



Sufinancirano  
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Europske unije za  
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# PROJEKT CROCODILE 3 CROATIA

Exchange of data on road conditions  
for safer and more efficient travelling



# CROCODILE 3 CROATIA

The Crocodile 3 corridor includes the three core network corridors of the Trans-European Transport Network (TEN-T): Baltic-Adriatic, Orient/East-Med, and Mediterranean.



The project is a result of cooperation between public administration, motorway and state road operators, and traffic information service providers, as well as a follow-up to the previous stages of the Crocodile project. The project, which is participated by seven EU Member States located in Central and Eastern Europe (Austria, the Czech Republic, Hungary, Italy, Slovenia, Cyprus, and Croatia), is aimed at securing coordinated traffic management and control and good-quality traveling information, which will result in high-quality services for passengers on one of Europe's most important road corridors.

The project will contribute directly to the Commission Delegated Regulation (EU) No. 886/2013 of May 15, 2013, with regard to data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users, as well as to the Commission Delegated Regulation (EU) No. 885/2013 of May 15, 2013, with regard to the provision of information services for safe and secure parking places for trucks and commercial vehicles, supplementing the Directive 2010/40/EU of the European Parliament and of the Council. Furthermore, Crocodile 3 will contribute to the Commission Delegated Regulation (EU) No. 2015/962, with regard to the provision of EU-wide real-time traffic information services, which was the main focus of the Crocodile 2 project.

The said corridors go through a number of countries (with different languages spoken in most of them) with heavy cross-border traffic. Accordingly, cooperation and exchange of traffic-related information are imperative. The cooperation starts with overcoming organizational obstacles and continues with the exchange of data and information based on joint standards and protocols, ultimately resulting in high-quality services for the end users.

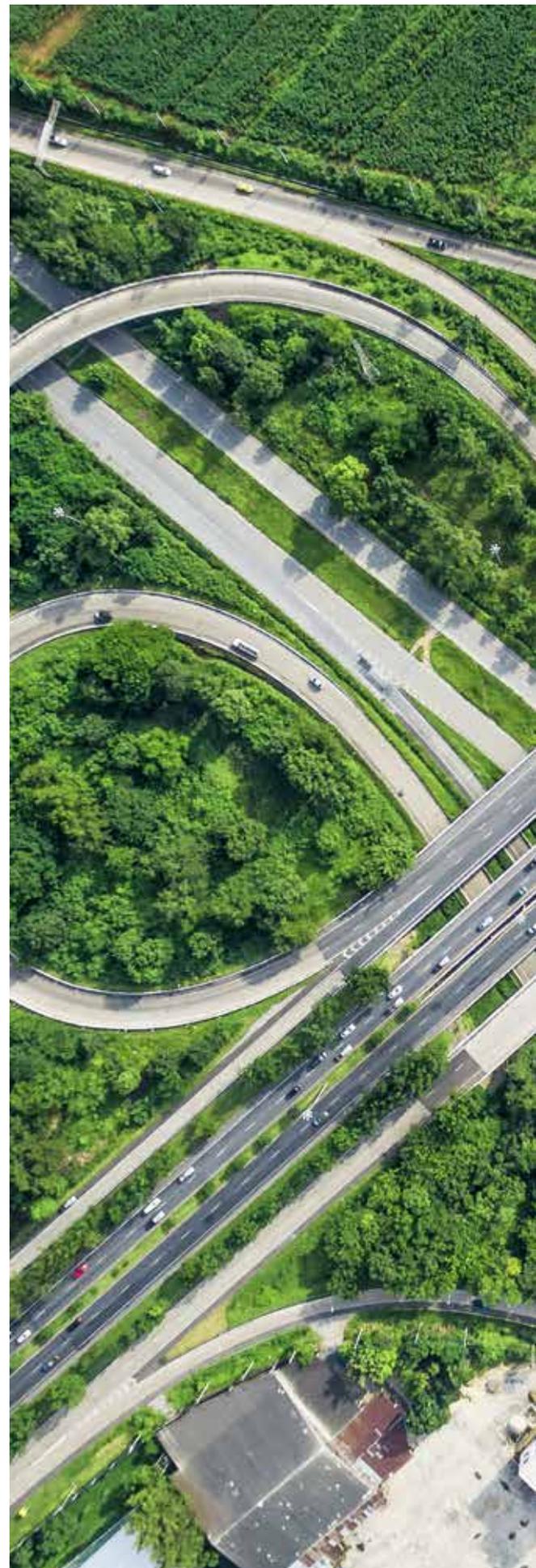
The project will allow the drivers to, either before or during their trip, optimize their route, react to traffic disruptions, and avoid potentially dangerous situations. Moreover, the project's implementation will have a positive impact on the society, environment and economy through increased road safety and mobility of passengers and goods, as well as lower congestion and pollution levels.

