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The Methodology for Selecting a Promising Functional Specialization of a Suburban Rural Settlement

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Abstract

A retrospective analysis of the rural settlements' typology has been carried out; the most common types of suburban rural settlements (SRS) have been identified: satellites, recreational and production ones. Within these basic types, 14 possible SRS subtypes are proposed. Modern tendencies in changes of SRS functional and planning organization are revealed. These changes relate to the deterioration of the cultural and domestic service sector, a significant increase in the rural settlement area with a decrease in its population, stratification of rural population by employment, income, ownership ratio, etc. Functional-planning organization of SRS is conditioned by its specialization. Functional specialization of a settlement, or formation a certain new type based on the traditional settlement, depends on the settlement's resources. The analysis has defined the determinants of the development and formation of functional SRS type, and has revealed the parameters that determine the total effect of these factors. To determine the functional type of settlement as a strategy for its development, the methodology of the point's assessment of the determining parameters characterizing the settlement's resources is proposed. The algorithm of definition of suburban rural settlements' functional specialization is developed, which provides comparison of alternative variants of SRS functional specialization.

Keywords: *suburban zone, functional and planning organization, suburban rural settlement (SRS), algorithm of choice, functional specialization*

1. Introduction

The fundamental socioeconomic changes that took place in Ukraine: reorganization of agrarian production, destruction of the social infrastructure of villages, increased degradation of the rural settlement network, deep deformation of demographic potential, destruction of the functional and planning structure of the villages revealed the lack of a valid scientific and methodological base for finding a strategy for the development of rural settlements and their functional and planning organization.

The new paradigm of the Common Agricultural Policy (CAP) for 2014 – 2020, the Europe 2020 strategy has identified one of the priorities of rural development for the promotion of non-agricultural activities, the environmentalization of the rural economy and the preservation of ecosystems, protection and improvement of the environment. In the context of the European Union policy, the sustainable development of the Ukraine rural settlement network, based on the ecological and socio-psychological characteristics of rural lifestyle, has a high value for preserving the identity of the Ukrainian nation and reviving the national economy.

Particularly, there is a rural settlements problems aggravation in the zones of influence of large cities. The territorial expansion of cities, the placement of housing for urban residents in suburban settlements, the reduction of agricultural land intensify conflicts between city-centre and rural settlements, increase human-made pressures on natural habitats and, consequently, worsen the environment. These problems deepen in the context of territorial reform. The development strategies, the definition of the united territorial communities' boundaries, the functional restructuring of land, the search for vital and active self-sufficiency, and the improvement of the functional and planning organization of villages are required. Thus, in the conditions of socio-economic transformations, the issue of scientifically grounded definition of principles and methods of functional and planning organization of rural settlements located in the large city influence zone is becoming particularly acute. For their designation the notion of suburban rural settlement (hereinafter SRS) is introduced – it is an administrative-territorial unit with the status of a village, which is located in the influence zone of the settlement group system's city-centre and is different in urban character.

1.1. Review of Research and Publications

Typological signs of rural settlement and the features of different type's settlements were investigated by N.M. Devyatova (1989), T.A. Zakovorotnaya (1988), V.O. Kodin (1988). K.I. Kolodin (2004) researched the principles of forming the countryside objects, including new production complexes and farms; R. Lubik (2008) investigated modern trends in the development of villages. Research on the principles of functional and planning organization of villages had been developed by A. Yu. Dmytrenko (2006), A.V. Stepanyuk (2011), V.O. Ogonyok (2013). Researches of recent years devoted to village-resorts: N.S. Sosnov and I. Lipchy (2016), cottage settlements: M.O. Dyomin and I.V. Dreval (2018), V.O. Yatsenko (2015), and also to eco-settlements:

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Yu.S. Velihotska (2018), A.Ye. Konyuk (2017) and others. But most of these works indirectly relate to the suburban rural settlements' formation, do not distinguish their functional types and do not consider the definition of functional specialization of settlements as prerequisites for their sustainable development.

1.2. The Purpose of the work

The purpose of the work is to develop a methodology for assessing the determining parameters that characterize settlement resources, as well as the algorithm for determining the functional specialization of suburban rural settlements within certain types: settlement-satellite, recreational or production settlement.

