Werk

Titel: Managing and marketing of urban development and urban life
Untertitel: proceedings of the IGU-Commission on "Urban Development and Urban Life", Berlin, August 15 to 20, 1994
Jahr: 1994
Kollektion: fid.geo
Signatur: XX
Digitalisiert: Niedersächsische Staats- und Universitätsbibliothek Göttingen
Werk Id: PPN1030505985
PURL: http://resolver.sub.uni-goettingen.de/purl?PPN1030505985
OPAC: http://opac.sub.uni-goettingen.de/DB=1/PPN?PPN=1030505985

LOG Id: LOG_0033
LOG Titel: An urban evolution model applied to Romania's towns
LOG Typ: article

Übergeordnetes Werk

Werk Id: PPN1030494754
PURL: http://resolver.sub.uni-goettingen.de/purl?PPN1030494754
OPAC: http://opac.sub.uni-goettingen.de/DB=1/PPN?PPN=1030494754

Contact

Niedersächsische Staats- und Universitätsbibliothek Göttingen
Georg-August-Universität Göttingen
Platz der Göttinger Sieben 1
37073 Göttingen
Germany
Email: gdz@sub.uni-goettingen.de

Abhandlungen - Anthropogeographie
Institut für Geographische Wissenschaften, FU Berlin
Band 52, Berlin 1994

AN URBAN EVOLUTION MODEL APPLIED TO ROMANIA'S TOWNS

Ioan Ianos
Institute of Geography, Bucharest, Romania

Any town evolves in close correlation with its development potential and its ability to put it to good account. If the equivalence relation between these two basic components is frequently disturbed through external intervention (which happens in supercentralized regimes) then the evolution of towns is marked by a succession of bifurcation points.

Assuming population to be a synthetic indicator and town fluctuation in the national or regional hierarchy to represent an edifying sign of competition with other urban centres, we could build a simple evolution model, similar to the LOTKA-VOLTERRA one, particularly suitable to being reproduced graphically.

In the first half of the 20th century, towns in Romania recorded normal developments. Things changed in the last forty years when the building of huge enterprises - a specific option of the industrialization drive - has disturbed normal evolution. Together with the house-building campaign that accompanied this process, industrialization has led to a significant population increase. The close correlation between the moments when huge enterprises were put into operation and the spectacular demographic leap (registered over a fairly long time-interval) has resulted either in the disruption or in accelerated multiplication of the urban population.

This model, applied to Romania's towns, has revealed the following types of evolution: explosive, cascade-like, tending toward a dynamic equilibrium, contradictory and regressive.

Key Words: Urban Evolution Model, Romania, Town

Introduction

Any town's evolution is a long-lasting process of self-organization against a specific environmental background. Assimilating the town to a living organism we shall distinguish a moment of birth, a phase of maturity and, finally, of decay and disappearance. Viewing it in this light, we could say that the town is the product of its own environment, developing within its framework and eventually becoming organically integrated into it.

The town could also be assimilated with an open, optimal thermodynamic and informational system, fact that accounts for its specific and permanent relationship with its environment and its ability to survive through self-organization.

The contemporary geographical literature provides a wealth of town evolution models, some of them simple, others very intricated and difficult to implement, and of controversial efficiency. The model presented herein is a very simple one, and it is based on the idea that the situation of a town can be assessed by the number of its inhabitants. This is a synthetic indicator which reflects on the one hand, the relationships between the respective town and its immediate environment and on the other hand, the permanent competition with other towns. The foundation on which

this model is built represents a correlation between the number of inhabitants and the position held by the respective town in the urban hierarchy during its lifetime.

Description of the model

An essential aspect of urban dynamics is the ratio between its development potential (Pd) and its ability to use it (Up).

The development potential is conceived as a generic function and is given by the soil and subsoil resources, geographical position, available workforce, traditions, etc.

$Pd = f(i_1, i_2, \ldots\ldots i_n)$,

where $i_1, i_2, \ldots.i_n$ represent various development potential components.

At the same time, using its potential depends on the town's ability to put to account its natural, human and material resources, its infrastructure, etc. Thus,

$Up = f(j_1, j_2, \ldots\ldots j_m)$,

where $j_1, j_2, \ldots.j_m$ represent components of the town's capacity to put its potential to good account.

