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A methodology for assessing poverty in Moldavia (Romania)[1]

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ABSTRACT

Community poverty, analyzed as the sum of several types of social and territorial deprivation, is the geographical expression of various processes and phenomena, commonly the object of sociological and economic studies. In this paper we performed a statistical compaction of a series of synthetic indicators, generating an indicator called the index of community development. The statistical validation of these results is accompanied by a spatial validation, which identifies the legitimate social structures in rural areas, emphasizing that obtaining valid results in the implementation of territorial development strategies depends more on the consistency of the scientific methods used to interpret statistical analysis.

Key words: community poverty, regional disparities, statistical methods.

RESUMEN

La pobreza comunitaria, analizada como la suma de varios tipos de privación social y territorial, es la expresión geográfica de distintos procesos y fenómenos, y comúnmente es objeto de estudios sociológicos y económicos. En el presente estudio se realizó la condensación estadística de una serie de variables primarias, generándose un indicador sintético, superior desde el punto de vista informativo, que se denomina índice del desarrollo comunitario. La validación estadística de los resultados está acompañada por una validación espacial, identificando el comportamiento de estructuras sociales legítimas en áreas rurales, destacando que la obtención de resultados válidos en la implementación de estrategias de desarrollo territorial dependen más de la consistencia de los métodos científicos utilizados que de interpretaciones estadísticas certeras.

Palabras clave: Pobreza comunitaria, disparidades regionales, métodos estadísticos.

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From a classic perspective, sciences such as economy and sometimes sociology analyze poverty based on information regarding population's income and consumption levels. Beyond the numerous discussions on how we should accurately define poverty, most sources point out the data regarding income sources as the starting point in the study of the phenomenon (Nolan & Whelan, 2007; Atkinson, 2002).

By taking into account the exhaustive character of surveys collecting data on income to various degrees, both economy and sociology have sought to identify statistic thresholds to classify the population according to its financial or even by its social possibilities. Two such thresholds are most often accepted in the literature: the *absolute poverty* threshold, determined depending on the minimum expenditures necessary for the normal functioning of the individual in the society (Townsend & Gordon, 1991; Jansson, 2000) and the *relative poverty* threshold (Sen, 1983). Sen believes that poverty should be analyzed from the perspective of the individual's society, thus using statistic distances from certain central values, among which the most common is the median income (Townsend, 1979; Mack & Lansley, 1985).

The more recent forms of poverty analysis draw attention to the fact that the field is not sufficiently covered and they seek to establish more complex approaches. The delimitation of poverty classes according to the income levels is currently labelled as reductionist due to the fact that it tends to ignore the presence of other needs, which are considered vital for the vertical mobility of the individual. Among these, the feeling of security, the freedom of speech, the access to education and the health care system, to a natural health-promoting environment, etc., were designated by the Indian economist Amartya Sen as *commodities*. Subsequently, the regarding these methods has greatly developed, thus completing various niches in the study of poverty or attempting to create synthetic indicators with a vast coverage of the phenomenon: childhood poverty (Minujin, 2006), female poverty (Daly, 1989), relative poverty (Smeeding & O'Higgins, 1990).

From this epistemological perspective, poverty becomes a multidimensional theme and the corresponding indices have a composite structure. They get closer to the concept of standard of life without eluding that of standard of living: the multidimensional poverty index, indices adjusted to the inequality index, or the index of basic unsatisfied needs (the latter is frequently used in Latin America).

The concerns for the spatial dimensions of poverty are even more recent, and the geographic analysis on the phenomenon is, most of the times, integrated in economic or sociologic studies. These studies derive from the need to explain the emergence of localized forms of poverty, sometimes at the initiative of UN-affiliated structures, in their intention to outline the *profiles of poverty* (Lok-Desallien, 2004). Such an example is *rural poverty,* which aims to explain the particularities of the widest diffused type of poverty. Hence, the studies following the processes, causes and effects of the occurrences when poverty associates with the rural setting are present in all specialized schools in the world (Jazairy *et al*., 1995).

The development of data computation methods allowed modern geography to develop its own analysis methods for poverty repartition. For geography, the map turns from a simple visualisation solution for statistic information into a research method; this discipline is called spatial analysis. By focusing on the study of distances, contiguity, discontinuities and accessibility, spatial analysis proposes several study methods for the repartition of poverty, among which the best-known are circumscribed by the centre-periphery models, as well as by the spatial diffusion of innovation and by vicinity models, each of them with several analysis techniques, such as spatial autocorrelation, geographic weighted regression and spatial interaction (Anselin, 2005).

The spatial sciences benefit from the advantage of integrating the social and economic information to the horizontal architecture, thus assimilating the individuals to strictly localized human groups, but subtly described through topologic indicators, such as relays, point-*described* masses and volumes, information networks, and emission and reception relations *described* through lines, surfaces, capitals and patrimonies *described* through polygons.

Within these concrete reference points, the geographer has the necessary skills to discriminate certain inequalities generated by society through repetitiveness/self-regeneration, flexibility/ rigidity, simplicity/ complexity, thus mixing methods and models from economy, sociology, history, which he integrates in a synergic matter in a volume of map-ready information called *spatial capital*. The absence/lack of spatial capital produces a geographic species of underdevelopment called *community poverty*.

The difference between community poverty and the other types of poverty comes, first, from the spatial dimension ascribed by geography to the phenomenon. In this case, statistic individuals are no longer social, but they become topologic. The person (or family) is replaced by locality, which, through its position from certain commodities/needs, will personify the individual needs within those of the social-spatial group.

The hypotheses of this study come from the difficulties of circumscribing the indicators that analyze the problems of rural community underdevelopment, regardless of the nature of approach – economical, sociological, or geographical.

The relations inter-particularized by territorial statistical individuals make classifications depending on multi-criteria hierarchies very difficult, the main impediments being the following:

- The use of alternative synthetic indicators leads to para-mathematical, disputable conventions, in which multiple origin explanatory variables are used to the same degree for the result, leading to arbitrary conclusions (Gadrey, 2002).
- The successive weighing of a partial underdevelopment indicator frequently uses incomplete, subjective statistical methods that elude, by using scores, the real energies between variables.
- The application of multivariate analysis methods not taking into account the essential particularity of territorial data series, which is retaining a large amount of unexplained information, invisible if we simply correlate the variables or if we relate them to an average profile.

Methodology

Methodologically speaking, the social state of the Moldavian[3] rural population is structured on four assessment levels, progressively elaborated, with a bottom-up type of integration:

1. Identifying the life quality compartments, with concrete relevance for the socio-economic inspection of rural communities.
2. Elaborating partial indicators, applied to each segment of life quality, analysing the composition of low redundancy simple parameters.
3. The synthesis of partial indicators through means of statistical integration, in order to obtain a general index of community development, capable of emitting classifications/hierarchies.
4. Extracting, from the deductive plan (obtained through modelling), the spatial expression mandatory character of rural communities, with the purpose of understanding the ameliorative/ degenerative fields of rural societies in crisis.

