



SUSTAINABLE PLANNING OF STATE ROAD NETWORK DEVELOPMENT IN CROATIA

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Abstract

Hrvatske ceste d.o.o., a state-owned company, manages the 7,455 km long state road network of the Republic of Croatia. The road network represents national wealth, a vital resource and a prerequisite for balanced development. The construction and maintenance of public roads contribute significantly to economic growth, mobility and accessibility, yet the implementation of projects is often limited by budgetary constraints. The maintenance of existing roads and the construction of new roads must follow the principles of sustainability. This includes setting priorities based on traffic safety and flow efficiency, while minimizing negative impacts on the environment, public health and the quality of life of residents living near the roads. Sustainable development of the transport system also understands financial responsibility, which implies careful and efficient management of available funds. The paper presents strategic plans for the development of the road network, as well as active and planned projects, with a particular emphasis on the construction of expressways. In addition to an overview of other responsibilities of road network operators, special attention is given to current construction and financial challenges.

Keywords: state roads, road planning, road network management, financing

1 Introduction

Roads are a significant factor in the integration of the Republic of Croatia into the European transport system. They connect regions, counties, and cities, and integrate transport systems of all modes. Roads have a positive impact on social dynamics and on the demographic and economic profile of a society; they support the development of underdeveloped areas and islands and form a prerequisite for society decentralization and for access to various services and activities. On the other hand, road transport undeniably generates higher levels of pollution than competing rail transport or maritime and inland waterway transport. Consequently, the main European Union policy document relating to transport [1] places emphasis on achieving climate neutrality targets. Other topics include intramodality, and resilience to climate change and disasters such as war. When planning the construction of new roads, their alignment with the stated objectives is considered, and co-financing from funds generally gives priority to projects that contribute to climate goals, strengthen resilience, and enhance intramodality. Such an approach to new road corridors does not fully correspond to conditions in the Republic of Croatia, as historical circumstances have resulted in the underdevelopment of certain internal road connections. The construction of the motorway network over the past 25 years has led to a significant improvement in connectivity and accessibility. However, new circumstances such as the increase in tourist traffic and Croatia's entry into the Schengen Area generate increased demand for the construction of new roads and significant reconstruction of existing routes within the network of express roads and state roads.

The network of state roads in the Republic of Croatia, which in 2025 had a total length of 7,455 km, is managed by Hrvatske ceste d.o.o. (HC), a state-owned company. Most of the company's revenue comes from collected excise duty on energy products amounting to 0.11 euro per liter, while in recent years significant resources for the construction of new roads, as well as for post-earthquake road reconstruction, have been drawn from EU funds. The objectives of managing the road network can be grouped into four main areas: traffic safety, traffic flow (i.e. elimination of bottlenecks), regional and international connection, and cost-effectiveness in the use of substantial budgetary resources.

Over the past 10 years, from the beginning of 2016 to the end of 2025, a total of 214 kilometers of new state roads have been constructed, i.e. an average of 21.4 km per year. It is estimated that in the coming period the construction pace should increase to around 30 kilometers of new roads per year in order to meet traffic demand and societal needs. However, it should be noted that during the same period the total length of state roads actually increased by 542 km, as 328 km of lower-category roads became part of the state road network. These are mostly roads that needed to be upgraded to the standard of state roads through investment maintenance works. The pace of investment maintenance during the said period amounted to about 100 km of roads per year, which is insufficient, so acceleration will also be required in this area. HC can also be viewed in its role as a public contracting authority: during 2024, approximately 700 public procurement procedures were conducted and contracts worth around 450 million euros were concluded.

