Republic of Turkey
Ministry of Transport Maritime Affairs and Communications

GENERAL DIRECTORATE of HIGHWAYS

RESILIENT ROAD TRANSPORT INFRASTRUCTURE DEVELOPMENT IN TURKEY

UNECE and EUSDR PA 1b WORKSHOP

How to develop resilient Infrastructure (Global SDG 9)

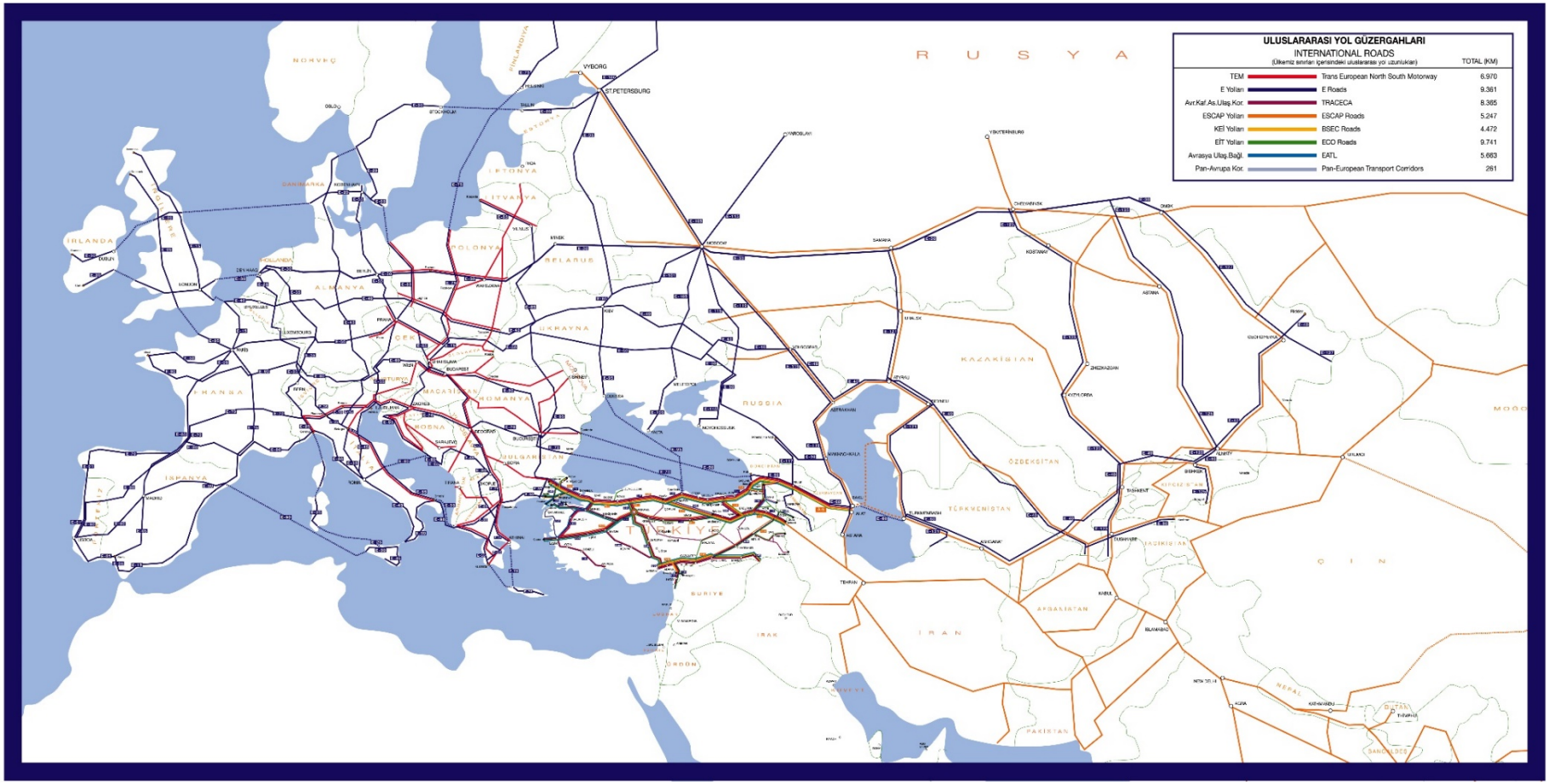
Thursday and Friday, 16-17 November 2017 Ljubljana. Slovenia

OUTLINE

1. GENERAL OVERVIEW of HIGHWAY NETWORK
2. ROAD FINANCING IN TURKEY
3. ROAD INFRASTRUCTURE DEVELOPMENT
4. MOTORWAYS AND PPP MOTORWAY PROJECTS

1 GENERAL OVERVIEW of HIGHWAY NETWORK

LOCATION OF TURKEY



The lands of Turkey are located at a point where the three continents; Asia, Africa and Europe are closest to each other. Turkey has 13000 km of international road network. Within 4 hours flying time, about 1.5 billion people from 56 countries can reach Turkey.

ROAD NETWORK IN TURKEY

Type: Village and Forest roads
Responsibility: Special Provincial Administration

Type: Urban roads
Responsibility: Municipal Authorities

Type: Motorways, State & Provincial roads
Responsibility: General Directorate of Turkish Highways

The road network excluding urban roads is about 385.000 km in length

GENERAL DIRECTORATE OF TURKISH HIGHWAYS

- GDH is responsible for planning, design, construction, maintenance, repair and operation of roads, bridges and structures within the network of motorways, state and provincial roads and keep all the network safely in operation in all weather conditions.
- GDH was established on March 1, 1950
- GDH is an affilliated institution of the Ministry of Transport, Maritime Affairs and Communications.

ORGANIZATION CHART

DIRECTOR GENERAL

DEPUTY DIRECTOR GENERAL 4

PRIVATE SECRETERIAT UNIT

PRESS & PUBLIC RELATIONS UNIT

COUNSELLING AND SUPERVISION UNITS

INSPECTION BOARD	LEGAL ADVISORY OFFICE
DEPARTMENT OF STRATEGY DEVELOPMENT	INTERNAL AUDIT UNIT

MAIN SERVICE UNITS

DEPT. OF SURVEY, DESIGN AND ENVIRONMENT	DEPT. OF MOTORWAY OPERATIONS
DEPT. OF RESEARCH AND DEVELOPMENT	DEPT.OF EQUIPMENT AND SUPPLY
DEPT. OF ROAD CONSTRUCTION	DEPT. OF STRUCTURES
DEPT. OF FACILITIES AND MAINTENANCE	DEPT. OF REAL ESTATE
DEPT. OF TRAFFIC SAFETY	DEPT. OF PROG. AND MONITORING

SUPPLEMENTARY SERVICE UNITS

DEPT. OF SUPPORT SERVICE	DEPT. OF HUMAN RESOURCES
DEPT. OF INFORMATION TECHOLOGIES	

56 DIVISIONS

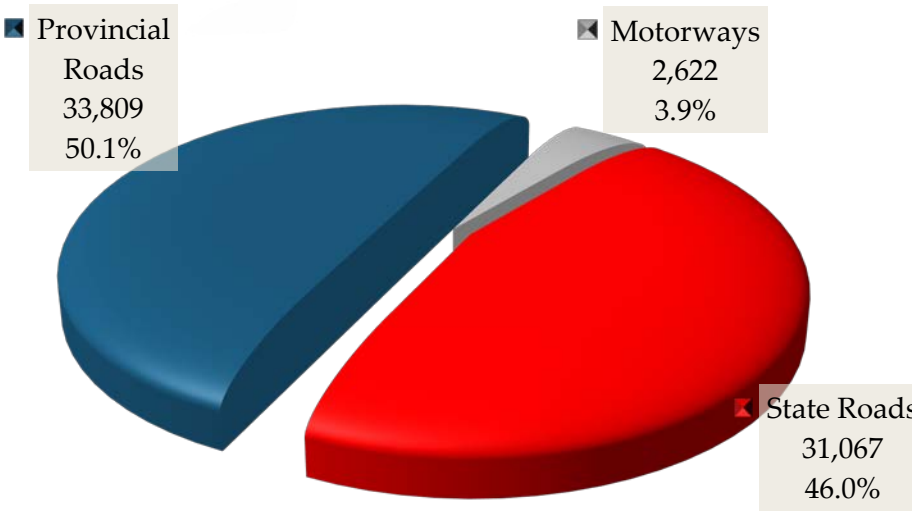
REGIONAL DIVISIONS OF GDH

- 18 Regional Divisions
- 118 Subdivisions
- 285 Maintenance Houses
- 25 Motorway Maintenance and Operation Offices
- 2 Equipment and Supply Directories

NATIONAL HIGHWAY NETWORK

- Total road network is 67.498 km.
- 38% of total road network (25.757 km) is dual carriageway

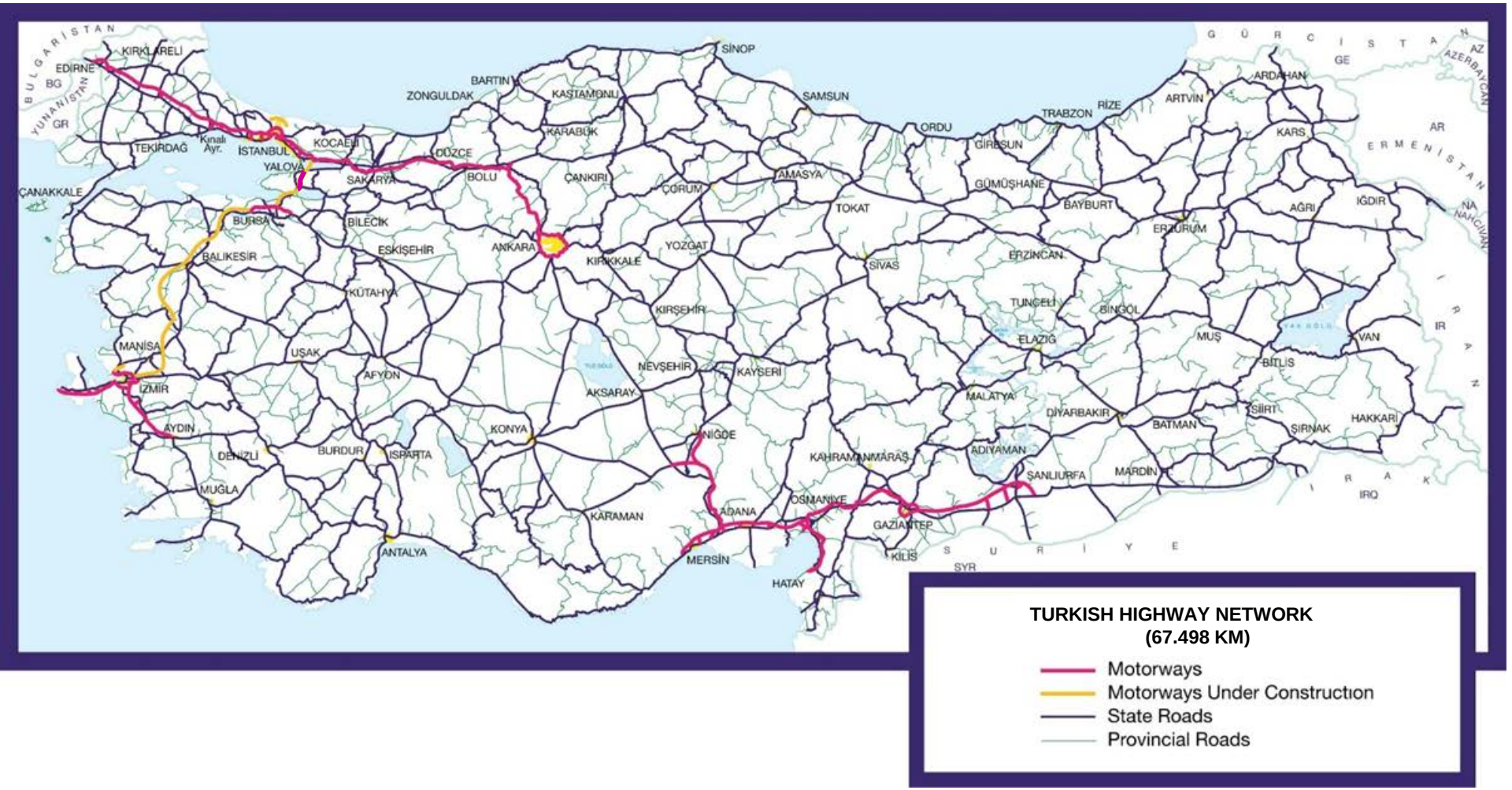
Highway Network (Km)



