THE ROLE OF GEOGRAPHIC INFORMATION SYSTEMS IN THE STUDY OF URBAN PROBLEMS

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ISPRS Commmission GIS and expert systems

KEY WORDS: G.I.S., urban problems, conflict areas, analysis, variable modelling, decision-making.

ABSTRACT:

The aim of this paper is to show the results arising from the implementation of a Geographic Information System in the city of Bahía Blanca, located in the south of Buenos Aires province, Argentina. The results obtained are part of two research projects -developed at the Department of Geography of the Universidad Nacional del Sur- that aim at defining conflict areas arising from several problems caused by man and his activities.
The methodology used is the following: data entry and collection, cartographic basemap digitalisation (scale 1:5,000), attribute allocation, document and field updating, analysis and variable modelling and representation. Thus, through the rates obtained, areas with different degrees of problems are detected. Multi-criteria analysis makes it possible to apply rates such as the flooding rate to determine those risk sectors for floods and the criticality rate, given by the conflicts generated in the environment, transportation and loading and unloading points.
Location in the urban area of illegal housing settlements and clandestine dump areas shows the evidence of peripheral places, together with green spaces and population density, trying to detect potential sectors for social risk.
It is the interest of this research to focus on the incidence of the different land uses and means of transportation in the local economic context. In addition, the insertion in the Mercosur, the hypermarket and shopping mall settlement and the prospective free zone implementation are also taken into account. It is also important to highlight the possibilities that this technique offers for planning and decision-making towards an improvement in the quality of life and the environment in the community of Bahía Blanca.

I. INTRODUCTION

The aim of this paper is to show the results arising from the implementation of a G.I.S. in the city of Bahía Blanca, located in the south of Buenos Aires province, Argentina.

The results obtained are part of two projects that aim at defining conflict areas arising from several problems caused by man and his activities.

Thus, two research scales are selected: urban and regional. In the former, it was deemed appropriate to consider variables such as

transportation, loading and unloading points (*) land use and population density, which allow to determine rates, optimum locations and areas with different degrees of conflict. In the latter, analysis is focused on cereal and mail transportation issues. The results of this analysis are not shown in this paper, since they form part of studies that have not been submitted to the corresponding examination bodies yet.

II. INTERRELATION BETWEEN THEORETICAL AND TECHNICAL ASPECTS IN THE SOLUTION OF URBAN PROBLEMS

It is important to highlight that the results reported here derive from the projects: "*Implications of urban processes for the environmental quality. Experience in G.I.S. (city of Bahía Blanca)*" and "*The role of G.I.S. in the study of the means of transportation in the south of Buenos Aires province and in Bahía Blanca*". Some of the aims corresponding to the local level are:

- To detect the implications of land use, when defining conflict areas.
- To put forward load transportation strategies that take into consideration the dynamic urban context as well as life and environmental quality.

Secondly, with both projects, an urban and regional G.I.S is implemented, while efforts are channeled into training human resources -especially prospective professors and bachelors from the Department of Geography- in the project issues and in digitalised techniques. (FIGURE 1)

In short, the methodology used includes the following stages: data entry and collection, cartographic basemap digitalisation (scale 1:5,000), attribute allocation, document and field updating, analysis, modelling and representation of variables (FIGURE 2).

By correlating variables it is possible to draw rates to detect areas with different degrees of conflict. For example, multi-criteria analysis makes it possible to define areas subject to flooding or risk sectors for floods. Also, loading and unloading points (storehouses for goods, industries, petrol stations and bus transportation companies) generate conflicts with the environment, which are expressed by the criticality rate, this being obtained from the relation between the location and features of loading and unloading points, population density and the presence of schools and hospitals. In the cartographic document shown in FIGURE 3, the degree of conflict of each loading point is represented. Criticality areas (FIGURE 4) are worked out by adding up the points within a radius of 200 meters, depending on a weight alloted in accordance with the above mentioned aspects and also with whether they have a vehicular entrance and a manoeuvring yard, their working hours and the kind of transport.

Cartographic results and research projects are shown in detail in FIGURE 5. The first approach to a location-in the urban area-of illegal housing settlements and clandestine dump areas shows the evidence of peripheral places that, together with green spaces and population density, will be used to detect potential sectors for social risk.

It is important to highlight that the entry of a considerable amount of data into the system -supplied by several sources and the fieldwork carried out by the team- is a key resource for

(*) Santarelli de Serer *et al.*, (1997) "Loading and unloading points represent a form of spatial occupancy with the purpose of storing different kinds of goods.
The exchange of goods between the city and other places, as well as the re-distribution within the urban area, originate loading and unloading activities, which give rise to the flow of different kinds of vehicles. Movement of vehicles at these points obstruct roads and block mainly busy arteries.
Traffic congestion and deterioration of the environment, resulting from load-related activities, cause drivers and people residing in neighboring areas a lot of inconvenience"

future undertakings. At this stage, it is especially relevant to update and check the databases, due to the changing forces in which the city is immersed as a consequence of the quick changes in the land use and the building of new means of communication that give the city a new shape.

