



# Quality of Life in Relation to Urban Areas and Sustainability. Application Case: City of La Plata, Buenos Aires, Argentina **18**

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## 18.1 Introduction

This chapter deals with theoretical-conceptual and instrumental aspects that relate the fundamental dimensions of the quality of life within the framework of the urban environment and its degree of sustainability. These relationships may be conditioned or be conditions of the urban structure and its inhabitants. Although there is diversity and heterogeneity, these inhabitants have some common factors that crystallize within the framework of urban services, and necessarily require for its analysis a methodology that allows understanding and assessing its main aspects. Although this habitat has evolved in line with the progress of each society, in most cases technology has made significant contributions to well-being although with questioning as to its global and local environmental consequences. Complex interactions are necessarily related to physical support, and their approach must include objective and subjective aspects that relate collective well-being to basic urban services and the environment.

With respect to the concept of quality of life, we consider it as a complex construct involving individual and collective perceptions that interact forming a welfare state. In other words, a person with “well-being”, in the sense of “being well”, influences the collective, and if that collective is

socio-technologically contained in their habitat, it should necessarily contribute positively as a context to the well-being of its individuals. As this work is limited to the urban environment and the sustainability of its surroundings, it is pertinent to focus on the collective dimension of the quality of life, since the city and its structure in general intervene in resolving this situation. This approach requires an understanding of “what” are the variables involved, as well as “how” and “where” they intervene. To this end and to investigate the quality of life in the urban environment, a comprehensive, transparent and open methodology is developed which includes methods of analysis at different scales; and its instrumentation is supported by a geographic information system. Its conceptualization and valuation make it possible to measure in some way “levels of urban quality of life (LUQL)” within the same urban pattern, as well as some of its environmental consequences on the territory. Regarding the aspects of sustainability, although it is understood that in order to achieve it, the basic relationship between the social, the ecological and the economic must be permanently adjusted, it is true that the city according to its scales requires an intensive demand for resources, permanently unbalancing this relationship. Consequently, this aspect does not yet have real alternatives in our cities that optimize and minimize these demands, understanding that in these cases until now can only be evaluated “degrees of improvement” aspiring to a greater “degree of sustainability”.

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The approach of the topic is materialized in a model tending to express and interpret the levels of urban quality of life (LUQL) from relating and evaluating the urban infrastructure providing services in its different expressions, the coverage of each service; as well as some of its environmental consequences and the area of influence of each pathology; and finally the opinion/perception of the inhabitants. As a result, maps were obtained to territorialize and define the situation status through LUQL indices, showing trends based on the identification of homogeneous areas of behavior. These maps show the diversity in terms of the quality of each urban service expressed in the territory. Finally, some methodological and operational considerations are made regarding advantages and limitations that are experienced in the application of the model.

With this logic, convergent instrumental solutions have been proposed that allowed the integration of objective and subjective aspects, as well as qualitative and quantitative aspects of the different urban variables that intervene in the quality of collective life.

According to the regional trend, the main cities of Argentina have evolved in the context of excessive growth, and in our case, such growth has generally not been planned (Rosenfeld 2007; Hardoy and Satterthwaite 1987a, b).

This situation was due in part to its natural growth, but fundamentally to a population migration dynamics consistent with the mostly adverse socio-economic processes. This dynamic channeled the migratory flow from the interior of the territory to the urban centers, strongly increasing the urbanization rates of our country reaching rates of 91.44% (National Census of population, households and housing of the R.A. of 2010). Among the causes we can mention the search for better life expectations; improvements in the economic-labor relationship; and access to urban services, almost non-existent in their places of origin; all situations that have generated imbalances in the consolidation of the main urban centers. Among them we can mention the unplanned and spontaneous densifications; the collapse of some existing services; the

formation of semi-precarious and precarious settlements with different degrees of marginality; in most cases with situations of strong inequality and poor habitability. This logic ended up forming heterogeneous cities with compact sectors of high consolidation; and diffuse sectors with different levels of dispersion with medium and low consolidations (Hardoy and Satterthwaite 1987a, 1987b; Discoli 2009). Thus, the main cities of Argentina, although it is characterized what is called the compact city and the diffuse or dispersed city, we should really consider that these are cities with at least confusing urban structures. This is due to the coexistence and diversity of socio-economic structures within the same urban space in which they are observed, adjacent levels of bonanza or precariousness, and heterogeneity in the quality of the same basic services. This has already been noted in the Joint Program UNDP/World Bank/UNCHS, Dowall and Clark (1996) where it is stated that the local deterioration is produced by the lack of resources and insufficient investment in infrastructure and by the conditioning of local governments in their ability to plan, coordinate and manage the city growth operation.

This problem although it is partly related to the development models of these last decades in the region; it is also exacerbated by the dispersion and fragmentation of information managed by administrations, a situation that prevents the systematization of data for the development of accurate diagnoses and their consequent approaches.

Given the complexity of the problem it is necessary for its approach to establish in the first place a methodological body that allows to include conceptual aspects and the variables that make the quality of life, taking into account those most important for the citizen. Secondly, to propose a model that allows evaluating the relevant aspects of the quality of life in the urban context, based on the analysis of the interactions between the physical components of the city, the demands of the users, their opinion/perception, as well as its location in the territory. Thirdly, to propose an instrumentation that allows integrating aspects related to qualification, quantification, location

and opinion on the disaggregation of demand into levels of urban quality of life (LUQL). Fourth, integrate dimensions and evaluate urban areas with inequities, areas with disaggregated needs and areas with different levels of vulnerability. This would help to formulate more precise actions to overcome imbalances and inequalities, and thus allow support for decision-making that leads to a better quality of life for all inhabitants.

## 18.2 Quality of Life and Quality of Urban Life

The concept of quality of life, although it is related in general to the well-being of individuals, in this work it focuses on its collective context based on the satisfaction of its basic needs provided by the urban space. There are different opinions in terms of defining these needs, but whatever they may be, there is a certain consensus regarding the fundamentals. Although this consensus may evolve over time, it generally remains independent of the socio-cultural context in which the individual is inserted. As for the ways to meet these needs, these vary in relation to the time and space of belonging of each community. The satisfactions from the population, involve actions on the natural environment and on the artificial environment at its different scales: local, regional and global. At present, the hegemonic socio-economic model is immersed in the framework of a development sustained by intensive production and mass consumption, focusing on concentrated economies; what strongly affects with respect to:

- The disarticulation with the natural environment from a logic of sustained growth, with concentration and waste, considering some natural resources as infinite as it has been the case with fossil fuels;
- and a consequent local and global environmental degradation mainly promoted by the citizen concentration located in artificial energy-intensive means such as the current cities, a situation that deepens with

underdevelopment, poverty, and the fragmentation of peri-urban settlements.

This logic of sustained growth had its emergence fundamentally in the post-war culture from the 1950s, where technology gained a massive participation in daily life, both in the US and in the Nordic countries. It was incorporated as a very significant dimension associated with “well-being” immersed in an economic and utilitarian context. During the 1960s, this well-being brought about the need to measure it through objective methods to establish and quantitatively assess the quality of life. Then the social sciences began to introduce the subjective variable in order to complement their assessment. In the 1970s and 1980s, framed in the energy crisis, mainly in the US and Europe, the concept of quality of life was evolving, and where the challenge was to sustain the well-being achieved through improvements in current technology. This situation also led to changes in behaviors in the use of basic inputs and in some cases to the application of joint restrictions aimed at mitigating situations that did not always have equitable criteria between countries and communities. In recent decades, “well-being” has been assimilated into expressions such as “standard of living”, “lifestyle” and “equity”; expressions that are associated in the first two cases to people as individuals, oriented to their own well-being in a framework of similarity of preferences with different socio-economic strata. The third case includes different types of preferences and a set of consumptions associated with the productivity of the economy, mainly in industrialized societies; and the last expression, can be associated to the existence or absence of opportunities that from the collective, would make reference to a distributive justice, conception related to the universe of analysis and field of application of this work (Nussbaum and Sen 1996; Discoli et al. 2016).