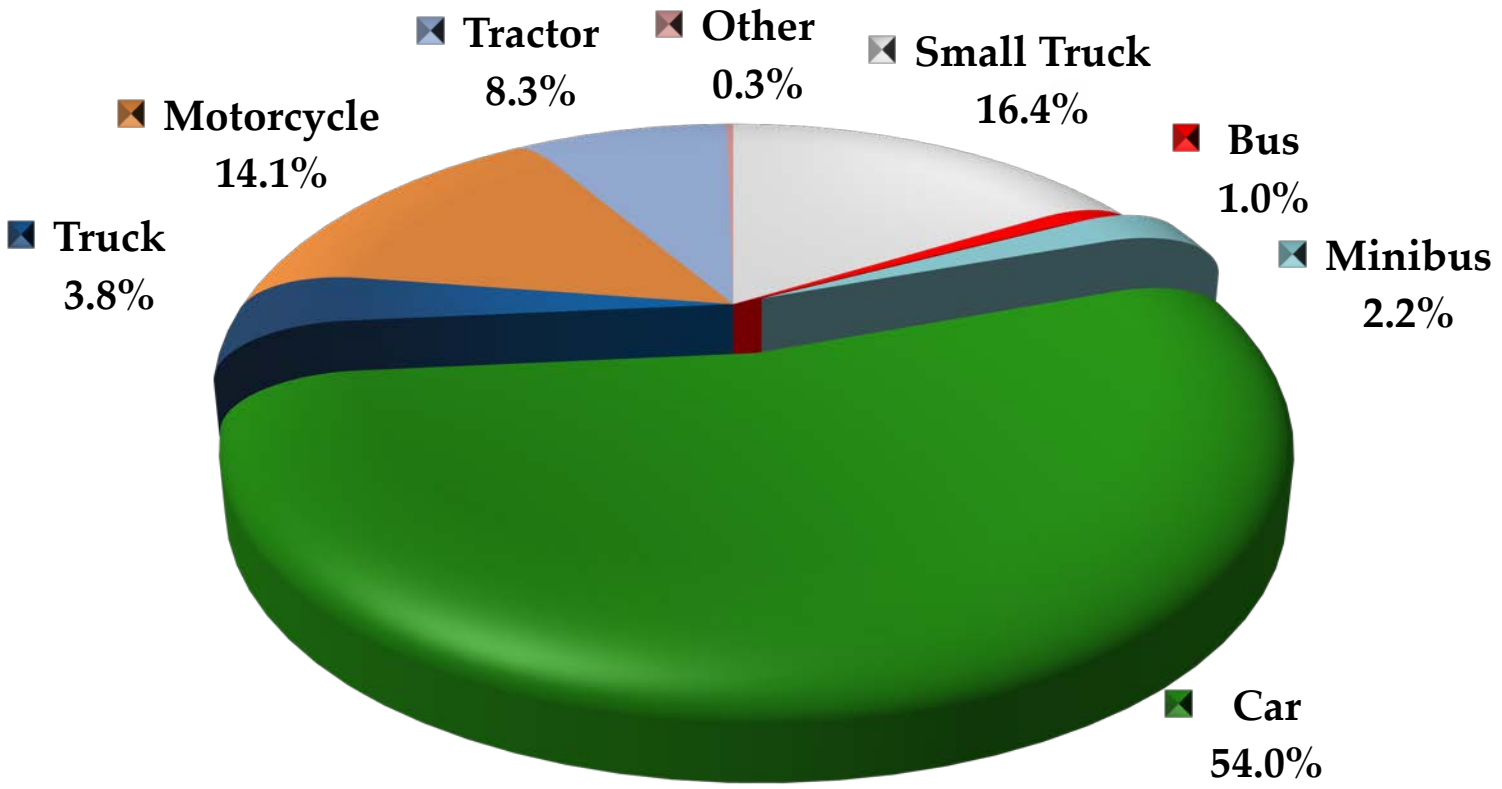
- Total Replacement Value: 67 Billion $
- Road Density: 50 km / 100 km² (Excl.Urban Roads)
- Motorway Density: 3.34 km/ 1000 km²

NATIONAL HIGHWAY NETWORK (67.498 km)

- Turkish Road Network under General Directorate of Turkish Highways' responsibility.



VEHICLE FLEET (AUGUST 2017)

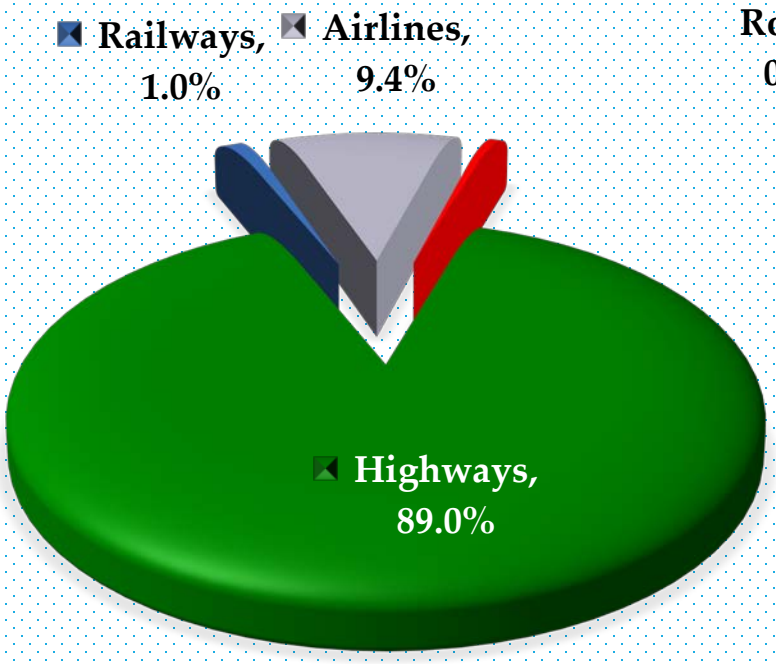


By the end of August 2017

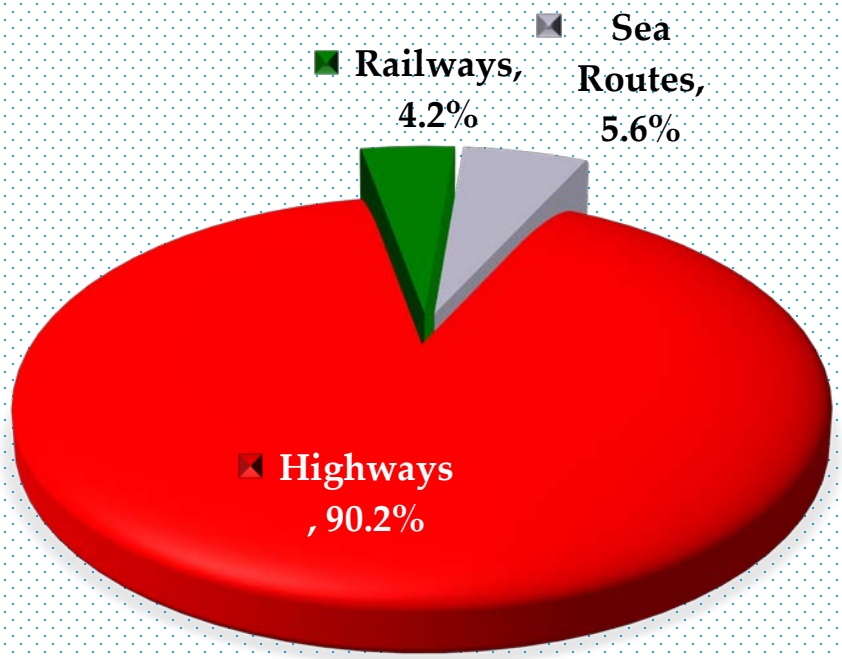
- Number of Vehicles: 21.863.854
- Number of Passenger Cars: 11.802.713 (54% of Vehicle Fleet)

DOMESTIC PASSENGER & FREIGHT TRANSPORT

PASSENGER TRANSPORT



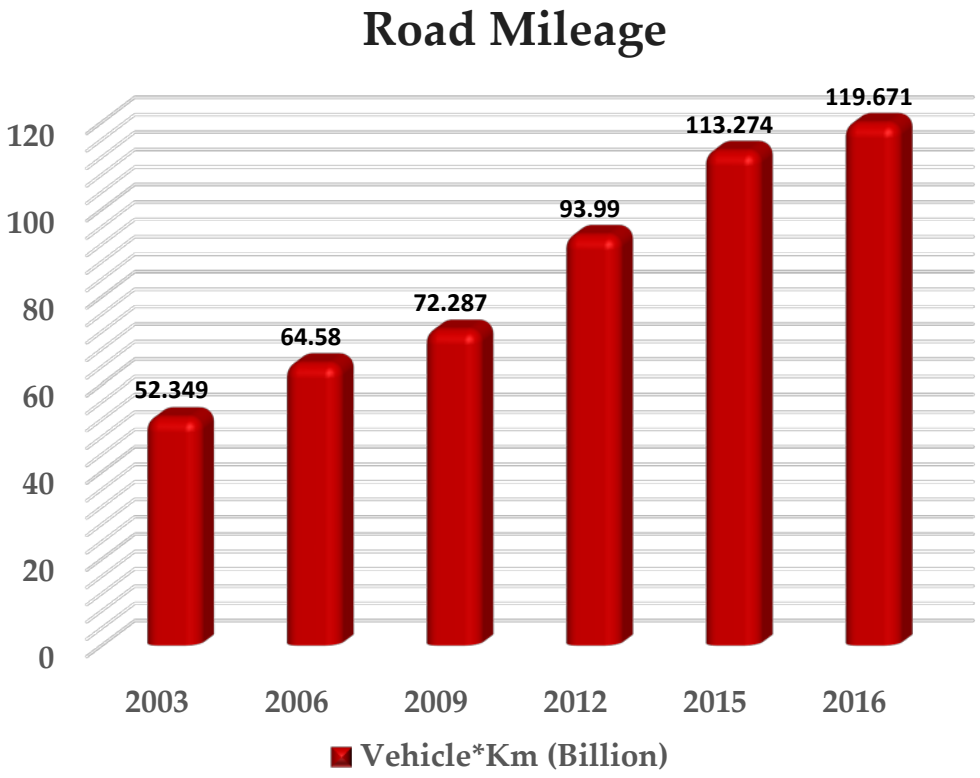
FREIGHT TRANSPORT

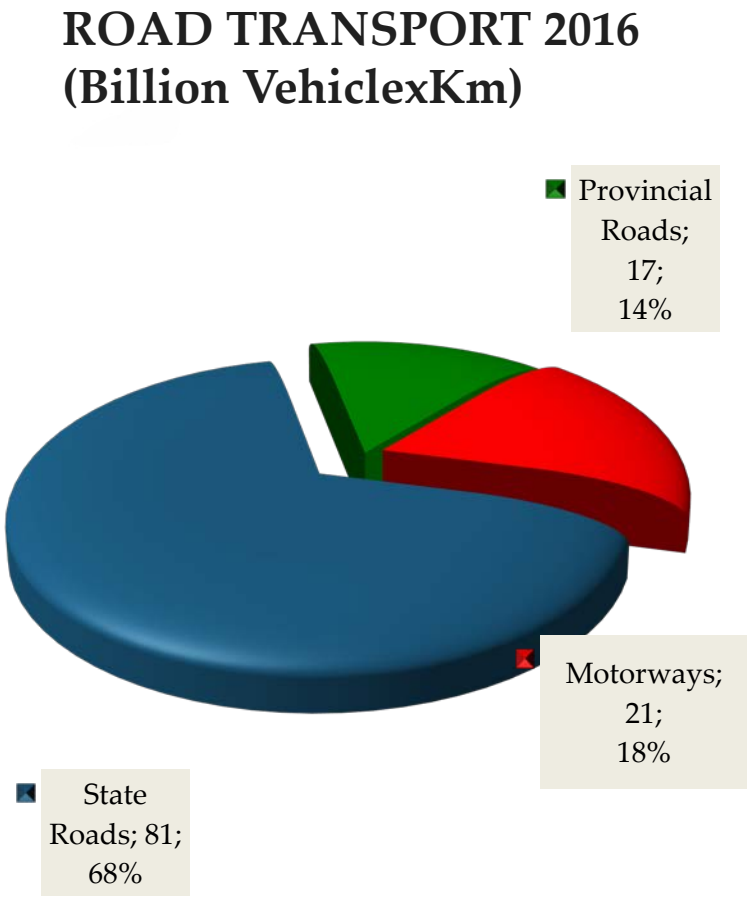


Passenger Transport
Highways: 89 %

Freight Transport
Highways: 90,2 %

ROAD MILEAGE IN TURKEY



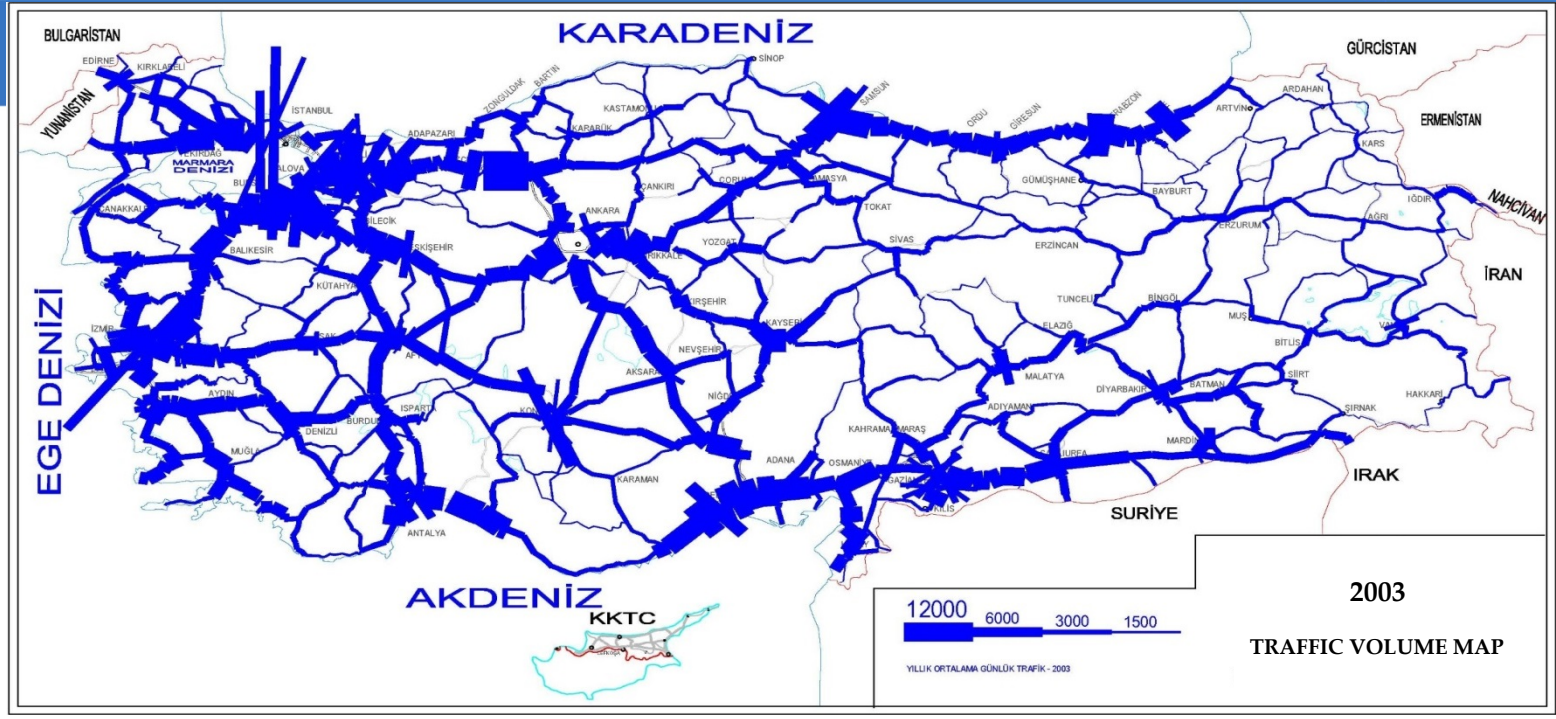


- 129 % increase in vehicle-km, in the period of 2003 & 2016
- Despite only accounting for 3,8% of the road network as a whole, our motorway network is carrying 18% of all road transport.

