

# GOVERNMENT STATUS REPORT OF REPUBLIC OF KOREA

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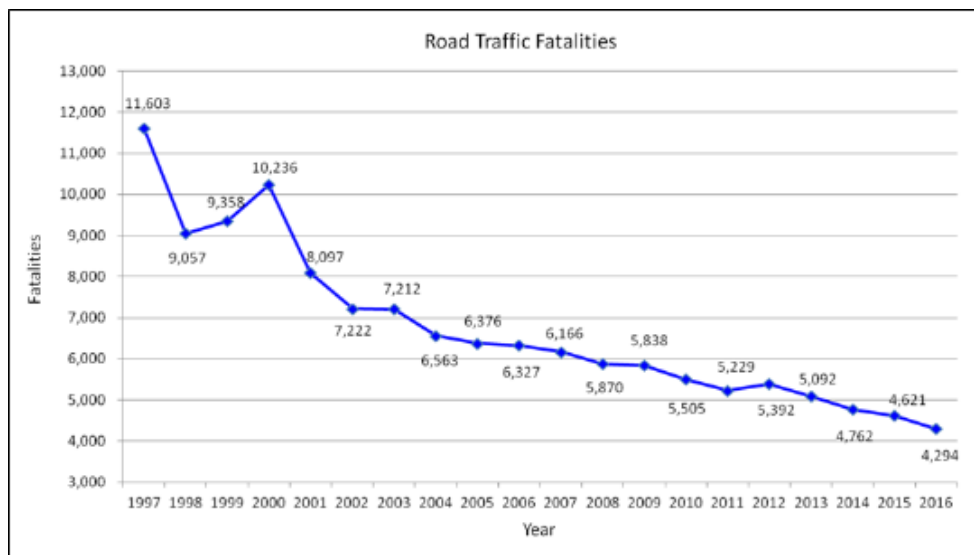
## FATALITIES IN ROAD TRAFFIC ACCIDENTS

### Analysis of road traffic accidents statistics

The efforts led by the Government of the Republic of Korea to reduce the fatalities and road traffic accidents played a major role in decreasing the fatality rate in road traffic accidents. In the past 5 years (2012-2016) the fatalities from road traffic accidents continued to decrease due to the implementation of the 7th transportation safety master plan. Table 1 and Figure 1 show that the number of fatalities from road traffic accidents was decreased by 17.9 % from 5,229 deaths in 2011 to 4,294 deaths in 2016. Even though the fatality rate was decreased below 10 deaths in 100,000 populations since 2014, the rate is still twice as high as those of countries with good road traffic safety records. The number of vehicle registered has increased from 18.44 million in 2011 to 20.99 million with an annual rate 3.3 %. On the other hand the fatalities have decreased with an annual rate of 3.9 %.

**Table 1.**  
**Total fatalities and fatalities per 100,000 (unit: death)**

Year	2011	2012	2013	2014	2015	2016
Total Fatalities	5,229	5,392	5,092	4,762	4,621	4,294
Fatalities per 100,000	10.5	10.8	10.1	9.4	9.1	8.5



**Figure 1. Road traffic fatalities**

To improve national road safety the 8th transportation safety master plan was established and will be implemented in the next 5 years (2017-2021). The goal is to decrease the number of fatalities of road traffic accidents to be below 2,800 by 2021. To reduce the pedestrian fatalities which accounts for 38% of the total fatalities, the road traffic environment will be improved to pedestrian-friendly environment and the pedestrian protection regulations will be strictly enforced. In addition, various measures will be carried out to cope with the increase in accidents associated with older drivers; the period to renew drivers' licenses of the advanced age will be adjusted; the management of older drivers with geriatric illness will be revised; the aptitude tests for older commercial drivers will be strengthened.

