

USING G.I.S. FOR IDENTIFYING MOBILITY PROBLEMS IN MILAN CITY

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Abstract: Becoming an indispensable instrument in the integrated management of settlements, GIS has become very useful for territorial organization, the fluidization of the traffic representing the priority problem from both the environmental and the social costs point of view. Thus, through various informatical systems and mathematical modeling, a series of thematical layers can be realized, taking into account different variables which enter the equation of the territorial mobility, which, once overlapped, can generate extremely precise information regarding the neuralgic points for mobility, the hours with congestions and the road arteries on which they take place, the finality of information hence obtained being integrated in the territorial organization planning that will solve the main town-planning problems taking into account the valid legislation.

Key words: GIS, territorial mobility, the mathematical modeling, the territorial organization

The capital of Lombardia region is placed, beginning with the Middle Ages period, on the route of the most important commercial tracts that connects the meridional region of the peninsula with the rest of Europe. Throughout the years, this aspect meant a positive feature for the economic-social development of the city, but also a negative characteristic regarding the demographical and environmental problematic which carried along the city on the brink of collapse. With a population of 1,182,693 people unequally distributed on the surface of the city of about 182 square km, the density of the population is 6498 inhabitants/square km in the urban boundaries of the city. Even if the density of the population already shows the outrunning of the sustaining potential of the urban area, the planning of the urban area would be somehow facilitated by the integrated management insertion because the working data would be known. But, as it is already known, in the Milan area, the urban continuum reflects and represents the reality; moreover, it is a conurbation according to Jean Gottmann's definition, because the metropole tends to focus the socio-economic activities on a 100 km surface, the environmental and territorial mobility study cannot be analyzed as an independent unit as it represents an open system in which the material and energy flows do not follow the city's limits.

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The statistical data and geographical information systems use (in this case ArcGis 9.3) allow the mathematical modelling so that the functional areas are individualized, but also the areas that require the intervention of the public administration to solve traffic congestion problems, the habitat and the urban degradation problems.

Through the processing of satellite images and the delimitation of Milan's urban area, (its main demographical areas) and the settlements nearby, the attribution of quantitative and qualitative values and the use of SQL functions, querying and buffer which allow data interpolation, several cartographical materials could be elaborated, emphasizing the reality and facilitating a better coordination of the resources. It is an important polarizing centre for labor force due to the 350,000 production units, having about 1.7 million employees. The first application of the information system trying to determine labor force places of origin and the access means in the city towards the interest points of the metropole. According to the statistical data, there are 600,000 persons that enter Milano daily heading for their jobs, most of them coming from the settlements placed in the northern part of Milan (Monza, Asso, Saronno, Lecco, Como), but also from the north-western part (Busto Arsizio, Rho, Magenta) and north-eastern (Bergamo); the persons coming from the southern settlements (Pavia, Lodi) have a smaller share. It is obvious that no matter the means chosen for transportation (road or railway) the congestion problems can easily come up, especially because most entrances intersect Area 1 of the city. A railway belt caters for this area of the city: the stations Farini, Greco, Bovisa, Lambrate, which serve the northern areas and Porta Genova, San Cristoforo, Porta Romana, which serve the southern areas (Fig.1), but also two important routes which penetrate to the centre of the city (Stazione Centrale – the main station of the city and Stazione Cadorna – which allows the connection with the international airport Malpensa). Trying to solve the mobility problems in the access ways to the city, especially the northern ones, the railway services and substructure are trying to be intensified and the road traffic is discouraged by embracing the London system ecopass.