TRAFFIC VOLUME Million Km (2003)

52.349

Total Vehicle-Km

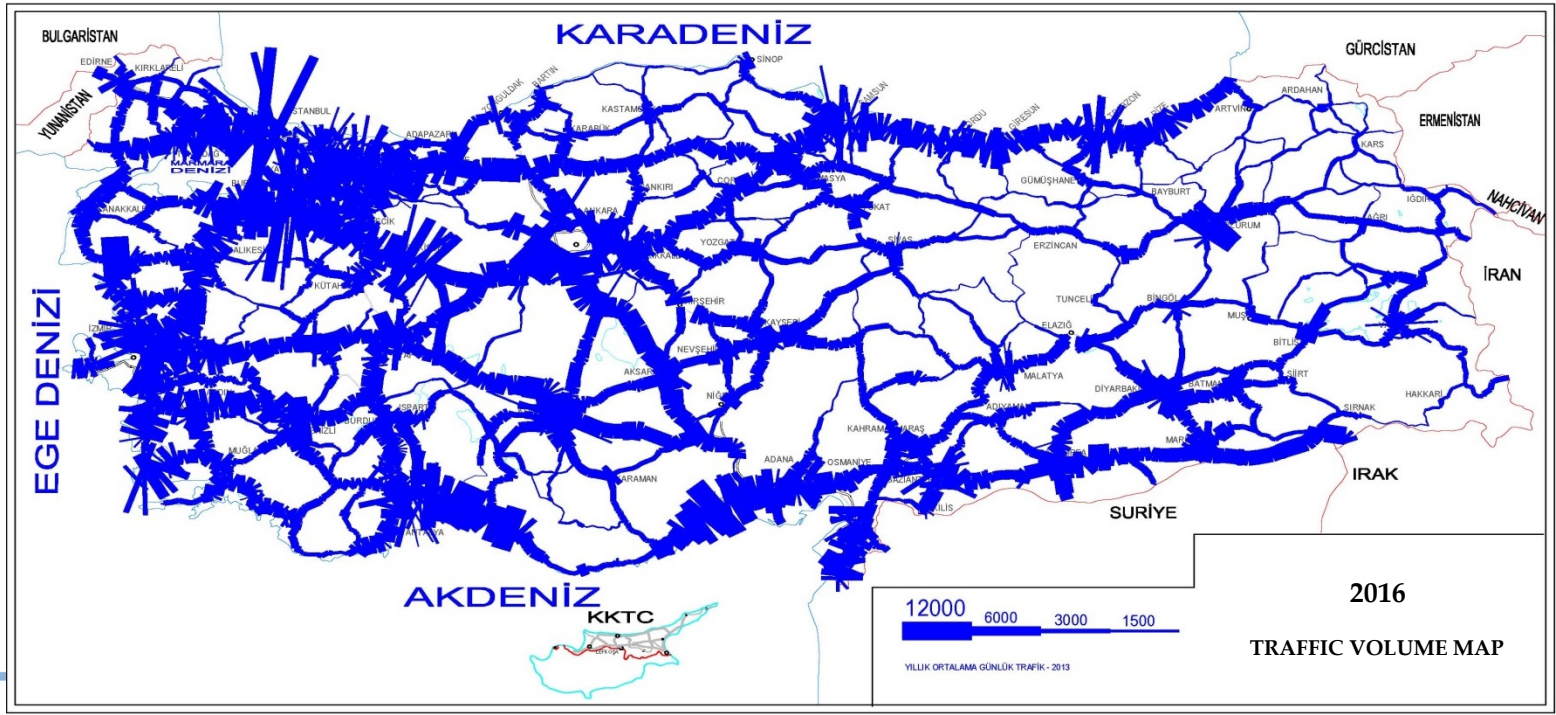


TRAFFIC VOLUME Million Km (2016)

119.671

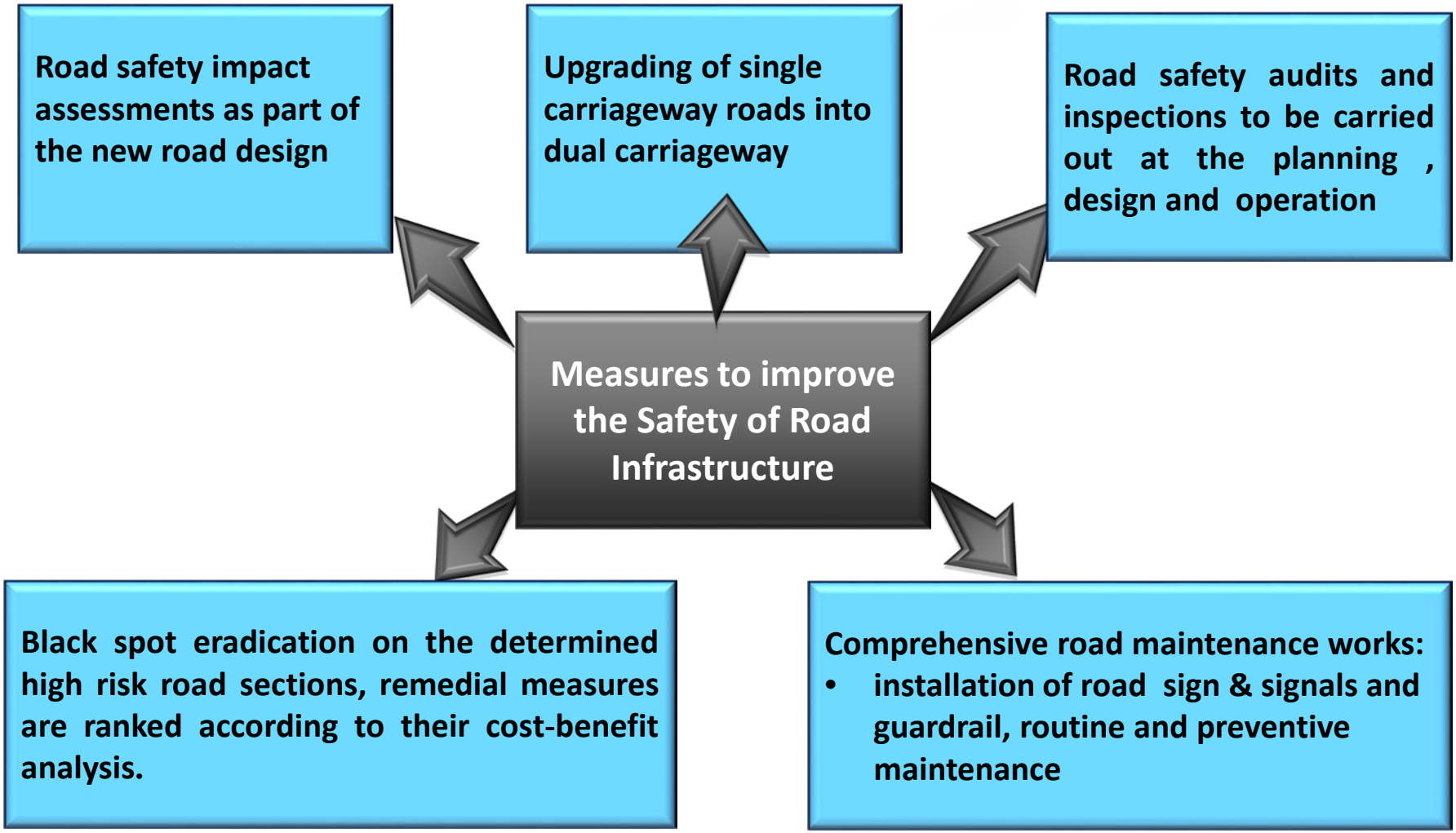
Total Vehicle-Km

129 % increase in vehicle-km



ROAD SAFETY IN TURKEY

SAFETY & ROAD INFRASTRUCTURE



ROAD SAFETY IN TURKEY

Improvement of Black Spots

- Curve improvement
- Rearrangement of Junction Layout
- Construction of climbing lane
- Underpass and overpass for pedestrians
- Signalization
- Guardrail etc.

ROAD SAFETY IN TURKEY

TRUCK ESCAPE RAMPS

Truck escape ramps are constructed for accommodating out-of-control trucks on long steep downgrades.

ROAD SAFETY IN TURKEY

Rumble Strips

To warn the drowsy, fatigued or careless drivers who go out their lane by noise and vibration

GOAL

To decrease the number of run-off and head on collisions

GOAL

To reduce the number of fatalities caused by run-off and head on collisions by 40-50 percent

2 ROAD FINANCING IN TURKEY

HIGHWAY FINANCING RESOURCES

National Budget

- financing approxiamately 95 % of road investment budget
  - Road used related taxes and excise taxes on vehicle purchasing taxes directly go to the consolidated budget. Ministry of Finance collects all taxes and allocates those taxes to all public expenditures.

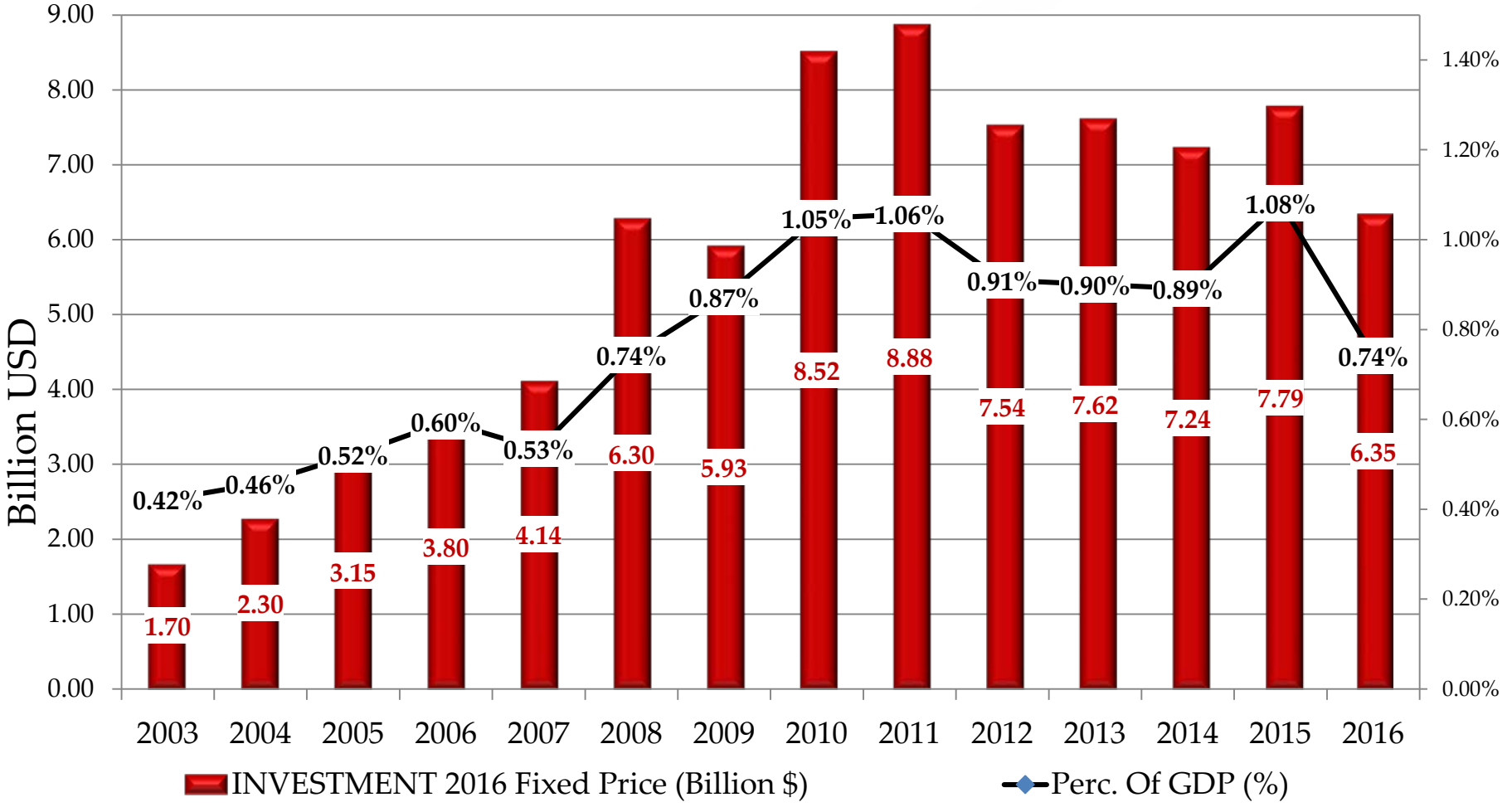
Toll Motorway Revenues

- 400 Million USD, covering %5 of total road invesment budget
  - Istanbul-Ankara toll rate is about 6 USD for 380 km(1,5 US Cents/km)
  - Two intercontinental suspended bridges over Istanbul Strait 2 US $ for two way

