ROAD INFRASTRUCTURE
SAFETY MANAGEMENT ON
TURKISH HIGHWAYS

14 APRIL 2015
GENEVA
OUTLINE

1. GENERAL OVERVIEW of HIGHWAY NETWORK
2. ROAD SAFETY FIGURES
3. ROAD SAFETY ACTIONS
4. CASE STUDIES
GENERAL OVERVIEW of HIGHWAY NETWORK

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

Type: Village and Forest roads
Responsibility: Special Provincial Administration

Type: Urban roads
Responsibility: Municipal Authorities

The road network excluding urban roads is about 385,000 km in length.
Total road network is 66.035 km.
35.9% of total road network (23.716 km) is dual carriageway

- Total Asset Value: 70 Billion $
- Road Density: 50 km / 100 km² (Excl. Urban Roads)
- Motorway Density: 2.85/ 1000 km²

**HIGHWAY NETWORK**

- Provincial Roads: 32,473 km (49.2%)
- Motorways: 2,282 km (3.5%)
- State Roads: 31,280 km (47.4%)
Turkish Road Network under General Directorate of Turkish Highways’ responsibility.
VEHICLE & CAR OWNERSHIP

- Car ownership 127 cars per 1000 inhabitants is much lower than the EU and other developed countries.
- High potential for an increase in the number of vehicles per capita (compared to developed countries)

*IRF WORLD ROAD STATISTICS 50 TH YEAR ANNIVERSARY VOLUME 1 DATA 2000-2011*
In our highway network, the rate of heavy vehicle traffic volume is 27%.
90% increase in vehicle-km, 47% increase in ton-km, 63% increase in passenger-km in the period of 2003 & 2013
TRAFFIC VOLUME
Million Km (2003)

52,349
Total Vehicle-Km

TRAFFIC VOLUME
Million Km (2014)

102,990
Total Vehicle-Km
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Average</td>
<td>10 People</td>
</tr>
<tr>
<td>Monthly Average</td>
<td>307 People</td>
</tr>
<tr>
<td>In 2013</td>
<td>3,685 People</td>
</tr>
<tr>
<td>In last Decade</td>
<td>42,447 People</td>
</tr>
<tr>
<td>In last 30 years</td>
<td>385,000 People</td>
</tr>
</tbody>
</table>

were killed because of road accidents in Turkey

In 2013,

- more than 1,2 million accidents were reported.
- In these road accidents,
  - 3,685 people were killed and
  - 275 thousand people were injured.
### ROAD ACCIDENT STATISTICS 2013

<table>
<thead>
<tr>
<th>Category</th>
<th>TURKEY TOTAL</th>
<th>GDH NETWORK</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Accidents</td>
<td>1,207,354</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Number of Accidents with injuries and/or fatalities</td>
<td>161,306</td>
<td>47,407</td>
<td>29%</td>
</tr>
<tr>
<td>Number of Fatalities (scene of the accidents)</td>
<td>3,685</td>
<td>2,320</td>
<td>63%</td>
</tr>
<tr>
<td>Number of Injuries</td>
<td>274,829</td>
<td>102,509</td>
<td>37%</td>
</tr>
</tbody>
</table>

#### Number of Accidents

- **GDH Network:** 29%
- **Other:** 71%

#### Number of Deaths

- **GDH Network:** 63%
- **Other:** 37%
Turkey has achieved substantial reductions in road crash fatalities over the last 25 years, and has reached 1970’s level despite a 120 % increase in population and a rapid increase in registered motor vehicles from 370 thousand to 18.8 million.
While there has been a measurable decrease in death on Turkish roads in last 12 years, there has been slower national progress in reducing the number of serious injuries.

Includes road traffic accidents in responsibility area of traffic police and gendarmerie.

* Total Vehicle-Km of Motorways, State Roads, Provincial Roads only.

