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CHALLENGES OF DEVELOPING TRANSPORT MASTER PLAN

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Abstract

A transport master plan is a strategic document that aims to achieve an efficient and sustainable transport system that is in line with the needs of the economy and residents in the study area. A master plan represents a strategic foundation for all future transport projects, which speeds up preparation and increases the probability of their funding from European funds or other sources of financing. Methodologically, the development of a transport master plan involves data collection, traffic surveys research, traffic model development, transport system analysis and assessment, definition transport system development objectives definition, and finding measures that achieve the set objectives. So far, a dozen transport master plans have been developed in the territory of the Republic of Croatia, covering the area of single functional region (multiple counties), county or city. The paper presents a comparison as well as a critical review of developed transport master plans. Special accent is placed on the methodology for the development of the traffic model, as a basic tool for the transport system analysis and testing the scenarios for the future transport system development. The paper emphasizes the need to involve all stakeholders and interested public through the whole process of developing master plan.

Keywords: transport master plan, traffic model, transport planning, hypothesis testing

1 Introduction

With accelerated urbanization and the growing demand for transportation, transport system planning has gained great importance. To integrate the development of a larger region consisting of several smaller administrative units in such a way that their development takes place at the same pace, planning is done in different hierarchies. Master plan is one of such documents that provides rules and guidelines for a planned transport system development. It is a comprehensive document, multidisciplinary in nature, i.e., it involves various study disciplines such as social aspects, economics, environment, engineering, urbanism, etc. A transport master plan is an instrument that determines the needs of the transport system. The purpose of a transport master plan is to promote the growth of the society, as well as to direct and regulate current and future development of a transport system with a perspective of 20-25 years. Therefore, it is a long-term document, meaning it defines a vision and plans the future development of the transport system. It is also a guide intended for various stakeholders, such as planning offices, councils, or managers. Overall, a master plan presents a political statement that promotes the values, desires, and visions of society in the principles of development, which can ultimately lead to the progress of society. The development of a transport master plan implies active cooperation and communication with key stakeholders and working groups, as well as active public participation. Unfortunately, it must be pointed out that for now there are no uniform guidelines for the transport master plan development,

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but the development is based on terms of references, mostly written by clients, which to a greater or lesser extent prescribe methodology and task scope.
As the transport system is an instrument of regional development that actuates the exchange of goods and availability of all economic, health, tourist, and other content, the development of the transport system in the Republic of Croatia is considered extremely important for economic and social growth, as well as for international connectivity. In accordance with the Transport Development Strategy of the Republic of Croatia (2017-2030) [1], in the past 5 years, a dozen transport master plans have been prepared (Figure 1). They are mainly developed for areas of functional regions, such as the Master Plan of the City of Zagreb, Zagreb County and Krapina-Zagorje County [2, 3] (part of the functional region Central Croatia), the Master Plan of the functional region Eastern Croatia [4] (contains Virovitica-Podravina, Požega-Slavonia, Brod-Posavina, Osijek-Baranja and Vukovar-Srijem County), the Master Plan of the functional region North Adriatic [5] (contains Istria, Primorje-Gorski Kotar and Lika-Senj County) and Master plan for integrated passenger transport in the Northern Croatia region [6] (contains Međimurje, Varaždin and Koprivnica-Križevci counties). Some Master plans were developed only for a single county or a city, such as Dubrovnik-Neretva County [7] (also known as functional region South Dalmatia), Zadar County [8] (part of Nort Dalmatia functional region), Karlovac County [9], City of Osijek and Osijek-Baranja County [10] Sisak-Moslavina County [11], or the city of Šibenik [12]. At the time of this writing, two more master plans are being prepared, one for the area of the functional region Central Dalmatia and the master plan for the Bjelovar-Bilogora County.