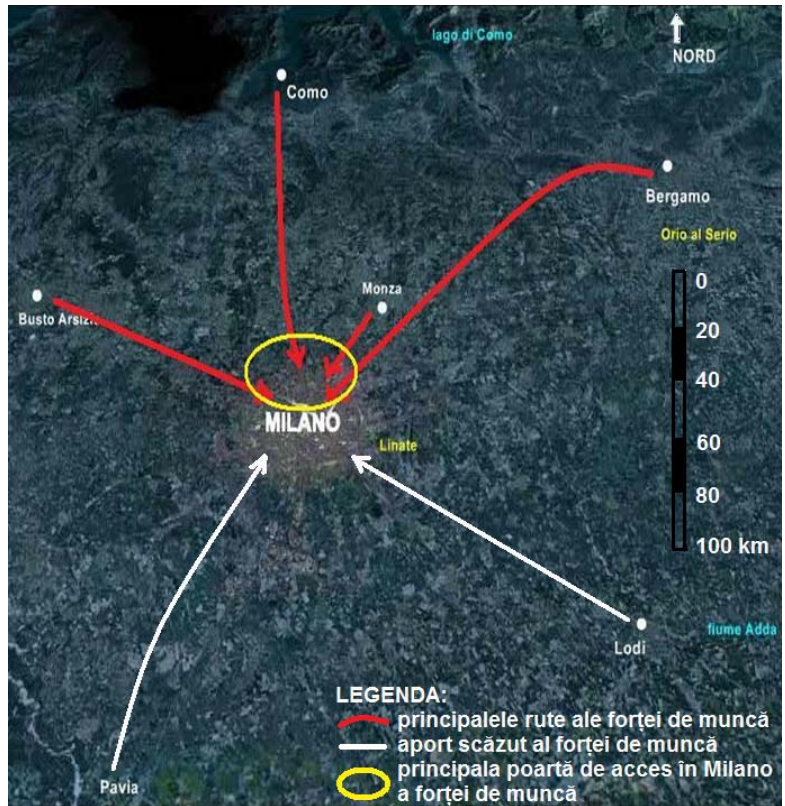


Fig. 1 The main towns for labour force of the productive units in Milan (processing of the data from Piano di Governo del Territorio, Milan, 2008)

The geographical informatical system finds its second application for the issues of the territorial mobility by individualizing different points of demographical attraction. Separate layers production and their overlapping restraints their areas and points out the critical regions. It is already demonstrated that most entrances in the city are situated in the northern part of the city and that the main attraction poles of the city are placed in the same area, explaining the appearance of congestion problems. The layers that were used are represented in Fig.2 (services structures, industrial units and the development of major projects), which include most part of the labor force; through the interpolation of the three layers we can obtain a cartographical product (Fig.3) which best highlights the critical areas, the areas with the highest attractivity and hence, the most liable for generating mobility and fluidization of the traffic problems.

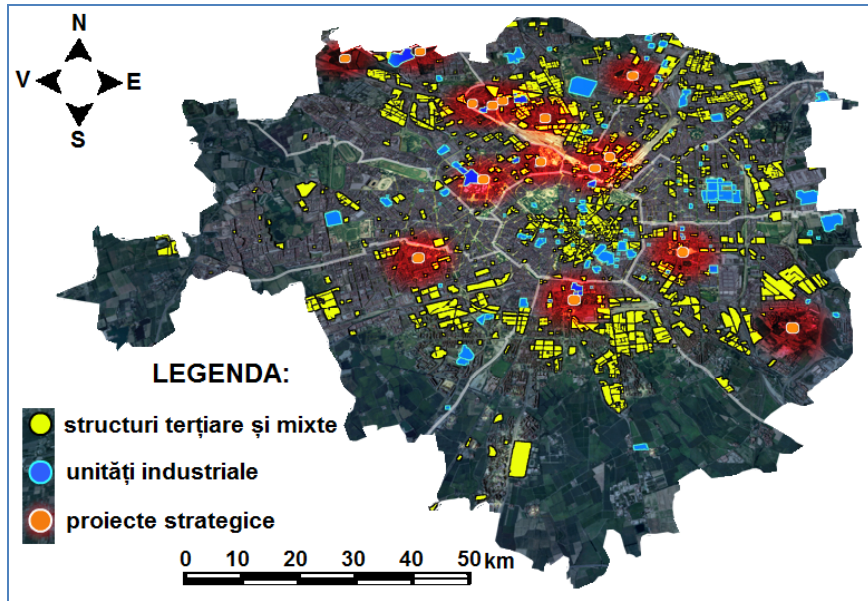


Fig. 2 Different layers that are used for identifying the main attraction points for the labor force (processing of the data from Piano di Governo del Territorio, Milan, 2008)

