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THE PEDDALING OF THE LOCAL PUBLIC AUTHORITIES TOWARDS "VELOCITY"

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Abstract

The paper aimed to present the importance of Geographic Information Systems within the progress of various activities in terms of improving life conditions in the urban areas and also for promoting alternative methods of transportation such as bicycling. With this purpose in view it was submitted to examination a representative area of the capital, regarding the road network and its bordering estates. Through the instrumentality of Geographic Information Systems it was given the opportunity of inventorying them while creating a specific date base able to serve as a decisional support for the local public administration authorities. Given the fact that the textual information accompanies the graphic data it was easily established the way in which the transport roads could be adjusted so that they could insure the safety of all of the traffic participants.

Key words*: bicycle, bike route , database, GIS, Romania.*

INTRODUCTION

Like most European capitals, Bucharest is also suffering from noise-related problems, congestion and excessive pollution caused mainly by the road service.
Some countries acknowledged decades ago the damages generated to the environment by the carbon black emanated from diesel engines and also the direct impact of road congestions upon citizens safety.
Romania is still in the process of implementing specific strategies that are both economically and socially efficient and also environmentally friendly, protecting the natural heritage.
There have been listed frequent and considerable excesses of polluting matter in the air, responsible for health problems, easily inhaled particulates causing respiratory diseases and death in extreme cases.
According to the Evaluation Centre for Air Quality, the quality of the capital's air is under the specifications of the World Health Organization and the European Union and that the main responsible is motorised traffic our country is in need of practical and economical solutions.
Mainly, these solutions have to reduce the impact of everything that technological progress means has over the population.
On terms of shifting from individual motorised traffic (cars and motorcycles) to collective transport wasn't enough for considerable reduction of air noxae, municipalities are centring on developing methods by which cycling can be included in all urban development plans.
Therefore, establishing the precise way in which this transport mode won't be still considered collateral method of circulation is imperative, considering all aspects of energetic efficiency, decreased level of phonic pollution as the main advantages.
In times of economic crisis and regarding the limitation of all natural resources, local public administration authorities pay more and more attention towards bicyclists due to external costs caused by gridlocks and the need of high standards concerning mobility.

MATERIALS AND METHODS

In order to offer practical solutions to all issues caused by motorised vehicles in cities, solutions concerning the methods in which these might be resolved by using bicycles as a main way of transport within all traffic streets it's necessary to take into consideration the existing road network. The purpose of this analysis is establishing the possibilities of developing dynamic cycling tracks.

In this case, plans to scale 1:500, scanned and having represented a small area of the capital were useful.

Scanned large-scale plan don't have any spatial references, reason why it is necessary to align them to a coordinate system, not only for envisioning, operating, comparing or analysing them together with other geographical data. All these procedures can be realised by using a Geographic Information Systems from Environmental Systems Research Institute, Inc. (ESRI) as a spatial analysis instrument.

ESRI's ArcGIS systems provide tools and command that allow georeferencing as a way to define dataset's location using map coordinates and assign a coordinate system and vectorization, as the process of converting raster data to vector features.

Thus, all topographic and cadastral elements identified on the original image were stored in a simple, nontopological format by using shapefiles.

Shapefile is a usefull geospatial vector data format which makes possible the storing of the geometric location and attribute information of geographic features.

The main advantage of using this type of structure over other data sources is the fact that shapefiles offer faster drawing speed and edit ability. Features that overlap or those that noncontiguous are handled through shapefiles which typically require less disk space and are easy to read and write.

While attributes are held in a dBASE format file., area features are represented as closed loop, double-digitized polygons, shapefiles supporting point, line and area features.

Each attribute record has a one-to-one relationship with the associated shape record. (ESRI, 1998)

Given the fact that geographic features in a shapefile can be represented by points, lines, or polygons (areas), the structure of the shapefiles needed to complete the analysis of the area considered are presented in Table 1.

Carrying into effect the vectorization on the pilot area and by entering the data for every outlined element, according to prior definitions regarding geometry (such as the element's type: point, line, polygon) and the textual information indentified on the map and registered into the corresponding field it was given the opportunity to study the applicability of the project -using spatial analysis instruments.

It was taken into account the carriage way, the sidewalk and real estates in close proximity.

