CONSIDERATIONS REGARDING THE USE OF INFORMATIC SYSTEMS FOR ESTABLISHING THE MAINTAINANCE STRATEGY OF URBAN ROADS NETWORK

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***Abstract**: The expansion on the horizontal of the urban roads network is not possible for the majority of the cities, and its reconstruction being too expensive, the priority for the moment remains the development of the maintenance strategy for the existing one. Setting up an efficient management agenda for the urban roads' maintenance constitutes a priority for the road administrators. An efficient solution in this respect is the creation and the implementation of IT management systems.*

The modern computation techniques and the database software of the type G.I.S. allow the creation of applications that should permit realizing an IT system of management for the urban road network.

The IT management systems are designed to become a working tool in the decision process that aims at discovering realistic intervention strategies, pertinent ones and in accordance with the administrator's politics.

***Keywords**: G.I.S, strategy, maintenance, urban roads.*

1. General

Development of cities with all their needs, but also appearance of vehicles, contributed to the emergence of a new concept of making roads within municipalities. They were designed to ensure that fixed support to achieve the movement of vehicles, pedestrians, but also can be used for placement of the necessary elements of the city utilities.

Cityes are live organisms, constantly developing, which depends on a number of decisions for his future. Once build, urban roads should be maintained by taking account of developments in traffic, the influence of the environment or changes in city life.

If for public roads outside the towns were many concerns for their management strategy and maintenance, for urban roads these strategies don't have yet a unanimous acceptance of the diversity of factors that influence them.

Thus, any study or research regarding this matter are important and beneficial, especially for Romania, where the problem of maintenance strategies in the cities is still a start.

2. Management systems

Modern computers and software with GIS databases allow creation of applications that would result in a computerized urban road network management.This system can store a large amount of data in databases organized in domains and will enable the analysis and

bidirectional access of all users, but limited to a specific area of interest information, constituting the basic factor determining the strategies and decision processes.

Management system database is specialized software that allows creating, updating and consulting of the databases.The objective of an effective management system is to select the optimal intervention solution by analyzing economic and technical factors, so the decisions would not be influenced by subjective factors.

Management systems of urban road networks emerged as a necessity, because of the many parameters and criteria underlying at the establishment of intervention strategies. An effective strategy requires not only a timely intervention, but choosing the most efficient solution. Here lies the need for establishing a rigorous diagnosis, examining both the causes of degradation of road structure and the severity of their effects.

3. Maintenance strategies

Synthesis capacity of a wide range of information by decision factors and network characteristics are important prerequisites of optimal management. To the extent that decision process is greatly supported by a computer system, the network status will be maintained in optimum parameters with minimal costs. Managing an urban road network is difficult because of the unique urban traffic, the existence of public service networks, with their specific functionality, with characteristic positioning rules of municipal networks and the need for access to interventions. So it is absolutely necessary that the choice of intervention solution to streets should be taken into account by the scheduling of work on these objectives.

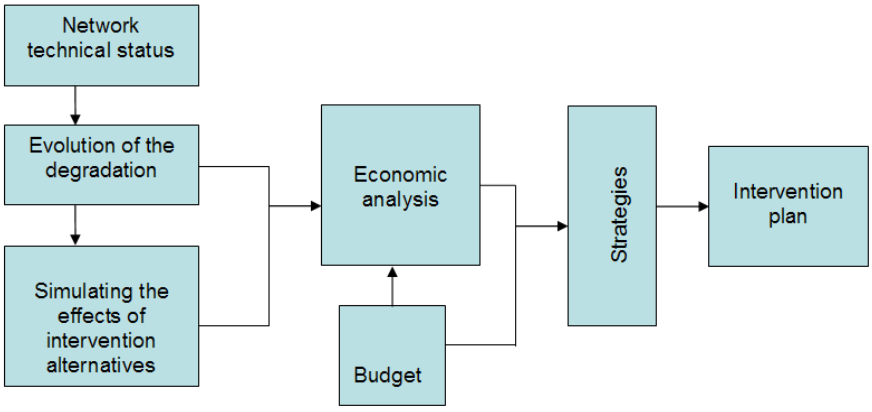


Fig. 1. Algorithm for determining the strategies and plans

Urban road network management problem is a concern facing all countries of the world. Depending on the complexity of the network in each city and its special features, governments try to establish programs of short and long term management, more efficient, to have a road network that provides a high level of service.