PPP concessions for the construction of BOT motorways

- İstanbul-İzmir Motorway (Inc. İzmit Bay Crossing)
- Northern Marmara Motorway, Odayeri-Paşaköy Section (Inc. Yavuz Sultan Selim Cable Stayed Suspension Bridge) Project

PERCENTAGE OF GDP USED FOR HIGHWAY INFRASTRUCTURE INVESTMENT



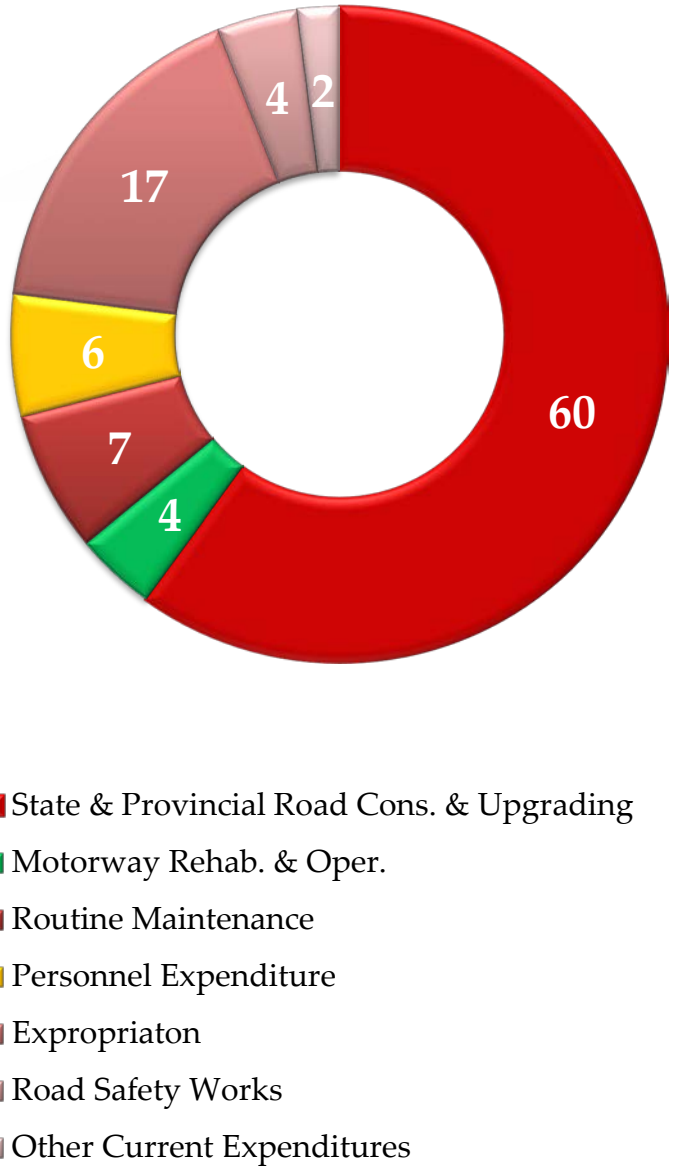
THE BREAKDOWN OF GDH's TOTAL BUDGET

In 2016, Total budget of Turkish Highway amounted to 7.5 Billion US $.

Out of total budget,

- **60 % on state and provincial road construction & upgrading**
- **4 % on motorway rehabilitation and operation,**
- **7 % on routine maintenance,**
- **4 % on routine road safety works,**
- **6 % on personnel expenditure,**
- **17 % on expropriation**
- **the remaining 2 % on other current expenditures.**

KGM's 2016 total expenditures is about 0.90 % of Gross Domestic Product (GDP)



3 ROAD INFRASTRUCTURE DEVELOPMENT

NATIONAL ROAD DEVELOPMENT PROGRAM

OUR NATIONAL ROAD PROGRAM :

The road infrastructure investments are planned to ensure;

1. Staying competitive by reducing travel times and transport costs
2. Providing uninterrupted and safe road transportation
3. The improvement of mobility and road user comfort
4. Facilitating the distribution of economic prosperity to all regions of the country

ROAD INFRASTRUCTURE DEVELOPMENT

1. UPGRADING OF SINGLE CARRIAGEWAYS TO DUAL CARRIAGEWAYS
2. CONVERSION OF SURFACE TREATED ROADS INTO ASPHALT CONCRETE
3. UPGRADING OF SINGLE CARRIAGEWAY ROADS
4. SUPERSTRUCTURES (Bridges,Viaducts, Tunnels)
5. PPP MOTORWAY PROJECTS

UPGRADING SINGLE CARRIAGEWAYS INTO DUAL CARRIAGEWAYS

Action	Missions & Goals	Current Situation
General Directorate of Highways started the implementation of a highway upgrading program in 2003 involving the upgrading of existing single carriageway into dual carriageway.	The primary objectives of dual carriageway road construction: • to reduce traffic accident fatalities and serious injuries due to head-on collision, • to improve the level of service affected by inadequate capacity.	The length of dual carriageway roads opened to traffic has reached to 19.656 km including motorways since 2003.

MULTILANE DIVIDED HIGHWAY NETWORK (2003)

1.714 Km
MOTORWAY

4.387 Km
MULTILANE DIVIDED STATE&PROVINCIAL ROADS

6.101 Km
TOTAL

MULTILANE DIVIDED HIGHWAY NETWORK (October 2017)

2.622 Km
MOTORWAY

23.135 Km
MULTILANE DIVIDED STATE&PROVINCIAL ROADS

25.757 Km
TOTAL

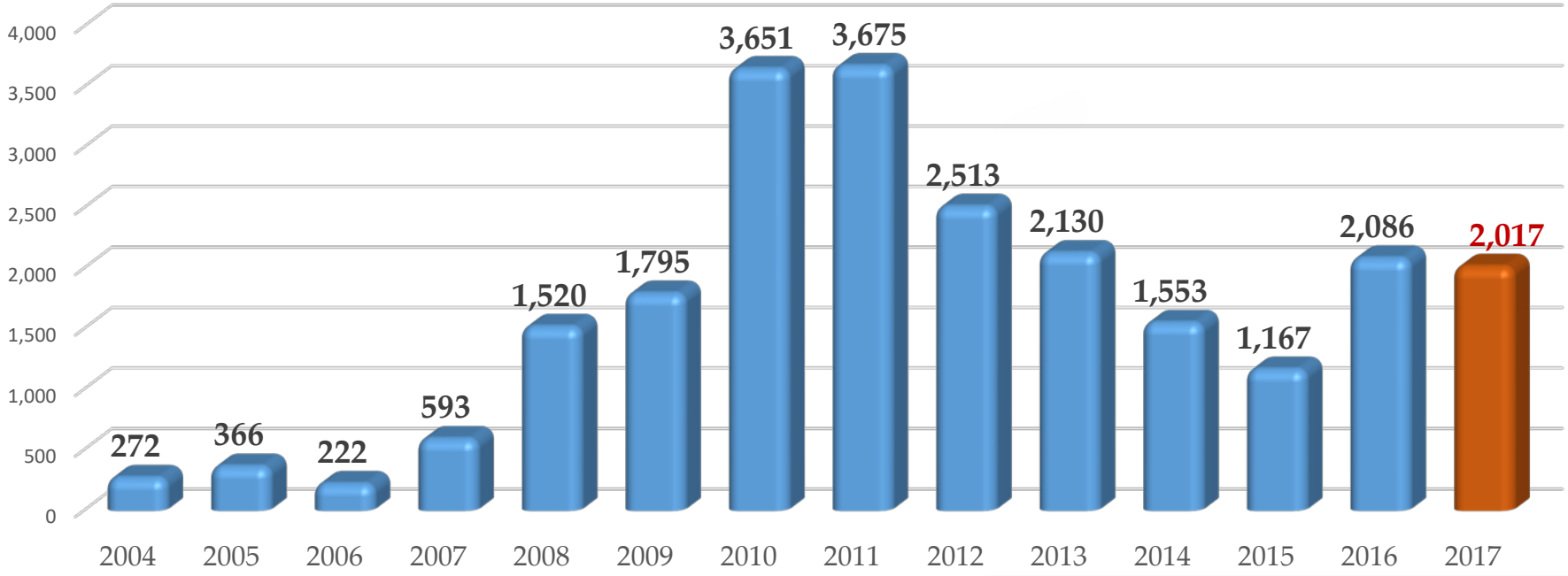
EAST-WEST CORRIDORS (8.524 KM)

Corridor	LENGTH (KM)	In Operation	Under Construction	Will be Tendered
D010	1.552	1.201	108	243
D100	1.852	1.852	0	0
D200	1.235	1.235	0	0
D300	1.925	1.898	0	28
D400	1.960	1.403	145	412
TOTAL	8.524 (100%)	7.589 (% 89)	253(3%)	683 (8%)

NORTH-SOUTH CORRIDORS (12.146 KM)

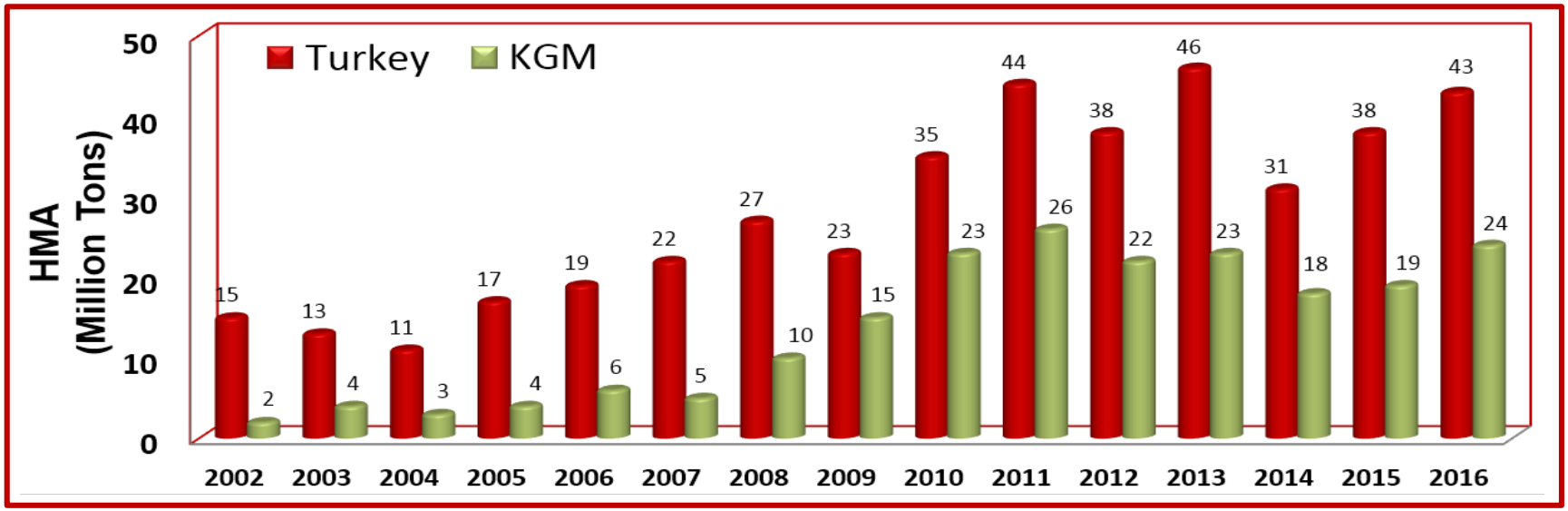
	DUAL CARRIAGEWAY	SINGLE CARRIAGEWAY	TOTAL
In Operation	9.380 (87%)	651 (49%)	10.031 (82%)
Under Construction	890 (8%)	288 (21%)	1.178 (10%)
Will be Tendered	543 (5%)	394 (30%)	937 (8%)
TOTAL LENGTH	10.813 (89%)	1.333 (11%)	12.146 (100%)