Planning of the construction and maintenance of public roads in the Republic of Croatia is regulated by the Roads Act [2] and is carried out at three levels: long-term, through the Transport Development Strategy [3]; medium-term, through the four-year Construction and Maintenance Program for Public Roads; and short-term, through annual plans of the road network operators. In addition, plans are aligned with the Spatial Development Strategy [4] and related planning documents. The Transport Development Strategy adopted in 2017 is programmed until 2030, while the four-year Program has not been adopted since 2021. Therefore, it can be said that the time has come to revise existing and adopt new strategic documents, among which the National Spatial Development Plan should also be highlighted; as of early 2026, the Strategic Environmental Assessment procedure for this plan is currently underway. The annual plans of the state road operator also depend significantly on financial constraints. Based on strategies, programs and specific decisions of the Government of the Republic of Croatia, HC prepare annual plans, aligning them with the financial plan and the project preparation status, in cooperation with the Ministry of the Sea, Transport and Infrastructure. The systematic strengthening of institutional control over investment projects is reflected in the Regulation on the Method of Evaluation and the Procedure for Approval of Investment Projects, under which the Ministry of Finance provides additional oversight of major road construction projects [5].

2 Network of expressways

The most expensive strategic projects of HC relate to the construction of the express road network, which was comprehensively defined by the Strategy adopted back in 1999 [6] and therefore certainly deserves revision. One proposal aimed at defining a network of new express roads and state roads is shown in figure 1. Among express roads, particular emphasis is placed on those connecting county seats to the motorway network, as some county centers still lack a modern (high-speed) connection to motorways. Overview of planned interventions for the construction of new state roads, prepared by HC for the proposal of the new National Spatial Development Plan; it includes road sections already in operation, planned roads, and projects at various stages of preparation and construction.

Current express roads projects include a new connection of Sisak to motorway A11, scheduled for completion in 2026, as well as the final section of the express road toward Bjelovar, with the continuation toward Virovitica already under construction. This road, together with the express road toward Koprivnica, which is also under construction, forms the Podravina Y. Upon completion of the final section in 2026, the express road from the Okučani interchange on the A3 motorway to the border with Bosnia and Herzegovina will be completed (this is a route connecting Budapest with Banja Luka and continuing onward to Split). During 2026, construction will also begin on the already contracted express road to Požega. The connection from Vukovar to Vinkovci will ultimately shorten the link between the city on the Danube and motorway A3. With the construction of the express road from Varaždin to Ivanec, the implementation of a project leading to Krapina has begun, connecting important regional centres and linking two motorways, A2 and A4. Construction of the Zagreb ring road will continue in 2026 with the start of works on the Zlatar Bistrica – Marija Bistrica section. Work is also underway on connecting Dubrovnik by a new motorway, which will be linked to the express road from the City to Čilipi Airport. The Solin – Omiš express road is being intensively constructed as part of the Split agglomeration bypass.



Figure 1 Express roads network (planned and constructed), marked in red, and planned state roads (green)

Among other planned express roads, the Podravina state road stands out, running from the border with the Republic of Slovenia to the border with the Republic of Serbia, along an important transit corridor near the Drava River. In the perception of most citizens, express roads imply dual carriageways with four lanes and grade-separated interchanges; however, this need not always be the case.

An express road is reserved for motor vehicle traffic, intersections are mostly grade-separated, but the road itself may also be two-lane. On many express roads in Croatia that belong to the state road network (outside the toll collection system), a phased construction model has been adopted. This means that initially one carriageway with two lanes is built, while intersections with local and unclassified roads are grade-separated (figure 2). Intersections with state and county roads may remain at-grade, with appropriate traffic signs. During the design phase, preparations are made for the construction of the second carriageway, which follows once traffic volume indicators exceed certain thresholds. Phased construction of express roads is carried out in sections, and those sections form functional traffic units and the pace of implementation aligns with the available budget.

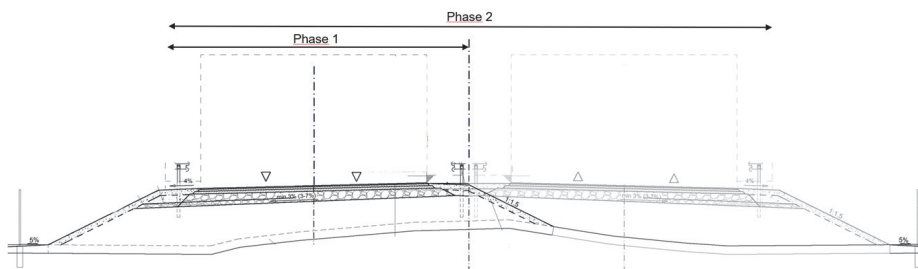


Figure 2 Express road under phased construction: in the first phase one carriageway is built and intersections with local roads are grade-separated

