SPATIO-TEMPORAL DYNAMICS OF HOUSING PRICES IN IASI, IN THE PERIOD 1990-2010

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Abstract. This study addresses the complex issues of urban changes and provides an experimental methodology applicable to the market value of residential properties in Iasi during the period 1990-2010. This study identifies the differentiation factors and tries to determine their influence on the market value of residential properties in the data about apartments and their adjustment at the conditions of the city. Estate value reflects not only the intrinsic characteristics of housings, but also the places' assets, assessed and collected at different scales (position within the city, neighbourhood characteristics and value of street). Trend in the evolution price represent a determining factor of social sorting, that take place in the urban core of the city. In the context of a steady increase in the houses prices since 1990, have made profiles of increasing estate market trends and modelling of the influence of differentiation on sizing housing prices in the neighbourhoods of the city of Iasi, resulting in gaps with different values. The general trends show a homogenization, a decreasing centre-periphery gradient, although some neighbourhoods offer contrasting images of their development.

Keywords: Iasi, spatial analysis, real estate market, discontinuities.

1. Introduction

Studies of residential dynamics are carried out, in particular, from an economic perspective, most of the researchers identifying elements to approximate housings price dynamics, at different scale levels.

Theoretical problem, that has received most attention from the researchers is the efficient market hypothesis (EMH), which examines if housing markets are informational efficient. Existing studies should be accepted with caution because the housing market is very dynamic, difficult to measure and evaluate, as a result of structural attributes and functional heterogeneity that is influenced (Man, C., 1996).

According to some researchers, the most important feature in the territorial distribution of housing values is the quality of the surroundings (Linneman, 1990), Can (1990) shows that houses price influence the territorial dynamics of the neighbourhoods and Chengri (2003) sustain that housing prices represent an indicator which insufficient for determining the quality of a residential area. Quantitative and qualitative changes of the endowments, positively or negatively affect the neighbourhoods and residential land prices, measuring these characteristics is a very big challenge, which makes it difficult to analyse urban residential areas (Koomen and Buurman, 2002). Spatial dynamics of land prices, has gained significant attention after 1990 in the estates research (Mulligan, 2002), (Kestens, 2006) but relied increasingly on building hedonic price indices.

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The purpose of this article is to provide a methodological experiment, which aims to determine the role of intrinsic characteristics of study areas and indicators collected and evaluated at different scale levels (block, street, area, neighbourhood), in sizing of housing price and in creating specific spatial fluctuations. Novelty brought by this article is related to the hedonic approach (explains formation by quantifying house prices using multiple regression, building its own facilities (surface, floor) or those related to habitat), (Guerois and Le Groix, 2009) from geographical perspective of residential area, by framing price per m^2 housing in complex spatial contexts, which explains the different parameters influence in the distinct dynamics of this economic indicator, for each territorial unit under review.

Thereby should be considered five preliminary indicators of influence, in the form of qualitative schematic assessments: centrality, schools, transport network, green areas and pollution sources. For a much finer analysis, we aim to amplify the complexity degree of the methodological approach and inventory sheets differentiation factors.

2. Materials and methods

The methodological design includes the steps of a complex research, centred on an exhaustive analysis of bibliographical materials and statistical data.

By analysing bibliographical materials, the theoretical and practical thoroughgoing directions were established. Through database we have been developed models and mapping of indicators taken into account, both in terms of the current situation and their dynamics over time. Data obtained through bibliographical research and database creation were interpreted and filtered through geographical computerized systems, resulting in a diachronic image, synchronic, spatial and qualitative of the analysed elements.

3. Study area and the scalar analysis

The study area for this research is represented by the administrative territory of the Municipality, which we divided into neighbourhoods, areas and type of collective housing blocks.

The delimitation of neighbourhoods was based on the functional and structural principles and of interaction on neighbourhood relations, road infrastructure, socio-economic infrastructure and form.