Within the framework of this conceptual evolution, it is clear that the city as an artificial medium incorporates and combines dimensions that complexity the concept of quality of life,

affecting the planning and management of the city. The actions to be undertaken in the city must necessarily aim to raise the quality of life of the population from the collective, through the provision of equitable basic services of infrastructure, sanitation, etc., and from the improvement of physical-environmental aspects.

In summary, and taking into account the dimensional complexity of the concept, we consider appropriate to define that *the Quality of Urban Life, being related to the well-being of the population and its artificial-natural environment in a reciprocal process of scalar, spatial and temporal interactions, is a relative and sensitive construction that can be approached through the interpretation of a set of relatable dimensions, which can be replaceable according to the context, and therefore need to be updated, analyzed and interpreted systematically* (Discoli et al. 2016).

Consequently, addressing the issue of quality of life in cities implies considering three significant dimensions:

- the needs of the population expressed through the demands, which are represented by the objective and subjective requirements of the citizens;
- what the city offers as an offer of services and their benefits, provided in and by the built space, which is integrated by the material and immaterial resources;
- and finally, the articulation between these needs and benefits with their environmental consequences.

Each of these dimensions is a complex system of interrelated components with specific requirements and basic needs channeled by different satisfiers. These are channeled through use goods and consumption that allow to satisfy the objective needs, and that also trigger and enrich the subjective aspects. In our region, these satisfiers are not evenly distributed in society or in urban spaces. That is why to analyze the quality of urban life, it is necessary to develop a theoretical-methodological approach that combines a large part of the dimensions at stake,

involving the factors in terms of benefits and needs (supply and demand); to social actors through their opinion/perception; and to the geographical-territorial-environmental component, through its specific location.

Once the framework and the terms of reference that describe the quality of urban life have been defined, a methodology and instrumentation is designed to assess the well-being of the inhabitants and provide elements for urban-regional management that tend to improve the observed situation.

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### 18.3 Methodological Aspects

The complexity of the subject requires a flexible methodology with an interdisciplinary approach, which can be adapted to diverse contexts with an open structure that includes a great diversity of variables and dimensions. For the purpose of ordering and classifying such complexity, the structure was organized taking into account transversely the different urban components: urban services and equipment and environmental aspects, as well as their levels of integration. The urban components considered correspond to the Basic Services of Infrastructure, Sanitation, Health, Education, Administration, Commerce, Transportation; and environmental aspects are those that respond consistent with the dynamics of each of the mentioned components. This methodological proposal includes the disaggregation of territorial scales and the possibility of carrying out different analyzes in each of them. With regard to the territorial scales in this work, it refers specifically to the urban space and its immediate environment, analyzing its interactions between components and aspects mentioned above.

This methodological conception makes it possible to integrate the analysis of the territory as a scale containing smaller scales and to determine standardized quality levels for each urban system and environmental aspect. In this way, qualified information is synthesized, without losing the original one, thus making it possible to give

more accurate answers to different interventions at their different scales.

Based on the approach described, in this work an analytical-descriptive instrumentation is formulated that includes the use of a wide variety of variables and the obtaining of quality indices expressed through mathematical formulas and their behavioral maps. It worked on the concentration and systematization of information using standard databases and spreadsheets compatible with the Geographic Information System (GIS). Descriptive and analytical statistics techniques were implemented to determine the relationships between the variables determine their dimensions and calculate the weight of each component, thus identifying the dependent, independent, structural and critical variables of each subsystem.

With the formulation of the indices which describe the state of each urban aspect, behavioral maps were built, allowing the systematization of common variables and dimensions, and the integration of its behaviors in the different sectors of the city (neighborhoods, apples, etc.). The grouping and study of urban components and the integration of results by juxtaposition of layers, allow obtaining partial or total territorial maps and inferring the status of urban space and/or region, as well as their quality levels. These maps are part of a body of basic and unpublished information for each sector and urban area, which can be used in the formulation of models that express the state of situation.

Objective and subjective information is obtained from various sources (Rosenfeld 2000, 2002; Discoli 2011; Discoli et al. 2016) for which different collection instruments have been adopted and/or developed. Examples are the socio-urban-environmental surveys, whose objective was to gather information at the urban level and on smaller scales of urban services through consultation with the inhabitants-users. These surveys were built as semi-structured instruments aimed at collecting information with the characteristics of urban services, and their opinion taking into account the specific qualities of each of them. They were carried out in the residential sector considering the urban and the periphery area of the city of La Plata, taking a

total universe of analysis of 1320 dwellings from different research projects. Disaggregated areas of the city were considered in three levels of consolidation taking into account the number of dwellings and the amount of services covering the entire urbanized territory. The ranges considered for each level are: low (from 0 to 20 dwelling/Ha), medium (from 21 to 72 dwelling/Ha) and high (more than 72 dwelling/Ha).

The information processing was carried out with complementary statistical programs such as SPSS and SIMSTAT, establishing a wide variety of outputs. Different maps were generated as outputs showing the status of social, infrastructure, coverage and opinion variables. In relation to the opinion/perception, the locations of the surveys were georeferenced so that the different variables were assigned, each one, to a specific point in the territory. Those places which we did not have data, Thiessen polygons (for each variable) were used, to expand the results to the rest of the territory. The other layers were also spatialized by linking the databases with their corresponding location through a Geographical Information System (ArcGIS 9), in order to visualize in the territory the quality levels of each analyzed urban service.

Processing through SPSS and GIS allowed:

- Manage information with an important degree of detail and integrate it through the development of indexes and maps that describe the complexity of each urban component in relation to its context.
- Manage disaggregated, qualified and truthful information located geographically in the territory, which makes it possible to identify and highlight urban contrasts in terms of quality and equity, to assess demands, to determine overlays and to define inefficiencies, infer potential vulnerabilities, visualize areas of greatest concentration of contaminants, dimension mitigation scenarios, etc.

Both instrumentations were included in a common structure forming a model of levels of urban quality of life (LUQL) that includes urban services (infrastructure and sanitation),

equipment (communication and social); and urban-environmental aspects (noise, air pollution, etc.). This structure allows the incorporation and qualification of urban infrastructure by evaluating its qualities; quantify the coverage areas thereof; detect the areas affected by the different consequential disturbances (waste, pollution, etc.), and systematize the opinion of the inhabitants-users. Figure 18.1 shows the simplified structure of the model differentiating both analyzes with their corresponding levels of integration addressed.

In synthesis, the methodology and the proposed conceptual model allow to evaluate situations on the territory, as well as to determine maps guided to define and locate the parameters of the city in terms of quality. Interactions between Urban Services and Equipment ( $LUQL_{USE}$ ), whether public or private; and the consequent Urban-Environmental Aspects ( $LUQL_{UEA}$ ), directly influence the levels of quality of life of the inhabitants. In all cases, the dimensions of each aspect analyzed are assessed, their degree of coverage, opinion/perception, impacts at the urban level and the area of involvement, thus forming maps that characterize and locate the urban situation in the territory.

From this process,  $LUQL$  can be assessed and spatialized with a consolidated model instrumentation, and define homogeneous quality areas with different levels of integration within a given urban space.