2. Statement of the main material

Scientists-geographers S. A. Kovalev (1963), T. I. Zaslavskaya (1983) for the first time drew attention to the specifics of suburban type settlements. They determined their rurbal character: the combination of urban and rural features and functions, and the low population employment in agriculture (up to 10%).
In the course of the study, it was discovered that the proximity to the city center and the developed infrastructure of transport communications cause the formation of a rurbal settlement type that has the following features:
– the best socio-demographic indicators compared to other settlements;
– a significant part of the population (30 – 100%) is employed (studied) in the city-centre and carries out pendulum migration both for work and for providing accompanying needs;
– a small share of the population (10 – 15%) is employed in the agricultural sector; therefore, agricultural commodity production loses its significance to the population employment; instead, an urban direction business appears in which partly urban residents work;
– the localization zone expands on the released production and reserve zones, gradually turning into a single function of the rural settlement;
– in villages there are blocks of residential development, inhabited by city inhabitants;
– a significant percentage of seasonal and free housing;
– part of the village is occupied by weekend houses and garden companies, which causes seasonal fluctuations of the population, which is a prerequisite for both unorganized and organized recreation.
These features gave an opportunity to determine the rural settlement in the city-centre influence zone as a separate object of urban studies and on the basis of the terms analysis to introduce the term "suburban rural settlement" (SRS) for their designation.

2.1. Contemporary trends in the forming of suburban rural settlements

An analysis of foreign experience found that at the beginning of the XXI century there are the new types of settlements in suburban areas of major cities of Russia, namely settlements of exclusive character: arts castles, residences of large city firms, tourist, ecological centers of rural territories rehabilitation and settlements of high scientific and agrarian technologies [15]. In Europe, a significant part of the large cities functions (educational, scientific, administrative and business, employment of the population, provision of its housing, trade services), which require significant free areas, is often carried out in a suburban area. This is due to lower real estate taxes and a lower cost of land in the suburban area. The main types of suburban settlements in Europe are: satellites and recreational settlements, as well as urbanized residential areas, the purpose of which is the cities-centres unloading.
During the study, the current trends in changes in the functional and planning organization of rural settlements in suburban areas were identified: the decline of the rural population's cultural and household services; a significant increase in the territory with a reduced population, due to the expansion of agricultural land and the elimination of production areas; resettlement of rural production areas to another direction, more often their decay and liquidation; an increase in the number of land users, which complicates the planning of territories; reduces the importance of an agricultural enterprise as a main employer, which replaces the business of various ownership forms; export from the cities-centres to the territory of the SRS the following main functions: residential, industrial and recreational; formation of new functions: recreation, business, scientific and educational, forming production complexes of different purposes; organization of cottage settlements for city residents within existing SRSs, in the territory of holiday villages and garden societies, in the territories of the land stock and the arable land, which is withdrawn from the lands of agrarian purpose; distribution of the public services' functions and objects between settlements of the united territorial community.
At the same time, the elimination of a significant livestock production, located within the village with a violation of sanitary protection zones, improves the environment and creates conditions for the use of vacant plots for housing, recreational activities, production that does not require keeping sanitary distance. The conduct of private business at its own site provides a certain employment of the population, causing the formation of new development elements – bifunctional housing. It was found that in the large cities influence zone, in the past decades, the differentiation of the SRS according to the functional specialization, which is a consequence of self-organization, takes place. It was revealed that changes in the SRS functional and planning structure and the forming of different settlements' types differ significantly depending on the distance to the city-centre. Thus, within a radius of 20 km from Poltava and Sumy, it was found: villages operating as satellites of large cities; centers of primary settlement systems and agrarian enterprises; agro-industrial settlements; holiday villages and settlements, the production sector of which is a private subsidiary farm; settlement of subsidiary farms of city enterprises. In the radius of 40 km it was found: centres of primary settlement systems and large agrarian enterprises; farm settlements; the settlements, the production base of which is a small business of different industries; settlements-centres of arts crafts, crafts, tourism, individual recreation, etc; nature conservation farms, which population is engaged in the restoration of natural resources, beekeeping, ecologically pure crop production, biotechnologies, etc.
Thus, in the suburban areas of large cities-centers there is the tendency to form the following types of rural settlements: settlement-satellites, recreational and production settlements.