Dividing neighbourhoods into zones was achieved after statistical processing of real estate ads, by framing their physical and geographical administrative territory of each neighbourhood. So areas are micro-territorial assemblies, related to a reference unit (street, commercial space, cultural space and recreational facilities), domesticated in the collective mind map as a reference point.

The number of neighbourhoods that we have identified in Iasi is 30, differing in three categories according to the housing nature and extent utilities:

- Neighbourhoods with collective housing (Dacia, Alexandru, Mircea, Cantemir, Podu Ros, Bularga) with proletarian specific who differ by building blocks period, the degree of utilities and comfort and in which is observed strongly the socialist heritage in the urban landscape;

- Neighbourhoods with individual housing (Ticau, Sararie, Aviatiei, Moara de Vant, Bucium) wich is remarked by a high degree of technical municipal facilities for housing built before 1990 and a deficiency from this point of view in neighbourhoods developed after 1990, which were constituted as reactions against the ordering rules of socialist city;

Mixed neighbourhoods (Nicolina, Tatarasi, Cantemir), in which the degree of utilities is dependent on housing construction year (Stoleriu O., 2008).
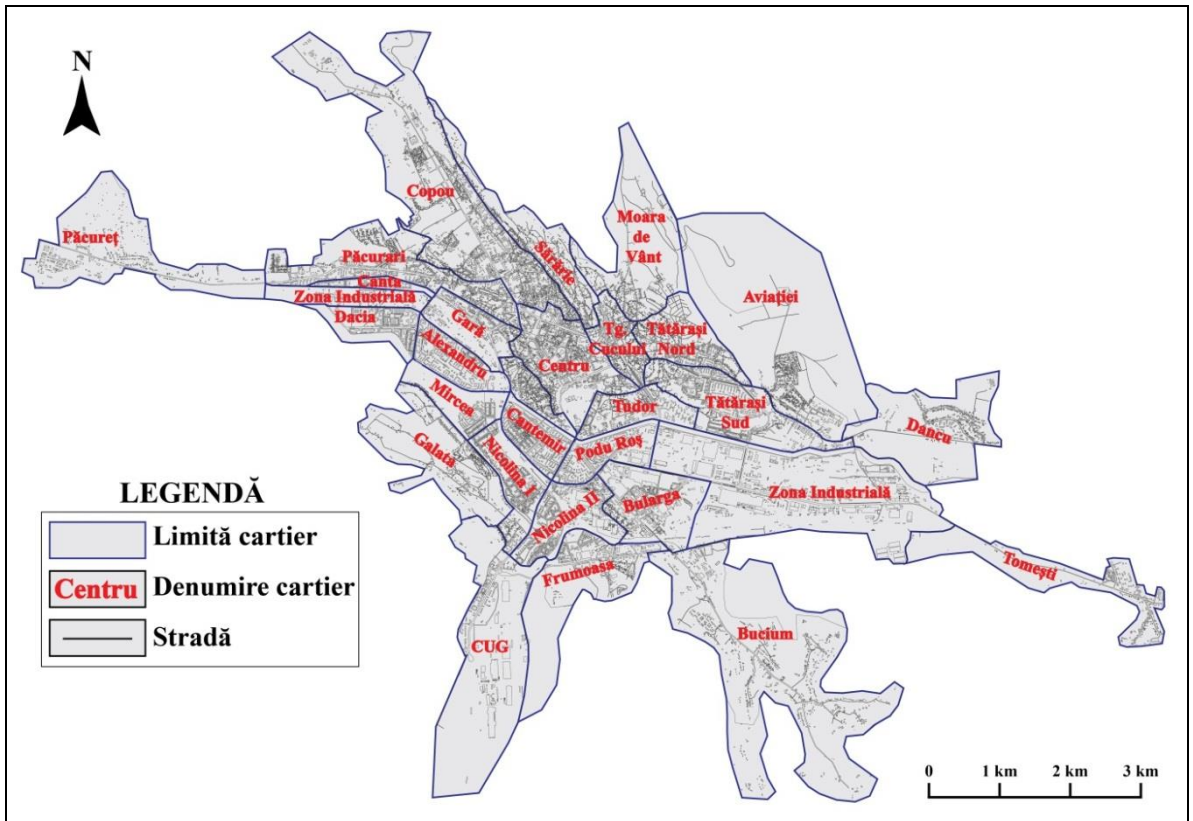

