

## **Compact city versus diffuse city: Their implications in the urban life quality and the sustainability**

### **1- Introduction**

At the present time cities have become the epicenter of lifestyle changes, because of being catalyst spaces of the contemporary culture, in relation to the technological advances and the social changes. In consequence it is necessary to develop tools that facilitate the visualization of the well-being state in which the inhabitants of the cities are. They should also be sensitive to their diversity. We mainly refer to our cities with important imbalance tendencies among what is defined as compact city and diffuse city. This is a difficult process since different dimensions are conjugated in the mechanisms process determination that qualify and quantify the Urban Life Quality (ULQ). All planning process and management should have as objective, to minimize these imbalances and to ensure good quality levels of the population's life establishing certain equity as for: i. to consider good homogeneity levels in the different regional urban services; ii. to assure population's needs: socio-economic, education, health, housing and basic services, recreation, personal security, and iii. to minimize the physical-environmental impacts in order to preserve and/or to reestablish the harmony environment-society in a considered city.

In the Argentina, during the last three decades of the XX century, the main urban areas were subjected to socioeconomic policies of the neo-liberal calendar that polarized the economic, social and territorial fragmentation. Based on that challenge the planners had scarce tools that reflected the situation and the urban areas perception from the citizenship.

In consequence the works developed by our research group is focused in the development of a methodology and a model which interprets and integrates the aspects that interact in the urban life quality concept of their inhabitants' as for the urban-environmental systems, the critical resources and the environment. The reference projects that enabled the developments correspond to "Diagnostic systems of infrastructures, services and environmental quality basic needs, at an urban-regional scale." (Discoli C. 2006/08) and "Life Quality Model, diagnostic of infrastructures, services and environmental quality basic needs." (Discoli C. 2008/10).

The Model allowed to analyze the demands related with the basic services and urban infrastructure as well as the urban-buildings systems and the surroundings environmental condition. It also enables to give answer to the project objectives, among those we can mention: i. to study the urban-environmental life quality (ULQ) in a local and regional scale; ii. to integrate the knowledge of the urban systems and the environmental consequences of their dynamics, considering the energy infrastructure services network, sanitation services, their coverings and the users opinions; iii. to elaborate indicators and indexes which enable to measure in a quality and social equity terms. iv. to visualize and to analyze the quality, equity and sustainability implication in the compact and diffuse city contexts.

Our work was based on a multidimensional model whose methodology has been exposed in different scientific and academic ambits (Rosenfeld E. et al. 2001), (Rosenfeld E. et al. 2002), (Discoli C. 2006).

The considered analysis universe corresponds to urban centers of half complexity in its different scales and consolidations, and in particular it was adopted as a case study La Plata City, Capital of Buenos Aires, first Argentinean state. It is conformed by a consolidated urban central area and a suburb of low residence density, with a total population that overcomes the 650.000 inhabitants.

We consider that the importance in the determination of the ULQ in urban sectors is actually based on the definition of a theoretical-methodological approach that can combine the offer/demand factors, the involved social actors and the geographical-territorial component. Their interaction in relation to the empiric developments based on models and indicators allow us to evaluate the needs satisfaction levels between the compact and the diffuse city, as well as to compare homologous situations. From this conceptual framework we consider convenient to delineate some aspects of the ULQ model implemented.

## 2- Model structure

The model evaluates ULQ levels taking into account the satisfaction level that reach the needs and demands of the different population groups associated to the territory, sustained in the relationship among different actors. The offer integrates on one hand the Urban and Equipment Services (ULQues) in its different management levels, public or private, at a National, Provincial or Municipal scale evaluated from its qualification, covering and the users' opinion. For the other side, we analyze the balance among the Urban-environmental aspects (ULQuea), as they influence directly on the quality concept. (Ainstein L. et al, 2000). They are studied taking into account their qualification, their influence area and the perception. (Figure 1). "n" hierarchical levels of integration are adopted, which discriminate the information corresponding to: n1 = Infrastructure Services; n2 = Sanitation Service; n3 = Communication Services; n4 = Social Services which integrate the Urban and Equipment Services, and, n5 = urban aspects; n6 = environmental aspects which integrate the urban-environmental Aspects.



Figure 1: Structure of the model

The quantification of the ULQ indexes of each service is carried out considering the components interaction in which one or more integration levels can participate ( $n_i$ ). From the characteristics of the studied urban area, the existent homogeneity degree can be visualized for each urban service analyzed. The exposed results show different ULQ levels obtained in the region under study. Important differences can be identified between the compact city and the diffuse one, and in its own area.

