An evolutionary approach to settlement systems

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AN EVOLUTIONARY APPROACH TO SETTLEMENT SYSTEMS

Urban geography has contributed to the understanding of the urbanisation process by developing the concept of settlement system. This approach disaggregates urban and rural population into elementary and spatially autonomous settlements which are considered, within a given territorial framework and at a certain moment in time, as interdependent and evolutive. The concept of geographical situation, including relative position and functional specialisation, is central for analysing and qualifying the potentialities of any settlement within the system.

The categories “rural” and “urban” have had a significant meaning at some stage of the development of settlement systems, for differentiating settlement types whose characteristics were opposite simultaneously on several dimensions. It is well known that, in population analysis, this dichotomy refers to a specific moment in the evolution of settlement systems. Its relevance is linked to the dynamic processes which have contributed to the historical differentiation of settlements. We argue that it is necessary to understand the dynamics of settlement systems and the trends in their evolution in order to suggest more detailed and relevant typologies of settlements. As settlements have evolved and become more complex, the rural and urban classes must be, probably not redefined according to new criteria, but completed with new classes.

This approach aims not only at establishing settlement types as geographical contexts having a possible impact on population characteristics and behaviour. It refers to a more circular causality chain where settlement types are considered being produced by the social and spatial interactions among the population as well as they may influence them. This systemic approach is not only micro-macro but multilevel: it considers that each settlement is a subsystem, which cannot be described by the simple addition of its individual residents with their characteristics, but acquires specific collective properties during its development, which is embedded in a competitive process with other subsystems. Settlement systems may then be interpreted as a spatial mode of the structuration of societies, as well as the product of successive social choices in the arrangement of spatial interactions.
Why the rural-urban dichotomy has never been totally relevant

It has been explained in previous chapters that, because of the last thirty or forty years period of urban sprawl, which blurred the spatial limits between urban agglomerations and the countryside, referring to what has been called suburbanisation, peri-urbanisation or rurbanisation processes, as well as because of the “urbanisation of the society” including the diffusion of the urban economy and urban way of life in the most remote parts of every developed country, there is nowadays less substance in the traditional distinction, which is still made by the national and international statistical institutes, between rural and urban populations.

One should however be aware that such a distinction, although significant and practical, has perhaps never been totally relevant. Several formal distinctions have been made in social sciences to qualify the difference in nature between rural and urban places, according to a variety of theories and criteria. Economically, the partition between agriculture and other activities is a breaking point: rural settlements were traditionally the places inhabited by farmers, as they still are today in countries where agriculture keeps a large part in the national economy. Sociology has underlined the role of towns and cities as places where new ways of life and new status and professions were invented in a more or less continuous process of social division of labour. Political economy insists on the role of urban places as nodes of power and platforms for exchanges. Geographers have noticed the differences in type of resources which are exploited and in spatial range of rural and urban activities: rural settlements depend for their survival on resources located nearby, on their site, whereas towns and cities are using more distant resources through the various networks they activate. According to these dichotomy principles, a “finite” story has been suggested as an analogy with the demographic transition process.

Phase transition in the history of settlement systems

The concept of “urban transition” developed by Zelinski (1969) is useful to coin a major event in the evolution, which transformed mostly rural settlement systems, made of numerous and scattered hamlets and villages, which are relatively homogeneous in their size and functions, into almost entirely urban systems, made of elements much more differentiated in size and functions, hierarchised in a wider number of complexity levels, with a higher degree of spatial concentration of the population. To various degrees and different timings according to countries in the world, the urban transition is linked with the demographic transition,
industrial revolution and increasing speed of transport. Starting as soon as the beginning of the nineteenth century in European developed countries, the acceleration in the urbanisation rate took place only after 1950 in most developing ones (Bairoch, 1985). It has been everywhere accompanied by large migration moves from the rural type of settlements to the urban ones, although in developing countries a larger share of urban growth has been taken by natural increase. As summarised everywhere by the logistic curves showing the historical progress of the population urbanisation rates, it appears typically as a world-wide spatial diffusion process.