2.2. Algorithm for determining the functional specializations of suburban rural settlements

Determination of the SRS's functional specialization is based on the presence of favourable resources on its territory, which are determinants for a particular type of settlement. Studies carried out in [12, 13] have revealed a certain set of factors that influence the SRS type forming. Their decisive influence can be estimated by parameters characterizing settlement resources. The strategy for the development of each SRS is based on the choice of an optimal variant of its functional assignment. It is expedient to formulate an algorithm for determining the SRS's functional specialization as a clear consistency of actions [13]:
1. Systematization of the resources' availability in the SRS for a certain functional specialization;
2. Selection of parameters for assessing the indicators characterizing the influence of determining factors on the functional specialization of the settlement (available 14 statistical indicators);
3. Determination of the scale of the parameter ranking on the quantitative and qualitative indicators, in accordance with SRS available resources;

4. A total score for 3 variants of the settlement functional type (recreational, satellite settlement and production) for 14 parameters and determination of the prevailing type of functional specialization for the highest amount of points;
5. Verification of the results of the functional specialization's choice according to the parameters (most important for a certain type of SRS) and comparison of options;
6. Clarification of the SRS functional specialization's choice.

The justification for choosing the functional specialization of the SRS can be carried out on the basis of a point assessment of the parameters characterizing the resources that determine for certain types of settlements: recreational, production or satellite settlements. All parameters (14 available statistical indicators) are grouped into the following groups: natural features, protected areas, demographic, production, communication, and also take into account the features of the SRS's land resources and housing stock. According to the total indicators of 14 parameters (groomed in points from 0 to 7), it is possible to assess the parameters of available resources of a certain SRS and determine its priority functional specialization (Table 1). Natural resources in the territory of the SRS and their assessment in points are made by quantitative indicators, for example: the river – 1 point; river and pond – 2 points; river, pond, beam – 3 points; river, pond, beam or ravine, forest – 4 points, etc. In general, in the presence and quantity of natural resources (river, lake, beam or ravine, forest, pond), the assessment of the SRS territory on natural factors, recreational and tourist and other factors is conducted. The presence of significant volumes of seasonal housing stock in the territory of the SRS causes its conversion into a recreational settlement, and a free housing stock in a small settlement with a steady population decline – into the holiday village with appropriate infrastructure organization. Thus, for recreational settlement, the availability of natural resources and protected objects, the absence of harmful production, the amount of free and seasonal housing stock, availability of country or garden cooperatives, free land resources, etc. are important. The presence of seasonal housing, we identified as one of the important parameters that contribute to the forming of a recreational settlement. This is also in line with European norms, according to which a resort settlement is considered to be a populated place where the number of places for temporary settlements exceeds 60% of the permanent settlement [16].

Significant factors for the satellite settlement's forming are: the distance to the city-centre (up to 20 km), the share of the working population, which performs daily migration movements (up to 30%), the availability of free land resources (more than 10 hectares) is important for organization of new housing development)/ The land resources features are characterized by the availability of: a land fund for new housing construction within the village and land stock.

For the forming a production type of settlement, as well as satellite settlements, the parameters that contribute to the forming production types of settlements are decisive. The key factors for it are: free labour resources, availability of land resources, breeding facilities that have ceased to function (this situation is typical for most SRSs). Thus, research on the socio-economic status and planning structure of 148 villages of the Poltava region in this group of indicators revealed that there are: free land for new housing construction – 37 SRS (25%); land stock – 48 SRS (32%); state land reserve – 24 SRSs (16%); free land under pasture and pasture – 86 SRS (58%); lands of garden cooperatives – 48 SRS (32%) in their territory

A comparative analysis revealed that some of these parameters are not typical for most SRSs, which causes the consideration of alternative variants of their development.