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## 18.4 Universe of Analysis and Territorial Units of Application

The universe of analysis considered corresponds to the city of La Plata, Province of Buenos Aires, Argentina, representing intermediate urban centers,<sup>1</sup> with different scales and consolidations.

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<sup>1</sup> When we refer to intermediate cities, we understand them as an interaction of qualitative phenomena, where their morphological expression is characteristic of each civilization and admits quantitative expressions (Santos 1996). In these terms it is clear that the intermediate city cannot be defined only by the size of its population. As much or more important is the role and function that the city plays in its

It has a consolidated foundation town and surrounding areas of medium and low housing density. La Plata has a total population of 799,523<sup>2</sup> inhabitants, of whom most of them live in urban area. The territorial unit considered for this study is the urban block (blk). The block was used for the purpose to formulate different urban consolidation sectors, identifying three areas well defined regarding the built density and existing services. The ranges calculated of built density vary from: A = >72 dwellings/blk and with all basic services (electricity, gas, drinking water and sewer services), B = 21–72 dwellings/blk and with more than two basic services, and C = <20 dwellings/blk and with two or fewer basic services. For the study area, a total of 4144 blk were computed, of which 1260 blk correspond to high consolidation areas, and 2884 blk correspond to medium and low consolidation areas.

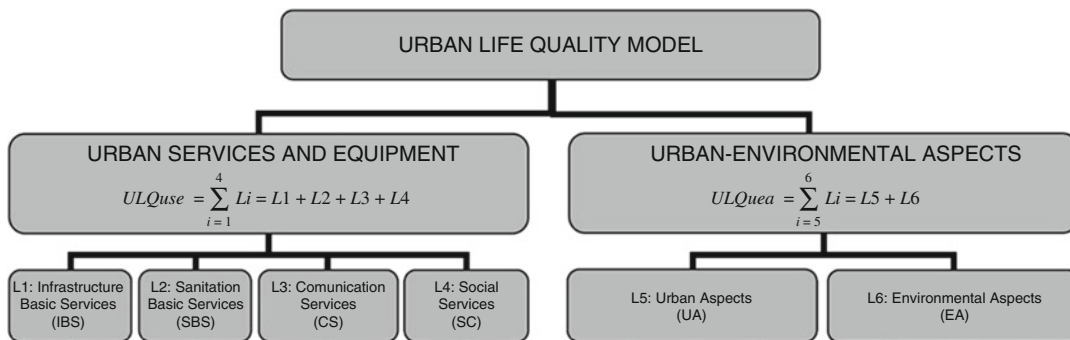
Intermediate cities, although its definition in part depend on the amount of population, they also depend on a significant level of qualitative interactions, and as Santos (1996) expresses, their morphological expression is characteristic of each civilization and admits quantitative expression. This expression depends on the socio-economic and cultural context in which the city is inserted. On the other hand, the intermediate city cannot be defined only by the size of its population (Ajuntament de Lleida 2002). Likewise or more important is the role and function that the city plays in its more or less immediate territory, the influence and relationship it applies and maintains in it; as well as the dynamics of flows and relationships generated abroad. The intermediate cities articulate the territory and function as reference centers for a more or less immediate territory.

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more or less immediate territory, the influence and relationship that it performs and maintains in this and the flows and relationships that it generates abroad. The intermediate cities articulate the territory and function as reference centers for a more or less immediate territory (Llop Torné and Usón 2012).

<sup>2</sup> Buenos Aires, La Plata. Total population by sex and masculinity index, according to age. 2010. INDEC. February 13th 2020.





**Fig. 18.1** Simplified structure of levels of urban life quality model (Source: Own elaboration)

Regarding their morphology, mixed situations coexist between the areas of less consolidation (where some services and different segments of the residential and productive sectors coexist), and the areas of greater consolidation in which basically all of the urban components converge (services, residential and tertiary sector). In this sense, the degree of consolidation is defined as a comprehensive concept that would include the urban diversity characteristic of the region. Therefore, our universe of analysis is characterized by the heterogeneity of variables, among which the structural ones related to: services in general (energy, water, sanitation, health, education, etc.) were identified with their corresponding qualities, coverage and subjective opinions; and most of the critical environmental problems, according to the urban scale considered.

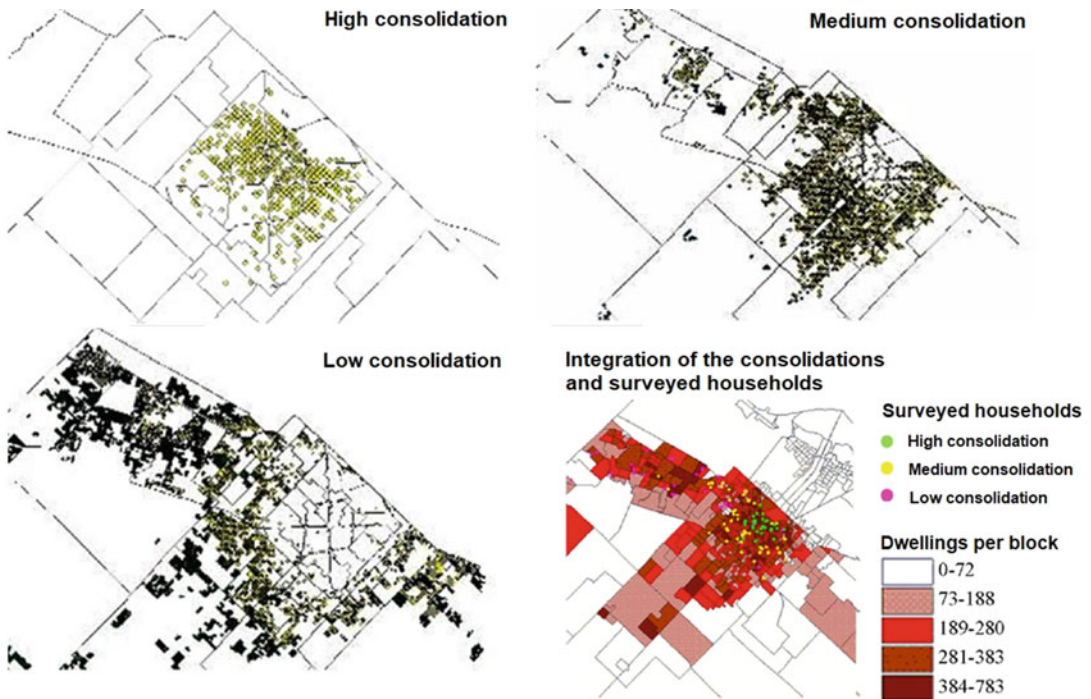
For a better visualization and interpretation of consolidation trends, maps are displayed in a disaggregated or integrated way using higher territorial units (Fraction and/or Radio Census)<sup>3</sup>. Figure 18.2 shows the maps that identify in a disaggregated way three levels of consolidation, obtaining a percentage by occupancy and type of services of each block in relation to the total blocks, and a map that integrates the three levels

<sup>3</sup> They are census units, which are part of the census survey structure, defined by a territorial space with geographical boundaries and a certain number of housing units to be relieved. Each political-administrative unit is disaggregated into fractions and each of them is also disaggregated into radios with population grouped by block and/or sectors belonging to the same area.

in a higher territorial unit (urban fractions), including the localization of the surveyed households to assess their opinions. Defined the territorial units, the following step is to develop the methodology for assessing Levels of Urban Quality of Life (LUQL).