Figure 1: The neighbourhoods division of the Municipality territory

4. Database

Creating database is an extremely important milestone in its efforts to achieve the research essay (study), representing essential prerequisite for a rigorous scientific substantiation. The documents on the housing market are extremely low, at microterritorial level, the only viable sources are represented by those in the Trade Registry data, but they are extremely difficult to access. These data have been used by researchers (Leishman, 2000), (Lim and Pavlou, 2007), to obtain an index of housing prices.

Regarding to the present study, the database was done by information from real estate transactions in Iasi, in the period 1990-2010, extracts from local newspapers: Monitorul de Iasi and Evenimentul de Iasi. Trading data included the following indicators: location, publication year, price and total surface (square meters).

Table 1: Inventory sheet of housing prices

Year 2000				
Neighbourhood	Address	Price	Surface	No. of rooms
CENTRU	INDEPENDENȚEI	7.000 $	35 mp	1
CENTRU	PIAȚA UNIRII	10.000 $	52 mp	2
CENTRU	CENTRU CIVIC	17.500 $	72 mp	3
CENTRU	ȘTEFAN CEL MARE	28.000 $	100 MP	4

Selling price and total surface were indicators used to calculate the selling price per square meter, which led to the graphics and mapping. Statistical data are synthetized in Table no.2, highlighting the existence of regional differences at the neighbourhood's level in the city.

Table 2: The average price per m² in Iasi neighbourhoods

Neighbourhood	Period/price per m² ($)				
	1990-1994	1995-1998	1999-2002	2003-2006	2007-2010
Centru	259,4932	347,036	298,5541	937,8287	1859,17
Gara	206,0152	209,9102	212,1078	679,4385	1597,23
Tudor Vladimirescu	135,1414	151,3791	150,4239	454,5298	1170,431
Tatarasi Nord	118,5225	186,228	149,1662	535,7422	1165,889
Copou	235,582	272,8897	284,451	842,1454	1588,874
Alexandru	123,8934	112,1921	142,1644	528,3853	1265,842
Bularga	63,71684	98,67623	109,199	516,3897	1015,418
Podu Ros	190,8417	202,4471	188,1031	561,3666	1292,299
Dacia	72,05486	131,0652	136,2331	526,7109	1255,681
Tatarasi Sud	158,7934	184,5737	182,1203	571,5144	1330,594
Tg. Cucului	251,1119	293,1235	241,1348	631,2105	1345,341
Pacurari	186,846	232,4121	211,2306	665,6185	1442,951
Frumoasa	158,6977	166,6531	191,097	567,4107	1327,852
Nicolina I	141,6453	195,6758	202,0763	625,1619	1271,308
Nicolina II	115,2718	161,9472	167,7924	591,1564	1210,744
Mircea	109,8476	115,61	125,3288	478,8521	1218,12
CUG	94,37842	134,6678	130,2046	535,7743	1302,897
Cantemir	136,5291	165,7212	172,8765	524,8781	1184,326
Canta	120,0865	158,7578	136,6629	539,9279	1163,141
Dancu	60,18519	74,31613	118,7572	457,3564	1033,054