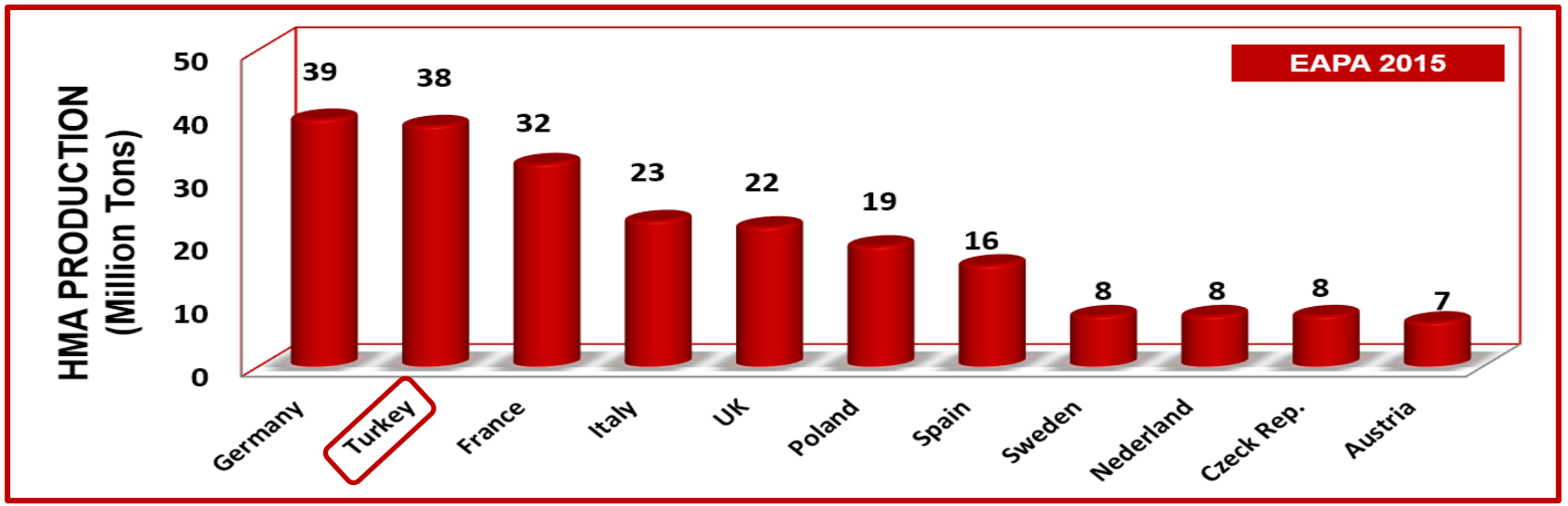
CONVERSION OF SURFACE TREATED ROADS INTO ASPHALT CONCRETE



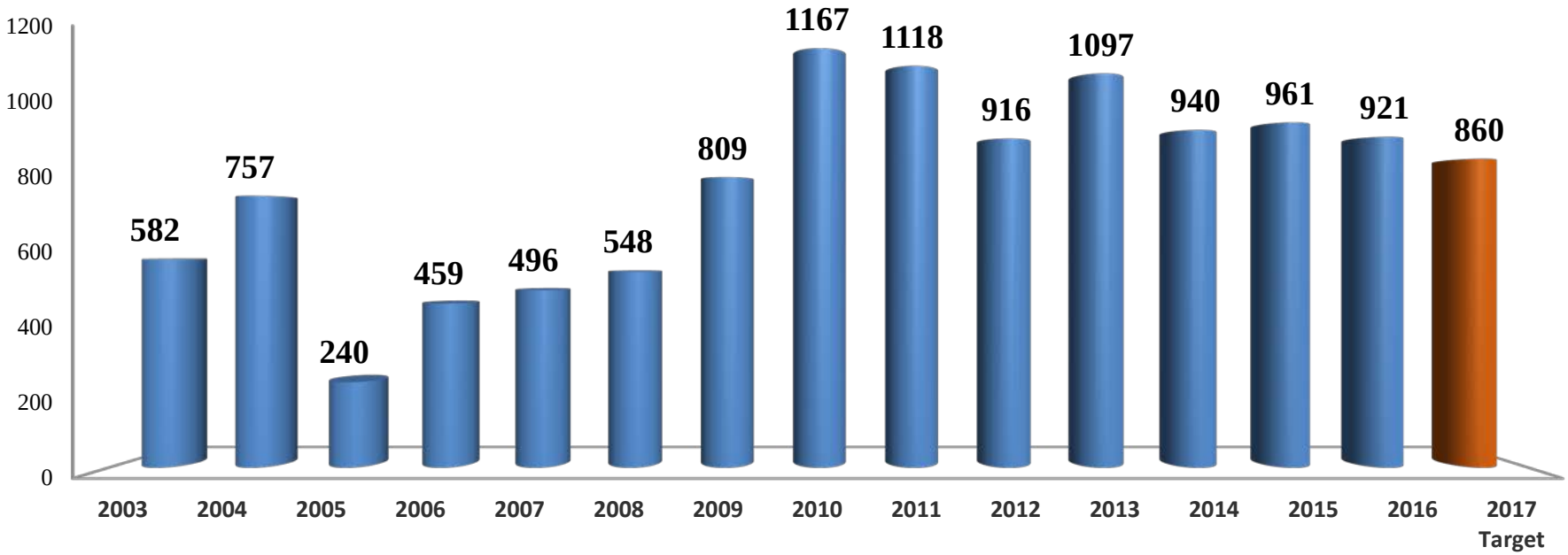
- **2003 – 2015** • 1.500 km (Ann.Avr.)
- **2016** • 2.086 km
- **2017 Target** • 2017 km

HOT MIX ASPHALT PRODUCTION IN TURKEY





UPGRADING OF SINGLE CARRIAGEWAY ROADS



2003 – 2015	• 776 km(Ann.Avr.)
2016	• 921 km
2017 Target	• 860 km

ROAD STRUCTURES –TUNNELS , BRIDGES & VIADUCTS

- Number of Tunnels : 83
- Length of Tunnels: 50 km

2003

- Number of Tunnels : 315
- Length of Tunnels: 372 km

2017

- Number of Tunnels : 184
- Length of Tunnels: 482 km

Under Construction

- Number of Bridges&Viaducts : 5.967
- Length of Bridges&Viaducts: 311 km

2003

- Number of Bridges&Viaducts : 8.193
- Length of Bridges&Viaducts 541 km

2017

- Number of Bridges&Viaducts : 483
- Length of Bridges&Viaducts 62 km

Under Construction

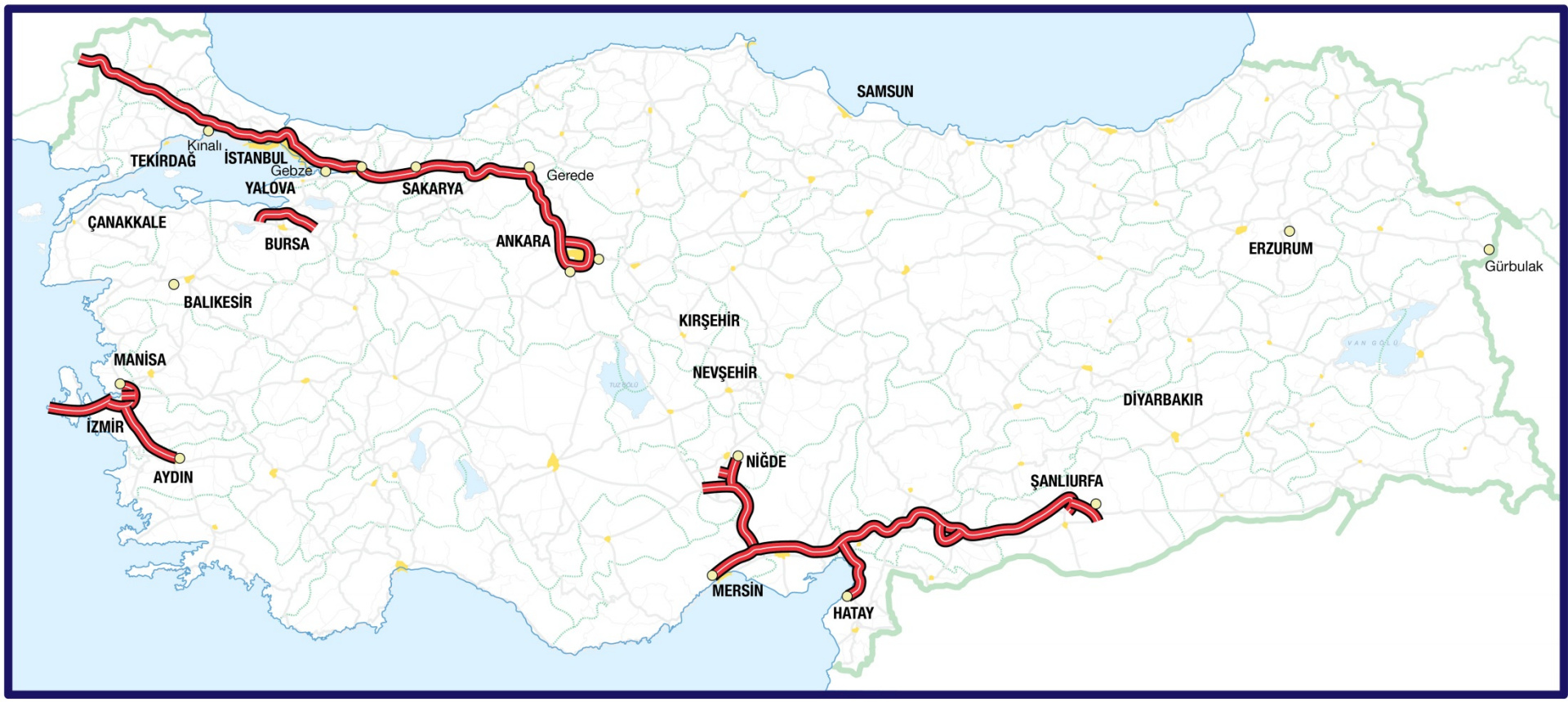
RESILIENT ROAD TRANSPORT INFRASTRUCTURE DEVELOPMENT IN TURKEY

2023 TÜRKİYE

MOTORWAYS & PPP MOTORWAY PROJECTS

UNECE and EUSDR PA 1b WORKSHOP

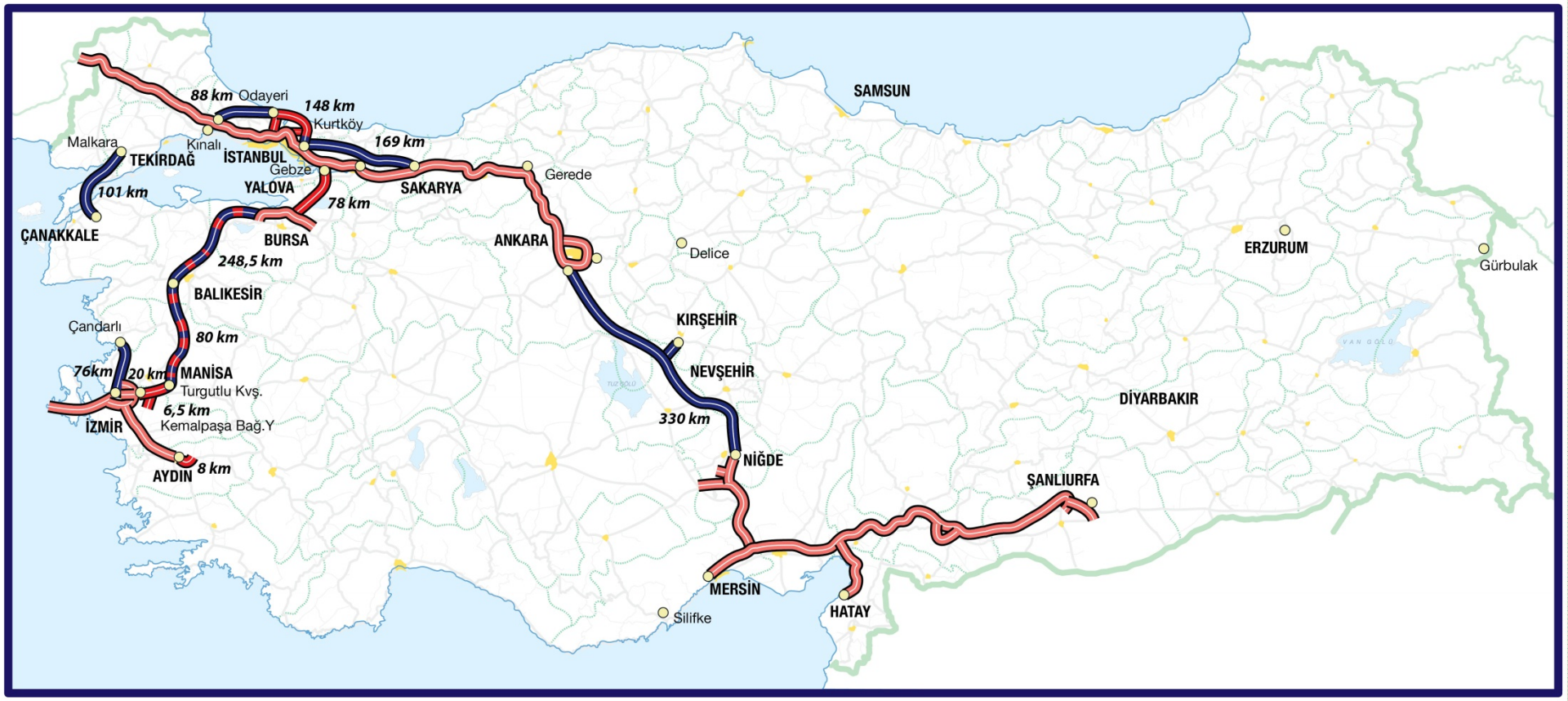
MOTORWAY NETWORK CONSTRUCTED BEFORE 2010



An ambitious motorway construction program was started in early 1980s. With regard to this expedited motorway construction program, up to 2010, a motorway network with a length of 2.289 km has been opened to traffic. This program was financed by mainly national budget and loans from IFI.

MOTORWAYS REALIZED BY NATIONAL BUDGET	2.289 Km

PPP MOTORWAY PROJECTS AFTER 2010



OBJECTIVE: to expand and improve our Motorway Network to meet the transport demand of the economic growth.