** 2013 statistics
Turkey’s fatality rate stands at 87 deaths per 1,000,000 people in 2000 and 51 deaths per 1,000,000 people in 2012, while the best performing countries (United Kingdom, Sweden and the Netherlands) have achieved rates below 40.
Between 2003 & 2013, we achieved **59%** reduction in fatality rate per 100 Million VehicleKm.

**TARGET 2023**
Reduce Fatality Rate below 1 for 100 Million Vehicle x Km
STRATEGIC PLAN OF TURKISH HIGHWAYS 2012-2016

GOAL 1: Mobility

GOAL 2: Road Traffic Safety

GOAL 3: Organizational Excellence & Continuous Development

GOAL 4: Preserve & Develop Highway Network

GOAL 5: Sensitive to Human Being & Environmental Stewardship

Road & Traffic Safety is one of the 5 Goals of STRATEGIC PLAN OF TURKISH HIGHWAYS 2012-2016
MISSION:

➢ In a framework of authority entrusted with rule to the institution, to contribute to the social and economic development of the country through planning, designing, constructing, maintaining and operating in every climate conditions of motorways, state and provincial roads, meeting road users’ demand, compromising with other transportation systems in a way of providing safe, comfortable, environmentally sensitive roads, meeting contemporary needs.
VISION: To be an institution

- providing safe and comfortable transport service,
- using advanced technologies,
- preparing road projects sensitive to environment and human in a base of reality,
- having a strong budget,
- having smiling personnel and modern management
NATIONAL ROAD PROGRAM

ACCORDING TO 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

- The National Road Safety vision 2023 aims to set out a path for national action on reducing fatal and serious injury crashes on our roads
SAFE SYSTEM APPROACH

- In order to increase the safety of our national network and also for our Vision 2023, we pay attention to application of ‘Safe System Approach’.
- The strategy is founded on the internationally recognized ‘Safe System’ approach formally endorsed by the OECD.

This approach:
- accepts that road users will make mistakes and therefore the whole system needs to be more forgiving of those errors.
- consists of 4 module: Safe Roads, Safe Vehicles, Safe Speeds, Safe Road Use

Safe Roads are today’s subject and those we are responsible for.
## ROAD SAFETY ACTIONS

### MAJOR NATIONAL & INTERNATIONAL ROAD SAFETY ACTIONS

<table>
<thead>
<tr>
<th>KITGI (Highway Improvement and Traffic Safety) Project</th>
<th>PARTNERS for ROADS</th>
<th>TINA Turkey and 2008/96/EC Directive</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Financed by World Bank between 1996-2002.</td>
<td>✓ Sustainable road design</td>
<td>✓ Turkey identified 15.200 km of road network which will be considered as a part of TEN-T Backbone Network following the approval of EU membership of Turkey.</td>
</tr>
<tr>
<td>✓ Purpose is to reduce the number of accidents on high risk roads, black spots that result in injury and death</td>
<td>✓ Safe road design</td>
<td>✓ Network Needs analysis of this network was made for EU-Turkey membership negotiations</td>
</tr>
<tr>
<td>✓ General Directorate of Highways (KGM) is responsible for “safer roads” section</td>
<td>✓ Roundabouts, road infrastructure safety control,</td>
<td>✓ Turkey has responsibility as a candidate country for the application of directive called as “Road Infrastructure Traffic Safety Management – 2008/96/EC</td>
</tr>
<tr>
<td>✓ Road Safety Audit Handbook was published in 2006</td>
<td>✓ City passings and ring roads applications,</td>
<td>✓ Our institutional expectations about increasing road safety and application of mentioned directive on our road network are defined in 2012-2016 Strategic Plan.</td>
</tr>
</tbody>
</table>
ROAD SAFETY ACTIONS

2008/96/EC Directive

SHORT TERM (1 YEAR)

• In order to define the effectiveness of these improvements and also RSIA (comply with 2008/96/EC): Before-After Analyses of road safety improvements