5. Results and discussions

5.1. General trend of housing prices

Between 1990 and 2010, the medium price/m² in collective housings increased by about 10 times, due to a combination of several micro and macro-territorial factors that influence the economic perspective of evolution and the geographical (territorial distribution).
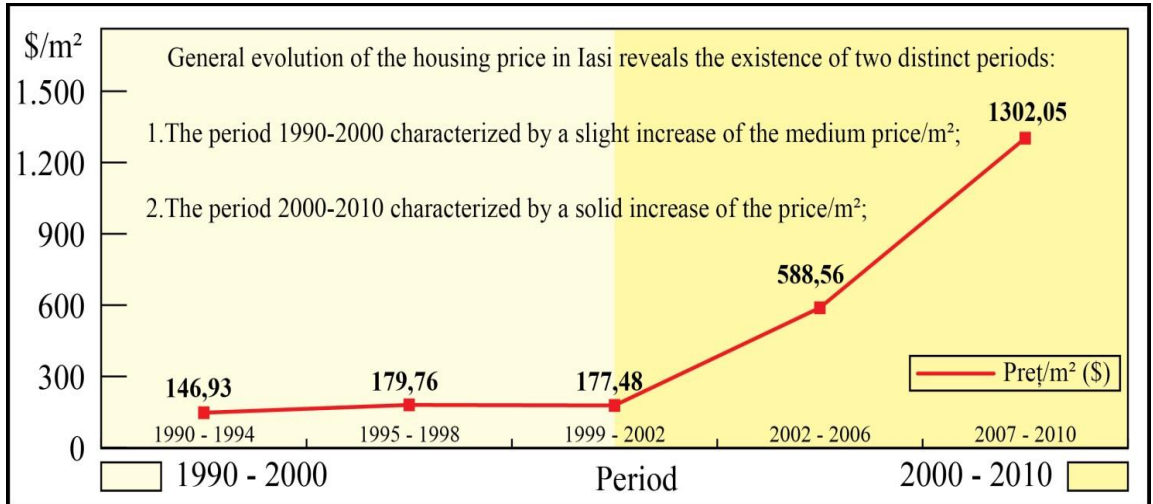

Figure 2: Evolution of average price per m² at the local level, during 1990-2010

After 1990, severely limiting of the social policy and public aid in housing acquisition, while returning to private ownership, leaves free space to the liberal market economy mechanisms that begin to structure housing market from Iasi. Increasing the difference in income occurs concomitantly with ground rent differentiation, depending on the quality, age, centrality and the level of housing equipment and according to the new spatial location of population trends.

The main mechanism that stayed behind the ground rent differentiation is the increasing imbalance between housing supply and demand, in detriment of the latter. Due to the lack of new apartments the old prices soared, however without being accompanied by an improvement in living conditions.

Moreover, the progressive facilitation of mortgage generated a further increase in demand for housing, the main targets being apartments from old buildings, the most affordable as a price and credit possibility (Stoleriu O., 2008).

In order to analyse the evolution of housing prices in city neighbourhoods, we calculated a coefficient brought forward, which I reported rate of price changing to the value associated with the first year of the time series.

Formula for the coefficient of brought forward is:

$$\Delta_{i/j}^{y\%} = \frac{yi - yj}{yj} * 100$$

yi = $/m² in the final period analysed
yj = $/m² in the initial period analysed

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Put forward, coefficient values for the period 1990 - 2010 reveal an evolution of the price differential, highlighting some neighbourhoods with very high values and others with constant evolution. Dacia neighbourhood registered the highest growth in housing price per square meter, with a value of 1.600% while the opposite pole Targul Cucului neighbourhood with an increase of approximately 400%.