## Project focus

- Implementation of the ITS Directive 2010/40/EU in order to secure data access
- Further upgrade of the DATEX II nodes with the aim of securing technical preconditions for information accessibility and exchange
- Cross-border information services with an emphasis on their accessibility to the end users (network services, mobile applications)
- Cooperation with the other countries implementing the project to ensure an exchange of experiences
- Formation of working groups to ensure the continuity of cross-border cooperation and finding common solutions
- Provision of information services along the corridor where the planned services will be implemented through the Crocodile 3 project; the information in question will allow the drivers to, either before or during their trip, optimize their route, react to traffic disruptions, and avoid potentially dangerous situations.

## Project goals

- Improvement of the infrastructure and implementation of the processes that will ensure the following: availability, exchange, reuse, and updating of the road traffic data in order to provide real-time traffic-related information
- Implementation of the services used to inform the users about traffic safety by employing cross-border ITS applications for travelers, which will contribute to the reduction of the number of accidents, fatalities, and injuries, and to the curbing of congestion and gridlock levels
- Implementation of the EU Intelligent Transport Systems Directive (EU ITS Directive) with the aim of securing data access
- Further upgrade of the DATEX II nodes with the aim of securing technical preconditions for information accessibility and exchange
- Cross-border information services with an emphasis on their accessibility to the end users (network services, mobile applications)
- Better-quality traffic flow management and travel planning, as well as timely notifications on emergency situations and adverse weather conditions with the aim of reducing the number of accidents, fatalities, injuries, and material damages
- Cooperation with other countries to ensure the continuity of cross-border cooperation in the transport sector