A reason for replacing such a major event, which could be called a bifurcation, analogous to a phase transition in physics, in the interpretative framework of self-organising systems theory, is that the evolution of urban systems is not finished once the total population has become urban. Instead of considering that a specific historical period marked by a diffusion process has ended, or expecting reversal trends taking place as in “counter-urbanization” theories (Berry, 1976) including sometimes explicit cyclical perspectives about urban development (van den Berg et al., 1982), we shall insist on the necessity of producing a more integrative and continuous theory of our ways of inhabiting the planet, which would include the major episode of the transition from rural to urban, as well as what happened before, and will happen after.

Difficulties in measuring rural and urban populations
However important historically were the categories of “rural” and “urban”, it always has been difficult and questionable to precise their limits, especially by quantitative measurement (Goldstein, Sly, 1975). The existence of a legal definition, separating the status of population on each side of town walls, was by no means universal, and disappeared well before censuses were generalised! The demographic size of settlements, their densities, are attributes which were very often used for establishing thresholds between settlement categories but which have never direct rationale in theoretical definitions. One may for instance question the significance over time of a threshold which define urban population in France by a value fixed to 2000 inhabitants since…1856. Major uncertainties in the application of definitions come from the emergence of settlements which have contradictory attributes: are mining towns, exploiting local resources only, truly “urban”? In which category “towns” with population above the urban threshold but with dominant agricultural activities (as for instance in Southern Italy) should be classified? Are communes having low population densities and a green
environment but located on the edges of urban areas and a majority of their residents involved in urban activities still rural?

Another general property of settlement systems prevented any easy partition between rural and urban population. Instead of more or less visible thresholds in size between rural and urban settlements, there is always a statistical continuum in settlement population size statistical distributions. The typical models of reference are very dissymmetrical in form, like a Pareto law or a lognormal distribution. From the huge literature on this, it may be retained that Pareto’s laws are convenient for the description of urban settlements while lognormal distribution adjust better to whole settlement systems (Baker, 1969, Pumain, 1982). An important remark is that all settlement systems share this property: even in ancient pre-historical times, as shown by Fletcher (1986) for a variety of settlements in archaeology, worldwide. Actually, continuity in size distribution can only be explained in a dynamic perspective. There is no possible absolute distinction between rural and urban settlements because the latter proceeds from the former. There is no definition of settlement size in theory because the size of a settlement does not result from any optimisation process, but it is produced by a multiplicative growth process.

An evolutionary theory of settlement systems

The rural-urban continuum in settlement sizes and the generality of the hierarchical models of size distribution, whatever the historical or regional political circumstances, have suggested many tentative explanations. Among them, several were static, referring to some optimising principle (as for instance in Christaller’s central place theory based on spatial economic equilibrium, or in Zipf’s suggestion of an equilibrium between two opposite principles of spatial concentration and dispersion). It seems now admitted that it can be better understood when related to the spatial distribution of population growth in settlement systems (Robson, 1973, Pumain, 1982, Dendrinos, Mullaly, 1985). The knowledge of the growth process gives an explanation about how the system’s structure is generated. It may help in making predictions about its future. It also can be easily related to the concrete life of settlement systems by orientating explanation towards the interactions between the settlements and the way they change.

The statistician Robert Gibrat (1931) developed an explanation and suggested a dynamic process for generating the lognormal distribution. According to it, the size of settlements in
any system becomes lognormal if at every short interval in time, the growth in population of a settlement is proportional to its initial size (this hypothesis is equivalent to say that in average the relative growth rates are the same for any settlements whatever their size), and if the growth rates are independent of the initial size and between successive time intervals. Such rules have been tested on empirical processes of urban growth and these hypotheses appear relevant in most of the cases studied (for a review see Pumain, 1982 or Moriconi-Ebrard, 1993).

A model of spatially distributed growth
The relevance of the statistical process suggested by Gibrat for explaining the universal shape of settlement size distributions can be interpreted by conceiving a dynamic model of the settlement systems, including their ecological and spatial dimensions. The competition for resources between subsystems is the main driving force shaping this dynamics. Among villages, there is an ecological constraint which limits the growth of population of each settlement, according to the available state of agricultural technologies and/or social organisation, but there is also a limit to their development which comes from the pressure on local resources which are exerted by neighbouring villages. This spatial constraint becomes more obvious once a few of those villages have succeeded in developing commercial activities or various crafts and compete with others for trade. With time passing and networks building, the competition space expands and more and more distant places are concerned. Competition implies that individuals and groups located in a place will try to capture the benefits from innovation, either by inventing new ways of attracting wealth or developing their economy, or by imitating the innovations which appeared elsewhere, or by robbing or submitting other territories...This competition process is one part of the explanation of the consistency in the development of a settlement system. Even well before direct connections are made between all distant places, they become integrated in a coherent system of places through local interactions (Bura et al., 1996). Another part of the explanation is in the establishment of a circulation space which is progressively made homogeneous for ensuring a variety of transactions, through imposition of common rules and provision of facilities by political powers.