These differential increases are due to housing demand continued by the sharp fall of the construction sector, amplified by the relative democratization of real estate credit. Therefore, established liberalism in Romanian society has led to extremely high rates of growth of the housing price in stigmatized neighbourhoods in the early 90's. Mutations that took place in these neighbourhoods have overshadowed the specific social imaginary, in favour of changing realities to a regenerative urban development well-individualized.
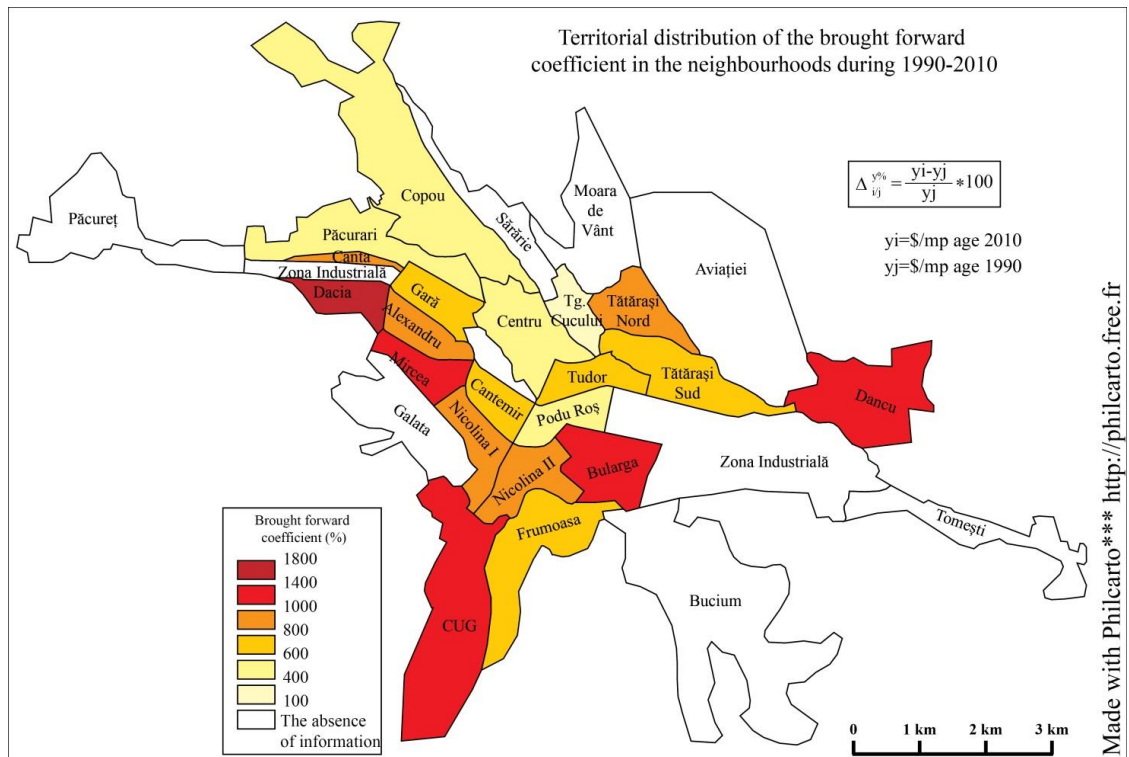

Figure 3: Territorial distribution of the brought forward coefficient in the neighbourhoods

The explanation for this differentiation development of the neighbourhoods considered peripheral can be attributed to the phenomenon of gentrification (process which involves filling by the wealthy people of typical working-class neighbourhoods, transformation and rehabilitation, both in terms habitats, public and commercial) (Clerval, A., 2010), which in case of Iasi municipality has been favoured by strong industrial decline after 1990 and by aesthetics (at an early stage) of the socialistic urban landscape. Neighbourhoods such as Dacia, CUG, Bularga have exceeded their status of repulsive spaces, with industrial-looking by enhancing the old factory buildings and converting them into specific trade areas.

5.2. Territorial differentiation model applied to housing price

Analysis of price evolution per m² at the collective housing must be guided by an efficient algorithm, based on which it can observe fluctuations which are achieved at macro-territorial level and to identify the trend behaviour modifications of the micro-territorial units, under the influence of local factors of differentiation. To observe these trajectories of evolution comparative analysis of the urban area of municipality was used, where there is collective housing such as apartments.

