*, 2017). It is rather problematic to analyze the forced displacement and its impact on sustainable development of rural areas (Kolodiziev *et al.*, 2018). This is conditioned by the undefined legal status of forcedly displaced population (Arakelova, 2017), the ongoing military conflict in Donbas since 2014 (Pogorelov *et al.,* 2017), the ineffective Anti-Terrorist Operation (hereinafter - ATO) (Pylypenko, 2018), the lack of a state policy on the protection of migrants' rights (Vasyltsiv *et al.,* 2019). Military conflicts constantly develop in different regions all over the world (Bucholski, 2015). The recent trend in the cycles human civilization development includes bipolarity, strengthening of technical development and globalization (Adamson *et al.,* 2019). Sustainable development of the world's economy is manifested in the decolonization, world's territory reconstruction (Demirdjian, 2005; Panizzon *et al.,* 2019), strengthening of social capital (Arango, 2000) and capitalization of social processes (Simianescu *et al.,* 2017). Any social and political destructive process serves as a catalyst for such cycles and demonstrates the degree of responsibility of relations between the state and society (Danko *et al.,* 2020; Sardak *et al.,* 2018). Examples of such destructive processes include wars, political and social revolutions (Bucholski, 2015), terrorism, AIDS, and natural disasters (Petrushenko *et al.,* 2014).

The following socio-political factors determine current migration processes in Ukraine

- Geo-economic factors are determined by the used resources and location. They are created artificially: relevant financial flows, agglomeration effect, human capital (Sardak *et al.,* 2018), infrastructure, type of economy and management (Sassen, 2005). The reasons that force people to migrate under the influence of the above mentioned factors are the search of self-protection, self-fulfillment, primary or extra income and comfort (Zhitin *et al.*, 2016);
- Social factors: social stratification of population, interest groups, social roles, priority and status in the society, social codes (Castles, 2002), intellectual and cultural resources of the nation, maturity of territorial communities (Morales *et al.*, 2015). Under the influence of these factors, people migrate in search of understanding and public support in order to integrate into the local communities (Bezugly *et al.*, 2019);
- Political and information factors: governmental organization and the development of civil society (Betts, 2012; Bisong, 2019), transparency of elections and justice system, maturity of the political structure (Bank, 2015); the extent to which the political rights and freedoms of citizens are protected (Lavenex, 2019);
- Psychological factors: values, principles, motivation of the displaced population (Arcarazo *et al.*, 2015).

At present time, there are 3 million refugees in Ukraine (Roskladka *et al.*, 2020). Since the beginning of the military conflict in the eastern Ukraine (2014), half of Donbas residents have become refugees (Stukalo *et al.*, 2018). According to the international organizations (Arakelova, 2017), the non-Ukrainian

territories are inhabited by 2.7 million people. They left their homes in 2014–2019 and moved either to other regions of Ukraine (Bezugly *et al*., 2019) or to Russia. More than 1 million 780 thousand inhabitants of Donetsk, Lugansk regions and Crimea have become forcedly displaced population (Bogush, 2018). All these displacements of Ukrainian citizens have an impact on the economic status of the territorial communities where they currently reside (Drakokhrust et *al*., 2019). A literature review has shown that the structure of world migrations has changed in recent years. In low developed countries, external and forced migration prevails. In Ukraine, forced internal migration has prevailed since 2014. A large number of Ukrainian refugees put a strain in social and economic terms on the host communities.. There is also a need to study the possibility of their socio-economic integration into host communities. Research objective is to analyze the impact of forced migration on sustainable development of Ukrainian rural areas. The study area of research is the level of rural social and economic development under the influence of forced migration. The objectives of the study are 1) to analyze the status and dynamics of migration processes in Ukraine; 2) to study the reasons and consequences of forced migration; 3) to determine the impact of forced migration on sustainable development of the host rural areas and opportunities for their socio-economic integration. This study has been carried out in Poltava region of Ukraine in 2020 on the basis of 2019 survey data.

MATERIALS AND METHODS

Four methods were used to determine the impact of forced migration on sustainable development of rural areas, including integrated territorial communities. These methods include cluster analysis, factor analysis, game theory and taxonomy method. The goal of factor analysis is to identify the most significant indicators of forced migration on the level of economic development of rural and united territorial communities (UTC). Cluster analysis was applied to classify rural and UTC groups according to their gross regional product, local budget revenues, and the number of forcedly displaced population (FDP) living and working within the community. The game theory identified the essence of the conflict of interests between FDP and rural areas and developed the strategy of its resolution. The taxonomy method helped to create a community-based development plan with the involvement of FDP in rural economy. This plan took into account the interests of both FDP and host communities. The concept of the applied methods is as follows. The purpose of factor analysis is to, identify indicators that describe forced migration and generalize the characteristics of these indicators. The generalizing characteristics of the indicators is called a factor. The initial information was obtained from the Chief Statistics Department of Poltava region, the Unified Information FDP Database, the State Employment Service of Poltava Region. The indicators for the analysis were chosen through a survey of Heads of host communities, employment service specialists. Factor analysis was carried out using the STATISTICA program. The methodology of factor analysis is as follows: the main results of factor analysis are presented as a table of factor loadings. The table includes: 1) number of rows equal to the number of indicators, 2) number of columns equal to the number of obtained factors. Factor loadings are the correlation coefficients of indicators with factors. A positive sign of the factor loading indicates a direct correlation of the indicator with the factor, while a negative sign indicates the opposite. Factor weights (factor scores) are quantitative values of connection of the selected factors with the object under study. The object under study is the level of rural territory development (local budget size). The greater the factor weight, the stronger influence of the factor on the value of the object under study. The cumulative percentage of dispersion shows how fully the phenomenon under study was described with the help of obtained factors. In general, the dependence of the object under study on the factors is determined using Eq. 1.

$$GDP_s = \sum_{j=1}^{n} F_j \quad (1)$$

Where, GDP_i is a gross domestic product of *i-th* rural area; Fj is the j factor; n is the number of factors obtained. The value of each factor is determined using Eq. 2.

$$F_j = {}^{1}/_{Expl.Var_j} \sum a_{ij} \times Var_{ij} \quad (2)$$

Where, $Expl.Var_j$ is the factor scores *j-th* factor*; aij* is the factor loadings of the Var_{ij} indicator; Var_{ij} is the *ij-th* indicator.

The cluster analysis method was used to classify rural areas depending on the intensity of forced migration and the level of host communities development. The classification was done using the k-means method as follows: 1) ~~many~~ all elements of a vector space were divided into a predetermined number of clusters k; 2) the center of mass for each cluster obtained at the previous stage is recalculated at each iteration; 3) the algorithm ends when there is no change in the intra-cluster distance at any iteration.

The calculation algorithm is to minimize the total quadratic deviation of cluster points from the centers of these clusters.

$$V = \sum_{i=1}^{k} \sum_{x \in S_i} (x - \mu_i)^2 \quad (3)$$

Where, k is the number of clusters, S_i is the obtained clusters, i=1.2,..., k; μ_i are the mass centers of all x vectors from the S_i cluster.

standard deviations (RMS) were calculated using the most significant indicators identified at the first stage (factor analysis).

The game theory method was used at the third stage. The game theory is a mathematical theory of optimal behavior in a conflict situation. The subject of its study is a formalized model of conflict or the so-called "game". The main task of game theory is to determine the optimal strategies of behavior of participants. A conflict situation or a "conflict" is defined as the existing several opposite goals and strategies of participants to achieve these goals. In our case, the conflict is presented in the form of incompatibility of goals and opposing strategies to use the resources of host communities and refugees.

