22nd Meeting of the COMCEC TCWG

Developing Intelligent Transportation Systems in OIC Member Countries

Türkiye Case Study

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Content

1 Introduction

Introduction

Intelligent Transportation Systems - ITS are encapsulation of:

- **monitoring**,
- **measurement**,
- **analysis,**
- **control systems,**

which depend on **multi-directional data exchange** in the frame of **user-vehicle-infrastructure-center**.

ITS :

- Reducing travel time
- Increasing traffic safety
- Optimum use of existing road capacities
- Increasing mobility
- Contributing to the economy by ensuring the energy efficieny and reducing the environmental impacts of transportation sector.

Introduction

INTELLIGENT VEHICLES

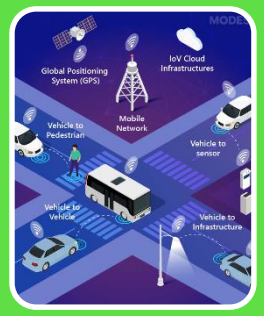
- Navigation Systems
- Driver Support Systems
- Automated Parking Systems
- Autonomous Vehicles

ECONOMY AND ENVIRONMENT

- Intelligent Energy Systems
- Electric Vehicles
- Environment Friendly Transportation Infrastructures
- Economical Benefits of ITS
- Human Factor

INTELLIGENT ROADS

- Intelligent Intersections
- Traffic Management ITS equipments
- Cameras
- Sensory Systems



INTEGRATION SYSTEMS

- Integration of All Transportation Modes
- Transportation Control Centres
- Cooperative ITS Structure
- Single Fee Payment System for All Mobility

SMART CITIES

- Emergency Management
- Public Transportation
- Fleet Management
- Smart Parking Systems
- Transportation Safety

IT AND SECURITY

- Big Data
- Data Security and Open Data
- Cybersecurity
- Communication Systems

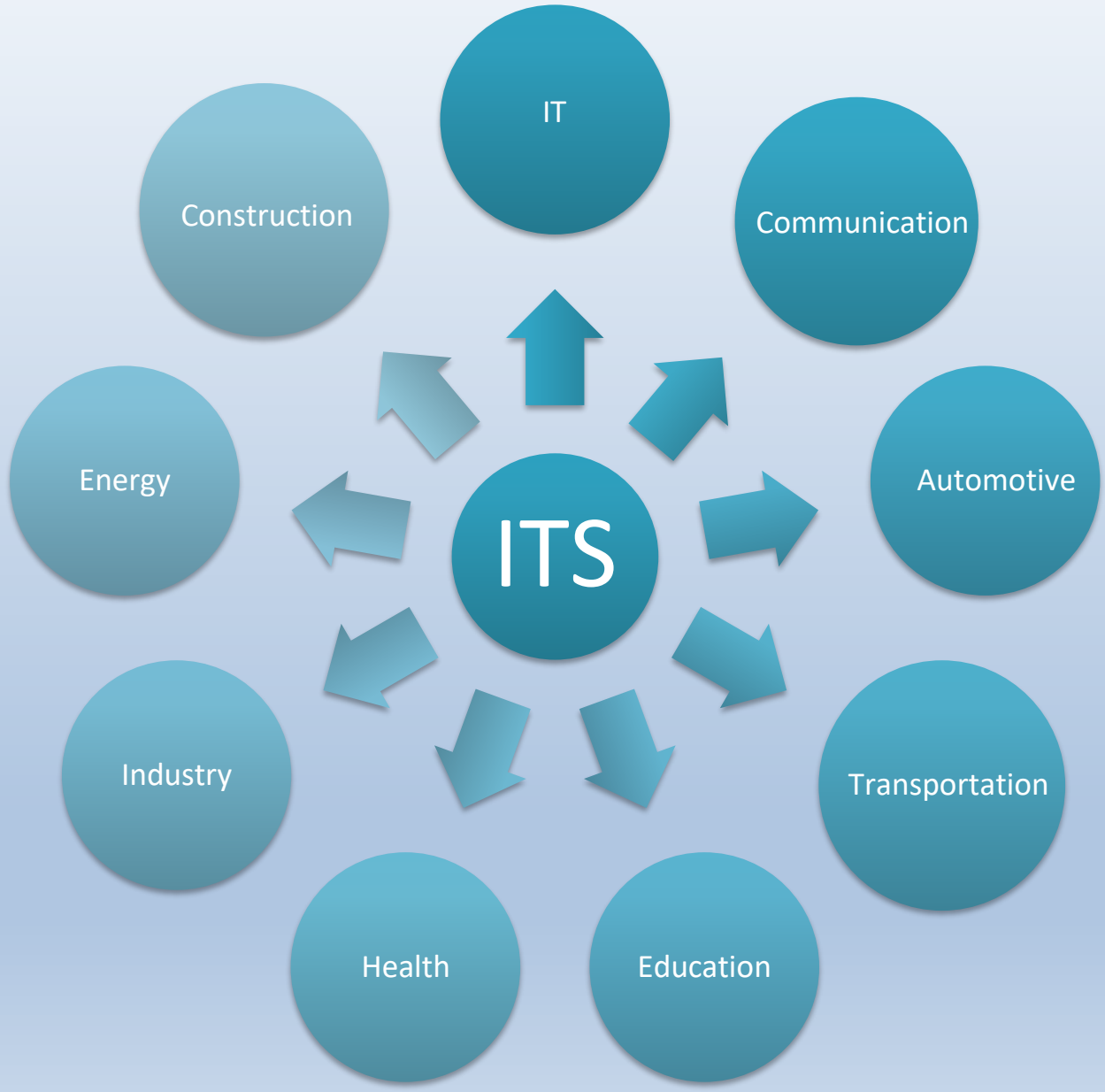
Introduction

- ITS are in integration with many **different disciplines and sectors**.