Mapping the territorial distribution of housing prices, reveals the existence of territorial discontinuities that we have categorized based on the difference of value applied to the neighbourhood principle. Formula for discontinuity values

$$RD = \frac{Xi - Xn-i}{\bar{X}i} * 100$$ where:

RD = discontinuity rank
Xi = average price of housing in local units "i"

Interpretation of results, applied to the mapping is as follows:

Discontinuity of rank 1 – appears in homogenous territorial units in which the price per m² at housing is at least 40 % higher than in neighbouring territorial units. This price distribution is specific to the period 1990-2002, when the status of central area caused a very pronounced imbalance in relation to other areas. If during the period 1990 - 1994 the Centre area included Copou then a restriction of this unit during the period 1995-1998 has followed, as until 2002 to return to the original configuration.

Discontinuity of rank 2-specifically to the price differences between 30-40% of two homogenous territorial units. This discontinuity occurs first during 1995-1998 due to the slight decrease of the housing price in outlying areas and more pronounced price decrease in the centre. Thereby, discontinuity of rank 2, replace in period 2003-2010 the discontinuity of rank 1, being influenced by the differentially increase of the price per m² at the level of the neighbourhoods considered peripheral.

Discontinuity of rank 3 – occurs when the difference is less than 30% between the housing prices in two neighbouring territorial units. First period that such a discontinuity occurs is 2003-2006, when the increasing rate of housing in Copou is higher than the Centre. During 2007-2010, we can observe a tendency to standardize housing prices, neighbourhoods such as Gara and Pacurari, recording a sharp increase, which distinguishes themselves from the other areas.

Therefore, by analysing different types of discontinuity at the municipality level, it was concluded that the notion of centrality (as a main differentiating factor of the housing price during the early 90"s) has lost his identity as a result of functional diversification of other urban spaces. Thereby, the centrality remained rooted in the public mind as a geometrical-Euclidean space with specific functions, but it is currently defined in terms of the simultaneous interaction of the socio-economic processes, political and cultural and the development of infrastructures.

