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EXPERIENCES AND PROSPECTS OF TRANSPORT STUDIES AND PROJECTS IN CROATIA

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INTRODUCTION

The dynamic economic growth and the implied transport requirements over time have stipulated a progressive development of the transport profession and science as well as the specific education of the transport profile, mainly as part of conventional technical faculties – of civil and mechanical engineering.

These scientific fields of technical sciences, as the related immanent research methodology, however, have not proven as sufficient in solving complex problems of optimizing the existing transport system and modelling of the transport development.

The sixties of the last century marked in Croatia institutional beginnings of research and education of the transport profiles. Branch specialized vocational schools were opened, as well as interfaculty university study of transport and specialized research institution – Institute of Transport Sciences.

Over time and resulting from the specific development demand in the transport sector, these institutions adapted institutionally and organizationally to the new requirements, improving thus also the methodology of its academic and research activities. The newly adopted concept of the so-called "goal-oriented" strategic planning of the transport system requires integrative intermodal approach to the basic postulates of the sustainable development.

The methodology of the strategic transport planning, mainly within the context of the regional development, is based on the complex of influencing factors. This means system analysis of wider problems – ranging from geotraffic analysis and traffic flow dynamics to the elements of transport policy – infrastructure, management and regulations, external transport costs, transport safety and environmental protection; specific characteristics of urban transit and physical planning; new technologies in the function of the transport development, transport acquis, etc.

Recently, the European integration processes have stipulated the need to harmonize national transport systems and implement the objectives of a common transport policy.

The academic and research resources in the transport sector of Croatia are focused on the curricula and portfolio of the scientific projects of a small number of scientific and academic institutions, which have insured the consistency of the previous transport development and expert potential for parrying the demanding strategic guidelines of further transport development of Croatia within the enlarged Europe.

TRANSPORT DEVELOPMENT CONTEXT

The progressive trend of the traffic growth has not been accompanied by adequate transport policy, mainly regarding compatible development of the transport network at the regional level, balanced development of transport branches and intermodal and inter-sector coherence.

Therefore, more recently the regional approach to regulatory co-ordination, infrastructure planning and management in the transport sector have been emphasised in order to implement

the instruments of the common transport policy and modelling of the integrated trans-European transport network. In this sense, the subsidiary objectives of sustainable development of the transport system have been articulated through the notions of environmental balance, integration and interoperability.

The transport policy of a country assumes long-term postulated objectives of the transport development – Transport Strategy, which is in the conditions of integration processes dictated by regional development context. For the realisation of the strategic objectives, dynamic application of different transport policy instruments has been planned.

Strategic planning, thus, understands identification of the relevant objectives of long-term development that serve as inputs of the transport policy and the origin of adopting development guidelines and making decisions in the executive government bodies.

The strategic objectives of the transport development in Europe include – integration of the trans-European transport network, fair pricing in transport, environmental protection, transport safety, social cohesion and strengthening of the transport market.