## 3- Obtained results

The services considered for this work correspond to the energy services distribution, electric power and natural gas, both distributed by networks; the main sanitation service are drinkable water and sewers; the complementary services are health and education. As for the environmental aspects, problems related to floods and to urban air quality in the main corridors of the transport are considered.

With regard to the electric power service distributed by network, if we compare the compact city with the diffuse city, the model verifies in figure 2 different ULQ levels. Chart 1 synthesizes in percentage values the obtained results.

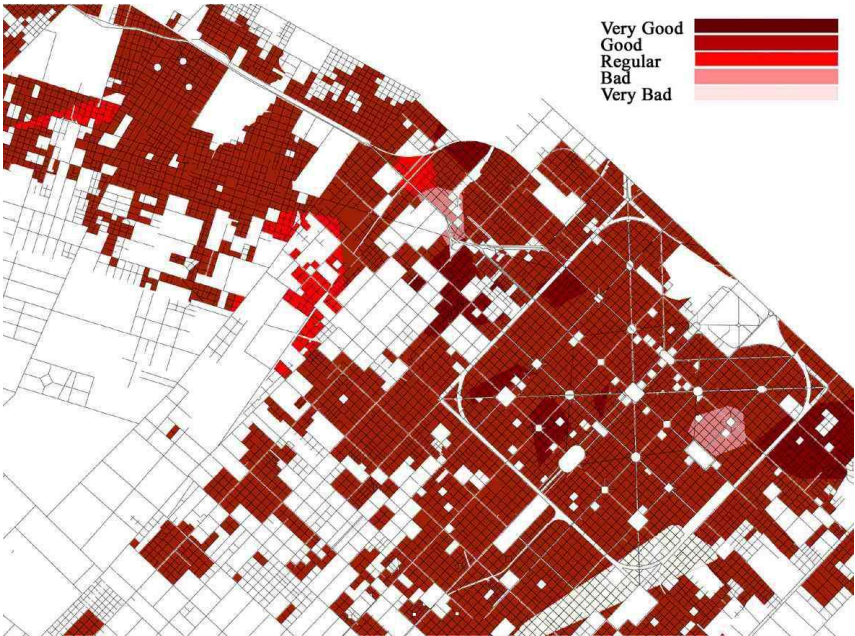


Figure 2. ULQ levels of the Electric power service

Compact City	ULQ Levels %	Diffuse City	ULQ Levels %
Very Good/Good	95	Very Good/Good	89
Bad/Very bad	5	Bad/Very bad	11

Table 1. Percentages values of ULQ levels for Compact City and Diffuse City. Ep service.

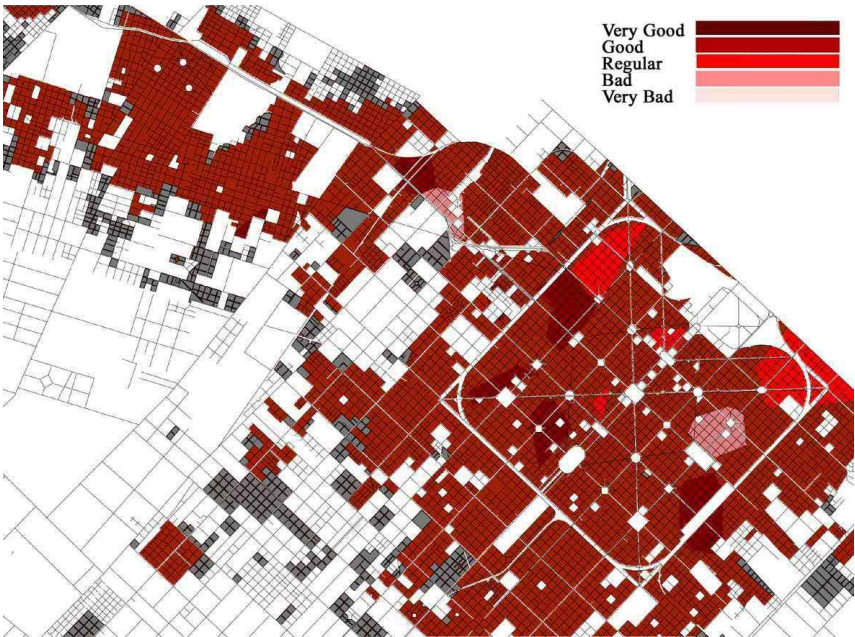


Figure 3. ULQ Levels. Natural Gas service.

