



MINISTRY FOR INNOVATION AND TECHNOLOGY

HUNGARY'S NATIONAL REPORT

on the national activities carried out in 2014-2017 in connection with the priority areas listed in Article 2 of Directive 2010/40/EU of the European Parliament and of the Council and the results achieved in the course of the implementation of the projects.

Budapest, July 2018

(data collection closed on 31 December 2017)

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INTRODUCTION

Similarly to the previous reporting period, Hungary still considers the promotion of ITS development and research, as well as innovative industrial development, as high priority. In the 2014-2017 period, significant investments took place both at municipal and regional level with the aim of improving the efficiency, degree of organisation and sustainability of transport.

In the field of ITS, in addition to the development of the infrastructure (such as CROCODILE, C-Roads, M76 smart road etc.), Hungary also follows developmental directions that adhere to expectations and trends of the automobile industry, vehicle development and telecommunication/communication.

The Ministry for Innovation and Technology (hereinafter referred to as the “MIT”), the ministry of the Hungarian Government responsible for transport, supports and encourages promising applicants of various research, development and innovation tenders. It plays an active role in the projects associated with transnational cooperation, the deployment of transport development and intelligent transport services, as well as the promotion of the standardisation and homology efforts.

Transport development (and ITS in particular) also enjoys significant support from various operational programmes. The National Transport Infrastructure Development Strategy (hereinafter referred to as the Strategy) is Hungary’s new transport policy with a horizon of 2050, approved by Government Decree 1486/2014 of 28 August 2014 (available in Hungarian at the following link:

<http://www.kormany.hu/download/b/84/10000/Nemzeti%20K%C3%B6zleked%C3%A9si%20Infrastrukt%C3%BAra-fejleszt%C3%A9si%20Strat%C3%A9gia.pdf>.)

The ITS domain forms a separate part of the Strategy, and therefore it explicitly mentions the need for creating a separate ITS Strategy. In the end of 2015, a prospective, comprehensive study analysing the situation, entitled ‘Development Strategy of National Intelligent Transport Systems (ITS)’, which strives to take into account the lines of development carried out by the end of 2015 or planned/proposed for the future based on transport sectors (the timeframe of the study coincides with the end of the current financing cycle of the EU [2020], although due to the n+3 rule applicable to financing, this extends to 2023), has been prepared.

However, as a member of the European Union, Hungary wishes to be an active player in the development of the European Transport Area so as to provide a response to the challenges of the coming decades as well. The ITS Development Infrastructure can be a founding tool for the exploitation of the capacity of the transport infrastructure, as well as the opportunities and reserves accumulated in the technical and technological development, in line with the EU objectives and obligations.

The strategic document primarily focuses on the programmes implemented or planned by the state and **serves the establishment of the basic ITS infrastructure** constituted by the entirety of the services used in the public institutional system and provided to the business sector and the end-user sector. Another important aim is to exploit the strategic potential of

the data of public sectors, the ITS services and the information flows, as well as apply them in an integrated manner.

Hungary aims to achieve the following main objectives by the implementation of the ITS developments:

- compliance with the international standards, prompt development and application of international regulations, procedures and standards, as well as becoming part of the best third of the EU Member States with regard to compliance;
- the institutional establishment of the conditions for the planned implementation of the EU tasks of the responsible Hungarian line Ministry and the competent authorities (provision of data, databases, data exchange);
- provision of National ITS services and the establishment of conditions specified in the related regulations (e.g. the National Access Point or the Public Safety Answering Point), the relevant master data repository, standardisation, regulation of the procedures and provision of the necessary technical background; and
- methodological and professional support of individual or private ITS developments (particularly with regard to road safety and the real-time disclosure of infrastructural and schedule-related conditions).

The amount allocated to the Integrated Transport Development Operational Programme (IKOP) built on the Strategy is EUR 3.92 billion, including the national co-financing of 2014-2020 (of which the EU's transport development aid is cca. 85 %). The IKOP approved by the European Commission on 12 February 2015, similarly to the Strategy, considers ITS as a horizontal element and specifically emphasises the importance of the interconnectivity of different systems, regarding which all priority axes envisage some interventions:

1. The priority axis of *'Improving international accessibility to the country's road network'* primarily plans ITS interventions regarding the improvement of road safety related to the road development of the Trans-European Transport Networks (TEN-T).
2. The priority axis of *'Improving international accessibility to the country's rail and waterway networks'* primarily envisages the development of GSM-R, ETCS and RIS systems that facilitate interoperability on the TEN-T network, as well as the modernisation of the provision of passengers with information at stations and the sale of tickets.
3. The priority axis of *'Improving urban and sub-urban public transport'* envisages ITS interventions regarding the linking of transport chains and road safety in metropolitan areas.

As part of the *development of transport energy efficiency priority*, ITS arises in connection with awareness-raising and road safety related interventions (e.g. e-Call).

The main founding document of the EU on ITS tasks and aims is Directive 2010/40/EU (hereinafter referred to as the ITS Directive), which focuses on the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes.

The priorities of the ITS Directive are the following:

- I. optimal use of road, traffic and travel data,
- II. continuity of traffic and freight management ITS services,
- III. road safety and security applications of ITS,
- IV. linking the vehicles with the transport infrastructure.

Priority areas related to priorities I and II:

- a) the provision of EU-wide multimodal travel information services; (I)
- b) the provision of EU-wide real-time traffic information services; (II)
- c) data and procedure for the provision, where possible of road safety related minimum universal traffic information free of charge for users; (I)
- d) harmonised provision of interoperable EU-wide e-Call services; (III)

- e) the provision of information services for safe and secure parking places for trucks and commercial vehicles; (III)

The requirements of Directive 2010/40/EU regarding the priority areas (including the obligations of the Member States) are explained in detail in the following delegated regulations:

- Regulation (EU) 305/2013 on the harmonised e-Call system,
- Regulation (EU) 885/2013 on the information system ensuring safe and secure freight parking;
- Regulation (EU) 886/2013 on the deployment of transport data provision relating to minimal road safety,
- Regulation (EU) 585/2014 on the deployment of the e-Call system,
- Regulation (EU) 2015/962 on real-time traffic information services,
- Regulation (EU) 2017/1926 on multimodal travel information services.

The most significant national ITS developments of the 2014-2017 period and the major projects planned for the subsequent periods are presented in the following chapters, broken down by the priority areas specified in the ITS Directive.

I. PRIORITY AREA:

Optimal use of road, traffic and travel data

CROCODILE

A5/3 – Implementation of internet-based transport information services (2014-2015)

Project costs: EUR 100 000

In addition to the stationary provision of road users with information on the roads, there is an increasingly large demand for information that is available on the internet or mobile devices before and during transport, even regarding the international transit traffic that flows through the capital. In the project, we strived to improve the successful pilot project carried out in the course of the EasyWayII project by publishing the available real-time data and by the qualitative and quantitative extension of the scope of the available data. An additional aim is to ensure the compliance of the information portal with the conditions of the single international transport information services.

Responsible:

BKK Közút Zrt.

- Dénes Kovács, Director denes.kovacs@bkk-kozut.hu
- Gergely Rónai, Chief Development Engineer gergely.ronai@bkk-kozut.hu

A5.1/3 – Provision of transport information services through the improvement of the existing information channels (e.g. mobile site, TMC), development of mobile application (5 November 2015)

Project costs: HUF 8 350 000 (cca. EUR 26 900; at an exchange rate of HUF 310/EUR)

The aim of the development is the ‘renewal’ of the existing application, incorporating the original features as well as new options (e.g. saving favourite routes/areas, display of dynamic parking information and data on restrictions/blockages) in line with priorities c) and e) of the EU ITS Directive.

In the course of the development, a new application was created, which incorporates the functions available in the previous software, as well as useful new services. In addition to the latest Android and iOS version, the application is now also available for Windows operating system, and the new interface is consistent with the design and logic applied in the event of the utinform.hu site. The features available in the new system are the following:

- motorway news list/‘events’ view current events,
- main roads news list/‘events’ view current events,
- textual representation of information recorded on the interface (e.g. truck driving ban, announcements etc., information received from partners),
- option of saving favourite routes/areas, sending/retrieving information related to them from the continuously updated database,
- list of web cameras,
- static parking information,
- dynamic parking information (display of online data of the M1 truck management system),
- contact details/direct dialling, e-mail messaging.

An important communication channel of the company was renewed and is now available for all three major mobile platforms and enables the provision of end-user services in line with priorities c) and e) of the EU ITS Directive.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A5.3.1. – Development of the Traffic Management Plan (TMP) (20 December 2015)

Project costs: HUF 14 400 000 (cca. EUR 46 400)

Objective: The close cooperation of road operators/managers concerned is a fundamental condition for the consistency, up-to-date state and reliability of the traffic information services provided on the TEN-T corridors that cross our country. For operational, management-level cooperation, action plans must be developed for the predefined situations and summarised in a mutually agreed traffic management plan (TMP).

Strategic goals:

- Harmonisation and integration of the ITS systems, extension of its services and operation of the necessary data exchange;
- Improvement of traffic flow, management of planned restrictions and traffic disruptions caused by emergencies with close cooperation among road operators;
- Review of bottlenecks and problematic hubs of road traffic on sections that directly or indirectly affect the capital's traffic flow, with the clear identification of causes and impact factors;
- Development of traffic management, traffic organisation and traffic information measures implemented based on common traffic management strategies that reach across operational borders.
- Improvement of conditions for intramodality, facilitation of change between different means of transport;

The work performed: The planning task had to be carried out taking into account Application Guidance EW TMS-DG07 on 'The traffic management of transport corridors and networks', and contains the following parts of work:

- assessment and identification of bottlenecks and hubs of the planning area, assessment of the existing ITS Infrastructure used for their management;
- development of management strategies that reach across operational borders as well as specific action plans;
- elaboration of a development strategy to facilitate the optimal operation of the established traffic management measures.

Planning area: Priority road network of Budapest and environs

Results achieved: Based on the finished plan, the common traffic management activity of the road network in the capital, the M0 Ring Road and the connected express road network elements can be formalised, the elements of the established measures can be recorded in a regulated form and incorporated into the processes of the organisation concerned. The identified bottlenecks, hubs and the needs for infrastructure and resource development required for taking further measures can be considered in the course of the ITS developments planned by the organisations concerned, which can help expand the toolbox of traffic management cooperation and improve the quality of the services provided jointly.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A5.3.2. – Implementation of the mobile application for the existing traffic information portal of the capital, enhancement of the system functions (20 December 2015)

Project costs: HUF 14 700 000 (cca. EUR 47 400)

Objective: Supporting the transport-related decisions of road users with real-time traffic and parking information before and during travel with a mobile application that can be used on smart phones. Another aim of the publication of real-time dynamic parking information is to facilitate the propagation of multimodal transport and reduce traffic load in the city centre.

The work performed: The implementation of the development started with the preparation of the detailed functional specification based on the requirements recorded in the invitation to tender. On the basis of its finalised version, a system plan has been prepared, then the actual development has started. During implementation, we followed the principle that the export of data from the source systems must take place based on the method developed earlier in the case of the traffic information portal; the data supply had to be established accordingly in the event of new data sets to be displayed as well. The application server's logic was implemented on the basis of open-standard JAVA and HTML5. The finished mobile application, which runs both on iOS and Android, displays the following data sets in real-time (for the territory of the capital): images of traffic monitoring cameras, parking information, electric car charging station availability, messages on dynamic information signs, accidents and other events causing traffic disruptions. In addition to the provision of basic information, convenience functions, such as personalisation, the option of setting favourites, applying filters or using the Help function, are also available for users. The application supports portrait and landscape use, and can be run on both smart phones and tablets.

Results achieved: with the help of the traffic information provided for road users in the mobile application, travel has become easier to plan, while dynamic parking information contributed to the increase in the utilisation rate of P+R facilities.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
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CROCODILE 2.0 HU

A2.2. – Development of traffic management plan (2017-2018)

Project costs: HUF 19 300 000 (cca. EUR 62 200)

Objective: Ensuring the continuous and smooth traffic flow on the sections in the capital located in operational border areas directly connected to the TEN-T network is a priority task of the road operator of the capital. Full traffic management can be implemented by the application of a common arsenal of instruments based on the automated data exchange of road operators, which arsenal needs to be continuously improved and expanded.

As part of this project, our aim is to improve and actualise the traffic management plan prepared as part of the CROCODILE phase I. A5.3.1 project, as well as develop action plans that can be integrated into traffic management central systems in order to improve the traffic flow of the operational border areas building on the dynamic traffic data of the automated data exchange (DATEX II) carried out with road operators and other organisations involved in road management.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

CROCODILE 3 HUNGARY

A5.1 Development of mobile application ‘Útinfó’ (planned: 2018-2020)

Project costs: EUR 30 000

Development and modification of the application prepared in the first phase of the CROCODILE project in accordance with user needs. The new application is planned to be upgraded with data regarding service stations, web camera images and traffic information from abroad – received under international cooperation.

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomascsek, Head of Traffic Management
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ITS DEVELOPMENTS IN THE COUNTRYSIDE AND THE CAPITAL

NYDOP-3.2.1/B-12-2013-0008 – Development of intermodal traffic system in Körmend and its environs (2014)

Project costs: HUF 36 961 530 (cca. EUR 119 000)

In Körmend's railway and bus station, in addition to GYSEV Zrt's and ÉNYKK's electronic passenger information boards providing real-time information, which were implemented as part of another project, 5 passenger information signs that display train and bus lines jointly, on the same displays and in real-time, will be installed in the course of this project.

An interface between the passenger information systems of GYSEV and ÉNYKK has been developed based on the Transmodel database, in compliance with Transexchange and SIRI standards. GYSEV Zrt. did not have a passenger information database that complied with the Transmodel standard earlier, its development also took place as part of this project. GYSEV Zrt. has been ensuring the maintenance and updates of the Transmodel database since its deployment.

Responsible:

GYSEV Zrt.