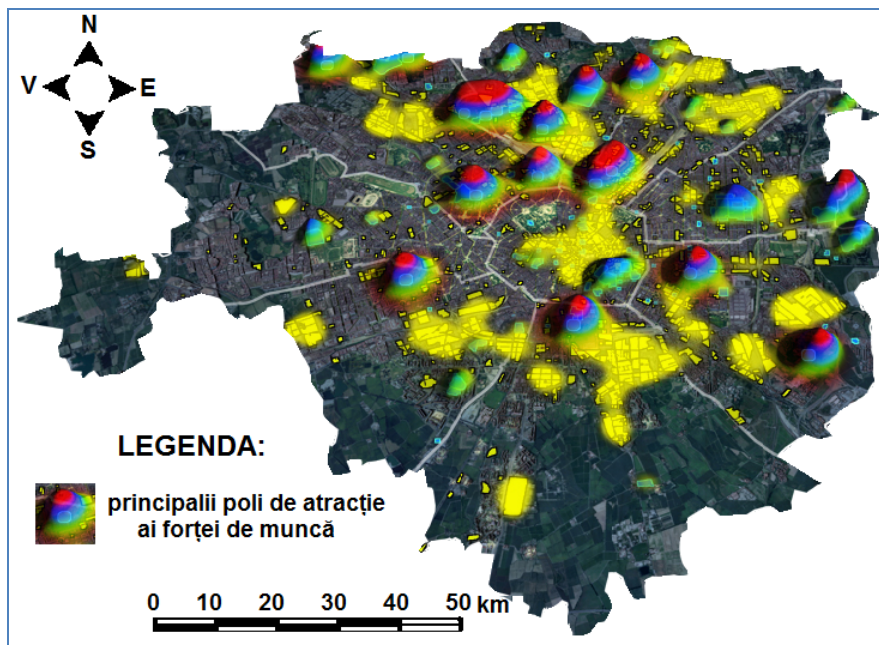


Fig. 3 Main attraction poles for the labor force (processing of the data from Piano di Governo del Territorio, Milan, 2008)

For a more objective view of the potential mobility problems, in a city like Milan one should take into consideration the cultural sites which possess a significant attraction both on a regional and international level. According to statistics, in 2006, there were 100,000 students matriculated in Milan universities, but they lived outside the city and were obliged to spend 30 to 90 minutes arriving to classes. According to statistics there were sold:

- 3,900,000 museum tickets
 - 2,300,000 theatre tickets
 - 5,800,000 cinema tickets.
- Thematic layers become absolutely necessary in order to point out the cultural sites (Fig.4), to interpolate these layers and to individualize the areas with a high potential of creating mobility problems (Fig.5). It could be easily pointed out that the central area concentrates most attraction points, but also the northern part of the city, overlapping with the previous areas highlighted for their labor force attractivity.