Considering the necessity of implementation of such a system in our country, we have made such a management system for urban road networks, called GESDRU. The management informatics system is structured in 4 modules in which are processed all the parameters that define the street network**.**

Module 1. [M1]. Background of the urban road network;

Module 2.[M2] Calculation of the tehnical status and study of the degradation indices over time;

Module 3.[M3] Choosing the maintenance strategy;

Module 4. [M4] Reports and viewing road charts.

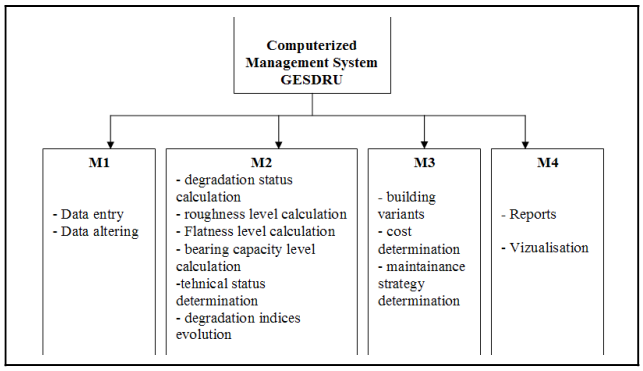


Fig. 2. The informatic system scheme

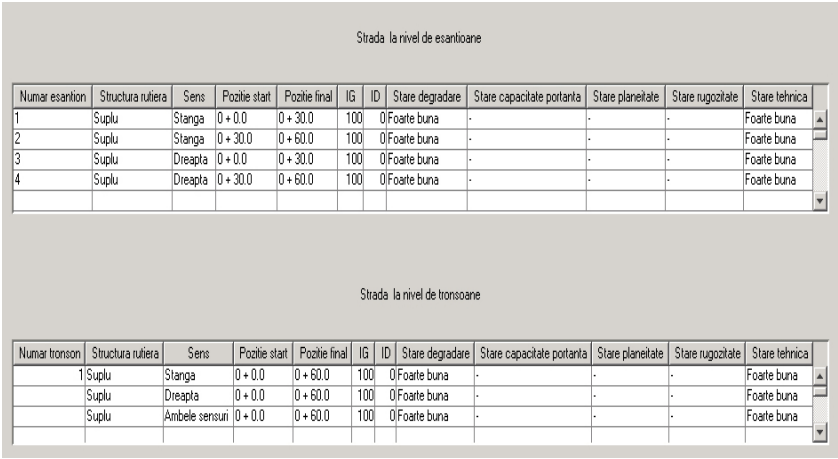
GESDRU program presents a graphical interface that allows you to enter data collected in a manner readily easy by the user. Navigating the application is done using the main which is always easily found by the user.

Main menu and its options:

- Insert street
- View street
- Modify street
- Tehnical status calculation
- Maintenance

Following the data processing program, information is obtained up to the smallest detail about the technical state of roads, maintenance of technical solutions but also an analysis of their cost.

