



Journal of Urban and Environmental
Engineering

E-ISSN: 1982-3932

celso@ct.ufpb.br

Universidade Federal da Paraíba
Brasil

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Journal of Urban and Environmental Engineering, vol. 4, núm. 2, julio-diciembre, 2010, pp. 63-73

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ANALYSIS OF NEIGHBORHOOD IMPACTS ARISING FROM IMPLEMENTATION OF SUPERMARKETS IN CITY OF SÃO CARLOS

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Received 18 March 2010; received in revised form 27 October 2010; accepted 16 November 2010

Abstract:

The study included supermarkets of different sizes (small, medium and large - defined based on the area occupied by the project and volume of activity) located in São Carlos (São Paulo state, Brazil) to evaluate the influence of the size of the project impacts neighborhood generated by these supermarkets. It was considered the influence of factors like the location of enterprises, size of the building, and areas of influence contribute to the increased population density and change of use of buildings since it was post-deployment analysis. The relationship between the variables of the spatial impacts was made possible by the use of geographic information system. It was noted that the legislation does not have suitable conditions to guide the studies of urban impacts due to the complex integration between the urban and impacting components.

Keywords: Urban planning, Law 10257/2001, neighborhood impacts, supermarket cluster

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INTRODUCTION

São Carlos is a Brazilian municipality located in the state of São Paulo, near its geographic center and in a distance of 231 km from the state capital. With a population of around 220 463 inhabitants (IBGE, 2009), distributed a total area of 1 141 km², is the 14th largest city in the state in number of residents. The city is an important regional center, with the economy based on industrial and agricultural activities (in this sector, there is the production of sugarcane, oranges, milk and chicken).

Served by a several bus and rail systems, São Carlos has units of production of some multinational companies, among them Volkswagen, Faber-Castell, Electrolux, Husqvarna and Tecumseh and some units of domestic companies, among which Toalhas São Carlos, Tapetes São Carlos, Papel São Carlos, Brazil Prominas, Cardinali, Opto Electronics and Latina.

In the light of local needs, and in certain aspects, regional, the city has a network of trade and services distributed in high street shops, gas stations convenience, several supermarket chains and a shopping center of Iguatemi group. In the field of research, they present the Federal University of São Carlos (UFSCar) and the University of São Paulo (USP), also are present in the city two centers of technical development at Embrapa.

Despite these qualifications, the occupation of urban space took place in a disorderly way, due to high population growth and the absence of laws to propose a direction to the use and occupation. The result can be seen in the segregation experienced by the population and the ineffectiveness of urban infrastructure for subsequent deployment of large buildings without the proper review within the current legal parameters.

According Lollo (2006), since the adoption of the Neighborhood Impact Study as a tool for urban management by the City Statute, the technical means has an instrument whose purpose is to analyze the behavior of high density, however, the fact there is an administrative mechanism of this magnitude, does not represent a significant advance in public administration since there is no standardized evaluation system for such analysis and the means are not known for the correct application of such instruments.

Molina (2008) states that the City Statute is subject to many discussions of how to apply the study of neighborhood impacts and what requirements that should be considered for the analysis of impacts, since this document is of recent creation. It is emphasized that the proposition and use of instruments of control and supervision of urban densification activity in Brazil is

typical of a certain size of cities (especially capitals and major cities within the states), while in small and medium cities, such instruments do not exist or are not applied.

The Neighborhood Impact Study has been practiced by most government (Molina, 2008) to indicate the developments of greatest potential impact on the dimensions of these, but is overlooked aspects which relate to the use and occupation of land, traffic generation and urban planning.

In view of this, this study addressed the urban impacts arising from Neighborhood Impact Study post-deployment supermarket which fit this grouping, (Decree n. 19.915/98 *apud* Lindau *et al.*, 2009), in the municipality of São Carlos and propose strategies to support impact assessments of the neighborhood.

For this, we used the methodology developed by Lollo (2006) which produced an impact study of neighborhood in the same region whose focus was on business information technology. It was based on the parameters required by Federal Law 10.257/2001, reporting and questionnaires to standardize the quantification of variables that had more than one interpretation.

THE NEIGHBORHOOD IMPACT STUDY (NIS)

The Neighborhood Impact Study under the City Statute guarantees the negotiation between the private interests of entrepreneurs and the right to urban environmental quality of city residents, especially those who live and travel in the vicinity of the project under study.

The NIS, when established in the Organic Law of Municipalities, provides for the participation of society in the analysis of each new development to be built, thereby exercising democracy and inclusion of local communities that participate in the decisions of what is best for their city. Some authors such as Leão-Aguiar *et al.* (2005, p. 2) argue that “the charge required for the preparation of the NIS, fills an important gap in the legislation, with regard to buildings or activities that damage the local environment”.

Urban growth has increased demand and need for new jobs, housing options public transportation and pollution control, as well as the provision of basic services like water, sanitation, education and health. Regarding the social content, urban growth contributed with the intensification of segregation since the inhabitants, according to Gregori (2004, p. 6) “are forced to live in poor neighborhoods of large cities, which have given the poor quality of life in cities, and directly contributed to environmental degradation and increasing poverty in urban society”.

It is noteworthy that the Statute, the collective interest should prevail over the use of private property (Brazil, 2001). With regard to the social function of the city and urban property, people's participation in the public interest, must ensure democratic management and equitable distribution of benefits and burdens resulting from the urbanization process.