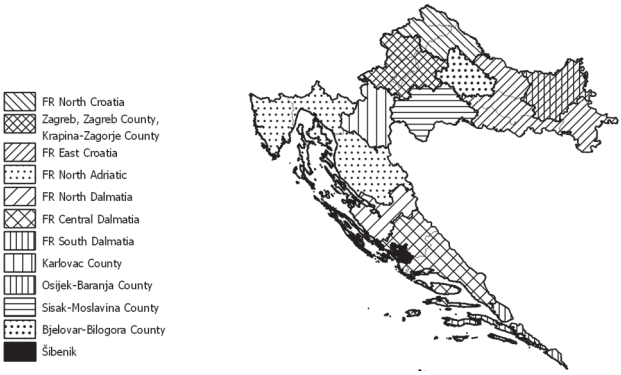

Figure 1 Overview of developed transport master plans in Croatia

Considering the specific requirements from the Terms of Reference and the applied development methodology, although very similar in terms of results, the developed master plans are quite different. Following the good practices that the authors and their colleagues have practiced for many years, this paper presents the essential differences in the Terms of References (ToR) for the developed transport master plans in Croatia, discusses developed master plans, and proposes a methodological approach that aims in improving quality and unifying the master plan development in the future.

2 Terms of references

For the most efficient implementation of a master plan results, it is important to apply a methodological approach that includes all the important methodological elements that need to be followed during its development. Such approach is defined in the ToR, compiled by the client. In general, a methodological approach includes all relevant segments of master plan development, from collecting primary and secondary data (documents, databases, sur-

veys, counting, anonymized data, etc.), defining starting points, analysing, and assessing the transport system, and defining objectives and measures to improve the transport system (Figure 2). In parallel with the development of a master plan, and to support a transport system analysis and testing its development scenarios, the development of traffic model for passenger and freight transport is required.

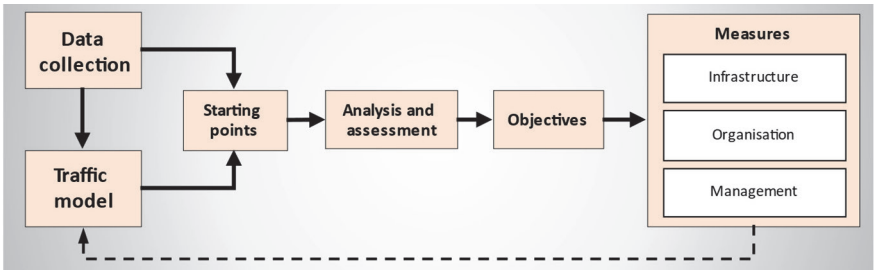

Figure 2 The schematic overview of a master plan development methodology

The first and perhaps most important task in developing a master plan is to collect available, relevant, quality, and up-to-date data. Namely, the quality of the developed master plan as well as the quality of the traffic model are in direct correlation with the availability and quality of the collected data.

Secondary data are generally available on request from relevant stakeholders: statistical data from the Central Bureau of Statistics, data on transport systems from competent stakeholders, development plans from the planning offices, etc. These data are mostly available at the state and county level, while they are rarely available at the municipal level, and are mostly unavailable at the statistical unit level. Such data are applicable when describing land-use, demography, and economy, but for the purposes of developing a traffic model it is necessary to have data at the statistical unit level.

Collection of primary data describing travel behaviour and traffic volumes, such as passenger surveys, and passenger and vehicle counts, in accordance with ToR, should be collected through field research or web questionnaires. The task of collecting primary data is mainly described in the form of a list of research, while the scope of each research is left to the project holder. For example, while the ToR [2] leaves to the consultant the opportunity to offer a survey of vehicle counting, the ToR [5] defines very precisely the minimum number of locations, time periods, duration of the vehicle count, and the categories of vehicles that need to be counted in the given time intervals.

The task of traffic model development prescribes mainly development of passenger individual and public transport, while ToRs [2, 5] prescribe the development of passenger and freight model. Further, while ToR [4] defines only the need to develop a traffic model and gives in general description of the traffic model components, the ToR [5] describes the methodology of developing a base and forecast traffic model in detail.

The conduction of an analysis by testing of hypotheses, where each of the hypothesis represents a specific problem of a transport system, is defined within all ToRs. Although the development of the hypotheses needs to be based on existing national and regional strategic documents, expert discussions, and workshops with all interested stakeholders, including public participation, the ToR [5] prescribes a comprehensive initial list of working hypotheses.