- András Czibula, Head of Strategic Technical Developmnet aczibula@gysev.hu

ITS DEVELOPMENTS OF THE TRANSPORT OPERATIONAL PROGRAMME (KÖZOP) IN CITIES AND MUNICIPALITIES

ITS DEVELOPMENTS IN THE CAPITAL

Improvement of publication platform of the specialised systems (2014)

Project costs: HUF 13 200 000 (cca. EUR 42 600)

Based on the successful pilot of the publication platform planned and developed in the course of the EasyWayII project, in the first half of 2014, we started the improvement of the portal. Within this framework, the publication of the traffic information generated in the course of the traffic management activity and relevant to road users is made possible through the establishment of real and automated data connection in the road traffic management centre of the capital and between the related ITS systems and the publication platform, as well as the extension of the previously developed functionality. Our aim is to create an internet-based traffic information service which can help us provide the road users of the capital with real-time, reliable traffic information, assisting them, before or during travel, in making transport-related decisions, be it choosing the optimal route or the most favourable method of transport.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Division

Establishment of KARESZ, the road data collection system (2013-present)

Project costs: HUF 360 000 000 (cca. EUR 1 161 000)

An accurate knowledge of the road assets, the operated field facilities and devices, their correct representation on the map and the provision of an adequate user environment for the use of these digital map data (web maps, digital map applications, conversion of case management to map-based operation) are crucial to the performance of road operational tasks and the preparation of development tasks.

With a view to these tasks, the development of KARESZ, the road data collection system that prepares the 3D survey of the entire territory of Budapest with the most modern solutions, commenced in 2013. In addition to the preparation of the map data, the system also provides a 3D imprint – point cloud – of the city, which can facilitate the performance of accurate analyses for a more economical planning and quality assurance of road rehabilitations and other developments. The maintenance and rehabilitation of roads can therefore be faster and cheaper.

Parallel to the map data collection, continuous developments were made with regard to the recording of the data and its integration into the case management system, and by the end of 2014, the framework, which provides the Company's employees with support with the use of an online digital map interface together with the previously used case management system, was established.

In 2012, a detailed study with an international outlook was prepared as part of the preparation of KARESZ, so as to ensure the soundness of the project's planning. As a result of the study, an impact study on the first phase of KARESZ, the data collection system, as well as the related budget, have been prepared. Due to the support of decision-makers, over the past year, KARESZ was prepared completely in accordance with the Company's plans and under its coordination, which resulted in the creation of one of most modern and efficient data production systems in the world, with the help of which our Company started the survey of the capital in 2014. The survey and the recorded data is being processed on a continuous basis, in accordance with a schedule based on the priority of the main road network elements.

Responsible:

Budapest Közút Zrt.

- Gyula Fekete, Head of Division

**E-JEGY – Preparation and implementation of electronic ticketing system
(1 September 2011 - 31 January 2019)**

Project costs: HUF 5 306 697 000 (cca. EUR 17 118 000)

The aim of the project is to develop, deliver, operate and maintain a server-based, open-standard electronic ticketing system for the territory of Budapest. The project contract envisages the need for the following goods, performances (works), services and purchases:

- ticket validating equipment for 2 300 buses, trams and trolleybuses
- ticket validating equipment for 65 suburban railway stations and 13 metro stations
- entry gates and ticket validating equipment for 47 metro and suburban railway stations
- a total of 13 500 smart card readers that comply with the ISO 14443 standard
- delivery of 3 million smart cards that comply with the ISO 14443 standard
- delivery of 600 portable handheld controlling devices
- acceptance of new electronic ID cards
- NEK (National Single Card System) and NEJP (National Electronic Ticketing Platform) system integration
- delivery of ticket sales system, customer service system and management system regarding the information solutions
- delivery of back office system for the above elements
- integration with the existing BKK systems (corporate governance system, ticket vending machines etc.)
- fixed and wireless telecommunication services

The project also includes the following:

- preparation of plans, studies and surveys needed to substantiate the introduction of the system
- involvement of external experts (e.g. quality assurance)
- external public procurement/legal advice and representation
- performance of communication tasks necessary for the introduction and operation. Additional information: funding.

Based on Decision 554/2013 of 9 April 2013 of the General Assembly of Budapest, the loan agreement of EUR 54.5 million concluded between BKK Zrt. and the European Bank for Reconstruction and Development (hereinafter referred to as the EBRD) for the implementation of the electronic ticketing system was executed on 6 September 2013. On 6 September 2013, the Municipal Support Agreement concluded between BKK Zrt., EBRD and the Municipality of Budapest was signed with the aim of managing the relations between the different development resources.

Responsible:

BKK Centre for Budapest Transport

- Dr Zsolt Denke, zsolt.denke@bkk.hu

FUTÁR – Improvement and modernisation of the traffic management and passenger information system in the surface and underground public transport (2009-2014)

Project costs: HUF 6 648 583 280 (cca. EUR 21 447 000)

FUTÁR (Traffic Management and Passenger Information System) was created as a result of an EU tender. It is an integrated IT system for public transport, which enabled satellite vehicle tracking and localisation, integrated traffic management and disruption management, as well as passenger information based on real-time data within the service area of BKK concerning buses, trams, trolley buses and, with a subsequent upgrade, boats on the Danube, including a total of 2 295 vehicles, 257 300 public transport stops and hubs. The system is available on mobile devices and an online platform.

The system includes the prioritisation of vehicles at 30 locations with traffic lights, which shortens travelling time for our passengers and also leads to significant savings. In addition, the project also included the establishment of a new communication system.

The creation of FUTÁR completely replaced the previous, outdated passenger information and traffic management systems that did not manage real-time data, at the same time allowing for a passenger-centred, modern public transport service that is highly reliable, follows the schedule more accurately and provides passengers with real-time data.

Over the past few years, approximately 100 vehicles (including ships on the Danube), 50 displays at stops and an equal amount of public address equipment have been added to the system. The main extensions of the functionality of the mobile application that displays the data provided by the system are the following: accessibility for visually impaired people, integration of the MOL BUBI public bicycle rent system, integration of ticket sales points (real-time travel planning with the use of public bicycle, as well as with the need for advance ticket purchase). On certain displays installed at stops, we provide integrated information service by showing the data received from partner suburban transport operators. The number of nodes integrated into traffic signal prioritisation reached 78.

Responsible:

BKK Centre for Budapest Transport

- Attila Kalmár, Technical Leader, attila.kalmar@bkk.hu

Development and implementation of P+R parking facilities in the capital (2012-2018)

Project costs: HUF 1 598 474 000 (cca. EUR 5 156 000)

The leadership of Budapest has a clear urban-policy-related aim of relieving the inner districts from road traffic, increasing the proportion of public transport users and reducing the environmental, health-related and economic harms caused by road transport. In our capital, the infrastructure of combined transport, one of the most important element of which is the network of P+R and B+R parking facilities, is quite obsolete.

In the course of the task, the reconstruction and extension of the existing P+R parking facilities, as well as the installation of new P+R parking facilities and B+R facilities, has taken place at several locations in the capital. The new parking lots are equipped with hard pavement, public lighting and a drainage system, while the safety of vehicles is ensured by a surveillance camera system. Part of the parking facilities is guarded, fenced, equipped with a toll-bar entry system, and integrated into the system of paid P+R parking lots. The saturation of renovated and new parking facilities is planned to be shown on an electronic capacity-displaying system which provides data for the capital's parking management system to be deployed.

P+R parking facilities implemented recently as part of the P+R development in the capital:

- Cinkota P+R
- Csepel P+R
- Húvösvölgy P+R
- Kaszásdűlő P+R
- Örs vezér Square P+R
- Pillangó Street P+R

Additional parking facilities under preparation:

- Akadémia Park P+R
- Békásmegyér P+R

Responsible:

BKK Centre for Budapest Transport

- Balázs Fejes, balazs.fejes@bkk.hu

Construction of P+R parking facilities that are connected to the points of change between different means of transport in Budapest (2014-2020)

Project costs: HUF 3 342 154 000 (cca. EUR 10 781 000)

The leadership of Budapest has a clear urban-policy-related aim of relieving the inner districts from road traffic, increasing the proportion of public transport users and reducing the environmental, health-related and economic harms caused by road transport. In our capital, the infrastructure of combined transport, one of the most important element of which is the network of P+R and B+R parking facilities, is quite obsolete.

In the course of the task, the reconstruction and extension of the existing P+R parking facilities, as well as the installation of new P+R parking facilities and B+R facilities have taken place at several locations in the capital that had been prepared in addition to the parking facility development in the capital, or as part of the parking facility development in the capital. The new parking lots are equipped with hard pavement, public lighting and a drainage system, while the safety of vehicles is ensured by a surveillance camera system. Part of the parking facilities is guarded, fenced, equipped with a toll-bar entry system, integrated into the system of paid P+R parking lots. The saturation of renovated and new parking facilities is planned to be shown on an electronic capacity-displaying system which provides data for the parking management system of the capital to be deployed. The exact locations will be determined based on the feasibility study, which is currently under preparation.

Possible or planned locations:

- Békásmegyér P+R (implementation of the location prepared using resources provided by the Municipality of Budapest)
- Csepel P+R Phase II
- Mexikói Street P+R
- Népliget P+R
- Újpest-Városkapu P+R

Responsible:

BKK Centre for Budapest Transport

- Péter Balogh, Peter.Balogh2@bkk.hu

Modernisation of freight traffic entry control (1 December 2012 - 31 December 2015)

Project costs: HUF 119 723 000 (cca. EUR 386 000)

Development tasks:

- Control of revenue from freight transport entry, replacement of costly controlling carried out by manpower with devices and software development, recording and transfer of so-called camera images (recording of registration number plate, timestamp, GPS position) to BKK's IT system.
- Data retrieval from the TOBI number plate database in order to find out whether the vehicle had a valid entry permit at the site and in the time of the control.
- Development of the examination of access restriction that can be applied

to vehicles. Objectives:

- Increasing access discipline
- Increasing revenues through the administrative offence procedures initiated based on the additional data from the developed system
- The development can be used for preparing statistical summaries and making revenue projections more substantiated.

By 1 April 2016, the capital's transport institutional system's was restructured, which lead to Budapest Közút Zrt. performing public service tasks related to operational road management and freight transport.

Responsible:

Budapest Közút Zrt.

**TVM – Procurement, installation and operation of ticket vending machines
(19 June 2013 - 31 December 2019)**

Project costs: HUF 3 450 000 000 (cca. EUR 11 130 000)

The ticket vending machine network previously used in Budapest consisted of old machines that were based on an obsolete technology. By establishing a network of new ticket vending machines, BKK has repositioned this sales channel. Clients can buy any fare product in the new machines (TVMs). The purchased tickets or passes can be paid for in coins, banknotes or by bankcard at every machine. The ticket vending machines are connected to an IT network, therefore provide up-to-date information at all times on the data that may be crucial for reliable operation. After the implementation of the project, 300 new ticket vending machines have been placed at the most important transport hubs of Budapest. Client feedback and the traceability of sales volumes allow the connection of areas excluded in the first round into the service, i.e. the further extension of the network. Currently, more than 360 modern machines are at the disposal of the Users. The awarded contractor has to carry out the full range of production, software development, planning, licensing and implementation tasks to prepare the installation.

Responsible:

BKK Centre for Budapest Transport

- Dr Zsolt Denke, zsolt.denke@bkk.hu

II. PRIORITY AREA:

**Continuity of traffic and freight management
ITS services**

CROCODILE

A2/1 Review of the finished Traffic Management Plans, preparation of new plans with the neighbouring countries in order to manage the traffic of cross-border transport corridors and the events that occur on corridors as well as possible (16 November 2015)

Project costs: HUF 11 210 000 (cca. EUR 36 000)

The traffic management of traffic corridors and networks refers to the development, application and quality control of ‘Traffic Management Plans (TMP)’, which include the European transport network and transport corridors, including cross-region and cross-border aspects, as well as multimodal options. The objective of this subtask is the review and actualisation of the previously finished traffic management plans and the development of new plans for the TEN-T core network corridors in Hungary, in particular with respect to the critical Motorway M1.

The *Traffic Management Plan (TMP)* is a collection of predefined measures applicable for various special situations.

The aim of the traffic management plan – a European basic service – is to provide road users with efficient traffic management, route recommendation and information on a consistent basis, thereby increasing the performance of the transport infrastructure with the establishment of a possible cross-border, network or multiparty cooperation (where possible). The situations may be unforeseeable (emergency, accident) or foreseeable (recurring or non-recurring events). Traffic management plans can be categorised based on the area that they cover:

- *Regional plans*: for networks included in TERN and within regions, which can be extended under certain circumstances, and can be linked to the neighbouring regions at interregional and cross-border levels.
- *Cross-region plans*: on areas of the TERN, for national corridors and network that include multiple regions.
- *Cross-border plans*: on areas of the TERN, for cross-border transport networks and major transport corridors.

The coordinated implementation and application of traffic management plans across Europe makes it possible to use the European road network more efficiently and provide road users with integrated services.

The document reviews the *antecedents of the cross-border traffic management*, the effective cooperation agreement concluded by the partners concerned and the joint work commenced, also presenting the results achieved so far by the jointly developed management plans.

In the course of the work, the following detailed analyses have been prepared:

- Traffic analyses that include the examination of the daily traffic, the relevant hourly traffic and the rate of capacity utilisation (by examining the ratio of the actual and permissible traffic at the permissible and tolerable service level), trends in the composition of the traffic with the examination of the rate of freight transport, as well as the daily and monthly distribution of the traffic, regarding the entire motorway section over the past 5 years. In addition to analysing traffic characteristics in the past few years, the studies also include the forecast of the developments and composition

of the traffic until 2020, taking into consideration the analyses of changes in the toll system (previously unpaid sections have become toll-roads and the purchase of toll stickers for counties has become possible). As part of the traffic analyses, the major relations of the cross-border road traffic were analysed in detail on the core corridors as well – supplemented by the major relations of the cross-border traffic, particularly with regard to Motorway M1.

- The detailed accident reports prepared by analysing the accidents in the period between 2010 and 2015 involved the classification of the accidents based on the type of the accident, the relative accident ratios calculated based on the consequences of the accidents, the density of the accidents and the analysis of the frequency of accidents.
- The analysis of congestions include analyses based on causes, duration and length of the congestion, the time of the day, the day of the week and the month, as well as the comparison of the congestions with the database of accidents.
- In order to plan the traffic management measures, it was necessary to examine the available infrastructure, such as the possibilities for the placement of trucks and additional accessible parking surfaces, as well as the devices of traffic management and information systems of motorways (monitoring devices: traffic counting stations, traffic monitoring cameras/web cameras) and the Variable Message Signs (VMSs).