The community development index

The community underdevelopment analysis for the Moldavian rural settlements starts from the premise enounced in the following lines. The statistical "noise" effect obtained when elaborating final typologies or big differences between the results based on model-selected explanatory variables and the results based on adjusting the model by introducing new exogenous variables changing the behaviour of the endogenous variable, are created because the initial variables are randomly selected.

[3] Moldavia is one of the three great historical provinces of Romania, located in the northeast of the country. Since 1940 the province is divided in two different political structures: eastern region became part of the USSR (after 1991 proclaimed its independence, becoming the Republic of Moldavia) while the western half remains part of Romania. The study covers only that Moldavian territory which is now part of Romania, the region encompassing eight counties with a total area of 46,000 Km² and a population totaling 4,700,000 inhabitants.

It is true that the abovementioned deficiencies are solicited by the requirements of *geometrical statistics,* using highly independent raw variables, when explaining a process or a socio-economic phenomenon, considering that the relevance of final classifications is increased when using simple modalities. Nonetheless, the realities individualizing geographic processes contradict this model.

A simple indicator, which evolves, apparently, as an elementary variable, such as illiteracy, hides geo-demographic, socio-economic explanations of gender inequalities or of differences among ethnic and confessional minorities. At the same time as this statistical disagreement, elaborating typologies based on multiple coagulations of simple variables will have a redundancy effect, meaning that the interpreter will include involuntarily and repetitively the same variable. This is why it is better for the statistical analysis of territorial data to work with derived indicators, comprising several variables, which can extract their own typologies, with less final variables, but higher explanatory and conclusive effect.

When constructing the rural community development index, we took into account six composite indicators, each one responsible with identifying the functioning of a certain component within the rural settlement system. These indicators are the following: *educational fund component; vital capability of rural communities' component; labour force inclusion component; effective use of agricultural real estate component; human habitat quality component; and the transactional component of financial-banking service system*.

Considered from the perspective of *welfare geography (*Rawls, 1971; Esping-Andersen, 1990*),* the analysis is based upon nomothetic interpretation methods, with a focus upon the *community poverty* concept, seen as a major deficiency state in ensuring several types of accessibility/commodities (Amartya Sen, 1999).

The methods used to identify the aforementioned deficiencies belong to certain models specific to geography: *the central place model; the graph model* (Dupuy, 1991); *the gravity model* (Pumain, 2001*)*; and *the centre-periphery model* (Figure N° 1).

The advantage of using a synthesis of these models is demonstrated by the necessity to distinguish, for each of the 2.944 localities within the study, two essential categories of relationships, transformed into potential accessibilities:

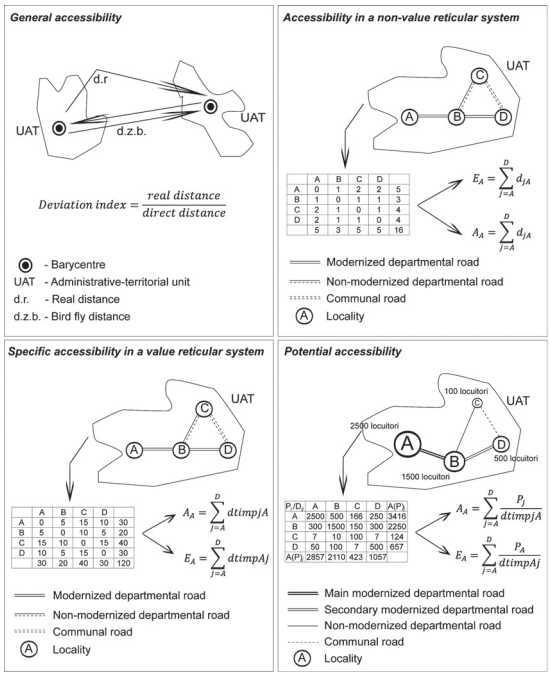
- The emissivity potential of a locality will include variables emphasizing on the necessity of a market for those needs, may be present in that locality or not. These variables are set at the level of fraction's denominator (number of students between 7 and 11 for primary school education services; number of aged people for sanitary services; number of persons trained in the primary sector for the agro-alimentary commercial services, etc.)
- The attractiveness potential of a locality will include variables emphasizing on the necessity of a clientele to satisfy the offer. These variables are set at the level of fraction's numerator (number of teachers; number of medical staff; number of persons left abroad; number of active companies in sectors specific to the rural development, correlated with diversity variables; the number of employees in the banking system, etc.).

For both forms of potential we will use, for the denominator, distances-time calculated from the emitting centre toward the closest attractive centre, for each index and sub-index, so that, eventually, form the two types of potential accessibilities – attractiveness and emissivity –, an interaction potential between the locality needing serving functions and the locality benefiting from those functions will result.

In order to avoid the statistical-mathematical deformations generated by the strict geographic inclusion of administrative-territorial units, we will use trans-scalar methods through which the same territorial element will dispose, subsequently, of several accessibility indices, depending on the complexity of relations induced by the quality and quantity between necessity and service (commodity).

In this sense, we will respect the *geographic transitivity principle*: a rural locality

Figure N° 1
Accessibility calculation methods



Source: author

unfavourably placed far from the centre of the commune will ignore these relations if it is favourably located in relation to a town within the higher rank.

In order to understand the way we have elaborated the six partial indicators[4] of the community development index, we will present the mathematical expressions that have constituted the grounds for these indicators and of the construction of specific sub-indicators:

Index of the interaction potential between the population and the educational services

This index presents the assessment of *social capital* (Azocar *et al.*, 2003; Flores & Rello, 2003[5]; Putman, 1993; Coleman, 1988); it is calculated using the following formula:

Aed=Aep+AepAeg+AegAes+AesAeu,

Where: *Aed* represents the potential accessibility to education; *Aep* represents the population's accessibility to primary educational services; *Aeg* is the accessibility to secondary school services; *Aes* is the accessibility to high-schools services; *Aeu* is the index of general accessibility to higher education services.

In order to understand the way we have elaborated the partial indicators, we will present the formula used to calculate the accessibility to primary educational services:

[4] All the values of the accessibility indices represent coefficients calculated for each locality (with no measurement unit).

[5] The authors attribute to the notion of social capital the phrase "social network" seen as an ensemble of cultural relations originating from the flexibility of expressing human resources in the territory.

Aep=Pcm·Nes·NpD3·N7–10,

Where: *Pcm* represents the percentage value of the high-school and college graduates from the total employable population. The purpose of this coefficient is to identify the fund of education created, maintained or attracted, while also assessing the community's possibilities to ensure educational services; *Nes* is the number of students in the locality at the time of the study, testing the community's capacity to regenerate the educational fund; *Np* is the number of teachers serving the population within the elementary education process; it is a symbol of the offer and it is always calculated with reference to the locality with the nearest elementary school; *D (in minutes)* calculates the distance/time between the locality emitting the request and the one providing the educational services. The cube exponent within the formula is explained by the fact that spatial roughness in the case of elementary education services is higher than for higher education levels. At the same time, it proves the importance given to this level of educational polarization, considered essential for the community's capacity to develop complex professional structures; *N7–10* represents the number of children 7 to 11 years old; its use as an absolute value is explained through the necessity to weigh the absolute values used for the numerator of the formula. The ratio between this number and the number of students can help identify the size of school abandonment associated to a low level of educational integration within a given community.