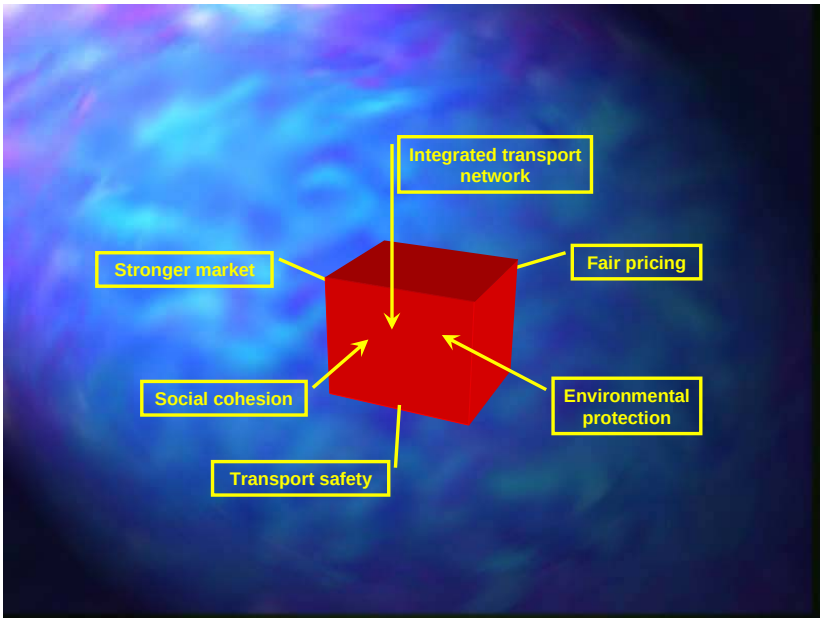

Figure 1: Transport policy inputs – transport strategy objectives

In its nature, transport is global, the result of a very branched and complex interaction between governments, manufacturers, operators, procedures and technical systems (hardware and software), and as a system it has to satisfy international standards and unique practice. In conceiving its development there is inevitably the need to harmonise the conditions and the interests of a whole series of subjects.

For the needs of strategic planning, as a rule, the national scientific, research and expert resources are mobilised with the aim of solving the variable internal and external requirements in the transport sector, but also in other sectors of government significance. This continued process imposes the need for harmonisation at all levels – Parliament, executive authorities, as well as industry and science, and of no lesser importance, the public, i.e. the users.

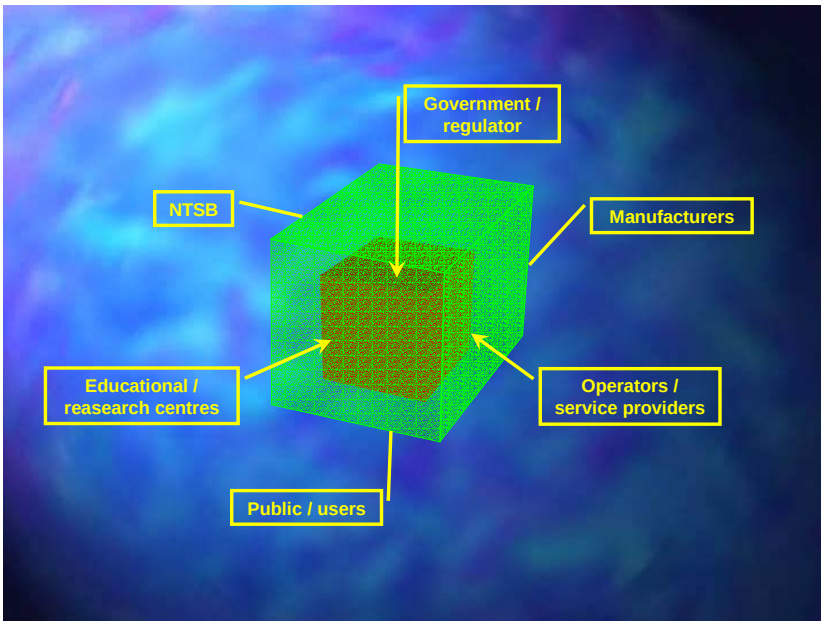

Figure 2: Transport policy subjects

The economic situation and the investment capability at the national and regional level, as well as the subsidiary objectives of the transport development, dictate the principle of intermodality in the transport network development concept. At the current imbalance in the level of development of transport branches, this actually means higher investments into the transport infrastructure of rail, combined and water transport, control of road transport growth, stimulation of non-road transport options and public transport.