- The most prominent relationship that ITS have are

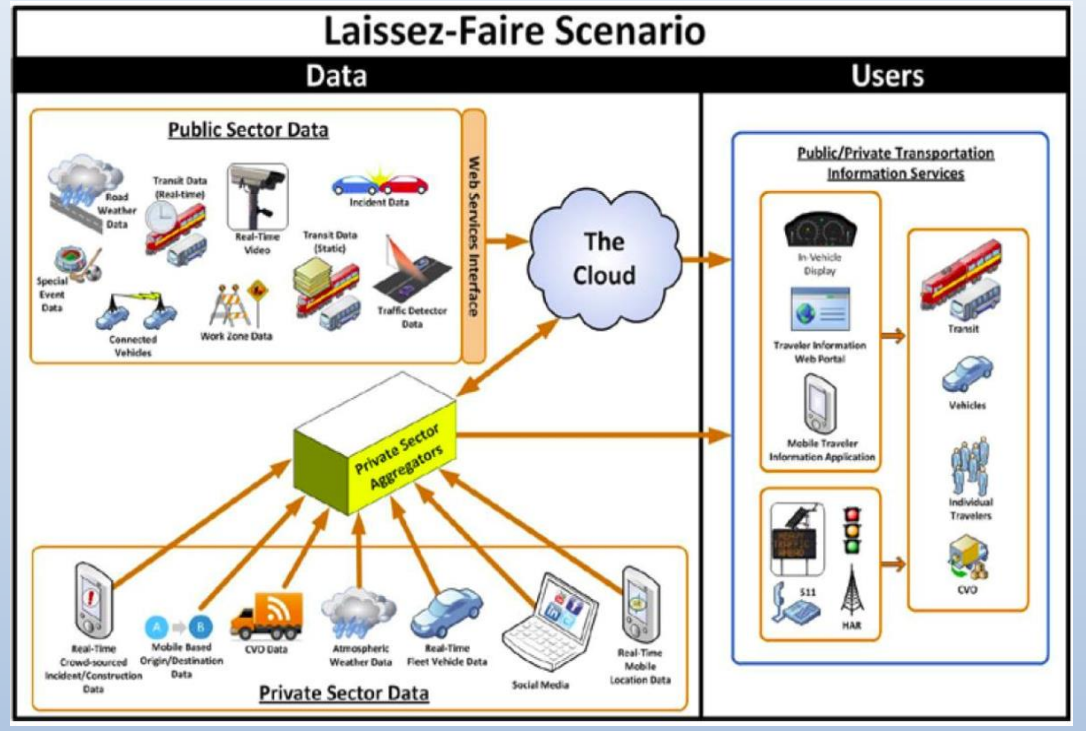
✓ **Transportation sector**

✓ **Information Technologies** (IT) sector.



Categorization of ITS

- The most fundamental categorization of ITS are made in level of **urban traffic** and **intercity traffic**.
- ITS can be categorized in **4 subsections** when perspective of transportation management is taken into consideration. These subsections are:
  - **ATIS:** Advanced Traveller Information Systems
  - **ATMS:** Advanced Traffic Management Systems
  - **APTS**: Advanced Public Transportation Systems
  - **EMS**: Emergency Management Systems



Iqbal (2018)

2 Development of Intelligent Transportation Systems in the World and Türkiye

Historical Development of ITS in the World

1960s

- Magnetic Loop Sensors
- Red Light Violation Systems
- Variable Message Signs (VMS)
- Speed Limit Signs
- Electronic Route Guidance Systems – in USA

1970s

- Speed Detection Radars
- Comprehensive Automobile Traffic Control System
- Telematics
- Automated Plate Recognition Systems

1980s

- Mobile Speed Detection and Traffic Cameras
- SCATS (Sydney Coordinated Adaptive Traffic System – in Germany and Australia)
- Road and Weather Information Systems
- Automated Navigation Systems
- Electronic Cruise Control Systems

1990s

- Electronic Toll Collection Systems (ECTS)
- GPS Based Navigation Systems
- Dynamic Signalization Systems
- World ITS Conference
- ERTICO ITS Europe
- LED Signalization Systems

2000s

- Digital Red Light Camera Systems
- Blind Spot Information Systems
- Mobile Traffic Information Systems
- IEEE 802 11P in Vehicle WiFi Systems
- Lane Violation Warning Systems
- E-Call Emergency Systems
- Web 2.0

2010s

- Autonomous Vehicles
- Connected Roads and Infrastructure
- Transportation Economics

Historical Development of ITS in Türkiye

1985-1995	• Traffic Management Systems (TMS) • Automated Tolling Systems
1995-2005	• Electronic Payment Systems • Traffic Control Centres • Variable Message Signs (VMS)
2005-2019	• Enforcement Systems • Adaptive Junction Control Systems • Automatic Vehicle Counting • Passenger Information Systems • National ITS Strategy Document and Action Plan (2014-2016) • E-Call Emergency Management Systems • Freight and Fleet Management • Electric Vehicle Technologies (after 2010)
2020-2023	• National ITS Strategy Document and Action Plan (2020-2023) • Connective Cooperative Autonomous Mobility (CCAM) • Mobility as a Service (MaaS) • Legislation, technological developments and financial reports for electromobility

3 Intelligent Transportation Systems Applications in Türkiye

Scenery of Transportation Sector in Türkiye

- Türkiye's significant growth for a century

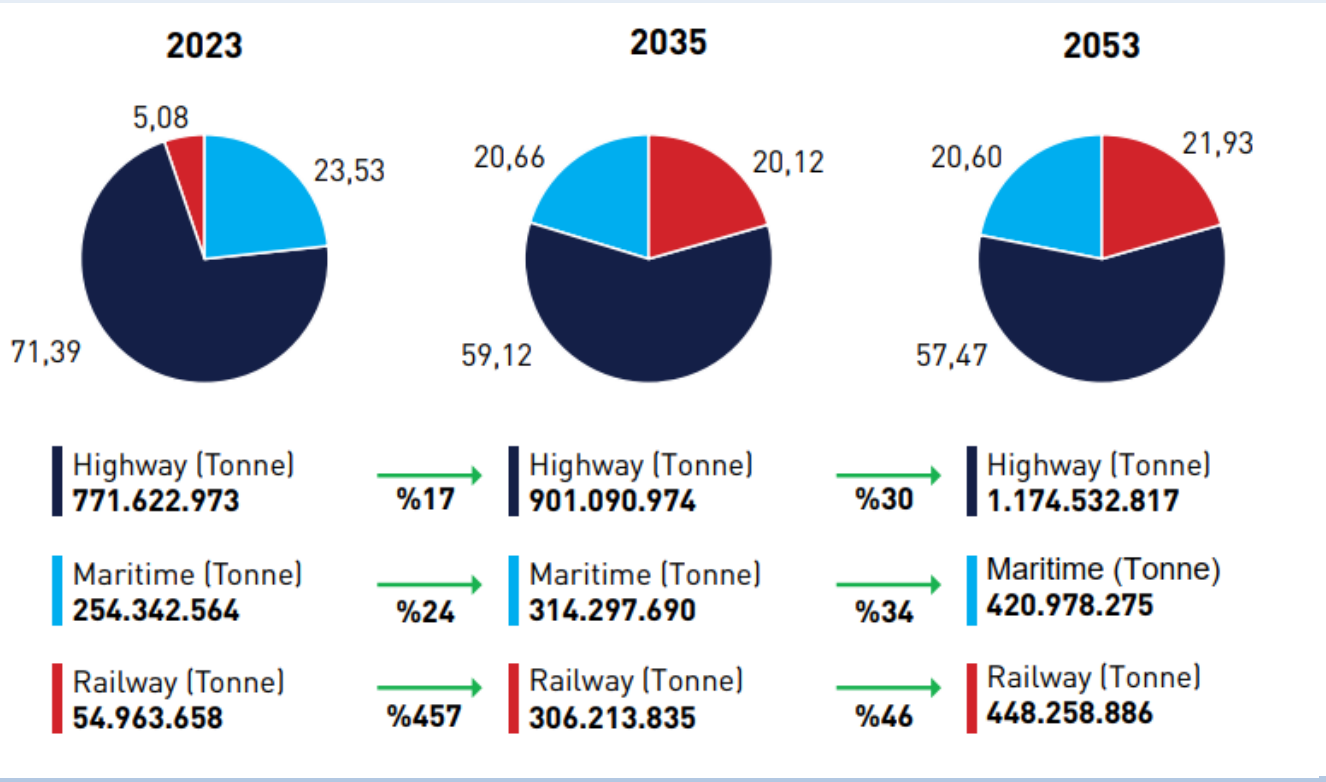
- population from **13.5 Million** to **85.3 Million,** when looked at economic growth the GNP have grown from **$7.5 Billion** in 1960 to **$907.5 Billion** in 2022.