In view there were considered two circumstances:

1. Engineering the bike routes so that the traffic way will remain at the same width and creating the space needed from expropriations.
2. Engineering the bike routes within bounds of the traffic way.

Table 1. Dataset structure
(name, geometry and attributes)

Name	Geometry	Attributes	Data Type
Sector	Polygon	ID	Long Integer
		NrCad	Text
		Suprafata	Float
		Perimetru	Float
Imobil	Polygon	ID	Long Integer
		NrCad	Text
		NrPostal	Text
		Artera	Text
		DenStrada	Text
		NrConstr	Long Integer
		Mod_adm	Text
		SuprActe	Float
		SuprMas	Float
Cladire	Polygon	ID	Long Integer
		NrCad	Text
		NrConstr	Text
		Destinatie	Text
		Stare	Text
		Categorie	Text
		SuprMas	Float
		SuprDesf	Float
		Perimetru	Float
		NrFam	Float
		NrPers	Float
		NrNiveluri	Float
		Observatii	Text
Strada	Polygon	ID	Long Integer
		NrCad	Text
		Artera	Text
		DenStrada	Text
		Suprafata	Float
		Perimetru	Float
Trotuar	Polygon	ID	Long Integer
		NrCad	Text
		Suprafata	Float
		Perimetru	Float

Case 1.

Considering all regulatory documents into effect in our country, in order to ensure traffic safety, all cycling routes have to have 1.70 metres in width, considering bicyclists and cars to have the same sense of direction (Figure 1).

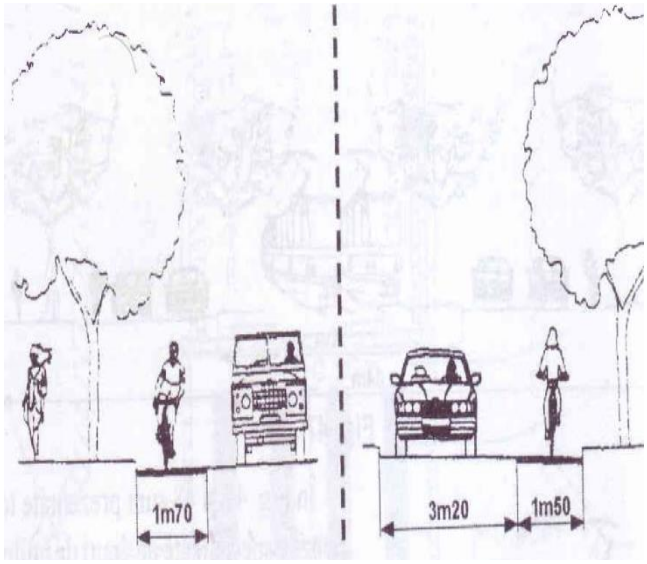

Figure 1. Width of cycling tracks depending on the type of circulation (Source: Dicu, 2010)

For this purpose and using ArcGISs instrument "Buffer" it was created a created a target layer, containing polygon features. The buffer was realised around all streets at a distance of 1.70 metres and it will be used to obtain the intended surface for the bike trail. The option "Intersect" which was used to discover the intersection between the buffer area created and the existing surface of the footwalk will calculate the geometric intersection of these feature classes and feature layers.

The features, or portion of features, that are common to all inputs (that is, they intersect) will be written to the output feature class.

Having designed the cycling tracks it is now necessary to rearrange the traffic way.

ArcGIS allows features or portions of features in the input and update features that do not overlap to be written to the output feature class, by using Symmetrical Difference. Features used were Pista and Trotuar and the result of this operation is the remaining area of the sidewalk. These portions don't have the necessary dimensions in order to allow pedestrians to circulate in rows. For 2 rows of citizens which are circulating from opposite directions to be able to pass besides each other, without any inconveniences, the sidewalk has to be designed so that its width will have at least 2 metres. (Dicu, 2010)

It is necessary to create a new buffer area around the cycling tracks and to intersect it with the real estates area in order to establish an optimal dimension for the side walk.

This new buffer area also allows those interested to determine the exact sections from the real assets that will be expropriated and also the boundaries of the new estates. The result is represented in Figure 2.