Index of the interaction potential between the population and the sanitary services

As=Ase+AseAsu+AsuAso+AsoAsm+AsmAsj,+ AsjAsc,

Where: *Ase* – population's potential accessibility to settlements providing elementary services – we have included here all the localities with a medical cabinet or a pharmacy; *Asu* – population's accessibility to settlements with medical-social units; *Aso* – population's accessibility to settlements with urban-level hospitals, and also polyclinics; *Asm* – population's accessibility to settlements with municipal hospitals. *Asj* – population's accessibility to settlements with departmental hospitals; *Asc* – population's accessibility to settlements with urban-level ultra-specialized hospitals.

To calculate the partial indices, we have used calculation principles similar to those presented within the chapter on educational accessibility. This is why, as model, we have given the example of the index for the accessibility to elementary (proximal) sanitary services:

$Ase=PsP0–20d3P_v$, where:

Ps is the active population in the sanitary sector; *PsP0* represents the number of persons aged between 0 and 20; P_v represents the number of persons over 65; *d* represents the distance-time (displacement minutes) to the nearest locality providing elementary sanitary services.

Index of the agricultural exploitation profit

This index calculates the probability for a rural community to have additional incomes by effectively using the agricultural exploitations depending on the differentiated accessibility to the market of agricultural products (Chiran, 2004)

$Ief= S_I+ S_c2(P_a+1)+V_{com}–K\ D_t$, where:

I_{ef} represents the index of agricultural exploitation effectiveness; S_I is the number of employees in the locality, and is used in order to determine the buying capacity of the community; S_c is the number of employees in the polarizing centre; P_a represents the number of individuals active in agriculture. V_{com} is the community's income from agriculture, expressed in RON (the Romanian currency unit); *K* is a constant which equals with the product between the annual average number of trips effectuated by an agricultural community, evaluated at 52, meaning the number of weeks within a year, and the cost of a round trip for one minute distance-time, evaluated at 0.6 lei. D_t is the distance-time between the locality benefiting from the services and the one providing these services and it is expressed in minutes.

The community's income from agriculture is an essential component of the index; it is calculated according to the following mathematical expression:

$V_{com}=V_a+V_z+V_{fs}$, where:

V_{com} – total income from exploitation production (lei); V_a – income from agronomy-related activities(lei); V_z – income from stock raising-related activities(lei); V_{fs} is a special component assessing the surplus of fodder production at the community level, liable to being altered at the community level, obtaining further system incomes(lei).

Index of the interaction potential between the population and the labour market

The following formula is used:

$A_{fmr}=D_l+A_{pl}+A_{pl}A_{pz}+A_{pmr}+A_{pr}/5$

where: A_{fmr} – accessibility to the polarizing centres of labour force in rural-specific fields; D_l – local service index; A_{pl} – accessibility to local polarizing centres of labour force; A_{pz} – accessibility to regional polarizing centres of labour force; A_{pmg} – accessibility to the labour market offered by departmental centres. A_{pr} – accessibility to regional polarizing centres.

In order to understand the way we have elaborated the partial indicators, the formula used to calculate the accessibility to the local polarization centres of labour force is presented here:

$A_{pl}=P_{sl}(P_{st}+P_t)+P_{s1l}\ (P\ S_l+P_T)\ 2\cdot d$, where:

p_{sl} – number of employees in the polarized locality, carrying on their activity in place of residence; p_{st} – total number of employees in the polarized locality; p_t – total population of the polarized settlement; P_T – total population of the polarizing settlement. P_{Sl} – employed population in the polarizing settlement; P_{s1l} – population in the polarized locality activating outside the locality; d – distance-time, expressed in minutes, between the polarizing and the polarized locality.

The index of technical-urbanistic habitat comfort

The sub-indices used may be divided into two categories:

1. Indices of habitation density;
2. Indices of habitat technical comfort.

The indices of habitation density aim to delimitate the habitation intensity within the same space, starting from three statistical variables: number of inhabitants for each household; number of households; and, of course, number of occupied households. The measurement unit of this indicator is the number of conventional persons/household. The number of conventional individuals increases by the number of families involved in cohabitation; the increase in the number of families will introduce an additional habitation discomfort, even if the number of persons does not modify, because the promiscuity hazard increases. It is presented through the following formula:

$I_{dl}=(N_f+N_p)/N_l$, where:

I_{dl} – inhabitation density index; N_l – total number of households; N_g – total number of families; N_p – total number of persons.

The indices of habitat technical comfort will take into account five types of facilities: cold water supply; hot water supply; electricity and gas; sewer system.

All these categories of facilities are considered as participating, to different extents, in determining the development level of a community. Thus, the presence of electricity, though vital for the study of absolute poverty, is less important when characterizing the community poverty, as it is a ubiquitous good, only levelling certain states when given the same proportion of the result. We have weighed the other indicators according to the reverse of their frequency; the rarer a service, the more the urban character brought to the respective locality:

$I_{ct}=0,4\cdot 1_c+0,3\cdot 1_g+0,2\cdot 1_{ac}+0,1\cdot l_a$

where: I_{ct} – Index of habitat technical comfort; I_c – households with sewer system (% of the total households); I_g – households with gas supply (% of the total households); I_{ac} – households with hot water supply (% of the total households); I_a – households with drinking water supply (% of the total households).

In order to obtain the urbanistic index, the ratio between the index of habitat technical comfort – directly proportional to the development level of the communities –, and the index of habitation density, reversely proportional to the development level of the communities will be calculated. Finally, this index is added, as previously mentioned, with the index of electricity presence, but the latter must be related to the number of inhabitants in the same village, thus being sub-unitary and insignificant for the positions in the upper part of the classification, but decisive for the localities where all four facilities are absent, thus very important in differentiating the lower part of the classification.

The synthesis of the two categories of habitat indices is elaborated through the following formula:

$$I_e=I_{ct}I_{dl}+Ii$$

Where: I_e – the index of technical-urbanistic habitat comfort; I_{ct} – the index of habitat technical comfort; I_{dl} – the index of habitation density; I_{el} – the index of electricity in the houses.

Index of the interaction potential between the population and the financial-banking services

This index estimates the integration degree of rural communities in the system of financial markets (Henriquez *et al.*, 2007; Chaves, *et al.*, 2001); it is calculated according to the following formula:

$A_{fb}=A_{bl}+A_{bsl}+A_{bmun}+A_{bjud}$, where:

A_{fb} – general accessibility to financial-banking services; A_{bl} – accessibility to local banking services (including the working points of national banking societies or mutual benefit societies; savings banks[6]); A_{bsl} – population's accessibility to supra-local polarization banking services; A_{bmun} – population's accessibility to municipal centres of the financial-banking centres; A_{bjud} – population's accessibility to departmental polarization centres of the financial-banking centres.