Since the population should have access to intervention, it must be aware about the recovery of public investment that provided the valuation of urban property and appropriateness of economic policy instruments, tax and financial public spending on development urban to reach the goals.

The aim of the Neighborhood Impact Study is to democratize the system for making decisions on major projects to be undertaken in the city, listening to neighborhoods and communities that are exposed to the impacts of large ventures.

The Art. 36 of the City Statute (Brazil, 2001) states that "the bylaws must include criteria to define which constructions depend of a previous neighborhood impact study as a condition for approval. These criteria may vary depending on the characteristics and urban infrastructure of the municipality, and may be based on, for example, the impact of traffic generated, strain on infrastructure, population density, shadowing of neighboring properties, noise, etc." (p. 1).

Under the same Act, art. 37, "the NIS will run to consider the positive and negative effects of the activity on the quality of life of people living in the area and its vicinity, including the analysis, at least the following questions: (i) density of population, (ii) urban and community facilities, (iii) use and land cover, (iv) valuation of real property, (v) generation of traffic and demand for public transportation, (vi) ventilation and lighting; (vii) urban landscape and natural and cultural heritage" (p. 1).

The NIR (Neighborhood Impact Report) should be elaborated from a series of identifiers that indicate the level of impact on the deployment of any new venture on the urban landscape, human activities that can be installed, urban infrastructure and on natural resources of the neighborhood (Moreira, 1999).

Moreira (1999) also says that the factors can be quantified and demonstrated through mathematical models, computational, and diagnostic reports (or preliminary studies).

According to Moreira (1999), the roadmap for the development of a NIR must bear the thought of the following questions: "(i) the impact of new development on the urban landscape, (ii) located on human activities, (iii) on the move people and goods,

(iv) on urban infrastructure, and (v) on the natural resources of the neighborhood" (p. 110).

Moreira (1999) also describes what should be the end products of a NIR that the script needs to indicate: "(i) the demonstration of the compatibility of the road system and transport, (ii) the demonstration of the compatibility of the drainage system with increased volume and velocity of storm water generated by the sealing area of intervention, (iii) the demonstration of the feasibility of water supply, sewage collection, electricity supply, (iv) an indication of urban transformations induced by the project, and (v) the insertion of the work in the landscape" (p. 111).

The observation of the points raised by Moreira (1999) compared to the analytical criteria of the City Statute (2001) suggests that the discussion on the NIR tends to spread, because the legislation is not complete on all possible parameters of analysis urban only serves "as a guideline for the preparation of bylaws that address the evaluation of neighborhood impacts" (Lollo & Röhm, 2005, p. 39).

About these items of the Statute, Lollo & Röhm (2005) produced a material that points to the aspects that are not considerate in some neighborhood impact studies. It was found that the main problems occur or disability legislation or disability of the methodology applied. Following the reasoning of Lollo & Rohm (2005, p. 41), "The consequences of the development of Neighborhood Impact Studies that do not properly describe or evaluate the conditions of the project, neighborhood, or components subject to impact, create bad consequences in four spheres, namely: the environment, for local residents, for the general population and to the public government".

SUGGESTION TO URBAN IMPACT EVALUATION

The NIR does not yet have a standardized methodology; therefore, the discussion over the horizon of reach of neighborhood impacts is still open. However, over recent years and given the speed at which technology evolves, one sees a tendency to simplify the procedures for the method of assessing impacts on urban areas, "in order to remove subjectivity from this process and thus shape, streamline decision-making processes" (Lollo & Röhm, 2005, p. 7).

Lollo and Röhm (2005) also argue that this trend is not unique to the evaluation of neighborhood impacts, and falls within a global context of establishing criteria for evaluation and ranking of environmental impacts as an alternative to standardization of the language issue.

In this sense, the use of Geographic Information Systems tends to be an excellent alternative to technological development of such activities, because their use permits, in addition to encoding information that facilitates their treatment, large savings in storage process, updating and analysis data.

The implementation of an urban model in a geographic information system is one of the best ways to convey to users of the facilities of the urban structure as the changes could interfere both positively and negatively to the inhabitants of any area depending on the facilities that current technology provides.

An "Urban GIS" can be used as a tool for automation of the municipal administration, therefore, contributes to urban planning with descriptive analysis of urban space which serves to support local government which demands efficient data transmission due to the growing processing public services (Falcoski, 1997).

Falcoski (1997, p. 12) describes that "in general, in studies of urban impacts, using the computational model proposed levels of study in the urban scale has considerable improvements in both macro-analysis well as in micro-analysis, therefore, it is possible to simulate potential of high density, indices to build, compare the volume and verify the proper application of coefficients determined by law and can create comparisons of urban models desirable, and likely present. With regards to urban design, the emphasis is on mechanisms of regulatory control and management (monitoring) of dynamic spatial information".

DATA COLLECTION

The procedure for obtaining the data followed the proposal prepared by Lollo (2006), which suggests the delimitation of areas of influence through the process of comparison matrix between the variables selected for the study. According to Leopold *et al.* (1971) *apud* Lollo (2006, p. 173), the matrix system stands out among the available techniques of impact evaluation "due to the agility, flexibility and simplicity that allows the survey and impact assessment. It's also widely used when trying to make identifications and assessments of environmental impacts if it is agile". The basic proposal of an "impact matrix" (Lollo, 2006) suggested in this study is to cross the proposed actions with environmental factors, and assign these crosses (characterizing impacts urban) values that represent the relative importance.