Scenarios have been developed for the entire national TEN-T core network with various intervention levels (which determine the necessary level of communication):

Level 0: intervention level: provision of information only

Level 1: intervention level: local/regional traffic diversion + provision of information

Level 2: intervention level: traffic diversion involving multiple nodes (with cross-border measures) + provision of information

In addition, a cooperation agreement on the exchange of traffic information has been concluded between the Hungarian and Romanian parties, which was one of the milestones of the CROCODILE project.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management

tomaschek.tamas@kozut.hu

A3/1 Development and extension of the existing traffic data collecting and data processing (monitoring) infrastructure, installation of automatic sensors and traffic monitoring cameras, establishment of real-time communication solutions (22 December 2015)

Project costs: HUF 313 285 327 (cca. EUR 1 010 000)

CROCODILE A3/1: An important part of the work programme is the replacement of the obsolete devices and the systematic elimination of deficiencies in the equipment; an additional key objective was the replacement of the obsolete traffic counting equipment on Motorway M1 that operates with hourly updates. The development was launched as two subprojects. In the first subproject, 15 new online traffic counting devices were installed. At 9 locations, the existing obsolete equipment was replaced or compensated for at a different location, while at 6 locations, completely new measurement sites were built. Nine devices were installed on M1, which lead to the almost complete renewal of the traffic counting system on M1. Most of the stations operate online, and traffic counting has become continuous on M1, with the exception of a few sections between certain junctions. In addition to M1, new equipment was also built on Highway M0 and along Motorways M3 and M43.

In the second subproject, 22 new observation points have been set up and equipped with surveillance cameras, at 5 of which new incident detection (AID) cameras have also been installed (primarily in the vicinity of M0). The incident detection cameras represent the next generation of surveillance cameras, which are able to automatically evaluate the digital video signal and detect certain events such as stoppages, slowdowns, wrong-way drivers or foreign objects. After detection, they immediately send an alert to the operators, who then make a decision regarding the intervention.

Of the above-mentioned pieces of equipment, most (8) were set up near Budapest, on M0 and in the immediate vicinity of the ring road in Budapest. Another 5 new cameras operate on Motorway M1, and some cameras have also been placed on Motorways M3, M43 and M7. The application of these systems makes it possible to reduce response time between the occurrence of an accident or a serious congestion and their detection, thereby reducing the length of congestions, travelling time and the number of secondary accidents. With the implementation of the project elements, the coverage of critical and higher-traffic sections of the TEN-T network has been improved. Automatic sensors were installed at 20 locations (traffic counting loop detector, automatic incident detection camera), and an additional 17 traffic monitoring cameras help detect traffic disruptions and incidents in order to ensure their fast resolution.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A3/2 Development of data collection and monitoring network through the installation of detectors and intelligent field termination points on the road sections in the capital covered by the TEN-T corridors (planned: 2014-2015)

Project costs: EUR 600 000

CROCODILE A3/2: In order to establish a cooperation with national and international express road networks and create information services that operate on a uniform basis, we must have a sufficient amount of good-quality static and dynamic data on the areas and sections in the capital concerned by the TEN-T corridors. For this, network elements that are not or only partially covered by the data collection system must be improved. In order to transfer the field data for central processing and use, the communication network must also be provided.

Taking into the consideration the location of the TEN-T corridors in Budapest, the areas for development include Road 10, the joint section of Motorways M1 and M7 leading into the city, Road 6 and Motorway M6, Road 5 and Motorway M5, as well as the area of Road 4.

We plan to install traffic data collection devices, traffic monitoring cameras and other monitoring devices in strategically significant intersections and road sections as part of the traffic monitoring system and integrate them into the traffic management centre. In addition, the extension of the duct network and optical network required for the data communication, as well as its supplementation with the missing elements, is also required.

Responsible:

BKK Közút Zrt.

- Dénes Kovács, Director denes.kovacs@bkk-kozut.hu
- Gergely Rónai, Chief Development Engineer gergely.ronai@bkk-kozut.hu

A3.2.1. & A3.2.2. Extension of communication network of the traffic monitoring system and installation of traffic data collecting and monitoring devices (30 December 2015)**Project costs: HUF 144 679 660 (cca. EUR 467 000)**

Objective: In order to establish a cooperation with national and international express road networks and create information services that operate on a uniform basis, the manager/operator must have a sufficient amount of good-quality static and dynamic data on the areas and sections in the capital concerned by the TEN-T corridors. For this, areas and network elements involved in the TEN-T corridors that are not or only partially covered by the traffic monitoring system must be improved. In order to transfer the field data provided by the monitoring devices installed as part of these developments for central processing and use, the communication network, as well as the electronic connection and communication of the field devices and the central systems, must be provided.

In summary, the project's aim is to extend the traffic monitoring network at strategic locations and road sections, and establish the communicational network necessary for the central integration of the newly installed monitoring devices.

The work performed: As part of this project, traffic counting and traffic monitoring devices, as well as monitoring devices with integrated functionality, have been installed at locations that are relevant to the cooperation with the national road operator, as well as to the traffic management of the capital's road network. The devices had to be integrated into the central systems, ensuring their normal operation and use in the daily monitoring activity. The traffic counting stations were installed in the vicinity of the M0 Ring Road, where the devices carry out full cross-section counting at each location, while the data is sent into the centre by way of GPRS communication. Traffic monitoring cameras have been set up at frequented locations where the observation of the current situation of traffic also provides relevant information to the dispatchers at the traffic management centre and, through traffic information services, to road user as well. The integrated monitoring stations provide real-time traffic data, overview camera images and camera streams suitable for comprehensive central analysis. In order to ensure the central communication of the monitoring devices installed as part of these developments that allows for real-time, high-speed data exchange, the communications cable network in the capital had to be developed as well. As part of this, the devices were connected to optical network and certain missing sections of the network were implemented.

Results achieved:

M0 – measurement sites at the capital:	20 traffic counting cameras at 10 locations
Traffic monitoring:	24 traffic monitoring cameras at 12 locations
Integrated measurement point:	14 intelligent cameras at 7 locations and 7 overview cameras
Communication network:	extension of optical network by 8 840 m

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
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A4/1 Development of DATEX-based information exchange platform – establishment of national DATEX II node in order to implement automated data exchange on the cross-border corridors (16 November 2015)

Project costs: HUF 72 000 000 (cca. EUR 232 000)

CROCODILE A4/1: The aim of the development is to improve the DATEX-based information exchange platform of Magyar Közút Nzrt. based on the results of the road transport data portal established as part of the EasyWay II programme (A.1.1.1) in order to allow for the establishment of national and international automatic data exchange connections (the support of the Slovenian-Austrian-Italian-Croatian-Hungarian cooperation with DATEX II-based information exchange is a key objective). The data exchange facilitates the proper management of situations that occur in the border regions and on the road network of neighbouring countries, while in the long run, it may even allow for the introduction of harmonised cross-border traffic management measures. The international transfer of online information is particularly important in the event of exceptional situations, taking into account priority c) of the EU ITS Directive (provision of road safety related minimum universal traffic information free of charge).

The improvement of the data portal includes the conversion of the system to the latest version (v2.3) of the automatic data exchange standard, as well as the implementation of the entire code pane, which allows for all information in the standard to be understood on the receiving end, as well as any collected/available information to be published from the website of Magyar Közút (e.g. measured traffic-related and meteorological data can be published). The data portal can manage multiple standard location identification systems, which was extended in the course of this development with the standard OpenLR, and another task was to harmonise the location identification systems in order to allow for data exchange between neighbouring countries.

The implementation of the entire DATEX code pane took place based on the latest version, 2.3. The data portal creates the possibility of starting an automatic data exchange with both domestic and foreign partners, the test run is expected to be started with the involvement of the Austrian and Romanian motorway companies, as well as Budapest Közút Zrt.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

**A4.2/1 System development, establishment of online database and system connections
(7 December 2015)****Project costs: HUF 54 250 000/Full task: HUF 94 800 000 (cca. EUR 306 000)**

CROCODILE A4/2: In this project, the establishment of missing system connections between the basic systems that operate at Magyar Közút Nzrt. was required in order for the data received from the foreign partners to reach all necessary locations, as well as for the data collected and stored in the systems to be published to external partners. As part of the development, the so-called C-ITS-S module of the cooperative system (compare A4.2/3 Cooperative pilot system) has also been established, which ensures the monitoring of fixed and mobile roadside devices. The physical and logical communication interface prepared as part of the development allows for the transferability of all online measurement data collected by the Traffic Management System (FIR) of Magyar Közút in compliance with the DATEX 2.3 standard, as well as the receipt of measurement results or information on events that affect traffic (accidents, congestions, traffic diversion etc.) transferred from external systems to the FIR. Another important subtask was the implementation of the cooperative pilot system's central module. It is mainly this central site that is responsible for the information management: it transfers information from the traffic management system to the roadside devices (R-ITS-S) and the vehicles (V-ITS-S) ('downward'), as well as from the fleet that carries out the operational works and the vehicles to the traffic management centre ('upward').

To produce the downward data flow, it receives traffic (event) information from the traffic management system and produces standard messages from it, then forwards the messages to the appropriate roadside devices (R-ITS-S). In the event of the upward direction, it receives information from the vehicles and the operating fleet, and if necessary, forwards it to the traffic management system. In addition, C-ITS-S also performs the monitoring of roadside devices. In the event of the downward direction, the central site selects the proper roadside (R-ITS-S) device to transmit certain traffic information within a specified dissemination area (which can be specified in the traffic management system). As a result of the development, the connections between the basic systems were successfully established, the information flow was thereby improved both within the company and towards the external partners/end users.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management

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A4/3 Creation the conditions of open, standard data communication and ensuring the accessibility of the data available (2014-2015)

Project costs: EUR 150 000

CROCODILE A4/3: Access to traffic information that is generated on the road network or available in the capital's ITS systems and relevant to the TEN-T corridors must be ensured in order to allow for data exchange with organisations involved in the management of the national road network, national and international ITS service providers and other organisations concerned. In order to establish a foundation for the traffic information services that operate on a uniform basis in order to serve end users, the ability of the capital's systems to communicate in compliance with the DATEX II standard must be created by modifying the existing databases and establishing open standard interfaces. As part of the project, the accessibility of the data that is available in the ITS systems of the capital, but currently only used for internal processes must also be ensured.

Responsible:

BKK Közút Zrt.

- Dénes Kovács, Director denes.kovacs@bkk-kozut.hu
- Gergely Rónai, Chief Development Engineer gergely.ronai@bkk-kozut.hu

A4.3.1. Provision of support to transport information services through the development of source systems (20 December 2015)

Project costs: HUF 44 500 000 (cca. EUR 144 000)

The work performed: The development consisted of multiple subtasks. One of the most significant elements was the integration of the previously implemented, isolated camera systems that mostly operated independently from each other on a new platform. The new Integrated Transport Organisation and Regulation System (IKRSZ) provides a framework for the previous traffic monitoring functions (traffic monitoring, traffic counting, traffic control and other traffic data collection functions), moreover, the scope of its services has been extended as a result of the integration, covering several segments of the traffic management activity. The services of the system are available on a single operator interface, and the new real-time system monitoring module provides high-level support to the operational activity. The establishment of an interface that allows communication in compliance with the DATEXII standard, which enabled standard data exchange with external organisations, was an important element of the development. Results achieved:

- unified visual traffic observation and traffic monitoring;
- broad traffic analysis functionality;
- uniform data provision for traffic information services, control of information devices;
- standard external data exchange, provision of system connections;
- serving of various traffic control needs;
- online monitoring of devices and functions to provide support to the operation;

Results achieved:

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A4.3.2. Operational implementation of data exchange in line with the DATEX II standard with the national road operator, extension of traffic analytical functions (20 December 2015)

Project costs: HUF 13 700 000 (cca. EUR 44 000)

Objective: The implementation of real-time, automated, standard data exchange between organisations involved in road management and operational traffic-related activities. Building on this additional information and the cooperation of the organisations, traffic organisation, the management of planned traffic disruptions and disruption caused by emergencies, as well as the minimisation of their impact on the traffic in operational border areas and on the network elements connected to the TEN-T network can be made more efficient.

An additional aim is to establish a traffic analytical function on the network of the capital, which is near its capacity limits, based on the existing traffic-monitoring infrastructure, in order to support the operational traffic control.

The work performed: As part of the development, an interface specification has been defined on the general DATEXII interface regarding the following data sets: traffic counting data, information on accidents, weather information, information on congestions, travelling time data, parking information, messages on VMSs. This enabled the export of the data concerned from the database and its transfer to the external partners in a standard format.

The traffic analytical function was implemented as a module of the integrated digital video centre. As a result, the analytical features can be applied to the images from any of the digital cameras connected to the centre. It is possible to set permanent monitoring tasks and alerts related to the given parameter for the selected camera images, which allows the partial or complete automation of certain tasks carried out by dispatchers. Due to the large number of field monitoring devices, this function provides significant support to the specialist personnel. Results achieved:

- real-time standard traffic data exchange with external partners;
- establishment of central traffic analytical software function in the capital's road traffic monitoring centre.

Results achieved: The ensuring of the compatibility of existing databases with DATEX II 2.3. and real-time data exchange with the manager of the national roads (Magyar Közút Nzrt.) Integration of the traffic analytical function into the central traffic monitoring system.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A5.1/1 – Provision of transport information services through the improvement of the existing information channels (e.g. mobile site, TMC), publication of online (measurement) data (7 December 2015)

Project costs: HUF 45 000 000 (cca. EUR 145 000)

CROCODILE A5.1/1: The national Traffic Management System (FIR) used by Magyar Közút Nonprofit Zrt. is a data collection and intervention system with a national scope that allows the display of real-time data of various electronic systems that support road operation on a single platform, as well as the direct control of traffic management intervention systems. The purpose of this development is the improvement of the FIR system, the development of the operator interface and the integration of additional information sources, as well as their display.