- In the same period, **highway network** expanded from **18,300 km** to **70,000 km**,
  ports and piers increased to **180**
  airports to **62**, especially in last two decades

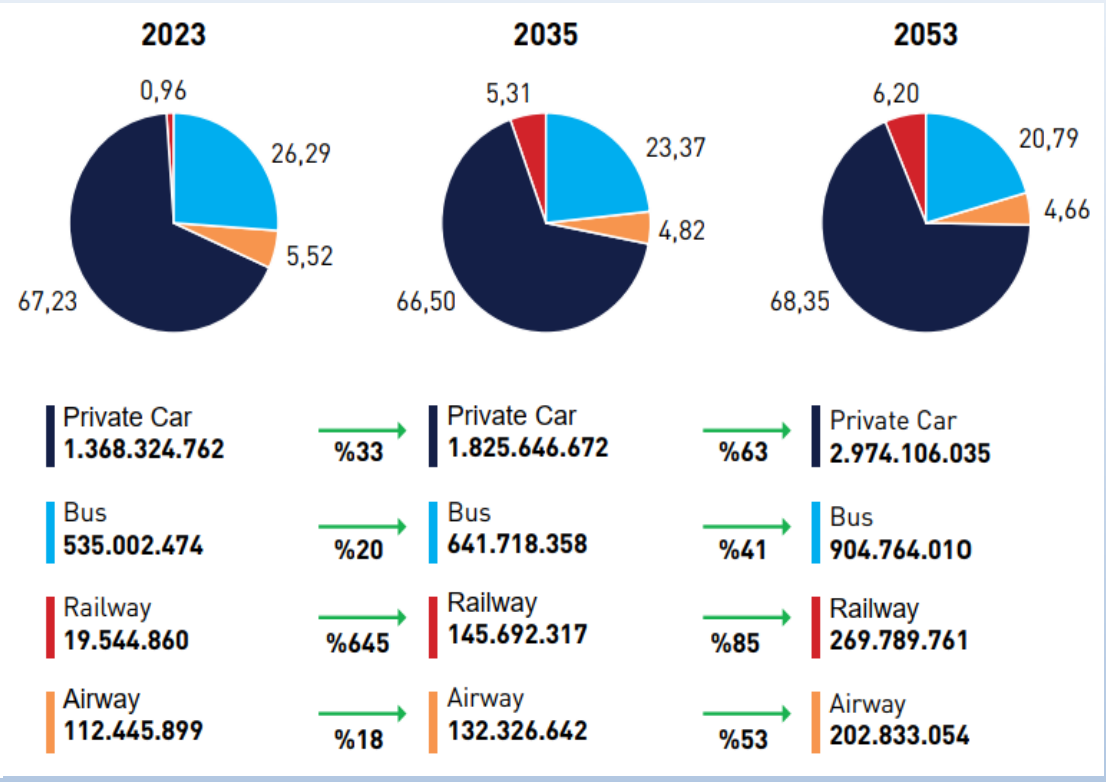
- Mobility in **airline transportation,** grown **6 times**
  in **railway transportation,** grown **4 times** and
  passenger-km numbers grown **2 times** in **road transportation**

- In the same period **licensed motorized vehicles,** grown from **$8*10^6$** to **$28*10^6$**.

Scenery of Transportation Sector in Türkiye



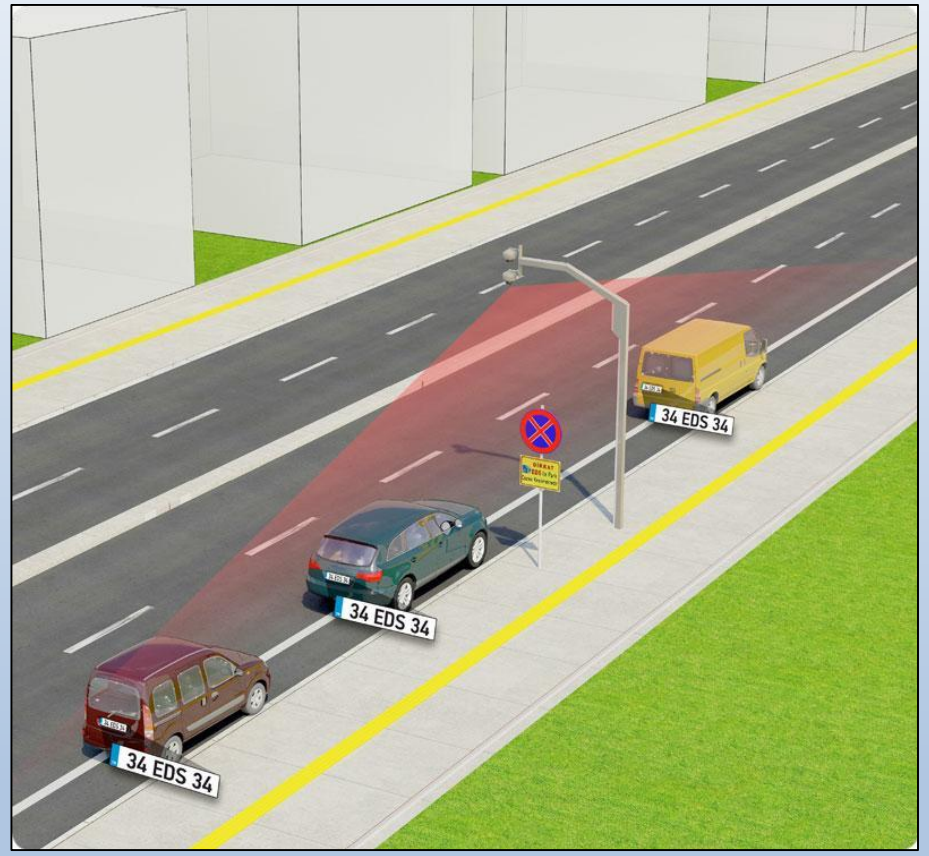
Expected Modal Share in Freight Transport