During the first stages in the history of settlement systems, many inequalities are observed in the growth rates of settlements, even in a small region, and the sudden emergence of new sites, or the total disappearance of settlements which were prosperous for decades or even
centuries, are rather frequent (Archeomedes, 1996). In the course of time, rural or urban foundations become rarer events and the probability of disappearance of settlements becomes more and more inversely correlated to their size. The regime of distributed growth as described above becomes the “normal” way of evolution of the settlement system.

**Selection processes**

The stochastic distribution of growth among settlements belonging to the same system is expressive of the interdependences between these subsystems. It is related to the process of spatial diffusion of the innovation within the system (Pred, 1977). When urban changes are studied in detail, being observed comparatively in each settlement for a wide variety of aspects of social life and economy, they appear to consist in continuous local adjustments to the ongoing transformation of society and technologies, which make the growth process very fluctuating in time and space, but create rather little differentiation on the long run among the settlements. This property, which is sometimes interpreted as demonstrating the “inertia” of settlement structures, on the contrary is a proof of their ability to incorporate new developments by ensuring their diffusion throughout all parts of the settlement system. The system is self-organising through the amplification of some of these fluctuations or asymmetrical interactions.

It is well known that diffusion processes are not always instantaneous nor ubiquitous. Selection processes appear among settlements, usually in connexion with main innovation cycles. For instance selection among towns and cities has occurred each time an important innovation was linked to some ecological resource which is unevenly distributed (as for instance coal mines for industrial revolution of the XIXth century, or coastal sites for tourist resorts which started developing at the same time but have continued since, contrary to the former). Linkages of some uneven urban developments with economic innovation lead in most cases to a cyclical episode of growth for settlements which specialised in this particular activity. The result is the emergence of what has been called by historians and geographers “generations” of towns and cities. These settlements keep the marks of their period and type of specialisation long after the time when they benefited from this innovation, since the gap which was once created between them and the other settlements is maintained through the “normal” incremental usual mode of evolution of the settlement system. Socio-economic typologies of settlements often reveal former selection processes: the major differences which are identified by multivariate analysis or classification of settlements can very often be
interpreted in terms of traces of the unequal diffusion of former cycles of innovation within the settlement system. For instance in Europe old industrial centres which emerged at the time of industrial revolution still appear as very distinct from older administrative and political capitals, among them a few have become modern high level service centres, while new urban categories as technopolitan nodes have emerged. Such contemporary trends in restructuring the settlement system can be revealed by significant correlations between growth rates at successive time intervals, revealing the persistency of trends in growth and decline in the same places. For instance, during the second half of XXth century such a trend has intensified in France, and taken more systematic spatial patterns, opposing regions gaining or loosing population in almost all settlement categories (whereas during the century before, the process affected only a few settlements in each region) (Bretagnolle, Paulus, Pumain, 2001).

Another example of a more durable selection process refers to the way the dichotomy between rural and urban settlements has been created and maintained. When adjusting the total distribution of settlement sizes in France to a statistical model, one gets a better fit if instead of considering a single lognormal distribution, two different lognormal curves with different mean and dispersion are adjusted: the actual “rural” settlements, typically under 10 or 20 000 inhabitants, have a neatly different slope on figure 1 than the “urban” ones whose distribution is adjusted by another line on a gausso-logarithmic graph. One may explain and relate by simulation the formation of this inflexion between the two distributions by considering that the rural settlements have systematically lost population during more than one century and a half, while the mean growth rate of urban settlements remained positive during all that time. Rural and urban settlements would then have ceased to evolve under the same common growth process, once the “selection” of those which would become towns and cities had been made.