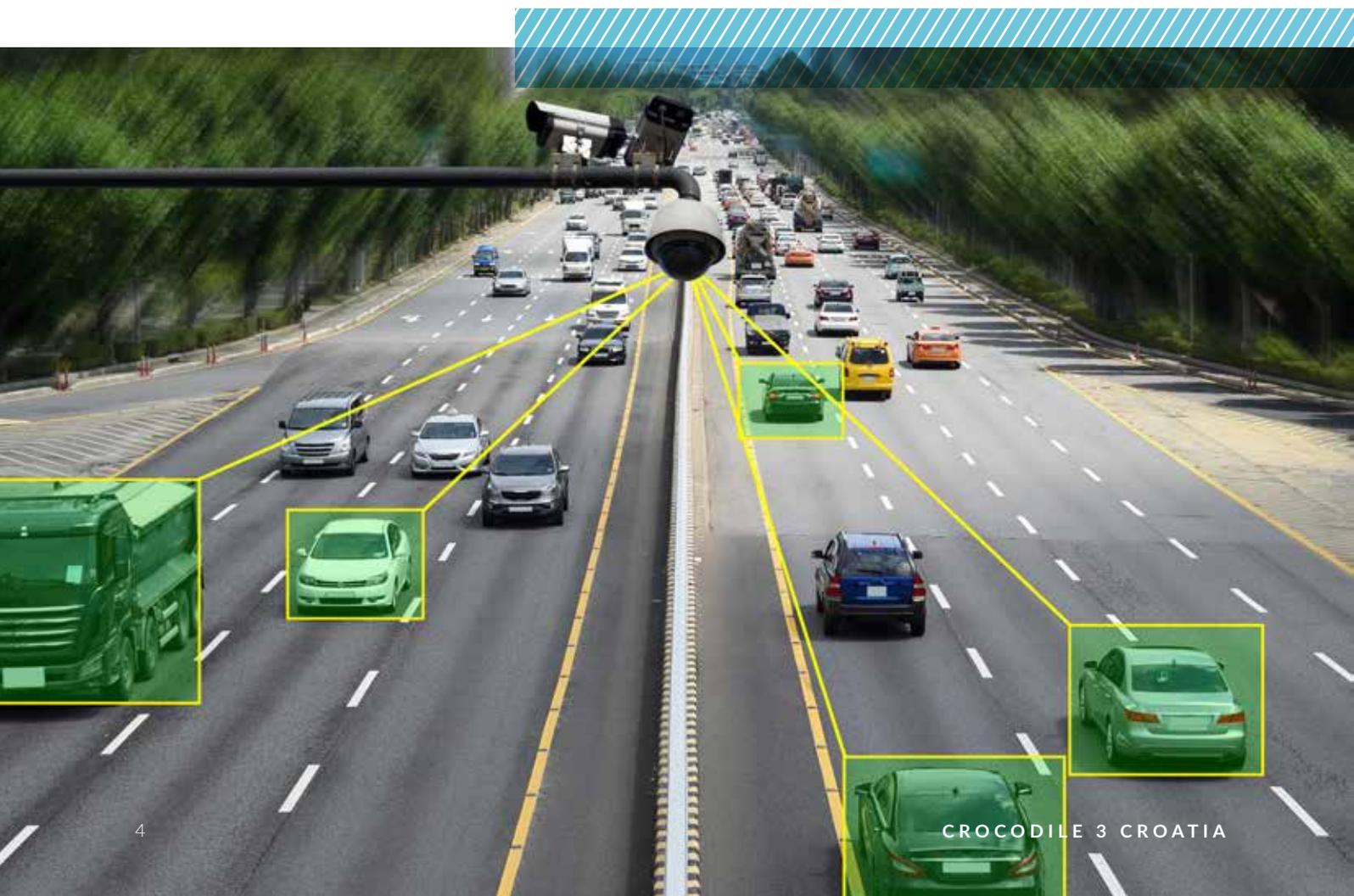
## Project participants and financing

- Hrvatske autoceste d.o.o. – Project Coordinator (76.50%)
- Autocesta Zagreb – Macelj d.o.o. (6.47%)
- Bina-Istra d.d. (1.57%)
- Hrvatske ceste d.o.o (15.46%).

In 2017, the abovementioned project participants and the Innovation and Networks Executive Agency (INEA) signed a grant agreement for the Crocodile 3 Croatia project. In accordance with the agreement, the grant amount from the Connecting Europe Facility (CEF) is set at EUR 4,161,600.00 for the period between January 1, 2018 and December 31, 2022.

An important objective of the Crocodile 3 project is enabling the use of data through good-quality information gathering, managing, and distributing via certain access points, i.e. infrastructure and equipment. The Crocodile 3 project partners also have a number of different networks that fall under their responsibility, and the exchange of information between different network operators is a precondition for efficient management. The measures undertaken as part of the Crocodile 3 project will both facilitate and include the cooperation between neighboring operators.

Optimal use of road-, traffic- and passenger-related data is especially focused on an activity whose purpose is the full utilization of real-time road and traffic data, aimed at providing different traffic and travel-related information. The main concept is to facilitate both access and use of data for the providers of the widest range of services through the DATEX II protocol so their services can reach as many end users as possible.



# Project's social and economic significance

Improving the road networks' safety and mobility is of great importance for maintaining the functioning of the European road network as a strong pillar of the European Union's economic development. Road traffic accounts for 80% of the traffic across the EU; forecasts indicate that that will not considerably change in the medium term, despite the current drop in activities caused by the COVID-19 pandemic and efforts to redirect a portion of that traffic to the railway corridors.