Expected Modal Share in Passenger Transport

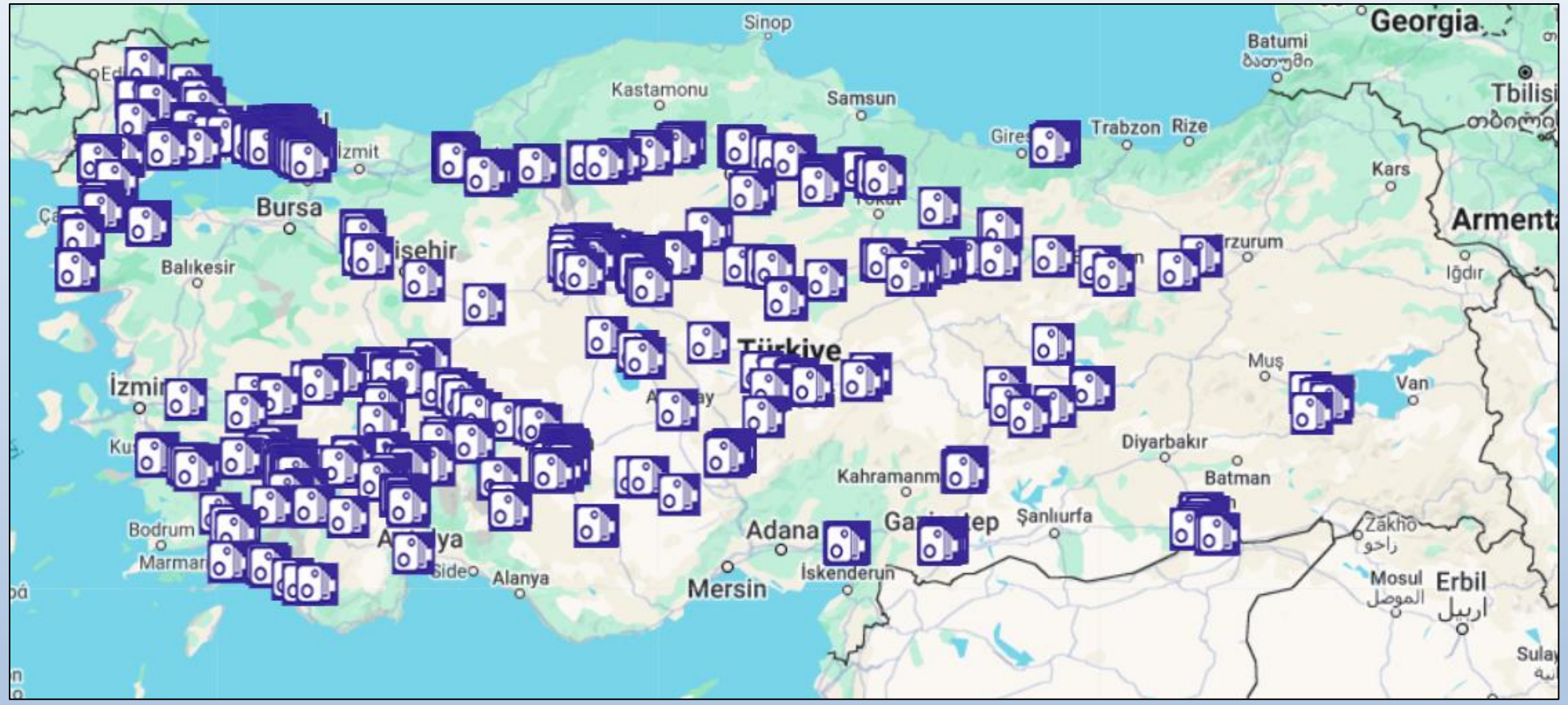
ITS in Türkiye – Advanced Traffic Management Systems (ATMS)

- **City Security Management System (KGYS),** monitoring system established by General Directorate of Security (GDS)
- **Electronic Detection Systems (EDS),** essential contributor of ensuring traffic safety in urban areas implemented to urban roads
- **EDS,** detecting average speed, red light, emergency lane parking, pedestrian crossing, offset scanning, yellow box, wrong way, tram line, wrong turn, instant speed and gabarite violations through **image processing and sensors**
- All enforcement systems under EDS, operating on the same application via **cloud technology**.
- With EDS traffic violations are **registered and reported.**



Parking Violation Detection via EDS (İSBAK)

ITS in Türkiye – Advanced Traffic Management Systems (ATMS)



Points of deployed EDS in Türkiye (General Directorate of Security, accessed in 2024)

ITS in Türkiye – Advanced Traffic Management Systems (ATMS)

In highways which are in the road network of **General Directorate of Highway (GDH)**

- **Radars and laser based violation systems**
- **Laser based speed measurement devices**
- **Magnetic loops**
- **Air pressure tubes**
- **Variable Message Signs (VMS)**

are in use for traffic measurement studies and violation detections

ITS in Türkiye – Electronic Toll Collection Systems (ETCS)

- Highways under road network of **GDH, Strait Bridges of İstanbul and Çanakkale and Osmangazi Bridge**
  subjected to **electronic toll collection (ETCS)**