In the history of each town, the population appears to be both a resource of labour and an instrument of using extent availability. Development depends largely on the relationship established between these two components. In principle, three major types of relation develop between them: subunitary (Pd < Up), equivalent (Pd = Up) and supraunitary (Pd > Up).

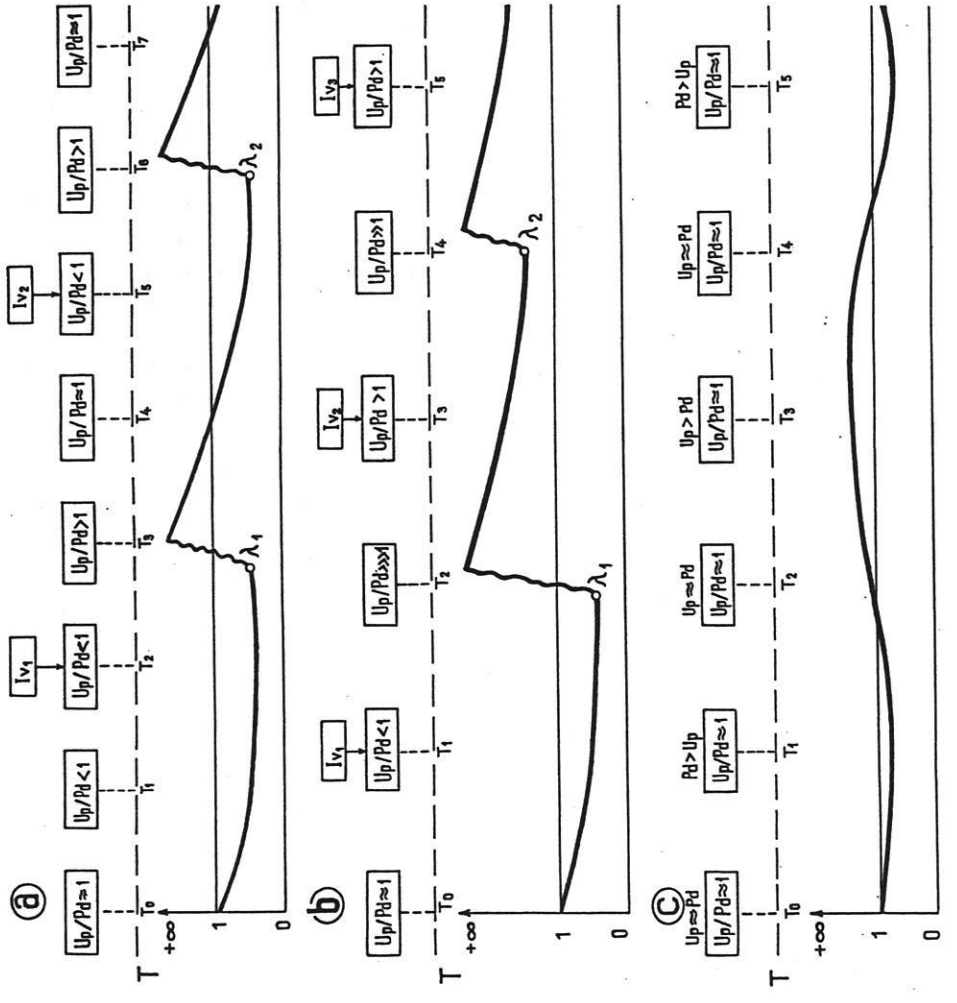
The town is not an isolated whole, it is part and parcel of the society that has built it. This means that, whether willfully or not, it stands selective restrictions imposed upon it by society. These restrictions are the result of demographic and economic policies, of policies of regional development, territorial planning and the like. They can be favourable or on the contrary, detrimental to some towns, intervening in the normal relations between their two components.

In theory, if a town were isolated in space, the ratio between the two major components would be readjusted in time, tending to unity (value 1). In reality, however, the Up/Pd ratio is oscillating close to unity, causing fluctuations around a normal trajectory. These fluctuations are the outcome of technological progress or of gradual accumulations occurred in the town's evolution.