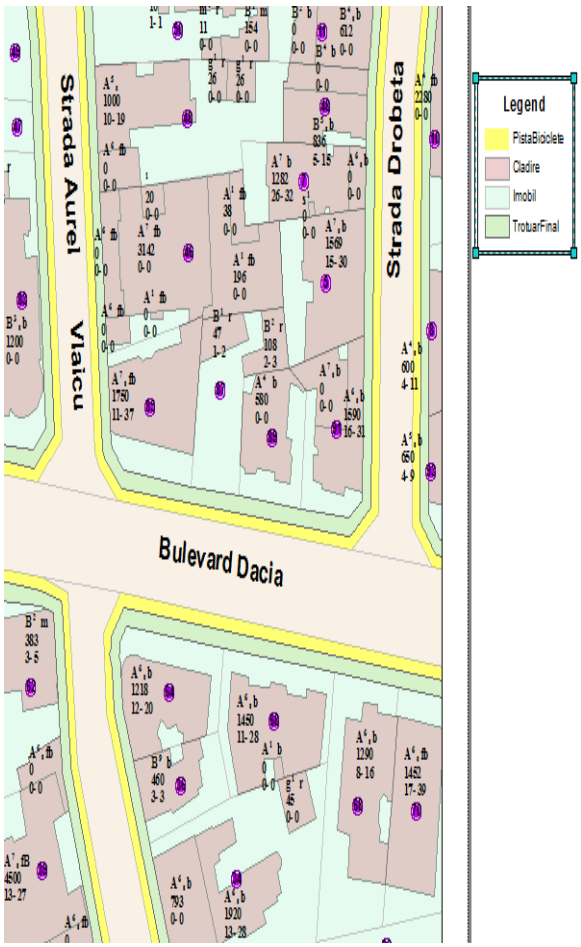

Figure 2. Designing bicycle routes while keeping the streets original width

Case 2.

All bike routes to be enhanced won't be constructed using any of the private domain but by using space from the traffic ways. (STAS 10144/2-91, 1991).

The dimension of these tracks will depend on the type of traffic trunk on which it is

constructed on and it will depend on the way in which these two circulation ways will interfere.
In the case of bicyclists and cars circulating on the same roadway and in the same sense, the cycling track's width has to have 1.70 metres and 1.50 metres contrary.
Considering the width of the traffic way in the pilot area, which fluctuates between 12 metres in case of the main artery, with 3 lanes of circulation and 9 metres in case of the side streets, creating the tracks implies reorganizing the street network.
For the implementation of all the concepts stated previously it is necessary to apply the same sequence of procedures and to use the same instruments as well as in the prior case, having in mind some distinctive features.
Realizing the tracks for cycling on the arteries consisting of 3 lanes presumes rehabilitating them by limiting the lane number to 2. Thus, the tracks will be located on the traffic way and the circulation will take place in the same direction as the motor vehicle's one.
The buffer area created by the instrumentally of the Buffer option will have 1.70 metres width on both sides of the street.
In case of one-way streets, establishing these areas implies the assignment of a 1.70 metres segment from the traffic way's area, supposing that all traffic will take place in the same direction.
Regarding two-way streets with one lane per direction, adding in cycling track in a safe manner implies converting them in one-way roads.
The main criteria taken into consideration for this conversion refers to both safety and also maintaining optimum dimensions for the cycling track and the avenue. The buffer area will have in these circumstances 1.50 metres in width, bicyclist's circulation oppositely directed to the vehicles. (Figure 3)