The traffic management system prepared in 2009 as a result of the CONNECT project displayed the monitored road sections on its own raster map integrated into the application, which did not provide adequate clarity and limited the scope of displaying the information. In addition, a client application also had to be installed on the user's computer in order for them to be able to access the system. In the course of the development, a platform-independent, browser-based end-user interface was prepared that is compatible with the existing databases of the FIR System, is more in line with the current trends and allows the thematic display, searchability and management of all (old and newly integrated) data managed by the system. In order to ensure greater clarity, the new 'thin client' map viewer can display individual motorway sections with any resolution and orientation, while devices/device groups can be turned on/off as layers.

As a result of the development, the basic system of the traffic management was provided with a new operator interface, while the background infrastructure of the system was modified. With the modifications, the servers are able to handle a larger number of operators/viewers, and the information that impacts traffic management sent by external partners or other units, as well as the measurement data received from external partners, can also be displayed on the operator interface.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management

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CROCODILE 2.0 HU

A2.1.1 Conclusion of agreement with neighbouring countries and other road operators. Development of traffic management plan for critical sections and regions (planned: 2018)

Project costs: HUF 10 000 000 (cca. EUR 32 000)

The CROCODILE project focuses on the elements of the TEN-T network, therefore the traffic management measures will also be developed for these sections. The current phase of the project focuses on the following areas:

- I. Review of feasibility study on the cross-border traffic management plan (TMP) for the TEN-T core network corridors in Hungary – review of document prepared in the first phase of CROCODILE;
- II. Development of a regional traffic management plan in order to manage unexpected events on Highway M0 and the connected road network, as well as the action plans related to the Traffic Management Plan in cooperation with Budapest Közút.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management

tomaschek.tamas@kozut.hu

A3.1.1 Creation of decision support document, designation of National Body and National Access Point, development of technical and legal framework (2017-2018)

Project costs: HUF 40 127 029 (cca. EUR 129 000)

CROCODILE 2.0_HU A3.1.1: In practice, these national access points can take the form of a repository, registry, web portal or similar, depending on the type of the data. Because of the EU regulations, Member States have to reorganise the existing public or private access points into a single common access point, allowing access to all types of the relevant and available data covered by these regulations. In order for the road authorities, road operators, service providers and digital map makers to be able to successfully and cost-efficiently learn and use the data that are relevant for them, the content and structure of these data must be adequately described – using appropriate metadata.

Member States shall designate an impartial and independent national body competent to assess whether the requirements set out in Directive 2010/40/EU and the relevant delegated regulations (see Chapter 1.4.1) are fulfilled by public and private road operators and service providers and broadcasters dedicated to traffic information. Two or more Member States may designate a common body competent to assess compliance with these requirements on their territories. The designated national bodies shall randomly inspect the correctness of the declarations of a number of public and private road operators, service providers and broadcasters dedicated to traffic information, and shall request proof of compliance with the requirements set out in the relevant regulations. The aim of the project is the preparation of a decision-support study, which will serve as the basis of the implementing of the National Access Point (first part of work) pursuant to Commission Delegated Regulations 885/2013/EU, 886/2013/EU and 2015/962, and also provides guidance on the designation of the National Body; the selected expert must also prepare the technical specification of the National Access Point (second part of the work).

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A3.2.1 Development of National Access Point (2017-2018)

Project costs: HUF 129 641 169 (cca. EUR 418 000)

CROCODILE 2.0_HU A3.2.1: Access to current and accurate static road data, dynamic data on the condition of the road and traffic information is crucial to the provision of EU-wide real-time traffic information services. The relevant data is collected and stored by road authorities, road operators and real-time traffic information providers. In order to facilitate the exchange of these data for the provision of these services, as well as their use for other purposes, the road authorities, road operators and real-time traffic information providers have to make these data available for other road authorities, road operators, real-time traffic information providers and digital map creators through the National or Common Access Point, together with the relevant metadata and the information on the data quality. The aim of the project element is the implementation of a National Access Point pursuant to Commission Delegated Regulations 885/2013/EU, 886/2013/EU and 2015/962, in line with the decision-support study prepared as part of the A3.1.1 project and the technical specification.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A5.1.1 Data accessibility, updating of Datex hub to the most recent version (2017-2018)

Project costs: HUF 77 167 363 (cca. EUR 249 000)

CROCODILE 2.0_HU A5.1.1: The national work programme submitted in the CROCODILE 2.0_HU tender – in line with the objectives of CROCODILE – places particular emphasis on the establishment of the DATEX II nodes and databases, which are crucial to the automatic data exchange, and the implementation of the National Access Point. For the data exchange, access to the data must also be ensured, which requires the development of the interfaces of the subsystems. The provision of access to the data is necessary particularly due of the exchange of travelling times, with which the systems measuring travelling times in the Capital and on M0 surrounding it can be interconnected. An additional aim is to expand the data collection network in the missing sections.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A3.3. Preparation and implementation of connection to the National Access Point (2017-2018)

Project costs: HUF 18 600 000 (cca. EUR 60 000)

Objective: Connection to the National Access Point currently being implemented as data provider. An aim of the project is to implement the forwarding of data that is relevant to static and dynamic traffic and road management and the provision of information for users through automated transfer, in a standard format (e.g. DATEX II).

In order to allow the transfer of data on a single platform, it is necessary to interconnect the central data collection, traffic management and registration systems, extend the data sets and upload the extended data sets as part of the project.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A3.4. Implementation of the database of road demolitions and the related dynamic system (2017-2018)

Project costs: HUF 24 000 000 (cca. EUR 77 000)

Objective: Network disruption management and the minimisation of the impact of planned and unexpected events on traffic are important elements of traffic management, which is a basic duty of a road operators.

Several public utility providers and market players carry out pavement breaking works within the capital, which, if they affect roads, can only be performed with the consent of the road operator. In the consent that it issues, our company may define different traffic technology requirements for each phase, the control and monitoring of which within a single platform is currently not ensured. As part of the project, the aim is to create a dynamic system where all ongoing and planned pavement breaking works that directly or indirectly affect roads are recorded, together with their current status.

In addition to the option to control the traffic-related requirements and regulations specified in the road operator's consent, the planned system also allows the global scheduling of various projects and the minimisation of the impact of planned pavement breaking on the city.

The real-time data of the system to be implemented as part of the project can be displayed on the company's information platforms or transferred through a standard platform (DATEX II) to organisations involved in road management or provision of information for end users.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A4.1.1 Installation of automated, online sensors, traffic monitoring and automated incident detection cameras and web cameras (planned: 2018)

Project costs: HUF 133 789 686 (cca. EUR 432 000)

The electronic devices that provide support for road operation can primarily be divided into two main groups; one is the group of monitoring equipment and the other is the group of traffic controlling/managing equipment. Without each other, the groups cannot or can only be used in a limited manner to support the road operation, and in order to achieve the expected results, both need to be adequately established. One of the primary aims of the company's strategy is the continuous and systematic elimination of the deficiencies in the monitoring infrastructure and the equipment that enables intervention. These deficiencies must be remedied on the corridors specified in the project proposal to the extent necessary for the provision of the service on the involved elements of the TEN-T network operated by Magyar Közút Nzrt., particularly on Highway M0 and Motorway M1.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A4.3. Installation of field traffic management, monitoring and road information devices (2017-2018)

Project costs: HUF 277 800 000 (cca. EUR 896 000)

Objective: The operation of intelligent transport systems is an efficient tool for improving the traffic flow of the capital's road network that currently operates nearly on the limit of its capacity. In addition to the function of providing end users with information, the task of the intelligent systems applied in Budapest is to expand the toolbox of traffic management, mainly by the use of adaptive systems. In order to operate the adaptive systems, real-time, sufficiently detailed and accurate data is required, which can be accessed, processed and used in the traffic management centre.

The objective of the project is to extend the geographic coverage of the monitoring and end-user information network to the strategically important intersections and road sections included by the TEN-T network to the operational borders, connecting it with the national road operator's information and traffic management system.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A4.4. Development of communication network (2017-2018)

Project costs: HUF 400 000 000 (cca. EUR 1 290 000)

Objective: In order to carry out the central integration of the devices to be installed in the course of the development of the traffic monitoring and information system planned as part of the CROCODILE 2.0_HU project, the development of the existing wired and wireless communication network is indispensable. In addition to the extension of the geographical coverage of the communication network, the project has an additional objective of eliminating the bottlenecks of the existing system and improving operational safety by establishing redundant data paths and installing active network devices that ensure redundancy.

The implemented communication network with a great operational safety and geographic coverage will be crucial to satisfying the data need of intelligent vehicles (Car to X systems, self-driving vehicles) in the near future.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A4.5. Development of traffic control and management central functions (2017-2018)

Project costs: HUF 74 100 000 (cca. EUR 239 000)

Objective: Modernisation of the infrastructure of the existing traffic management centre and extension of the functions that can be used in operational traffic management and operation. The aim of the development is to improve operational safety, accelerate the detection of operational and traffic disruptions and increase the efficiency of intervention. As part of the project, the display of the various source data to the operators of the centre with an extended functionality on a single platform and the improvement of the ergonomics and usability of the existing control centre is also envisaged. The capacity of the existing systems and their databases to transmit data in a standard structure that is in compliance with the National Access Point is also to be established as part of the project.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A4.6. Development of a dynamic parking management system (2017-2018)

Project costs: HUF 30 900 000 (cca. EUR 100 000)

Objective: The balance of traffic on the TEN-T corridors is directly affected by the progressive increase in the number of commuters from the agglomeration area that surrounds the Capital. The reduction of individual vehicle use by residents of the agglomeration and the promotion of combined transport requires the introduction of innovative, indirect traffic regulation methods in the territory of the Capital. The most logical indirect traffic management method that achieves optimal results is the establishment of a dynamic parking management and information system that encompasses the entire Capital. As part of the project, the aim is to have a study of the concept of central parking management in the entire city of Budapest prepared, which, in addition to including the plans regarding the concept of zoned parking in the capital and the dynamic forecasting system that covers the entire city, also places significant emphasis on defining the ideal platforms and methods for the provision of information for end users.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

A6.1.1 - Development of traffic management devices, installation of VMS (planned: 2017- 2018)

Project costs: HUF 70 000 000 (cca. EUR 226 000)

The project places special emphasis on the upgrading of the traffic controlling equipment of the express road network. In addition to cooperative (C-ITS) transmitters, a Variable Message Sign (VMS) will also be installed on Motorway M1, on the Győr bypass.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomascsek, Head of Traffic Management
tomascek.tamas@kozut.hu

A6.2. Development of traffic information services (2017-2018)

Project costs: HUF 37 000 000 (cca. EUR 119 000)

Objective: Extending and improving the functions of our field and online information services based on the data provided by the monitoring systems implemented as part of the cooperation with Magyar Közút and other developments. In the course of developing the improvement of the existing systems, in addition to the integration of the extended data sets generated as a result of company developments, we also place great emphasis on supplementing the dynamic data sets available in the systems with static data, as well as improving software ergonomics, design and usability, primarily building on the feedback received from end users. As part of the latter, we develop the user interface of our information application available for mobile platforms so that accessing certain functions requires the least possible amount of clicks by the road user, and display specifically the data that are important in the given situation.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

CROCODILE 3 HUNGARY

A4.1 Extension of C-ITS infrastructure (planned: 2018-2020)

Project costs: EUR 630 000

CROCODILE 3 A4.1: The development of central traffic management is a key element of the national work programme that can ensure the performance of tasks related to cross-border cooperation and traffic management. Traffic management at Magyar Közút Nzrt. is currently completely decentralised despite the fact that the conditions for its centralisation are mostly fulfilled, since several systems support it (FIR, JTR, ÚTMET, Dispatch system). The current system is mostly suitable for a two-tier hierarchy, where the regional level is established within certain prominent county centres, while the national centre is set up above this level (the national centre can also perform the regional management tasks of the central region). Within the framework of CROCODILE phase 3, the establishment of a national centre is a priority objective. The key tasks at the national level are the following:

- supervision/coordination: supervision and coordination of the activity of regional centres;
- communication: with other operators and authorities;
- event management/network traffic management measures: network regulation tasks, in regions;
- cross-border traffic management measures.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A3.1 Development of National Access Point (planned: 2018-2020)

Project costs: EUR 130 000

CROCODILE 3 A3.1: Access to current and accurate static road data, dynamic data on the condition of the road and traffic information is crucial to the provision of EU-wide real-time traffic information services. The relevant data is collected and stored by road authorities, road operators and real-time traffic information providers. In order to facilitate the exchange of these data for the provision of these services, as well as their use for other purposes, the road authorities, road operators and real-time traffic information providers have to make these data available for other road authorities, road operators, real-time traffic information providers and digital map creators through the National or Common Access Point, together with the relevant metadata and the information on the data quality. The objective of the project element is to improve the National Access Point prepared as part of the CROCODILE 2.0_HU project.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

MOBILE PAYMENT

National Mobile Payment Systems (15 October 2012 - ongoing)

Project costs: HUF 800 000 000 (cca. EUR 2 580 000)

Nemzeti Mobilfizetési Zrt. is a state-owned private limited company, founded on 15 October 2012 in compliance with Act CC of 2011 on the National Mobile Payment System. The tasks of Nemzeti Mobilfizetési Zrt. and the conditions for its operation are specified in the above-mentioned act and its implementing regulation, Government Decree 356/2012 of 13 December 2012. Nemzeti Mobilfizetési Zrt. is a 21st century public innovation and technology provider both in terms of the market and society, which provides a single system for national mobile payment as a national coordinator.

Main tasks and objectives:

- provision of mobile payment of public services in a single system;
- making mobile payment available for increasingly wider sections of the Hungarian population;
- positioning mobile payment as a real payment method in order to curb cash payments;
- development and provision of mobile and electronic payment services in connection with the national public transport;
- development and provision of mobile payment services related to the concept of 'Goods State';
- provision of a professional base by Nemzeti Mobilfizetési Zrt. with regard to the IT innovation work related to public services.

Implemented projects:

- As part of the National Mobile Payment Project:
 - HU-GO e-toll collection system
 - provision of E-ticket services (road use authorisation for the express roads in Hungary, which can also be purchased using mobile payment);
 - mobile parking in Hungary (from 1 July 2014) Establishment and integration of national mobile parking payment system.