III. CONCLUSIONS

It is relevant to underline the possibilities provided by the G.I.S. for planning and decision-making towards an improvement of life and environmental quality. In addition, the practical applications achieved in this way generate conductive links between the theoretical and technical aspects.

As a final conclusion, it can be asserted that the availability of standardised codes for data entry is essential and contributes to an easier effective exchange among data bases, which is already carried out between Proatlas-Conicet and the above projects. It is essential to highlight that this kind of communication fosters a mutual enrichment and avoids unnecessary work.

Moreover, these undertakings provide for the training of human resources, especially the students that help various issues to take shape and in learning about a Geographic Information System.

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Collaboration: Guillermina Urriza, Lorena Ardissono y Débora Beigt (students of Department of Geography, U.N.S.)

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PROJECTS:

- IMPLICATIONS OF URBAN PROCESSES FOR THE ENVIRONMENTAL QUALITY. EXPERIENCE IN G.I.S. (City of Bahía Blanca)
- THE ROLE OF G.I.S. IN THE STUDY OF THE MEANS OF TRANSPORT IN THE SOUTH OF BUENOS AIRES PROVINCE AND BAHIA BLANCA

REGION

Theses
Scholarships

AIMS

- To analyze cereal and mail transportation systems in the south of Buenos Aires province.
- To draw models for the load transportation system with the purpose of helping in decision-making.

CITY

Researchers
Students
Assistants

- To detect the implications of land use, when defining urban conflict areas.
- To put forward load transportation strategies that take into consideration the dynamic urban context as well as life and environmental quality
- To implement a G.I.S. in the city of Bahía Blanca and south of Buenos Aires province.
- To train researchers and students in the project issues and the G.I.S.