All ToRs define that the objectives and measures for the transport system development must be in accordance with the Transport Development Strategy of the Republic of Croatia [1] and based on the assessment of the analysed area. Objectives must be divided into general objectives, which apply to all transport branches, and specific objectives, which apply to each

of the transport branches separately. Measures, on the other hand, need to be defined for each transport branch separately, but they must cover the area of infrastructure, organization, and management.
Due to the lack of documents that prescribe the content of the master plan document (report) itself, clients have defined the content of the delivery in different ways. For example, ToRs [4, 7, 8] prescribe reporting according to the main tasks of master plan development, and delivery of master plan as one single document. On the other hand, ToR [5] prescribes in detail the content of each report according to main tasks of master plan development, and main delivery of master plan as a single document composed of individual reports.
The analysis of the ToRs showed that there are certain similarities in terms of the structure of the master plan development methodology, i.e., the list of main tasks that need to be performed. On the other hand, ToRs differ greatly in the specification of subtasks, especially in terms of data collection and traffic modelling, as it can be seen in Figure 3.

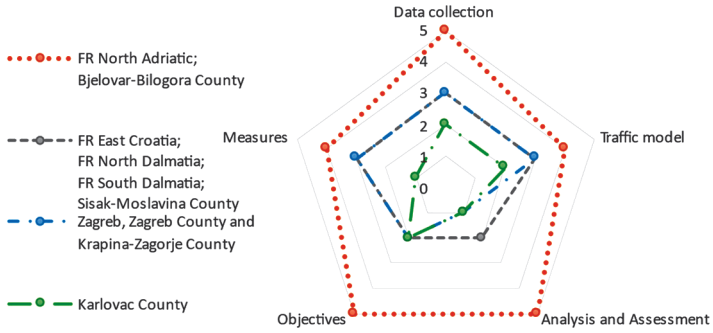

Figure 3 Level-of-detail of the task description in ToR

3 Developed transport master plans

Differences in the ToRs as well as in estimated values of work, ranging of 100 thousand to 3 million euros regardless of the scope of work, resulted in significant differences of the offered values for the master plan development, and in content and form of the developed and adopted master plans.
Regarding the content of the documents, most developed master plans are single documents that contain descriptions and results of all tasks, including tasks of data collection, traffic modelling, and transport system analysis by testing of hypotheses. Such documents, very extensive in number of pages, are extremely difficult to read, and generally do not highlight the real problems of the transport system of the analysed area. Certain developers divided the master plan document into: (1) main document containing a description of the applied methodology, starting points, a summary of the analysis and assessment of the transport system, a definition of objectives, and a list of transport system development measures; (2) appendices to the main document describing the task of data collection, traffic model development and traffic system analysis by testing of hypotheses.
Practice has shown that the biggest differences in the developed master plans are in terms of transport system analysis. Although the ToR prescribes the analysis by testing of hypotheses, where ToR [5] even gives an initial list of hypotheses, most consultants conducted the analysis in the classical way, citing and discussing various indicators without expressing a critical review of what is good and what is not good. Testing of hypotheses in accordance with the Transport Development Strategy [1], on the other hand, focuses the analysis on real problems of a transport system, which ultimately results in a clearer assessment of a trans-

port system, and facilitates the development of measures for the future development of a transport system.
Finally, the developed master plans differ in a way of defining the list of measures. Among the measures, certain documents list specific projects that need to be implemented to improve a transport system. Also, although a master plan is a strategic document at the functional region or county level, certain measures relate to very specific urban projects such as lowering the curb in at the intersections or construction of speed bumps, which are the subject of urban transport plans, e.g., Sustainable Urban Mobility Plan (SUMP).

4 Proposition of a master plan development methodology

To implement a transport master plan project as efficiently as possible, the methodological approach to its creation must include all the essential elements that need to be followed. To improve the quality of the developed transport master plans, independent of the client and consultant, it is necessary to develop guidelines, such as the Guidelines for developing and implementing a Sustainable Urban Mobility Plan recently issued in the 2nd edition. The proposition of the transport master plan methodology development shown in Figure 4 has been prepared by the authors by following the good practices that the authors and their colleagues have practiced for many years with many clients. The methodology includes all relevant segments of developing a master plan from collecting primary and secondary data, developing a traffic model, analysing a transport system, and preparing objectives and measures to improve a transport system.