Aiming to represent the influences of the development phase of the project impacts in the urban environment and considering the peculiarities of each of these steps, in this work, it was chosen to follow the

model proposed by Lollo (2006) who distinguished stage of development where the impact occurs in order to properly weigh the importance of each impact.

The delimitation of the area of influence of the companies is extremely important for correct evaluation of the effects stemming from neighborhood impacts and implications of conflict in urban land use, and depends, according Lollo (2006, p. 20): "(1) conditions of the space, (2) the occupation in question, (3) impact analysis".

Lollo & Gonçalves Neto (2006) also highlight the importance of a thorough assessment of interventions and the means considered to establish specific criteria for defining the area of influence of each factor. According Lollo (2006, p. 20.), "the determining factors for defining the area of influence are those related to traffic and parking issues because they are the most far-reaching".

For the quantification of the impacts were possible to be examined, was designed a questionnaire based on studies of Lollo (2006), able to quantify the variables regarded as quality by implementing a new development in the urban area.

The step of the valuation of the impacts identified and listed in the questionnaire established the relative values for each result of each impact considering their order (direct or indirect), magnitude (high, medium and low) and duration (temporary or permanent) shown in **Table 1**. For each of the conditions described were established values (weights) that consider the relative importance of impact, allowing the assessment of impacts (Lollo, 2006).

From this, it was possible to establish a scale for quantification of the data that were collected in the field by means of questionnaires.

The field survey was the option to refine the data volume, because the experiments reported in the work of Lollo (2006) demonstrated that independent of cooperation by the companies (in this case, supermarkets), some kind of information was not reported, which required data collection by visiting the field.

Table 1. Values adopted for quantifying the impacts identified

Classification		
	Classes	Values
Order	Direct	3
	Indirect	1
Magnitude	High	3
	Medium	2
	Low	1
Duration	Permanent	3
	Temporary	1

Source: Lollo (2006).

Table 2. Schematic representation of the structure of the matrix of impacts used

Phase of Company	Planned Intervention	Impact	Available Components				Measures Proposed
Planning	Info	Info	I+	H+	M-	D+	Info
	Info	Info	T+	D-	L+	P+	Info
	Info	Info	M+	P-	T-	I-	Info
	Info	Info	H-	T+	I+	M-	Info
	Info	Info	P+	I+	L+	D+	Info
Construction/Adaptation	Info	Info	H+	M	T+	P-	Info
	Info	Info	D-	T+	H+	I-	Info
	Info	Info	L-	D-	P+	H-	Info
	Info	Info	I+	P+	D+	L-	Info
	Info	Info	P-	H-	I-	T+	Info
Operation	Info	Info	P-	L+	M+	D-	Info
	Info	Info	M-	I+	T-	H-	Info
	Info	Info	D+	H+	P-	M-	Info
	Info	Info	H-	L-	T-	I-	Info
	Info	Info	T-	I+	H+	L+	Info
	Info	Info	M+	P+	L-	D-	Info

Source: Lollo (2006).

Thus, based on the proposed system were considered three steps: (1) Planning, (2) Construction / Adaptation / Occupancy (as appropriate), and (3) Operation, each representing different possibility of generating potential impacts as shown below.

Still, according with Lollo (2006, p. 9): “The structure in module of the matrix gives two clear advantages. The first is that it allows the impacts are assessed at each stage, allowing the discussion of the importance that each phase represents the environmental quality of the neighborhood, and providing alternatives to distinguish between businesses that represent construction, those resulting from adaptations or extensions to buildings already exist. This situation also allows treat equally the two situations described (construction \times adaptation/upgrade), the impacts generated by the second group are despised. In case of upgrade/expansion, such a proposal still allows only interventions are valued consistent with the process”.

Aiming to represent the influences of the development phase of the impacts identified in the project, and considering the peculiarities of each of these steps, we chose to distinguish the stage of development where the impact occurs in order to properly weigh the importance of each impact.

The structure includes the categories of information (aspects of the occupation, its consequences, environmental components assessed, mitigation measures and compensation arrangements) in columns, while the actions themselves are described and their impacts are assessed in rows of the matrix.

DATA PROCESSING

This phase included the selection and refinement of information obtained and defined in the stage of data collection, in addition to proper storage of information collected in a database compatible with the Geographic Information System from the referencing of the enterprises to enable spatial analysis.

Such results of evaluation of responses obtained by the use of the questionnaires were fed into a database in Access and subsequently inserted into the environment of ESRI ArcGIS 9 which interface controls and handling are similar to others standards software of engineering, facilitating data manipulation and vectors. The structuring of the data followed the proposal already included in the work Martinetti (2006), Sacute (2006) and Gonçalves Neto (2006) which related the type, the relationship of the work, time and intensity of

activity, but was kept the same geographic information system.

The selection of companies whose impacts would be considered in this proposal was based on the criteria proposed by Lollo (2006, p. 8) described as follows: “(1) can be identified neighborhood impacts occurred by the time of deployment of business or during the execution of their activities; (2) companies should have characteristics that allow their classification as supermarkets, and (3) firms should be installed in urban areas”. **Figure 1** shows the companies selected on this criterion.