The game theory method helped to identify conflicts of interest between FDP and rural areas and the UTC. Their conflict of interest is outlined as follows. The interest of rural areas and the UTC is the intention to obtain the maximum possible amount of regional gross product and revenues to the local budget at the lowest possible amount of welfare payment for the FDP living on this territory. That is, this problem can be solved using maximin. The FDP's interest is the intention to minimize their contribution to the territory's economy while receiving the highest possible social benefits. Consequently, the solution to this problem is to implement a minimax principle.

Task 1

$$\begin{cases} f1(x) = x_1 + x_2 + \ldots + x_n \rightarrow \max \\ a_{11}x_1 + a_{12}x_2 + \ldots + a_{1n}x_n \le 1 \\ a_{21}x_1 + a_{22}x_2 + \ldots + a_{2n}x_n \le 1 \\ a_{m1}x_1 + a_{m2}x_2 + \ldots + a_{mn}x_n \le 1 \end{cases}$$

$x_i \ge 0$

$(i = 1, 2, \ldots, n)$

where f1 (x) is local budget revenues;
xj - contribution of the j-th category of FDP to local budget revenues and i–th territory (j = 1, ... n)

Task 2

$$\begin{cases} f2(y) = y_1 + y_2 + \ldots + y_m \rightarrow \min \\ a_{11}y_1 + a_{12}y_2 + \ldots + a_{m1}y_m \le 1 \\ a_{21}y_1 + a_{22}y_2 + \ldots + a_{m2}y_m \le 1 \\ a_{1n}y_1 + a_{2n}y_2 + \ldots + a_{mn}y_m \le 1 \end{cases}$$

$y_j \ge 0$

$(j = 1, 2, \ldots, m)$

where f2 (x) is the cost of social support for FDP;
yi - social expenditures of the i-th territory for the maintenance of the j-th category of FDP (i = 1, .., m).

In order to determine the optimal strategies for resolving conflicts of interest in particular rural areas and FDP, the maximin problem has been solved. According to it, the first player (maximization of local budget revenues, minimization of social costs for FDP maintenance) chooses a strategy in accordance with a maximum principle, using Eq. 4.

$$\max_{pi} \left\{ \min \left(\sum_{i=1}^{n} a_{i1}x_i, \sum_{i=1}^{n} a_{i2}x_i \ldots \sum_{i=1}^{n} a_{in}x_i \right) \right\} \quad (4)$$

The second player (minimization of contribution into the local budget revenues of rural areas, maximization of social benefits) chooses a strategy in accordance with a minimax principle, using Eq. 5.

$$\min_{pi} \left\{ \max \left(\sum_{j=1}^{m} a_{j1}y_j, \sum_{j=1}^{m} a_{j2}y_j \ldots \sum_{j=1}^{m} a_{jn}y_j \right) \right\}, \quad (5)$$

Where, x_i is the probability of choosing the i-th strategy of rural behavior (local budget revenues), y_j is the probability of choosing the j-th strategy of FDP behavior (social benefits). Solution of this maximin twin challenge will allow to develop an optimal strategy to solve the conflict of interest for each rural area or community and FDP. It will also take into account the interests of both parties.

The taxonomy method was used at the fourth

stage. This method allows finding out spatial inequality of FDP settlement and regional asymmetry of rural development. The algorithm of taxonomic analysis contains the following stages: formation of the observation matrix - the most significant indicators determined at the stage of factor analysis; standardization of the matrix element values; identification of the vector-etalon; determination of the distance between individual observations and the vector-etalon; calculation of the taxonomic development coefficient. The indicators obtained at the stage of factor analysis are determined using Eq. 6.

$$\widehat{x_{ij}} = \frac{|x_{ij} - \widehat{x_j}|}{|_{max/min} x_j - \widehat{x_j}|} \quad (6)$$

Where, $\widehat{x_j}$ are the best (or worst) estimates for each indicator; $_{max/min}$ x are the extremes of the indicators, using Eq. 7.

$$\begin{matrix} max/\ min\ x = min\ x, если\ |_{min} x_j - \widehat{x_j}| > |_{max} x_j - \widehat{x_j}| \\ max/\ min\ x = max\ x, если\ |_{min} x_j - \widehat{x_j}| \leq |_{max} x_j - \widehat{x_j}| \end{matrix} \quad (7)$$

To rank rural areas, it is necessary to determine the dimensional vector, using Eq. 8.

$$S_i = \frac{|x_{ij} - \widehat{x_j}|}{\prod_{j=1}^{m} |_{max/min} x_j - \widehat{x_j}|} \quad (8)$$

This value characterizes in exemplary fashion the extent to which refugees have an impact on the rural economy because the stronger the indicators differ from the benchmark, the larger the S_i value will be and vice versa. Ranking of rural areas is achieved by calculating the dimensional vector $D°_{(n)}$. Vector of difference $D°_{(n)}$ shows the degree of remoteness (closeness) of rural areas from the ideal rate – bench markable metric, using Eq. 9.

$$d_i = \sqrt{\prod_{j=1}^{m} (x_{ij} - \widehat{x_j})^2} \quad (9)$$

Two integral indicators were calculated using the taxonomy method: 1) integral indicator of rural development by the degree of integration of FDP into the local economy; 2) integral indicator of rural development by the size of local budgets. Map of positioning of rural territories by size of local budgets and level of integration of FDP into local economy of Poltava region was drawn up in the coordinate system of these two integral indicators.

Data description

The forced displacement in Ukraine in 2014 began after the annexation of the Crimea, outbreak of an armed conflict in the eastern Ukraine, and temporary occupation of a part of the country's territory. A new phenomenon of "sudden poverty" has emerged in Ukraine (Pylypenko, 2018). The middle-class population suddenly found themselves at the extreme of poverty because of the armed conflict (Arakelova, 2017). Among the "suddenly poor" were the FDP and the population affected by the conflict in two eastern regions: Donetsk and Luhansk. During 2014 and the first half of 2015 (Bogush, 2018; Romaniuk *et al.,* 2016), there was a deep economic crisis in Ukraine, some of its economic potential was lost, and the standard of living of the population reached rock bottom. In 2014-2015, the GDP of Ukraine decreased by 15.8% (Panizzon *et al.,* 2019), the volume of industrial production - by 21.8%, the growth rate of consumer prices increased by 60.9%, the average monthly wage decreased by 23.3% (Ineli-Ciger, 2019). As a result of the armed conflict, Ukraine has lost a significant part of its economic and export potential (Pogorelov *et al.,* 2017), besides eastern Donetsk and Lugansk regions have lost a significant part of human and material resources. The most common reasons of forced displacement was "the desire to save one's life and prevent harm to one's health" (82.2% of refugees), the "desire to save the lives of loved ones" (70%) (Bogush, 2018; Romaniuk *et al.,* 2016). The actual forced displacement of the population of Ukraine 2014-2018 can be conditionally divided into the following stages (waves) (Drakokhrust *et al.,* 2019), (Table 1).

- The First wave: February - July 2014 (Petrushenko *et al.,* 2014);
- Second wave: August-November 2014;
- Third wave: December 2014 - March 2015;
- Fourth wave: January-February 2016;
- Fifth wave: 2017-2018.

A visualization of the concentration of FDP's placement as per early 2020 is shown in Fig. 1.