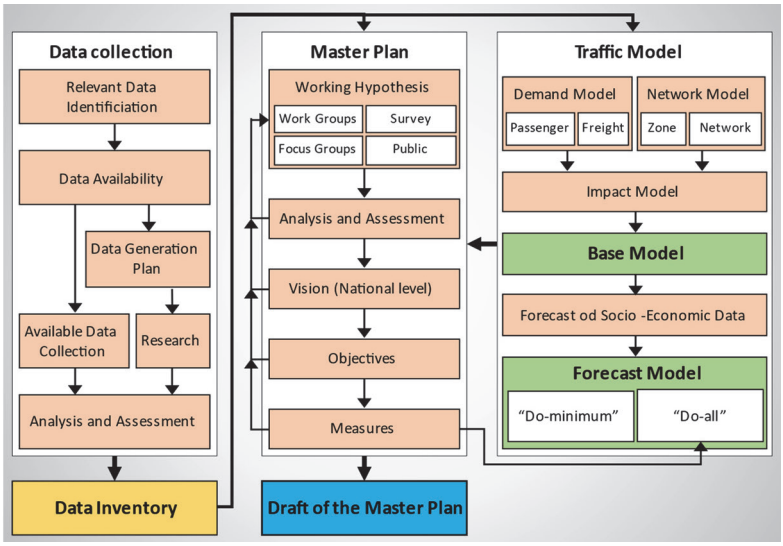

Figure 4 Proposed master plan development methodology

The data collection task, the first and perhaps most important task in transport master plan development, needs to be performed through the following main steps: (1) determination of relevant data for the development of a transport master plan; (2) collecting available data from publications and relevant stakeholders; (3) analysis and assessment of data availability; (4) analysis of missing data - development of a plan for collecting missing data; (5) conducting research; (6) development of a plan for regular data collection. Analysis and assessment of the relevant data should be performed according to the criteria of availability, quality, and actuality of data. The result of the analysis is the identification of all necessary

data that need to be collected as part of the development of a transport master plan. Additionally, with the aim of gaining insight into the travel behaviour of the population and filling in the picture of traffic indicators, several traffic research should be conducted, for example, household surveys, public transport survey, traffic counts (if there is no automatic continuous counting), passenger counting (if there is no data from the ticketing system). All collected data (primary and secondary) should form a single inventory of data. Here we must emphasize that the collection of primary data in the form of one-time counts of vehicles and passengers and roadside interviews should be conducted only in exceptional cases, i.e., if there is a need to conduct such research. Namely, conducting the above research requires significant workforce mobilization, while the results of the research may not be crucial for the development of a master plan. Furthermore, conducting such extensive research can provide indicators that describe traffic events that occurred once in a lifetime, at the time of data collection, and may differ significantly from common traffic events specific to the research area. The next task in the development of a master plan is the development of a traffic model. Figure 5. presents a model development methodology for an example of passenger transport. The developed traffic model is one of the key bases for making decisions on transport and spatial policy, on investments in infrastructure that require time and financial resources, on the shape and dimensions of transport infrastructure and their impacts, etc. Given the complexity of a traffic model developing task, the methodological approach should be left to modelling experts. However, it is necessary to emphasize that a traffic model needs to be developed following good practices and in accordance with Jaspers Appraisal Guidance (Transport), The Use of Transport Models in Project Appraisal.