A smartphone application has also been created for the above systems.

Ongoing ITS-related projects:

- National electronic ticketing system platform (NEJP): development of a single public electronic fare payment system (planned costs for 2014-2017: HUF 4 000 000 000)
- Intelligent National Passenger Transport Systems Platform (NESZIP) – (2014-2017); determination of technical and technological specifications that ensure the coherence and interoperability of the data, databases and electronic data communication technologies related to public passenger transport services, as well as the establishment of the central databases and the related central services. (in compliance with Act XLI of 2012 and the related Government Decree 123/2014 of 10 April 2014).

Responsible: Nemzeti Mobilfizetési Zrt.

- Gábor Dávidházy, Project Director,
davidhazy.gabor@nemzetimobilfizetes.hu

ROAD TRAFFIC MANAGEMENT DEVELOPMENT PROGRAMME FOR 2014 - 2017

Development of real-time travelling time monitoring system and dynamic parking management system (financed by the Municipality of Budapest) (31 December 2017)

Project costs: HUF 339 971 076 (cca. EUR 1 097 000)

Objective: In 2012, Variable Message Signs that can indicate the expected travelling times to the different bridges of the Danube, as well as other traffic information, with the help of the established intelligent traffic monitoring system were installed at three locations on the access roads to Budapest as part of the EasyWayII project (section of Motorways M1-M7 leading into the city, Road 6, section between Duna Street and Kőtár Street, junction of Szerémi Street-Kitérő Street). With this system, the number of road users on the sections concerned can be displayed, which, in addition to making the journey predictable, can also help in choosing the best route. Based on the positive feedback provided by road users on the system, our company has set the objective of improving the system, which primarily involves the extension of geographic coverage.

Another aim of the development programme is to extend the services related to the existing and newly built P+R parking facilities that relieve the city centre of the traffic load, as well as to integrate the facilities into the existing parking management centre and establish a dynamic information system.

The work performed:

1. Development of real-time travelling time monitoring system:

Within the project, a number plate detection system equipped with central intelligence, which is required to measure and display travelling times, and full matrix Variable Message Signs (VMS), which are required for the provision of information, were deployed on the following three routes:

- in District II, on Hidegkúti Street, before Bátori László Street, which displays travelling times to Széll Kálmán Square and the buda bridgehead of Margit bridge; altogether 1 VMS, 5 number plate detection and 3 overview cameras have been installed on the route.
- in District XIX, on the road leading to Liszt Ferenc Airport, before KÖKI terminal, which displays travelling times to Könyves Kálmán Boulevard, Ferenc Boulevard and Kálvin Square; altogether 1 VMS, 9 number plate detection and 3 overview cameras have been installed on the route.
- VMSs were installed in District III on Szentedrei Street, at the junction with Raktár Street, as well as near the junction with Zsófia Street, which display travelling times to Margaret Bridge and Árpád Bridge, with the additional option of selecting a route in the event of Margaret Bridge; altogether 2 VMSs, 15 number plate detection and 11 overview cameras have been installed on the route.

The variable message signs and the intelligent cameras that form part of the system were also integrated into the central traffic management systems. As part of the project, every installed device was connected to the wired optical communications network operated by the Municipality of Budapest in order to ensure system stability.

2. Development and central integration of a dynamic forecasting system of parking facilities

As part of the project, a total of 4 facilities have been equipped with dynamic forecasting system, at three locations. The displays installed are controlled directly by the central traffic management system's module responsible for parking management, using GSM communication. This design grants several advantages over local control, e.g. information that deviates from the available capacity sent by the facility can be removed, and through the integration with the travelling time system, the centre is able to indicate an estimated available capacity using a special algorithm, building on historical data, which is particularly useful in the event of displays that are located far from the parking facilities.

The locations and the number of dynamic displays installed at each location are summarised below:

- integration of Hűvösvölgy P+R and 1 dynamic parking management sign;
- integration of KöKi terminal P+R and Kőbánya-Kispest, as well as 6 dynamic parking management signs;
- integration of the underground parking garage in Rákóczi Square and 3 dynamic parking management signs;
- integration of the Órmező P1 and P2 and Etele Square P1 and P2 facilities, as well as 8 dynamic parking management signs.

Responsible:

Budapest Közút Zrt.

- Gábor Szabó, Traffic Technology Director
gabor.szabo@budapestkozut.hu

NIF - DEVELOPMENT OF SERVICE COMMUNICATIONS SYSTEMS**Projects related to the development of the service communications system on Highway M0, Motorways M3 and M43 and Express Roads M85 and M86 (2009-2015)**

Project costs: HUF 7 036 518 129 (cca. EUR 22 700 000)

A000.31-A000.42: Establishment of a single system technology for the service communications equipment on Highway M0, on the section between 2+840 – 29+500 km markers

Implementation period (11 February 2014 - 22 July 2014): HUF 3 003 268 037

Implementation period (23 May 2014 - 23 November 2015): HUF 472 343 532

Nemzeti Infrastruktúra Fejlesztő Zrt. has concluded a grant agreement under the number KÖZOP-1.1.1-07-2008-0002 and with the title ‘Construction of M0 Ring Road on the section between 0+000-29+500 km markers’. In the course of the project, we established the second track in the existing and continuously operating southern sector, and established the connection with the previously delivered and operating eastern sector. In the southern sector of Highway M0, which has become a dual express road with 2x3 traffic lanes as a result of the construction of the second track, the superstructure devices of the electronic systems supporting the operation of the highway were installed by the contractors of the given sections as part of the construction work of the new track.

- (A000.35) M0 ring road between M7 and M6 (section between 2+840 – 9+400 km markers), temporarily commissioned (29 April 2009 - 9 August 2012)
HUF 931 888 641
- Project manager: Attila Baksza (baksza.attila@nif.hu)
- (A000.36) M0 Ring Road, section between Motorway M6 and Main Road 51 (12+140 – 23+200 km markers);
temporarily commissioned (7 January 2010 – 9 September 2013)
HUF 1 549 022 396
Project manager: András Szarvas (szarvas.andras@nif.hu)
- (A000.31) M0 Ring Road, section between Main Road 51 and Motorway M5 (23+200-29+500 km markers); temporarily commissioned (27 July 2009-12 August 2013)
HUF 323 400 000
Project manager: László Szilasi (szilasi.laszlo@nif.hu)
- Additionally, a section of M0 Ring Road between 9+400 – 12+140 km markers was also finished, in the same phase as the Motorway M6 junction.

The construction agreements listed here included the installation of the equipment of the superstructure and the establishment of a duct network, however, in order to ensure its operational use, the constructed sections had to be connected into a single system, which required the setup of an IT centre for the sections as well. On the basis of consultations concluded with the operator, the centre of the service communications system was set up in the available motorway operation and maintenance centre in Szigetszentmiklós.

In the course of 2009, during the call for proposals for the construction agreements, Állami Autópálya Kezelő Zrt. (ÁAK) established the National Traffic Management And Information Centre (FIR). With the help of the centre, a larger electronic system that supports the operation of motorways at a national level can now be monitored with fewer resources.

As a result of the establishment of the system, all devices installed on motorways have become available not only in the individual motorway operation and maintenance centres, but also in the centre of ÁAK Zrt. As a result, traffic management tasks can be performed both in the motorway operation and maintenance centre (APM) operating the section and the Centre. This is why it was necessary to extend the Traffic Management and Information Centre to the extended Highway M0.

The establishment of a single system technology and the FIR integration took place as part of separate projects:

- (A000.42) Establishment of a single system technology for the service communications equipment on Highway M0, on the section between 2+840-29+500 km markers, delivered to MK NZrt., in operation (11 February 2014-22 July 2014) HUF 198 957 000
- Project manager: Attila Baksza (baksza.attila@nif.hu)

The ongoing construction (section between M1-M7, A000.32) includes the connection to the completed system and the integration of the equipment to be installed.

- (A000.32) M0 Ring Road, section between M1 and M7 (0+115 – 2+840 km markers) under construction (23 May 2014 - 23 November 2015) HUF 472 343 532
- Project manager: Tamás Pál (pal.tamas@nif.hu)

With the completion of the last section (the end of 2015), the devices installed in the southern sector of M0 will constitute a single system connected to the FIR. The devices are visible and controllable from both the motorway operation and maintenance centre in Szigetszentmiklós and the centre of Magyar Közút Nzrt. The use of optical cables ensures continuous availability regardless of the weather.

Responsible:

Nemzeti Infrastruktúra Fejlesztő Zrt.

- Attila Baksza, baksza.attila@nif.hu
- Tamás Pál, pal.tamas@nif.hu
- András Szarvas, szarvas.andras@nif.hu
- László Szilasi, szilasi.laszlo@nif.hu

A003.19-A003.21: Establishment of a single system technology for the service communications equipment on Motorway M3 between Nyíregyháza and Vásárosnamény, on the section between 234+238 – 279+900 km markers (11 February 2014 - 11 August 2014)
HUF 828 765 896

Implementation period (29 April 2014 - 30 October 2014): HUF 278 361 432

Implementation period (5 December 2014 - 5 February 2015): HUF 10 000 000

In the investment of Nemzeti Infrastruktúra Fejlesztő Zrt., the implementation of Motorway M3's section between Nyíregyháza and Vásárosnamény takes place in accordance with the following construction schedule:

- (A003.19) Motorway M3, section between Nyíregyháza and Highway 49 (234+238-268+000 km markers);
commissioned (29 June 2011 – 30 April 2013) HUF 800 334 896
Project manager: Tamás Tüske (tuske.tamas@nif.hu)

In connection with the implementation of the section, a duct network of cca. 34 km (10 HDPE50 conduits) have been set up for the service communications network and the optical backbone network. The signals of the 17 emergency poles, 3 traffic counting stations, 2 traffic monitoring cameras and 5 meteorological stations installed on the section are received by the Service Communications Centre set up in the Engineering Site of Ófehértó (A003.21), their processing and assessment takes place on this Engineering Site.

- (A003.19-1) Integration of the equipment installed on Motorway M3 between 234+000-268+000 km markers into the national Traffic Management System of Állami Autópálya Kezelő Zrt. under a contractor agreement,
delivered (11 February 2014 - 11 August 2014) HUF 28 431 000
Project manager: Tamás Tüske (tuske.tamas@nif.hu)

In the course of 2009, during the call for proposals for the first section of M3, Állami Autópálya Kezelő Zrt. established the National Traffic Management And Information Centre (FIR). With the help of the centre, a larger electronic system that supports the operation of motorways at a national level can now be monitored with fewer resources. As a result of the establishment of the system, all devices installed on motorways have become available not only in the individual motorway operation and maintenance centres, but also in the centre of ÁAK Zrt. As a result, traffic management tasks can be performed both in the motorway operation and maintenance centre (APM) operating the section and the Centre. This is why it was necessary to extend the Traffic Management and Information Centre to Motorway M3. The FIR integration has been carried out, the devices installed on Motorway M3 are now also available from the centre of Magyar Közút Nzrt.

- (A003.20) Motorway M3, section between Highway 49 and Vásárosnamény (section between 268+000 – 279+900 km markers),
under construction (29 April 2014 - 30 October 2014) HUF 278 361 432
Project manager: Tamás Tüske (tuske.tamas@nif.hu)

In connection with the implementation of the section, a duct network of cca. 12 km (10 HDPE50 conduits) have been set up for the service communications network and the optical backbone network. The signals of the 7 emergency poles, 1 traffic counting station and

2 meteorological station boxes installed on the section are received by the Service Communications Centre set up in the Engineering Site of Ófehértó (A003.21), their processing and assessment takes place on this Engineering Site. The contract price includes the integration of the devices installed on the section into FIR!

- (A003.21) Motorway M3, section between Highway 49 and Vásárosnamény (268+000 – 279+900 km markers),
planned project (5 December 2014 – 5 February 2015) HUF 10 000 000
- Project manager: Tamás Tüske (tuske.tamas@nif.hu)

In the course of the implementation of the II. construction phase of M3, Magyar Közút Nzt., overriding its previous road operator consent, requested the installation of a traffic monitoring camera in the junction of M3-41, which was also required by amendment No 5 of the building permit. For reasons related to public procurement, this additional work could not be included in the existing contractor agreement, therefore, Nemzeti Infrastruktúra Fejlesztő Zrt. issued a call for tender under an open public procurement procedure in this respect. The installation of a camera in the junction of M3-41 improves its safety, and provides online information on potential accidents for Engineering Site, which also leads to shorter intervention time.

Responsible:

Nemzeti Infrastruktúra Fejlesztő Zrt.

- Tamás Tüske, tuske.tamas@nif.hu

A043.03: Establishment of a single system technology for the service communications equipment on Motorway M43 on the section between Makó and the national border and the implementation works of the connected constructions, in progress

Implementation period (15 October 2012 - 30 September 2014): HUF 1 496 908 025

Under construction. The contractual deadline is currently being modified, the new completion deadline is 1 June 2015

Percentage of completion of the implementation of the service communications system: 32 % (relating to the total costs, this amounts to cca. HUF 480 million). In the course of the implementation works of the section of Motorway M43 between Makó and the national border, as well as the connected constructions, the service communications system is established as part of the ongoing investments, with the connection of the optical cables to Magyar Közút Nzrt.'s Operations Engineering Centre in Makó. The operations engineering centre currently performs the operation of Motorway M43's section under traffic between Szeged and Makó, therefore, after the delivery of the motorway section in question, the services communication system of the entire section of Motorway M43 between Szeged and the national border will be operated from the Operations Engineering Centre in Makó.

Responsible:

Nemzeti Infrastruktúra Fejlesztő Zrt.

- Gábor Csicsely, csicsely.gabor@nif.hu

KO85.01-KO86.23: Establishment of a single system technology for the service communications equipment on Express Roads M85-M86 between Győr-Csorna-Szombathely and the implementation works of the connected constructions**Implementation period (10 June 2013 - 16 October 2016): HUF 3 560 906 560**

The implementation of the service communications systems is in progress.