Compact City	ULQ Levels %	Diffuse City	ULQ Levels %
Very Good/Good	88	Very Good/Good	98
Bad/Very bad	12	Bad/Very bad	0.4
		Without Service	1.6

Table 2. Percentages values of ULQ levels for Compact City and Diffuse City. NG service.



In general, relatively homogeneous values are verified with important differences in some very outlying places. This homogeneity situation responds to a total covering of the service, being verified a less quality in the diffuse city sectors, particularly in the more distant areas effects of "end line", and in some sectors with demands not foreseen for the installed capacity.

As for the natural gas service by network, figure 3 shows different ULQ levels. The percentages are shown in chart 2.

In this service a smaller ULQ level is verified in the compact city with regard to the diffuse one. This situation is justified by the obsolescence of the original network in the urban area, generating low pressure and cuts off situations in function of its vulnerability. As for the diffuse city the contrast is observed fundamentally among those that have the service, with modern technology and infrastructure, assuring in general a good service and those users without service located in the most outlying sectors. Differences inferior to 10% ULQ levels are verified in the compact city.

Figure 4 shows Drinkable Water Service ULQ values and Chart 3 visualizes the results in percentages.



Figure 4. ULQ Levels. Drinking water service.

Compact City	ULQ Levels %	Diffuse City	ULQ Levels %
Very Good/Good	88	Very Good/Good	42
Bad/Very bad	18	Bad/Very bad	15
		Without Service	35
<b>Table 3. Percentages values of ULQ levels for Compact City and Diffuse City. Drinking water service.</b>			

In this service a great difference is observed between the compact city and the diffuse city. In the urban area a total covering is observed with an affected area with low ULQ level equivalent to 18%. In the diffuse city a great inequality is observed with a 42% of the affected area with good service, 15% with a regular service and a significant area without services that corresponds to 35% of the diffuse city total area. This situation forces the users to use substitutes systems like pumping with an irregular quality.

In the case of Sewers Service, different CVU values are verified; figure 5 and chart 4 show the results.



Figure 5. ULQ Levels. Sewer service.

Compact City	ULQ Levels %	Diffuse City	ULQ Levels %
Very Good/Good	90	Very Good/Good	86
Bad/Very bad	10	Bad/Very bad	4.1
		Without Service	9.9
<b>Table 4. Percentages values of ULQ levels for Compact City and Diffuse City. Sewer service.</b>			

This service registers minimum differences in the ULQ levels if exclusively covering areas are analyzed. In spite of the undertakings carried out by the commune, the service has non covered areas in the diffuse city equivalent to 9.9%, showing a significant difference with the drinkable water system. A policy guided to minimize the polluted underground sheet of water is evidenced since the commune at this time uses pumping systems to cover practically 50% of the provision of drinkable water. In spite of the efforts, a significant area of the diffuse city still exists which is not covered by the network service.

With regard to the complementary services, health and education services were evaluated. In the case of the health Service, figure 6 and chart 5 visualize the results.

In this service an important ULQ level prevails in the compact city, situation that is justified for the existence of a significant high complexity hospitals network of a regional covering. With regard to the diffuse city a very different map is appreciated, being significative the low quality and the reduced covering of the service. For the low complexity buildings, characteristic of the most outlying areas, a covering radius of 1500m (15 blocks) was considered. This is due to that it is considered that in the most outlying areas the accessibility decreases significantly because of the lack of convenient accesses and near public transportation.

In the case of the Education Service, the compact city shows better values that the diffuse one. In particular it is detected that in the diffuse city the lowest levels are very significant. Figure 7 and chart 6 show the results.





Figure 6. ULQ Levels. Health service.

Compact City	ULQ Levels %	Diffuse City	ULQ Levels %
Very Good/Good	85	Very Good/Good	11
Bad/Very bad	15	Bad/Very bad	35
		Without service	54

Table 5. Percentages values of ULQ levels for Compact City and Diffuse City. Health service.