## 18.5 Methodology for Assessing Levels of Urban Quality of Life (LUQL)

The Urban Quality of Life (LUQL) is strongly influenced by satisfaction levels that reach the collective needs and demands of different groups of population. Much of the satisfactions are related to urban supply, which are considered from the interactions of material and immaterial resources based on objective needs. Unlike other conventional models (Velázquez 2001), among the urban infrastructure and services variables have been incorporated energy and environmental variables involved in the functioning of the city, the evaluation and assessment of the urban-regional services, the opinion/perception of the users understanding them as the demand, as well as the geographical localization of each dimension. The systematization of the information has allowed studying the behavior of each variable from the interaction of a number of indicators that enable an integral evaluation. The results define differences and quality levels through georeferenced maps related to tables with numeric and alphanumeric information. The



**Fig. 18.2** Urban consolidation levels and localization of the surveyed households (Source: Own elaboration)

urban services and environmental aspects considered can be grouped into:

- Urban Services and Equipment (LUQLuse) constitute the offer, and are evaluated based on their qualities (attributes valuation), use factor (only in the case of basic infrastructure and sanitation services), and territorial coverage and the users' opinion (as a correction factor for the demand side). With the normalization of the results and the interaction of the dimensions considered, disaggregated profiles on quality levels were obtained (homogeneous areas of LUQLuse). The services considered can be grouped and summarized in the following levels of integration (Li): L1 infrastructure basic services (electricity network, natural gas network, and alternative services: electricity by generator, bottled gas, liquid fuels, firewood); L2 sanitation basic service (sewage sanitation by network, drinking water network, and alternative resources, such as soak away, ditch effluent, water by electric pump, water by manual pump) L3 communication services (transportation, railways, main roads, telephony, public telephony, and satellite TV) and L4 social services (health, education, security, firemen, garbage collection, additional resources: pluvial, lighting, green spaces, sidewalks, wooded).
- Urban Environmental Aspects (LUQLuea): For their analysis, equivalent criteria of valuation were considered (qualification of the impact, area of influence and perception) and are grouped into the following levels of integration: L5 Urban Aspects (existence of dumps, existence of precarious settlements, existence of dangerous places, flooded areas, industries or inactive residences, incompatible activities with residential use, dangerous and pathogens waste, spatial barriers, advertisements on public roads, transit risk points) and L6 Environmental Aspects (noise pollution, air pollution, soil contamination and water pollution).



As it was mentioned previously, in all cases, “L” hierarchical integration levels are adopted. Figure 18.3 summarizes the structure of the Levels of Urban Quality of Life (LUQL) model.

The result of each expression will depend on the components valuation of each formula and of the interaction of different integration levels (L). One or more services can participate according to the urban area analyzed as well as one or more environmental aspects. The achievable degree of satisfaction of the residents significantly influences the rate of LUQL. In it, objective aspects are included related to the technical, subjective and scientific evaluation of the intangible urban systems, which belong to the social constructions of socio-cultural nature.

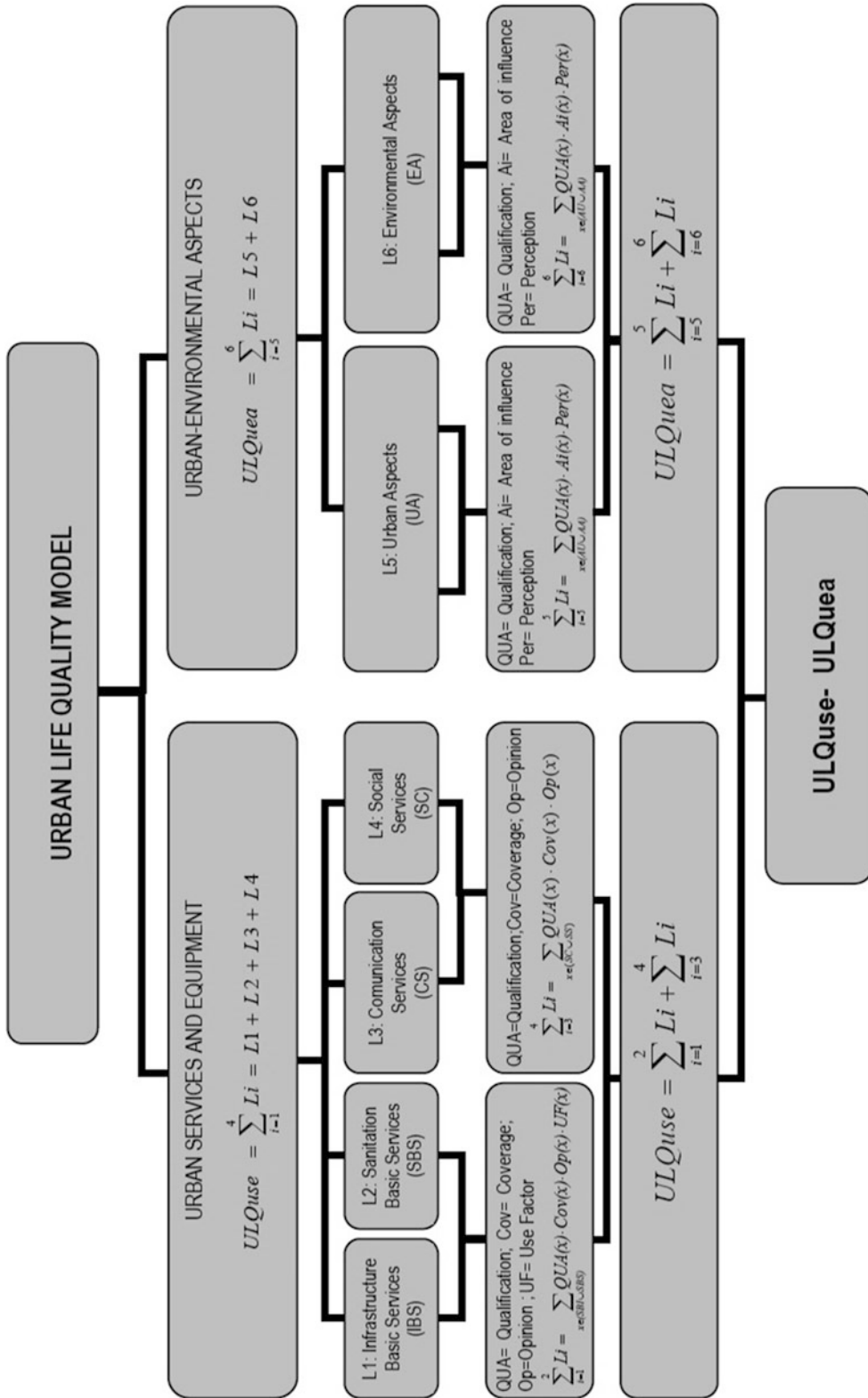
Thus the model allows: (i) evaluating and qualify each of the involved services, (ii) including its influenced geographic area, and (iii) evaluating the quality perception by the inhabitants (opinion/perception factor) in a space-time framework.

- (i) To evaluate and qualify urban services and environmental aspects a set of qualities or attributes of valuation are proposed in order to establish a mechanism of relative weights between services and/or aspects. For its weighting, optimal levels (acceptable) are defined (in the case of services), and of low impact (in the case of the environmental ones) within existing urban systems. This is those urban/environmental systems which count with safe, reliable and regular skills and do not necessarily represent the most efficient. These are the ones that in a social, urban and technology context provide the best answers to the context needs. This is those systems whose qualities cover almost all expectations. Consequently, those that meet with these requirements are used as a reference system weighting other systems within a numerical ranking between 0 and 10. The results were verified by alternative evaluation mechanisms such as fuzzy logic (by fuzzy inference system). In environmental aspects, weighting includes

environmental impact assessment and variables are qualified based on the impact intensity, the sign, its significance and temporality (Discoli 2005; Viegas et al. 2006).