- (K085.04) M85, section between Győr and Enese (0+000 – 6+800 km markers)
(28 June 2013 - 29 May 2015) HUF 483 030 325
Project manager: Attila Batay (batay.attila@nif.hu)
- (K085.01) In the event of the service communications network on Main Road 85 Enese bypass, section between 6+800 - 13+800 km markers (distance M85), the optical cable had to be threaded through the established conduit network, which was implemented as part of the K085.04 construction project of M85's section between Győr and Enese, with a deadline on 29 May 2015.
- (K085.05) M85, section between Enese and Csorna (13+800 – 20+800 km markers)
(1 July 2013 - 28 June 2015) HUF 396 513 671
Project manager: Attila Batay (batay.attila@nif.hu)
- (K085.02) M85 Csorna bypass phase I.
(10 June 2013 - 30 June 2015) HUF 788 724 514
Project manager: Norbert Vizi (vizi.norbert@nif.hu)
- (K086.23) M86 Express Road Szeleste-Csorna section - phase II: Section between Hegyfalu and Csorna (105+800-139+165 km markers)
(16 October 2013 - 16 October 2016) HUF 1 460 944 898
Project manager: Balazs Wagner (wagner.balazs@nif.hu)
- (K086.22) M86 Express Road Szeleste – Csorna section, phase I: Szeleste – Hegyfalu section (to main road junction No. 84) (between 98+300 - 105+800 km markers)
(1 October 2013 - 1 September 2015) HUF 431 693 152
Project manager: Balazs Wagner (wagner.balazs@nif.hu)

On the Győr-Csorna-Szeleste section of Express Roads M85-M86, the service communications system is established as part of the ongoing investments, with the connection of the optical cables to MK NZrt's Operations Engineering Centre in Csorna. The reconstruction of the Operations Engineering Centre in Csorna and therefore the establishment of the service communications building is carried out by MK NZrt. MK Nzrt., taking into consideration the progress of the reconstruction, provides final or temporary rooms until 31 March 2015 at the latest on the premises of the Operations Engineering Centre, where the host infrastructure of the service communications system is established and set up as part of the road construction investments. The section between Győr and Csorna will operate with an optical backbone network connection, while between the commissioning of the section between Szeleste and Hegyfalu in September 2015 and the commissioning of the section between Hegyfalu and Szeleste in November 2016, the 7.5 km section of the first phase will operate without an optical backbone network connection, transmitting signals to the Operations Engineering Centre in Csorna using microwave radiation.

The cca. 19 km section of Express Road M86 between Szeleste and Szombathely was

constructed and commissioned as a main road, therefore, service communications were not planned or established neither in respect of ducts, nor in respect of the superstructure. Regarding this section, the planning (preparation, land acquisition, licensing) and implementation of the service communications system has to be ordered by the Ministry, and the provision of resources is also necessary.

Responsible:

Nemzeti Infrastruktúra Fejlesztő Zrt.

- Attila Bátay, batay.attila@nif.hu
- Norbert Vizi, vizi.norbert@nif.hu
- Balázs Wagner, wagner.balazs@nif.hu

OTHER TRAFFIC MANAGEMENT PROJECTS IN THE CAPITAL

Planned and scheduled development programme of road traffic management in the capital (2014-ongoing)

Project costs: HUF 365 000 000 (cca. EUR 1 180 000)

Tasks:

- Integration of P+R parking lots into the parking management system at 3 locations (Rákóczi Square, Hűvösvölgy, KÖKI);
- Extension of road information and travel control system through the installation of VMSs and a field measurement system at two locations (in the vicinity of KÖKI P+R and Hűvösvölgy P+ R);
- inclusion of 74 traffic control devices installed at currently unmonitored nodes in the remote monitoring system;
- integration of 18 pieces nodal traffic control equipment into the central control system;
- modernisation (replacement) of nodal traffic control equipment at 10 locations;
- design of adaptive traffic management method at 34 locations;
- installation of nodal audible warning devices for pedestrians at 11 locations in order to fulfil requirements for equal opportunities;

Responsible:

BKK Centre for Budapest Transport

- Gábor Szabó, Head of Division
- Potzner Zoltán, Technical Leader

Extension of the network of traffic monitoring cameras (2014)

Project costs: HUF 35 000 000 (cca. EUR 113 000)

Depending on the resources available, we continuously improve and extend the traffic monitoring camera network that operates as part of the traffic monitoring system, as well as the communication network that allows connection between field devices and the centre. In addition to cameras that only serve traffic monitoring purposes, we also install so-called intelligent endpoints that can perform several different traffic monitoring functions (traffic counting, detection of occupancy status, vehicle categorisation, license number detection, entry control etc.). These devices can serve multiple systems due to their broad functionality. A total of 35 devices have been installed recently, typically in frequented nodes and on road sections that had previously not been covered by traffic monitoring, as well as at some otherwise significant locations.

Responsible:

Budapest Közút Zrt.

- Gergely Rónai, Head of Project Coordination
gergely.ronai@budapestkozut.hu

Electronic control system of carriage of goods by road (2015)

Project costs: HUF 11 700 000 000 (cca. EUR 37 740 000)

In order to reduce VAT fraud, Act I of 2015 stipulated that the sale, purchase and movement for other purposes of goods specified in the ministerial decree issued based on this act carried out with a tolled vehicle, entailing road transport, more specifically:

- a) the intra-Community acquisition or import for other purposes from other Member States of the European Union to Hungary,
- b) sale of goods or export for other purposes from Hungary to another Member State of the European Union and
- c) sale of goods subject to value added tax within Hungary to other than the direct end user

can only be carried out by taxpayers that have an Electronic Road Transportation Control System (EKÁER) number.

In the event of products classified as risky in terms of tax in the regulation, an EKAER number has to be requested from the National Tax And Customs Authority even in the event of transport with a vehicle whose gross weight is less than 3.5 tonnes.

With EKAER, the payment of tax obligations related to road transport from any EU Member State to Hungary and from Hungary to any EU Member State, as well as within the country, can be controlled.

The purpose of EKAER is to strengthen the position of compliant market players, ensure the transparency of freight transport, avoid abuse associated with food, which can often pose risks to human health, and last but not least, enable the detection of tax evaders by the National Tax and Customs Authority (NTCA) that uses the system.

Those who report their activity involving road transport are registered by the National Tax and Customs Authority and are issued an EKAER number based on their report. The declaration must be made on the electronic interface of EKAER. Here, the National Tax and Customs Authority issues an EKAER number, which is valid for 15 days, in the event of every report.

In the EKAER the data related to transport (name of good, quantity, data of the shipper and the consignee, registration number of transporting vehicle etc.) must be recorded in the central electronic system before the transport takes place; using the HU-GO system's control function, the NTCA can track the actual journey of the goods.

The reporting obligation must be fulfilled using the interface available on the website of NTCA (<https://ekaer.nav.gov.hu/>). For further information, please refer to <https://ekaer.nav.gov.hu/articles/view/tajekoztato>.

The project of the system implementation was carried out by NÚSZ Zrt. in compliance with the government's decisions of 2015; the company was also given a mandate to operate it in the long term in Government Decision 1437/2017 of 30 June 2017. The government has allocated HUF 11.7 billion to the development and deployment of the EKAER system.

Responsible:

Nemzeti Útdíjfizetési Szolgáltató Zrt. (National Toll Payment Services; NÚSZ Zrt.)

- Zoltán Jákli, Project Director, jakli.zoltan@nemzetiutdij.hu

National support network for axle weight and related controls (2016-2018)**Project costs: HUF 28 300 000 000 (cca. EUR 91 290 000)**

The system of Magyar Közút Nzrt. and the former National Transport Authority (NTA) ensuring the control of overweight and oversized road vehicles by stopping them, as well as their measurement network, the concept of which had to be reviewed due to the elimination of the internal borders of the European Union, can be considered as an antecedent of the development. Near border crossing points and at other frequented locations, the new concept uses High Speed Weight in Motion (HSWIM) technology, which is able to conclude measurements on moving vehicles, even in the event of crossing at high speed.

The decision required for the establishment of the National Support Network for Axle Weight and Related Controls (hereinafter referred to as TSM) was made by the government in its Decision 1102/2016 of 3 March 2016.

Government Decision 2009/2016 amended by Government Decision 2047/2016 specified tasks and deadlines for NÚSZ Zrt. through the competent governmental bodies, ordering the establishment of the TSM system at the appropriate level to allow for screening by 22 February 2017 and at the level required to allow for penalisation based on objective liability by September 2017.

The measurement network has been implemented on the basis of the HU-GO control system. Certain elements of the HU-GO technology that allow the detection of the registration number, nationality mark and category of vehicles that cross the controlling cross-section were supplemented with HSWIM sensors, which carry out validated measurements that have legal effect. The measured values and the recorded data is sent to the authorities concerned for analysis and the initiation of sanctioning procedures (imposing administrative fines) on overweight vehicles.

The portals of HU-GO's control infrastructure that are suitable for serving the TSM functions as expected have been selected. These sites were upgraded with 16 new portals that are able to meet the control requirements set by NTCA and NTA. Therefore, currently a total of 89 measurement sites 107 measurement stations have TSM function. The totality of portals that provide coverage for the entire road cross-section where the distance between the portals does not exceed 600 m is to be considered as one measurement site.

The TSM system takes its measurement data from the toll system and verifies its authenticity in real time. In the event that the TSM system indicates an infringement, the visual number plate verification that precedes the substantive procedure takes place by the retrieval of images of the scene based on the identifier generated by the measurement stations, via the toll system.

The TSM system is able to determine infringements relating to gross vehicle weight and axle load. The TSM system can compare the gross weight determined based on the measurement with the maximum permissible weight of Hungarian vehicles specified in the vehicle register, as well as the measured value of axle load with the values specified in Section 7 of KöHÉM Decree 6/1990 of 12 April 1990.

If the vehicle is overweight, the TSM system consults the database of Magyar Közút Nzrt. containing the route licenses to determine whether the road operator authorised the journey of the vehicle under the given terms.

If the TSM system determines the infringement, based on the principle of objective liability, the system automatically generates the documents required for the conclusion of the

administrative procedure.

In the course of the evaluation of the measurement data, the TSM system takes into consideration the data content of the exemption registers (restriction at weekends, technical differences), as well as the valid route licenses issued, and can support the issuing procedure of the exemption permits.

The TSM system is capable of data exchange through standard interface with other external specialised systems, such as the EKÁER system of NTCA. This way, the fact that the movement of the good subject to tax has taken place is not only presumed based on the movement of the vehicle with the reported registration number, the movements of goods reported in the EKAER can be controlled with the real-time measurement of mass of the transported goods.

The investment related to the TSM system took place with the use of HUF 28.3 billion.

Responsible:

Nemzeti Útdíjfizetési Szolgáltató Zrt. (National Toll Payment Services; NÚSZ Zrt.)

- Zoltán Jákli, Project Director, jakli.zoltan@nemzetiutdij.hu

Preparation of the improvement of PIR (Parking Management System) – study (2014)

Project costs: HUF 5 000 000 (cca. EUR 16 000)

In the beginning of 2009, the Municipality of Budapest launched the pilot project of the Parking Management (PIR) System in the capital as part of CONNECT, the European regional project, involving three parking facilities. In the course of the successful pilot project, the receipt of the data on the occupancy status of the facilities integrated into the system in the centre, as well as the display of the number of currently available parking spaces on the dynamic boards installed was implemented. Therefore, the foundation of a centrally controlled dynamic PIR system in the capital has been established. In the course of the modernisation carried out in 2012, with the creation of the Sitraffic Guide module, the centre of the PIR system was integrated into the road traffic management centre, therefore, the parking management function became an integral part of the traffic management activity.

Based on the successful pilot, we wish to improve the system by involving additional facilities within a specific area of the capital. As part of this, we intend to create a single parking management system based on ITS solutions by integrating the parking facilities concerned, which system is connected to the existing parking management centre of the road traffic management centre of the capital.

As a preparation of the implementation, a study plan on the quantitative and qualitative extension of the system was prepared by the end of 2014.

Responsible:

BKK Közút Zrt.

- Dénes Kovács, Director denes.kovacs@bkk-kozut.hu
- Gergely Rónai, Chief Development Engineer gergely.ronai@bkk-kozut.hu

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III. PRIORITY AREA:

Road safety and security applications of ITS

GENERAL ROAD SAFETY DEVELOPMENTS

Road safety investments without building permit procedure on Hungary's express road network /KÖZOP-1.5-0-09-11-2011-0010 (2011-2015)

Project costs: HUF 1 171 650 327 (cca. EUR 3 780 000)

The project placed special emphasis on the upgrading of the traffic controlling equipment and traffic monitoring systems of the express road network, taking into consideration the previously prepared document entitled 'The determination of basic electronic infrastructures for engineering'. As a result of the strategy, coverage gaps were reduced and Variable Message Signs (VMS) were installed in the vicinity of nodes suitable for traffic diversion and at major decision points, while additional VMS portals were installed in order to ensure the management of M0. As part of the project, traffic management devices that are crucial for the planned cross-border operation were installed in the junction of M7 and M70, as well as in the area of the Croatian-Hungarian border.

Completed subprojects:

- /1 Installation of portals with Variable Message Signs and surveillance cameras in the junction of Express Roads M7 and M70 and the border-crossing point in Letenye: HUF 188 884 880
- /2 Installation of portals with Variable Message Signs at specified locations of the eastern sector of M0, Motorways M3 and M43: HUF 387 823 431
- /3 Installation of portals with Variable Message Signs at specified locations of the southern sector of M0, Express Roads M1, M6, M7 and M70: HUF 367 672 668
- /4 Installation of traffic counting and meteorology stations, extension of surveillance camera systems: HUF 227 269 348

Responsible:

Magyar Közút Nonprofit Zrt.

- Dr. Attila Pere, Head of Division
pere.attila@kozut.hu

Developments to improve road safety on the national road network /KÖZOP-3.5.0-09-11-2011-016 (2011-2015) ITS subproject

Project costs: HUF 1 320 000 000 (cca. EUR 4 258 000)

Magyar Közút Nzrt. carries out a traffic light reconstruction programme on the national main road network (with the exception of Pest County) as part of project number KÖZOP-3.5.0-09-11-2011-016 with the subject 'Developments to improve road safety on the national road network'.