The survey of the surroundings of each company on the map of the city was through sketches prepared during field visits. The visits to the site of each company had as its initial objective, to answer some questions that employees of these establishments did not know or did not respond, but was also serving to provide a more reliable location of each company, with the realization of these sketches.

The simplicity of spatial representation of neighborhood impacts (defined area of influence surrounding each company considered) significantly facilitated the structuring of the data model in GIS. Thus, taking up the company as spatial reference data, the data structure in ArcGIS was composed of three fundamental layers: “Streets”, “Points” and “Buffers”.

The spatial representation of the companies was done by using points, based in sketches made in field.

The category “Companies” (with model data object type) absorbed the information about the spatial location of each company (represented by points referenced to the network of streets), and a set of data (as data table) with all information obtained in the surveys, which allowed the evaluation of neighborhood impacts.

The category that has been the basis used for mapping the location of firms and evaluation of their areas of influence was named “Network Logradouros” (with cadastral data model) and corresponds to the spatial representation of the axes of public areas (roads centers or centerlines) with details of their name and direction of traffic flow.

The database relating to this category was already available in the laboratory of the Center for GIS (NGeo - UFSCar), which is used for other academic work and its upgrade has performed steadily.

The category designated as buffers (thematic data model) has the spatial representation of areas of influence of the companies studied. A circular buffer was the choice to standardize the treatment given to the spatial area of influence of all businesses and consider that in this case, the intensity of impacts can be considered uniform in all directions.

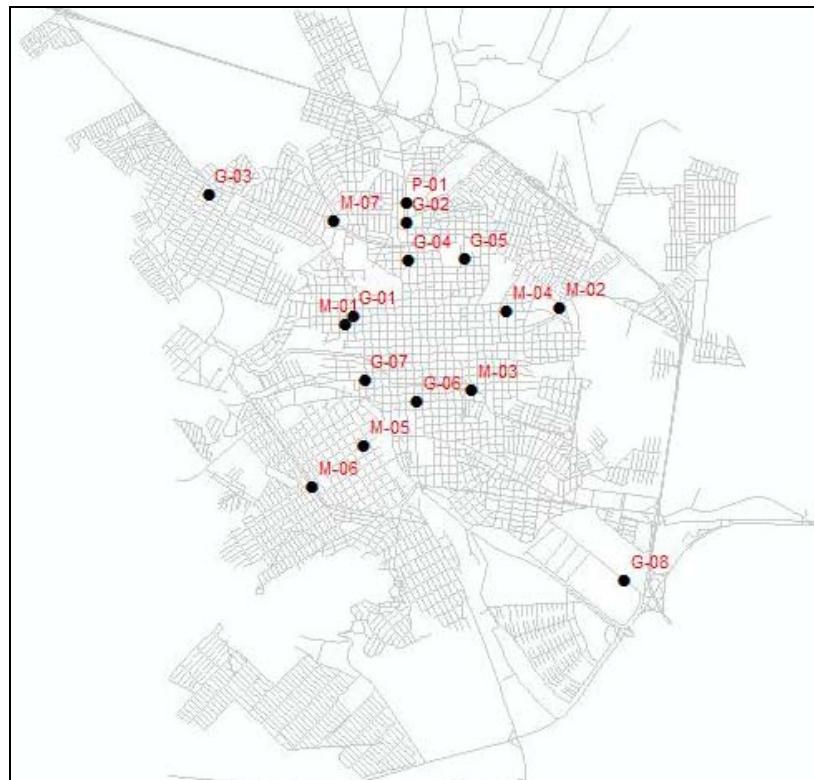


Fig. 1 Companies selected.

The location of each company was represented on the map using coordinates of the UTM system which indicates the central point of the frontage portion which belongs to the company.

After the conclusion of this Step, the sum of the weights of the issues data were transported to an Access base and after to ArcGIS. Thus, the goal was reached by the proposed matrix method: analyze not just isolated to quantify the impact of a single company, but also enable its comparison with another company and also compare the results with the set of all companies with respect to the variable of urban infrastructure.

Regarding the classification of neighborhood impacts, Lollo (2006) proposed the separation of variables directly related to the impact on urban infrastructure to be evaluated in the array: high density population, realty valorization, ventilation and lighting, cultural heritage and urban transformations, traffic generation, demand for public transport and urban and community facilities.

The next phase (impact evaluation) corresponded to the treatment in GIS, of the information that coming from the previous steps, so as to allow three types of analysis: (i) from impact isolated (interpretation of the causes and consequences of each impact considered, for each of the areas assessed); (ii) in groups of impacts, according to the classification already given (checking for all areas

assessed, the existence of a group that is more significant impacts), and (iii) the combination of several related impacts (assess the full extent of impacts generated by each area, to classify the areas according to the total impact generated by each one and see if there are portions of the urban area more weaker on this type of proposal occupancy).

ANALYSIS AND RESULTS

The work done by Lollo & Gonçalves Neto (2006), showed that urban impacts may have a direct relationship to the size of the building, but in the case of supermarkets and even more specifically on the issue of urban impacts that reality exists, but not shown be the largest contributor to the intensity of impacts, partly due to the impossibility of assessing post-deployment of temporary impacts depending on the size of the building.