- (ii) Regarding the coverage degree of the services, such as infrastructure, its coverage is considered in the territory (supply or distribution networks), and in the case of other urban services such as health or education, its existence and distribution in the territory is considered. Regarding environmental aspects, an influence area is defined from the affected area by the pathology.
- (iii) In relation to the users’ opinion and the inhabitants’ perception, the results are systematized from the declaration, identification and/or disturbance degree that they express. This information can be obtained from different tools of data collection: structured surveys, news media under different supports (written, online), citizen advocacy organizations, etc. The use of different sources or recollection tool will depend of the availability of information in each case, since each of them can be applied independently or complementary. With the obtained results maps were generated from the coverage/influence area, opinion/perception and quality of each service defining homogeneous areas.

The others components of each expression (service qualification, coverage/influence area and opinion/perception) are included, and the results are evaluated and normalized in databases with numeric and alphanumeric information (SPSS 13) and georeferenced in GIS (ArcGIS 9). The resulting maps allow identifying in the territory life quality levels for the urban components analyzed. These show different trends in relation to their urban consolidation and to the integration levels of different systems, network services, and environmental aspects. The next step is to show the resulting maps for urban services and equipment as well as urban-environmental aspects disaggregated into some significant integration levels Li.



**Fig. 18.3** Model structure (Source: Own elaboration)

## 18.6 Obtained Results

Once developed the methodology, some results of the model for different integration levels are presented.

### 18.6.1 Urban Services and Equipment: Analysis of the Opinion, Coverage and Levels of Urban Quality of Life (LUQL)

The results obtained in the application of the LUQL model in La Plata city, Argentina, are synthesized in maps where the reached levels for urban components for L1 (infrastructure) and L2 (sanitation) and its integration are registered.

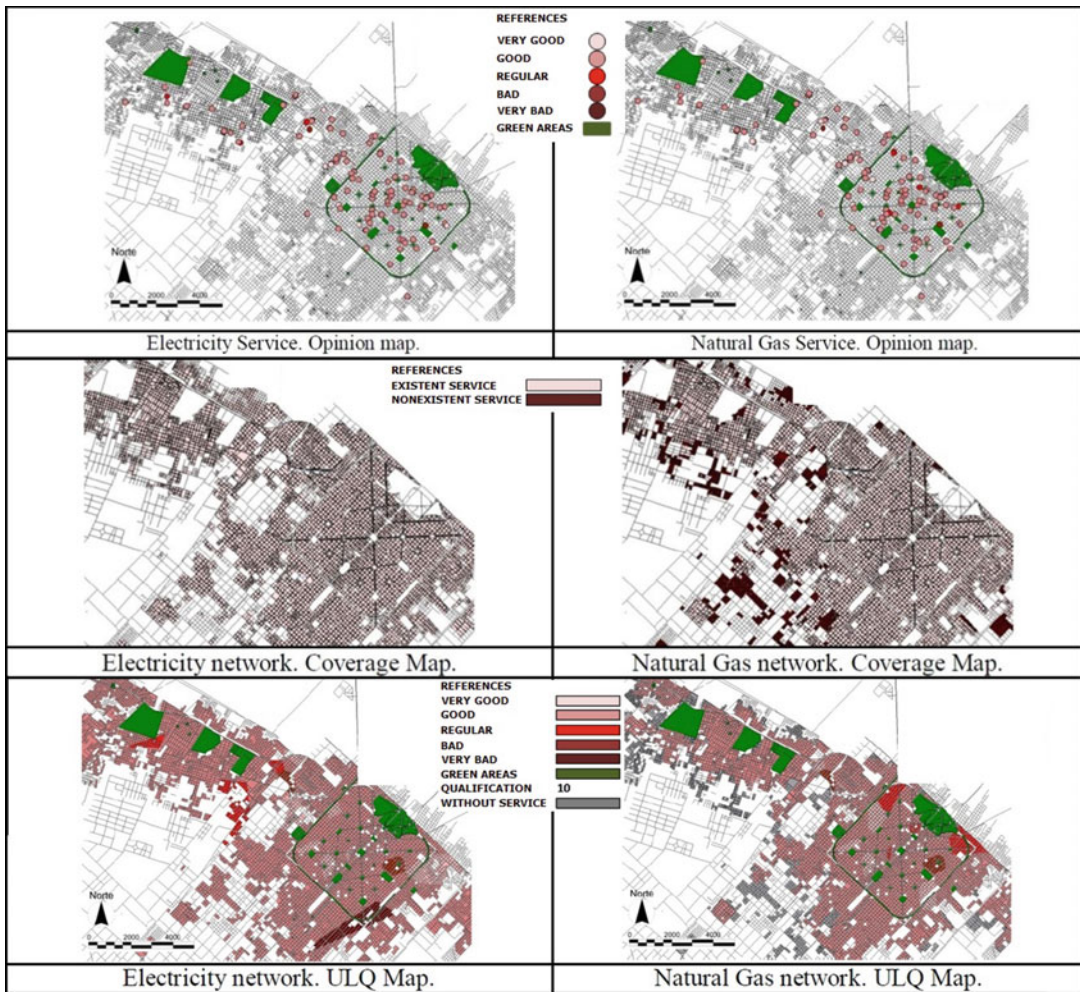
Under the urban consolidations described, disaggregated outputs are obtained from the model, for each service where the users' opinion, their coverage and the quality of each urban service are shown in a detailed and standardized way. The latter can identify on one hand, the degree of unmet needs in those maps registered with UQL lower levels, and on the other hand, through the components of the model (qualification, coverage and opinion) if the dissatisfaction is due to the lack of service (coverage), or to problems of each quality, evidenced both in the qualification as in the users opinion. In both cases the model can generate and view maps with specific data. Figure 18.4 shows an example of LUQL trends for basic infrastructure services (L1). Users opinion maps, coverage maps and LUQL maps for electricity services (EE) and natural gas network (NG) were calculated in a disaggregated way.

It is observed that LUQL of EE present some differences mainly justified by the opinion component of the model since the coverage of this service is practically 100% of the territory. The differences expressed by the opinion arise primarily from problems related to the divestment, cut off frequencies, voltage quality, etc.; mainly in those areas where distribution networks are obsolete or are in an over consumption situation. As for the natural gas (NG) services, low levels of LUQL, are observed, coinciding with smaller

consolidation areas, in particular the more peripheral locations. This service verifies areas without coverage (gray areas), in which energy substitutes vectors are used (bottled gas, solid fuel, etc.). In these cases, although the maps are not exposed in this work, LUQL become substantially worse, mainly due to the discontinuity of the services (bottled gas distribution) and because of their higher costs. For areas of higher consolidation, homogeneous areas with higher LUQL exist, although with some variations in their results, adjudging in these cases low pressure problems caused by the high population density, and problems in the offices customer service.

In the same way, other basic sanitation services (L2) were studied, such as drinking water, sewer, and social services related to health and education. Figure 18.5 shows the characteristics of each service. Less coverage is verified in drinking water with respect to sewers. In the case of drinking water, LUQL show dispersed homogeneous areas, with significant inequalities in different consolidations. In the center of the city (high and middle consolidation), despite of registering a better service, significant fragmentation are identified with significant areas of very low LUQL. This map advertises the critical situation of the drinking water service in the region, mainly caused by the obsolescence of the supply networks. The sewer service presents fewer difficulties than the drinking water service in the intermediate and high consolidations, since it is a service, which its qualities or valuation attributes register lower difficulties. As for the opinion, it expresses less conflict (except in cases of obstruction). It should be noted that it presents major inequities in urban peripheral consolidations as the lack of networks rise environmental conflicts. In a similarly way, all services are studied, respecting in each case, hierarchical levels (n) and its peculiarities (qualification, qualities, coverage and users opinions).