$A_{bl}=S_{tsup}+N_s(N_{ub}+D_{ub})I_{d1}+d+(I_{d2}+D)$, where:

A_{bl} – accessibility to local banking services; S_{tsup} – active occupied population in the upper tertiary of the polarizing locality; N_s – number of persons reviewed as left abroad at the last census available (2002); N_{ub} – number of banking units in the polarizing locality. D_{ub} – diversity of banking units in the serving locality, calculated as the sum between the number of citizens acting on the financial-banking market of a certain locality; I_{d1} – index of the occupied population's dependence of the polarized locality. I_{d2} – index of the occupied population's dependence for the whole of the polarized localities by the centre providing the financial-banking services. D – sum of the distances between the polarized localities and the locality providing local financial-banking services; it is expressed in minutes.

Methods of standardization and multi-criteria hierarchy order for partial indices of a human community social state

The multi-criteria hierarchy order methods are used for the territorial profile studies, being useful not only to elaborate regional classifications, but also to compare the territorial unit to the average level in order to measure the inequalities among the units (Nelea Mihai, 2005).

In a world where attention is a very rare resource, information becomes a pricey product as it may distract our attention from the

[6] Similar classifications are adaptable to other countries in Europe or Latin America, as the covering functions of the financial-banking services are known as revitalizing for the isolated rural economies (Delalande & Paquette, 2007).

important to the non-important things (Simon, 1997).

Using six synthetic indicators for which we used 55 variables creates many difficulties in the intention of getting a single final index with maximum probability of an equidistant characterization of Moldavian rural settlements.

In this sense, we had to use statistical modelling methods such as the *factorial analysis*, which, by using multivariate exploration techniques, allows the graphic extraction of similarities among the statistical strings, being also capable to quantify the correlation degree among several factors, apparently independent.

The best-known statistical methods of organizing strings into compact groups, with higher explanatory capacity, are *the ascendant hierarchical classification, the analysis based on the main components, and the rank sum method.*

Multivariate analysis method – Hierarchical classification

Also named *tree classification* or *aggregation classification*, its purpose is to obtain typologies created depending on independent variables, by successively dividing individuals belonging to a statistical population into classes created through a successive fusion, so that two subjects initially belonging to two different subgroups (*clusters*) will be united by an increase in the precision level within common subgroups[7].

The ascendant classification method will not be used as the final method to establish the community development hierarchy of the Moldavian localities, but elaborating it will be essential in determining the inter-class/ intra-class differences within the final typology realized through the *exploratory statistical analysis based upon multiple correlations between variables and depending upon the analysis on the main components.*

The rank sum method refers to attributing ranks to each administrative-territorial unit, successively, depending on the hierarchy created by each indicator to take into account during the analysis. Consequently, the unit with a maximum qualitative performance is ranked 1, with the following next localities getting progressively higher ranks, with the highest rank being attributed to the unit which has the minimum qualitative level for each variable (n = number of units for the researched unit). By adding up the ranks corresponding to each territorial unit, we get a *score*. The lowest scoring territorial unit is the most performing from all the perspectives included within the multi-criteria analysis and gets the final rank as the score increases, and the final rank 1. As the score increases, the final rank also progresses, until rank *n* attributed to the territorial unit with the highest score.

The rank sum method presents the advantage of an easy and rapid application, providing generally correct information regarding the classification of administrative-territorial units. Moreover, the results can be valorised in the territorial planning researches based upon non-parametric methods to measure the intensity of the relations among variables (Goschin & Pârlog, 2004).

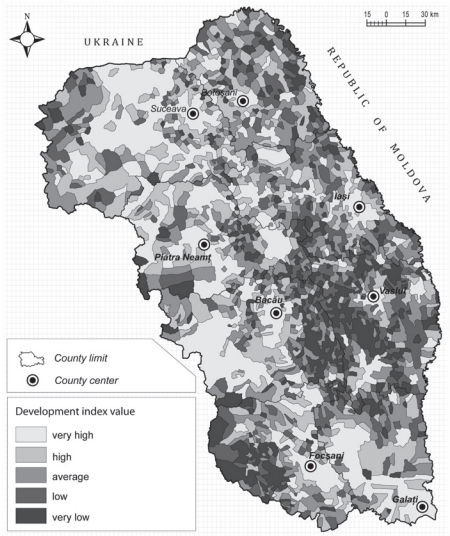
The shortcomings of this method are related to the double levelling of the differences among the territorial-administrative units. The real gap being replaced with an arithmetic progression with rate 1: the first levelling takes place when attributing ranks for each of the characteristics within the study, and the second levelling takes place when replacing the score with the final rank string. That is how we lose a lot of the information quality, the various distances among successive units being systematically replaced with the difference (1) among successive ranks.

Factorial analysis and proportions depending on the correlation means within an exploratory statistical analysis

According to the main components analysis, we concluded that the six direct (primary)

[7] For more details regarding the factorial analysis, see *Analiza factorială a fenomenelor social-economice* în *profil regional*, Voineagu & Furtuna, 2002.

Figure N° 2
Social state typology of the Moldavian rural population



Source: author.

variables that we have previously presented may be reduced to 4 factors ensuring 90% of the explanation for the whole dispersion. Taking over from the connection matrix the values of each factor, we could answer to two questions:

1. What is the correlation between the primary variables?

For example, by observing the way in which the six variables were loaded upon factor 1 and factor 2, we saw 3 types of dependencies between the variables (Table N° 1):

Table N° 1

Rotated Component Matrix				
	Component			
	1	2	3	4
Education	.194	.882	.086	.108
Financial-banking	.926	.070	.086	.064
Technical-Urbanistic	.861	.293	.086	.050
Agriculture Exploitation	.082	-.008	.061	.985
Labour Market	.118	.257	.942	.081
Sanitary Services	.148	.748	.337	-.150

a. Convergent correlations involving a positive evolution, the increase in a variable being directly proportional with the increase in the other. Such correlations are established among the educational services index, the technical-urbanistic household index, the labour force index, and the financial-banking index, with the strongest correlation between the technical-urbanistic index and the financial-banking index. The closest correlation is that between *the technical-urbanistic index* and the *financial-banking accessibility index*.
b. Quadrature correlations, in fact *non-correlations*.
c. Divergent correlations involving a reversed dependence, the increase in a variable being dependent upon the decrease in the other. Such a correlation, even though at the limit of non-correlation, may be observed between the *sanitary accessibility* factor and the *exploitation profit* factor.

2. What is the proportion of each variable in determining the four main components of the analysis?

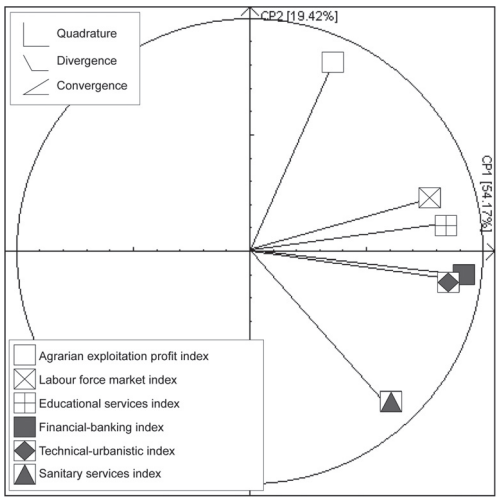
In order to emphasize the unequal participation of primary (expressed) variables in creating the community development index we will initially use an exploratory statistical analysis with the purpose of determining the importance of each variable depending on the correlation between them.