*Evolutionary trends*

The human settlement growth process is dominated by clear historical trends, which give a probably irreversible direction to its evolution. This invite to conceive a more specific model for human settlements (Pumain, 2000), which integrate specific features of social and spatial interaction and their transformation over time. For instance, the Gibrat model alone can account for a small part of the reinforcement of settlement size hierarchies, but it does not explain entirely what is observed. There is a recurrent trend for larger urban settlements to grow faster than the smaller: if not expressed by high correlation between growth rates and
city size, the trend appears frequently in statistics when size classes are considered. This is linked with the initial advantage given to the largest places by the hierarchical diffusion of innovation, which was noticed for long in many studies of evolution of urban systems.

More generally, the observed features of the settlement systems dynamics are governed by a major historical trend. This trend is a combination of two main processes: first, a process of creation of innovation, which sustains a demographic and economic expansion, and ensures the emergence of new types of activities and of more complexity in the upper levels of the settlement system’s hierarchy; this innovation process is partly incited by the emulation between settlements and computer simulations have shown that its continuity is necessary for maintaining the settlement system in its structural properties (Bura et al., 1996); second, a process of acceleration in the speed of communication causes an apparent shrinking of geographical space, and contributes to the further hierarchisation of the system in two ways: the hierarchical diffusion of innovation gives an initial advantage to largest settlements, which are connected first to rapid communication networks and whose more complex society adopts innovation quicker, while on the other hand smaller settlements are short-circuited as their customers are captured by larger ones, which have become closer in time-space.

These evolutionary trends are defined at a macro scale, for the entire settlement system. It should be added that they are only probability laws which are compatible with possible reversals in trends at local scale, for some individual settlements. There is no absolute determinism in the evolution of a specific place, which always can be reoriented by inventing new activities or capturing innovation. The probability is however much lower for smaller settlements, especially if their geographical situation is not of good accessibility to the urban centres; and because of what is called “path dependency” in complex systems theory, and despite postmodernist collages, individual settlements keep their specificity as defined by their original trajectory within the system, they cannot become what they have never been.

**Concluding remarks**

Our hypothesis is that the same processes which already occurred during the historical development of settlement systems will continue, even after the end of the “urban transition”. According to such an hypothesis, a few conclusions can be taken from the evolutionary concept of settlement systems for preparing settlement typologies: most urban settlements proceed from former rural ones, they represent the result of a selection process which is
durable but not totally irreversible. No classification of places can then be assessed in definitive terms. Second, there is no permanence in size thresholds or in services portfolio which would identify a rural or an urban character, because of the continuous changes in the income, needs and travelling capacities of population. So settlement typologies have to be evolving in time, as settlements are. We shall see from the European example mentioned below that they also have to be adapted according to the regional context of population concentration and spatial pattern (which reflect themselves the past trajectories of settlement subsystems).

**Classical approaches to rural-urban classification in Europe**

The European continent has a long and rather continuous history in human settlement. When compared to other parts of the world, it is characterised by a rather high population density (around 100 inhabitants per square km in average), which is not too heterogeneously distributed at least at regional scale. It also has a high density of towns and cities (spacing between two neighbouring towns over 10 000 inhabitants is less than 15 km, against 50 in North America) and a spatial distribution of urban population which is less concentrated than in other parts of the world: the first thirty largest metropolises have less inhabitants than in North America, and the share of urban population living in agglomerations over one million inhabitants is less than in other continents (Moriconi-Ebrard, 1993). At a local scale, another common feature can be observed in the spatial organisation of urban settlements (Benevolo, 1993). Very frequent is a concentric model of urban development including an old core, still highly valued as architectural and urbanistic heritage, densely and continuously built-up “banlieues” surrounding that core, and more recently developed and less dense suburbs which spread out in the countryside during the last three decades.

Despite this shared history and many physical and cultural similarities, there is no common statistical definition of what an “urban” settlement is among European countries, perhaps because there are not uniform representations of a “town” or of a “city” throughout Europe. The non comparability of European statistics, however mentioned as soon as in XIXth century (Meuriot, 1897), is a recurrent problem (Bunle, 1934), despite repeated efforts by international agencies (International Institute for Statistics, 1962, OECD, 1988, Eurostat, 1999) or research communities (Hall, Hay, 1980, Pumain, Saint-Julien, 1991, NUREC, 1994) for promoting comparison. Heterogeneity in statistical sources and non comparability of urban information remain the rules in Europe (Pumain, Saint-Julien, 1996). We briefly
summarise the main discrepancies which were detailed in a report for Eurostat (Pumain, Saint-Julien, 1991, brought up to date in Le Gléau et al., 1996).