It is especially in overcentralized economies that violent interventions imbalance this ratio, fact that causes frequently dysfunction and points of bifurcation in the evolution of a town. It should also be remembered that the general level of urbanization in a country or region augments or depresses the effects of such interventions.

The scope of these interventions, the duration and incidence of each of them tell one the general evolution of towns. Let us take moment T_0 in which the Pd/Up ratio stands close to unity (Figure 1). If the historical evolution is normal, and there is scientific and technological progress, the town's use potential is greater than its

Figure 1 Hypothetical evolution of town development potential (Pd)/use potential (Up) ratio. a) the case of violent interventions at great time-intervals; b) the case of violent interventions at small time-intervals; c) the case of normal situations, with the ratio neighbouring 1. Each case has at the bottom its own hypothetical trajectory.



capacity to put it to account at moment T_1, hence the ratio is subunitary. What follows, is a state of mild involution due to an excedent of resources and labour, the town's influence zone shrinks, its population migrates, unemployment rises and revenues decrease. An outside intervention, e.g. the building of big industrial units (customary under Ceausescu's regime in Romania) mainly in the small- and medium-sized towns, tends to reverse this ratio, with the use potential exceeding the development potential ($Up < Pd$). In this case the town experiences a shortage of resources (raw materials, workforce) and grows into an active territorial convergence centre.

This theoretical succession of relationships between the two components which suffer the impact of external shocks indicates three distinct situations:

a) when the time-space between the two interventions is sufficiently long for the town to rebalance and proceed at almost normal development rates until a new violent shock is inflected (Figure 1a);
b) when the time-space between the two interventions is fairly small and the two components have not succeeded in attaining a normal balance; or when the singular intervention is initially sudden and then grows progressively, maintaining the imbalance between the use potential and the capacity of putting the production capacity to good account (Figure 1b);
c) when town evolution is not disturbed by large-scale interventions, the Up/Pd ratio is being adjusted in time through fluctuations, which tend to bring it close to value 1 (Figure 1c).

These types of evolution are governed to a large extent by intertown relationships. Let us take two towns ***A*** (Up_1, Pd_1) and ***B*** (Up_2, Pd_2) and analyse them by analogy with DENDRINOS and MULLALLY's interurban evolution models (1985). If the type of use potential between the two is complementary and functional, then we witness a symbiotic interaction model, with $Up_1 > Pd_1$ and $Up_2 > Pd_2$ in both cases; if $Up_1 < Pd_1$ and $Up_2 < Pd_2$, then the interaction model is governed by competition. If $Up_1 = Pd_1$ and $Up_2 = Pd_2$, it means that the two towns have not established significant relationships between them. In case in one town $Up_1 > Pd_1$ and in the other $Up_2 < Pd_2$, we are faced with a situation in which town ***B*** falls pray to ***A***, meaning that part of the workforce, resources (material and financial) and influence zone of the former are snatched by the latter. Hence a predatory-type relationship. The other two situations, developing commensal and ammensal-type relations result in one town having either a positive ($Up_1 > Pd_1$; $Up_2 = Pd_2$), or a negative ($Up_1 < Pd_1$; $Up_2 = Pd_2$) impact upon the other.

The relationships between two towns can be fairly simple at a given moment, but they become extremely complex when it comes to urban systems. The more components these systems have, the more diversified the relations among them. Assessing the effects of these relationships on individual towns means resorting to a new indicator, beside the Pd/Up ratio, which is the town's hierarchical seat variation within the respective system over time. The relation between the demographic

Abhandlungen - Anthropogeographie
Institut für Geographische Wissenschaften, FU Berlin
Band 52, Berlin 1994

evolution (according to the Up/Pd ratio) and the town's rank variations could be edifying in establishing an evolution pattern.

In consequence, writing the number of inhabitants on the ordinate and the hierarchical rank occupied by town ***X*** when "measurements" had been made on the abscissa, we obtain the real trajectory followed by the respective town over or given time interval (Figure 2). Trajectories vary widely when it comes to labeling a town (a) predator; (b) pray or (c) alternating position. Other trajectories indicate that a town has come close to a state of imbalance (d), or holds a contradictory position (e).