The method may be synthetically expressed according to a matrix with the correlograms between the six partial indices taken two by two (Figure N° 3).

The strongest connections are emphasized between the *accessibility to financial-banking services* and the *urbanistic quality of the habitat* (the very strong relation between the two variables is explained by the fact that both of them hide in the value of indices, the incomes from the international migration of labour force).

The lowest values for the slope of the regression line equation are those between the variables of *sanitary accessibility* and *agrarian exploitations profit*, which makes the two variables less explanatory. This conclusion

Figure N° 3
The correlation between the community development indices. Main components analysis



Source: author

becomes debatable if analyzed from a strictly geographic perspective, their low relevance being induced by the ubiquity of its parameters. Geo-demographic aspects such as population ageing or those regarding the agrarian density are substantial to all the components of the rural settlement system[8].

Those correlations may be transposed according to a mathematical formula, and then mapped (Figure N° 4):

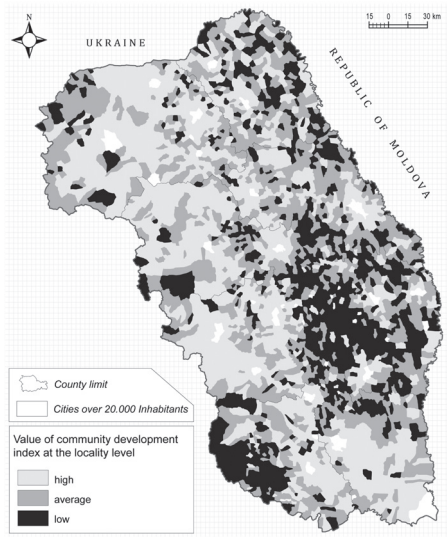
$$I_{dc}=0.220\cdot I_{ed}+0.272\cdot I_{fb}+0.237\cdot I_{te}+0.108\cdot I_{pea}+0.190\cdot I_{pfm}+0.045\cdot I_{ss}$$

Where: I_{dc} – *Community Development index;* I_{ed} – *Educational services index;* I_{fb} – *Financial-banking index;* I_{te} – *Technical-urbanistic index;* I_{pea} – *Agrarian exploitation profit index;* I_{pfm} – *Labour force market index;* I_{ss} – *Sanitary services index.*

[8] The statistical-mathematical methods cannot identify these invisible/subtle relations, hiding beyond the quantitative interface of the primary variables; the disadvantages are caused by an essential flow of territorial database collecting –*statistical imputation*.

Going back to the connection matrix extracted through the main components analysis, during the next phase we should eliminate the two variables as insignificant in explaining total dispersion.

Figure N° 4
Community development index in Moldavia
Classification depending on the proportions of correlation means between the variables



Source: author

The shortcoming of such a method is given by the stochastic character of separating the variables with high explanatory value from those with low explanatory value, losing two of the primary variables.

Moreover, the geographic reality shows that, unlike geometrical statistics, territorial data series are emphasized by *inferential* relations in which the variables analyzed are in a permanent synergic evolution.

If this is validated by the specific of geographic statistical information, then, within the territorial analysis, the factors that seem the least explanatory will become, because of their independence compared to other variables, the most important parameters for the final value of the community development index.

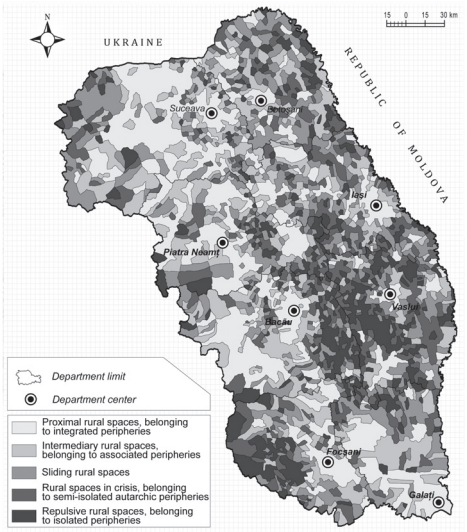
Under these circumstances, we prefer to use the connection matrix only in order to extract the magnitude with which the variables

are loaded on each factor, thus recuperating the primary variables. The difference is that each of them will be multiplied through a coefficient indicating the explanatory value of the variable in the whole of the dispersion.

The equation of the community development index becomes the following:

$$I_{dc}=13.57\cdot I_{ed}+13.56\cdot I_{fb}+13.57\cdot I_{te}+16.15\cdot I_{pea}+16.47\cdot I_{pfm}+16.67\cdot I_{ss}$$

Figure N° 5
Typology of Moldavian settlements depending on the community development index (classification based on rank ordinal values)



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After a comparative analysis of the four methods, we see a complete similarity between the results, each interpretation repeating the same territorial cleaving between the areas with high community development indices, dependent upon the presence of urban areas or major road communication axes, and areas with low community development indices. They are specific to isolate or weakly polarized territorial structures, depending on the urban type of functions.

The repetitive character of the final results/typologies, regardless of the method used, leads to the following conclusions:

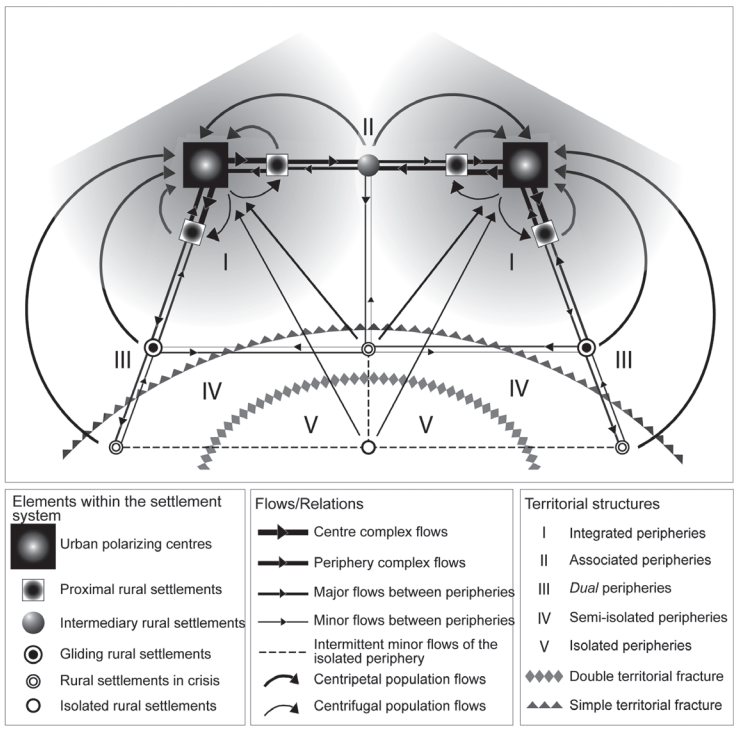
- The importance of modelling and statistical weighing methods for partial variables is very low when operating with territorial databases, as most of the explanatory information should be included in the partial indicators.
- There is a high probability to arrive to wrong conclusions using the factorial analysis method when the interpretation is rigid, according to geometrical statistics; for the seemingly independent geographic data series, they are able to structure most of the explanatory information.