Results provided by management information system GESDRU:



Strada la nivel de esantioane

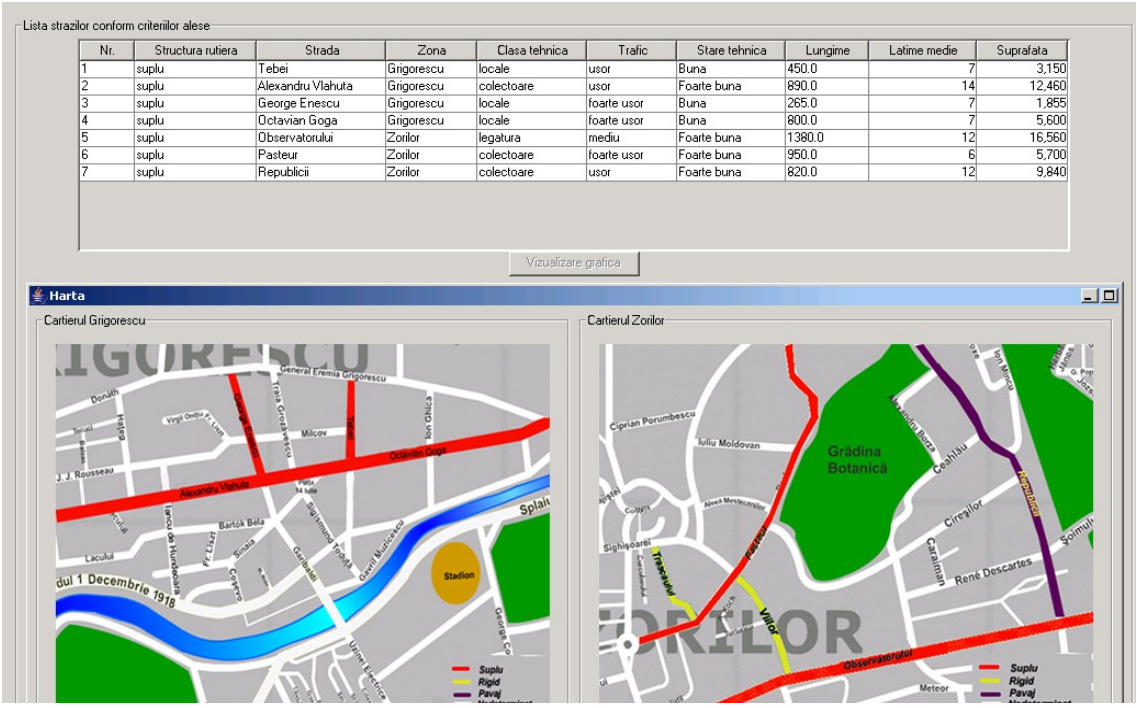
Numar esantion	Structura rutiera	Sens	Pozitie start	Pozitie final	IG	ID	Stare degradare	Stare capacitate portanta	Stare planeitate	Stare rugozitate	Stare tehnica
1	Suplu	Stanga	0 + 0.0	0 + 30.0	100	0	Foarte buna	-	-	-	Foarte buna
2	Suplu	Stanga	0 + 30.0	0 + 60.0	100	0	Foarte buna	-	-	-	Foarte buna
3	Suplu	Dreapta	0 + 0.0	0 + 30.0	100	0	Foarte buna	-	-	-	Foarte buna
4	Suplu	Dreapta	0 + 30.0	0 + 60.0	100	0	Foarte buna	-	-	-	Foarte buna