The major tasks in the road safety of the 8th transportation safety master plan are as follows;

- A. Road uses: the reduction of pedestrian fatalities by 40 %; the strengthening of safety management of older drivers such as the implementation of preventive measures tailored for older drivers-involved traffic accidents and the improvement of older drivers' driving performance
- B. Road environments: the reduction of accident severity by speed enforcement; the intensive management of risks in the roads prone to accidents
- C. Advanced Vehicle Safety: Active prevention of traffic accidents with the application of advanced vehicle safety features; Rapid response to the future transportation environment such as autonomous vehicles
- D. Safety management system: the strengthening of safety management of commercial vehicles; the improvement in the legal system for the strengthening of transportation safety; the strengthening of roles and responsibilities of local governments enforcing road safety

### **The 2nd vehicle policy master plan**

In 2016 the 2nd vehicle policy master plan was established due to the necessity of strategy reestablishment to reflect the changes in vehicle policy and technologies since the 1st vehicle policy master plan (2011-2016). To improve vehicle safety and to protect people from traffic accidents, the implementation direction of vehicle safety and management policy was proposed to cope with the change in vehicle policy environments and new technologies in the next 5 years (2017-2021). The plan has several purposes, for example the directives of vehicle research and development for improving safety and the international harmonization policy of vehicle technical regulations to timely reflect international regulations to domestic regulations. In addition the strategy and detailed tasks were prepared to secure international competitiveness and to provide convenient and reliable vehicle service to people.

The major tasks in the 2nd vehicle policy master plan are following;

- A. The strengthening of vehicle safety and international cooperation: reorganize the vehicle safety regulation system; strengthen vehicle safety; assist the promotion and sales of advanced vehicle safety features; new periodic inspection of in-use vehicles with advanced vehicle safety features; strengthen international vehicle regulation harmonization and international cooperation
- B. The improvement of vehicle service platform for vehicles lifetime: improve the vehicle license plate in quantity and quality; create the reasonable vehicle maintenance service culture; enlarge the vehicle aftermarket such and tuning and replacement parts; establish the transparent system of used vehicle trade; Revitalize the recycle and reuse industry of end-of-life vehicles
- C. The strengthening of consumers' rights: improve the vehicle recall system and quality control system; improve the mutual aid business system; rationalize the liability insurance system; strengthen the aid to traffic accident victims
- D. The establishment of vehicle operational environment for future vehicles: assist the deployment of autonomous vehicles; create the environments for eco-friendly vehicles; provide the future mobility service; create the transport network based on vehicles
- E. The establishment of a sustainable vehicle policy making system: establish the system to utilize big data based on vehicle statistics; improve the vehicle regulatory system; foster vehicle experts for the era of future vehicles

### **INTERNATIONAL HARMONIZATION ACTIVITIES**

The Republic of Korea, a contracting party to 1958 Agreement and 1998 Agreement, have been harmonizing domestic vehicle safety regulations with UN Regulations and UN Global Technical Regulations (GTR) under

UN/ECE/WP.29. This section introduces what Korean Government is carrying out regarding international harmonization.

### Research on international harmonization

The harmonization of domestic vehicle safety regulations has been carried out according to the annual plan of Table 2. In 2015 researches on brake lining, wheels of passenger vehicles, installation of lighting equipment of motorcycles, electromagnetic compatibility have been completed. In 2016 researches on eight subjects, such as camera monitor system, brake lining, seatbelt reminder, have been completed. In 2016 eight regulations have been studied, and 75 subjects will be completed among the target of 85 subjects by the end of 2017.

**Table 2.**  
**Harmonization rate and number of research subjects**

Year	2013	2014	2015	2016	2017 (planned)
Harmonization Rate (%)	65.9	71.8	78.8	88.2	95.3
Number of Research Subjects (cumulative)	4 (56)	5 (61)	6 (67)	8 (75)	4 (81)

In recent two years the following domestic vehicle safety regulations are harmonized with UN Regulations and UN GTR.

2015: UN GTR11 (Engine emissions for non-road machinery)

2016: UN R18 (Protection against unauthorized use), UN R27 (Advance warning triangles), UN R36 (Construction of public service vehicles (space for fire extinguisher)), UN R66 (Strength of the superstructure if large passenger vehicles), UN R69 (Rear marking plates for slow moving vehicles), UN R75 (Pneumatic tyres (moped, motorcycle)), UN R81 (Rear-view mirrors (motorcycle)), UN R90 (Replacement brake lining assemblies), UN R121 (Identification of controls & tell-tales), UN R124 (Passenger car wheel), UN R130 (Lane departure warning system), UN R131 (Advanced emergency braking system)

### Seatbelt reminder

In the existing UN R16 and domestic vehicle safety regulation, the seatbelt reminder was mandatory for front row seats. The seatbelt wearing rate in the second or rearward row seats was as low as 16.2 % in 2013. This minimal (or dismal) rate made the seatbelt reminder mandatory for all seats to increase the seatbelt wearing rate. The Republic of Korea proposed the mandatory installation of seatbelt reminder for all seats of passenger vehicles at the WP.29/GRSP in December, 2014. Afterward the Republic of Korea submitted an amendment proposal in collaboration of European Union, France and Japan. The 169th session of the World Forum approved the amendment in November, 2016. It will be effective from September 2019 in Korea in the hope that the safety of all passengers will be improved drastically.