Some particular trajectories do not indicate whether a town is the predator or the pray, despite having these attributes. These include the towns placed on the upper and the lower hierarchical seats, respectively. In this situation, the hierarchical position being stationary or almost stationary, the town's trajectory depends solely on its demographic evolution, showing an upward or downward course (f) on the upper and lower scales, respectively. The same situation is encountered in the case of significant hierarchical disruption, when some towns may nevertheless preserve their hierarchical seats (hierarchy barrier).

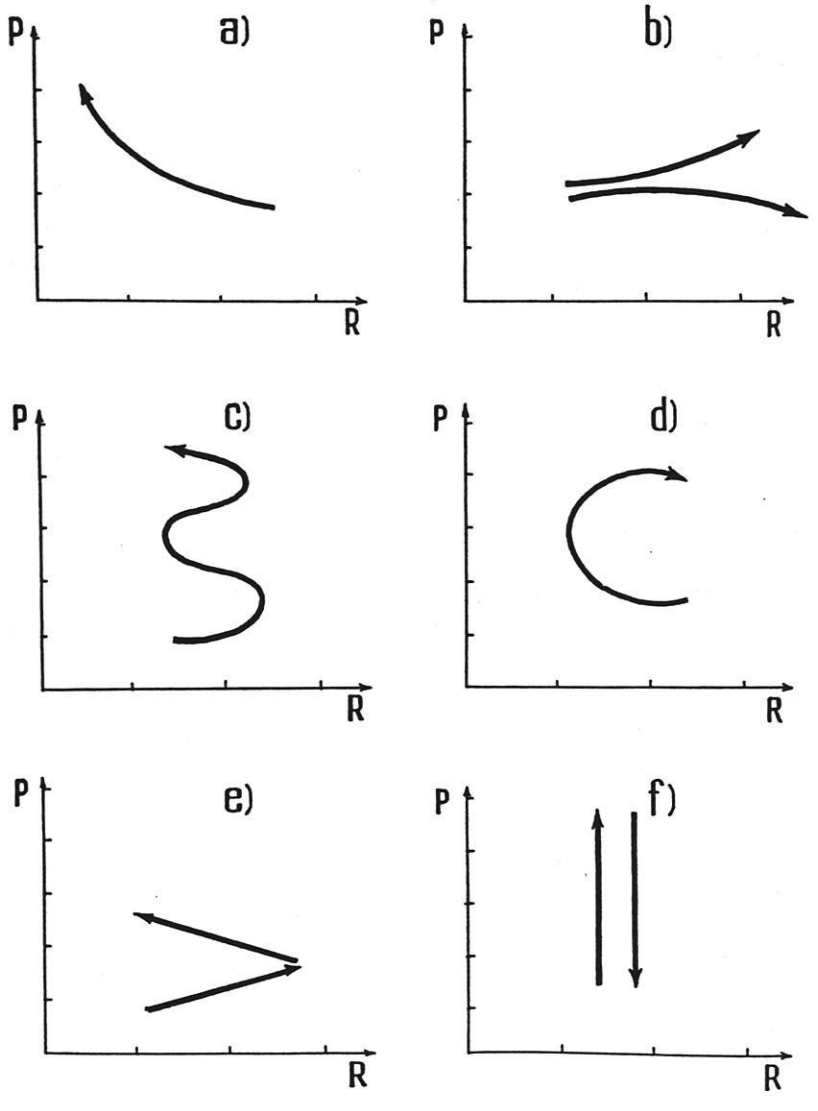
This particular aspect renders the model rather irrelevant for towns seating at the extreme ends of the hierarchy, it is fairly accurate for towns occupying the in-between segments. A perturbing factor of town evolution is the development of new towns. This phenomenon is particularly obvious in countries faced with spectacular urban population increases, where some rural settlements grow into towns.