From the above results of the study, it was found that the most significant indicators for comparison of alternative variants of the SRS's functional type are the following: availability of land stock (32%), free land for new housing construction (25%) and free land fund pasture and casting (58%), located within the SRS. In our opinion, the most important of the demographic groups is the availability and quantity of free labour resources (LR). It should be noted that the number of selected indicators as factors of development of SRS can be minimal (the 7 most significant for this type of SRS) and maximal (the entire range of available statistical indicators – 14).

Table 1: Parameters of SRS Resource Rating for Choosing a Strategy for its Development (1 – Recreational, 2 – Production, 3 – Satellite)

Serial number	Parameters	Resource name, quantitative and qualitative indexes	SRS's type and the number of points		
			1	2	3
1	Natural features (N)	0	0	5	1
		1	1	4	2
		2	2	3	3
		3	3	2	4
		4	4	1	1
2	Reserve objects (R)	0	1	6	5
		Local natural nucleus	2	5	4
		Regional natural nucleus	3	4	3
		Regional environmental corridor	4	3	2
		National environmental corridor	5	2	1
		National reserve	6	1	0
3	Population, (P), people	1 – 49	6	1	2
		50 – 99	5	2	2
		100 – 149	4	3	3
		150 – 199	3	4	4
		200 – 249	2	5	4
		250 and more	1	6	5
4	Number of able-bodied people (N_{ab}), %	More than 35	1	4	5
		Up to 20	2	3	4
		Less than 50	3	2	3
		Less than 20	4	1	2
5	Free labour resources (F_{lr}), people	Less than 20	6	1	5
		20 – 49	5	2	4
		50 – 99	4	3	3
		100 – 150	3	4	2
		151 – 200	2	5	1
		≥ 200	1	6	0
6	Employment in the city-centre (E_c),%	Up to 10	5	0	1
		11 – 20	4	1	2
		21 – 30	3	2	3
		31 – 45	2	3	4
		More than 50	1	4	5
7	Indicator of population dynamics (P_d),+ –	Reduction (–)	3	0	1
		No significant changes (0)	2	1	2
		Increase (+)	1	2	3
8	Distance to the city-centre (D_c), km	5-9	0	1	6
		10-14	1	2	5
		15-19	2	3	4
		20-25	3	4	3
		26-30	4	5	2
		31 і більше	5	2	1
9	Distance to public transport stop (D_{pt}), km	5	1	6	5
		4	2	5	4
		3	3	4	3
		2	4	3	2
		1	5	2	1
		0	6	1	0
10	Availability of production facilities (P_f), objects	More than 4	0	6	1
		3 – 4	1	5	2
		2 agrarian	2	4	3
		Agrarian (Collective farm)	3	3	4
		Farm	4	2	5
		0	5	1	6
11	Availability of land stock (L), ha	1 – 10	1	0	2
		11 – 20	2	1	3
		21 – 40	3	2	4
		41 – 70	4	3	5
		71 – 100	5	4	6

		More than 100	6	5	7
12	Free land fund for residential development within SRS (F_{rd}), ha	0	1	6	0
		1 – 5	2	5	1
		6 – 15	3	4	2
		16 – 20	4	3	5
		21 – 30	5	2	6
		31 and more	6	1	7
13	Seasonal housing stock (S_{hs}), %	3 – 9	1	0	5
		10-19	2	1	4
		20 – 29	3	2	3
		30 – 49	4	3	2
		50 and more	5	4	1
14	Free housing stock (F_{hs}), %	3 – 6	2	0	1
		7 – 15	3	1	2
		16 – 25	4	2	3
		17 – 39	5	3	4

Using the data of Table 1, it is possible to estimate the place of the SRS's belonging to a certain type to specify, by calculation of the score, the total influence of the parameters characterizing the resources of the settlement, to determine its priority functional specialization, according to the formulas given below.