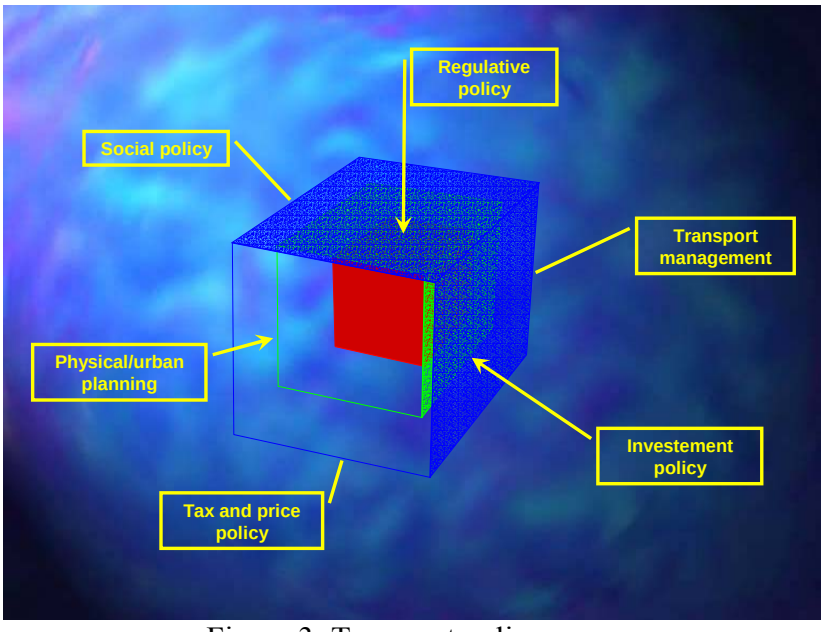

Figure 3: Transport policy areas

The implementation of transport development objectives primarily assumes the regulative autonomy of the transport sector and consistent cross-sector co-operation, in order to insure the efficiency in crucial aspects of: regulative policy, transport management, investment policy, tax and price policy, physical planning, and social policy.

A summarised status of the transport development and demanding needs to adapt the Croatian transport system within the context of its future integration in the European Union, represents a logical incentive to perceive the importance of insuring scientific and professional potential of the transport profiles.

Combining expert resources of all the transport related fields in the scientific and research projects and the tendency to rationalise the curricula with the aim of creating multi-disciplinary programs adapted to the needs of regional development, industry and market, represents a challenge for the transport science.

THE STATUS OF HIGHER EDUCATION AND RESEARCH IN TRANSPORT

By the analysis of the current higher-education, and scientific and research institutions in the field of transport, certain similarities in the chronology of founding and developing to other European universities can be detected.

It is a young scientific group, which has not reached its final form yet regarding the recognizability of the scientific methodology and the curricula.

The scientific and educational dimension is still in its development phase, and has been stipulated to the greatest extent by technological, operational and economic requirements, resulting from the context of sustainable development at the global and regional levels.

In Croatia, the tradition of higher education in transport dates back to 1962 when the study of Postal Traffic and Telecommunications was founded. In 1965, thirteen companies and professional associations initiated and financially supported the founding of a specialised institution - – Institute of Transport Sciences.

The traffic and transport study for the education of professionals achieving university degree was organised by the Faculty of Civil Engineering in 1968, and the inter-faculty syllabuses included also participation of several faculties within University of Zagreb – the Faculty of Architecture, Economics, Electrical Engineering, Mechanical and Naval Engineering and the Faculty of Law.

After two-year preparations, 1970 the Road Traffic College was founded. The study of air traffic was organised in 1972 by founding the College of Aeronautical Engineering with the course in aeronautics, and later also the course of aircraft engineering.

In 1981, the Centre of Transport Sciences was founded with two institutions – the Study of Transport Sciences and the Institute of Transport Sciences. The first integrated the curricula of the existing vocational colleges, and the second was oriented to scientific and research work in the field of transport.

The rail transport study program existed in a certain form within the inter-faculty study of transport, and its formal beginning is associated to the newly founded Study of Transport Sciences.

The Faculty of Transport and Traffic Sciences, University of Zagreb, as it exists today, was established in 1984 through reorganisation of the university inter-faculty study of transport, and as a successor of the specialised studies at vocational colleges and the Study of Transport Sciences.

Apart from the Faculty of Transport and Traffic Sciences, there are two more scientific and research resources in the transport sector of Croatia – the Institute of Transportation and Communications, founded in 1991, as legally and financially independent scientific and

research institution and the Scientific Council for Traffic of the Croatian Academy of Sciences and Arts.