A case study: Towns in Romania

Main features of urban evolution in Romania. Before going on to apply this model, I would like to outline some global characteristic features of urban evolution in this country. Here they are:

a) a predominantly rural network in mid-20th century (75% in 1948) would stamp its mark on town behaviour over the next period (after 1950);
b) relatively few towns compared to the number of rural settlements (one town/200 villages) and to present urban population figures (a medium-sized town records 47,600 inhabitants);
c) urban development policy espoused by the old regime were largely based on subjective factors, settlements being decreed towns on any ground but scientific;
d) industrialization policies basically pursued the building of large units (with over 1,000 employees), to fit into the harmonious development, pattern of all of the country's, regions no matter their economic efficiency;
e) collectivization of agriculture created a surplus of manpower and a huge gap between the peasants' revenues and the workers' wages in town. Together with the socialist industrialization of cities, the collectivization of agriculture was a cause of intense village-to-town migration;

Figure 2 Hypothetical types of trajectories. a) progressive evolution - predatory-type town; b) regressive evolution - prey-type town; c) leaps; d) tendency toward a point of equilibrium (limiting cycle); e) contradictory evolution; f) stationary.



f) detachment of Bucharest - Romania's capital - from the other towns, the city being almost six times as large as the second-in-rank town in the national hierarchy;
g) very strong intertown competition for acceding to the second hierarchical seat; the small difference in regard of number of inhabitants in five cities (Cluj-Napoca, Iasi, Brasov, Constanta and Timisoara) led to a kind of rotation of position in the second seat, with significant changes at that level;
h) underdeveloped services sectors in the majority of towns, generated a singular dependency upon industrial activities and construction works; as a matter of fact, a very close correlation between industrial activities, obvious just when large units were being put into operation, and the disruption they entailed in the number of inhabitants, can easily be established;
i) the urban evolution in Romania was also disturbed when relatively large numbers of settlements were periodically promoted to township (51 in 1968 and 23 in 1989); the hierarchical loss or gain experienced by some small towns the very years when new urban localities appeared on the map is not the consequence of involution but rather the result of these disturbances.

Types of town evolution in Romania. Analysing the relationship between town population and town seat in the national hierarchy has led us to building some specific graphical models. Comparing them, and finding them to be very much similar, we could deduce some characteristic classes (Figure 3).

1. *Towns marked by progressive or explosive evolution* have made a spectacular leap in the national urban hierarchy. Their promotion is rather momentous than continual throughout this century. One such moments is the period after the year 1966, when two categories of town recorded explosive development: a) the newly-established county-seats (after 1968), which had a population under 30,000 inhabitants, and b) the towns specialized in distinct industrial branches.
   The first category consists typically of "predator" towns, which had profited by big investments in industry and house-building. The systematic pumping of important funds into local budgets, pushed these towns steadily upwards in the hierarchy. The most significant leaps were made by Slobozia - 68 seats (Figure 4a), Zalau - 55, Vaslui - 45, Miercurea-Ciuc - 40, etc. In the conditions when the urban network is reduced, such leaps bring about major functional deregulation.
   The second category encloses quite numerous towns, i.e. the small and medium-sized ones. Their population increasing, they implicitly gained hierarchical seats. As a rule, either one single industrial enterprise was built there, or one of the old units would be extended to gigantic proportion. Dominant branches are mining, machine-building and chemistry. A typical example is Navodari which gained 121 seats over 1966-1992 when the Chemical Works, built after 1975, were put into operation and staffed with

Figure 3 Types of town evolution in Romania (not including settlements promoted to townships in 1989). 1, progressive (sometimes explosive) evolution; 2, leaps; 3, tending to a point of equilibrium (limiting cycle); 4, contradictory evolution; 5, regressive evolution; 6, stationary.