Strada la nivel de tronsoane

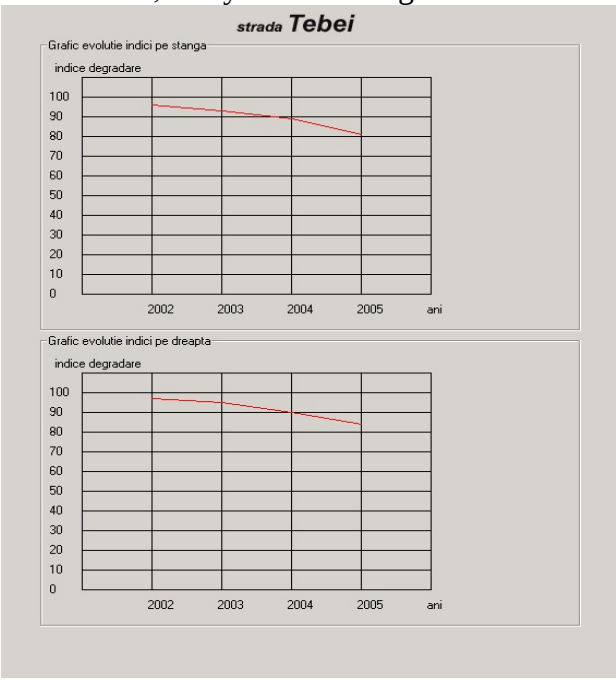
Numar tronson	Structura rutiera	Sens	Pozitie start	Pozitie final	IG	ID	Stare degradare	Stare capacitate portanta	Stare planeitate	Stare rugozitate	Stare tehnica
1	Suplu	Stanga	0 + 0.0	0 + 60.0	100	0	Foarte buna	-	-	-	Foarte buna
	Suplu	Dreapta	0 + 0.0	0 + 60.0	100	0	Foarte buna	-	-	-	Foarte buna
	Suplu	Ambele sensuri	0 + 0.0	0 + 60.0	100	0	Foarte buna	-	-	-	Foarte buna

-State-level sample technique and section
-State-level sampletechniqueand section.

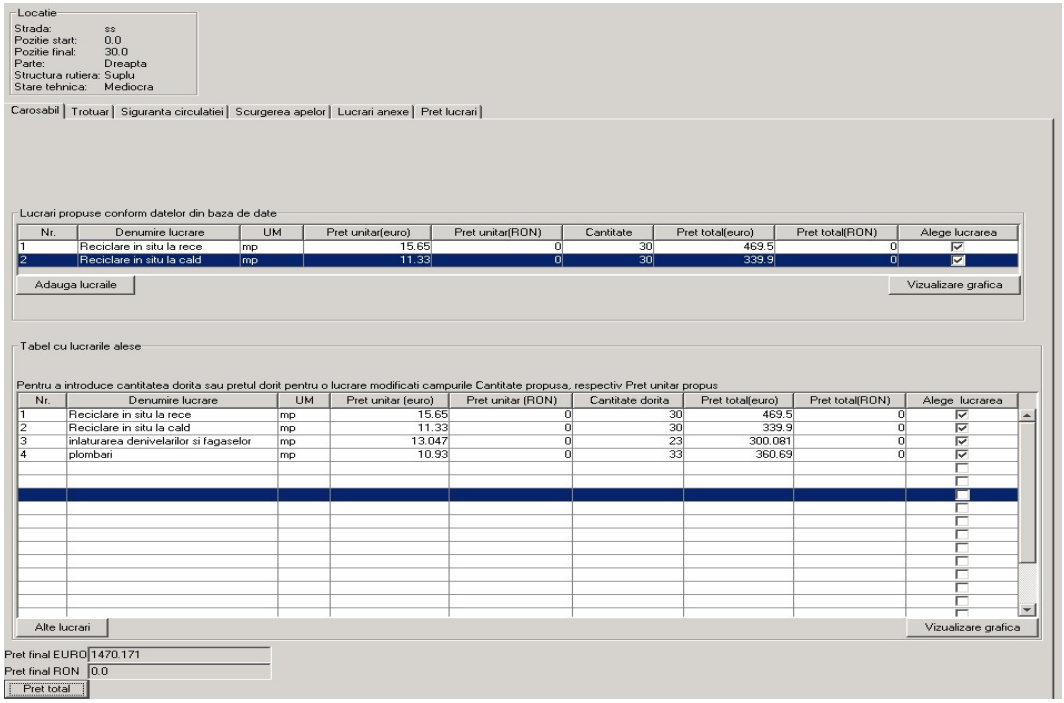
-map displaying by areas: state of degradation corrresponding to each artery:



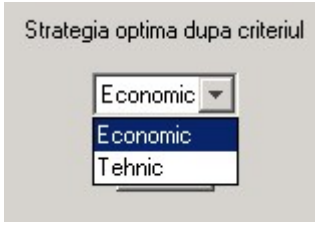
- state of degradation evolution in time, study based on degradation indices:

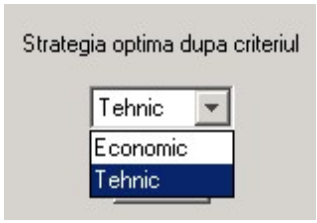


-maintenance solutions at sample and section level and their price analysis



In order to establish the optimal strategy for intervention, the output variants are analyzed based on tehnical and economic criteria.





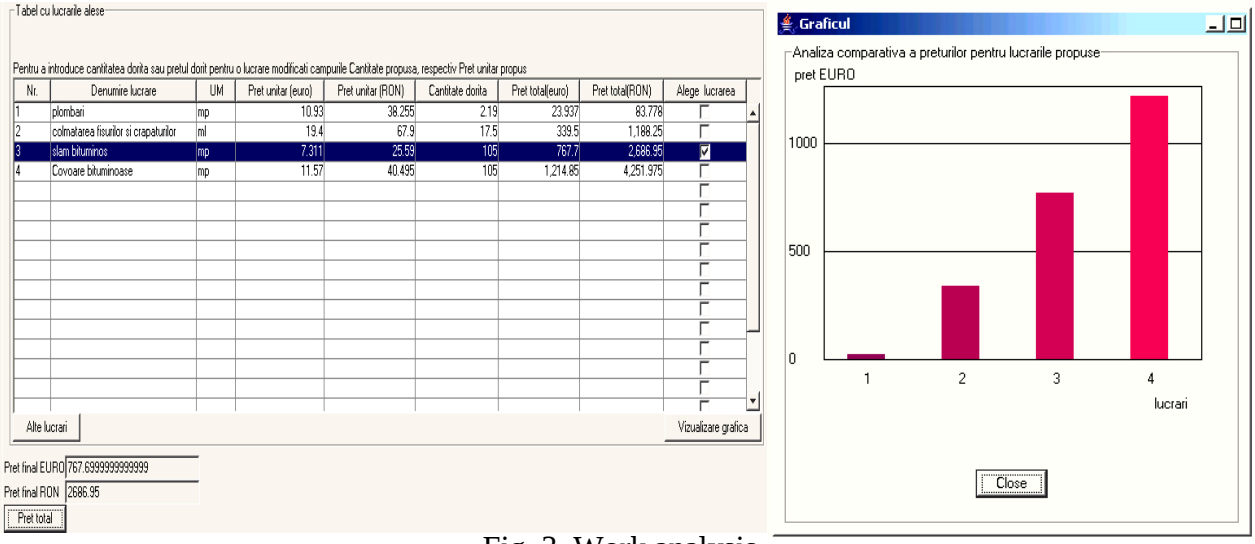


Fig. 3. Work analysis

This data is made available to decision factors, knowing such details can determine optimal intervention strategy.

4. Conclusions

Computerized Management systems are designed to become a tool for decision making for obtaining a realistic intervention strategy according to the politics used by the administrator. The main users of these systems are the decision factors from different levels. This approach minimizes the total cost, considering the infrastructure costs and user costs for the entire network and coverage for all future work.

5. References

1. Chira, C., Naş, S. ”Sistem informatic de gestionare a rețelei rutiere urbane – metodă modernă aplicată unei activități clasice”, Conferința națională de drumuri urbane, Oradea 2002.
2. Iliescu, M., Naş, S. ”Baza de date – o soluție modernă şi eficientă pentru administrarea rețelei rutiere urbane”, Revista Drumuri Poduri nr. 26 august 2005.
3. Chira, C. ”Întreținerea drumurilor”, Editura Mediamira, Cluj-Napoca 2005.