Using the same methodology and criteria of analysis, social services (L4) were calculated, where, in this instance, health and educational network were considered. In these cases each service has also been evaluated according to their qualities or attributes of valuation (accessibility, continuity, professionals' availability,



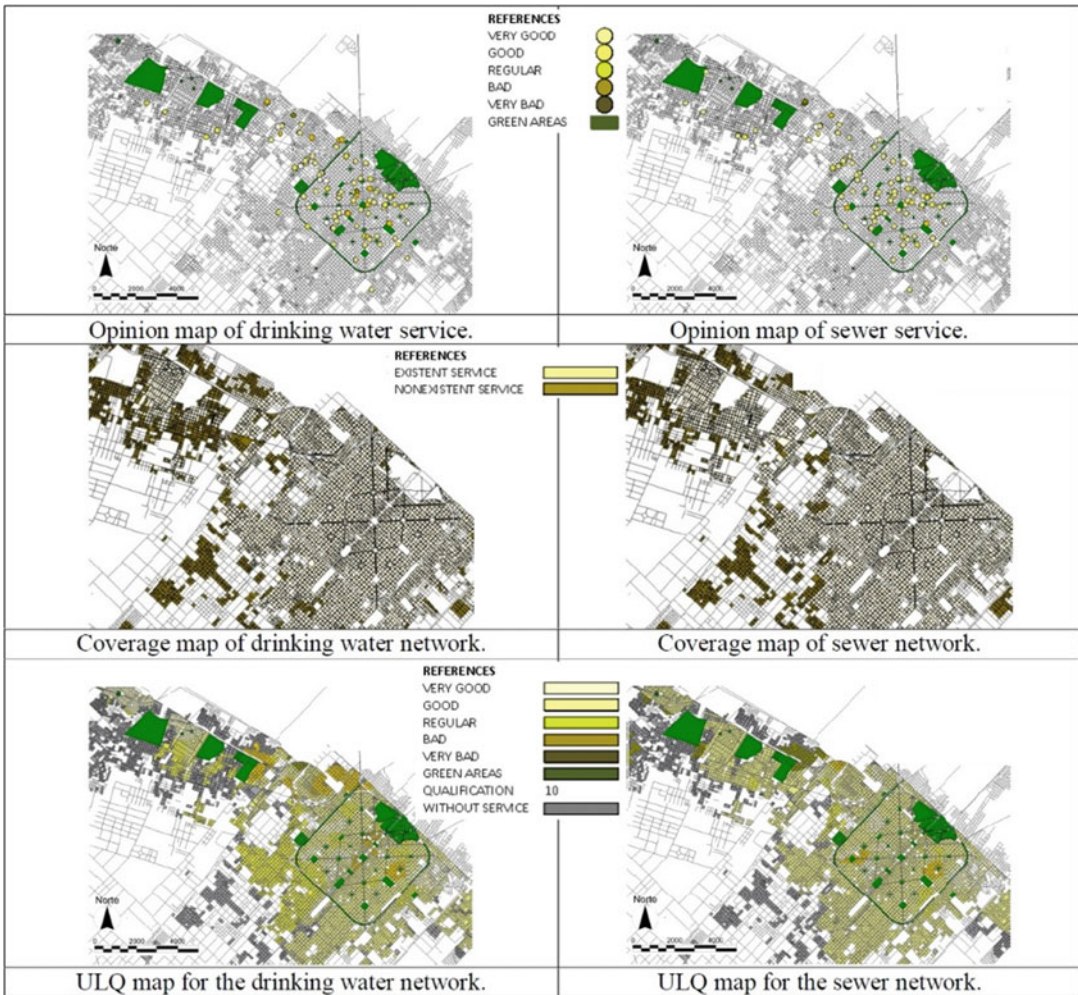
**Fig. 18.4** Trends maps for LUQL of EE and NG services, discriminated by coverage and opinion (L1) (Source: Own elaboration)

availability levels and availability of infrastructure, among others). Coverage is analyzed in terms of the following criteria: for hospitals, clinics and nursing a radius of coverage of 2000 m was adopted, and for medical units, 500 m. These distances were defined by the Ministry of Health considering the accessibility by different means. In the case of the education network, an influence radius of 300 m was considered in relation to school Criteria and Basic Architecture Standards.<sup>4</sup> As for the opinion,

maps are obtained with its location in the territory. With such information maps are defined with the LUQL results for each mentioned service, which are shown in Fig. 18.6. Some differences are observed in the territory on both networks. In the health network, weakness is attributed to the coverage, mainly on the preventive services (first aid), located primarily in areas of medium and low consolidation. And in the education network failures have been observed mainly in the opinion, admitting that despite they count with the coverage, there is some disagreement as to the quality of the service, awarded to problems of access, infrastructure, etc. in certain areas of the city.

<sup>4</sup> Criterios y normativas básicas de arquitectura escolar. Dirección Provincial de Infraestructura Escolar. Provincia de Buenos Aires, Argentina.



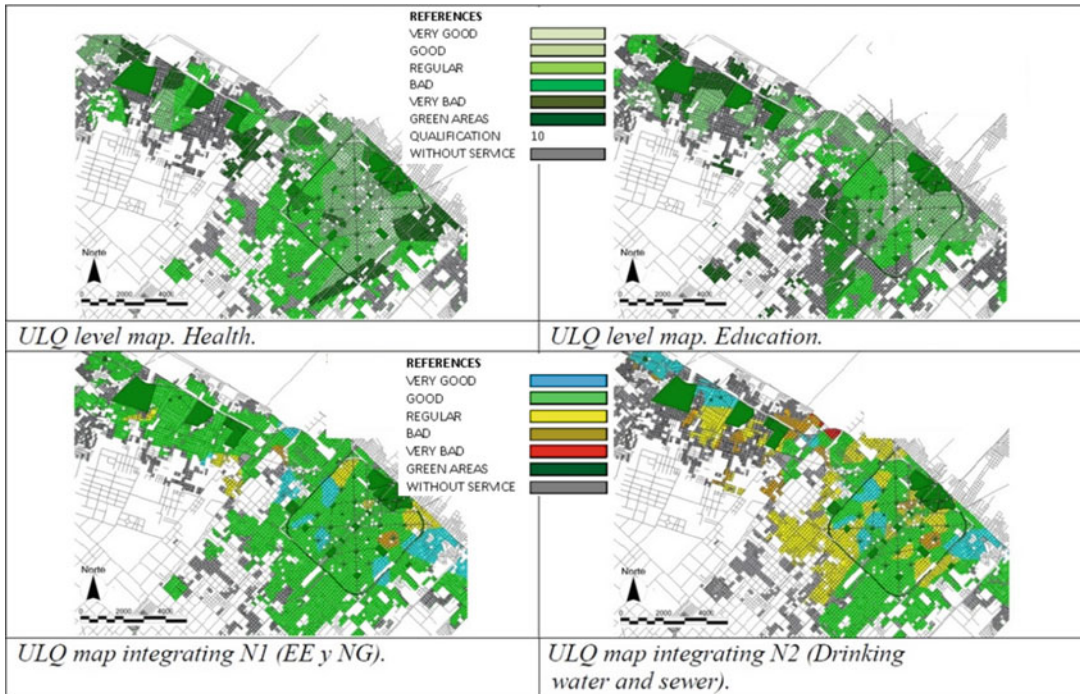


**Fig. 18.5** LUQL trend maps for drinking water and sewer discriminated by coverage and opinion (L2) (Source: Own elaboration)