According to Fig. 1, the typical region in terms of FDP's is Poltava region. According to the Unified Displaced Persons Information Database (Balueva, *et al.,* 2018), 22546 persons (16213 families) are registered in the region, among them 7,1 thousand

Table 1: Ranking of regions by FDP adopted in 2014-2018 (forced displacement localization profile) (Habchak *et al.*, 2019)

Rank / Year	1 place	2nd place	3rd place	4th place	5th place	6th place	7th place
2014	Kharkiv	Donetsk	Zaporozhye	Kiev	Dnipropetrovsk	Lugansk	Odessa
2015	Donetsk	Lugansk	Kharkiv	Kiev	Zaporozhye	Dnipropetrovsk	Poltava
2016	Donetsk	Lugansk	Kharkiv	Kiev	Zaporozhye	Dnipropetrovsk	Kiev
2017	Donetsk	Lugansk	Kyiv	Kharkiv	Dnipropetrovsk	Kiev	Zaporozhye
2018	Donetsk	Lugansk	Kyiv	Kharkiv	Dnipropetrovsk	Zaporozhye	Odessa

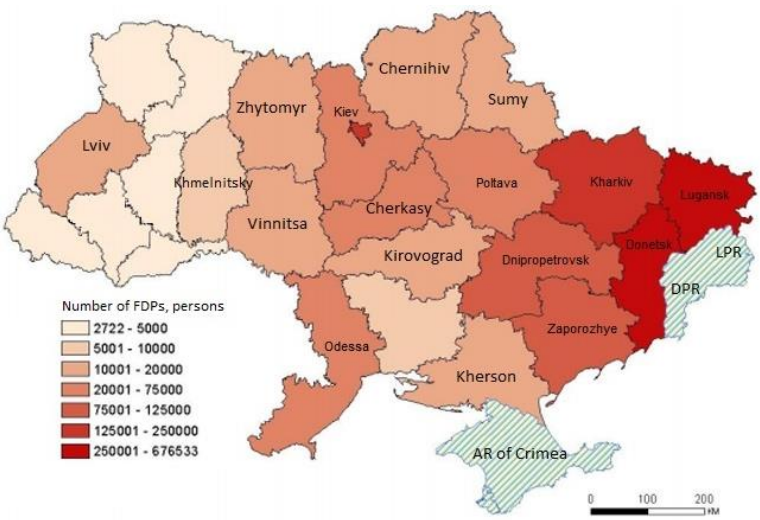

Fig. 1: Concentration of FDP's regional placement by regions of Ukraine as per early 2018 (Roskladka *et al.*, 2020)

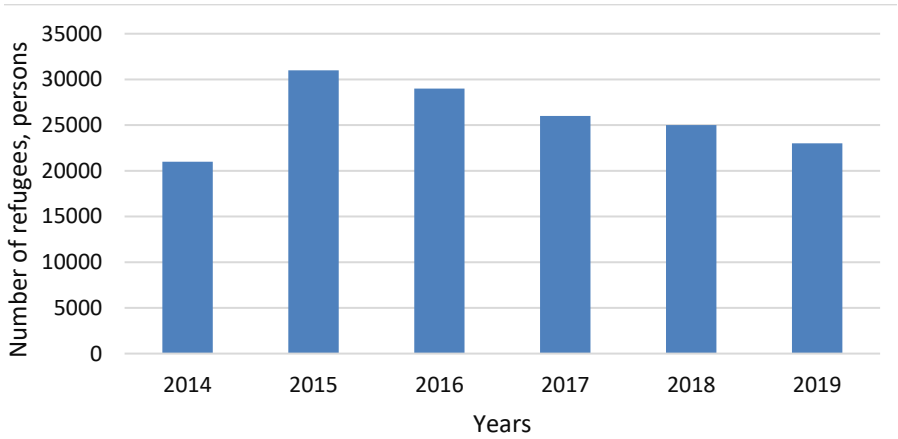

Fig. 2: Dynamics of the number of forcedly displaced population in the Poltava region (Roskladka *et al.*, 2020)

of disabled persons, 3,9 thousand of children, 1,3 thousand of persons with disabilities, 8,6 thousand of retired persons. Most of them live in rural settlements. Poltava region has relatively stable indicators - the share of rural population exceeds 50%. The dynamics of the number of forcedly displaced population registered with the social services bodies in Poltava region is shown in Fig. 2.

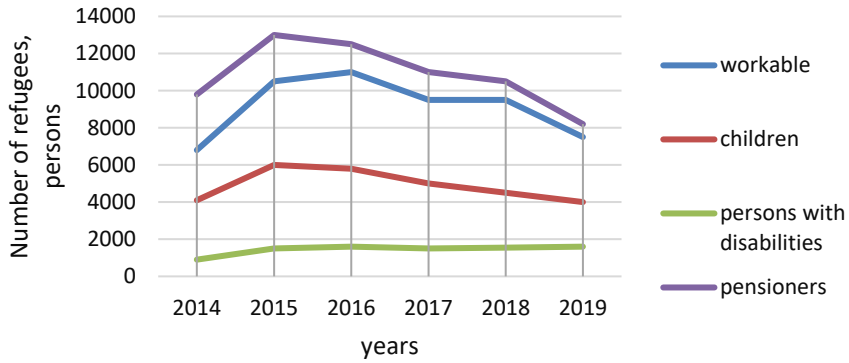

Fig. 3: Number of forcedly displaced population in Poltava region by category (Roskladka *et al*., 2020)

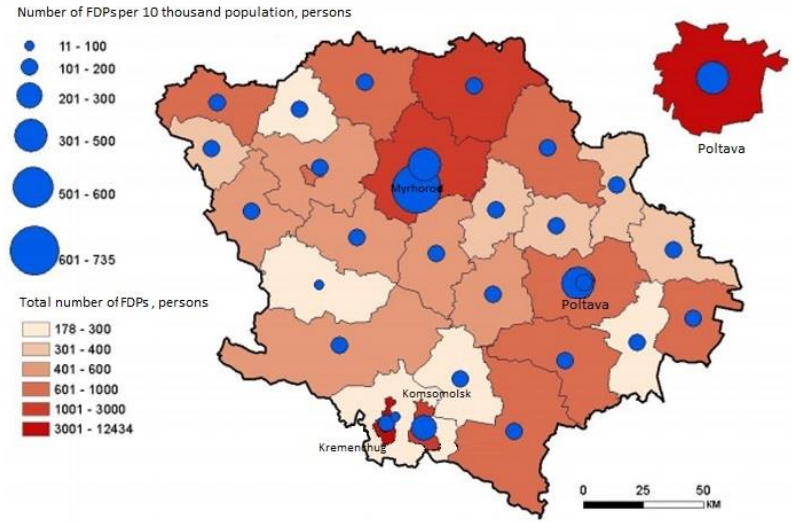

Fig. 4. Displacement of FDP in rural areas and territorial communities of Poltava region (Roskladka *et al*., 2020)

The number of FDP increased between 2014 and 2015 and made 41%. In 2016, the number of FDP decreased by 2%. In 2017 and 2018, FDP decreased by 13% and 12%, respectively. The maximum number of FDP in Poltava region was recorded in May 2016 - 31,251 people, and by the end of 2018 the number of FDP decreased by 19% to 25,174. The largest number of FDP are working-age persons and their minor children (Pylysenko, 2018). Between 2016 and 2018, the number of such persons decreased by 28%. In comparison, for the same period, the number of retired persons decreased by 18% and disabled persons by 15% (Fig. 3).