The final purpose of the spatial analysis based upon the intra-regional differences of the main indicators regarding the socio-economic population state is the creation of a spatial expression model for the rural communities within the areas studied. This model should also be applicable in case of other areas with average or high proportions of the stable population within the rural environment (Figure N° 6).

When naming the classes, we took into account the evolving/non-evolving tendencies within the categories of villages. We studied the positions of the localities within the settlement system and, especially, the interdependence/subordination relations with the urban settlement system, making the proper associations to the consecrated terminology of the centre-periphery model. (the French geographer Alain Reynaud, from the geographical school of Reims, explains, in the book *Société, espace et justice: inégalités régionales et justice socio-spatiale - 1981*, the main categories of peripheries and the relations between them and the dominant centre: *the dominated periphery* – provider of raw materials and population, benefiting from tourist flows; *the integrated periphery* – in advanced inter-relations with the centre and benefiting from two-direction flows, *the associated periphery* – advantaged by capital and innovation transfers, *semi-isolated periphery* – witness of modernizing autarchic socio-economic systems; *the neglected periphery* – developing one-direction flows towards the periphery, the most important being the population flows. Even though the comparison was initially made for the macro-regional scale, we may extrapolate the discourse to the infra-regional scale, taking into account the similarities discovered between the classes identified by hierarchy and this model.

Nevertheless, we underline that we will try to avoid the punctual use of the term *dominated periphery*, considering the tautological character of such an expression: all peripheries are dominated).

Figure N° 6
Model of Moldavian peripheral territorial structures



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Proximal rural spaces, belonging to integrated peripheries

The *very high* values of the community development index claim a close correlation with the presence of the urban element, as well as with the high rank communication ways (European and national roads).

Cautiousness is recommended when using the term *integrated periphery*, as the intra-class differentiations are significant enough, but there are also numerous similarities as regards the flow orientation:

- The most obvious are channelled from the rural towards the urban environment, such as: flows of people, expressed through oscillatory mobility (for work and studies), shown by a positive deviation from the average regional profile of the accessibility to labour market factor;
- The second category of flows is that of the *exportation* of qualified personnel from the urban towards the rural environment: didactic staff, sanitary, administrative staff, etc.;
- The rural-rural flows are modest, but they can punctually ensure an important proportion of the whole of interactions among the corresponding elements, first in case of localities competing territorially, the positions within the hierarchy of the settlement system being altered circumstantially.

Intermediary rural spaces, belonging to associated peripheries

In order to characterize this category, it is essential to understand the fact that the notion of intermediary rural space does not equal the terminological concept of *espaces entre-deux*. The latter are defined as *complex spaces situated at the crossroad of influence areas or in articulation points of multi-scalar dynamics, sometimes split, other times mixed; they are places where there are, at the same time, tensions and transformations, and they become, concomitantly, split and mediating places* (Pellen, 2009).

The flows generated by these localities are mainly oriented towards the settlements within the upper hierarchy level, both material and person flows (agrarian products, especially, and final products specific to industries with low added value and without many expenses on improving the human capital). At the same time, we do not exclude the interactions with upstream elements, as they provide them average qualified personnel, or sometimes they represent diffusion relays of innovation from the upper-level urban localities.

Reversely, these settlements benefit from the upper qualified personnel coming from urban settlements or even from localities belonging to associated peripheries.

They are not subordinated to the latter; the most common relations are horizontal, and the differentiations depend on the interaction potential with the system of large urban settlements.

Their localisation within the settlement system is marked by specific average-upper accessibilities; the ideal is represented by territorial structures at the limit of urban influence areas, where the space ensemble coordinated by the city loses its intensity. Intersection positions with the role of coordinating the flows towards the basic level of the locality network are not avoided.

Gliding rural spaces

The primordial particularity of these settlements is *dualism*. The discontinuous evolutions preceded and/or followed by involution phases within the locality network makes them very imprecise in being associated with a certain type of periphery. Mainly coming from the mass of deep rural or restructured around incipient administrative functions, vulnerable to change and indecisive between the territorial force lines, the settlements within the sliding rural spaces become the neuralgic points within the settlement system or the coherence-providing key-elements. Nevertheless, they can also bring instability to the unequal and composite fuselage of the centre-periphery model.

The flows particularizing such territorial structures are equally fluctuant, with mainly *downstream* relations: definitive population flows; agrarian product flows; and low-frequency processed product flows.

The relations with the settlements within the lower levels are modest, unclear, marking the incapacity of these localities to make a statement in the territory. Thus, the upstream flows elude this hierarchy threshold, looking for a direct relation with the centre.

Rural spaces in crisis, belonging to autarchic semi-isolated peripheries

The coagulant element of these localities is the location along territorial fraction lines. The splits generating the aforementioned structures have complex geneses: natural – the presence of mountainous or hydrographical barriers, socio-cultural, ethnic and confessional segregations, as well as political-administrative, such as the localisation in border areas or at departmental limits, all of which are frequently associated to a low quality of the road infrastructure.

As regards the structure of the flows, the permanent working population flows are predominant; this feature deteriorates the structure on age groups, crystallizing an extra factor of social, economic, and cultural lowering.

The flows from the centre are rare and ineffective (Arenas *et al.*, 1999). They rarely become sustainable, the main shortcoming

being the *interaction outage* (e.g., flows generated by the qualified personnel within the educational/sanitary system or those generated in order to collect agrarian products, etc.).

Marginalized and with stiff territorial connections, peripheral in comparison to the major system of communication ways, the localities within this class have a socio-economic profile dominated by patriarchal *relation functions* where balance is subordinated to the efficiency degree of agrarian exploitations.

Repulsive rural spaces, belonging to neglected peripheries

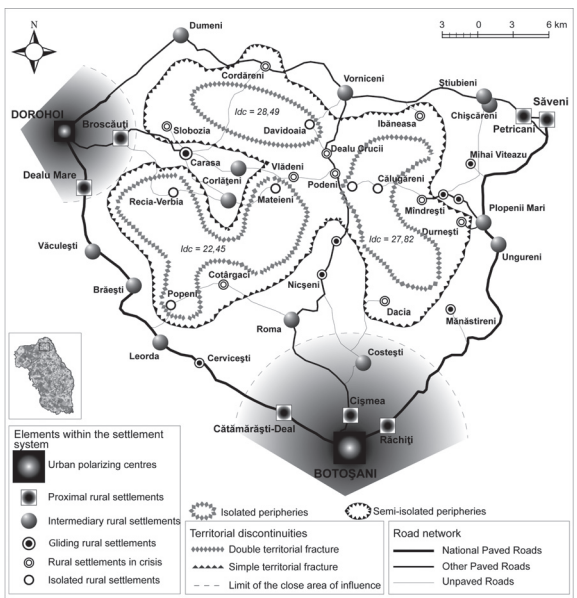
The limitation of the intra-class diversity, noticeable by summing up the statistical subjects towards the clusters with negative deviations to all the variables taken into account, indicates that these localities are deprived in relation to all categories of criteria comprised in the analysis. They are the following: the accessibility to the major system of communication ways is defective, the population does not have elementary commodities (secondary school education; sanitary dispensary and pharmacy; markets for agrarian products, etc.). The relation with the other elements within the settlement system is totally unequal (great distance, sometimes over 30 km to the closest city); the geo-demographic structures are aged or with a precarious educational fund (small villages affected by illiteracy), etc.