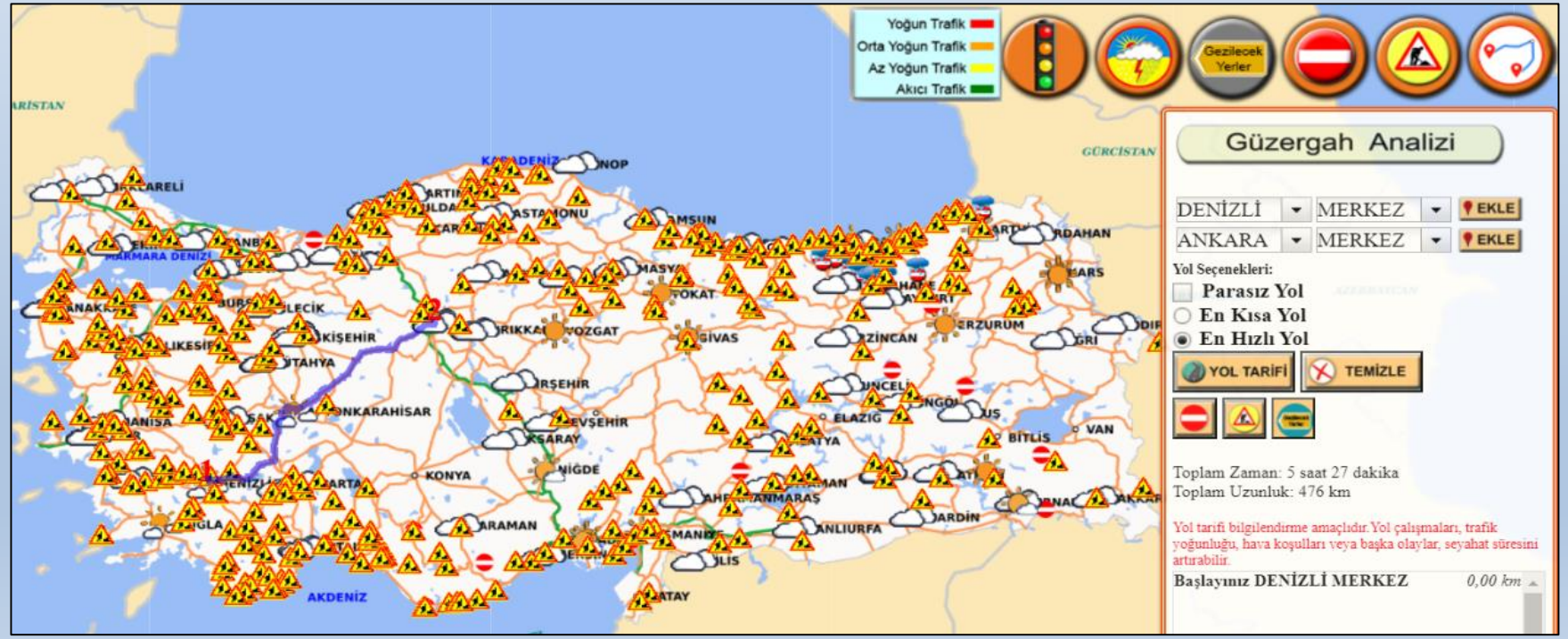
- Electronic toll collection, utilized by **Fast Pass System (HGS),** working through **RFID systems**.

- ETCS have collateral usages as such as **journey time estimation**, **vehicle classification** and **traffic count.**

ETCS gate in Osmangazi Bridge

ITS in Türkiye – Advanced Traveller Information Systems (ATIS)

- Travel information, provided by authorities via **Variable Message Signs (VMS), web sites** and **mobile applications**.
- **General Directorate of Highway (GDH),** providing information of road conditions, closed roads, route analysis services and traffic conditions via its website and mobile application.
- Traveller information, provided by **159 Call Line of GDH** and **announcement broadcasting via FM Radio transmitters**.



Route Analysis Application GDH (GDH, accessed in 2024)

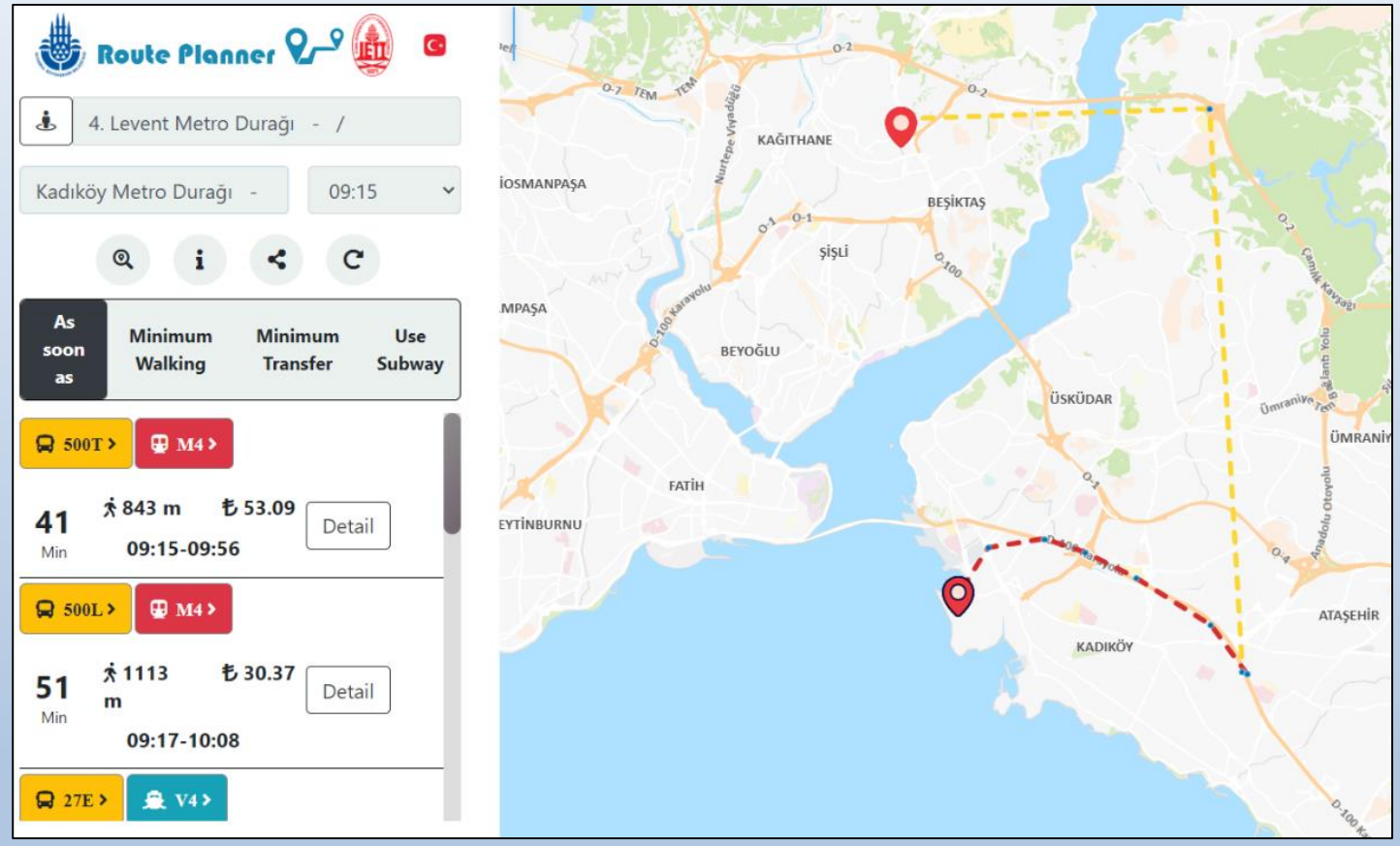
ITS in Türkiye - Advanced Public Transportation Systems (APTS)

- Metropolitan Municipalities in Türkiye **provide passenger information** for public transportation users via **mobile applications.**

Information including;

- route analysis
- service, delays
- arrival times
- intermodal route planning service
- locations of transit vehicles
- bus stop information

is provided for public transport users.