The number of FDP was influenced by the inability to find a job appropriate to their professional skills. Most FDP moved to Poltava region from the industrial region. Therefore, finding a job in a rural area was very difficult. At the same time, disabled persons and retired persons do not need employment and are provided with social benefits (Roskladka *et al*., 2020) in accordance with the legislation in force. The location of FDP in rural areas and territorial communities of Poltava region is shown in Fig. 4.

Fig. 4 shows that FDP are localized in a different way in rural areas and territorial communities of Poltava region. Such placement creates additional tension in the labor market in the industrial cities of Poltava region: Poltava, Kremenchuk, Lubny, Myrhorod. The Perspective Plan for the Development of 57 Unified Territorial Communities of Poltava Region requires

the creation of new enterprises and jobs (Bezugly *et al.,* 2019) and the systematic integration of FDP into the activities of territorial communities. The future plan to develop Poltava region's communities is based on the national and regional programs (Roskladka *et al*., 2020). This plan takes into account "growth points", which include measures to stimulate the arrival of migrant workers (from the FDP category), to the territories where their workforce is required.

RESULTS AND DISCUSSION

Research findings in terms of the dependence of rural economic development on the forced migration (Bogush, 2018; Romaniuk *et al.,* 2016) show that in the short term the impact of decentralization on migration will be insignificant. In terms of the territorial structure of migration movements, no change is expected, consequently the migration indicators (Danko *et al.,* 2020; Sardak *et al.,* 2018) will reflect the volume of the retrospective period. Fig. 5 shows the dependence of migration growth (or its reduction) on population at the expense of FDP and own revenues of local budgets of rural territories in 2014-2018.

Fig. 5 shows a questionable impact of forced migration on rural economies (Sassen, 2005).

The results of factor analysis are presented in Table 2.

where Var1 – the number of unemployed FDP able to work; Var2 – the number of FDP receiving employment services; Var3 – the number of FDPs receiving unemployment benefits; Var4 - the number of FDP who have been re-employed; Var5 – the number of retired FDP; Var6 – the number of disabled FDP; Var7 – the number of FDP receiving vocational training; Var8 - the number of FDP employed under the civil-law contracts or self-employed outside the settlement; Var9 - the number of FDP receiving a child care allowance, retiree health care benefit or a sick care allowance; Var10 - the number of FDP who participated in public and other temporary work; Var11 - the number of underage FDP; Var12 – the number of FDP employed by the enterprises of the given rural area; Var13 - the number of FDP entrepreneurs who have started new businesses / created new jobs. The data in Table 2 indicates that two factors explain the impact of forced migration on the level of development of rural and urban economy in Poltava region. The first factor has the greatest impact on the economy of the region. All significant indicators of the first factor are marked with red colour. They are negative. The dispersion of the first factor is 61.7496%. That is, as of the beginning of 2020 the involvement of FDP in the rural economy of Poltava region has a negative nature, – their maintenance (payment of social benefits) reduces local budget

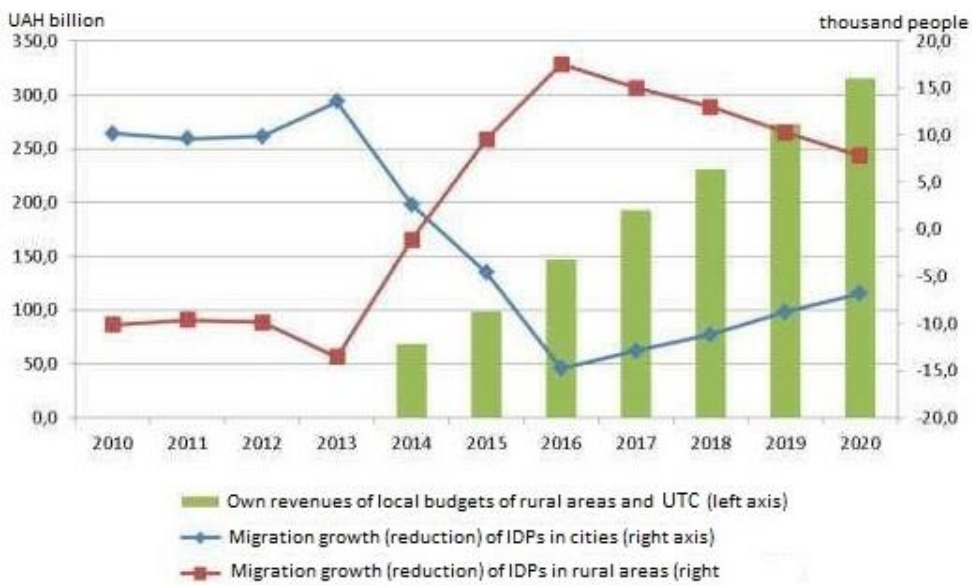

Fig. 5: Migration growth (reduction) of population and own revenues of local budgets in rural areas of Poltava region (Roskladka *et al*., 2020)

practically by 2 times. The dispersion of the second factor is 15.0167%. The effect of the indicators of the second factor is positive: all significant indicators of the second factor are positive. According to Table 2, the magnitude of the influence of the first factor on the economy of the region is determined using Eq. 10.

$$F_1 = {}^{1}/_{8,027448}\,(-0{,}996093 \cdot Var1 - 0{,}995298 \cdot Var2 - 0{,}992515 \cdot Var3 - 0{,}991698 \cdot Var4 - 0{,}993497 \cdot Var5 - 0{,}991565 \cdot Var6 - 0{,}981163 \cdot Var7 - 0{,}979545 \cdot Var8) \quad (10)$$

The magnitude of the impact of the second factor on the level of development of rural economy is determined using Eq. 11.

$$F_2 = {}^{1}/_{1,952176}\,(0{,}858041 \cdot Var12 + 0{,}909189 \cdot Var13) \quad (11)$$

Three indicators: Var9, Var10, Var11 do not affect the state of rural economy. These indicators are marked with black colour on the STATISTICA 10 listing (Table 2). The social maintenance of these categories of FDP is the most economical rating for

Table 2: Results of factor analysis. The impact of forced migration on rural economy of Poltava region (STATISTICA 10 listing)

Variable	Factor Loadings (Unrotated) (data) Extraction: Principal components (Marked loadings are >,700000)	
	Factor 1	Factor 2
Var1	-0,996093	-0,004777
Var2	-0,995298	-0,006704
Var3	-0,992515	0,024983
Var4	-0,991698	0,021135
Var5	-0,993497	0,023030
Var6	-0,991565	0,017140
Var7	-0,981163	-0,043433
Var8	-0,979545	-0,052663
Var9	0,096448	-0,199993
Var10	0,322435	-0,338269
Var11	0,204980	-0,477776
Var12	0,137791	0,858041
Var13	0,096858	0,909189
Expl.Var	8,027448	1,952176
Prp.Totl	0,617496	0,150167