The flows are quasi-absent, intermittent, and mono-directed, having as purpose permanent population displacements towards the centre and, more rarely, towards other categories of peripheries. The result of these unequal relations is the isolation, accentuated until *territorial claustration* and the socio-spatial injustice expressed through demographic compression reproduced until the final phase – *depopulation*.

Marked by autarchism and by socio-professional mono-chromatics, these villages respond to a sole conditioning: *they are repulsive*.

In what follows, the model is tested on a space situated in the north of the analyzed region: the area framed by the towns of Bot-

Figure N° 7
Model of the peripheral territorial structures in Moldavia. Case study: the area Botosani – Dorohoi - Saveni



Source: author

oşani, Dorohoi and Săveni (Botoşani County). The quantization of the 5 classes was done depending on the values of the community development index, and the conclusions of the case study are focused on the isolated rural spaces (Figure N° 7).

Placed outside the modernization/ urbanization processes of the rural settings, repulsive peripheral spaces are isolated areas, marking potentially deficient accessibilities towards all categories of services and commodities analyzed. The discontinuous/ syncopate unfolding of these spaces responds to physical laws similar to magnetic and/ or gravitational fields, such that most of the perimeters of the repulsive rural spaces are marked by the territorial rules governing the emergence of interstitial/residual spaces:

- they develop beyond the gravitational field created by the city;
- the distance from the city is dictated by the size and functions of the urban centre; small towns allow looser limits, while big cities force the contraction of these limits towards the core of the territory;
- they avoid the higher-rank communication ways (European road, national road);
- they can *invade* intermediary spaces if the latter are young, not-evolved or intermittent;
- they are differentiated from one another in terms of community development by size; the lowest community development indices appear within the largest repulsive rural spaces.

Final considerations

The spatial analysis based upon the trans-scalar approach, using the principles of the multicriteria classification of highly complex territorial series, has the shortcoming of a lack of visibility, seemingly concerning the final indices, thus affecting the reading quality and the relations among the indicators.

This is why we need to come up with essential, conclusive ideas, for a synthetic coagulation of the laws governing the territorial variation of the community development index (Figure N° 8):

1. The community development of the localities is dependent on the accessibility to the low and average level services, the upper level services introducing intra-class differentiations, at the upper level of the hierarchy.

Thus, the presence of primary, secondary and high-school educational services, of proximity sanitary services such as medical-social units and town hospitals, of proximity banking services provided by banking agencies, of small industrial and commercial units, as well as the elementary commercial structures necessary to ensure a minimum profit of *minifundio* agrarian exploitations, is more than enough to eliminate the shortcomings created by the reduced accessibility to higher education services, to ultra-specialized sanitary services or to *brokering* financial-banking services, to MLM services or to industries capitalizing an important *know-how* (*high-tech industry)*.

2. The community development of rural settlements grows depending on the proximity to the city.

The size, rank, and functions of this city prevail on the *polarization range:* a high and equidistant polarization range will impose a slow gradient of diminishing the value of community development. On the contrary, a low and unequal polarization range will impose a rapid gradient of deterioration in the community development index, on preferential directions.

3. The community development reacts to the mass effect.

Two rural localities belonging to the same *urban field* or to the same commune, situated at the same distance-time to the polarizing city/commune centre and meeting the same general accessibility conditions, will be differentiated depending on their mass.

The larger locality (demographically speaking) will have a higher gravitational force, being capable of extracting certain functional energies from the commune centre. Moreover, in the introvert relation to itself, this locality can provide, at least in theory, several types of socio-professional commodities; the concurrence itself and the social production are higher than in the case of small localities.

4. The community development is a distance-time relation describing the interaction probability between rural settlements and the major system of roads of an area/country

The presence of non-modernized road infrastructures may have a capital role in worsening the community poverty of a rural settlement. The most visible effect is that of day trips for work or trips to commercialize the surplus of agrarian exploitation.

The dominant axes of the territorial tissue always impose a faster development rhythm, thus favouring the population stability through the *space contraction* process, due to an increase in the movement speed towards the polarizing centres and to the spatial/temporal, economic/political, social/cultural accessibility of rural localities.

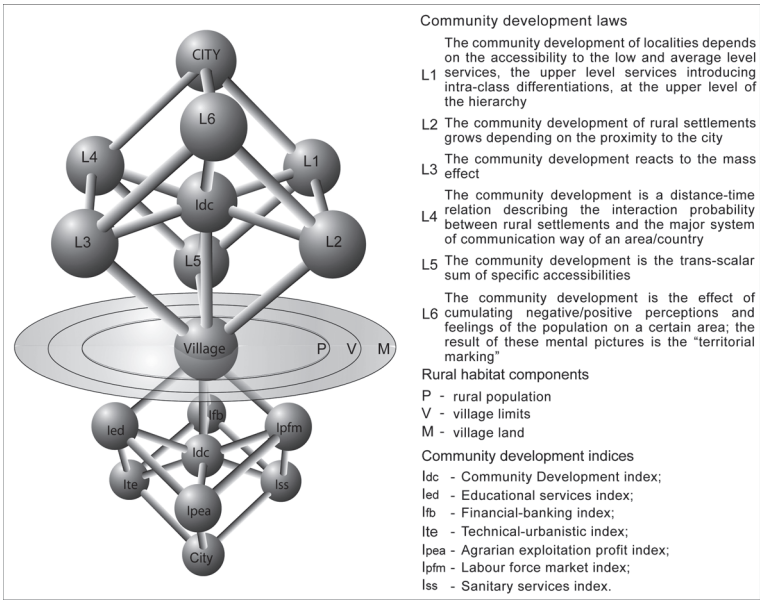
5. The community development is the trans-scalar sum of specific accessibilities

The isolation within an administrative structure respects the *transitivity* law. The isolation within the commune is annulled by a high departmental accessibility to the services provided by the departmental centre, by other big cities within the department or the department in the vicinity. Similarly, the isolation within the department is reduced by a high regional accessibility, imposed by the proximity to national or European road infrastructures, to regional urban centres, etc. Or, in the same manner, regional isolation is ignored if there is high macro-regional or national accessibility.

6. The community development is the effect of cumulating negative/positive perceptions and feelings of the population on a certain area; the result of these mental pictures is the "territorial marking".

The development may be the result of inculcated conclusions regarding certain territories, seen as repulsive and transmitting repulsiveness. It is very hard to assess the extent to which this may influence the decision of certain investors to use their capital there or the degree to which these esoteric reasons may provoke a discomfort to the communities living in/consuming within this space.