3 State road construction

Programs for the construction of new state roads include projects that have been in preparation for many years, sometimes even decades. Road alignments undergo extensive preparatory procedures including feasibility studies, environmental impact assessments, and harmonization with spatial planning documentation. Unresolved land registry and cadastral issues further prolong the process. In addition, the public procurement framework is not fully aligned with the specific characteristics of linear infrastructure projects. As a result, preparation in Croatia rarely takes less than three years. In most cases, more than five years pass from the initial concept to the start of implementation. These challenges delay the start of construction. Once prepared, projects are implemented in phases and sections. Their pace aligns available resources and project implementation on active construction sites.

When considering investment plans for new roads, the strategic orientation toward the development of the railway network must also be considered, as illustrated by the National Development Strategy of the Republic of Croatia until 2030 [7]: “Public transport policies will focus on reducing the quality gap between road and rail infrastructure in order to unlock economic opportunities offered by modern rail transport and related services, as well as to reduce carbon dioxide emissions associated with the dominance of road transport.” On the one hand, this means that roads will not be privileged in the planning of state investments; on the other hand, such an orientation opens new projects for rail – road connections, without which the railway system cannot function – these are projects related to multimodal transport, which involves the use of at least two transport subsystems. A similar statement applies to the development of seaports and river ports. Thus, a connecting road from motorway A1 to the Port of Zadar (Gaženica) has been built, as well as connections from motorway A7 to the terminals of the Port of Rijeka (DC404 to Brajdica and DC403 to Zagreb Pier), while construction of the first phase of a new connection from the Vučevica interchange on A1 to the Port of Split has begun. Among connecting roads, the expansion of the entrance to Pula from motorway A9 is also noteworthy.

The bypass construction program is implemented continuously and includes around fifteen projects under preparation and at least as many in the design phase. In recent years, bypasses of Petrijevci, Beli Manastir, Novi Marof, Turanj (near Karlovac), Buzet, Prelog, and Apševci and Lipovac (as part of the Srijem transversal) have been completed. Bypasses of Nedelišće and Pušćine (part of the new Varaždin – Čakovec connection), Vukovar, and Fužine are under construction, and the bypass of Orebić will soon follow, serving a dual function as a connecting road to the new ferry port for Korčula. Construction of the Drniš bypass is also set to begin, partially overlapping with a section of the future Šibenik – Knin – Bosnia and Herzegovina border express road. During 2026, construction of the Zaprešić bypass and the Čakovec bypass will continue (both projects are implemented in phases). Planned procurement also includes bypasses of Višnjan, Nova Gradiška, and Bašćanska Draga and Jurandvor on the island of Krk. The increase in transit traffic and higher driving speeds endanger safety and significantly reduce the quality of life in urban areas that originally developed along roads. A bypass allows for the redesign of roads through towns, the construction of wider pedestrian and cycling paths, and more parking spaces. The construction of bypasses additionally encourages the development of business zones near urban areas.

4 Reconstruction and extraordinary maintenance

Public attention is largely focused on new state road construction projects, with around 70 projects at various stages of preparation and implementation. However, in addition to new construction, significant resources are continuously invested in the reconstruction of existing roads – around 600 major and minor interventions were in various stages of preparation and implementation in 2025 alone. In addition to pavement rehabilitation and traffic signalization renewal, reconstruction projects often include improvements to road geometry, widening works, reconstruction of intersections (often replacing crossroads with roundabouts), construction of new bus stops, and pedestrian and cycling paths (figure 3), making execution sometimes more complex than building a new alignment. A separate reconstruction program addresses landslide remediation.

While it is undisputed that many sections of state roads require thorough reconstruction, extraordinary maintenance interventions – consisting primarily of pavement resurfacing and traffic signalization renewal – effectively improve safety conditions at significantly lower costs per kilometer. Specifically, reconstructions cost between 0.5 and 2 million euros per kilometer, whereas pavement renewal can be carried out at a cost of 200,000 to 400,000 euros per kilometer, prompting the need to balance major and minor interventions within defined limits.