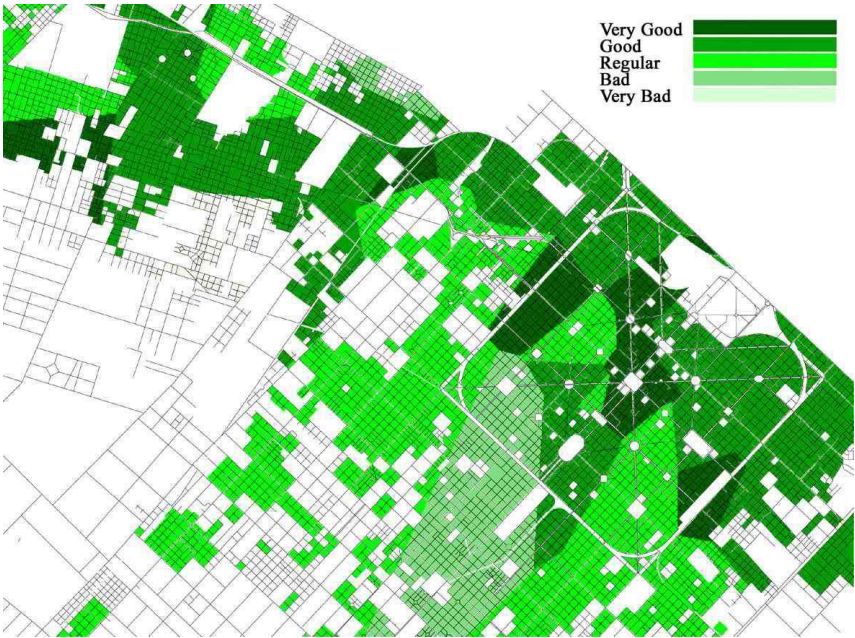


Figure 7. ULQ Levels. Education service.

Compact City	ULQ Levels %	Diffuse City	ULQ Levels %
Very Good/Good	68	Very Good/Good	44
Bad/Very bad	32	Bad/Very bad	56

Table 6. Percentages values of ULQ levels for Compact City and Diffuse City. Education service.

A better ULQ level is observed in the compact city, but an important covering area is appreciated with low quality services. With regard to the diffuse city, inferior levels are observed justified by less accessibility to the buildings. In both cases, the low quality level verifies the depreciation suffered by the Public Education in the last three decades.

With regard to the environmental aspects, we fundamentally worked with floods problems and air quality affected by the emissions of the passengers public transport system and the private users.

In the case of the flood areas, we worked on the natural drainages basins of the region, stressing that some of them are tubed mainly in the urban area. Figure 8 and chart 7 show that the Qualification (QUAL) levels of the region are mainly of low impact. This is because there are not enough samples to consider the opinion of the inhabitants.

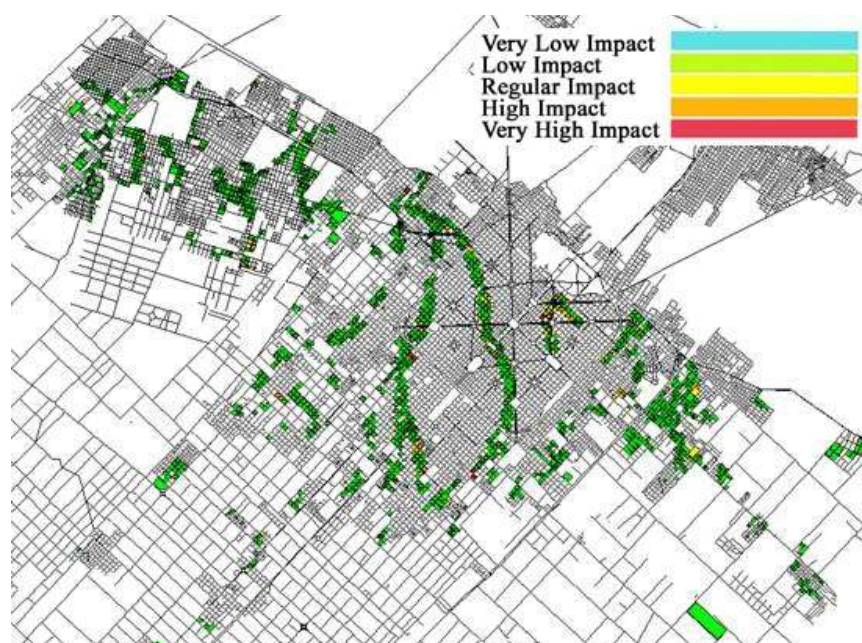


Figure 8. ULQ Levels. Flood.

Compact City	QUAL Levels %	Diffuse City	QUAL Levels %
Low Impact	11.2	Low Impact	29
High Impact	2.3	High Impact	1.6
13.5		30.6	

Table 7 Percentages values of QUAL levels for Compact City and Diffuse City. Flood.