The data obtained showed the prevalence of some types of impact, especially those related to real estate appreciation, the high density and traffic flow.

Table 3 shows the results obtained through the use of questionnaires. The companies were identified by symbols and each column represents a type of impact associated with putting the building in the urban system.

This table was inserted into the database after the processing of the results obtained in the field in numbers and in the GIS environment, allowing the

Table 3. Urban impacts identified in the area

ID Super	Question																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
M-01	x	x		x	x	x	x	x	x		x			x	x							x										x
G-01	x	x	x	x	x	x	x	x	x	x	x	x		x	x							x	x									x
G-02		x		x	x	x		x	x	x	x				x					x	x	x	x				x		x			
G-03	x	x		x	x		x	x	x											x	x	x			x	x	x			x		
G-04		x	x	x	x			x	x	x	x	x	x	x						x	x	x	x									x
M-02	x	x		x	x		x	x	x	x					x					x		x	x									x
M-03	x	x	x					x	x	x										x	x	x	x				x	x	x			x
P-01	x	x	x			x	x	x	x	x	x			x	x					x	x	x							x			x
G-05	x			x			x	x	x	x										x		x				x						x
M-04	x	x	x			x	x	x	x		x									x	x	x	x			x		x	x			x
G-06		x		x	x	x		x	x		x									x	x	x	x			x						x
M-05		x		x	x	x	x	x	x											x	x	x	x			x						x
M-06		x		x			x	x	x											x		x	x			x		x				x
G-07	x	x		x	x	x	x	x	x						x					x	x	x	x			x		x				x
G-08	x			x		x	x	x	x	x	x				x					x	x		x		x	x	x	x				x
M-07		x		x	x			x	x		x	x								x		x				x		x				x

ID SUPER (Supermarket ID) – P: Small Companies; M: Medium Companies; G: Large Companies; Questions: 1 to 10 – Real Estate Valuations; 11 to 14 – Urban Landscapes; 15 to 19 – Public Heritages; 20 to 24 – Traffic Volumes; 25 to 31 – Urban Facilities.

graphical representation and spatial impacts. It is emphasized here a curious fact with respect to the results by the field survey. Observing **Table 3**, it is clear that the largest contribution to the amount of work has been grouped into two main cores of the components of analysis: the real estate valuation and traffic volumes. The first component of this observation is directly related to the shift of people to nearby supermarkets.

In some areas in the municipality, the supermarket was the factor responsible for the attraction of people, given the existence of some as the Dotto supermarket that exists in the city more than 40 years, this season which saw the promotion of technological growth of the country, promoted by the

then president, Juscelino Kubitschek, and his slogan of “grow 50 years in 5”.

With the coming of multinationals into the country, the Brazilian citizen could live further away from the workplace, therefore the second component of the observation results, the acquisition of a material as a vehicle has become easier, moreover, the urban development grown creating more pathways to link the neighborhoods to the commercial centers.

Therefore, there was a swelling population which had the opportunity to reside in areas far beyond the commercial centers evidenced by **Figs 2 and 3**.