**Diversity of the European concepts of urban settlements**

In some countries, the urban concept is translated into an *administrative or political status*: the definition of a Greater London District in UK including its recent fluctuations is a well-known example, but a similar status does exist for Copenhagen and Frederiksberg in Denmark, special charts are given to the municipalities of Madrid and Barcelona in Spain, various degrees of urban status are defined in Ireland. More generally, in Austria as well as in England and Wales and in Germany, urban territories are recognised according to a legal decision.

Such administrative definitions may register the existing balance of power between the State and the cities at a given moment, but they do not help much in measuring the progressive expansion of the urban realm. Sometimes as in Germany the limits of urban municipalities have been extended to follow the progress of urbanisation, but these adjustments of political territories cannot be frequent enough to provide an adequate measurement of the urban settlements. This is made easier in countries where there is no legal but a purely statistical concept of urban units.

Most of times, the urban character is defined after a *threshold in size of the resident population in local units*. In Italy and Spain, a conventional definition classifies as urban all municipalities with population over 10,000 inhabitants, whereas all these which are under this threshold are considered rural. In order to free the definition from administrative boundaries, nine EC countries as well as Switzerland have defined a concept of urban agglomeration (named urban areas in UK) which regroups in a single urban entity the local units covered by a built-up zone in continuity. The exact definition of the continuously built-up area varies according to the countries, requiring no inferior threshold in population size up to 1000 inhabitants and a separating distance of 50 to 200 meters. Despite the criticisms which are addressed to the concept or urban agglomeration, which is too restrictive in evaluating the functional extension of urban settlements, especially since the diffusion of automobile and commuting habits and the general trend of urban sprawl in the last three decades, it has to be recalled that for historical comparisons at least, the morphological definition has one decisive advantage over all other possible definitions: it offers the certainty of continuity over time.
Urban built-up areas can vary only in one direction: they expand outwards, by successive accretion of adjacent localities. This will not necessarily be the case with entities defined after functional criteria based on the location of jobs or economic activity, whose centre of gravity may indeed shift and whose fringes are more subject to fluctuation over time.

**From urban agglomeration to urban field**

However, even when a common definition of urban agglomeration is applied (as for instance in the historical data base on European cities developed by Bairoch et al. (1988), or in the data base Geopolis prepared by F. Moriconi-Ebrard (1994) for the 1950-2000 period and consisting in more than 5000 urban units of 10 000 inhabitants and over for Western and Central Europe) a perfect comparability of the resulting units is not ensured because of the large diversity of the surface (and population) of the local administrative units which form the spatial basis for collecting population figures. To give an idea of these variations, let us recall that there is a factor hundred between the mean surface of French (15 square kilometres) and Sweedisch communes, and still a factor 30 between their average population. Within the same country, there also are variations in the size of local units.

This heterogeneity in size and shape of elementary administrative or political subdivisions also hampers the comparability of urban settlements whose definition would be based upon journey-to-work statistics. The first attempts came from researchers. The “Metropolitan Economic Labour Areas” designed by Hall and Hay (1980) in the 70’s were later converted into “functional urban regions” by Cheshire et al. (1988). Regrouping around an employment core (more than 60 000 jobs) all municipalities and districts sending more commuters to this centre than to any other, such definitions, which operate a complete partition of geographical space, however useful for regional studies or spatial planning at a broad scale are too large for permitting a detailed analysis of settlement systems. Official statistical definitions of daily urban systems are still rare in Europe. The recent design of “aires urbaines” in France is worth mentioning since it may help in correcting the underestimation of French urbanisation, which arises from both effects of the too restrictive concept of urban agglomeration and of the very small surface of the communes. The new definition gathers around a centre of 5000 jobs at least all communes (adjacent to the core or to an already formed cluster) sending more than 40% of their labour force to work in communes belonging to the centre or the cluster. The resulting units are about 350. The name which was chosen for them may lead to
misunderstandings when translated into English (the concept of urban area being closer to the definition of an agglomeration).