### Amendment proposal of fire resistance of rechargeable electric energy storage system (REESS)

As electric vehicles are widely accepted in the world vehicle market, it became necessary to strengthen the safety of rechargeable electric energy storage system in an electric vehicle. In 2012 the Republic of Korea proposed a new test method of fire resistance for REESS at the GTR electric vehicle safety informal working group. From 2013 to 2016 ROK conducted various comparative studies between a proposal and the existing test procedures. The study results showed that the repeatability, reproducibility and reliability of a proposal have been improved. The new test procedure was adopted as an alternative to the existing regulation in March, 2016.

### Participation in developing safety regulations of autonomous vehicles

The World Forum for Harmonization of Vehicle Regulations (WP.29) established the automatically commanded steering function informal working group in 2015 to develop safety regulations regarding autonomous vehicles. Korea proposed an amendment to existing domestic regulations for autonomous vehicles and wished to share the study results with international partners. The amendment proposals were mainly focused on the maximum speed, advanced driver assistance system.

### **Amendment to pedestrian protection for active hood**

The pedestrian fatalities, a leading fatality, account for 38 % in Korea. It needs a serious counter measure to deal with the reduction of pedestrian fatalities. In recent years vehicles with an active hood system have been introduced in the market. However, the existing UN R127 and UN GTR9 hinder the introduction of an active hood because those regulations lack the test procedures for active hood systems. In 2015 Korea proposed to amend the existing regulations in agreement with international partners and International Organization of Motor Vehicle Manufacturers (OICA). The study was carried to clarify the conditions of an analysis model for head impact duration and to develop a test method for active hood systems in 2016. Korea became a leading contracting party for amending the existing regulations in 2016. This group actively is working on developing a new test procedure for active hood systems.

## **AMENDMENTS OF DOMESTIC VEHICLE SAFETY REGULATIONS**

### **Advanced driver assistance systems in heavy-duty commercial vehicles**

Mandatory installation of advanced driver assistance systems in heavy-duty commercial vehicles has been studied under the project, 'Development of safety assessment of advanced driver assistance systems' since 2012, because advanced driver assistance systems were proven to be effective to prevent the traffic accidents of heavy-duty commercial vehicles. In 2015 the amendments to existing vehicle safety regulations were proposed for lane departure warning system, automatic emergency braking system. The mandatory installation of advanced driver assistance systems is in progress of legislation.

In 2016 a tragic accident in a tunnel happened in a tunnel, with 4 death and 38 injured. This accident prompted rapid legislation and counter measures. The effectiveness analysis and legislation of advanced driver assistance systems were prepared in 2016. Mandatory installation of advanced driver assistance systems in heavy-duty commercial vehicles was promulgated and effective in January 2017 for new model vehicles, and will be effective for current model buses in 2018 and current model trucks in 2019.

### **Emergency exit in case of fire, immersion and other situation**

In 2016 the door of a chartered bus caught fire and stuck at an accident on the express way. This accident resulted in 10 deaths. The existing regulation on the emergency exit in the bus requires one or more emergency exit. The windows are an alternative to the emergency exit. However, this requirement is not adequate and poses a high risk in fire or under water. In 2016 the amendment was promulgated to require one or more emergency exit (at least one emergency exit for buses with 30 or less passengers, more than one emergency exit for buses with 31 or more passengers) and emergency escape devices from 3 to 11 according to the number of passengers in January, 2017 to strengthen the safety of bus passengers. This requirement will be effective for new buses with 16 or more passengers in 2019.



**Figure 2. Escape simulation through emergency exits of large bus**

## **Camera monitor system**

The UN R46 on rear view mirrors was amended to introduce a camera monitor system as an alternative to rear view mirrors in November, 2015. The domestic vehicle safety regulation on rear view mirrors was harmonized to accept a camera monitor system in January, 2017. This amendment enabled vehicle manufacturers to develop and apply advanced safety systems to improve vehicle safety by amending current vehicle safety regulations impeding new vehicle safety features and innovative vehicle design.