Road safety and congestion reduction, combined with promoting energy efficiency at the EU level, are the key goals at both regional and national levels. The role of the Intelligent Transport Systems (ITS) is to combat the negative effects of the road traffic in Europe. The ITS is a proven tool for efficiently monitoring the demand and service rationalization in a network, and its benefits have been confirmed around the world. Compared to other regions, such as the US or Japan, in Europe, the

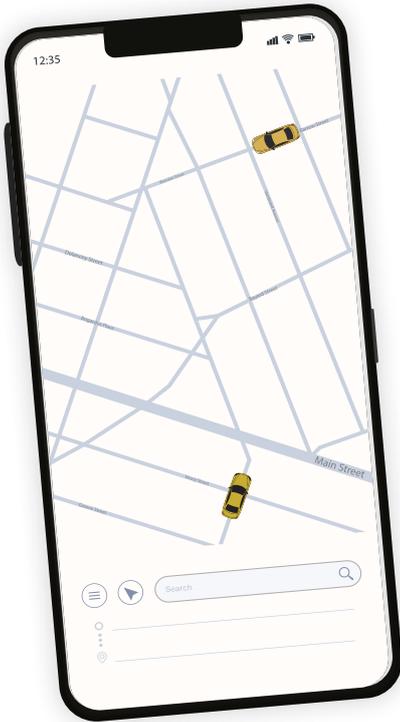
ITS is faced with a large number of jurisdictions and road operators. The scope and organizational structure of the Crocodile 3 corridor have been devised to overcome the obstacles and standardize the ITS protocols.

Owing to the economic progress made by the countries participating in the Crocodile 3 project, the traffic volumes have gone up significantly. Crocodile 3 is focused on resolving the congestion issue and securing traffic efficiency with the existing infrastructure. That requires a number of efficient strategies along the entire service chain, starting with handling data and categorization, to providing services to the end users to ensure a visible impact and added value.

As part of the Crocodile 3 Croatia project, activities are being carried out on the road itself and within the systems; the main activities include a mobile application and traffic management plans (TMP), tunnel radio communication, and road equipment installation.



# Mobile application



One of the project's goals is to develop a mobile application that will provide its users with the latest traffic information on motorways and state roads. This will be a significant step forward in terms of improving public information as the users will not only be provided with fast and relevant information, but also enabled easier use. The mobile application will be supported by Android and IOS platforms.

Furthermore, the application will allow its users to access up-to-date information on traffic flow and weather conditions on various sections across the entire network of motorways and state roads in Croatia. The application's interface will be intuitive and easy to use, allowing its users to quickly and unambiguously achieve the following:

## ▶ Obtain information about traffic conditions on their planned motorway route:

- Overview of traffic conditions
- Report on travel times
- Emergency events
- Works on motorways and connected state roads
- Situation at border crossings
- Traffic cameras
- Current speed restrictions on individual motorway sections
- Speed limit warning (if one's mobile phone's GPS receiver is activated)
- Information about weather conditions
- Rest stops and available services
- Information about toll collection
- Contact information based on type of inquiry (police, firefighters, ambulance, traffic-related information, information about toll collection etc.)

## ▶ Access other information

## ▶ Change mobile application's settings.



## The application's main features will be as follows:

- ▶ Planning travel routes
- ▶ Overview of the active emergency notifications and road works
- ▶ Overview of the latest weather conditions and traffic flow information
- ▶ Overview of the active emergency notifications and works on traffic route
- ▶ Overview of detours
- ▶ Current vehicle location on the map
- ▶ Current speed restrictions
- ▶ Information about traffic flows on individual motorway sections
- ▶ Detour routing suggestions

### ▶ Availability of other information

If the user has opted for receiving other information and/or promotional materials, they will be shown information about different events and/or promotional activities that might be interesting to a wider public.



# Traffic management plans (TMPs) during emergencies

## The most common emergencies are as follows:

- Snow (winter conditions) and related elimination and rerouting of the freight traffic
- Closed tunnel or road
- Road works
- Traffic accidents
- Longer traffic delays and gridlocks during the tourist season
- Other large emergency events (earthquakes, fires etc.).

Unplanned events on motorway networks (corridors) affect not only the traffic flows in the country where those events are taking place, but also the traffic flows in the neighboring countries. Accordingly, TMPs are being developed to be used on motorways across the EU, thus allowing for uninterrupted traffic flow and providing users with a certain degree of safety and quality. A TMP includes international traffic management scenarios to be used on a motorway network (corridors), as well as a list of measures for traffic management during various traffic-related events, and defines those responsible for the implementation of the measures in question. It also sets the values for each and every emergency, suggesting either an activation or a deactivation of the pre-planned scenarios that form an integral part of the plan itself.