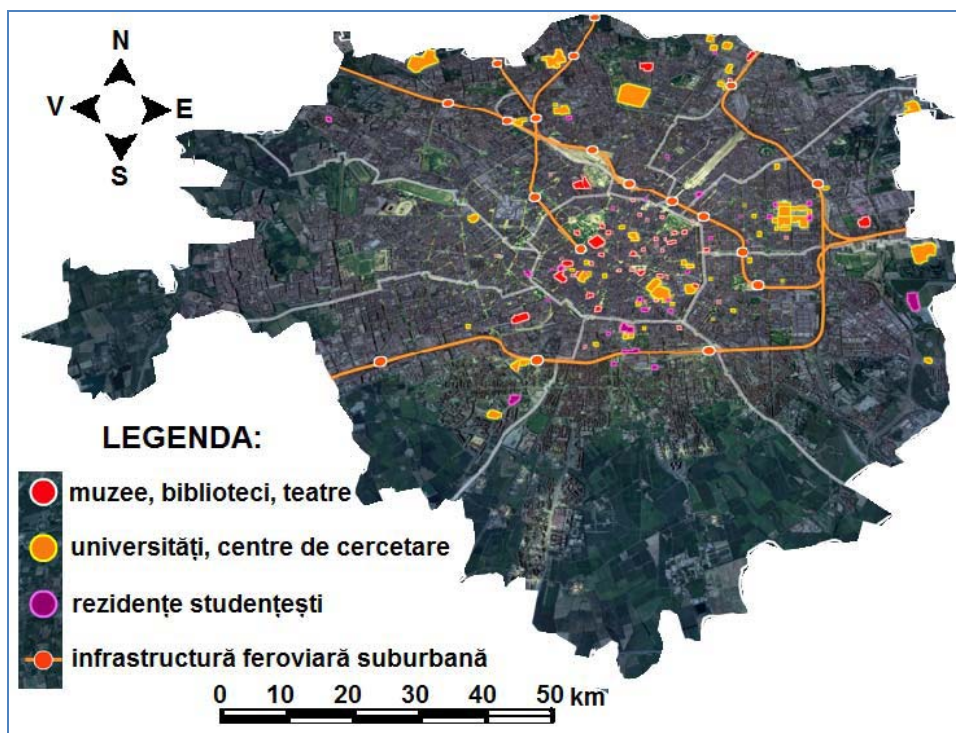


Fig. 4 Main cultural attractions in Milan (processing of the data from Piano di Governo del Territorio, Milan, 2008)

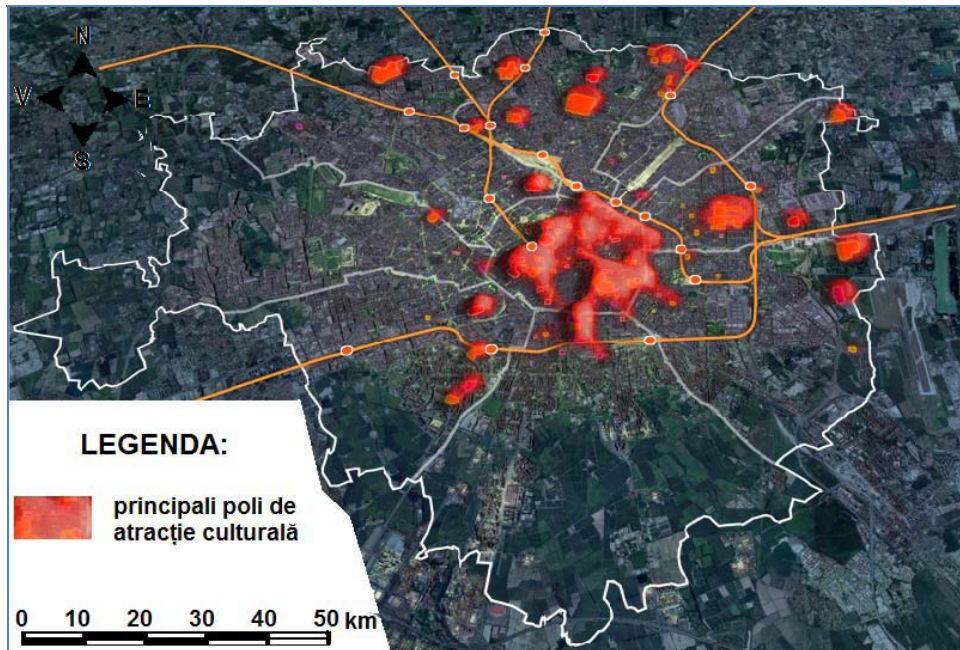


Fig. 5 Main areas of cultural attraction in Milan (processing of the data from Piano di Governo del Territorio, Milan, 2008)

The impressive values of the traffic of about 140,000 passings a day on Corso Buenos Aires (the first in Europe), outruns even the historical centre which registers a medium value of 140,000 passings a day and Corso Vercelli with 80,000 passings. The municipal authorities are obliged to administrate and ease the traffic of the city through two main interventions. Trying to ease the traffic in the historical centre, one resorts to the environment fee or the congestion fee, ecopass type, so that depending on the euro motorization, a fee of entrance in the central area is levied (Fig.6) between 7 a.m. and 7 p.m. The efficiency of this approach is further doubtful, even if the vehicles numbers which transit the historical centre has diminished and the average speed has increased.

The reason for which the fee is not yet very efficient is that it is still quite cheap because the persons that enter by car (Fig.7) in this area of the city have a high income and would even afford to pay a higher price for an ecopass licence. In this case, GIS allows the localization of most intensely used arteries in order to differentiate the fee, the classical administration of the traffic lights, the achievement of demographic density maps etc.