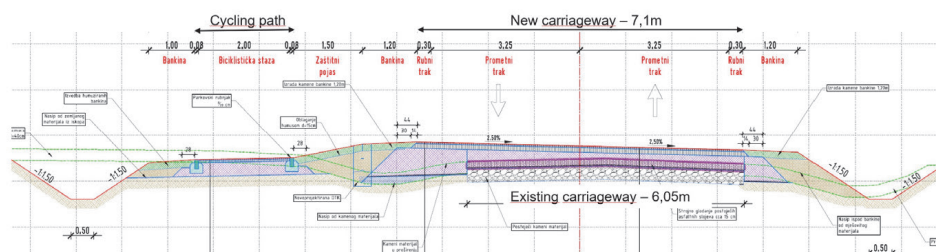


Figure 3 Typical cross-section of the reconstruction of state road DC213 Nemetin – Erdut, including drainage arrangement and the addition of a cycling path

It is also important to mention the implementation of projects not located on state roads, which are still managed and financed by HC under special decisions of the Government of the Republic of Croatia, acting as an efficient state investor. For example, bridges in Nin damaged by floods were rehabilitated, the old movable bridge between the mainland and the island of Čiovo was repaired, and over 20 projects for the reconstruction and construction of local roads in areas predominantly inhabited by national minorities were carried out, as well as the construction of certain roads in mountain areas.

5 Traffic safety and traffic management

Improvements in traffic safety are reflected through the analysis of key indicators, primarily the number of fatalities and traffic accidents, with national targets set for network operators defined by the National Road Traffic Safety Plan [8]. Dangerous road locations (black spots) are systematically identified, and following analysis, corrective measures are implemented through changes in traffic signalization and, where necessary, through construction interventions. One of the major advances in road management, however, is the introduction of Intelligent Transport Systems (ITS), in accordance with European regulations [9]. ITS represents a managerial and information-communication upgrade of the classical traffic and transport system. The road system gains an IT infrastructure that improves traffic flow, safety, and comfort, and reduces environmental pollution by decreasing congestion. Core ITS services include traveler information, traffic management, emergency services, weather and environmental monitoring, and major incident response management. Upon joining the European Union, the Republic of Croatia assumed legislative obligations in this field, primarily the ITS Directive and associated delegated regulations. In accordance with the Directive, the Government of the Republic of Croatia adopts the National Program for the Development and Deployment of Intelligent Transport Systems. Projects included in the Program are co-financed from EU funds.

At the beginning of 2022, Hrvatske ceste established the Central Traffic Control and Management Centre for state roads and the National Access Point as the main information hub for the exchange of traffic and travel data. The Central Traffic Control and Management Centre integrates data from the state road network (information on traffic restrictions and extraordinary events), as well as data from various systems owned by Hrvatske ceste (meteorological data and traffic counting data) used for improved monitoring and management. Nearly one hundred traffic signal installations in northern, central, and eastern Croatia are monitored and controlled from the Central Centre, and certain ITS data from regional traffic management and control centers are also integrated. The National Access Point represents a single point for traffic data exchange. Its purpose is to consolidate all existing data sources from stakeholders and make them available to users free of charge through a digital interface. The National Access Point can be accessed via www.promet-info.hr. The existing National Access Point has been established for road transport and is being upgraded to provide multimodal information that enables the combination of different modes of transport, including public transport.

6 Financing

A stable financing system for state roads aims to enable the maintenance of the existing network, the construction of new sections, and the fulfilment of the company's financial obligations. Investment in the state road network of the Republic of Croatia (construction and reconstruction) between October 2016 and November 2025 amounted to 1.5 billion euros from own (budgetary) funds, i.e. fuel excise duties, and an additional 564 million euros in EU project financing, including non-refundable EU funds and national co-financing resources.