The works have been ongoing since April, the completion of the software development is due at the end of October. The completion deadline of the full project is 31 May 2015. The main advantage of the new remote monitoring software is that in the future, every newly installed traffic light controlling device will be connected to this system, therefore, in time, the current variety of remote monitoring software used by dispatchers will be replaced by a single system. In the current project, 452 control devices are replaced and will be monitored through the new software. The software delivered by the contractor uses up-to-date, modern technology and provide a high level of service; communication between the traffic light control devices and the remote monitoring system takes place on an IP-basis. The public procurement procedure includes the delivery and replacement of field equipment and devices, as well as the development of the single remote monitoring software implemented as part of the project. The costs of the full project amount to HUF 1.32 billion, of which HUF 198 million is used for the implementation of the remote monitoring system (HUF 118.8 million of which is used for software development and HUF 79.2 million for making the finished software available).

Responsible:

Magyar Közút Nonprofit Zrt.

- Ernő Kiss, Head of Traffic Technology and Management kiss.erno@kozut.hu

CROCODILE**A5/2 Extension of M1 parking management system (including data exchange regarding the parking places available in the neighbouring countries) (31 December 2015)****Project costs: HUF 205 605 000 (cca. EUR 985 000)**

CROCODILE A5/2.: The major part of the East-West transit traffic flows through motorway M1. The traffic is later spread out by Highway M0, but a significant proportion continues its journey on highway M5. Due to the proportions of freight traffic, the accommodation of truck drivers spending their rest periods and their vehicles represents a serious problem everywhere along major freight transport routes – but, for obvious reasons, particularly along Motorway M1 –, especially in the evening and at night. For this reason, the key objective of the service is to ensure that the rate of utilisation of the available capacities approaches the optimum as much as possible.

Before the development, monitoring systems that determine the rate of occupancy in real time were only used in the Arrabona (section at 119 km marker, Győr bypass) and Moson (section at 163 km, Mosonmagyaróvár area) rest areas. These two alternative options – both with a significant capacity – were shown on the displays, but only for those headed towards the national border.

This system ensures the monitoring of a total of 110 rest areas. In the CROCODILE project, we extended this service to additional complex resting areas in the country along Motorway M1 (Óbarok, Remeteség, Concó right and left, and Moson left) and created the opportunity of displaying data received from similar systems of the neighbouring Austria (and where possible, Slovakia) in DATEX format. With the extension, the real-time monitoring of occupancy status was provided for 100 additional spaces. Information from the new locations are displayed on the new dynamic displays integrated into the existing static boards and the existing or newly installed portals with VMSs along the road. In addition to the road-side displays, we also made the service available on web-based/mobile platforms (compare A5.1/3 Mobile application development project).

As a result of the extension of the service to the left side, both drivers headed towards the Austrian border and those arriving from the West can plan in advance where they will spend their rest time, thereby making it possible for them to avoid forced, illegal or unsafe parking or parking that may cause harm to the infrastructure.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomascsek, Head of Traffic Management
tomaschek.tamas@kozut.hu

CROCODILE 2.0 HU

A4.2.1 Extension of the intelligent truck parking system (planned: 2018)

Project costs: HUF 339 536 395 (cca. EUR 1 095 000)

CROCODILE A4.2.1: Within the project, the objective set is to comply with Commission Delegated Regulation 885/2013/EU of 15 May 2013 and Directive 2010/40/EU of the European Parliament and of the Council on Intelligent Transport Systems. For this purpose, a data collection system that is able to determine the number of free parking spaces in the next two safe and secure parking facilities available for trucks along the corridors within 100 % on the elements of the TEN-T core network in the country is to be deployed.

Such a system is currently only operated on Motorway M1, which endures significant transit traffic (Orient-East Med corridor, western section), which had to be established on the eastern section (M5, M43) and the other significant TEN-T corridor, the Mediterranean, which also includes Motorways M3 and M7 (cca. every 100 km). This extension will ensure the monitoring of 274 additional rest areas.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

THE HARMONISED PROVISION FOR INTEROPERABLE EU-WIDE E-CALL SERVICES

Introduction of a single emergency number (112), development of the basic infrastructure of the harmonised e-Call system (2010 - 19 May 2014)

Project costs: HUF 2 588 000 000 (cca. EUR 8 348 000)

The single emergency number and the related emergency call centres went live in Hungary on 19 May 2014. The emergency call centres (that will also perform the function of Public Safety Answering Point after the establishment of the e-Call system) were set up in Szombathely and Miskolc. The automatic emergency call system does not operate in the centres yet, but the contractor undertook an obligation to establish it after the type approval requirements and other relevant specifications have been finalised (this is expected to take place in early 2015). With regard to the implementation of e-Call, it is also necessary to develop the answering points, the PSAPs, the e-Call modems, i.e. the ability to identify automatic emergency calls, the ‘e-Call flag’ and the processing and proper handling and transfer of MSDs.

The mobile operators have to make their mobile network and systems e-Call capable. The establishment of the single emergency call system and the basic e-Call infrastructure involves the following costs:

Construction costs (emergency call centre buildings in Miskolc and Szombathely)	HUF 750 000 000
Equipment costs	HUF 48 000 000
Costs of establishment of the IT system	HUF 1 790 000 000
Total:	HUF 2 588 000 000

Hungary is an observer member of the HeERO 2 project.

Participation in the HeERO 3 project is currently under negotiation.

Responsible:

Ministry of Interior – National Police Headquarters

National Media and Infocommunications Authority

Ministry for Innovation and Technology

Automatic emergency call system (e-Call) (2013-2014)

Project costs: HUF 80 000 000 (cca. EUR 26 000)

Pilot deployment and testing of the connection between the national e-Call vehicle and the centre as a preparation for joining the 'HeERO' project.

The aim of project of 2013 was the deployment and testing of the connection between the vehicle and a pilot centre, which included the following key tasks:

- understanding the technology made available,
- developing the methodology for testing in Hungary,
- carrying out tests, logging events,
- transferring MSD messages generated in the course of e-Calls to the PSAP (Public Service Answering Point),
- receipt of incoming messages, their storage in a database,
- validation of the recorded MSD messages in the standard system of the Finnish HeERO partner, assessment of the results, definition and measurement of KPIs.

In 2014, we carried out interoperability tests as part of the Finnish-Hungarian cooperation with the participation of a HeERO partner from each country in Finland and the Czech Republic.

Responsible:

Ministry for Innovation and Technology

- Tibor Mocsári, Head of Division, Traffic Technology Chief Engineer, tibor.mocsari@itm.gov.hu

IV. PRIORITY AREA:

Linking the vehicles with the transport infrastructure

CROCODILE**A4.2/1 System development, establishment of online database and system connections
(7 December 2015)****Project costs: HUF 40 550 000/Full task: HUF 94 800 000 (previously considered)**

CROCODILE A4.2/1: In this project, the establishment of missing system connections between the basic systems that operate at Magyar Közút NZrt. was required in order for the data received from the foreign partners to reach all necessary locations, as well as for the data collected and stored in the systems to be published to external partners. As part of the development, the so-called C-ITS-S module of the cooperative system (compare A4.2/3 Cooperative pilot system) has also been established, which ensures the monitoring of fixed and mobile roadside devices. The physical and logical communication interface prepared as part of the development allows for the transferability of all online measurement data collected by the Traffic Management System (FIR) of Magyar Közút in compliance with the DATEX 2.3 standard, as well as the receipt of measurement results or information on events that affect traffic (accidents, congestions, traffic diversion etc.) transferred from external systems to the FIR. Another important subtask was the implementation of the cooperative pilot system's central module. It is mainly this central site that is responsible for the information management: it transfers information from the traffic management system to the roadside devices (R-ITS-S) and the vehicles (V-ITS-S) ('downward'), as well as from the fleet that carries out the operational works and the vehicles to the traffic management centre ('upward'). To produce the downward data flow, it receives traffic (event) information from the traffic management system and produces standard messages from it, then forwards the messages to the appropriate roadside devices (R-ITS-S). In the event of the upward direction, it receives information from the vehicles and the operating fleet, and if necessary, forwards it to the traffic management system. In addition, C-ITS-S also performs the monitoring of roadside devices. In the event of the downward direction, the central site selects the proper roadside (R-ITS-S) device to transmit certain traffic information within a specified dissemination area (which can be specified in the traffic management system). As a result of the development, the connections between the basic systems were successfully established, the information flow was thereby improved both within the company and towards the external partners/end users.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

A4.2/3 Installation of a cooperative pilot system, installation of ETSI G5 WLAN equipment on the vehicles that carry out traffic diversion as well as along the road on Motorway M1 (5 November 2015)

Project costs: HUF 69 108 000 (cca. EUR 223 000)

CROCODILE A4.2/3: The term ‘cooperative systems’ refers to a telematic service that allows two-way data provision between the vehicle and the traffic management centre, as well as between vehicle and vehicle. The service mainly provides drivers with personalised, accurate information shown on an internal display within the vehicle, as well as provide information on the moving vehicles to the traffic management centre. The system that allows communication between the centre and the vehicle (or, in other words, the infrastructure and the vehicle) (I2V, C-ITS) consists of the following components:

- Central side infrastructure (C-ITS-S)
- Roadside infrastructure (R-ITS-S)
- Vehicle (V-ITS-S)

In this subtask, Roadside units (R-ITS-S) were implemented; the primary aim of the new system is to improve the safety of roadworks.

The location where the cooperative pilot system is established is Motorway M1 (section between M0 and Hegyeshalom). In this part, the aim is the establishment of the cooperative system’s ‘roadside infrastructure’ (R-ITS-S) elements:

- fixed transmitter (installed on portals with VMS, installed into emergency poles),
- transmitter installed on traffic direction vehicle (vehicles equipped with an arrow-shaped traffic direction light, ensuring the safety of roadworks, as well as on traffic direction trailers combined with VMSs).

These roadside units communicate with passing vehicles through short-range, standard (ITS-G5) data connection.

The devices installed on VMS/emergency poles were placed along the motorway in fixed positions, at a total of 26 locations, and mobile transmitters were installed on 20 traffic direction vehicles (trailer/device carrier).

One of the most important lines of development of the coming years is the communication between vehicles or between vehicles and the infrastructure. As a result of the development, this new service, which can significantly contribute to the improvement of road safety and in particular the safety of roadworks in the medium term, can now be tested in Hungary.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

CROCODILE 2.0 HU

A6.1.1 Development of traffic management devices, extension of cooperative (C-ITS) system (planned: 2018)

Project costs: HUF 40 000 000 (cca. EUR 129 000)

CROCODILE 2.0_HU A6.1.1: The objective of the development is the extension of the ‘Roadside infrastructure’ (R-ITS-S) of the cooperative system that operates on Motorway M1 to Highway M0. R-ITS-S is a system component that is installed along the motorway:

- in a fixed position,
- temporarily (e.g. in the event of temporary traffic diversion) or
- as mobile device – on operating vehicles (e.g. in the event of moving roadworks).

These roadside units communicate with passing vehicles through short-range, standard (ITS-G5) data connection. The R-ITS-S units must be able to code and decode the messages, and carry out the ex ante/ex post processing of the information received. In the course of the communication between the roadside units and the vehicles, R-ITS-S units can carry out the composition, decryption and transformation of messages in every direction, which also include the final composition and authentication of the message.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

CROCODILE 3 HUNGARY

A5.2 Extension of C-ITS infrastructure (planned: 2018-2020)

Project costs: EUR 40 000 (cca. EUR 129)

CROCODILE 3 A5.2: The main objective of the project is the establishment of a continuous pilot section near Budapest that reaches over operational borders, on the joint section of Motorways M1 and M7 leading into the city, in cooperation with Budapest Közút. As part of the project, the sections managed by Magyar Közút will be equipped with fixed road-side R-ITS-S transmitters.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

C-ROADS HUNGARY

A2 C-Roads Hungary pilot (planned: 2018-2019)

Project costs: HUF 589 099 955 (cca. EUR 1 900 000)

C-RROADS Hungary A2: Cooperative pilot systems are established in Member States across Europe. The aim of the platform is to summarise the experiences related to the pilot systems implemented in the individual Member States, as well as to harmonise the services and formulate recommendations regarding the establishment of the systems. The long-term aim is for the pilot locations to be implemented with international cooperation, in a harmonised manner, thereby ensuring interoperability. The C-Roads project provides an international forum for harmonisation, examining the operation of the pilot locations, organisational issues (business models, legal and regulative framework), technical issues (interfaces, standards, connection to traffic management) and the measurement of the systems' efficiency. Within the project, the work takes place in thematic work groups, where the participating countries share their experiences, the applied standards and technical specifications and efficiency measurement methodologies. Currently 8 member states (Austria, Germany, Czech Republic, France, Belgium/Flanders, the Netherlands and the United Kingdom) participate in the platform.

Another aim of the domestic work programme's is to increase coverage (further development of the roadside data network), test the mobile communication data transfer in addition to the currently exclusively used short-range radio transmission, and develop new functions that can be used in an urban environment (e.g. integration of traffic light control).

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

FRAME-NEXT (ongoing: 2017-2020)

Project costs: HUF 27 778 500 (cca. EUR 90 000)

The application of the ITS Framework Architecture in the preparatory phase of the ITS systems facilitates the careful planning and prudent architecture of the system, the organisation of expectations towards the contractor and the control of the implementation, which factors significantly influence the future success of the project and the achievement of the objectives set. The purpose of its application is also to detect and minimise the development of inadequately documented and/or individual closed systems. Its aim is to facilitate the improvement of the systems, and with the requirement for open, standard solutions, it also prepares their interoperability. In order to ensure the interoperability and efficiency of the systems, the framework specifies the basic mandatory requirements for the systems, with particular attention to the application of cooperative applications (communication between the vehicle and the infrastructure), which is used more and more often. For this purpose, the project contributes to the update of the technical content of the ITS-related Road Specification Standards (ÚME) as well. Technical content of the project:

- update of the current version of FRAME (European ITS framework),
- real-time traffic and travel information systems,
- transport information systems related to road safety,
- traffic management systems,
- reliable truck parking information and/or reservation systems,
- eCall,
- cooperative ITS (C-ITS) applications,
- extension of the support of additional ITS services that are relevant at European, national, inter-urban and local/city level,
- establishment of connection, possible convergences with similar projects in other parts of the world (USA, Australia...).