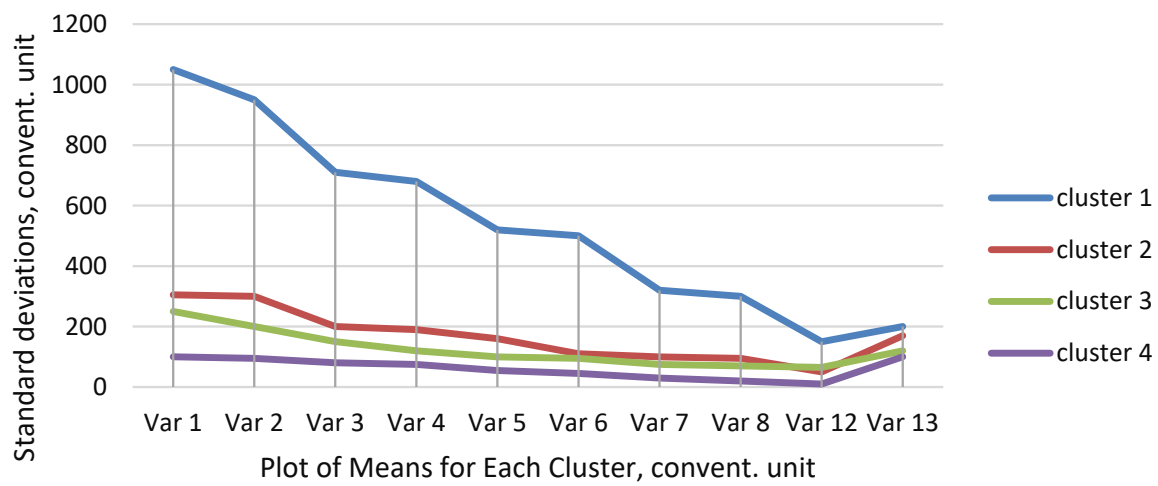

Fig. 6: Results of cluster analysis of the impact of forced migration on rural economy of Poltava region (STATISTICA 10 listing)

host communities. The next stage of the developed methodology is to use cluster analysis to differentiate rural areas and UTC. The clusters obtained differ in the level of economic development and the degree of active participation of current FDP. The results of the cluster analysis are presented in Fig. 6.

The data in Fig. 6 shows that based on the findings of cluster analysis rural territories of Poltava region are divided into 4 clusters. The first cluster includes: Poltava and Kremenchug urban areas (Table 3). Plot of means for each cluster.

The clusterization of these territories into a

Table 3: The first cluster composition (STATISTICA 10 listing)

Case No.	Members of Cluster Number 1 (data) and Distances from Respective Cluster Center Cluster contains 2 cases
	Distance
C_22	110,2933
C_23	110,2933

Table 4: The second cluster composition (STATISTICA 10 listing)

Case No.	Members of Cluster Number 2 (data) and Distances from Respective Cluster Center Cluster contains 4 cases
	Distance
C_2	28,09933
C_24	22,26145
C_25	80,43748
C_26	48,24292

Table 5: Strategy matrix for conflict resolution between rural areas, UTC and FDP

FDP category / Cluster rural area	Unemployed	Employees, entrepreneurs	Retired, disabled people
1 cluster: Poltava and Kremenchug urban areas	Q_{11} = – 32,7 + 0,11Var1 + 0,43Var2 + 2,63Var3 – 59,54Var4 – 3,17Var5 + 0,8Var6 + 0,32Var7 –0,28Var8	Q_{12} = – 17,6 + 0,03Var1 + Var2 + 0,9Var3 – 0,3Var4 + 0,29Var5 + 0,18Var6 + 0,13Var7 – 0,11Var8	Q_{13} = – 12,8 + 0,02Var1 + 0,06Var2 + 0,7Var3 – 0,03Var4 + 0,03Var5 + 0,13Var6 + 0,04Var7 – 0,44Var8
2 cluster: Hadyatskyi district, Lubensky, Myrhorodskyi, Gorishniplavnivskyi urban areas	Q_{21} = – 37,1– 0,28Var1 + 0,29Var2 + Var3 + 0,04Var4 – 0,01Var5 – 0,22Var6 – 0,31Var7 – 0,01Var8	Q_{22} = – 21,2 – 0,28 Var1 + 0,29Var2 + Var3 + 0,04 Var4 – 0,01Var5 – 0,09Var6 – 0,03Var7 – 0,023Var8	Q_{23} = – 17,5 + 0,32Var1 + 0,3Var2 + 0,4Var3 – 0,53Var4 + 0,43Var5 – 0,01Var6 - 0,021Var7 + 0,001Var8
3 cluster: Velikobagachansky, Globinsky, Zinkivsky, Karlovsky, Kobelyatsky, Kotelevsky, Lokhvytsky, Novosarzhsky, Orzhitsky, Piryatinsky, Reshetilovsky, Shyshatskiy rural areas	Q_{31}= – 32,7 + 0,11Var1 + 0,43Var2 + 2,63Var3 – 59,54Var4 – 3,17Var5 – 0,17Var6 + 0,14Var7 + 0,05Var8	Q_{32} = – 18,7+ 0,3Var1 + 0,29Var2 + Var3 + 0,04Var4 + 0,24Var5 + Var6 – 0,23Var7 + 0,23Var8	Q_{33} = – 13,9 + 0,22Var1 + 0,96Var2 + 0,33Var3 – 0,33Var4 + 0,33Var5 + Var6 + 0,04Var7 – 0,01Var8
4 cluster: Grebinkiv, Dykansky, Kozelshchyna, Mashevsky, Semenovsky, Khorolsky, Chornokhinsky, Chutovsky rural areas	*Q_{41}= – 32,7+ 0,19Var1 – 0,5Var2 + 0,13Var3 + 0,14Var4 + 0,36Var5 –0,1Var6 + 0,15Var7 + 0,17Var8*	*Q_{42} = – 18,6+ 0,22Var1+ Var2 + 0,4Var3 – 0,09Var4 + 0,13Var5 – 0,22Var6 – 0,28Var7 + 0,29Var8*	*Q_{43} = – 18,8 + 0,02Var1 + 0,06Var2 + 0,7Var3 – 0,03Var4 + 0,03Var5 – 0,03Var6 – 0,3Var7 + 0,29Var8*

[k]Clustering of rural areas was carried out using the K-means clustering method at the second stage of the study.

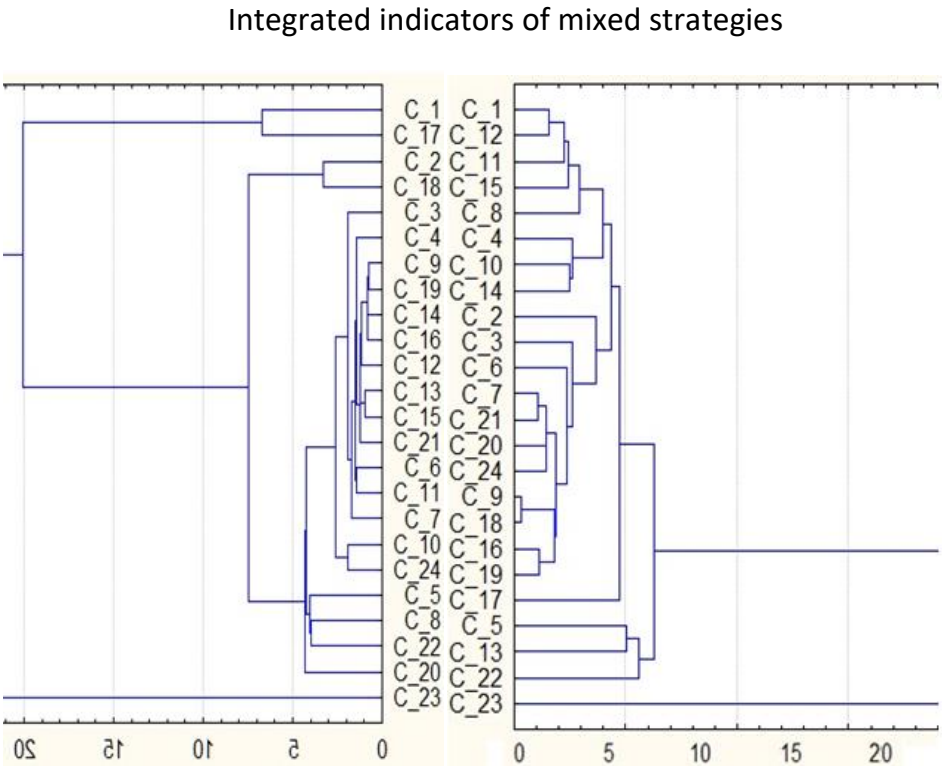

Fig. 7: Combined ranking of mixed rural, UTC and FDP strategies (On the left - mixed rural strategies, UTC; on the right are mixed FDP strategies)

particular cluster is explained by the fact that most of the enterprises located on these territories are industrial and create a large number of jobs. This stimulates FDP to choose these areas for their permanent residence and employment. The second cluster includes the following rural territories: Hadyatskyi district, Lubensky, Myrhorodskyi, Gorishniplavnivskyi urban areas (Table 4).