Developing consolidated TMPs for emergency events on the A3 and A4 motorways, which are on the Mediterranean Corridor of the TEN-T network and operated by Hrvatske autoceste d.o.o., will ensure coordinated traffic management and control, resulting in high-quality information services provided to the users of one of the most important road corridors in this part of Europe.

TMPs are based on a machine-to-machine data exchange, which enables both wired and wireless communication between other, same-type machines, without any human involvement. The key components of the machine data exchange include sensors, RFID, wireless or mobile communications connections, and computer software programs. They allow networked devices to interpret the available data and make decisions. Specialized protocols are being devised in order to develop machine data exchange in traffic. These protocols then allow standard ways of communicating and exchanging data between traffic centers, service providers, and traffic operators, among others. The existing standard DATEX II, which already covers a wide range of services and content in road traffic, will be used to exchange data and information at the European level. One of the main achievements of DATEX is setting up models supported by a large number of users across Europe. The initiative was launched by road operators but has now spread to include both urban and logistics domains. The implementation of the mobile application and associated TMPs is scheduled to start in half 2021 and conclude the end of 2022., when the TMPs will also be put into operation.



# Tunnel radio system

Tunnel radio systems are used for secure radio communication between various in-tunnel radio stations as well as between in-tunnel and external radio stations (radio stations outside tunnels). The system in question is primarily used by maintenance crews, emergency services (firefighters, police, ambulances), and any other organization concerned with safety (Mountain Rescue Service, National Protection and Rescue Directorate). The system also enables providing drivers with special instructions via in-vehicle radios. Most of the motorway tunnels have analog radio communication systems, which is a safety issue of sorts as the police and other public organizations and services use the digital communication network for encrypted speech and data transmission.

Since in-tunnel digital signal transmission is not possible, the police and other emergency services using the said signal cannot establish speech and data communication, which is a serious issue safety-wise. The existing radio communication systems in nine different tunnels on the A1 motorway, operated by Hrvatske autoceste d.o.o., will be rebuilt and upgraded. This includes modernizing the radio communication equipment in Croatia's two longest road tunnels, Mala Kapela and Sveti Rok. The reconstruction works began in August 2020 and are expected to conclude in early 2022.



## Improving the road weather station system

An increase in motorway traffic volumes calls for an increase in motorway traffic safety. Most emergencies on motorways usually happen on the interchanges or close to large facilities. High speeds on motorways require maximum commitment to traffic safety. To prevent potential consequences of various emergency situations on motorways, it is necessary to promptly detect such emergencies and use variable-message signs to get the message across to any traffic participants, as well as to immediately alarm all the relevant emergency services. Motorways have a traffic and information system, which comes with a subsystem used for measuring weather data. The Traffic Control and Management Center continually monitors weather conditions on motorways and undertakes the necessary measures in case the conditions change.