Following these reasons we can affirm that the general trend of the housing prices evolution is the homogenization and a centre-periphery gradient reduction.Peripheral neighbourhoods become more attractive, the more it removes from the architectural spectrum specific to the socialistic period and are "affected" by the positive process (slow) of urban regeneration.
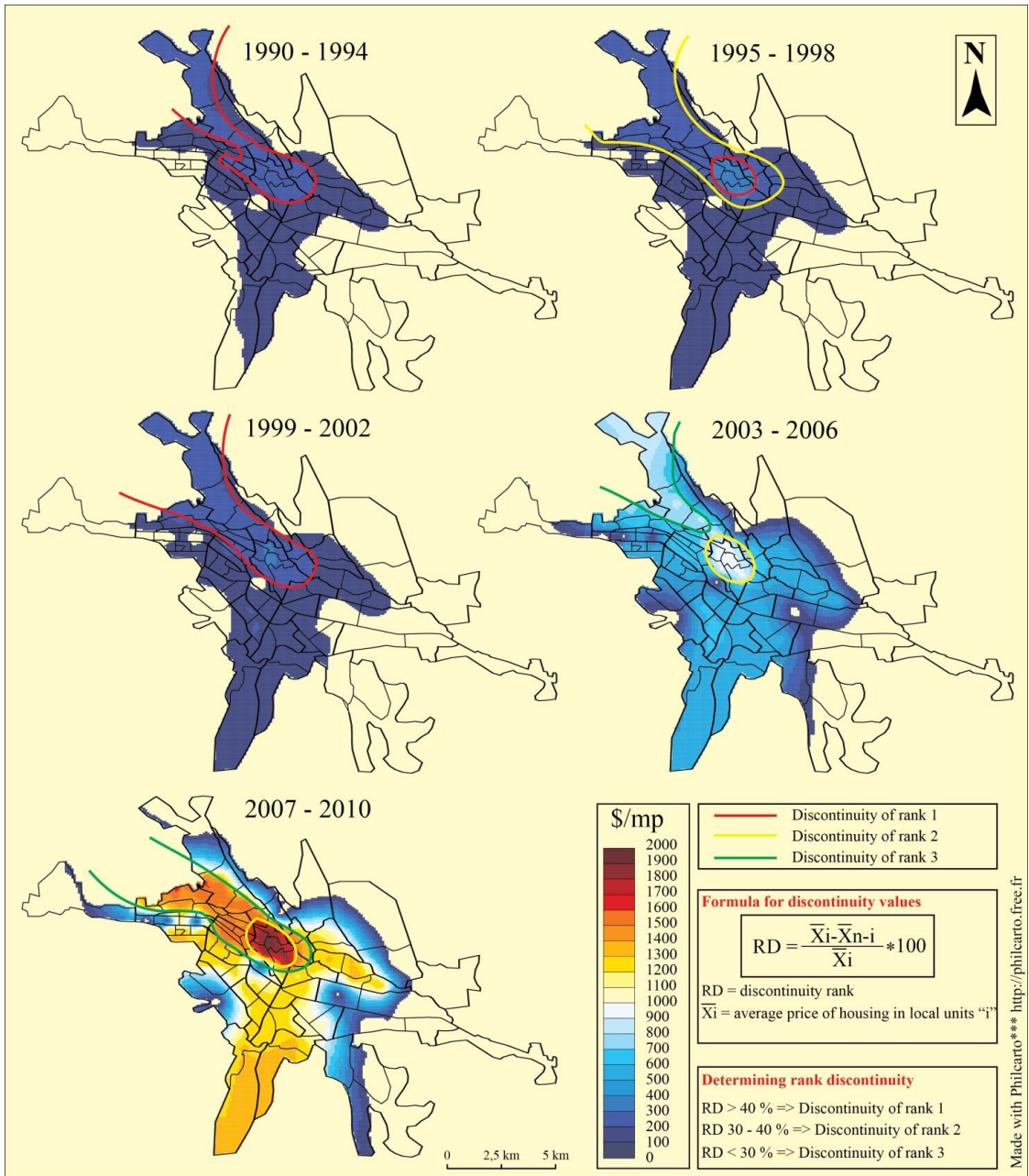
Figure no.4: Spatio-temporal evolution of the housing price in Iasi

5.3. Modelling the influence of differentiation factors against the sizing of housing price

To apply the model to approximate the influence of differentiation factors in sizing the housing prices of Iasi neighbourhoods we used two times series analysis: 1990-1994 and 2006-2010 and five influencing factors: centrality, schools, public transport , green spaces, pollution.

The model consists in applying Spearman rank correlation coefficient, to identify the correlation between each factor and the price per square meter in the two periods.

The first stage was represented by the ascending of each territorial unit in part depending by the housing value per square meter. Thereby Centru neighbourhood received evaluation note 1, and Dancu neighbourhood received evaluation note 20 in period 1990-1994. For the period 2006-2010, Centru neighbourhood received evaluation note 1 and Bularga receiver evaluation note 20.

For the indicators "centrality" and "public transportation" Centru received rank 1, and Dancu rank 20. At indicator "schools", Copou receiver rank 1 and Dancu reveived rank 20. For the indicator "green spaces", Copou received rank 1, and Gara received rank 20.

Table 5: The results of correlation and influence differentiation formula

Périod	Centrality (%)	Education (%)	Public transportation (%)	Green spaces (%)	Pollution (%)
1990-1994	32,85758	13,99939	16,09475	25,99453	11,05375
2006-2010	38,85089	8,891929	19,97264	25,80939	6,475148

By applying this model has been established that the weight which had an indicator in housing price sizing per m² in period 1990-1994 and the influence of the same indicator in the period 2006-2010. The most important changes were the indicator "pollution" and the indicator "schools" whose weight decreased during 2006-2010 up against 1990-1994.

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