The clusterization of these territories into a particular cluster is explained by the same reasons as for the first cluster. They are located near large cities. The only difference is that manufacturing enterprises on these territories are mainly engaged in the processing of agricultural products. The third cluster includes the following rural territories: Velikobagachansky, Globinsky, Zinkivsky, Karlovsky, Kobelyatsky, Kotelevsky, Lokhvytsky, Novosarzhsky, Orzhitsky, Piryatinsky, Reshetilovsky, Shyshatskiy districts. The rural territories of the third cluster belong to the developed southwestern, central and northwestern regions of Poltava region. Most of the enterprises in the rural areas of the third cluster belong to the fuel and energy complex of the region. Most of 26 oil fields are located in this part of Poltava region. Enterprises are engaged in drilling, oil and gas production, refining and gas processing. Besides, the third cluster include agro-industrial enterprises. The fourth cluster includes the following rural territories: Grebinkiv, Dykansky, Kozelshchyna, Mashevsky, Semenovsky, Khorolsky, Chornokhinsky, Chutovsky districts. The rural areas of the fourth cluster belong to the northeastern, eastern and southeastern regions of Poltava region. They are mostly agrarian. Their main types of activity include crop production (cultivation of cereals and industrial crops, potatoes and vegetables), animal husbandry (livestock, pig breeding, poultry farming).

The results of the solution of double maximin/ minimax problem are determined using Eqs. 4 and 5 (Table 5).

12 regression equations were obtained for each segment of the strategic matrix (Table 4).

They describe the dependence of the revenues to local budgets in rural areas on the costs of social maintenance of various categories of FDP. The correlation coefficient is 0.8227, the determination coefficient is 0.6768, which indicates a close relationship between these factors and explains 67.7% of the level of the dependent variable. This strategic matrix was calculated to determine the optimal ratio of local budget revenues in rural areas to the expenditures for social maintenance of various categories of FDP. The strategy to choose the types of social support and integration of FDP was analyzed using the matrix Table 5). The calculations using the obtained strategic matrix are as follows (Shymanska *et al.*, 2017). The integrated indicators of mixed strategies, calculated by the method of game theory, are presented in Fig. 7.

The positioning of rural areas according to the size of local budgets (Vasyltsiv *et al.,* 2019) and the level of integration of FDP into the local economy is shown in Fig. 8.

Map of rural territories positioning according to the size of local budgets and the level of FDP's integration into the local economy of Poltava region was created in the coordinate system of two integrated indicators. On the "OX" axis there is "Integral indicator of integration level of FDPs into the local economy". The "Integral indicator of rural development by the size of local budgets" is located on the "OY" axis. Both indicators were obtained using the taxonomy method. Positioning of rural areas on the map (Fig. 8) indicates the following. In the upper right corner there are rural areas with a large local budget and a high level of integration of refugees into the socio-economic life of ~~the~~ host communities. In the lower left corner there are rural areas with a low local budget and a low level of refugee involvement in the territorial economy. This visualization shows the leaders of the integration process and identifies "points of growth" in the rural areas. The practical implementation of the proposed methodology to determine the impact of forced migration on sustainable development of rural areas offers a method for its implementation (Stukalo *et al.*, 2018). This method is shown in Fig. 9.

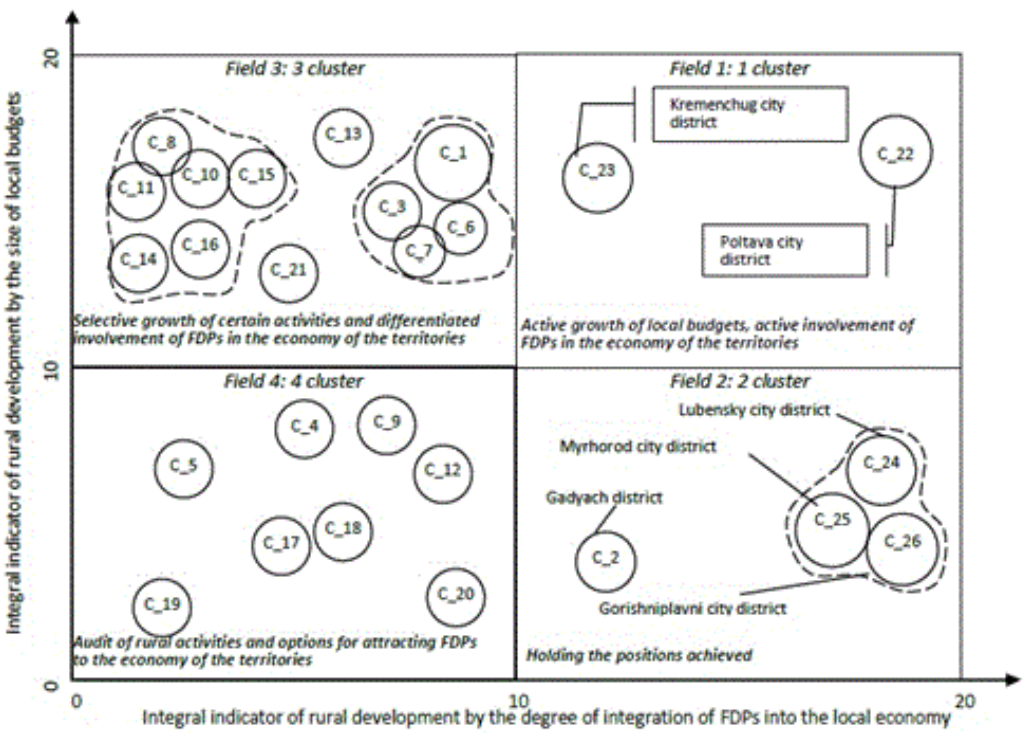

Fig. 8: Map of rural territories positioning according to the size of local budgets and the level of of FDP's integration into the local economy of Poltava region