How can the agglomeration and the daily urban system concepts be evaluated in an evolutionary perspective? The latter is obviously narrowly related to time-space, as it has been shown that, if commuting distances have considerably increased, the time which is devoted each day to commuting has remained remarkably invariant during the last decades. Thus the conception of urban settlements as urban fields where spatial interaction can occur in a given time is in favour of a definition based upon frequency and length of daily movements around an urban centre. On the other hand, the continuously built-up area which lies under the definition of urban agglomeration and seems to refer solely to topographical space cannot be considered as totally obsolete, since it has been shown in fractal studies that their external limit, which is variable over time, corresponds more or less at each date to the extension of the urban space which has a fractal structure (in buildings, networks, flows) compared to the outward space which remains more homogeneous (Frankhauser, Pumain, 2001). According to the question under consideration, either oriented towards behavioural or morphological space, one definition may then be preferred to the other, but both have an evolutionary character.

**Intermediary settlement types between urban and rural**

An interesting aspect of the new definitions used by INSEE since 1996 is that they identify several types of settlements, for which population and other statistics are regularly computed and published: central communes are the cores; the “banlieues” consist in all other municipalities belonging to the urban agglomeration; the suburban communes (couronnes péri-urbaines) are those belonging to the aire urbaine, but not to the agglomeration; together with the “urban centres” (made of cores and banlieues), they form the “space with a dominant urban character”; other communes where commuting is important but not directed toward a single urban centre are considered as “multipolarised urban”; the remaining communes are considered as “space with a dominant rural character” and are divided in four categories: “communes under a weak urban influence” (sending 20% of their labour force to work in an aire urbaine), “rural nodes” (little towns with 2000 jobs or more and a job ratio greater than one), their peripheries (communes sending 20% of their labour force to work in the rural nodes) and remote rural (10 000 communes).
Several European countries have defined classifications of settlements including intermediate categories between urban and rural. They may bring useful information in completing the description of a settlement system but they are hardly comparable between countries.

*Population densities or Corinne land cover?*

One may question the relevance of settlement classifications which would be based upon the concept of density (Eurostat, 1999). First from a theoretical point of view, because density is a concept borrowed from physics and related to an idea of homogeneity, whereas the spatial distributions of population densities, especially urban, never can be referred to this uniform distribution and on the contrary are of a fractal type (Batty, 1998, Batty, Longley, 1994, Frankhauser, 1993). Second, from a more practical view (since at the moment data on densities are easily computed and available while fractal measures are still in discussion among specialists), there is a systematic bias when assigning a density threshold for a geographical classification purpose, because, within a particular settlement style, urban densities are correlated to city size (Bussière, Stovall, 1978).

A solution towards harmonisation of definitions in Europe could be found by using information brought by satellite images. The European Agency for Environment already provides spectacular maps of the “artificialised” lands, which mainly correspond to human settlements (figure 2). According to experts, the criteria which have been used in different countries for identifying the two categories of land use are not yet fully comparable and adjustments have to be made. More detailed tests have been made for delimiting large metropolis after SPOT images (Eurostat, 1995) and research works are developed for evaluating the capabilities of this new source of information. In any case, this apparently objective and strictly comparable instrument reflects the morphology of settlements but has to be completed with population statistics in order to meet more general objectives of the classification of human settlements.

If progression toward an harmonisation of definition is desirable for comparative studies, it could be argued, especially from the point of view of an evolutionary theory of settlement systems, that a variety of definitions is not to be necessarily rejected, because it may partly reflect the diversity of configurations of national settlement systems or specific national representations of settlement types.
A regional typology of human settlements styles in Europe

We have seen that the cacophony in the European definitions of settlement types was partly arbitrary, partly explained by specific features of the historical structuring of political and administrative territories, whose consequences in terms of shaping contemporary social and spatial interactions could still remain relevant, but also could be partly depending upon more general aspects of the geographical context of development of the settlements. We would like to show how a limited number of neatly distinct settlement styles can emerge from a simple cross national comparison of the most apparent characteristics of settlement systems. As a detailed information about all settlements is not available, especially for the smallest ones, and because it is impossible to rely on national definitions of rural and urban settlements in Europe, original dedicated data bases have to be built for providing such a comparative view.

A level of resolution has to be chosen. It should not be too large because wide spatial subdivisions would erase the internal differentiation of settlement systems, which are very heterogeneous in size and spacing, but cannot be too fragmented because too small spatial units would not take into account the geographical consistency of urban systems. It should retain different types of indicators describing characters of the settlement systems which are more continuous in their spatial distribution as rural population densities, whose regional variations may be related to constraints of natural milieu for instance (altitude, climate), and discontinuous characters linked to the various forms of local urban concentrations, which may be either grouped in a single major centre or distributed into several nodes, and can be surrounded by high densities or isolated inside much less densely populated areas.