PROBLEM: financing new motorway projects

SOLUTION: financing mechanism on the basis of PPP

PPP MOTORWAY PROJECTS AFTER 2010

- NORTHERN MARMARA MOTORWAY (405 km)
  - Odayeri–Paşaköy Section (148 km)
  - Kınalı–Odayeri section (88 km)
  - Paşaköy–Akyazı section (169 km)

- İSTANBUL-İZMİR MOTORWAY (433 km)
  - 105 Km in operation
  - 80 Km finished (not opened to traffic)
  - 248 Km under construction

- KINALI-TEKİRDAĞ-ÇANAKKALE-BALIKESİR MOTORWAY (101 km)

- MENEMEN-ALİAĞA-ÇANDARLI MOTORWAY (76 km)

- ANKARA - NİĞDE MOTORWAY PROJECT (330 km)

TURKEY'S PPP POLICY

GENERAL FEATURES OF BOT MOTORWAY CONTRACTS:

- Design specifications and standard are determined by GDH.
  (Project start-end points, corridor, technical requirements for special structures like suspension bridges)
- Traffic Guaranty will be provided to secure the pay back of the debt and equity if the generated revenue is not enough
- Expropriation costs are mainly covered by Administration
- In case of the termination of Agreement, used loans will be paid by the Treasury
- The Tolls are updated every year based on the guidelines of United Nations Statistics Office
- Financing of project will be covered by the contractor as equity (at least 20%) and loan (80% at most)

PPP PROJECT CYCLE

PPP PROJECT CYCLE

ANNOUNCEMENT OF TENDER NOTICE

THE BEST BID IS CHOOSEN BY TENDER COMMITTEE AND APPROVED BY MINISTER

SIGNING OF CONTRACT

ADMINISTRATION CONTROLS THE PROJECT IN BOTH CONSTRUCTION AND OPERATION PERIOD

NORTHERN MARMARA MOTORWAY

NORTHERN MARMARA RING MOTORWAY (405 Km)
Including Cable Stayed Suspended Bridge YSS

ODAYERİ-PAŞAKÖY SECTION INCLUDING Cable Stayed Suspended Bridge YSS
148 KM

PAŞAKÖY-AKYAZI SECTION 169 KM (Asian Side)

KINALI-ODAYERİ SECTION 88 KM (European Side)

NORTH MARMARA MOTORWAY
(including 3rd suspension bridge,Yavuz Sultan Selim Bridge)

NORTH MARMARA MOTORWAY (Odayeri-Paşaköy)
(including cable stayed suspension bridge,Yavuz Sultan Selim Bridge)

TOTAL LENGTH : 148 Km

Cable Stayed Suspension Bridge with a length of 1875 meter

NUMBER OF VIADUCTS : 35

LENGTH OF VIADUCTS : 13.5 km

NUMBER OF TUNNELS : 2+2(Railways)

LENGTH OF TUNNELS : 2389+536 m

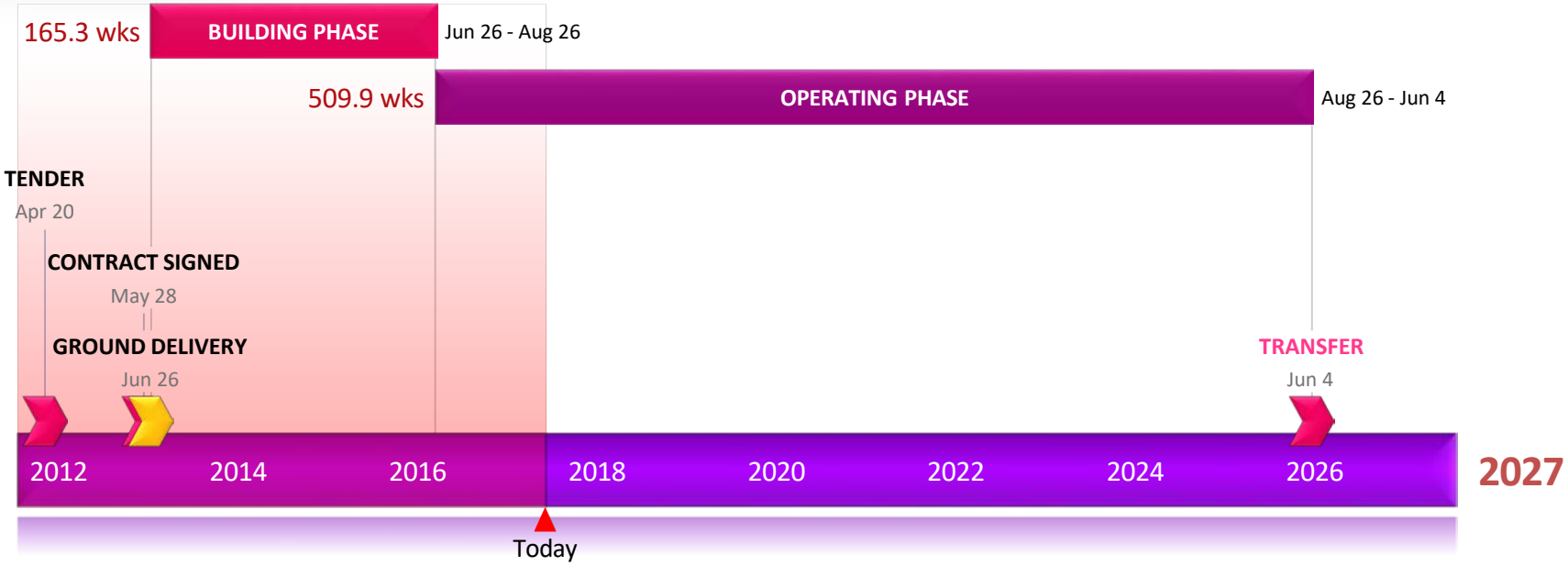
NUMBER OF BRIDGES : 97

LENGTH OF BRIDGES : 7,6 Km

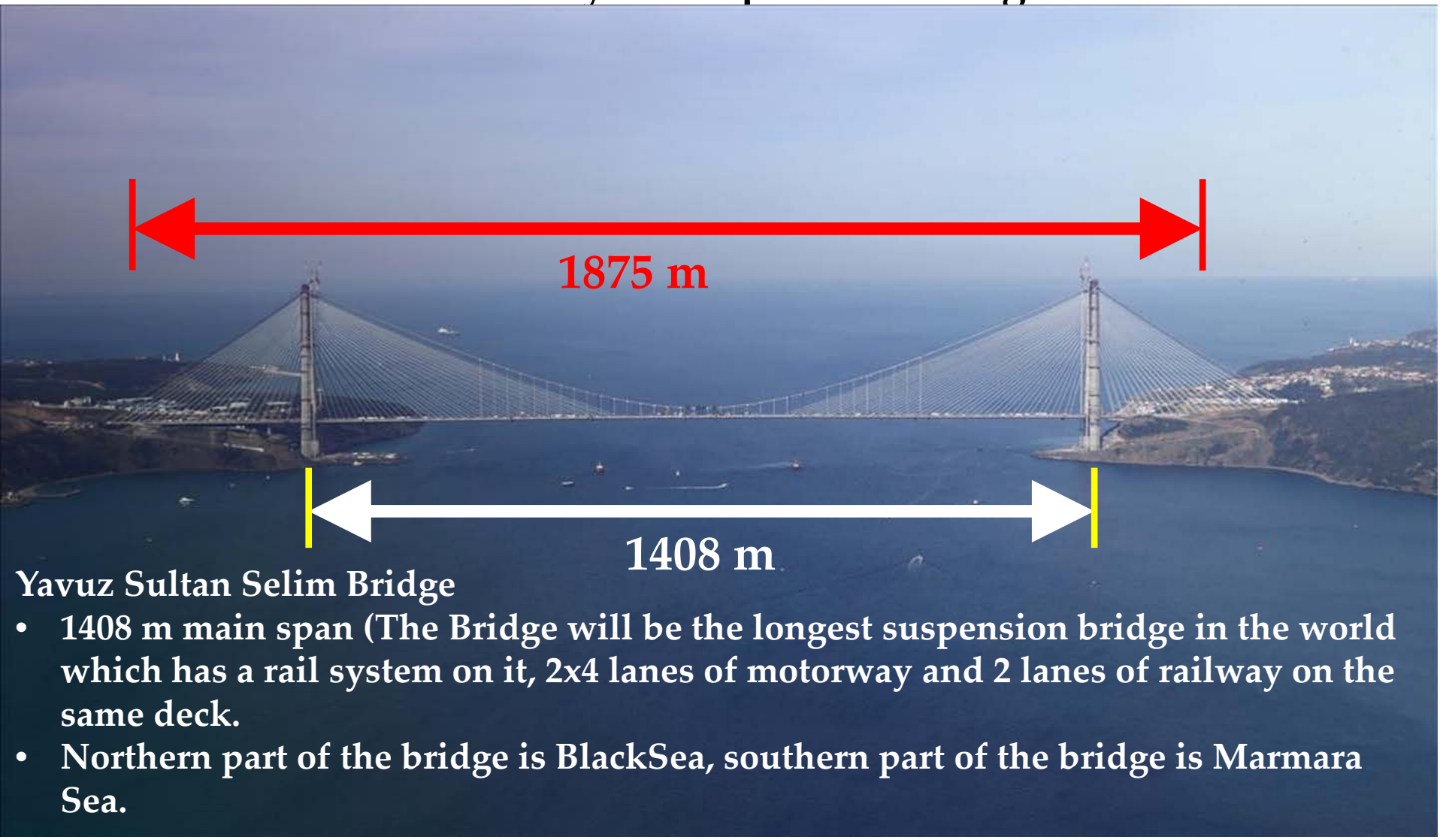
NUMBERS OF INTERCHANGES : 20

NORTHERN MARMARA MOTORWAY, ODAYERİ-PAŞAKÖY SECTION PROJECT

- Investment Cost is 3.5 Billion US $
- 148 Km Length
- 3 Years 2 Months Construction Period
- 9 Years 11 Months 6 Days Motorway Operation Period
- 13 Years 1 Months 6 Days Contract Period
- Consortium: ICA IC İÇTAŞ ASTALDİ



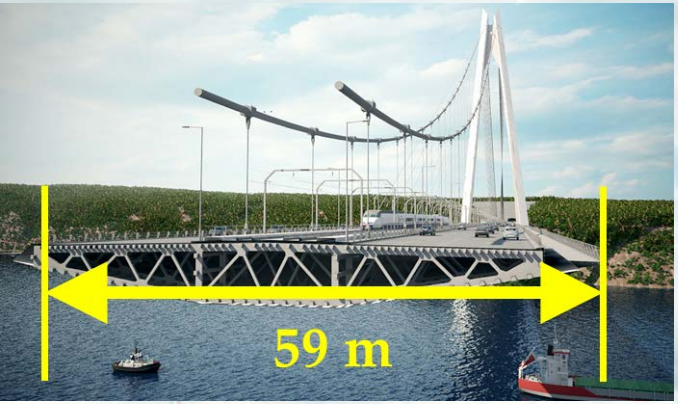
YAVUZ SULTAN SELİM BRIDGE
Cable Stayed Suspension Bridge



Yavuz Sultan Selim Bridge

- 1408 m main span (The Bridge will be the longest suspension bridge in the world which has a rail system on it, 2x4 lanes of motorway and 2 lanes of railway on the same deck.
- Northern part of the bridge is BlackSea, southern part of the bridge is Marmara Sea.

YAVUZ SULTAN SELİM BRIDGE



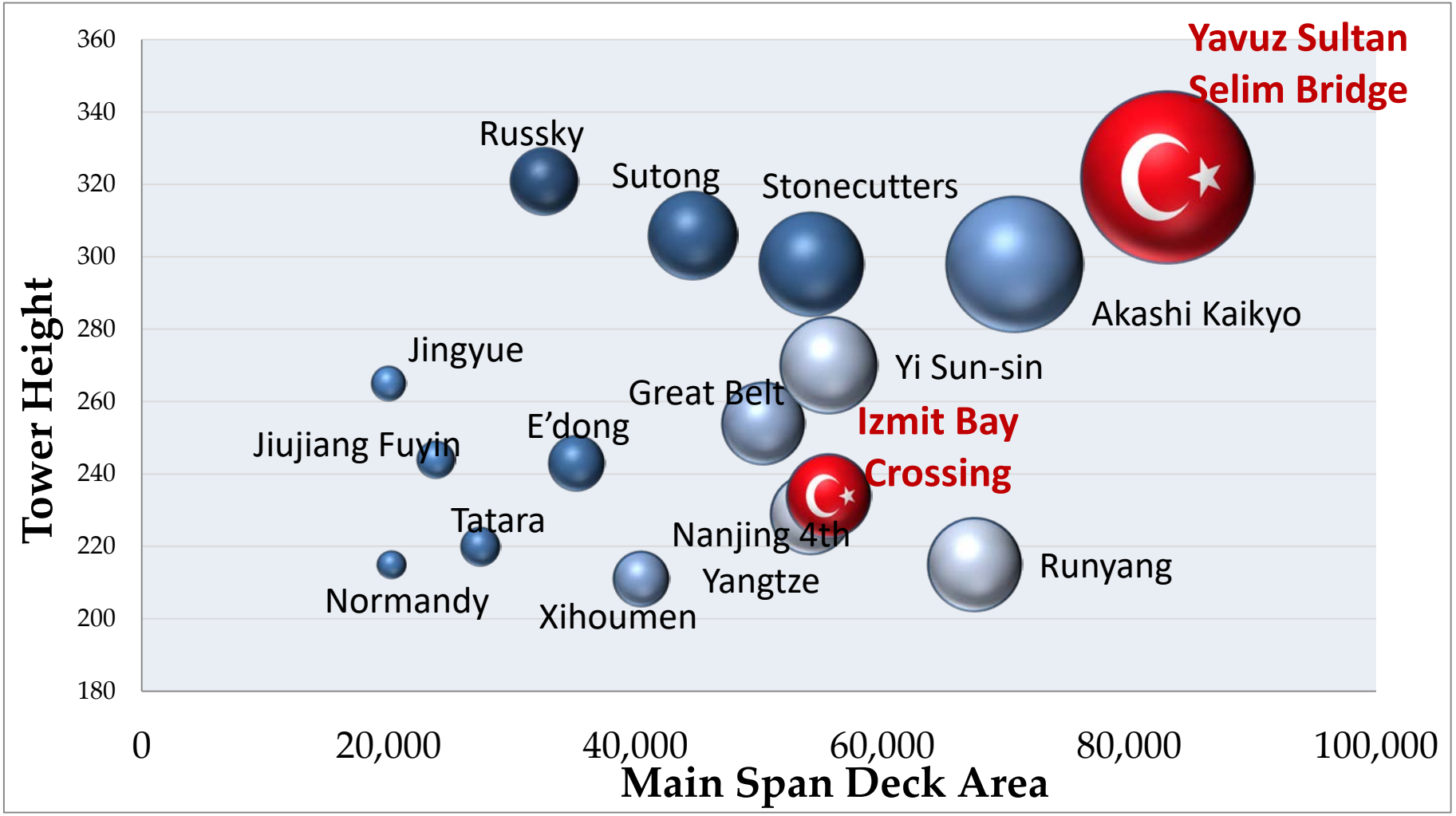
Yavuz Sultan Selim Bridge

- The width of the deck is 59 meters, the largest in the world.
- Also it has got the highest tower in the world with a height of 322 meters.