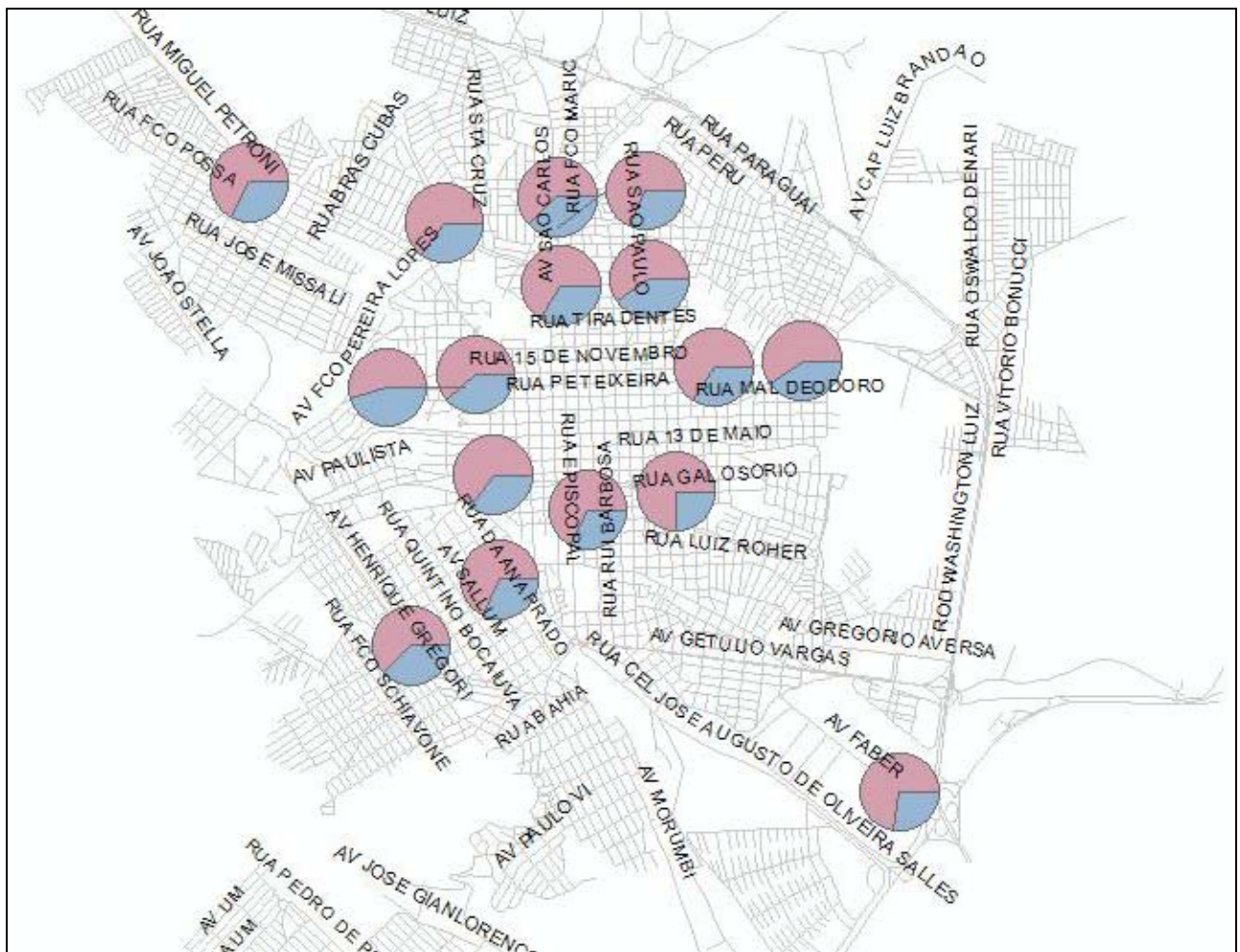


Fig. 2 Representation in "pie charts" of the relationship between the groups "real estate valuation" and the sum total of variables.

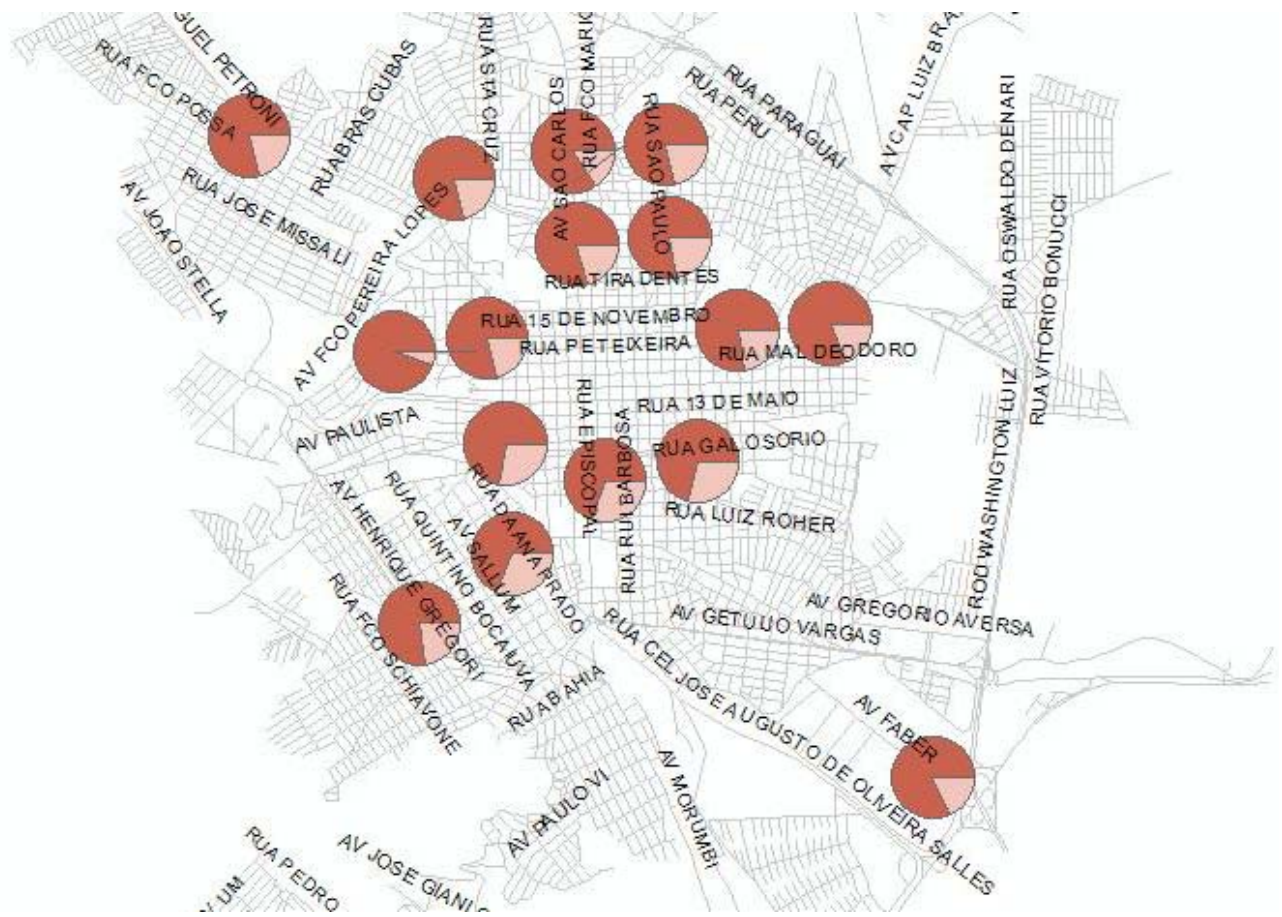


Fig. 3 Representation in “pie charts” of the relationship between the groups “traffic volume” and the sum total of variables.