• Proper & consistent accident data acquisition

• RSA and RSI Training and RSA certification of the staff

• Training of related softwares
ROAD SAFETY ACTIONS

2008/96/EC Directive

MID TERM (3 YEARS)

• Training of relevant staff by RSA & RSI trained and RSA Certificated personnel.
• Reorganization of related divisions
• Clear definition of jurisdiction and responsibilities of Road Safety Auditors and Road Safety Inspectors
• Road Safety Inspections in prioritized road sections which have high accident risk.
ROAD SAFETY ACTIONS

2008/96/EC Directive

LONG TERM (5 YEARS)

• Constitute RSA certification center to train Auditors.

• Administrative, legal and technical regulations for Monitoring and assessment of road safety actions

• RSIA, RSA, RSI and NSM in TEN-T network

• RSA of new road structures in Planning and Project stages

• Periodic Road Safety Inspections
## ROAD SAFETY ACTIONS

### Results Of Black Spots Eradication (KITGI Project)

<table>
<thead>
<tr>
<th>NAME OF THE WORK</th>
<th>NUMBER OF SPOTS</th>
<th>TOTAL COST ($)</th>
<th>RATE OF DECREASE %</th>
<th>BENEFIT/COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACCIDENT</td>
<td>DEATH</td>
</tr>
<tr>
<td>INTERSECTION ARRANGEMENT</td>
<td>74</td>
<td>9,558,858</td>
<td>75</td>
<td>94</td>
</tr>
<tr>
<td>INTERSECTION ARRANGEMENT &amp; SIGNALIZATION</td>
<td>15</td>
<td>981,039</td>
<td>23</td>
<td>52</td>
</tr>
<tr>
<td>CURVE IMPROVEMENT</td>
<td>20</td>
<td>1,774,292</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>BRIDGE IMPROVEMENT</td>
<td>1</td>
<td>78,759</td>
<td>88</td>
<td>100</td>
</tr>
<tr>
<td>CONSTRUCTION OF DUAL CARRIAGeways</td>
<td>7</td>
<td>1,282,079</td>
<td>77</td>
<td>92</td>
</tr>
<tr>
<td>CLIMBING LANE CONSTRUCTION</td>
<td>6</td>
<td>924,001</td>
<td>68</td>
<td>97</td>
</tr>
<tr>
<td>CONSTRUCTION OF UNDERPASS AND OVERPASS</td>
<td>12</td>
<td>506,038</td>
<td>66</td>
<td>93</td>
</tr>
<tr>
<td>INSTALLATION OF SIGNALIZATION</td>
<td>44</td>
<td>1,010,328</td>
<td>72</td>
<td>89</td>
</tr>
<tr>
<td>GUARDRAIL INSTALLATION</td>
<td>22</td>
<td>1,570,412</td>
<td>81</td>
<td>83</td>
</tr>
<tr>
<td>TOTAL</td>
<td>201</td>
<td>17,685,806</td>
<td>75</td>
<td>90</td>
</tr>
</tbody>
</table>

Average 75% decrease in number of accidents, 90% decrease in number of person killed in the sections of the project applied
Road safety improvements derive from two broad categories of infrastructure investment:

**Expenditure on safety-focused road works:**
This includes black spot remedial programs, but also covers route-based (mass-action) treatments to improve the risk profile of larger sections of the network. Such investment is associated with high benefit-cost ratios in general and high safety returns in particular.