We can observe significant QUAL levels of urban flood in the compact city. The registered values (13,5%) are located in main urban areas with a significant quantity of affected inhabitants. The registered levels in the diffuse city are high and correspond to areas near water courses. In this case the inhabitants affected are not so much as it is a low populational density area.

Lastly, if we analyze the Air Quality results, an inverse situation is observed to the previous pathology. Figure 9 and chart 8 show the QUAL percentages.

In this case a significant imbalance is observed in the main urban corridors of the compact city with high concentration areas in the central areas and in the main squares. In the diffuse city a smaller impact is observed in the air quality and in consequence a better QUAL level. Both pathologies show reasonable QUAL quality levels.



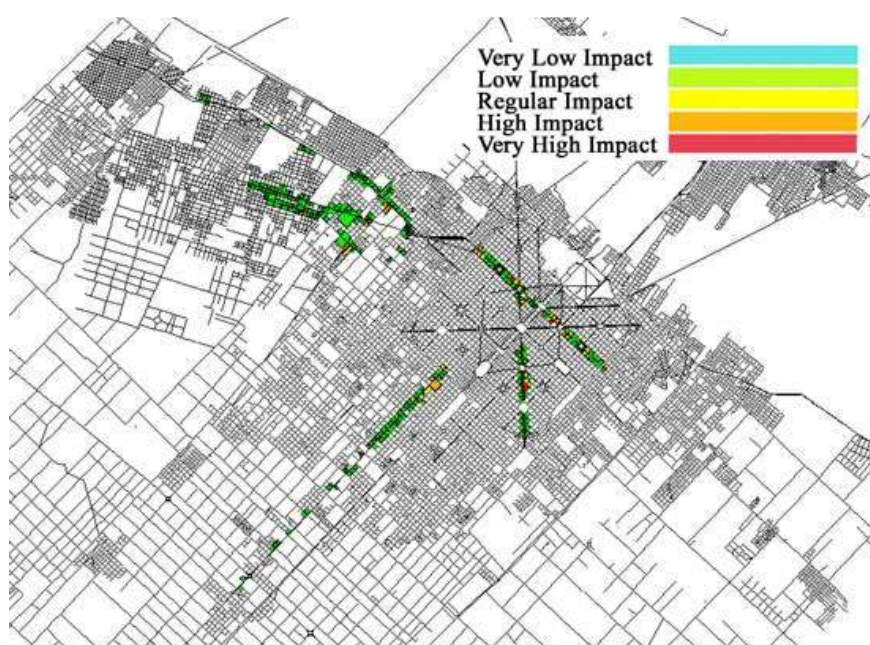


Figure 9. ULQ Levels. Air Quality.

Compact City	QUAL Levels %		Diffuse City	QUAL Levels %	
Low Impact	13	15.6	Low Impact	4.7	4.8
High Impact	2.6		High Impact	0.07	
Table 8. Percentages values of ULQ levels for Compact City and Diffuse City. Air Quality.					

#### 4- Conclusion

If all the considered urban services are observed, the Compact City show ULQ levels superior to the Diffuse City. As for the environmental aspects an inverse situation is observed.

The energy services in general show high ULQ levels with marginal particularities associated to the covering, to the most distant localizations and problems of obsolete technologies in the case of the gas network of the compact city.

The sanitation services verify important differences among the drinkable water and sewers network. In the case of the first one, the compact city duplicates the ULQ levels, while in the diffuse city a vast area exists without covering and with very low ULQ levels. In the case of sewers a bigger balance exists based in the municipality strategy of minimizing the underground sheet of water pollution by cesspool.

With regard to the complementary health and education services, significant differences exist between the compact city and the diffuse city, marking a regression in the quality of these public services in consonance with the policies carried out in the last three decades.

In some cases the services covering is very significant, as the natural gas network in the compact city sector, but its obsolescence is the main causing of the low ULQ levels registered.



It is clear that the compact city gives to the infrastructure and complementary basic services a bigger life quality than the diffuse one, verifying in the territory the inattention degree of the services from the center to the periphery.

In the case of the environmental aspects, the QUAL levels registered for floods, in spite of not being very high for the compact city, are significant if we consider the population density that characterizes them. With regard to the diffuse city the affected areas are bigger, but in affected absolute population's terms they are smaller because of being areas with less density. As for the air quality levels, a similar situation is observed. In consequence, the environmental QUAL levels register inverse results to the other services. This situation shows the different logical contrasts between the compact city characteristics and the diffuse one.

## 5- Reference

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