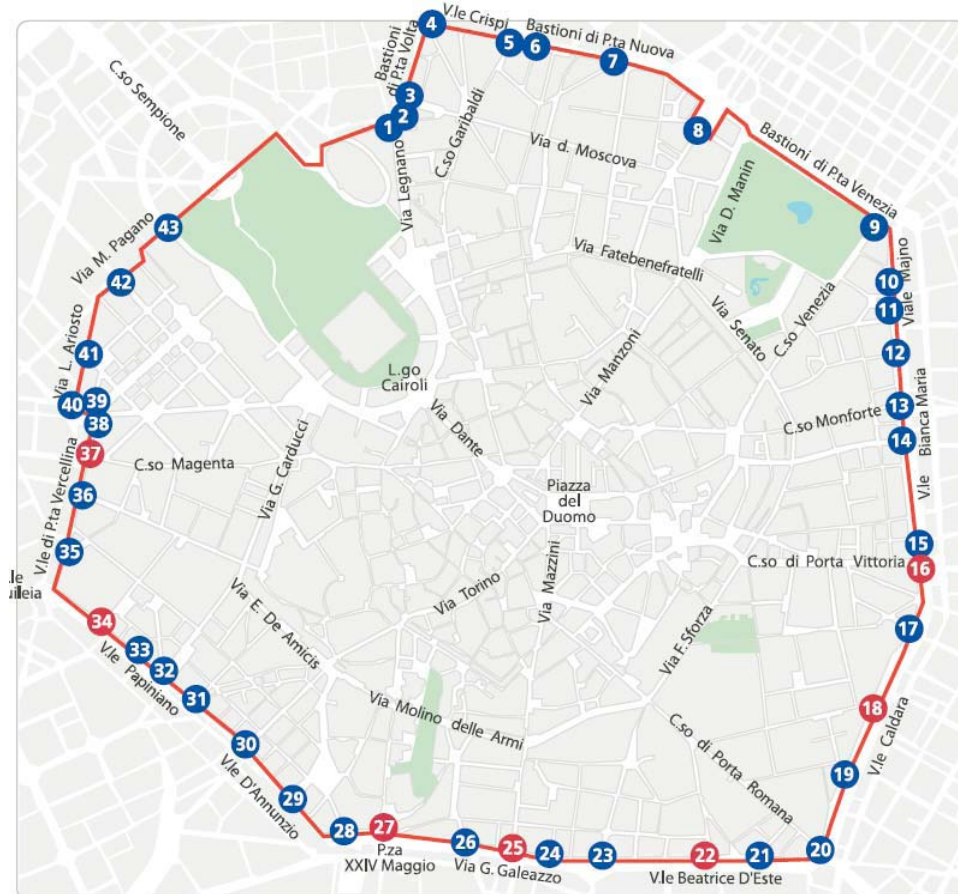


Fig. 6 The perimeter in which the Ecopass fee was introduced (Source: Comune Milano)

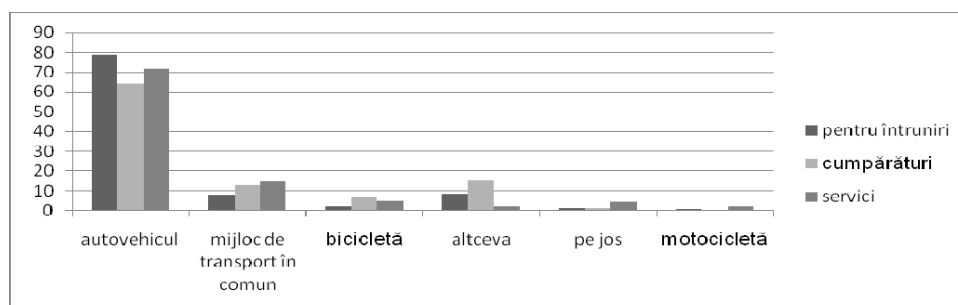


Fig. 7 Transport preferences of the persons that enter the historic center of Milan City (source: ISTAT, 2007)

A second direction adopted by the municipal authority is that of urbanistic settlement and territorial organization, in which there can be found various applications of the geographical informatical system. The first stage of the urbanistic settlement stipulates the planning directives and the highlighting in the field of its applicability by identifying the intervention needs (Fig.8).