Thus, the expediency of forming recreational suburban settlements (SRS_r), production (SRS_p) or satellite settlements (SRS_s) can be determined by the formulas, respectively:

$$\mathbf{SRS_r = \sum pDP_r = N+R+P_f+P+P_d+S_{hs}+F_{hs};} \quad (1)$$

$$\mathbf{SRS_p = \sum pDP_p = R+D_c+D_{pt}+P_f+L+P+F_{lr};} \quad (2)$$

$$\mathbf{SRS_s = \sum pDP_s = E_c+ D_{pt}+P_f+ D_c+N+R +F_{rd};} \quad (3)$$

$$\mathbf{SRS_r = \sum pDP_r > (\sum pDP_p, \sum pDP_s);} \quad (4)$$

$$\mathbf{SRS_p = \sum pDP_p > (\sum pDP_r, \sum pDP_s);} \quad (5)$$

$$\mathbf{SRS_s = \sum pDP_s > (\sum pDP_r, \sum pDP_p);} \quad (6)$$

where: $\mathbf{pDP_r}$ – points for determining parameters for recreational settlement, $\mathbf{pDP_p}$ – points for the defining parameters for the production settlement, $\mathbf{pDP_s}$ – points for determining parameters for satellite settlement, **N** – points for natural resources, type and quantity; R – point assessment of recreational resources, type and quantity; $\mathbf{P_f}$ – point assessment of production facilities, type and quantity; **P** – point assessment of humanity, persons; $\mathbf{P_d}$ – point assessment of dynamics (1 – 3 points); $\mathbf{S_{hs}}$ – point assessment of the seasonal housing share, %; $\mathbf{F_{hs}}$ – point assessment of the free (unoccupied) housing stock amount, %; $\mathbf{F_{rd}}$ – point assessment of the free land fund for residential development, ha; **L** – point assessment of the land stock, ha; $\mathbf{D_{pt}}$ – point assessment of the distance to public transport stop, km; $\mathbf{D_c}$ – point assessment of the distance to the city-centre, km; $\mathbf{F_{lr}}$ – point assessment of free labour resources, people; $\mathbf{E_c}$ – point assessment of the employees number in the city-centre, %.

After a thorough analysis of land resources and defining parameters of the particular SRS development, a score is assessed for three possible variants of the settlement functional type, with a view to choosing a promising strategy for its development. In this case, out of 3 variants of the predicted functional specialization, SRS's choose the option that scored the largest number of scores in the calculation.

As an example, an analysis of the point assessment results of the 14 SRSs parameters was performed (Table 2) and it was found that their functional purpose would be as follows:

recreational: villages Lavryky, Rozhaiivka, Ch.Dolyna;

production: villages Abazivka, Brychkivka, Petrivka, Valok, Kaplunivka, Ochkanivka, Lozivka, Vasylivka;

mixed: villages Solomakhivka, Hrynivka, M. Ladyzhyne.

Mixed-type SRSs, such as those with differences in point assessment for the maximum and minimum number of scores, can have the following directions of the functional type development:

village Solomakhivka – recreational and industrial: the population is 34 people, the distance to the city-centre is 20 km, there is agricultural production in the village, there are no employed in the city-centre;

village Hrynivka is a satellite settlement with a predominantly recreational function: the population is 70, the distance to the city-centre is 20 km, there is no production in the village, 10 people work in the city-centre (48% of the able-bodied population), 6 people do not work (22% from the number of able-bodied);

village M. Ladyzhine is a satellite settlement with a predominance of a type of production, based on the following: the population is 156, the distance to the city-center is 25 km, there are 7 people employed in the city, 74 able-bodied workers, 62 of them unemployed (84% from the number of able-bodied). Taking into account the good transport facilities of the SRS (placing on the highway of national significance Kyiv – Kharkiv), the presence of the working-able age population, it is expedient to place on its territory production of the logistic type, as a certain buffer zone for the residential zone. It should be noted that two variants of the ball scoring of parameters characterizing the resources of the SRS (for 7 indicators and 14 indicators) should be considered only if it is uncertain (close or equal to the sum of the points), with the priority given to the option less number of indicators – 7 (respectively, the above formulas).