Some Key Figures Of YSS Bridge

- 2x4 motorway lanes, 2 railway tracks
- **2,164 metre** length, **1,408 metre** span, **58.50 metre** deck width
- 2 towers with a height of **322 metres**
- **59** segments, **176** stay cables,
- Cable stay tensile strength: **1960 MPa**
- **597 metre** length of longest cable
- **7,800 tonnes** of steel for the stay cables
- Anchor units, **75 to 151**
- Maximum height of dampers:**7.2 metres** above the deck
- 2 suspension cables, each **2,420 metres** long
- **34** pairs of vertical hangers

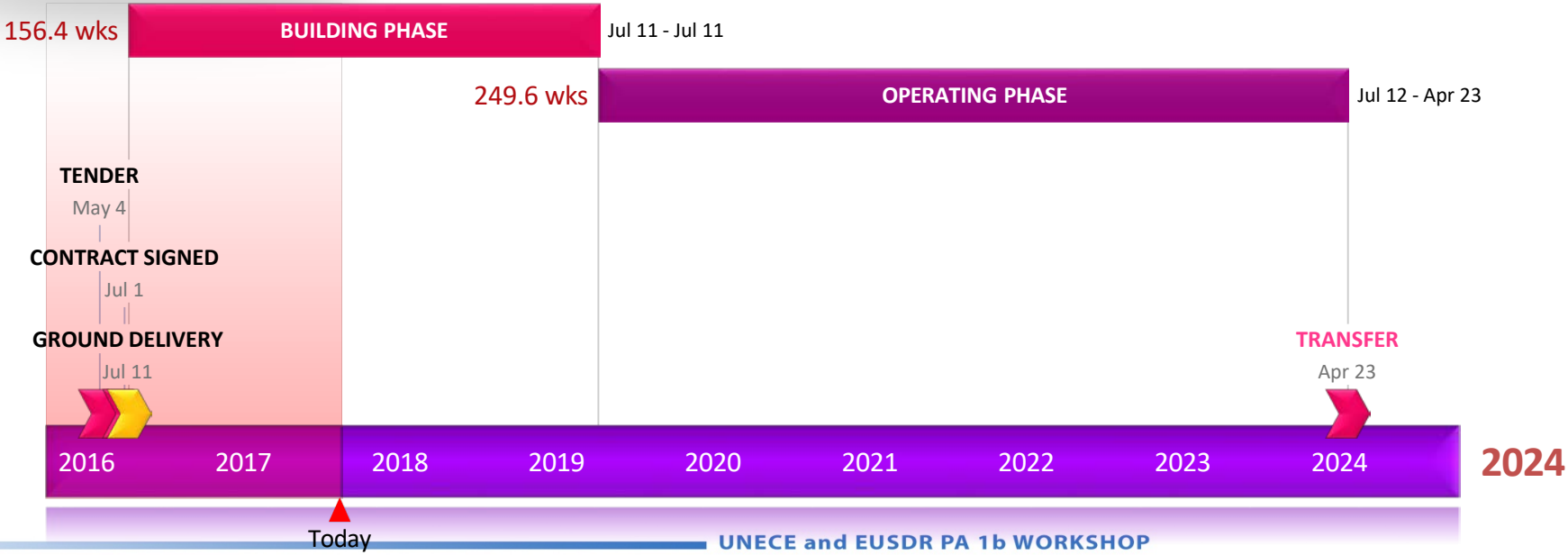
WORLDWIDE RANKING OF IMPORTANT BRIDGES



PPP MOTORWAY PROJECTS UNDER CONSTRUCTION

NORTHERN MARMARA MOTORWAY, KINALI – ODAYERİ SECTION PROJECT

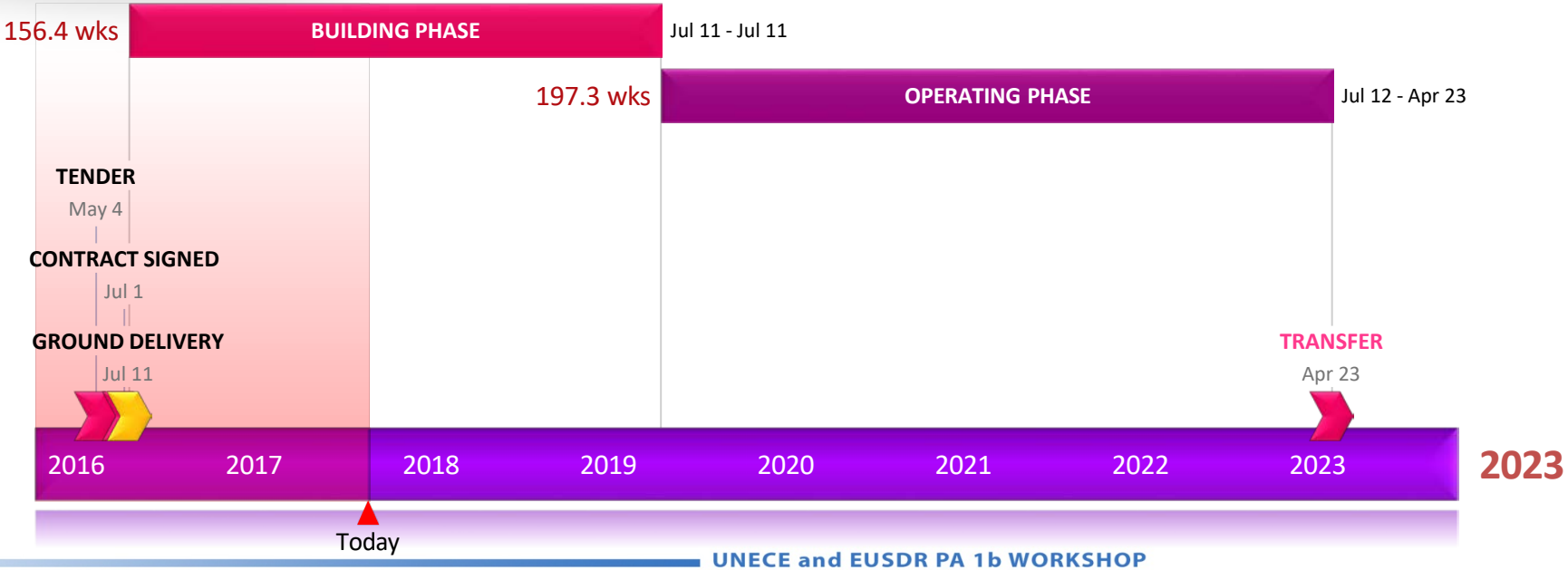
- Investment Cost is 950 million US $
- 88 Km Length
- 3 Year Construction Period
- 4 Years 9 Months 12 Days Motorway Operation Period
- 7 Years 9 months 12 days Contract Period
- Consortium: : KOLİN-KALYON JOINT VENTURE



PPP MOTORWAY PROJECTS UNDER CONSTRUCTION

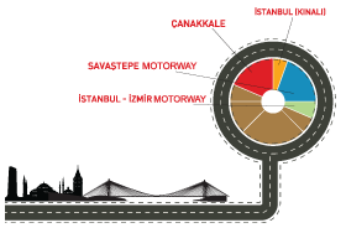
NORTHERN MARMARA RING MOTORWAY, PAŞAKÖY – AKYAZI SECTION PROJECT

- Investment Cost is 1.6 Billion US $
- 169 Km Length
- 3 Years Construction Period
- 3 Years 9 Months 12 Days Operation Period
- 6 Years 9 Months 12 Days Contract Period
- Consortium: : LİMAK-CENGİZ JOINT VENTURE



MAIN BENEFITS OF NORTHERN MARMARA MOTORWAY PROJECTS

Uninterrupted interurban and urban railway transportation from Edirne to İzmit will be conducted via the railway passing from the the 3rd Bridge, and this railway system will be integrated with Marmaray and İstanbul Metro, and the Atatürk Airport, Sabiha Gökçen Airport and the 3rd Airport.



Following the establishment of connection of the Northern Marmara Motorway which includes the the 3rd Bridge, as well – with the İstanbul (Kınalı) – Çanakkale – Savaştepe motorway and İstanbul – İzmir motorway, travel time to the neighboring cities will be reduced.

Fuel saving will be enabled by decreasing the traffic density within the city and the current bosphorus bridges. Vehicles will be able to make transit pass uninterruptedly, safely and comfortably.

The effect of air pollutants related to the transportation within the city will be reduced following the redirection of the transit traffic to the 3rd Bridge.

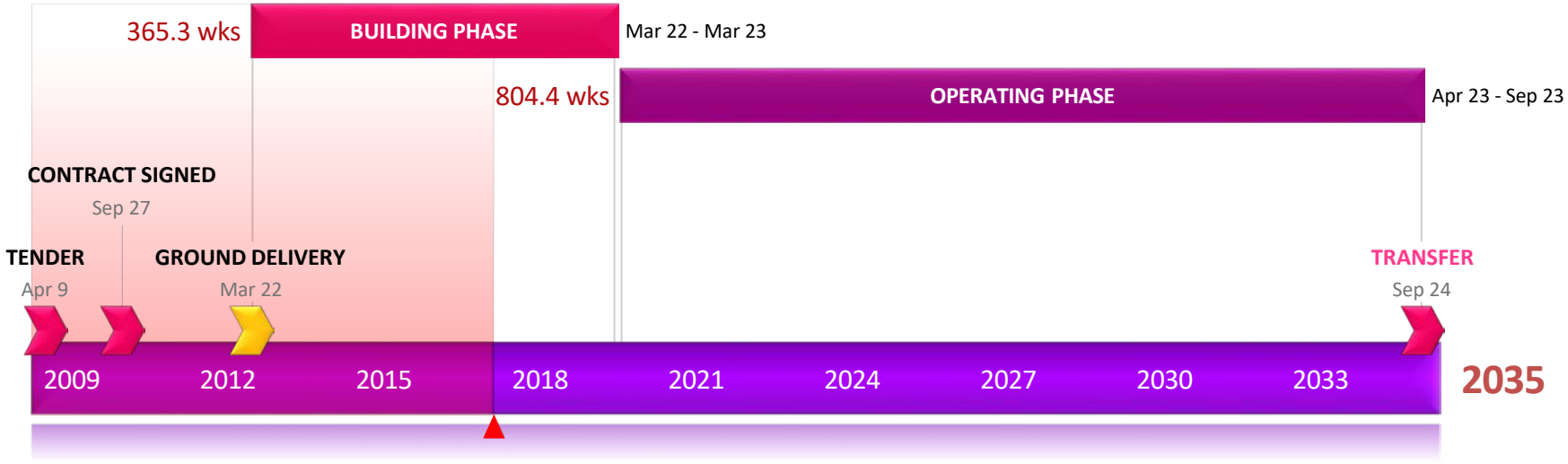
Time cost in our import and export will be reduced following the removal of the transportation restriction for loaded vehicles.

İSTANBUL-İZMİR MOTORWAY

PPP MOTORWAY PROJECTS UNDER CONSTRUCTION

İSTANBUL-İZMİR MOTORWAY (INCLUDING İZMİT BAY CROSSING AND CONNECTION ROADS)

- Investment Cost is 8.5 Billion US $
- 433 Km Length
- 105 Km in operation, the construction of 80 km was finished, but not opened to traffic.
- 7 Year Construction Period
- 15 Years 4 Months Motorway Operation Period
- 22 Years 4 months Contract Period
- Consortium: : OTOYOL YATIRIM VE İŞLETME A.Ş.



- Project's route is one of the main axes of Turkey.
- The Project will connect Izmir to İstanbul, Yalova, Bursa, Balıkesir, Manisa and Kütahya and serve directly to a geographic area with 25 million inhabitants.
- Length of the road between İstanbul-İzmir will be shorten by 95 km.
- Travel time from İstanbul to İzmir will decrease from 8-10 hours to 3-3.5 hours.