About the influence areas of selected supermarkets, it was observed that in several cases, there is the interpenetration or overlapping of the lines (**Fig. 4**).

According Chasco Yrigoyen & Uceta (1998) apud Sharma et al. (2006), “influence area or commercial area of a municipality or a commercial equipment is the area that has a strong trade dependence on the place of study” (p. 112).

The main occurrences of this grouping of influence areas appeared frequently in the central part of the municipality (which has different uses of urban land) and near to the Cidade Jardim neighborhood which has a residential character.

This overlap of buffers demonstrates the intention of different companies reaching geographically the same customer. This can be seen graphically by the existence of intersections when there is conflict in different spheres of influence.

In these regions confirmed that the urban impacts cannot be treated separately because, depending on the

proximity of the objects of study, the variables of each company began to interfere with the behavior of others.

The Master Plan of the city of São Carlos does not refer to possible interferences grouped in the period before the implementation of the venture, dealing with the variables for the study of urban isolation without admitting the existence of integrating factors for the use of urban facilities.

This is a problem that occurs in the most of the laws about the subject, because the municipal government has not been able to produce some material about NIS. Moreover the NIS does not have a definite pattern of federal legislation.

We must consider the efforts made by municipal authorities to tread a path of urban sprawl without a backing of the Federation, but the results showed a real need to reach a standard that considers the variables of integration of urban occupation, which must be added the mitigation measures in the period prior to installation of new developments.



Fig. 4 Influence areas of supermarkets.

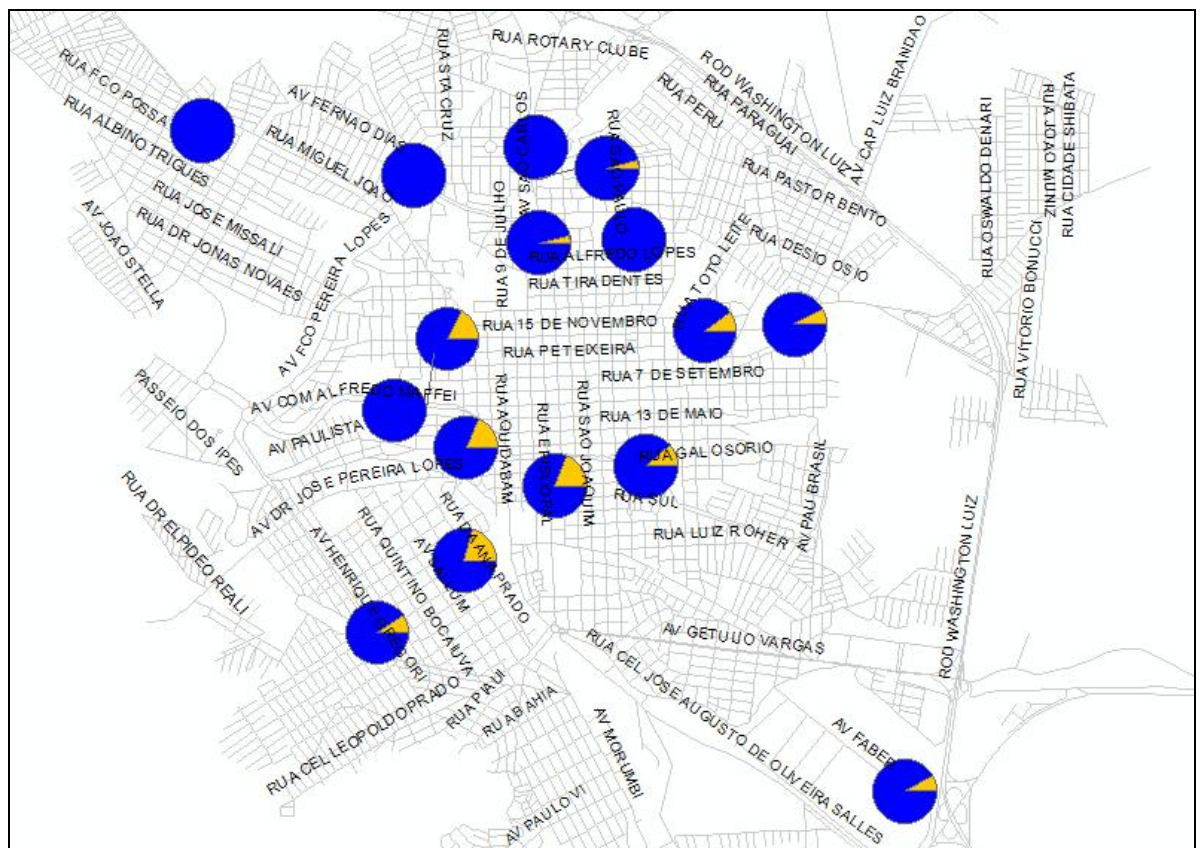


Fig. 5 Representation in proportional symbols of the relationship between the variables “supplier vehicles” and the sum of variables.

