INTELLIGENT TRANSPORT SYSTEMS (ITS) APPLICATIONS

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Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS)

Incheon, Republic of Korea, 2-4 April 2019
INTELLIGENT TRANSPORT SYSTEMS

• History
• Existing Applications
• Policy, Plan and Legislation
• Deployment of ITS
ITS DEVELOPMENT IN TURKEY

- DSRC NON-STOP TOLLING SYSTEM (OGS) ON MOTORWAYS
- D-100 HIGHWAYS BOLU MOUNTAIN PASS INFORMATION SYSTEM
  - Variable Message Signs
  - Meteorological Information Systems
  - Cameras
  - Traffic Counting & Classification Systems
- CONTACTLESS CARD PAYMENT SYSTEMS (KGS) ON MOTORWAYS

ISTANBUL STRAIGHT BRIDGE TOLL COLLECTION SYSTEM

1973

MOTORWAYS TOLL COLLECTION SYSTEMS

1992

BOLU MOUNTAIN TUNNEL SYSTEMS
- Illumination
- Ventilation
- CCTV Camera
- Traffic Control
- Licence Plate Recognition
- Emergency Call
- Fire Alert & Extinguishing
- Weather Condition
- Tunnel Radio
- CO and dust particles sensors
- SCADA Control Center

1999

ITS WORKSHOP

2005

2007

2012

2014

2016

• NATIONAL ITS STRATEGY (2014-2023) & ACTION PLAN (2014-2016)
• HIGHWAYS INTELLIGENT TRANSPORT SYSTEMS CONGRESS

• BOT MOTORWAYS - ITS APPLICATIONS
• FOUNDATION OF ITS - TURKEY
EXISTING APPLICATIONS OF INTELLIGENT TRANSPORT SYSTEMS

- Major services in operation:
  - Traffic Management Systems
  - Traveller Information Systems
  - Public Transport Management Systems
  - Electronic Toll Collection Systems
  - Tunnel Control Systems
TRAFFIC MANAGEMENT SYSTEMS

- Control Center
- Signalization
- Camera
- Meteorological Sensors
- Roadside Inspection Station
- Traffic Counting
- Parking
- Enforcement
TRAVELLER INFORMATION SYSTEM

- Variable Message Sign
- Variable Traffic Sign
- WEB Based Information
- Mobile Applications
- Traffic Density Map
- Travel Time
- Radio Broadcasting
- Call Center
PUBLIC TRANSPORT MANAGEMENT SYSTEMS

- Intelligent Bus
- Bus Management System
- Payment System
- Intelligent Stop
- Mobile Application
**ELECTRONIC TOLL COLLECTION SYSTEMS**

**OGS (DSRC Active Tag)**
- 1.979.370 Subscribers
- Payment %29

**HGS (RFID Passive Tag)**
- 12.415.894 Subscribers
- Payment %71

**TOTAL**
- 14.395.264 Subscribers
- The collected revenue:
  - 450 Million US Dollars
- Vehicles:
  - 463 Million
MULTI LANE FREE FLOW (MLFF) TOLL COLLECTION

- Transforming classical toll stations into MLFF toll stations since 2014
- Number of toll stations: 99
- Number of MLFF toll stations: 9
- Removing toll booths
- No lane choosing
- Improvement in traffic flow
TUNNEL CONTROL SYSTEMS

In Tunnels;

➢ SCADA Control Centre
➢ Fire Detection & Extinguishing
➢ Dust & Particle Detection
➢ Ventilation
➢ Traffic Control
➢ CCTV Monitoring
➢ Emergency Call
➢ Incident Detection
➢ Others
# DESIGN CRITERIA FOR TUNNEL SAFETY

<table>
<thead>
<tr>
<th></th>
<th>Traffic ≤ 2 000 veh per lane</th>
<th>Traffic &gt; 2 000 vehicles per lane</th>
<th>Additional conditions for implementation to be mandatory, or comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500-1 000 m</td>
<td>&gt;1 000 m</td>
<td>500-1 000 m</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>§2.8.1</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Normal lighting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Safety lighting</strong></td>
<td>§2.8.2</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>Evacuation lighting</strong></td>
<td>§2.8.3</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>Ventilation</strong></td>
<td>§2.9</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Special provisions for (semi-) transverse ventilation</td>
<td>§2.9.5</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>Emergency stations</strong></td>
<td>§2.10</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>At least every 150 m</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Water supply</strong></td>
<td>§2.11</td>
<td>●</td>
<td>●</td>
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<tr>
<td>At least every 250 m</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Road signs</strong></td>
<td>§2.12</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>Control centre</strong></td>
<td>§2.13</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>Monitoring systems</strong></td>
<td>§2.14</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Video</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic incident detection and/or fire detection</td>
<td>§2.14.5</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>Equipment to close the tunnel</strong></td>
<td>§2.15.1</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Traffic signals before the entrances</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic signals inside the tunnel at least every 1 000 m</td>
<td>§2.15.2</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
The 10th Development Plan proposes that ITS be deployed for the future.

- **Policy for Logistic and Transportation;**
  The utilization of Traffic Electronic Control Systems will be generalized.

- **Policy for Information and Communication Technologies;**
  The utilization of smart systems shall be generalized in the fields of transport.