## **NEW CAR ASSESSMENT PROGRAM**

There are many changes in the assessed items and contents of the new car assessment program in 2017. The assessment of pedestrian protection is strengthened and more advanced driver assistance systems will be assessed. The point system to each assessed field is modified also. Sixty points are allocated to crashworthiness, 25 to pedestrian protection, 15 to active safety systems (additional merit of 2 points). The points allocated to crashworthiness was reduced by 5 points, on the other hand the points to active safety systems were increased by 5 points.

### **Strengthening the assessment for vulnerable road users**

Traffic accidents involved with children account for 5.4 %, and those involved with female drivers account for 40.6 %. However the current new car assessment program is focused on the protection of male drivers based on the physical characteristics of an average male driver. In the past two years (2014-2015) the study on protection of vulnerable road users, such as children and small female drivers was carried to justify (support) the grounds for protection tailored to children and small female drivers. Dummies of 6 and 10 years old will be boarded in the events of off-set frontal collision test, side impact test and chest compression will be measured. Due to the increase of female drivers the assessment procedure was developed for female drivers based on the physical characteristics of female drivers, apart from the male-oriented assessment procedures.

### **Assessment of advance driver assistance systems (ADAS)**

The efforts Advance driver assistance systems are effective for preventing accidents so that the plan for the assessment procedures of advance driver assistance systems was established as a mid-to-long term project of the development of new assessment procedures. Since 2014 a lane departure warning system, forward collision warning system, and a seatbelt reminder have been assessed. From 2017 thirteen ADAS will be assessed, including a lane keeping assistance system, an automatic emergency brake system, an intelligent speed assistance, a blind spot detection system and a rear cross traffic alert system.

### **Study on the new car assessment program**

The following fields in the new car assessment program will be studied to continuously improve the program in 2017.

- Establish the mid-to-long term plan to improve the program
- Develop assessment procedure of AEBS for pedestrian during the night
- Develop assessment procedure of lighting equipment for night visibility
- Baseline study for developing assessment procedure of vehicle-to-vehicle crash
- Develop assessment procedure of female passengers in the 2nd row seats in a passenger vehicle
- Analysis of crashworthiness effectiveness

## **RESEARCH AND DEVELOPMENT**

### **Establishment of the 2nd vehicle policy master plan**

The 1st vehicle policy master plan (2011-2016) was established and implemented. The 2nd vehicle policy master plan was established in 2016, taken into consideration of the changes in vehicle environments and technologies. The

Ministry of Land, Infrastructure and Transport (MOLIT) established the road map of the National Vehicle Policy. In the road map 5 main strategic projects and 18 detailed tasks were developed. Those projects will be implemented for the next 5 years, including five main strategies such as, "A leading role in international harmonization", "Create a vehicle operational environment for future advanced safety vehicles".

Through these projects MOLIT will lay a firm ground for a mid-to-long term policies, research and development projects, an international harmonization center, wide application of advanced driver assistance system, and expansion of transportation safety business with Korea Transportation Safety Authority / Korea Automobile Testing & Research Institute (TS/KATRI). In addition the MOLIT will strengthen the research and development of future vehicles and the cooperation network for the commercialization of autonomous vehicles to promote the research and development of future vehicle safety, including autonomous vehicles and environment-friendly vehicles. Also the MOLIT will lay a foundation for the system to respond to the new climate regime, and strongly support a infrastructure system reformation for environment-friendly vehicles.

### **Safety of micro mobility (L7 category)**

Recently single passenger personal mobility as environment-friendly and short-distance transporter became available to the public. The current vehicle classification system, which lacks safety requirements and vehicle category, poses an impediment to the introduction of micro mobility. To resolve this issue the study on micro mobility is being carried out from December of 2015 to June of 2017. The main research subjects are classification, safety regulations, cost/benefit analysis and assessment of 4 fields (general safety, active safety, passive safety and performance). In the proposal micro mobility will be classified in the micro mobility to be included in the current category of light vehicles. For the safety requirement proposal, 29 current safety standards will be applied and 23 new safety standards only for micro mobility will be introduced. In the near future crashworthiness of micro mobility including frontal collision test, will be reviewed.