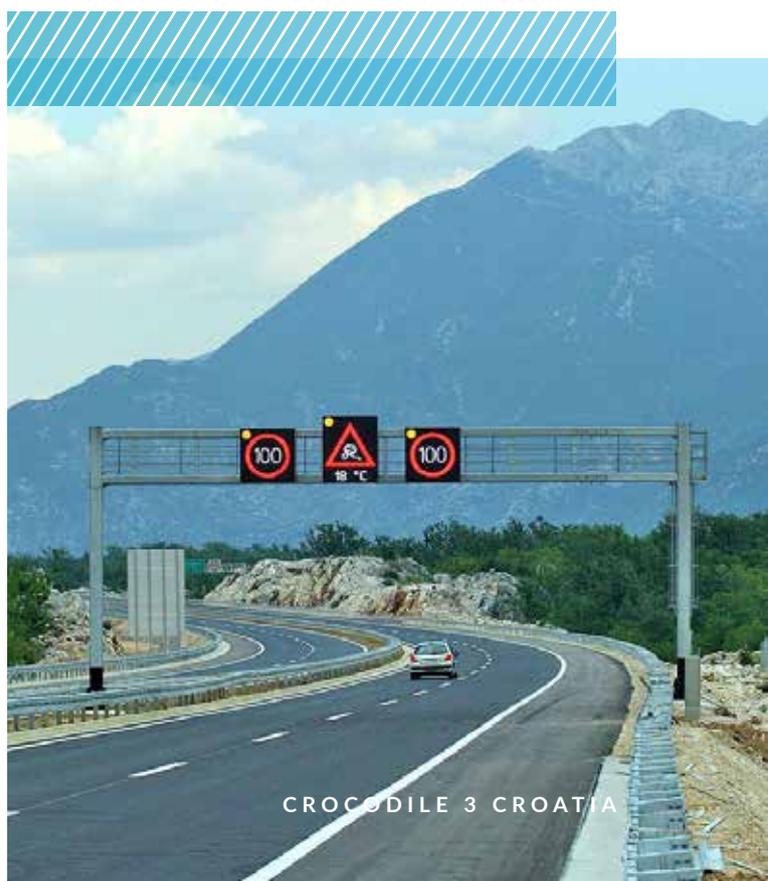
Efficient traffic management fully depends on the fast detection of any changes in the weather conditions. The weather data measurement system consists of an automatic weather measurement station with the relevant sensors and probes gathering meteorological data from the environment. The measurement stations on motorways thus provide output data, based on which the motorway variable-message signs can warn the traffic participants about any potential dangers. At the moment, it is evident that the motorways are insufficiently covered by weather stations as there are a number of areas with unique weather conditions that affect traffic safety and require prompt reactions.

Consequently, there is a need for an increase in the number of weather stations in order to safeguard and improve traffic safety and provide even better-quality real-time information and data. A number of new weather stations will be built across the motorway network managed by Hrvatske autoceste d.o.o. More specifically, these stations will be set up in locations where, it has been determined, they are necessary due to unique weather conditions. The necessary works will include installing the road weather stations and measuring instruments, upgrading the existing road equipment as well as the traffic and information system and the new short-term weather forecast system (RWIS) at the Traffic Control and Management Center. The works are scheduled to start by mid 2021. and are expected to conclude by the end of 2022.

## Implementation of the new motorway equipment

Various new equipment, including variable-message signs, information boards, rotating traffic monitoring cameras, and road weather stations, will be installed on motorways operated by Autoceste Zagreb – Macelj d.o.o. (AZM), Hrvatske autoceste d.o.o. (HAC), and Bina-Istra d.d.

Variable-message signs and information screens provide the drivers with clear and timely road- and traffic-related information, as well as approaching restrictions and conditions, and their main task is to respond to arising atypical situations such as traffic accidents and gridlocks, worsening weather conditions (ice, fog etc.) or congestions. Various devices will be installed on certain information boards, including meteorological measurement devices measuring weather conditions, devices measuring traffic density and traffic flow speed, and automatic video-surveillance and traffic control systems. Rotating traffic monitoring and analysis cameras will be used to monitor traffic conditions; they have zoom-in and focus features to aid in timely detections of emergencies any other event on the motorway. The works have already started on certain sections of the motorway, and the full implementation is expected to conclude by the end of 2022.



## Implementation of the new equipment on the DC 8 state road

To modernize the existing traffic management and information system, new ITS equipment will be installed on the DC 8 state road, more precisely, at the Franjo Tuđman Bridge (former Dubrovnik Bridge). This is due to occasional occurrences of severe winds, which require restricting bridge traffic for certain vehicle categories or even closing the bridge for all traffic. Installing the new traffic equipment, including variable-message signs, road weather stations, and cameras, together with

exercising the necessary bridge traffic management in gale-force wind conditions, will also enable better-quality traffic surveillance and management in other traffic incident situations (e.g. gridlocks, traffic accidents etc.). The said variable-message signs will be installed together with the relevant LED technology as well as pre-defined messages related to traffic management in severe wind conditions and a selection of traffic signs for other traffic incident situations, thus creating the preconditions for informing the users on waiting times at border crossings with Bosnia and Herzegovina and Montenegro. Implementation-related works will be contracted by year-end, and the implementation is planned to conclude by early 2022.





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#### ON BEHALF OF THE PUBLISHER

Boris Huzjan, President of the Management Board

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To obtain additional explanations and follow the status of the projects, please contact us via e-mail. Any additional project-related information is available project website.

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