FIGURE 1

METHODOLOGY

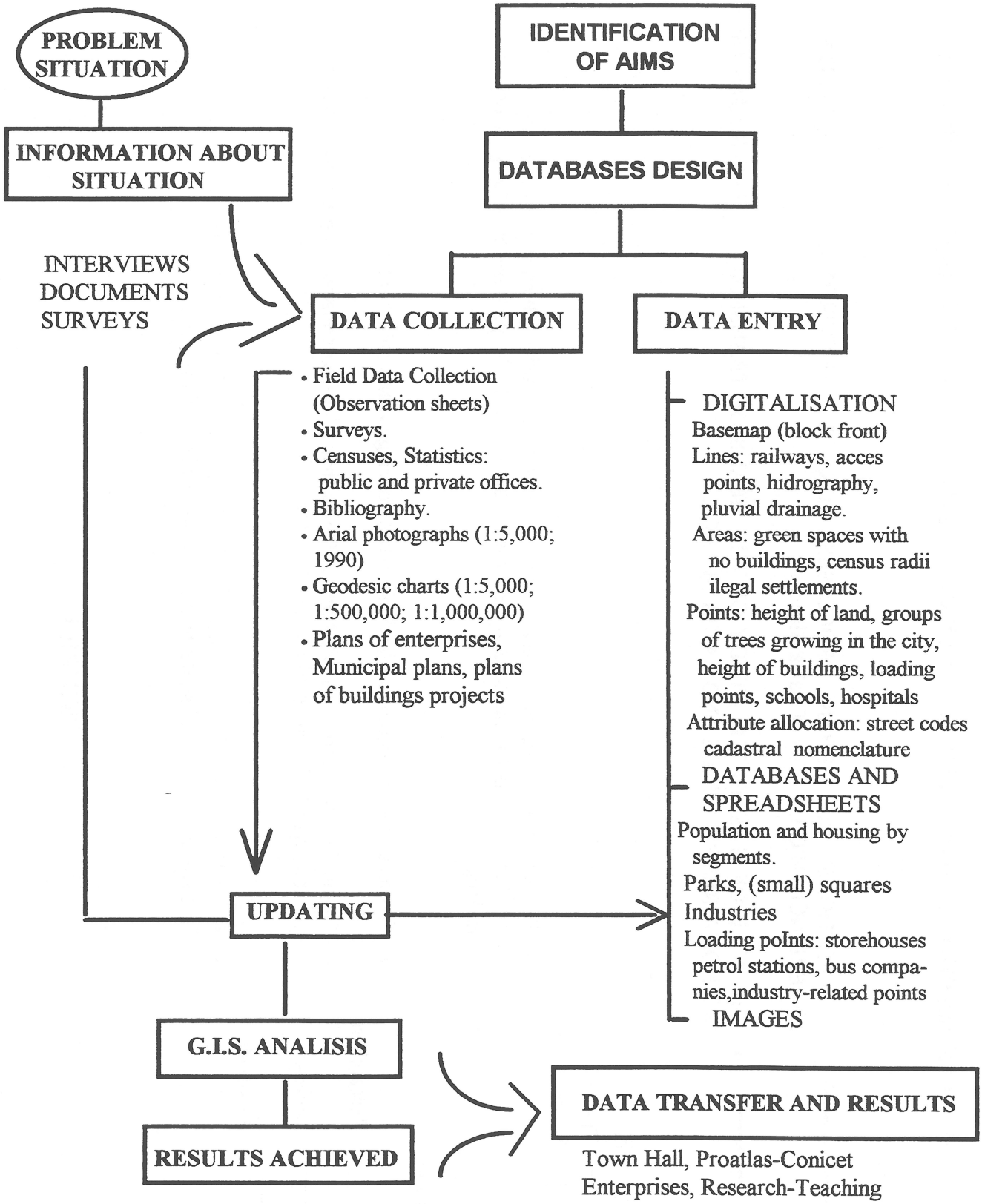

FIGURA 2

INCONVENIENCE CAUSED BY LOADING POINTS, DEPENDING ON SCHOOLS, HOSPITALS AND DENSITY OF POPULATION

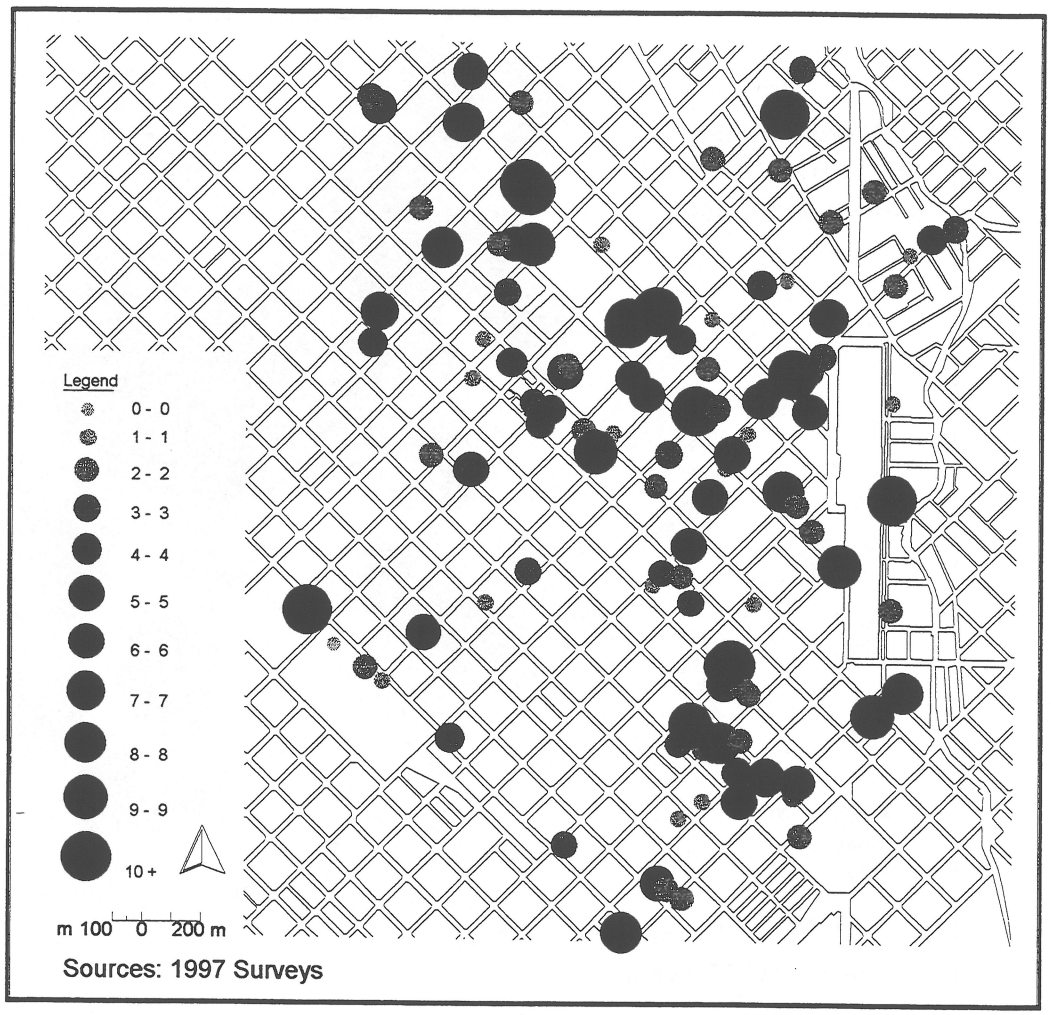

FIGURE 3

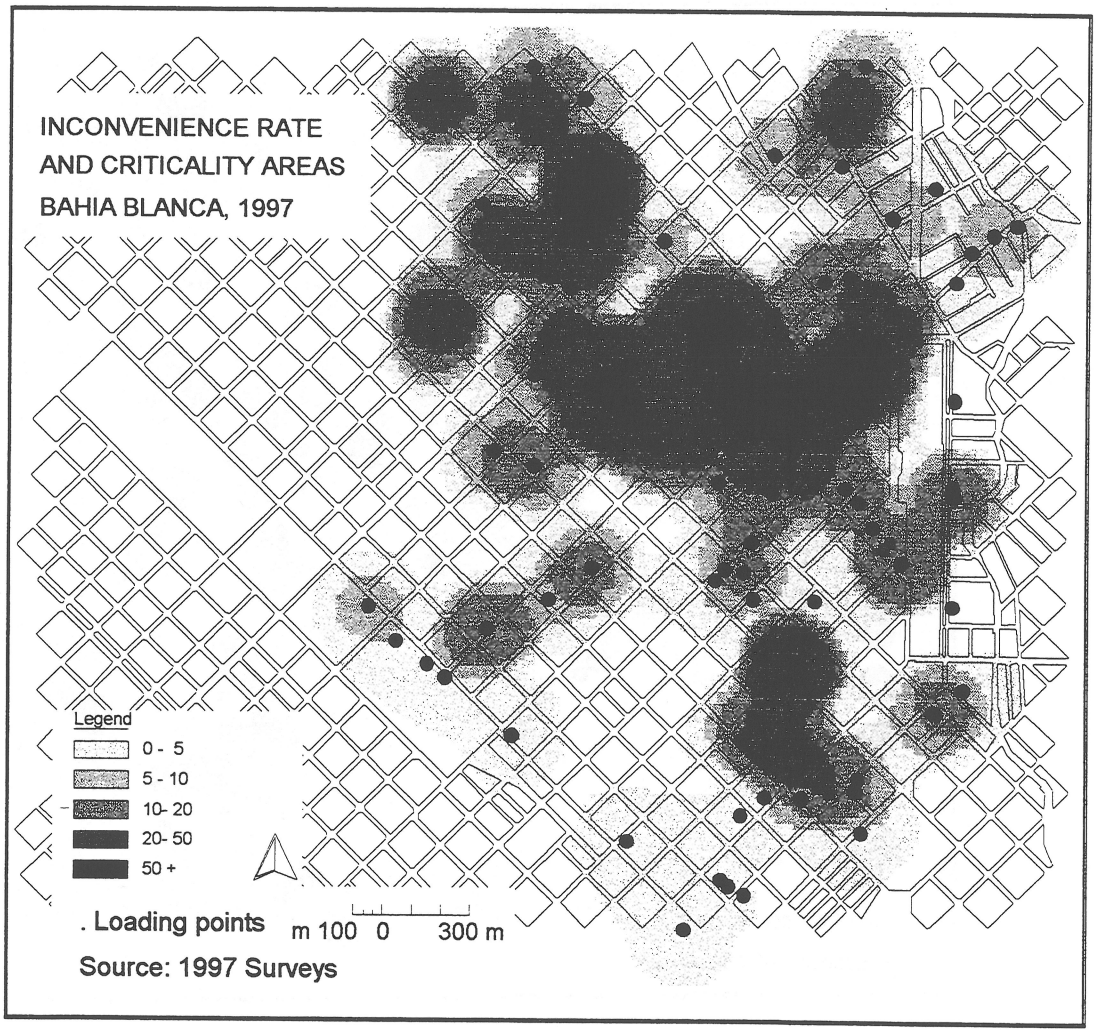
INCONVENIENCE RATE
AND CRITICALITY AREAS
BAHIA BLANCA, 1997
Legend
0 - 5
5 - 10
10- 20
20- 50
50 +
. Loading points
m 100 0 300 m
Source: 1997 Surveys

FIGURE 4

CARTOGRAPHIC RESULTS AND RESEARCH	RESEARCH PROJECTS
• **Map of the city of Bahía Blanca (S:1:5,000)**	***Updating of blocks layout, access points and house numbers.***
• **Location of:** **clandestine dump areas** **illegal settlements**	***Analysis of the clandestine dump areas-illegal settlements relation. Social risk sectors.***
• **Green spaces** • **Green spaces-population relation** • **Building-free areas**	***Green spaces, land use and population.***
• **Pluvial drainage systems** • **Height of terrain** • **Areas subject to floods** • **Map of gradient and elevation pattern.**	
• **Map of density of population by districts**	
• **Location of: loading points** **schools** **hospitals** • **Potential and actual inconvenience caused by loading points.** • **Conflict areas related to loading points.**	***Optimum location for a load transfer yard.***

FIGURE 5