The transformation of cities into smart cities shall be supported.

- **Policy for Urban Infrastructure;**
  Intelligent Transport Systems shall be utilized efficiently for traffic management and public transport services in urban transport.
This strategy paper prescribes the establishment of Main Traffic Management System Center and traffic management systems.

The goals and proposals including Intelligent Transport Systems components;

- The studies shall be carried out to establish dynamic passenger, driver and pedestrian information systems on urban transport network in the metropolitan cities.

- The formation and generalization of intelligent transport standards should be obligatory and integration between different modes of transport shall be provided by increasing their efficiency and effectiveness.

- The use of Electronic Control Systems shall be generalized throughout the country.

- All transport systems shall be digitalized and integrated.
Integrated Urban Development Strategy and Action Plan 2010-2023 covers the following action for the use of information technologies in urban transport systems.

- Action: 5. 5.4: “the regulations shall be made for the efficient use of information technologies in urban transport”.

“In the cities, it is required to establish “Transport Control Centers”, to monitor real time mobility by Global Positioning System receivers and to notify by communication Technologies (internet, GSM etc.)”. This action, which is under the responsibility of the municipalities, is intended on the action capacity development and institutional structuring, and valid for the period 2010-2023.”
The Forum was realized with the theme of “Transportation and rapid access for everybody” in 2013. Vision and targets in highways sector up to 2035 were determined in final report of the abovementioned forum.

- In this content establishment of intelligent highways on state highways and motorways that vehicles communicate with Intelligent Transport Systems and other vehicle was proposed in the Final Declaration of 11th Transportation, Maritime Affairs and Communication Forum.
The National Intelligent Transport Systems Strategy was issued by the Ministry of Transport, Maritime Affairs and Communications in 2014.

The objective of this paper is “to establish an integrated, safe, efficient, effective, innovative and sustainable intelligent transport system which is respectful of human and the environment by properly using information and communications systems in all transport modes.

38 actions;
- Setting up traffic control centers
- Establishment fiber optic cable
- Forming ITS Architecture
- Standardization
- Intelligent bus stops
- Foundation ITS Turkey
- ...
The Strategic Plan of General Directorate of Highways 2017-2021 also sets out strategy in connection with ITS. In the Strategy Paper, the vision of General Directorate of Highways is “Roads which are safe, sensitive to the environment, comfortable and making timely travel possible”.

- One of the objectives of the 2nd strategic goal is to “Generalize the Intelligent Transport Systems on highways”. In this scope, it is required to establish signalization systems, variable message systems, and meteorological information stations on state and provincial roads, construction of buildings of ITS centers.
STRATEGY PAPERS OF MUNICIPALITIES

- Strategy Papers of Metropolitan Municipalities might cover strategies and actions related with ITS. Some examples;

  - Strategic Plan of Istanbul Metropolitan Municipality for 2015-2019 includes the objective of “Generalization of Intelligent Transport Systems on Public Transportation Vehicles”.

  - Strategic Plan of Izmir Metropolitan Municipality for 2010-2017 prescribes the improvement of signalization system in order to provide safe and moving traffic.

  - Adana Metropolitan Municipality Strategic Plan for 2015-2019 covers the target of establishment electronic traffic control systems, signalization systems, intelligent intersections and intelligent stops in order to improve traffic safety, reduce traffic density and achieve safe and comfortable transport services in the province of Adana.

  - Balikesir Metropolitan Municipality Strategic Plan for 2015-2019 adopted the generalization and improvement of electronic ticket system and development of signalization project.
The regulation gives details on the duties, authorities and responsibilities of the Departments of General Directorate of Highways.

- In this regulation, it is specified that General Directorate Highways has the authority to install the elements of Intelligent Transport Systems. In this context, the duties for “the establishment and control of Intelligent Transport Systems such as traffic management and driver information systems for the realization of safe, efficient and rapid traffic management”, “the establishment of management information system for tunnels and large structures” and “realization or procurement of road pricing, toll collection and the related operations of the toll roads” are assigned to the related Departments.
Turkey is a candidate country to European Union and obliged to adopt European Union Legislation.


GENERALIZATION OF INTELLIGENT TRANSPORT SYSTEMS

- Enlargement of ITS in state roads and forming integrated and interoperable system;
  - Technical documentation
  - Establishment ITS management centers
  - Establishment Fiber Optic Communication infrastructure
  - Installation the required systems
  - Implementation a pilot scheme before widespread deployment
64 documents in total; Technical Specifications, Draft ITS Architecture and Application Plan, Country Reports, Technical Reports
ESTABLISHMENT OF INTELLIGENT TRANSPORT SYSTEMS CENTRES

18 centers in total; 17 ITS Centers for Highways Divisions and a Main ITS Center at Headquarter.
COMMUNICATION INFRASTRUCTURE

- Establishment fiber optic cable along highways
- ITS and other institutional communication requirements
- An Internal Circular issued in 2017 for fiber optic cable deployment.
- Fiber optic cable installation completed in pilot region
CONCLUSION

- Defining new actions for the subsequent period of actions in the National ITS Strategy

- Increasing interest to cooperative systems

- Participation in C-ROADS project of European Union

- Foundation of the Technical Subcommittee for Autonomous Vehicle
Thank you...
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