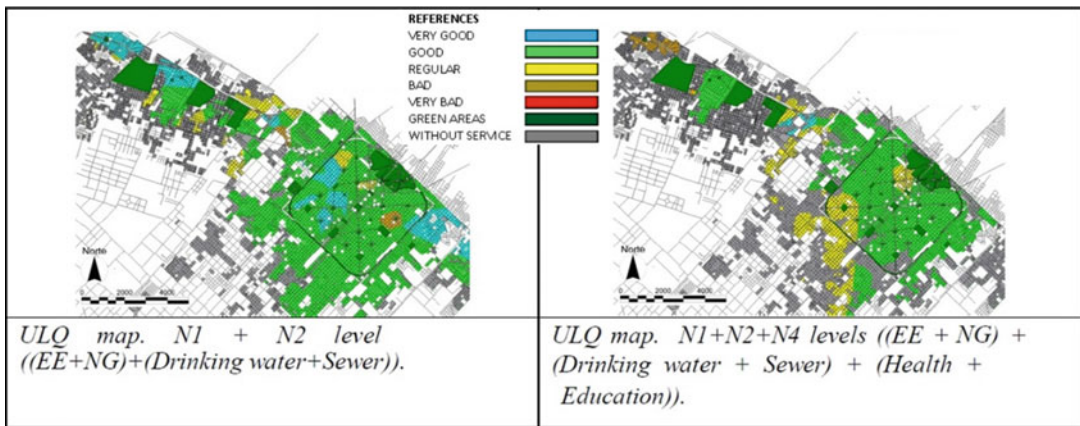
With the partial results of LUQL of the urban services and equipment, L1 levels were integrated, taking into account the different basic infrastructure services (EE, NG), and sanitation (drinking water and sewer), obtaining partial maps of LUQL for L1 and L2. It is observed that LUQL are enhanced or minimized depending on the matches or dissent of each component of the model (qualification, coverage and opinion). Figure 18.6 also shows the integrations for L1 and L2 highlighting areas which have changed the LUQL based on the juxtaposition in each level and results. Areas with improvement trends and others that maintain their situation are observed.

In a new integration, the basic infrastructure services and of sanitation calculated were grouped in a single map, making juxtaposition between levels, and providing LUQL maps for L1 + L2. Figure 18.7 shows the output map of the model, in which large areas with good LUQL are identified, specific sectors with regular and bad levels, and those sectors that do not count with the coverage. As we have already mentioned, the service's overlay allow visualizing those areas in which good performances or problems are juxtaposed, generally evidenced by the general opinion of users. The irregularities in areas of highest consolidation have to do with the obsolescence of some services, while in the peripheral





**Fig. 18.6** LUQL. Health map; LUQL. Education map; LUQL integrating L1 (EE y NG) map; LUQL integrating L2 (drinking water and sewer) map (Source: Own elaboration)



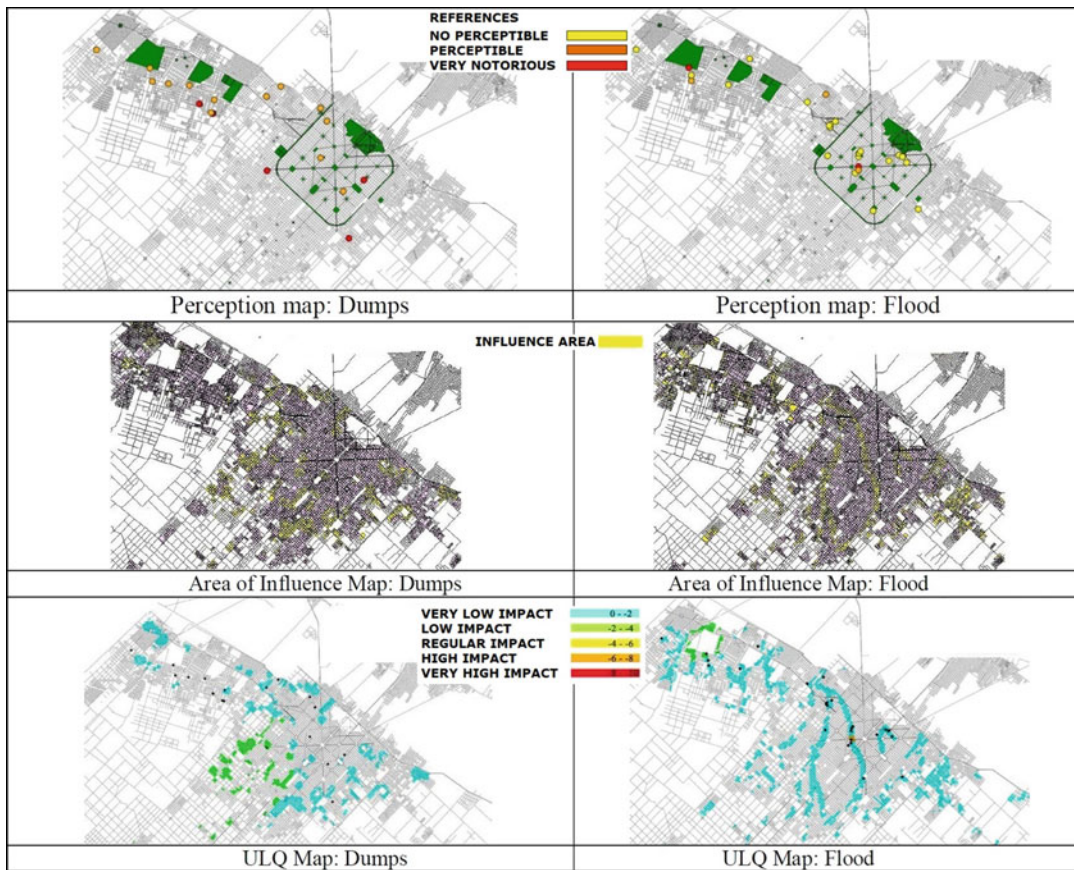
**Fig. 18.7** (a) LUQL map. L1 + L2 ((EE + NG) + (drinking water + sewer)). (b) LUQL map. L1 + L2 + L4 ((EE + NG) + (drinking water + sewer) + (health + education)) (Source: Own elaboration)

sectors we can find unforeseen growth with problems related to divestments (generally, exceeded coverage demand).

Continuing with the integration process and under the same criteria, social services (L4) were considered, in which health and education network were included. Figure 18.7 shows

social services integration representing in the map the LUQL results for L1 + L2 + L4; LUQL map. L1 + L2 ((EE + NG) + (drinking water + sewer)).

It is noted that in the integration process some urban areas modify its results in relation to the LUQL incorporated. They can improve or worsen, but quality displacements are observed in the urban



**Fig. 18.8** Trend maps of LUQL for dumps and flood, disaggregated by perception and area of influence (Source: Own elaboration)

area and greater inequities in the periphery. This shows that the incorporated sectors (health and education) are strengthened in terms of good quality in higher consolidations and failures occur in remote areas, defining more precisely the areas with unmet needs. We also have to keep in mind that different LUQL areas are indicative, whose boundaries depend on the precision level and location of the base information.