CONCLUSIONS

The use of standardized questionnaire on field surveys, attached to the information provided by the enterprises and added the field visits, allowed the identification of impacts on the study.

The ventures consolidated prior to the drafting of the City Statute were those who obtained the highest measurements of impacts because the surrounding urban growth in the region, unlike the supermarkets built or acquired after the Federal Law, which have found a developed urban structure and legal obligations to be met.

The urban sprawl around the supermarkets was aggravated by the excessive number of cars purchased by local residents in recent years and consequently increase of the flow of vehicles on roads which were not scaled enough to support such a volume of traffic.

This new condition prevents the delivery of products to the supermarket is done effectively, which contributes directly to the final assessment of results, therefore, the variables related to the flow of vehicles were the largest contributors in the final results.

Figure 5 shows the quantification of the variable related to the logistical vehicles coming from suppliers.

The Master Plan of the city of São Carlos has a pretty advanced legislation regarding the NIS, but still treats the components of analysis alone neither a standard method for the quantification of the impacts (of any type), because is backed by the Statute of the City, which also lacks a standard for determining the variables needed for the preparation of any NIR in the municipality.

Finally, the NIS is still evolving and needs to be deepened in order to provide conditions to develop methods that consider the interdependence of variables and its integration with the urban environment.

The geographic information system in this case, was the best option to generate relationships between variables and their spatial representation effectively.

Clearer legislation, setting standards, coupled with a GIS which relates to the integration of urban elements contribute to the improvement in decision-making by the government.

REFERENCES

- Brasil. Law 10.257, July 10th (2001) Regulates arts. 182 and 183 of the Constitution set out the general guidelines of urban policy and other matters. Official Gazette, 10 July 2001.
- Falcoski, L.A.N. (1997) *Dimensões Morfológicas de Desempenho: Instrumentos Urbanísticos de Planejamento e Desenho Urbano*. Doctoral Dissertation submitted to the Graduate Program in Environmental Structures College of Architecture and Urbanism, University of São Paulo, USP, São Paulo, Brazil, 1997.
- Gonçalves Neto, P.S. & Röhm, S.A. (2006) *Avaliação de Impactos na Infra-estrutura Urbana Decorrentes da Implantação de Empresas do Pólo de Alta Tecnologia de São Carlos*.
- Gonçalves Neto, P.S. (2006) *Estudo de impacto de vizinhança por meio do planejamento por desempenho na Região Central de São Carlos*. Trabalho de Graduação Integrado, UFSCar, São Carlos.
- Gregori, I.C. (2004) *Mesa Temática: Cidades e Gestão Urbana, O Estatuto da Cidade: perspectivas e desafios dos novos instrumentos de reforma urbana*. Universidade de Santa Cruz do Sul – RS.
- IBGE – Brazilian Institute of Geography and Statistics (2009) *Cidades@: informations from data base of IBGE*, Rio de Janeiro, 2009, Available in <http://www.ibge.gov.br/cidadesat/default2.php> Accessed on 14 August 2009.
- Leão-Aguiar, L., Campos, L.R., Moraes, L.R.S. & Borja, P.C. (2005) *Estudo de Impacto de Vizinhança: Instrumento de Gestão Pública para a Cidade de Salvador*.
- Lindau, L.A., Diógenes, M.C. & Pinto, A.B. (2009) *Quantificação dos impactos de pólos geradores de tráfego*. Available in: http://www.producao.ufrgs.br/arquivos/disciplinas/412_impactos_polo_gerador_versao_lindau_rev.doc Accessed in 10 September 2009.
- Lollo, J.A. (2006) *Utilização de Sistema de Informações Geográficas em Estudo de Impacto de Vizinhança: o caso do Pólo Tecnológico de São Carlos*.
- Lollo, J.A. & Röhm, S.A. (2005) *Proposta de Matriz para Levantamento e Avaliação de Impactos de Vizinhança*.
- Martineti, T.H. & Röhm, S.A. (2006) *Avaliação de Impactos de Vizinhança no Meio Físico usando Sistema de Informações Geográficas – o caso de Pólo de Alta Tecnologia de São Carlos (SP)*.
- Molina, V. (2008) *Efeito do Porte do Município em Impactos de Vizinhança Gerados por Supermercados*. Research Plan forwarded to PPGEU/UFSCar, Universidade Federal de São Carlos, São Carlos, 2008, 3–8.
- Moreira, A.C.M.L. (1999) *Parâmetros para elaboração do relatório de impacto de vizinhança*. *Magazine of the Graduate Program in Architecture and Urbanism of FAU/USP*, 7, p. 107–118.
- Sacate, B.C.A. & Röhm, S.A. (2006) *Avaliação de Impactos Urbanísticos Decorrentes da Implantação de Empresas do Polo de Alta Tecnologia de São Carlos*.
- Silva, L.R., Kneib, E.C. & Silva, P.C.M. (2006) *Proposta metodológica para definição da área de influência de pólos geradores de viagens considerando características próprias e aspectos dinâmicos de seu entorno*. Article Published in the *J. Civil Engng*, 27, 111–126.
- Unifra (2009) *Manual de Normas para Apresentação de Trabalhos Científicos*. Available in http://www.unifra.br/cursos/economia/downloads/Normas_UNIFRA_versao1.pdf Accessed in 23 December 2009.