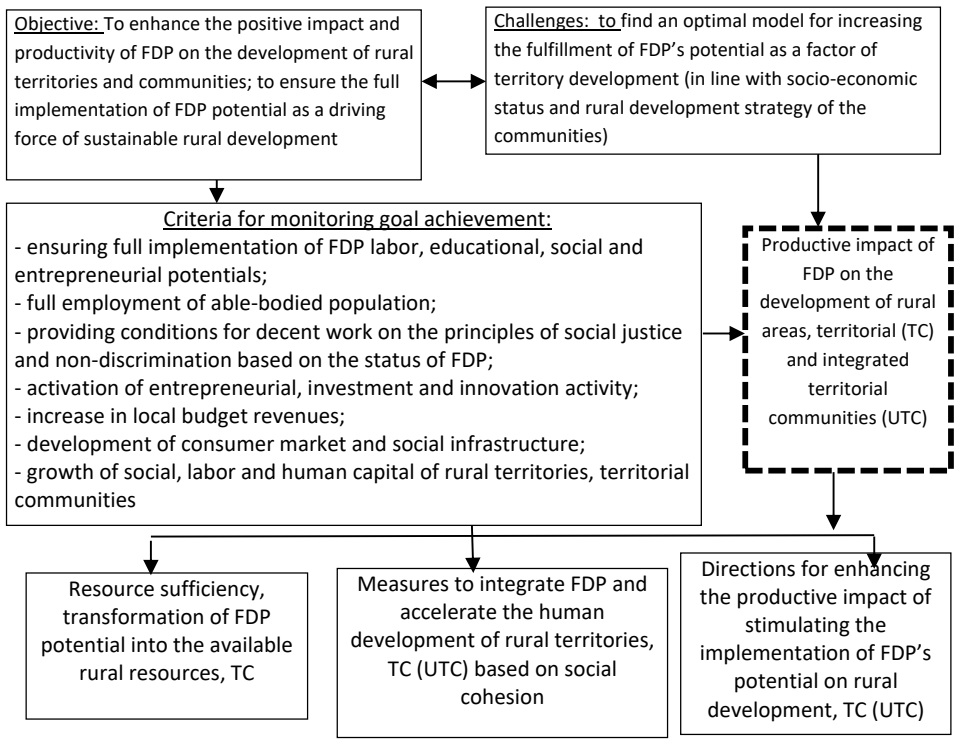

Fig. 9: Methods for enhancing the productive impact of FDP on the development of rural territories and territorial communities

Fig. 9 shows the mechanism for identifying and activating "growth points" in rural areas, tools for activating refugees to participate in the socio-economic life of host communities. For research practice, the study has identified all possible threats and opportunities for sustainable development of rural areas under the influence of forced migration. The proposed mechanism for resolving conflict between host communities and refugees makes it possible to identify not only "growth points", but also strategies for resolving it.

CONCLUSION

Forced migration in Ukraine affects the size of the population within individual regions: between 2014 and 2019 the number of refugees reached almost 3 million. The study has shown that forced migration reduces the economy of host communities by more than 60%. The State's impact on internal displacement can be achieved through socio-economic mechanisms. One such mechanism is to use the developed methodology. At the first stage, a factor analysis has been carried out. The factor analysis made it possible to identify the most significant indicators affecting the economy of rural areas: 10 out of 13 indicators under consideration. At the second stage, a factor analysis was carried out. The use of cluster analysis allowed classifying rural areas into separate groups depending on their level of economic development and the level of integration of FDP: 26 rural areas of Poltava region into 4 clusters. At the third stage, the conflict between refugees and host communities was identified through game theory and optimal conflict resolution strategies were developed. At the fourth stage, a positioning map of four quadrants was constructed using the taxonomy method. The first quadrant contains rural areas with large local budgets and a high level of integration of refugees into the host community economy: 8% of the total (2 out of 26). The fourth quadrant contains rural areas with a low local budget and a low level of integration of refugees into the host community economy: 31% of the total (8 out of 26). The second and third quadrants are at an average level

of development. Mapping rural areas according to local budgets and the level of integration of refugees allows us to identify "growth points" in the particular clusters of rural areas, justifying mechanisms to implement the potential and economic activity of refugees for rural development. As a result of the implementation of the proposed mechanism to stimulate the development of "points of growth", the budget of rural areas of the first cluster has increased by 18%, the second cluster by 14.5%, the third cluster by 13%, the fourth cluster by 8%. The possibility to be engaged in entrepreneurship will facilitate the integration of migrants into the local community. Integration of FDP into local communities will be stimulated through allowing FDP to access the government information on business opportunities (with the help of the state and municipal institutions). This information support has to ensure that FDP has access to business resources of the local communities and their businesses are integrated into the local entrepreneurial community. These factors confirm the need for a comprehensive mechanism to integrate FDP into the rural economy.

AUTHOR CONTRIBUTIONS

V. Shcherbak conducted methodology, research, validation, conceptualization and supervision. I. Brizgan reviewed the literature and collected the data. V. Chevhanova has implemented the software and wrote the original project plan. O. Hryhoryeva provided a graphic presentation of the material. L. Svistun calculated the models.

ACKNOWLEDGEMENT

The authors would like to thank the National University "Yuri Kondratyuk Poltava Polytechnic", Office of the Project "Integrated Development in Ukraine" in Poltava and their guidance in the financial and organizational support of this research.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

ABBREVIATIONS

%	Percentage
AIDS	Acquired immune deficiency syndrome
AR of Crimea	Autonomous Republic of Crimea
ATO	Anti–terrorist operation
DPR	Donetsk People's Republic
Eq.	Formula of calculation
Expl.Var	Explanatory Variable
FDP	Forcedly displaced population
Fig.	Figures
GDP	Gross domestic product
km	Kilometer
LPR	Lugansk People's Republic
OOS	Joint Forces Operation
ORDLO	Separate areas of Donetsk and Lugansk regions
Prp.Totl	Percentage of the total variance explained
RMS	standard deviations
STATSTICA	Statistical analysis software package
TC	Territorial Community
UAH	hryvnya
USA	United States of America
UTC	United Territorial Community
Var	Variable
C_XX	Case of UTC or rural area

REFERENCES

Adamson, F., (2006). Crossing borders: international migration and national security. Int. Secur., 31(1): 165–199 (**35 pages**).

Adamson, F.; Tsourapas, G., (2019). The migration state in the global south: nationalizing, developmental, and neoliberal models of migration management. Int. Migration Rev., XX(X): 1–30 (**30 pages**).

Aleshkovski, I., (2017). Globalization of international migration: social challenges and policy implications. RUDN J. Soc., 17(2): 213–224 (**11 pages**).

Arakelova, I., (2017). The influence of internally displaced persons on the social and economic development of regions in Ukraine. Baltic J. Econ. Stud., 3(5): 6–12 (**7 pages**).

Arandarenko, M.; Corrente, S.; Jandrić, M.; Stamenković, M., (2020). Multiple criteria decision aiding as a prediction tool for

migration potential of regions. Eur. J. Oper. Res., 284(3): 1154–1166 (**13 pages**).

Arango, J., (2000). Explaining migration: a critical view. Int. Social Sci. J., 52(165): 283-296 (**14 pages**).

Arcarazo, A.; Freier, D.; Feline, L., (2015) Turning the immigration policy paradox upside down? Populist liberalism and discursive gaps in South America. Int. Migration Rev., 49(3): 659-696 (**38 pages**).

Balueva, O.; Chuprina, E., (2018). Strategic priorities for the internal migration processes regulation in Ukraine. Baltic J. Econ. Stud., 4(1): 16–24 (**9 pages**).

Bank R., (2015). The potential and limitations of the court of justice of the European Union in shaping international refugee law. Int. J. Refugee Law, 27(2): 213–244 **(32 pages)**.