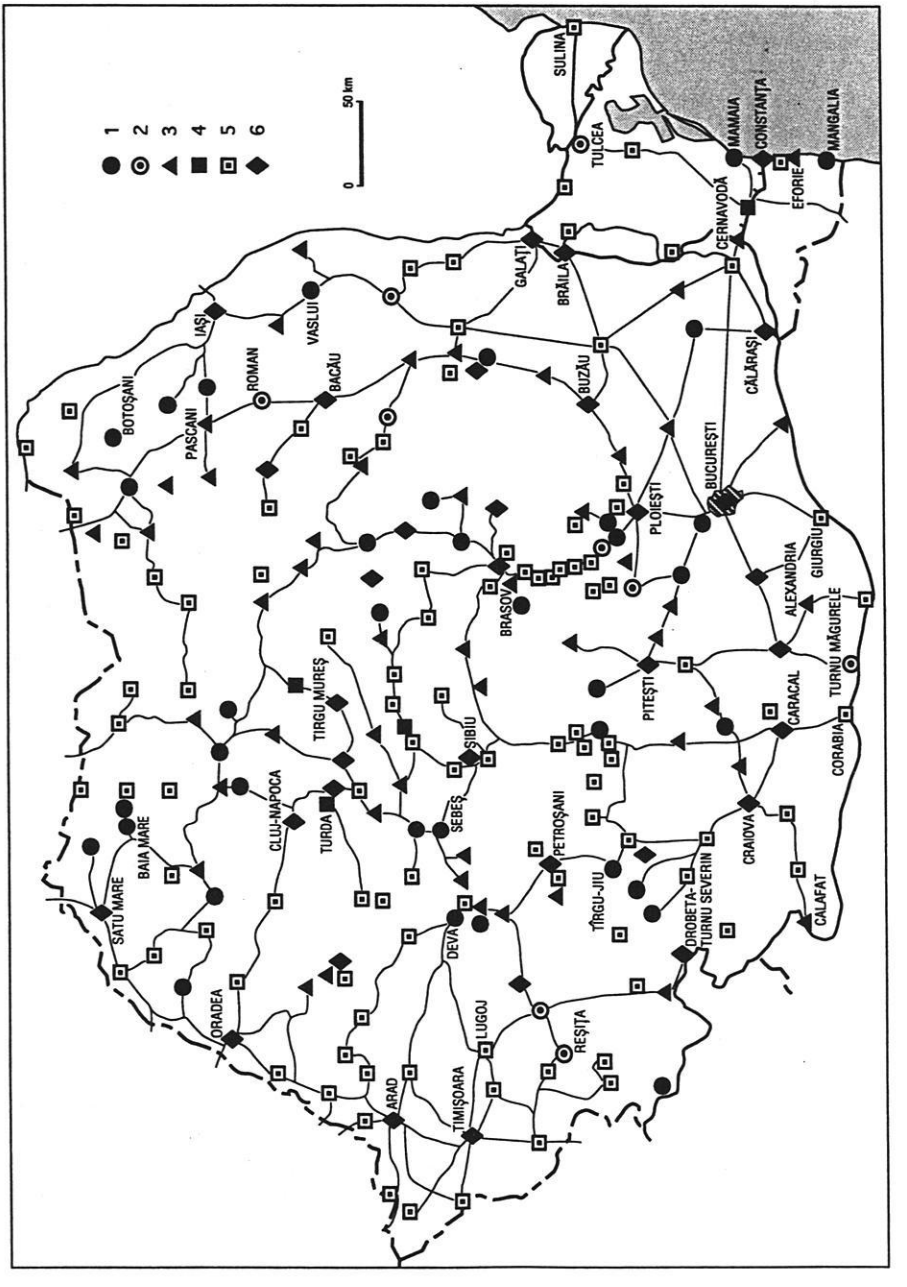
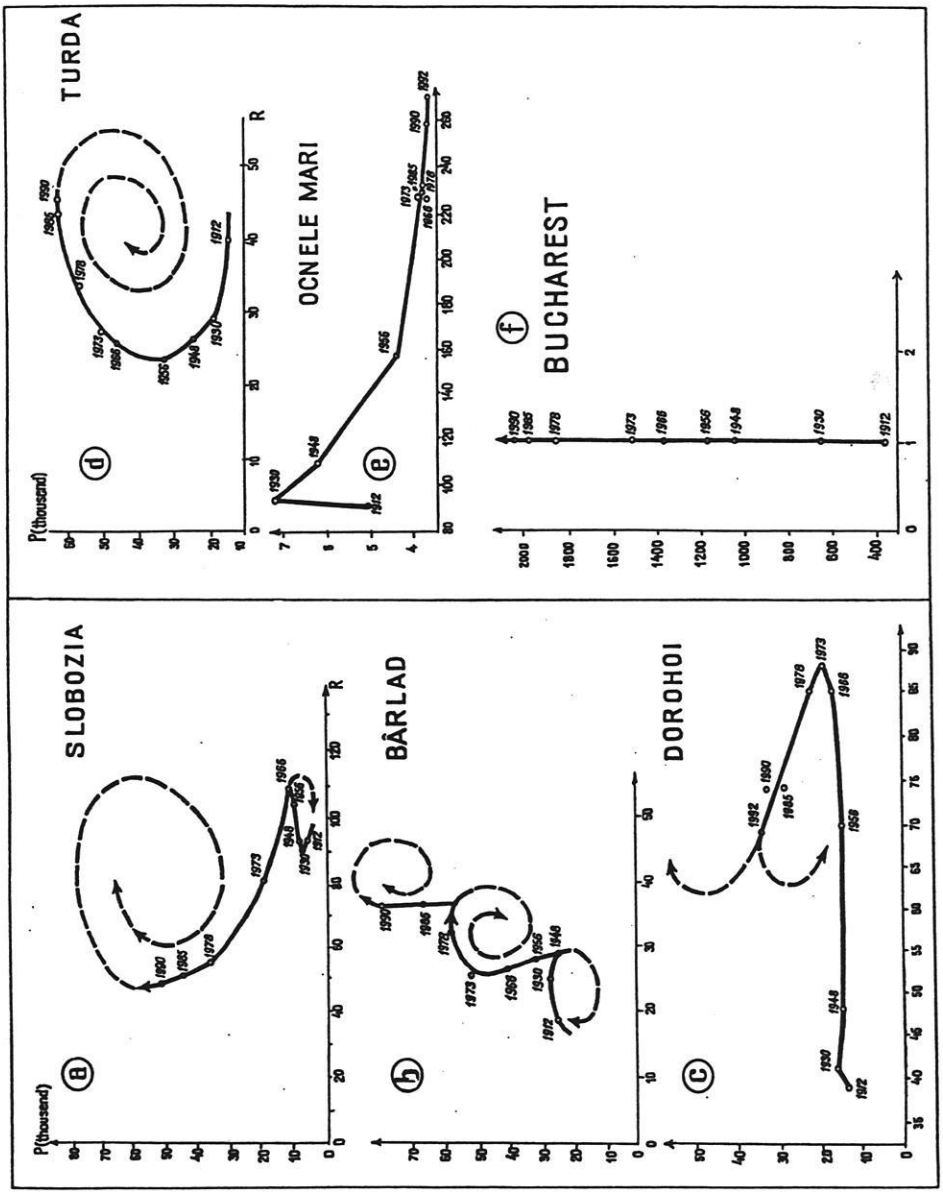