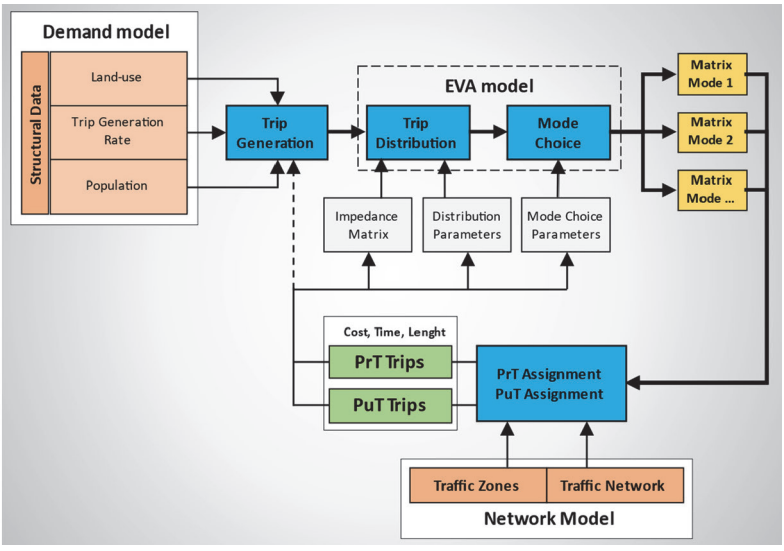

Figure 5 Passenger model development methodology

Transport system analysis is the next task in a transport master plan development. The analysis of a transport system needs to be conducted by testing of hypotheses, where each hypothesis describes in the form of a statement sentence a particular problem of the transport system. The participation of the client, relevant stakeholders and the public is necessary in this task. Through working groups, focus groups, working meetings, public presentations, and research, it is necessary to collect information on the problems of a transport system of the researched area. In this way, the analysis of a transport system becomes focused on real problems and facilitates the preparation of the next tasks, namely the development of

objectives for improving the transport system and a list of measures to be implemented to improve the transport system in accordance with the vision.
Like any strategic document, the transport master plan must consider the vision of the transport system development defined at the national level and adapt it to the regional needs of both the population and the economy. For the territory of the Republic of Croatia, the vision at the national level is defined with the Transport Development Strategy [1]. Of course, the master plan for the transport system development needs to be harmonized with the strategic settings for the development of the economy, tourism, health, education, etc. With the global goal of improving a transport system in the future, it is necessary to define, considering the set vision of development and stated issues of a transport system, objectives of a transport system development for which a master plan should offer an appropriate set of measures. Measure should be set up in such a way that it covers in a very general way several projects that could potentially be implemented to achieve the set objective. A list of measures must cover the areas of infrastructure and superstructure (new construction or upgrading of existing infrastructure, increasing capacity, increasing accessibility, reorganizing the network, etc.), organization (changes in transport policy and legislation, changes in operational concept, etc.), and transport management.

5 Conclusion

The main objective of a transport master plan is the achievement of the effective and sustainable transport system, beneficial for the national, regional, and local economy and the quality and the standard of the life of the local population. It can be achieved by ensuring the conditions of meeting the traffic demand and optimal integration of the entire transport system, in accordance with the realities of the area. A master plan development must include an active participation and cooperation with all relevant stakeholders, local and regional self-government units, competent national authorities (ministries), business support organizations, higher education institutions from the transport sector, agencies, institutes, companies from the domain of traffic and transport infrastructure, public bodies for the transport system management according to the individual transport branches, trade and economy chambers, airports, ports and port authorities on the coverage area, tourist boards, spatial planning institutes and regional development agencies as well as other stakeholders, and the public, i.e., users of transport systems.
In Croatia, the task of data collection greatly complicates and prolongs a master plan development. Namely, a large part of secondary data, in the form of strategic documents, planning documents, studies and projects, and statistical data and data from relevant stakeholders, although available on request, requires additional efforts of both consultant and client in collecting them. The existence and availability of a central database and the involvement of a client in the process of collecting secondary data would greatly facilitate and speed-up the process of data collection, and consequently affect the quality of a developed master plan.
Analysis of a transport system by testing of hypotheses should be incorporated in the master plan as it puts the focus of analysis on the real problems of a transport system, which ultimately contributes to a clearer definition of objectives and measures, that are in line with the vision of transport system development.
Finally, the master plan should consist of a main document, which contains a description of the starting point, main findings of analysis and assessment of the transport system, vision and objectives of transport system development, and a list of measures to be implemented to achieve transport system development objectives. For data collection, traffic modelling, as well as transport system analysis by testing of hypotheses, the development of separate appendices to the main document should be encouraged, all with the aim of simplifying the reading, interpretation, and implementation of the adopted master plan.

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