### 18.6.2 Urban-Environmental Aspects: Analysis of the Perception, Area of Influence and Levels of Urban Quality of Life

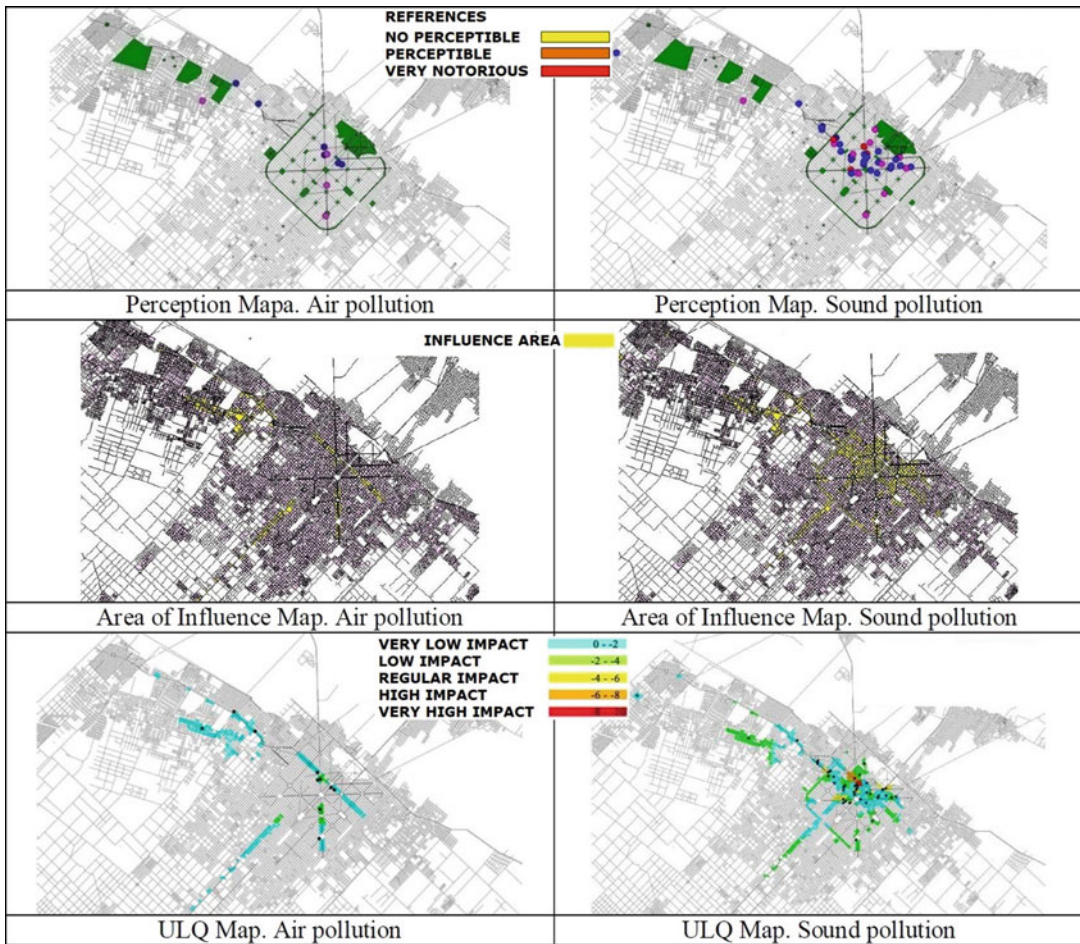
To study Urban-Environmental Aspects and to quantify the quality index (LUQL<sub>uea</sub>), various pathologies are evaluated and the evaluation

criteria are applied stated in the general methodology (impact qualification, area of influence and perception, see Fig. 18.2). In this case, integration levels correspond to L5 which include Urban Aspects (dumps, among others already mentioned) and L6 covering environmental aspects (noise pollution, air pollution, soil contamination and water pollution). Just as in urban services and equipment, the participation of one or more of them will determine the characteristics of the urban area under study.

To obtain LUQL<sub>uea</sub> index, each pathology is affected by the following indicators:

- (i) Qualification (QUA): it is evaluated from the study of decision matrices. For each pathology, the impact intensity, the sign, its significance and temporality was analyzed (Viegas et al. 2006; Discoli 2005). Figure 18.8 shows





**Fig. 18.9** Trend maps of LUQL. Air and sound pollution, disaggregated by area of influence (L6) (Source: Own elaboration)

trend maps of LUQL for dumps and flood, disaggregated by perception and area of influence (L5).

- (ii) Area of Influence (Ai): it is dimensioned from the affected area of each pathology.
- (iii) Perception (Perc): it is evaluated from the identification degree and/or disturbance of each pathology expressed by the inhabitants. Figure 18.8 shows an example of the results obtained in terms of qualification, perception, and area of influence and LUQL for urban aspects (L5). They were calculated in a disaggregated way for Dumps and Flood.

In relation to the obtained LUQL, the maps identify the balance of the environmental aspects

in the territory. Different responses are identified in relation to the origin and type of pathology, and of different sensitivities of the habitants regarding their perception. In this case, for example in Dumps, the origin and type of waste respond to low impact urban waste (organic and inorganic), with a low level of perception. In this particular case the methodology considers it necessary to count with an opinion against test or contrast (qualified person) as it is verified in the inhabitants certain level of adaptation to the pathology, situation that leads to reduce its perception.

In the case of flood areas, watersheds and natural drainage of the region are analyzed, noting that some of them are piped mainly in the

urban area. To assess the affected areas, a risk map, determined by the CISAUA (2006), was considered which is overlaid on the urban map with differentiated urban sectors (residential, education, health, etc.) delimiting for its assessment the risk areas according to hydric height, affected habitants and perception in relation to the sector (Discoli et al. 2007, 2008).

With regard to the environmental aspects (L6), noise pollution problems and air quality affected by the emissions from the public and private transportation system have been evaluated. For its assessment, gases concentrations were analyzed those that are emitted in transport corridors and distributed in residential areas. Regarding to its perception, habitants are surveyed in different areas of the city.

Figure 18.9 shows that Air Pollution is observed throughout the region, but the morphological and hygienic characteristics of La Plata significantly reduce its impact. Which shows a greater diversity of responses is Noise pollution, since they are very present in the most affected areas. These results justify the need for deepening in the aspects related to the perception, since there is a significant interest in the calculation method and in the sensitivity of the results.

It is also observed in this case, that the LUQL are enhanced or reduced depending on the matches or dissent of each component of the model (Qualification, Area of Influence and Perception).

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## 18.7 Conclusions

The Urban Quality of Life Model integrates a wide set of aspects and variables, and allows assessing quality in terms of the different sectors of the city. This will allow identifying homogeneous areas with satisfactions and dissatisfactions regarding basic needs in infrastructure, services and environmental quality.

Assessing the quality of urban services and equipment and of the urban-environmental aspects with the Urban Quality of Life Model, has allowed us to qualify and quantify the results with an acceptable approximation to the reality. This methodology provides necessary

information for the evaluation of actions in each urban intervention, thus establishing the basis for defining Levels of Urban Quality of Life. Areas with inequalities provide relevant information required to establish new mitigation scenarios in each vulnerable area.

The results obtained show significant sensitivity to the conformation of homogeneous areas descriptive of each situation. These can be analyzed in a disaggregated way, considering the detailed information of the different components of the model (qualification, coverage/area of influence and opinion/perception), in order to establish the causes of each situation.

In summary, the results obtained show a significant sensitivity from the diversity of the evaluated variables. The values warn, in relative terms, significant differences, demonstrating the reality of each situation.

To count with indexes of Levels of Urban Quality of Life (LUQL) and its geographic location, allows evaluating qualitatively and quantitatively the basic needs of the habitants. Incorporating a set of dimensions to the LUQL model, that constitute important components of everyday and future life of a city, allows analyzing and evaluating the current situation in order to consider the possible actions for situation problems and future planning.

It is clear that LUQL show significant sensitivity to the peculiarities of each urban service and to its consequent environmental aspects. It is also clear that from the territorial aspects, strong contrasts are identified, very permeable to the type of offer localized in each sector (referring to the technological and coverage circumstances of urban services in general), to the expectations of demand expressed through the opinion/perception, and to the environmental consequences caused by this interaction.

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