The difference between expenditures and revenues is covered by new company borrowing backed by state guarantees. Attention is also paid to fulfilment of financial obligations: at the end of fiscal year 2025, total long-term loan liabilities amounted to 1,588.18 million euros. Revenues of HC in 2025 amount to total value 412 million euros, mostly from fuel excise (86%) and from EU funds (11%). Investments and costs of in 2025 amount to total value 512 million euros. Most of the investments were in construction of new roads, 34%, and reconstruction 24%. Regular maintenance costs were 18% and operating costs around 10%, while the rest was financial costs (debt servicing). Expenditures significantly exceed revenues, and investment projects are ambitious, prompting the search for deficit reduction measures. The first proposal aimed at increasing revenues involves amending the Roads Act (Zakon o cestama) [6] to increase fuel excise duty for financing the construction and maintenance of public roads, increasing the share allocated to HC by 0.02 euro per liter, from the current 11 euro cents to 13 euro cents, while simultaneously reducing the share allocated to Hrvatske autoceste by 2 euro cents per liter.

Another measure to reduce the deficit is attracting funds from European Union programs. In April 2024, amendments to the Regulation on the Trans-European Transport Network (TEN-T) were adopted by the European Parliament, positioning Croatia on two additional European transport corridors: Baltic Sea – Adriatic Sea and Western Balkans – Eastern Mediterranean. It is expected that Croatia's increased importance in the European transport network will secure additional EU co-financing for projects on trans-European routes. The main financial instrument for road construction investments remains the Competitiveness and Cohesion Program, which for the 2021 – 2027 period includes an allocation of 285 million euros for road sector investments – significantly less than the 400 million euros allocated in the previous period [10].

HC utilize cohesion fund resources primarily for the Solin – Omiš express road. At the end of 2025, a grant agreement worth 78.2 million euros was signed for the section under construction, Mravince interchange – TTTS interchange, and at the beginning of 2026, a grant agreement was also signed for the Dugi Rat interchange – Cetina Bridge section and the connecting road Dugi Rat interchange – DC8 (section length approximately 4.5 km, EU funding 84.7 million euros). Additionally, a co-financing agreement was concluded for the construction of a branch of the Podravina Y, the Bjelovar – Virovitica express road section from Bjelovar to Velika Pisanica. This phased express road project is 20.8 km long, valued at 134 million euros, of which 82 million euros are non-refundable funds. The possibility of co-financing the New Entrance to Split project has also been announced. A third potential source of additional revenue currently under consideration is the introduction of user charges for transit freight vehicles, following the example of other European countries. Road construction, maintenance, and especially traffic management are reaching a new level, with rising operating costs. Policymakers should therefore make use of financing opportunities arising from increased transit traffic to reduce the need for funding investments through new borrowings

7 Conclusion

State roads are the most important segment of the national transport infrastructure, and traffic volumes on them are continuously increasing. In Croatia, the state road network is solidly developed and maintained, thanks to an established management system and a stable financing source from fuel excise duties. HC primarily allocates available resources to improving traffic safety, followed by measures aimed at reducing congestion and bottlenecks, maintaining existing roads, and finally, at constructing of new roads. Investments in network maintenance must remain the key priority, so the funds available for constructing new routes are insufficient to cover all projects, even those that are justified.

These include new bypasses, connecting roads, and express roads that significantly stimulate economic and social development. In addition to new construction, investment plans aligned with green transition goals, digitalization, and environmental protection measures should also be highlighted – such as noise protection, pedestrian and cycling infrastructure, Intelligent Transport Systems, roads on islands and in mountain areas, rest areas and alternative fuel charging stations, motorcycle safety equipment, and more. New circumstances, such as rapid tourism growth and Croatia’s entry into the Schengen Area, create traffic demands and development opportunities that the Croatian Roads cannot meet through construction financed solely from its own revenues. EU funds help bridge the gap between revenues and investment costs, but even with these funds, part of new construction is financed through new borrowing. Therefore, alternative funding sources must be found for major projects, or their implementation timelines extended. Sustainable operation of the state road authority primarily depends on balancing investments with budgetary constraints. At the beginning of the 2020s, following a period of stagnation, HC entered a new investment cycle. The period ahead presents challenges in sustainably financing the system, as well as in placing greater emphasis on social and environmental aspects of management.

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