Such considerations lead us to a list of indicators combining mainly two data bases: the Eurostat regional data base for basic information about rural and total population densities and the Geopolis data base (collected by Moriconi-Ebrard, 1994) for a more detailed description of the upper part of the settlement system’s hierarchy (including about 5000 urban agglomerations of 10 000 inhabitants and more, following the UNO definition, for western and eastern European countries, excluding countries of the former USSR). The NUTS 3 level has been chosen as a grid representing a good compromise. It has been a little modified when subdivisions were not homogeneous in size compared to other countries (former Yougoslavia excepted). All data have been computed in this spatial framework, excepted for the indicators which characterise the spatial influence of a large metropolis, which were smoothed over
broader surfaces. The indicators describe the size, spacing and intensity of human settlement at three spatial scales: the urbanisation rate and average rural density at the local level (NUTS3 region), the mean urbanisation rate and rural density in neighbouring regions, and the regional urban context (Sanders, Mathian, 2000), defined for a circle of increasing distance according to the size of the largest city and characterised by the class size of this metropolis, the inequality index of town size distribution and a primacy index.

The classification identifies six main types of regional human settlement (figure 3). A few regions are dominated by a very large metropolis. Paris, Madrid, Athens, belong to this type. Their development, generally associated with a centralised political and administrative organisation, has concentrated the population in a primate city and generated around them another type of regions, which consists of rural areas deprived of major towns because of this metropolitan influence. A different style of settlement hierarchy consists in a less contrasted distribution of sizes, including neighbouring metropolises in a polycentric pattern, scattered among high population densities, both rural and urban as in Rhine regions or mainly urban as in southern England. A third style of settlement is made of less urbanised areas, either including regular networks of smaller towns, as in Eastern European regions, or essentially rural as in some peripheral regions.

The importance of the exercise is not so much in the resulting typology, which could be subdivided in more different styles and perhaps give rise to slightly different regional limits if different indicators had been chosen (the relative stability of the map on figure 3 has however been tested respectively to these considerations). What is more significant in these results is the weight that the historical circumstances of the development of the settlement systems take in the definition of the settlement styles of today. Not only the main three families of settlements brought forward by the classification but also smaller groups can be explained in such a way.

**Suggestions from the evolutionary theory on settlement systems**

Suggestions are to depart from a too simple dichotomy and to move towards more detailed and flexible typologies of settlements, according to the purpose these classifications are aiming at. This attitude would rejoin an old tradition of the political economy which used to distinguish for instance not only between hamlets, villages, towns and cities but which
introduced nuances between borough, market towns, and towns, or between mining towns and administrative centres.

At the local level at least four main concepts could be defined in order to typify the nature of the spatial interactions which are involved in the constitution of a settlement entity:
- the municipal level is an elementary territory for political representation and decision
- the urban agglomeration corresponds to a physical unity covering several municipalities, which is defined by the spatial continuity of the built-up area and necessitates a minimal coordination of municipal policies for the management of basic urban services functioning on physical networks like water provision, sewage, transportation
- the metropolitan or functional area, or daily urban system, also includes surrounding municipalities which have a mainly residential character and send more than a given proportion of their labour force (and/or customers) toward the agglomeration on a daily basis
- the polycentric metropolises have two main origins: either they are conurbations which joined together several former towns and cities or agglomerations into a single continuous urban entity, or they are former monocentric agglomerations which integrated other urban centres in the course of their spatial development or where new centres emerged on the edges of the already urbanised area for various reasons (deconcentration of certain economic activities, emergence of new technological poles, especially close to airports or to research campuses, swarming of real estate investment for a part of urban bourgeoisie and offices, and so on).

At the upper scale of national or continental territories, other typologies may be interesting, for a range of purposes going from purely academic distinction to the application of European policies (ESDP, 1999). One should keep in mind that if size thresholds are the main indicator for the design of such typologies, they have to be defined in relative ways: first respective to the national or regional territory they belong to, which represents the main subset of local interactions through which their development took place, and second according to the spatial context (including location, human densities and physical constraints) in which they are embedded. For instance, if a category of settlement as “remote rural” can be defined everywhere, the population size and spacing threshold which will be used are different if the
settlements are located in the Berry’s plain in the middle of France, or in the central Apennine mountains in Italy or in the northern part of Sweden.