The project also contributes to the amendment of the European Transport Directive in line with the European regulations and standards.

In the event of a successful tender, the road operator can participate in the development of the European ITS Framework, which can help transpose the latest technical practice into the national technical regulations. This can make traffic management more efficient and support the development of information services that correspond to the actual needs of road users and the transport of autonomous vehicles.

Responsible:

Magyar Közút Nonprofit Zrt.

- Tamás Attila Tomaschek, Head of Traffic Management
tomaschek.tamas@kozut.hu

ZALA ZONE COOPERATIVE TRANSPORT DEVELOPMENT REGION APG – Automotive Proving Ground Zala (ongoing: 2018-2020)

Project costs: EUR 140 000 000

Hungary pays particular attention to innovative industrial development, especially to the change of automotive technology, as well as the vehicle and infrastructure developments supported by cooperative systems, integrating autonomous transport solutions.

To support the domestic development of the interconnected and autonomous (vehicle) control systems (hereinafter referred to as the CAD) and the intelligent transport systems, the consideration of various cooperation and project opportunities and the coordinated and interoperable implementation of the developments is required.

In order to advance the above progressive aims and objectives, Hungary has created a complex development concept, which is focused on an automotive proving ground that is suitable for the testing and development of self-driving vehicles and provides various relevant, intelligent urban, national and international cooperative and automated transport testing infrastructures.

The concept was launched by the Hungarian government with exclusive financing.

The aim of the projects is not to create a simple test track, but a complex test, research, development and service environment by integrating the related modern infocommunication and data technologies.

The main elements of the concept are the following:

- Automotive Proving Ground Zala (vehicle dynamics and CAD functions, smart city test environment, service provider with R&D facilities),
- smart cities and connectivity (Zalaegerszeg),
- smart road connectivity (e.g. M76, M70, etc.),
- training, education,
- establishment of basic data structure of HD mapping, cloud system and data collection vehicle fleet,
- establishment of a Mobility Centre for the integrated storage of the data accessible for R&D purposes,
- establishment of a single legal framework,
- international cooperation.

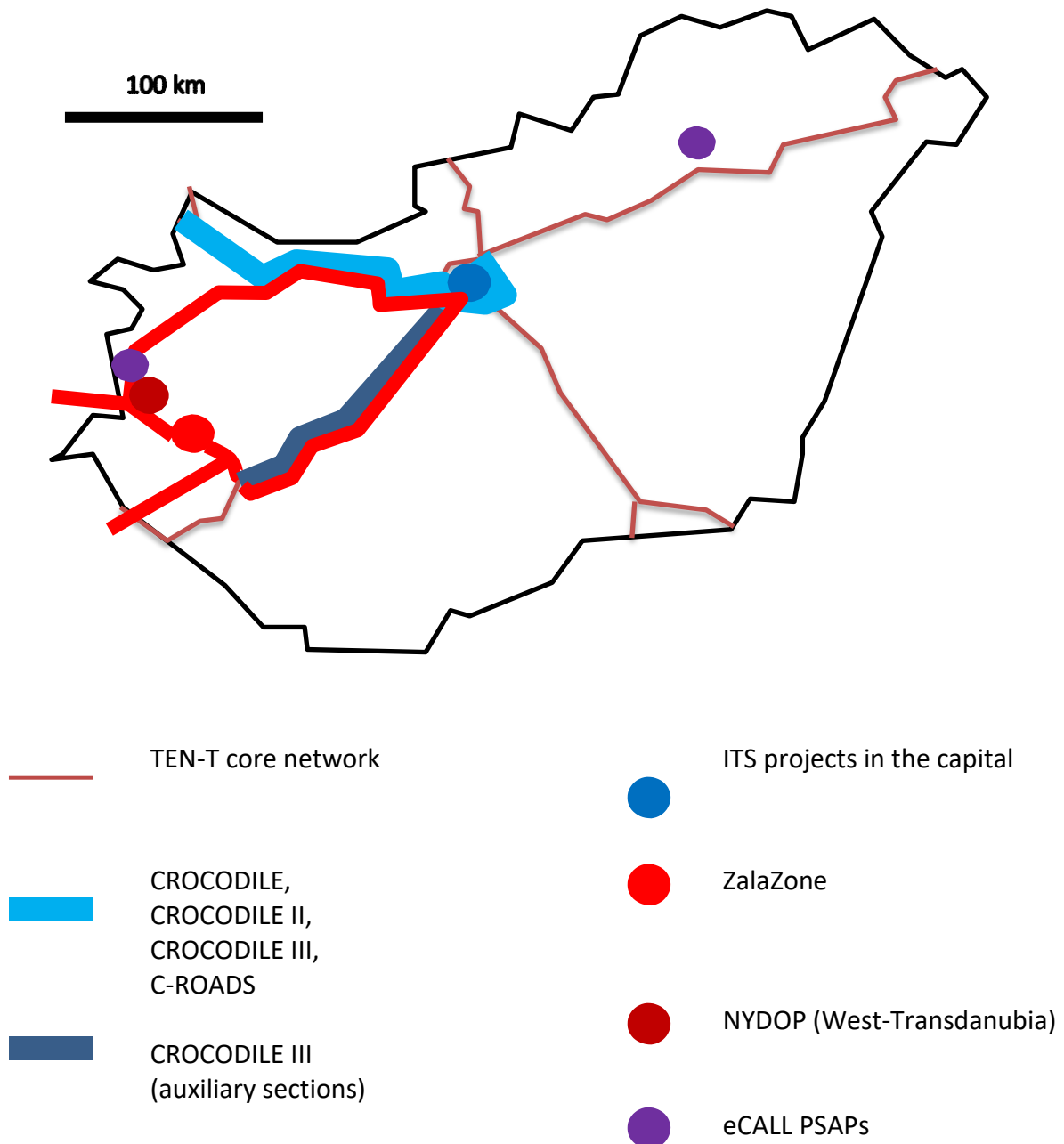
Responsible:

Automotive Proving Ground Zala,
KTI Institute for Transport Sciences

- István Füttyü, ITS, futyu.istvan@kti.hu

SUMMARY

Map chart of major ITS developments in Hungary:



Summary table of the significant ITS developments in Hungary:

PRIORITY AREA I: Optimal use of road, traffic and travel data	Costs [thEUR]
CROCODILE	
A5/3 – Implementation of internet-based transport information services (2014-2015)	100.00
A5.1/3 – Provision of transport information services through the improvement of the existing information channels (e.g. mobile site, TMC), development of mobile application (5 November 2015)	26.90
A5.3.1. – Development of the Traffic Management Plan (TMP) (20 December 2015)	46.40
A5.3.2. – Implementation of the mobile application for the existing traffic information portal of the capital, enhancement of the system functions (20 December 2015)	47.40
CROCODILE 2.0 HU	
A2.2. – Development of traffic management plan (2017-2018)	62.20
CROCODILE 3 Hungary	
A5.1 Development of mobile application 'Útinfó' (planned: 2018-2020)	30.00
ITS developments in the countryside and the capital	
NYDOP-3.2.1/B-12-2013-0008 – Development of intermodal traffic system in Körmend and its environs (2014)	119.00
ITS developments of the Transport Operational Programme (KözOP) in cities and municipalities	
ITS developments in the capital	
Improvement of publication platform of the specialised systems (2014)	42.60
Establishment of KARESZ, the road data collection system (2013-present)	1 161.00
E-JEGY – preparation and implementation of electronic ticketing system (1 September 2011 - 31 January 2019)	17 118.00
FUTÁR – Improvement and modernisation of the traffic management and passenger information system in the surface and underground public transport (2009-2014)	21 447.00
Development and implementation of P+R parking facilities in the capital (2012-2018)	5 156.00
Construction of P+R parking facilities that are connected to the points of change between different means of transport in Budapest (2014-2020)	10 781.00
Modernisation of freight traffic entry control (1 December 2012 - 31 December 2015)	386.00
TVM – Procurement, installation and operation of ticket vending machines (19 June 2013 – 31 December 2019)	11 130.00
PRIORITY AREA II: Continuity of traffic and freight management ITS services	Costs [thEUR]
CROCODILE	
A2/1 Review of the finished Traffic Management Plans, preparation of new plans with the neighbouring countries in order to manage the traffic of cross-border transport corridors and the events that occur on corridors as well as possible (16 November 2015)	36.00
A3/1 Development and extension of the existing traffic data collecting and data processing (monitoring) infrastructure, installation of automatic sensors and traffic monitoring cameras, establishment of real-time communication solutions (22 December 2015)	1 010.00
A3/2 Development of data collection and monitoring network through the installation of detectors and intelligent field termination points on the road sections in the capital covered by the TEN-T corridors (planned: 2014-2015)	600.00
A3.2.1. & A3.2.2. Extension of communication network of the traffic monitoring system and installation of traffic data collecting and monitoring devices (30 December 2015)	467.00

PRIORITY AREA II: Continuity of traffic and freight management ITS services	Costs [thEUR]
CROCODILE (part 2)	
A4/1 Development of DATEX-based information exchange platform – establishment of national DATEX II node in order to implement automated data exchange on the cross-border corridors (16 November 2015)	232.00
A4.2/1 System development, establishment of online database and system connections (7 December 2015)	306.00
A4/3 Creation the conditions of open, standard data communication and ensuring the accessibility of the data available (2014-2015)	150.00
A4.3.1. Provision of support to transport information services through the development of source systems (20 December 2015)	144.00
A4.3.2. Operational implementation of data exchange in line with the DATEX II standard with the national road operator, extension of traffic analytical functions (20 December 2015)	44.00
A5.1/1 – Provision of transport information services through the improvement of the existing information channels (e.g. mobile site, TMC), publication of online (measurement) data (7 December 2015)	145.00
CROCODILE 2.0 HU	
A2.1.1 Conclusion of agreement with neighbouring countries and other road operators. Development of traffic management plan for critical sections and regions (planned: 2018)	32.00
A3.1.1 Creation of decision support document, designation of National Body and National Access Point, development of technical and legal framework (2017-2018)	129.00
A3.2.1 Development of National Access Point (2017-2018)	418.00
A5.1.1 Data accessibility, updating of Datex hub to the latest version (2017-2018)	249.00
A3.3. Preparation and implementation of connection to the National Access Point (2017-2018)	60.00
A3.4. Implementation of the database of road demolitions and the related dynamic system (2017-2018)	77.00
A4.1.1 Installation of automated, online sensors, traffic monitoring and automated incident detection cameras and web cameras (planned: 2018)	432.00
A4.3. Installation of field traffic management, monitoring and road information devices (2017-2018)	896.00
A4.4. Development of communication network (2017-2018)	1 290.00
A4.5. Development of traffic control and management central functions (2017-2018)	239.00
A4.6. Development of a dynamic parking management system (2017-2018)	100.00
A6.1.1 - Development of traffic management devices, installation of VMS (planned: 2017-2018)	226.00
A6.2. Development of traffic information services (2017-2018)	119.00
CROCODILE 3 Hungary	Costs [thEUR]
A4.1 Extension of C-ITS infrastructure (planned: 2018-2020)	630.00
A3.1 Development of National Access Point (planned: 2018-2020)	130.00
Mobile payment	
National Mobile Payment Systems (15 October 2012 - ongoing)	2 580.00
Road Traffic Management Development Programme for 2014 - 2017	
Development of real-time travelling time monitoring system and dynamic parking management system (financed by the Municipality of Budapest) (31 December 2017)	1 097.00

PRIORITY AREA II: Continuity of traffic and freight management ITS services	Costs [thEUR]
NIF - Development of service communications systems	
Projects related to the development of the service communications system on Highway M0, Motorways M3 and M43 and Express Roads M85 and M86 (2009-2015)	22 700.00
OTHER traffic management projects in the capital	
Planned and scheduled development programme of road traffic management in the capital (2014-ongoing)	1 180.00
Extension of the network of traffic monitoring cameras (2014)	113.00
Electronic control system of carriage of goods by road (2015)	37 740.00
National support network for axle weight and related controls (2016-2018)	91 290.00
Preparation of the improvement of PIR (Parking Management System) – study (2014)	16.00
PRIORITY AREA III: Road safety and security applications of ITS	Costs [thEUR]
General road safety developments	
Road safety investments without building permit procedure on Hungary's express road network /KÖZOP-1.5-0-09-11-2011-0010 (2011-2015)	3 780.00
Developments to improve road safety on the national road network /KÖZOP-3.5.0-09-11-2011-016 (2011-2015) ITS subproject	4 258.00
CROCODILE	
A5/2 Extension of M1 parking management system (including data exchange regarding the parking places available in the neighbouring countries) (31 December 2015)	985.00
CROCODILE 2.0 HU	
A4.2.1 Extension of the intelligent truck parking system (planned: 2018)	1 095.00
The harmonised provision for an interoperable EU-wide e-Call	
Introduction of a single emergency number (112), development of the basic infrastructure of the harmonised e-Call system (2010 - 19 May 2014)	8 348.00
Automatic emergency call system (e-Call) (2013-2014)	26.00
PRIORITY AREA IV: Linking the vehicles with the transport infrastructure	Costs [thEUR]
CROCODILE	
A4.2/1 System development, establishment of online database and system connections (7 December 2015)	40 550.00
A4.2/3 Installation of a cooperative pilot system, installation of ETSI G5 WLAN equipment on the vehicles that carry out traffic diversion as well as along the road on Motorway M1 (5 November 2015)	223.00
CROCODILE 2.0 HU	
A6.1.1 Development of traffic management devices, extension of cooperative (C-ITS) system	129.00
CROCODILE 3 Hungary	
A5.2 Extension of C-ITS infrastructure (planned: 2018-2020)	0.13
C-ROADS Hungary	
A2 C-Roads Hungary pilot (planned: 2018-2019)	1 900.00
FRAME-NEXT (ongoing: 2017-2020)	90.00
Zala Zone cooperative transport development region	
APG – Automotive Proving Ground Zala (ongoing: 2018-2020)	140 000.00
GRAND TOTAL	433 914.63