Figure 4 Particular town evolution.



7,000 employees; Mangalia, a ship-building centre, gained 57 seats over the same interval.

Other towns which evolved in the same way during those years gaining significant seats, are: Motru - 85, Târgu Frumos - 68, Buftea - 49, Plopeni - 41, Cristuru Secuiesc - 33, etc. Some of the small specialized towns recorded explosive evolution during 1956-1966. This is especially the case of mining sites (Moldova Noua - 30 seats; Baia Sprie - 20 seats), oil-drilling centres (Baicoi - 26 seats), or towns in which huge industrial units used to be emplaced (Onesti - 61 seats, Zarnesti - 50, Sebes - 22).

Few towns recorded continuous evolution in mid-20th century. One such town is Hunedoara, which gained 104 seats over the 1930-1966 interval, due in principal to the steady expansion of siderural activities at the only plant of that town.

2. *Towns marked by cascading evolutionary leaps* have, in general, a population of 50,000 - 100,000 inhabitants. They feature by a succession of disruption. This however, only seldom means that a spectacular numerical rise is followed by a drop in the number of inhabitants; more often than not, what actually happens is simply a slowing down of the increase rate. A typical case is Bârlad, whose basic economic structure was directly and violently disturbed (Figure 4b), hence a sudden upsurge of population. In the early 1950s, a big bearing-material factory was built and the town's economy was revitalized. This brought it four new seats in the national hierarchy. The boom lasted until 1973, when despite continual population rises, the town fell pray to the new county-capitals that had been re-established in the year 1968. It declined at a steady pace when, in 1980, the construction of a machine-building factory and the enlargement of the ready-mades factory stopped its downfall and the town no longer lost hierarchical seats.

   Similar evolution were registered by the towns of Roman, Resita, Tulcea, Caransebes and many more.