Table 2: Comparison of Point Assessment Variants of Parameters Characterizing Available Resources of SRS by Different Number of Indicators

Serial number	Name of SRS	Population, people	Σ of points (1st variant)			Σ of points (2 nd variant)		
			1	2	3	1	2	3
1	Abazivka	1582	29	**52**	37	9	**26**	14
2	Lavryky	79	**46**	39	30	**22**	15	18
3	Rozhaiivka	10	**47**	46	33	**23**	20	15
4	Solomakhivka	34	43	44	27	21	19	18
5	Ch. Dolyna	7	**53**	43	30	**23**	18	17
6	Brychkivka	542	37	46	35	14	21	17
7	Hrynivka	70	**41**	38	39	**20**	15	21
8	Petrivka	421	36	47	34	17	20	17
9	Valok	256	37	63	42	9	39	15
10	Kaplunivka	7	43	**45**	40	19	**27**	20
11	Ochkanivka	150	46	**49**	38	12	**33**	13
12	Lozivka	249	42	**53**	42	13	**29**	14
13	Vasylivka	670	37	**53**	40	13	**31**	16
14	M. Ladyzhyne	156	46	**47**	46	21	**23**	27

In this study a point assessment of the Poltava district SRS's available resources for three options of functional specialization as a strategy for their development was conducted. The comparative analysis determined the most optimal of the options (for a larger sum of points, Table 1). In the paper [13] a point assessment was conducted for all rural settlements of the Poltava region, which is predominantly situated in the 1st belt of the suburban zone. Also the scheme of Poltava district rural settlements functional specialization was developed (Fig. 1).

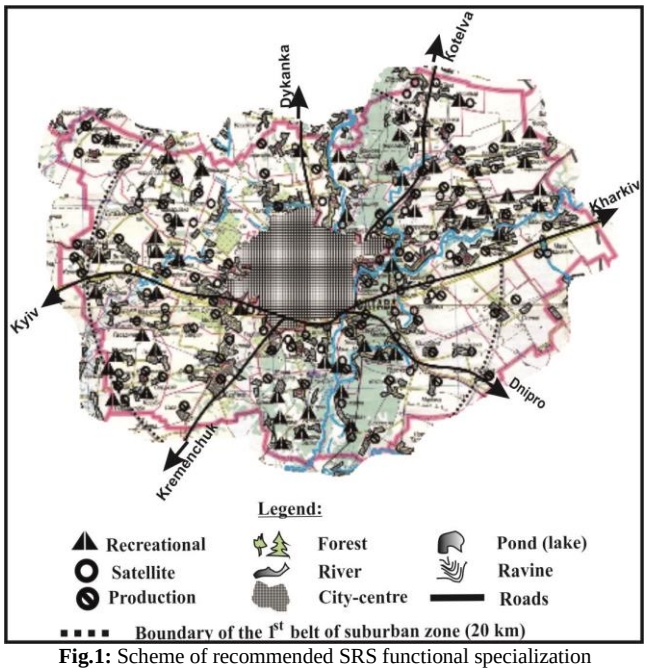


Fig.1: Scheme of recommended SRS functional specialization

Placement of suburban rural settlements within the pedestrian reach of transport communications and nature-recreation corridors must be taken into account when determining its functional specialization. The areas of pedestrian reach of transport corridors are defined within the limits of 1 km from the main highways of European, state and regional significance Kyiv – Kharkiv, Poltava – Kremenchuk, Poltava – Krasnohrad, Poltava – Sumy and railways Kyiv – Kharkiv, Poltava – Kremenchuk, Poltava – Krasnohrad. The natural landscape corridors are defined respectively [7] – Vorska – regional significance, Kolomak and Merla – local, in the 2nd belt of the suburban zone – Dykanskyi Regional Nature Reserve.

3. Conclusions

Investigation of the regularities of the city-centre and local resources influence on the the SRS functional and planning organization provided an opportunity to develop a scientifically grounded approach to the choice of strategies for their development, which is connected with specialization in the system of suburban zone populated areas. The factor dependence of the influence of the city-centre's needs, the presence of tourist and recreational, transport and communication resources of software and local SRS resources on the forming of functional specialization of settlements in the suburban zone was established. In order to compare and evaluate the resources of the SRS, quantitative and qualitative parameters that characterize them are determined. Thus, the technique of point assessment of SRS resources, which determines their functional specialization, is proposed as a prospective strategy for the development and improvement of the architectural and planning structure of these settlements.

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