İSTANBUL-İZMİR MOTORWAY (INCLUDING İZMİT BAY CROSSING AND CONNECTING ROADS)

TOTAL LENGTH : 433 km
(384 km motorway, 49 km connecting roads, 2.682 m suspension bridge)

NUMBER OF VIADUCTS : 40
LENGTH OF VIADUCTS :22.3 Km

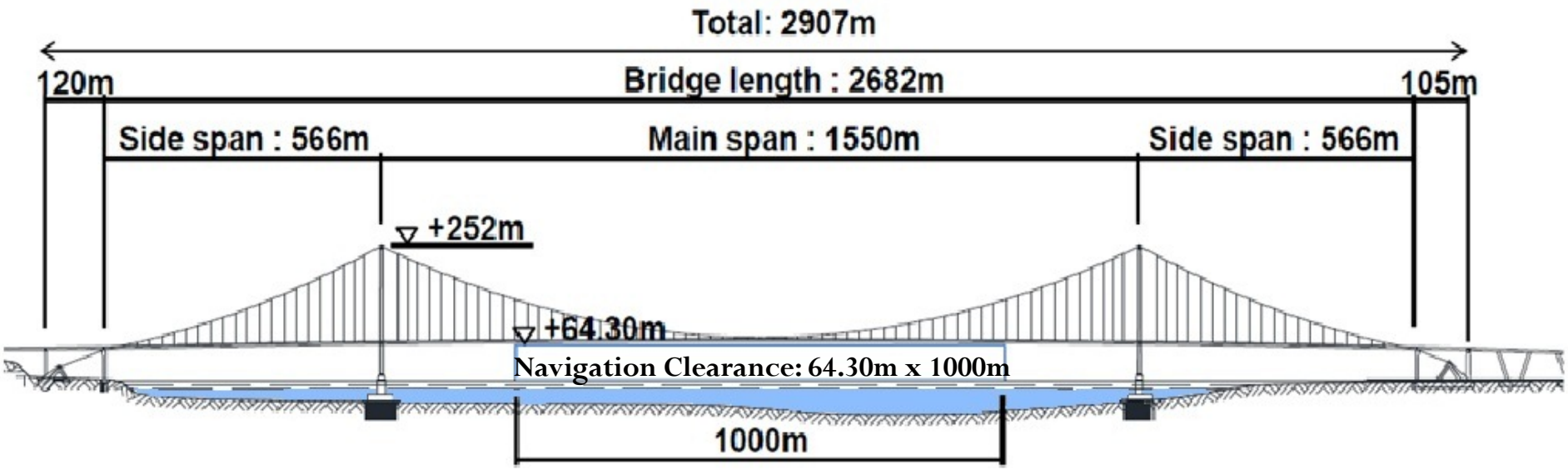
NUMBER OF TUNNELS : 3
LENGTH OF TUNNELS : 6.45 Km

NUMBER OF BRIDGES : 364
LENGTH OF BRIDGES : 20.8 Km

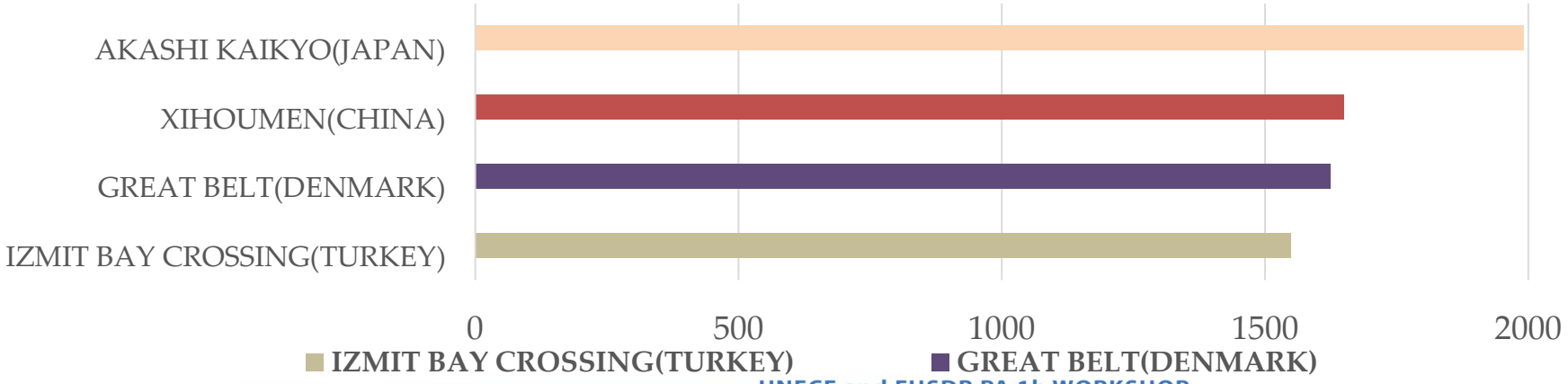
NUMBERS OF INTERCHANGES : 25

İZMİT BAY SUSPENSION BRIDGE

İzmit Bay Crossing comprise of ; North Approach Viaduct, Suspension Bridge Main and Side Spans and South Approach Viaduct.



Midspan Length (m)



İSTANBUL-İZMİR MOTORWAY

İzmit Bay Bridge with a length of 2680 m and 1550 m center span (4 th longest in the world)

KINALI-TEKİRDAĞ-ÇANAKKALE-BALIKESİR MOTORWAY

PPP MOTORWAY PROJECTS UNDER CONSTRUCTION

KINALI-TEKİRDAĞ-ÇANAKKALE-BALIKESİR MOTORWAY, MALKARA-ÇANAKKALE SECTION (INCLUDING 1915 ÇANAKKALE BRIDGE)

- Investment Cost is 2.7 Billion US $
- 101 km Length
- Longest midspan length of 2023 m in the World
- 5,5 years Construction Period
- 10 years 8 months 12 days Motorway Operation Period
- 16 Years 2 months 12 days Contract Period
- Consortium:DAELIM (KORE)-LİMAK - SK (KORE) - YAPI MERKEZİ JOINT VENTURE GROUP

MENEMEN-ALİAĞA-ÇANDARLI MOTORWAY

PPP MOTORWAY PROJECTS UNDER CONSTRUCTION

MENEMEN-ALİAĞA-ÇANDARLI MOTORWAY PROJECT

- Investment Cost is 394 Million US $
- 76 km Length
- 3 Years Construction Period
- 6 Years 10 Months 11 Days Operation Period
- 9 Years 10 Months 11 Days Contract Period
- Consortium: IC İÇTAŞ-ASTALDI-KALYON JOINT VENTURE GROUP

156.6 wks **BUILDING PHASE** Apr 5 - Apr 5

358.1 wks **OPERATING PHASE** Apr 6 - Feb 16

TENDER Feb 15

CONTRACT SIGNED Apr 4

GROUND DELIVERY Apr 5

TRANSFER Feb 17

2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 **2027**

Today

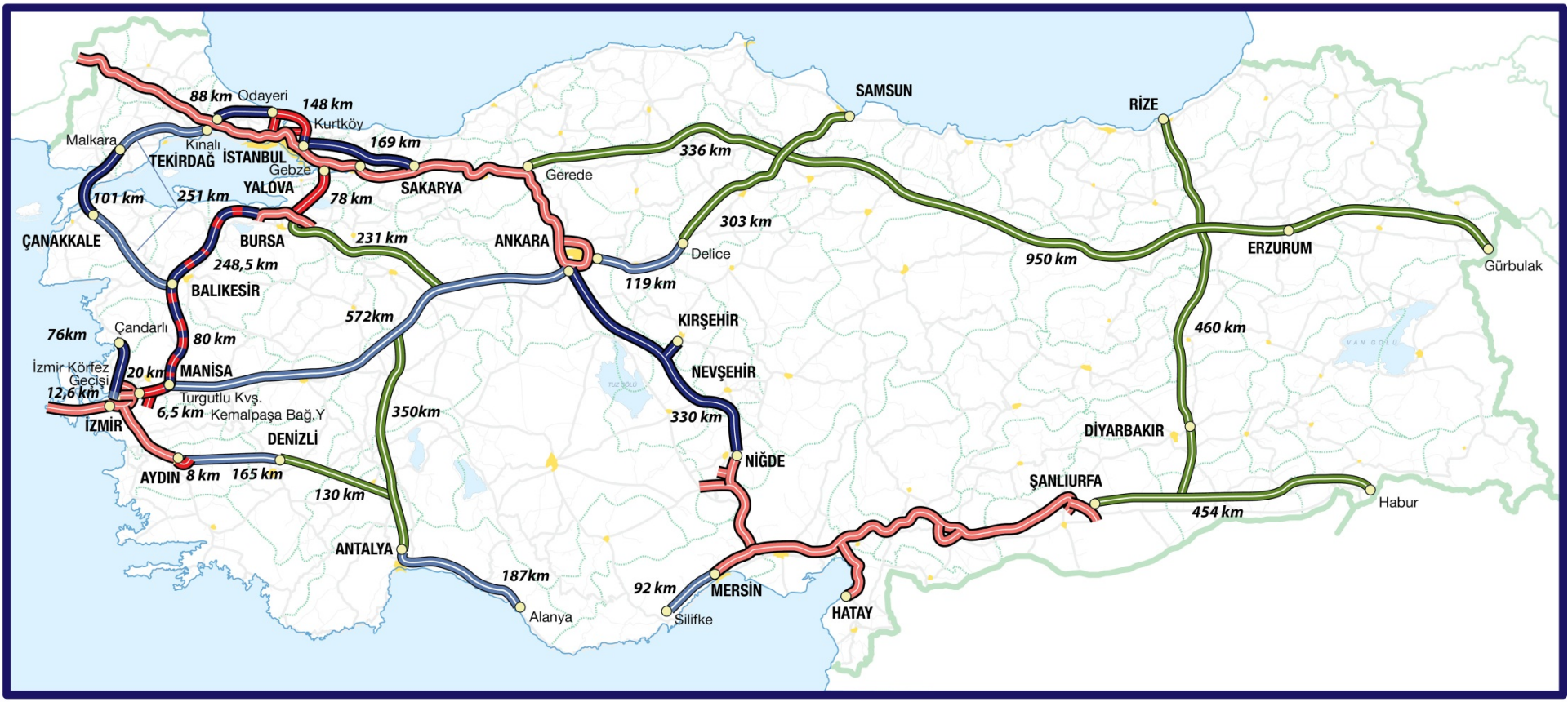
ANKARA-NİĞDE MOTORWAY

PPP MOTORWAY PROJECTS UNDER CONSTRUCTION

ANKARA - NİĞDE MOTORWAY PROJECT

- Investment Cost is 1.1 Billion US $
- 330 km Length
- 3 years Construction Period
- 8 years 10 months 17 days Motorway Operation Period
- 11 Years 10 months 17 days Contract Period
- Tender Date: 14 th of April, 2017
- Consortium: ERG İNŞAAT- SEZA İNŞAAT JOINT VENTURE GROUP

TARGET MOTORWAY NETWORK until 2035



MOTORWAYS IN OPERATION (2.285+44 Km BOT)	2.622 km	
BOT PROJECTS (UNDER CONSTRUCTON)	1.012 km	
BOT PROJECTS (IN TENDERING PROCESS)	257 km	5.914 KM
FUTURE BOT PROJECTS	2.023 km	

TOTAL: 8.199 KM

INTELLIGENT TRANSPORT SYSTEMS

- ITS focus on mainly;
  - Electronic Toll Collection Systems
  - Traffic Management Systems
  - Traveller Information Systems
  - Tunnel Operating Systems

TOLL COLLECTION

OGS (DSRC-ACTIVE)

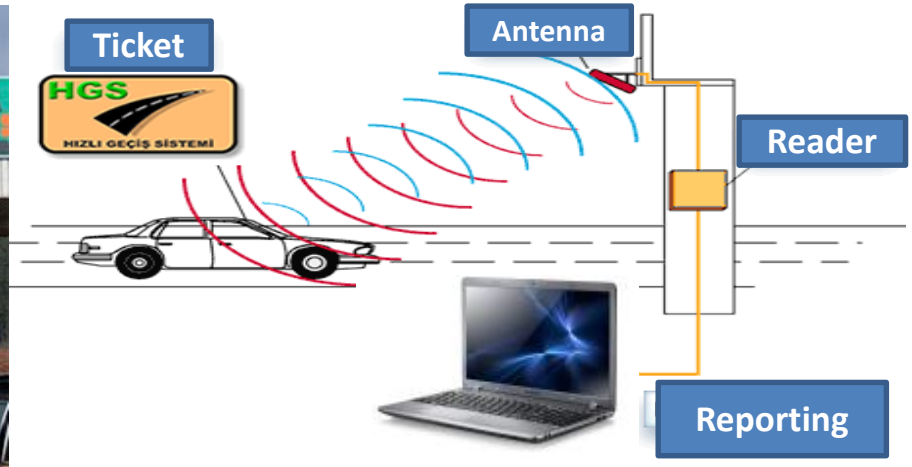
- 1.954.845 Subscribers
- 30,40 % of Payment

HGS (RFID-PASSIVE)

- 11.126.849 Subscribers
- 69,60 % of Payment

TOTAL

- 13.081.694 Subscribers
- 400 Million Dollar collected
- 323 MillionVehicles Passed



TOLL COLLECTION

SSG

- Removal of tolboth
- No need for lane preference
- Improvement in trafic flow

THANK YOU FOR YOUR ATTENTION !

Mücahit ARMAN
Deputy General Director
marman@kgm.gov.tr
Tel.:+90(312)4499078

Gökhan MACİT
Head of Strategy Development Department
gmacit@kgm.gov.tr
Tel.:+90(312)4498200

General Directorate of Turkish Highways
Ministry of Transport, Maritime Affairs and Communications