Route Planner of IETT (IETT, accessed in 2024)

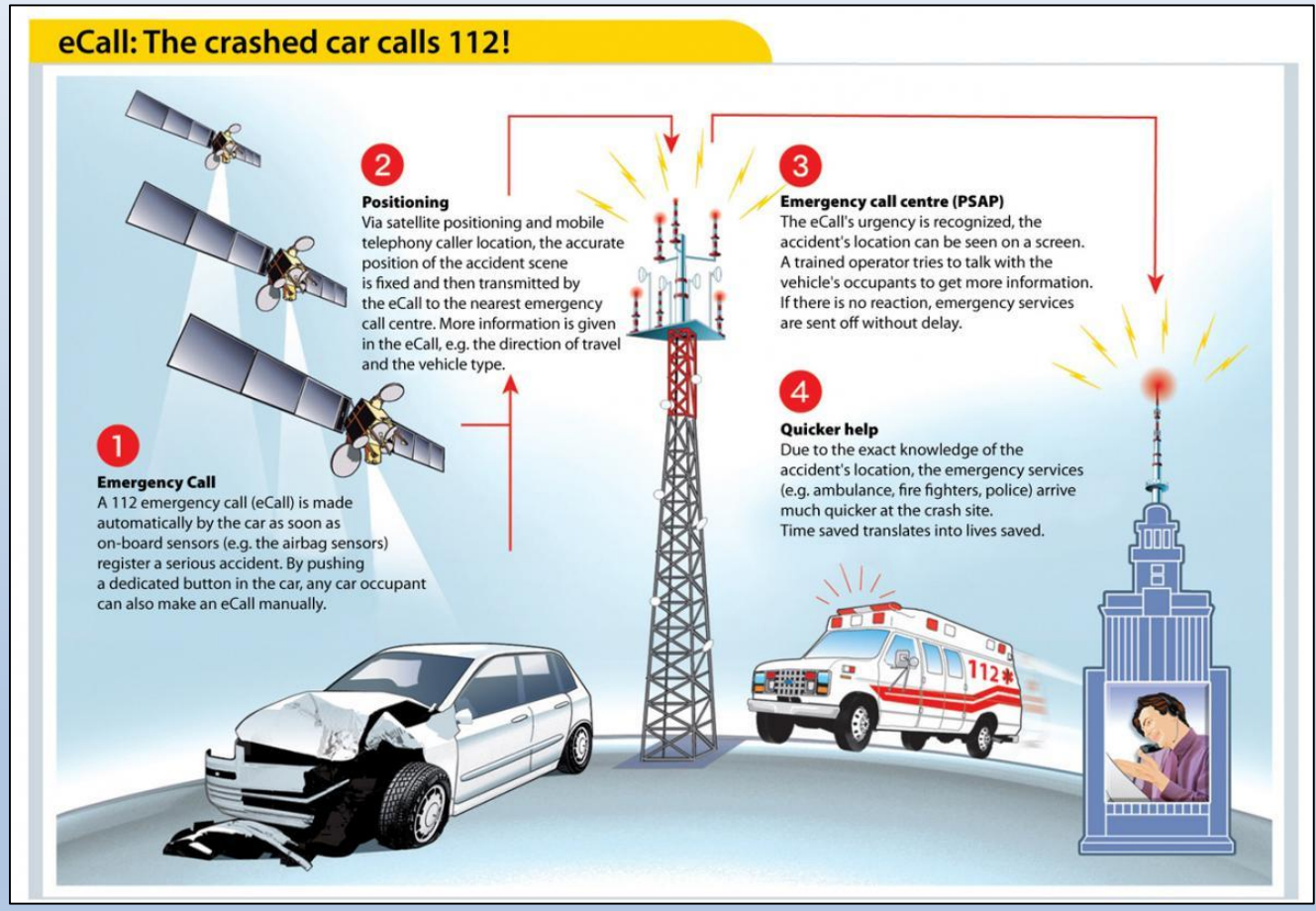
ITS in Türkiye – Emergency Management Systems (EMS)

- Türkiye

studies on singlifying **the emergency call number as "112"** starting from 2003 under embodiment of **MATRA projects** with collaboration of Ministry of Internal Affairs (MIA) of Türkiye and Government of Netherlands.

As of 2020 in **81 provinces, singlified to 112.**

As of 2015, Türkiye have been a part of the second phase of the **project HeERO**, aiming to develop an integrated and built in **in-vehicle emergency call system**.



HeERO E-Call System

ITS in Türkiye – Tunnel Traffic Management Systems (TTMS)

- In **Tunnel Management Centres of Istanbul IT and Smart City Technologies Inc. (ISBAK)**
  - traffic flow,
  - speed,
  - journey time,
  - traffic density,
  - queue length,
  - headways, are measured.

Tunnel Management Centre in Avrasya Tunnel

- **Alarm conditions** appear in detection of:
  - non-moving vehicles,
  - traffic congestion,
  - passengers in the tunnel,
  - queue length exceeding maximum level,
  - vehicles commuting over and under speed limits,
  - vehicles commuting in wrong way,
  - rubble in the road due to incidents.

ITS in Türkiye - Bridge Traffic Management Systems (BTMS)

- Many of the business centers in İstanbul are located in European side, therefore in morning peak hours and evening peak hours direction of dominant flow changes.
- In Istanbul Strait Bridges, **tidal flow application** to manage the oncoming traffic flow more efficiently in peak hours
- In order to ensure the quality of traffic management in morning peak hours, an **additional lane** by alignation of traffic safety cones to the Asia-Europe direction of the bridges
- In evening peak hours same application is done to the Europe-Asia direction.