**Investment in new road construction and major upgrades:**
This activity is primarily associated with mobility and economic performance benefits, and also increasing road safety as an ancillary benefit.
SAFETY & ROAD INFRASTRUCTURE

RSIA; as part of the new road design

Black spot eradication on high risk road sections

RSA & RSI; carried out during planning, design and operation

Measures to improve the Safety of Road Infrastructure

Upgrading of single carriageway roads into dual carriageway

Comprehensive road maintenance works:
- installation of road sign & signals and guardrail, routine and preventive maintenance
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 17.615 km including motorways since 2003.
SAFETY & ROAD INFRASTRUCTURE

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Projects</th>
<th>Total Length of Projects (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>720</td>
<td>1832</td>
</tr>
<tr>
<td>2013</td>
<td>770</td>
<td>2237</td>
</tr>
<tr>
<td>2014</td>
<td>1574</td>
<td>2065</td>
</tr>
</tbody>
</table>

Before Auditing
Inappropriate Road Connection

After Auditing
PERCENTAGE OF GDP USED FOR HIGHWAY INFRASTRUCTURE INVESTMENT

Million USD

- **2006**: 3.134
- **2007**: 3.519
- **2008**: 5.510
- **2009**: 5.386
- **2010**: 7.710
- **2011**: 8.163
- **2012**: 7.154
- **2013**: 7.383

GDP (%)

- **2006**: 0.60%
- **2007**: 0.53%
- **2008**: 0.74%
- **2009**: 0.87%
- **2010**: 1.05%
- **2011**: 1.06%
- **2012**: 0.91%
- **2013**: 0.90%

INVESTMENT (Million $)
• Total national expenditure on specific safety-focused road works is approximately **170 million Euro** in 2014

• This includes expenditure on black spot remedial treatments, as well as more broadly based safety-focused activities such as route risk assessment and treatment, road safety audits and treatments applied over large sections of road networks.

• While safety-targeted spending has increased substantially over recent years but it still represents small share of the total investment in Turkish’s road infrastructure.

In 2014:

- Eridication of 101 Accident Black Spots
- 25 Million M² horizontal signing
- 156 Thousand M² vertical signing
- 1.345 km of guardrail construction
ACCIDENT BLACK SPOTS
ACCIDENT BLACK SPOTS
ACCIDENT SPOTS AT A JUNCTION
ACCIDENT BLACK SPOTS DATABASE

Number of accidents per 1 km- (can be used for prioritization of road safety works)
ACCIDENT BLACK SPOTS DATABASE
Number of accidents /1 million vehicle-km (can be used for prioritization of road safety works)
Warning for tired or careless drivers

**RUMBLE STRIPS**

- **Purpose**
  - Shoulder Rumble Strips
  - Median Rumble Strips

**Target**

- **To Decrease Rollover and Head on Collision types of Accidents**
- **40% decrease in these types of accidents**
RUN AWAY TRUCK RAMP

- Run Away Truck Ramp is a traffic device that enables vehicles that are having braking problems to safely stop.

- The deep filling allows the truck's momentum to be dissipated in a controlled and relatively harmless way, allowing the operator to stop it safely.
RUN AWAY TRUCK RAMP

Length of the ramp: 340 m
Length of arrester bed: 195 m
Width of the ramp: 14.4 m

Width of the Gravel bed: 6 m
Slope of the ramp: 11%
Depth of the gravel bed: 7.5-60 cm
## RUN AWAY TRUCK RAMP

<table>
<thead>
<tr>
<th>Case</th>
<th>Date</th>
<th>Vehicle Type</th>
<th>Speed</th>
<th>Weight (tonne)</th>
<th>Stop Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.9.2012</td>
<td>Articulated Truck</td>
<td>40 km/h</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>5.9.2012</td>
<td>Truck</td>
<td>102 km/h</td>
<td>15</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>19.10.2012</td>
<td>Truck</td>
<td>117 km/h</td>
<td>15</td>
<td>115</td>
</tr>
<tr>
<td>4</td>
<td>31.10.2012</td>
<td>LPG Truck</td>
<td>104 km/h</td>
<td>19</td>
<td>175</td>
</tr>
<tr>
<td>5</td>
<td>6.11.2012</td>
<td>Truck</td>
<td>93 km/h</td>
<td>15</td>
<td>140</td>
</tr>
</tbody>
</table>
RUN AWAY TRUCK RAMP
THANK YOU VERY MUCH FOR YOUR ATTENTION