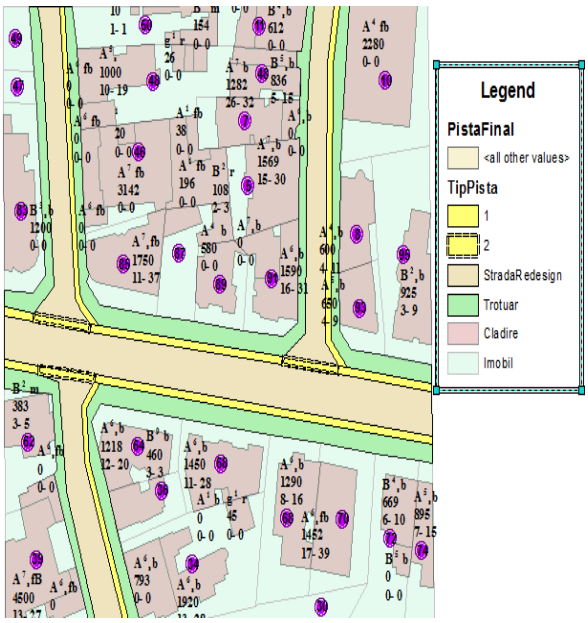

Figure 3. Designing bike routes using space from the streets area

RESULTS AND DISCUSSIONS

Riding a bicycle uses less of the public space, meaning less need for specific infrastructure and freeing valuable urban space for other uses (Auer and Reiterer, 2011).
Apart from all health benefits carrying into effect this type of project facilitates traffic decongestions.
A successful policy will have to carefully consider and plan the conditions under these ways of transport will be designed. Regarding infrastructural improvements, the interest goes to the costs of such developments.
Trough Geographic Information Systems these costs can be rated, funds needed for each expropriation being represented in Figure 4.

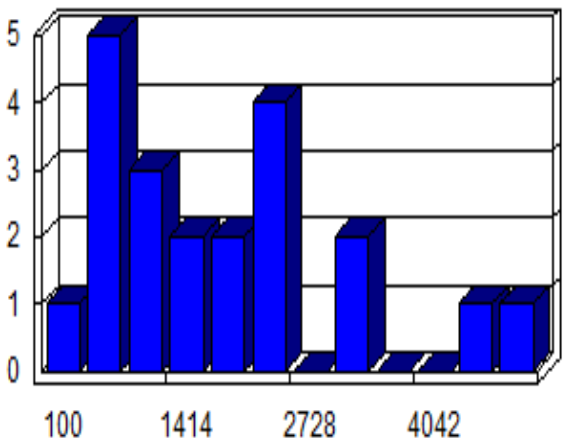

Figure 4. Evolution of prices for e expropriated estates(Euro)

Because short, isolated segments of bicycling tracks, with a length smaller than 500 metres aren't efficient cycling routes need fast connections between the starting and the ending point.
This is the main reasons for which the joining of these routes is essential.
In reality, given the fact that resource disposal is limited, all consideration channels not to the development of a costive network that will cover the entire capital or to the construction of completely separated tracks, but to the engineering of mixed traffic ways of transport. As important as the actual design of these areas is also their permanent improvement, as well as connecting them so that the result will be an uniform transport network.
According to the European Cyclists' Federation, 50 % of all vehicle transport was realized for distances shorten than 5 kilometres, the reason for selecting this way of transport being the lack of a faster one.
Based on this lack of alternative and by sinking the currency needed for the development of cycling tracks, the time spent in traffic could be reduced to half.
Also, from official reports it emerged the fact that last year 400 000 euro were given from the state budget to cover all hospitalization costs of citizen suffering from pulmonary chronic conditions, the funds needed for the expropriations being thus justified.
Opting in favour of rearing these establishments using instead space from the traffic lane will lead to significant drop in terms of total costs and also work volume.

Figure 5. Dacia Street- a look into the future

Realizing cycling tracks within the space destined for motored vehicles implies their rehabilitation by downsizing the number of lanes or by creating one-way streets similar to highroads.
Thus the risk of traffic related accident will be reduced by redirecting transient traffic uptown areas (Kuster el al.,2010).
The presence of bicyclists in traffic obliges all motorised vehicles to become more aware of them and learn to expect their presence and predict their behaviour reducing the safety risks of these transport modes (Auer and Reiterer, 2011).

CONCLUSIONS

Given the fact that both possibilities of creating a track for this alternative way of transport lead to the same result the planning of this project remains in the local public administration's hands and depending on the budget funds. Considering the fact that building bike routes using segments of the traffic network instead of expropriating estates conduces to zero costs and also taking into consideration all the advantages regarding safety and road comfort cycling tracks will offer other benefits.
Separating bicycles and motorised vehicles and creating special lanes for them at the border of the traffic ways tends to be the best solution.
Geographic Information Systems as a way of analysis and in order to establish the means in which this project will be implemented allows the process of decision making to be realized based on up-to-date and precise data.
The results are important not only for the future predictions concerning the design of cycling routes, but also for the development of a network for this way of transport as an alternative to the classic ones.
In order to save costs by using less electricity and fuel and also to solve some of the pollution problems, the opportunities given by the Geographic Information Systems allow a safe and efficient planning for these routes, taking into consideration both costs and volume of the project.

ACKNOWLEDGEMENTS

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