Tidal Flow Application in Bosphorus Bridge

ITS in Türkiye - Commercial Vehicle Operation (CVO)

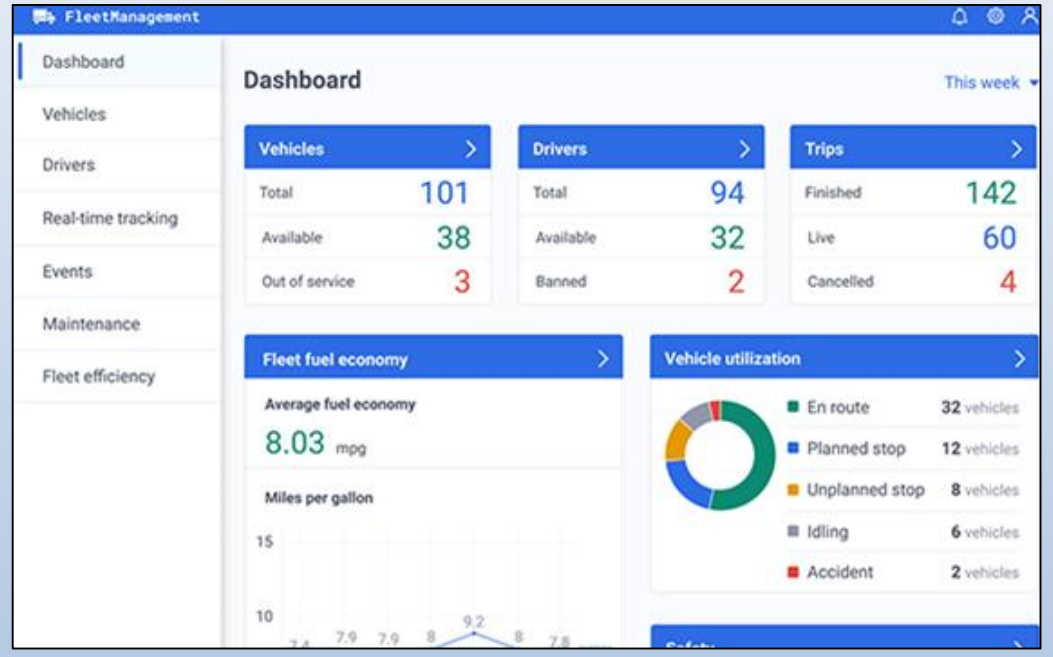
- In Türkiye, GSM operators' active involvement in **fleet management systems** by their **Machine-to-Machine (M2M)** studies integrated into their special sim-cards

- Through its fleet management centre software, ISBAK provides fleet management data with **ISMOBIL mobile application**.

- This system provides

vehicle **grouping**, **real time vehicle tracking** and have **sensors** detecting **emergency situations** such as unauthorized interventions and power outages.

- Vehicle location, speed and other data are communicated to centre via **VTA900 vehicle tracking device**.



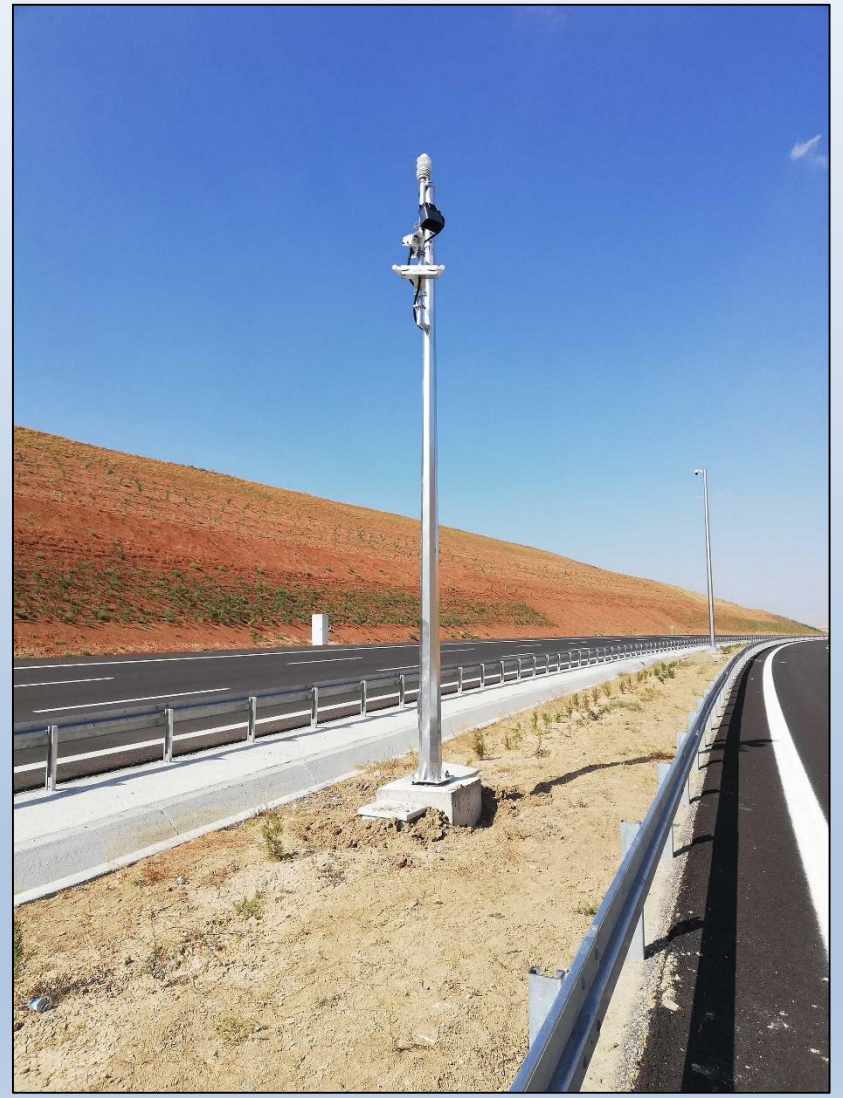
User Interface of Fleet Management Software (ScienceSoft)

ITS in Türkiye - Weather Information Systems (WIS)

- **Weather Information Systems'** transmitting data about road conditions, rain, snow, icing, humidity etc. to road users

via **road surface temperature sensors, event detection sensors and cameras**

- Deployment of these systems at common spots where accidents occur, entrance and exits of tunnels and spots or where extreme weather conditions are expected throughout the year



Meteorology Station in Ankara-Niğde Motorway

ITS Project Implementations In Türkiye

Intelligent Transportation System applications in **highways** in Türkiye in 4 systems as in,

- **TMS:** Traffic Management Systems
- **TIS:** Traveller Information Systems
- **ETCS:** Electronic Toll Collection Systems
- **TCS:** Tunnel Control Systems

Transportation Management Center of İstanbul Metropolitan Municipality (IMM)

ITS Implementations in Highways

- **Northern Marmara Motorway** is a high standard, 462 km long highway with 8 lanes (4+4)

connecting Asian and European continents.