3. *Towns marked by contradictory evolution* are these which, after having gained important seats in the national hierarchy during a certain time-interval, are steadily losing them, or the other way round, after significant losses, they begin recovering. This group, too, includes primarily small towns rather than medium-sized ones. Among the latter we would mention Alexandria and Dorohoi, which have a complex industrial sector. The upsurge of the former began in 1968, when it was decreed capital of Teleorman county. Dorohoi prospered after 1973, once its industrial development began to be heavily funded (Figure 4c).

   Some of the small towns are Bals, Cugir, Stei, Gaesti, Pascani (with a powerful machine-building sector); Uricani and Vulcan (mining centres); Covasna, Orsova, Pascani and Toplita.

4. *Towns tending to achieve a point of equilibrium or limiting cycle* in their evolution are few. Their evolution throughout the century is analogous to a limiting cycle, or we might see it as a tendency to stability. Most typical in this

respect are the towns of Turda and Medias (Figure 4d), old industrial centres both of them. Their enterprises have continually developed in time, without any spectacular leaps. Other towns tending toward a stable equilibrium after a period of upsurge, with important hierarchical gains, are Petrosani and Medgidia. They had been industrialized in the first stage of "socialist construction", subsequently diversifying this industrial basis at a reasonable pace.

5. *Towns marked by regressive evolution* represent the largest category, and fall almost permanently pray to others. Although in the majority of cases their population is increasing, they, nevertheless, are constantly losing seats. In this situation are the specialized industrial centres (Moinesti, Cisnadie, Buhusi), the dominantly agricultural centres (Vânju Mare, Beresti, Târgu Bujor, Curtici, etc.), or the towns in which the services sector prevails (Baile Govora, Baile Olanesti and Baile Herculane spas, Sângeorz-Bai). Irrespective of whether the population of these towns rises or drops, they lose seats in the national hierarchy (Figure 4e).
6. *Towns marked by stationary hierarchical evolution* are the large cities which, despite sensible growth, fail to change their hierarchical position: on the one hand, because towns ranking immediately below have a small chance of shifting their position and, on the other hand, because hierarchical barriers extent between some of them stand in their way. For example, Bucharest city, hugely oversized in respect to other towns, has been maintaining its top seat throughout this century (Figure 8: the vector perpendicular to the abscissa). Such a representation could hold also for Tusnad-Bai, a town seating at the bottom of the national hierarchy, but for the 23 new settlements given a township status in 1989 (which have all lined up ahead of it). This has obviously disrupted the vector (Figure 4f).
   Despite relatively small variations, the configuration of other large centres can be vectored, see for example Constanta, or others which show important variations in the upper segment of the national hierarchy, e.g. Brasov city.
   With due corrections depending on the hierarchical segment occupied at the time of our study, some small or medium-sized towns, showing insignificant seat variations (Intorsura Buzaului, Câmpia Turzii, Ticleni, Videle, etc.), also fall into this category.

Conclusions

The model presented herein is essentially a modified Volterra-Lotka graphical model. The modifications concern the particular relationship between an individual (town ***X***) and the group (urban system) containing it. In the event of a mathematical formalization of the model the twofold role (either pray or predator) a town may successively play in the course of time, asks for adequate parametrical selection.

BIBLIOGRAPHY

BERRY, J.L.B., KASARDA, D.J. 1977. Contemporary urban ecology. New York: Macmillan Publishing.
DENDRINOS, D., MULLALLY, H. 1985. Urban Evolution Studies in the Mathematical Ecology of Cities. Oxford University Press.
IANOS, I. 1992. "Stabilitate si instabilitate în sistemele geografice", Terra, 1-2: 79-90.
IANOS, I. 1993. "A comparative analysis between urban and industrial hierarchies of the Romanian towns", Geojournal, 29, 1: 49-56.
IANOS, I., TALÂNGA, Cr. 1994. Orasul si sistemul urban românesc în conditiile economiei de piata. Bucuresti: Institutul de geografie.
PUMAIN, D., SANDERS, L., SAINT-JULIEN, Th. 1989. Villes et auto-organisation. Paris: Economica.
SANDERS, L. 1992. Système de villes et synergétique. Paris: Economica-Anthropos.