Betts, A., (2012). Global migration governance. Int. J. Refugee Law, 24(3): 653–655 **(3 pages).**

Bezugly, V.; Boyko, Z.; Tsvietaieva, O., (2019). Demographic transformation in the agglomerations of Dnipropetrovsk region. J. Geol. Geogr. Geoecol., 28(1): 3–10 **(8 pages).**

Bil, M.; Stepura, T., (2018). Human development in Ukraine: assessment and policy of provision in mobile society. SCIREA J. Econ., 3(1): 19-31 **(13 pages).**

Bisong, A., (2019). Trans-regional institutional cooperation as multilevel governance: ECOWAS migration policy and the EU. J. Ethnic Migration Stud., 45(8): 1294-1309 **(16 pages).**

Bogush, L., (2018). Improvement of social inclusion of ATO participants and their families in Ukraine: approaches, problems. J. Geogr. Politics Soc., 8(1): 9-23 **(15 pages).**

Bucholski, M., (2015). Deliberative democracy and the European Union: habermasian and foucauldian perspectives. Thesis for: Bachelor of Arts **(22 pages).**

Castles, S., (2002). Migration and community formation under conditions of globalization. Int. Migration Rev., 36(4): 1143–1168 **(25 pages).**

Danko, Y.; Medvid, V.; Koblianska, I.; Kornietskyy, O.; Reznik, N., (2020). Territorial government reform in Ukraine: problem aspects of strategic management. Int. J. Sci. Technol. Res., 9(1): 1376-1382 (**7 pages**).

Demirdjian, Z., (2005). Differential perceptions of the dynamics of globalization: a survey study. Prob. Perspect. Manage., 3(2): 5–16 (**12 pages**).

Drakokhrust, T.; Prodan, I.; Tkach, U., (2019). Migration challenges: trends and implications for Ukraine and countries of Eastern Europe. Baltic J. Econ. Stud., 5(2): 30–37 (**8 pages**).

Greussing, E.; Boomgaarden, H., (2017). Shifting the refugee narrative? An automated frame analysis of Europe's 2015 refugee crisis. J. Ethnic Migration Stud., 43(11): 1749-1774. **(26 pages).**

Habchak, N.; Dubis, L., (2019). Labour migration of the population of Ukraine to the countries of the European Union: factors and risks of influence. J. Geol. Geogr. Geoecol., 28(1): 59–67 (**9 pages**).

Ineli-Ciger, M., (2019). The global compact on refugees and burden sharing: will the compact address the normative gap concerning burden sharing? Refugee Surv. Q., 38(2): 115–138 (**24 pages**).

Kolodiziev, O.; Tyschenko, V.; Ostapenko, V.; Kolodizieva, T., (2018). Assessment of the level of development of information and communication infrastructure in the regions of Ukraine. Prob. Perspect. Manage., 16(2): 134–144 (**11 pages**).

Lavenex, S., (2019). Regional migration governance – building block of global initiatives? J. Ethnic Migration Stud., 45(8): 1275-1293 **(19 pages).**

Nitschke, P., (2019). Migration, inequality and equality in a globalized world: The paradox of reframing the nation state. J. Globaliz. Stud., 10(2): 37–44 (**8 pages**).

Morales, L.; Pilet, J.; Ruedin, D., (2015). The gap between public preferences and policies on immigration: a comparative examination of the effect of politicisation on policy congruence. J. Ethnic Migration Stud., 41(9): 1495-1516 (**22 pages**).

Panizzon, M.; Riemsdijk, M., (2019). Introduction to Special issue: 'migration governance in an era of large movements: a multi-level approach'. J. Ethnic Migration Stud., 45(8): 1225-1241 **(17 pages).**

Petrushenko, Y.; Kostyuchenko, N.; Danko, Y., (2014). Conceptual framework of local development financing in UNDP projects in Ukraine. Actual Prob. Econ., 9(159): 257–263 (**7 pages**).

Pogorelov, Y.; Ivchenko, Y., (2017). The influence of internally displaced persons on the social and economic development of regions in Ukraine. Baltic J. Econ. Stud., 3(5): 358–366 (**9 pages**).

Romaniuk, M.; Smutchak, Z., (2016). Migratory threats to national security of Ukraine: current challenges and ways of regulation. Baltic J. Econ. Stud., 2(3): 107–112 (**6 pages**).

Pylypenko, V., (2018). Socio-economic consequences of labour migration in Ukraine. Int. J. Innovative Technol. Econ., 4(16): 84–88 (**5 pages**).

Roskladka, A.; Roskladka, N.; Karpuk, A.; Stavytskyy, A.; Kharlamova, G., (2020). The data science tools for research of emigration processes in Ukraine. Prob. Perspect. Manage., 18(1): 70–81 (**12 pages**).

Sardak, S.; Korneyev, M.; Dzhyndzhoian, V.; Fedotova, T.; Tryfonova, O., (2018). Current trends in global demographic processes. Prob. Perspect. Manage., 16(1): 48–57 (**10 pages**).

Sassen, S., (2005). Regulating Immigration in a global age: a new policy landscape. Parallax 11(1): 35–45 **(11 pages)**.

Shymanska, K.; Kurylo, M.; Karmaza, O.; Timchenko, G., (2017). Determinants of migration motives as a precondition for the migration flows formation. Prob. Perspect. Manage., 15(3): 352–364 (**13 pages**).

Simianescu, M.; Strielkowski, W.; Kalyugina, S., (2017). The impact of Brexit on labour migration and labour markets in the United Kingdom and the EU. TERRA Econ., 15(1): 148–156 (**9 pages**).

Stukalo, N.; Simakhova, A., (2018). Social and economic effects of the war conflict in Ukraine for Europe. Geopolit. Globaliz., 2(1): 11–18 (**8 pages**).

Vasyltsiv, T.; Lupak, R.; Kunytska-Iliash, M., (2019). Social security of Ukraine and the EU: aspects of convergence and improvement of migration policy. Baltic J. Econ. Stud., 5(4): 50–58 (**9 pages**).

Zhitin, D.; Krasnov, A.; Shendrik, A., (2016). Migration flows in Europe: space and time transformation. Baltic reg., 8(2): 68–86 (**19 pages**).

AUTHOR (S) BIOSKETCHES

Shcherbak, V.G., D.Sc. in Economics, Professor, Department of Entrepreneurship and Business, Kyiv National University of Technologies and Design, Kyiv, Ukraine. Email: *valery_shcherbak@i.ua*

Bryzhan, I.A., D.Sc. in Economics, Professor, Office of the Project, Integrated Development in Ukraine, Poltava, Ukraine. Email: *iryna.bryzhan@giz.de*

Chevhanova, V., Ph.D., Professor, National University, Yuri Kondratyuk Poltava Polytechnic, Poltava, Ukraine. Email: *chevganovavera@gmail.com*

Svistun, L., Ph.D., Associate Professor, National University, Yuri Kondratyuk Poltava Polytechnic, Poltava, Ukraine. Email: *svmila308@gmail.com*

Hryhoryeva, O., Ph.D., Associate Professor, National University, Yuri Kondratyuk Poltava Polytechnic, Poltava, Ukraine. Email: *olesya_hryhoryeva@i.ua*

COPYRIGHTS

©2020 The author(s). This is an open access article distributed under the terms of the Creative Commons Attribution (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, as long as the original authors and source are cited. No permission is required from the authors or the publishers.

HOW TO CITE THIS ARTICLE

Shcherbak, V.G.; Bryzhan, I.; Chevhanova, V.; Svistun, L.; Hryhoryeva, O., (2020). Impact of forced migration on sustainable development of rural territories. Global J. Environ. Sci. Manage., 6(4): 481-496.

DOI: 10.22034/gjesm.2020.04.05

url: https://www.gjesm.net/article_39873.html