VMS in Northern Marmara Motorway Tunnel

Northern Marmara Highway,
equipped with various systems such as:

- Variable Message Signs (VMS),
- Variable Traffic Signs (VTS),
- CCTV cameras,
- Meteorology Stations,
- Traffic Count Sensors,
- Fog Warning Systems (FWS)
- Optic Gabarite System

94 VMS signs, 2026 CCTV cameras, 171 VTS signs and with other systems

3589 ITS equipments throughout the highway

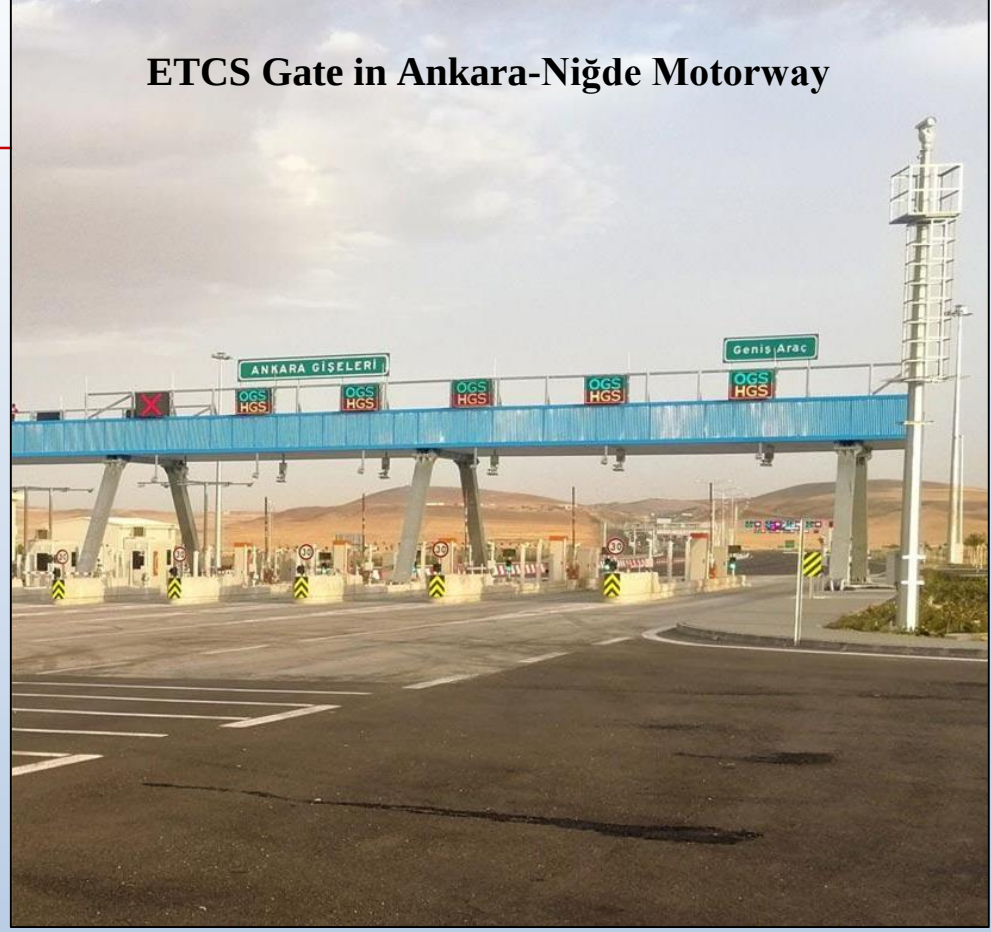
ITS Implementations in Highways

Ankara-Niğde Motorway opened up to traffic in 2020, **330 km long** highway, and 8 lane (4+4) wide

The highway is equipped with:

- 1300 km long Fiber-optic Communication Network,
- Incident Detection Cameras,
- Toll Station Cameras,
- Video Wall Monitoring Screens,
- Variable Message Signs,
- Traffic Measurement Sensors,
- Weather Stations,
- Fog Warning Systems,
- Field Management Units
- Mobile Radio Systems.

In total, **2640 ITS equipments** throughout the highway



ETCS Gate in Ankara-Niğde Motorway

- Existence of many ITS buildings and facilities throughout the highway such as Main Control Center (MCC), Traffic Control Center (TCC), Unit Control Center (UCC) and Toll Stations

ITS Implementations in Urban Areas – Traffic Management Systems (TMS)

- **Traffic Management Centers,** established in highways which are in road network of GDH in provinces of **Ankara, İstanbul, İzmir** and **Mersin**.

- Overall management of highway traffic is conducted covering road and weather conditions, information systems, vehicle sensors and CCTV cameras.

- Establishment of these centres are becoming more prevalent in other provinces of Türkiye such as **Kahramanmaraş, Gaziantep** and **Kocaeli**.

- **Traffic Management Center of Gaziantep,** established in 2015. From this centre, conduction of management of public transport modes and signalization systems
- In total, remotely controlled 350 signalized intersections

Gaziantep Traffic Management Center

ITS Implementations in Urban Areas – Traveller information systems (TIS)

- **Traveller information systems** utilized by **mobile applications**, variable **message signs**, **web sites** and **radio broadcasting**

- In **Kocaeli,** 301 busses and all trams of the public transport system with in-vehicle, visual and audible traveller information systems
- 2050 transit busses with audible traveller information systems

- **E-Komobil** through which bus arrival information, smart card deposit point information, route planning services, real time transit vehicle location, journey time information and online smart card deposition services are provided.

4 Conclusion

Conclusion

- Türkiye have shown significant improvement in transportation infrascture in 100 years since its founding in 1923. Highway network have expanded from 18.300 km in 1960 to 70,000 km in 2022.

- With the improvements in IT, communication technologies and transportation sectors in especially the last 20 years, Türkiye have reached significant milestones and set course for continuous improvement.

- As it is explained and estimated in 2022 Transport and Logistics Master Plan, passenger and freight mobility of Türkiye will continue to grow in the next 30 years.

- With the course of technological improvements in transportation related sectors and sustainability goals of Türkiye being taken into consideration, ITS will continue to improve in Türkiye.

Thank You

Do you have any questions?

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