For analytical issues, including the evolutionary perspective on settlement systems, as well as for planning purposes, the relative size of a settlement is essential to be considered, since it represents together a summary of the historical trajectory of the settlement in a competitive context, a proxy for a level of complexity of its society in terms of the number and diversity of the activities that it can supply, and a rather good approximation of the limits of its development perspectives in a given span of time.

At this scale, it is more difficult to suggest a priori a number of settlement types which should be taken in consideration. In the context of most European countries, rural settlements could be (and often are) identified as settlements which do not provide all services which would be sufficient for family life on a daily basis. For instance, they do not supply schools for secondary education. According to the countries and the geographical context, the typical sizes for such settlements may vary between 200 and 2000 inhabitants. Distinctions can be made between them for instance on a functional basis between those offering no services at all and those supplying a few basic services, and others having specialised in activities like forestry, fishing, mining, tourism, which are enlarging the range of their relation and frequentation compared to the other types of rural settlements but also always include at various degrees the risks and constraints on further development which are associated to a mono activity.

Among towns and cities, the range of variation in size and functions is much more important and there is a much wider list of relevant criteria upon which may be used for a classification. If the same logic is applied as was previously for rural settlements, i.e. the level of autonomy in their functioning and development, the portfolio of their activities may be relevant if taken in a dynamic perspective: towns and cities depending upon a dominant sector of activity, either manufacturing, or tourism, or public funding (redistribution) may be more fragile on the long run than more diversified urban settlements. It is obvious that for planning considerations mushrooming urban settlements (for various reasons as residential boom or discovery of a new resource, or building of a new communication infrastructure) could be profitably established as one category.
The subset of the largest urban settlements also is often referred to. The identification of a metropolitan level is easy if using the classical models of statistical distribution of city size as the model of a Paretoian form known as Zipf’s rank size rule, since it amplifies the “anomalies” which appear at the top of urban hierarchies. How can it be made acceptable for politicians? First it has to be remembered that a metropolis should be defined not by absolute terms in size or panel of activities but in relative terms, inside a given territorial context and relatively to the other elements of the settlement system it belongs to. Second, one has to admit that such a level is already clearly apparent in Europe for instance when policies for a polycentric development are put forward. More or less implicitly the relevant subset of cities which could benefit from such a policy includes all state capitals (which sizes range from 10 millions to 100 000 inhabitants) and the major regional capitals of the largest countries. It also may include a few towns or cities without any political prerogatives or major economic role but which have an international visibility through their specialised activities like tourism or finance.

Typically, the typologies which are suggested at the European scale and for spatial planning purposes include five or six levels which are not too different from the results of the classification that we have presented above (also see Camagni, 1996).

**Conclusion**

It has been shown in this chapter that, considering the long history of human settlement, the two categories of rural and urban could be included in broader typologies. The relevant types and criteria may be provided by referring to an evolutionary theory of settlement systems. It relates different classes of human settlements to selection processes which introduce discontinuities in their development and explain the major size and functional differentiation between settlements.

So the main suggestion is to complete the list of the criteria suggested by Hugo, Champion and Lattes in the first chapter of this book, i.e. settlement size, density and accessibility to services, by an additional information about the type of trajectory of the elementary settlement, relatively to its context in the settlement system. Although examples have been restricted to Europe in this short paper, application of the theoretical approach can be easily made for other continents, taking into account different stages and phases of the urbanisation process.
References


NOTE: Figure 1 is not yet available.
Figure 2: Delimitation of urban zones
The example of Milan, 1990

Artificial surfaces
from CORINE Land Cover

Source: EEA, 1996

Agglomeration 1 (NUREC)

Source: NUREC, 1994

Agglomeration 2

Source: Madella, 1999

Agglomeration 3 (Geopolis)

Source: Mericoni, 1994

Sistemi Locali del Lavoro

Source: Sforzi, ISTAT, 1989

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Figure 3. Settlement systems styles in Europe

- Regions dominated by a large metropolis
- Polycentric regions with high urban and rural densities
- Polycentric regions with high urban densities
- Rural areas under metropolitan influence
- Rural areas with small and medium sized towns
- Remote rural areas

Sources: Moriconi - Ebrard, Geopolis, 1994, et Eurostat