In the short but extremely dynamic development, these three institutions, through joint co-operation, insured consistent scientific engagement of all its employees in all the aspects of national transport development.

The scientific activity of these institutions came especially to the fore during the nineties of the last century, at the war period and consequent huge destruction and damages on the transport infrastructure, at times of Croatia's traffic isolation.

The need to repair war damages in the transport sector, organisation of the national transport sector, joining the international transport associations and reintegration of Croatia into the international traffic flows were the key issues of their scientific activities.

The scientists of the Faculty of Transport and Traffic Sciences and the Institute of Transportation and Communications, in co-operation with the Scientific Council for Traffic of the Croatian Academy of Sciences and Arts, contributed directly through their work on the projects and scientific studies, as well as by organising international conferences, to the routing of pan-European corridors in Croatia, at the 3rd Pan-European Conference of the Ministers of Transport in Helsinki in 1997 and during 1997 and 1998 they participated actively in the project of designing the Strategy of the Croatian Transport Development, which was adopted by the Parliament in 1999.

Similarly intensive was the scientific activity at the international level with the aim of reintegrating the international airways in Croatia. The invited lectures at the Air Traffic Control Association Conferences resulted at the beginning of 2000 in reactivation of the existing international airways in Croatia, as well as in obtaining a new Adriatic corridor through the Croatian airspace.

During 2000 and 2001, the scientists of these institutions were engaged in the project topic Transport as part of the Government project on designing the Development Strategy of the Republic of Croatia "Croatia in the 21st century".

The Faculty of Transport and Traffic Sciences and the Institute of Transportation and Communications have organisationally participated in numerous international scientific and professional conferences at home and abroad, out of which special emphasis is on the scientific symposia organised by the Scientific Council for Traffic of the Croatian Academy of Sciences and Arts – "Re-evaluation of the Geo-traffic position of Croatia and Bosnia and Herzegovina in the interest of both states" (1996), International Symposium "Connecting the Adriatic with the Central Europe" (1998) and the International Symposium "Traffic Connection of the Baltic and the Adriatic/Mediterranean" (2000), with participation of the transport scientists and experts from twelve European countries.

It was in the same organisation that the 1st International Symposium "Faculties of Traffic and Transport Sciences in Europe" was held in 2005 where a Declaration on International Academic Cooperation among twelve European transport faculties was signed. In co-operation with the scientific academies of Slovenia and Bosnia and Herzegovina, and the Transport Faculties of the University of Ljubljana and Sarajevo, the scientific conferences were organised: "Ecological problems of modern transport" (2004) and "Transport in the function of Economic and Sustainable Development" (2005).

The scientific and research projects as part of the program of permanent research activities of the Ministry of Science and Technology have been of special significance for the transport development in Croatia.

The more recent projects of the Faculty of Transport and Traffic Sciences have been, regarding their topic, marked by the aspects of solving the problems immanent to the actual status of the transport sector of Croatia and the implementation of the international references in the segments of: intermodal transport network planning, intelligent transport systems development, logistic modelling of terminals, air traffic planning in the context of "single European sky", safety and environmental aspects of transport development, sustainable development of urban transport and rail transport as the function of economic development.

Analogously, the projects of the Institute of Transportation and Communications, with a wider topic of strategic transport development planning, cover targeted topics related to the solving of specific problems of national transport sector, e.g. reconstruction of the dangerous spots on the roads, optimisation of public transport, phased approach to the development of road network, development of non-conventional aviation for the Adriatic coast, etc.

The research results as part of the mentioned projects have been referenced in the base of the Croatian Scientific Bibliography – http://bib.irb.hr.

The methodological approach to the profiling of the experts and scientists in the transport field, particularly articulated in the more recent curricula at the Faculty of Transport and Traffic Sciences, is characterised by the tendency of stronger linking the teaching and scientific dimensions, as well as by stimulation of students to actively participate in scientific and research work during their education and specialization.