### **Approval of real world test of autonomous vehicle and public access to the ITS proving ground**

To lift the regulatory barrier to development of autonomous vehicles a temporary approval of real world road test for autonomous vehicles was introduced in February 2016. Seventeen approvals were granted up to March 2017. The approval system helps the vehicle manufacturers to expedite development of autonomous vehicle technology by accumulating '26,000 km without accidents in the real world' and verifies the safe operation of autonomous vehicles in the real world. ITS proving ground is accessible by universities with limited resources. From 2015 TS/KATRI lowered its fees of proving ground by 50% for universities. From 2016 universities are able to use proving ground free of charge in the weekend. In addition TS/KATRI offers state-of-art proving ground, such as, DGPS, traffic signal system to universities at no cost. These efforts by TS/KATRI help universities to develop autonomous vehicle technology and to train experts for the future.

\* Intelligent Transport Systems proving ground: 364,000 square meters

### **Expansion of research and development**

The assessment procedures of core technologies in autonomous vehicles have been developed under the project of 'Development of assessment procedures for advanced safety vehicles (2015-2017)' since 2009 (Table 3). The test bed is under construction to assess three core safety fields of autonomous vehicles. The test bed (K-city) infrastructures is under construction and the assessment procedure of autonomous vehicle safety is being developed under the Government' policy of 'Early commercialization of autonomous vehicles by 2020'.

**Research on autonomous vehicles** The planning research was carried out for "Development of assessment procedures of autonomous vehicle safety and construction of test bed" from August 2105 to May 2016. Core safety fields, such as operation, failures and internal communication security, of autonomous vehicles are being studied from June 2016 to December 2018. The planning research was carried out for "Development of assessment procedures of driver's taking back control of autonomous vehicle and Improvement of social receptivity of autonomous vehicle" (August 2015-May 2016). The main research is under way from April 2017 to December 2020.

**Table 3.**  
**Road map of assessment procedures for advanced safety vehicles research**

Year	2009	1st Phase	2012	2nd Phase	2015	3rd Phase	2017
Passive Safety			protection of rear seat passengers		protection of far side passenger		
	active headrest		active pedestrian protection		pedestrian leg protection		
	pole-side impact		roll-over safety				
Active Safety	Passenger vehicle ACC /commercial vehicle AEBS		lane keeping system				
	lane departure warning system		automatic emergency braking system		motorcycle AEBS		
		blind spot detection		ESC of commercial vehicle			
	AFLS			safety assessment of active safety vehicles		crashworthiness of active safety vehicles	
				cybersecurity		EMC of advanced safety vehicles	
				alcohol interlock			
						safety of autonomous vehicle with ADAS	
Social Infrastructure	e-call		Injury DB (1st phase)		In-depth accident analysis DB (2nd phase)		
			cost/benefit analysis of ADAS				
				power of electric vehicle			

**Construction of test bed (K-city) for autonomous vehicle** In the TS/KATRI proving ground (364,000 square meters) a experimental city integrated with communication system is being constructed for testing autonomous vehicles. The world-class experimental city suitable for testing autonomous vehicles is under construction to secure the assessment procedures of three core safety fields, such as operation and failures, cyber security and driver's taking back control, of autonomous vehicles. By October 2017 a motorway system dedicated for vehicles will be completed. By December 2018 the rest of roads (downtown, rural roads and community roads) will be completed.



**Figure 3. Test bed (K-City) for autonomous vehicles**

**Improvement of commercial vehicle safety** Various measures of management of commercial drivers and transport companies have been implemented to improve commercial vehicle safety. In December 2012 a digital tachograph became mandatory in heavy-duty commercial vehicles. The data from digital tachographs will be utilized for improving safety. A lane departure warning system and an automatic emergency braking system became mandatory in buses longer than 11 meters and heavy-duty trucks with 20 or more tons GVW in January, 2017. The Ministry provides subsidy owners of heavy-duty commercial vehicles for retrofitting LDWS and FCWS since September 2016. This subsidy will be increased to have more vehicles equipped with advanced driver assistance systems.

## CONCLUSION

The Korean Government keep pace with the development of new safety technology in the future transport environment to reduce traffic accident fatalities through preventive measures and autonomous vehicles like application of advanced driver assistance systems as a main task of vehicle safety improvement. The legislation system of vehicle safety regulations will be revised to improve transparency and predictability. The ministry will strongly support international harmonization activities and make advanced driver assistance systems available as much as possible. International cooperation will be strengthened. Furthermore the Ministry will take every effort to create the operational environment amicable for future advanced safety vehicles.

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