Figure N° 8
Model of community development interdependencies



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Whatever the scale of analysis or the relationships established with the territory, the village remains a fragile element of the human settlements system.

Although the processes of globalization and glocalization contaminated peripheral societies through the expansion of urban-type behaviour, rural communities subscribe to dependency relations towards the dichotomous coordinator - the city.

The connections and determinations, which operate between rural and urban settlements, have a strong effect on the dynamic of the socio-spatial systems whose function depends on the quantity and quality of energy unloaded through spatial interaction and whose final product is *community development*.

References

ANSELIN, L. Local indicators of spatial association – LISA. *Geographical Analysis*, 1995, N° 27, p. 93–115.

ARENAS, F.; QUENSE, J. y SALAZAR, A. El aislamiento como desafío para el ordenamiento territorial. El caso de las comunas de Chile. *Revista de Geografía Norte Grande*, 1999, N° 26, p. 105-111.

ATKINSON, A.B.; CANTILLON, B.; MARLIER, E. & NOLAN, B. *Social Indicators - The EU and Social Inclusion*. Oxford: Oxford University Press, 2002.

CASPIS (Comisia Anti-Sărăcie şi Promovarea Incluziunii Sociale). *Dinamica sărăciei şi a săraciei severe* în *perioada 1995-2005*. Disponible en internet: http://www.caspis.ro/

CHAVES, A.; SANCHEZ, S.; SCHOR, S. & TESLIUC, E. *Financial markets, Credit Constraints and Investment in Rural Romania*. Washington: World Bank Technical Papers, 2001.

CHIRAN, A. *Piaţa produselor agricole* şi *agroalimentare - abordare teoretică* şi *practică*. Bucureşti: Ed. Ceres, 2004.

COLEMAN, J. Social capital in the creation the human capital. *American Journal of Sociology*, 1988, N° 94, p. 95-121.

DALY, M. *Women and poverty*. Dublin: Attic Press/Combat Poverty Agency, 1989.

DELALANDE, L. & PAQUETTE, C. El impacto de las microfinanzas en la reduccion de la vulnerabilidad. *Trace*, 2007, N° 52, p. 63-77.

DUPUY, G. *L`urbanisme des reseaux, theories et methodes*. Paris: Ed. Armand Collin, 1991.

EDITIONS BREAL. *Dictionnaire de sciences économiques & sociales*. Rosny: Editions Breal, 2002.

ESPING-ANDERSEN G. *The Three Worlds of Welafare Capitalism*. Ney Jersey: Princeton University Press, 1990.

FLORES, M. y RELLO, F. *Capital social: virtudes y limitaciones*. Santiago de Chile: CEPAL, 2003.

GADREY, J. *De la croissance au developpment: quels indicatuers alternatifs?* Lille: Universite Lillle, 2002.

GADREY, J. & JANY-CATRICE, F. *Les indicateurs de richesse et de développement. Un bilan international en vue d'une initiative française*. Lille: Rapport de recherche pour la DARES, 2003.

GOSCHIN, Z. & PARLOG, C. *Ierarhizarea multicriterială a regiunilor din România folosind metoda distanţelor relative*. Bucureşti: Ed. Economică, 2004.

HENRÍQUEZ, C. y AZÓCAR, G. Patrones de crecimiento en ciudades intermedias chilenas y su impacto en la sustentabilidad urbana. En: BELTRÃO, M.E. *Cidades* Médias: *Espaços em transição*. Sao Paulo: Editora Expressão Popular, 2007, p. 283-312.

HERBERT, S. *Models of Bounded Rationality*. Cambridge, MIT Press, 1997.

JAZAIRY, I.; ALAMGIR, M. & PANUCCIO, T. *The state of world rural poverty.* London: IFAD, 1995.

KATZMAN, R. y FILGUEIRA, C. *Vulnerabilidad, Activos y Exclusión Social en Argentina*

y Uruguay. Santiago de Chile: OIT-Fundacion Ford, 1999.

LOK-DESALLIEN, R. *Poverty profiles: interpreting the data*. New York: UN Social Development and Poverty Elimination Division, 2004.

MACK, J. & LANSLEY, S. Poor Britain. London: George Allen & Unwin Australia Pty Ltd, 1985.

MICHEL, A. *Dictionnaire de la Sociologie*. Paris: Encyclopedia universalis, 1998.

MINUJIN, A.; DELAMONICA, E.; DAVIDZIUK, A. & GONZÁLEZ, E.D. The definition of child poverty: a discussion of concepts and measurements. *Environment & Urbanization*, 2006, Vol. 18, Nº 2, p. 481- 500.

NELEA MIHAI, N., *Caracterizarea calităţii vieţii* în *România prin prisma statisticii multidimensionale*. Bucureşti: Ed. ASE, 2004.

NOLAN, B. & WHELAN, C.T. Multidimensionality of Poverty and Social Exclusion. In: JENKINS, S.J. & MICKLEWRIGHT, J. (editors). *Inequality and Poverty Re-examined*. Oxford: Oxford University Press, 2007, p. 146–65.

PAUGAM, S. *La disqualification sociale. Essai sur la nouvelle pauvreté*. Paris: Presses Universitaires de France, 1997.

PELLEN, M. *Penser les espaces intermediaires*. Lyon: Calenda, 2009.

PUMAIN, D. & SAINT-JULIEN, T. *Les interactions spatiales*. Paris: Ed. Armand Collin, 2001.

PUTMAN, R.D. The Prosperous Community: Social Capital and Public life. The American Prospect, 1993, Nº 13, p. 35-42.

RAWLS, J. A theory of justice. Cambridge: Harvard University Press, 1971.

REYNAUD, A. *Société, espace et justice. Inégalités régionales et justice socio-spatiale*. Paris: PUF, 1981.

SEN, A. Poor, relatively speaking. *Oxford Economic Papers*, 1983, Vol. 35, Nº 1, p. 153-169.

SEN, A. *Commodities and Capabilities*. London: Cambridge University Press, 1999.

SIMON, H. Models of Bounded Rationality. Cambridge: Mit Press, 1997.

SMEEDING, T.; O'HIGGINS, M. & RAINWATER, L. (editors). *Poverty, inequality and income distribution in comparative perspective*. Hemel Hempstead: Harvester Wheatsheaf, 1990.

SPICKER, P., ÁLVAREZ LEGUIZAMON, S. y GORDON, D. *Pobreza: Un glosario internacional*. Buenos Aires: Consejo Latinoamericano de Ciencias Sociales, 2010.

TOWNSEND, P., GORDON, D. What is enough? New evidence on poverty allowing the definition of a minimum benefit. In: ADLER, M.; BELL, C.; CLASEN, J. & SINFIELD, A. (editors). *The sociology of social security*. Edinburgh: Edinburgh University Press, 1991.

VOINEAGU, V. & FURTUNA, F. *Analiza factorială a fenomenelor social-economice* în *profil regional*. Bucureşti: Ed. Aramis, 2002.