The Faculty of Transport and Traffic Sciences, University of Zagreb has organised the post-graduate studies "Technical and Technological systems in Traffic and Transport", with a set of core and elective subjects, which have combined in a multidisciplinary manner the scientific disciplines within the area of technical sciences. A total of eight generations completed the post-graduate studies at the Faculty of Transport and Traffic Sciences, and more than 100 graduates have obtained the Masters of Science degree until now.

For the needs of a higher level of specialised knowledge and scientific improvement, the theoretical foundations have been expanded and upgraded by the program of doctoral studies.

The consistency of the scientific and methodological approach in profiling the transport experts and scientists is manifested in adapting the curricula to the new conditions in process of reformation, both of the system of higher education, and of the transport industry in Europe.

The first generation of the undergraduate studies of Transport, ITS&Logistics and Aeronautics enrolled in the academic year 2005/2006 according to verified curricula and in compliance with the Bologna Process. The first generation of students is currently being enrolled at the post graduate specialist studies and the doctoral study, also according to the innovated curricula in compliance with the Bologna Process.

CONCLUSION

In the process of transformation of the higher education system at the European level with the tendency of harmonising the institutional and organisational frames of the university work and academic activities, and stimulating knowledge transfer, the transport sciences will also have to insure adequate status in the scientific classification and a thematically and methodologically recognisable dimension of academic activities.

The specific subjects of the transport sciences study in the future will gain in significance, recognizability, and excellence, only by the consistent development and constant upgrading of the basic, specialist and scientific curricula.

Academic connections among the transport related faculties, the exchange of their students and lecturers and the collaboration in organising scientific conferences and in research projects are on the line of gradual adoption of new methodological solutions in higher education and science, which are stipulated by reformation and integration processes in the field of higher education and science in Europe.

In this sense, the past experience leads to the conclusion that it is easier to establish bilateral and multilateral cooperation in the field of transport sciences at inter-faculty level than at inter-university level, both because of the small number of autonomous scientific and educational institutions, and the small number of scientific and teaching staff of this profile. It is precisely this fact that has to be recognised in the acquisition of concrete joint projects at national levels, or in the application of concrete joint projects at the regional level.

Gatherings and exchange of knowledge and experience of the representatives from the transport faculties in Europe present an opportunity, apart from maintaining the continuity and improvement of academic co-operation, also for detecting potential research topics of mutual interest and concretisation of targeted projects as part of TEMPUS, SOCRATES/ERASMUS and 7th frame program of the European Commission.

Logically, the scientific and research resources of the transport faculties should be the most competent factors in the development of transport sciences, their promotion and further affirmation, and consequently the most important contributors in postulating the transport development of Europe.

LITERATURE

1. Božičević, J., Steiner, S.; Prospects of Transport Sciences Development. International Scientific Symposium “Faculties and Studies of Transport and Traffic Engineering in Europe», Croatian Academy of Sciences and Arts, Scientific Council for Traffic, Zagreb, 2005.
2. Badanjak, D., Bošnjak, I., Kavran, Z.: Organization of Studies at the Faculty of Transport and Traffic Engineering, University of Zagreb. International Scientific Symposium “Faculties and Studies of Transport and Traffic Engineering in Europe», Croatian Academy of Sciences and Arts, Scientific Council for Traffic, Zagreb, 2005.
3. Božičević, J.: The Development of Traffic Sciences and the Basic Traffic System Guidelines in the Republic of Croatia. Promet-Traffic-Traffico, Vol.16, 5-6, Supplement No.1, 2004.
4. Steiner, S.: National Transport Policies Harmonisation in Europe. Electrotechnical Society of Slovenia, 12th International Symposium on Electronics in Traffic “Harmonization of Transport Systems in the European Union”, ISEP 2004, Proceedings, Ljubljana (Slovenia), October 7-8, 2004, p. V2.
5. EXTR@Web Project, Transport Research Knowledge Centre, DG Energy and Transport.