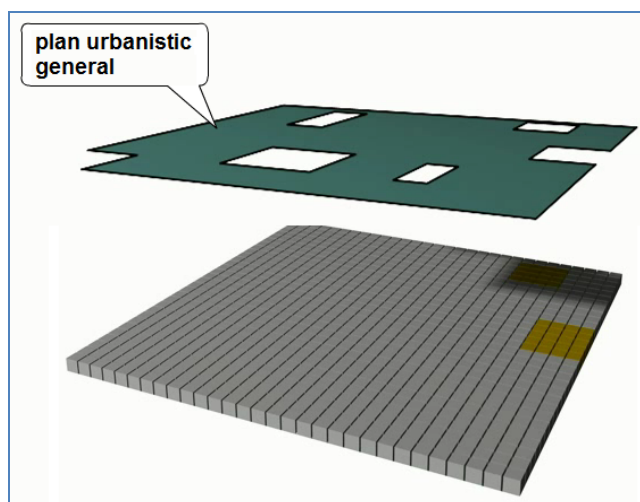


Fig. 8 The first step of the new urbanism planning's put into practice

In a second stage, using the cartographical materials made by using GIS, it comes out the private built up surface and the other built areas of from the public domain, divided into two categories: primary importance surfaces and secondary important surfaces (Fig.9). In the final stage, the former are developed mainly vertically (Fig.10) and the latter follow reorganization in order to improve the urban viability and the green areas.

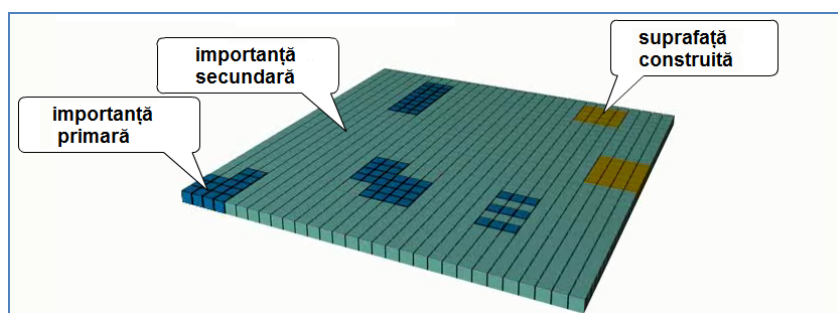


Fig. 9 The urban priorities' individualization stage in Milan

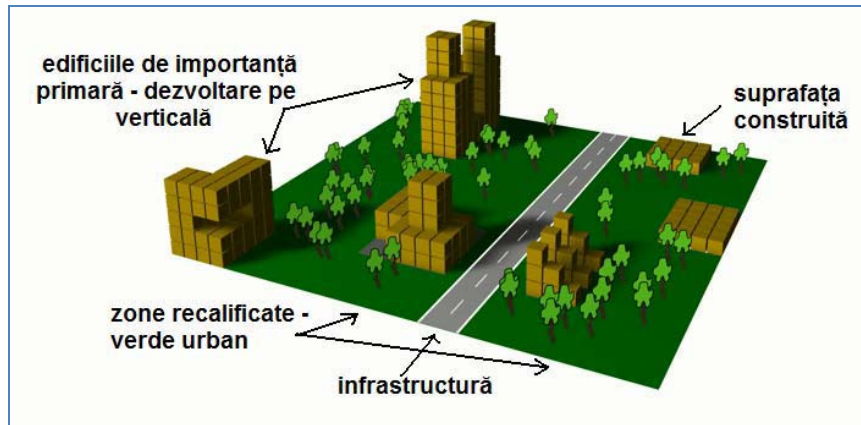


Fig. 10 The final vision of the urbanism planning adopted in Milan

Taking into account the actual problems that the urban settlements must face, it becomes necessary the implementation of geographic informatical systems to develop a better territorial analysis in the phases of: individualization, project and control of the organization decisions. Therefore, it represents a decisional support that the administrative public sector cannot ignore anymore in its connections with the territory, being also imposed by the European Forums in their rapports of public-private partnership to make up projects that concern the urban viability.

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