Drowsy Driving Countermeasures on Expressways in KOREA

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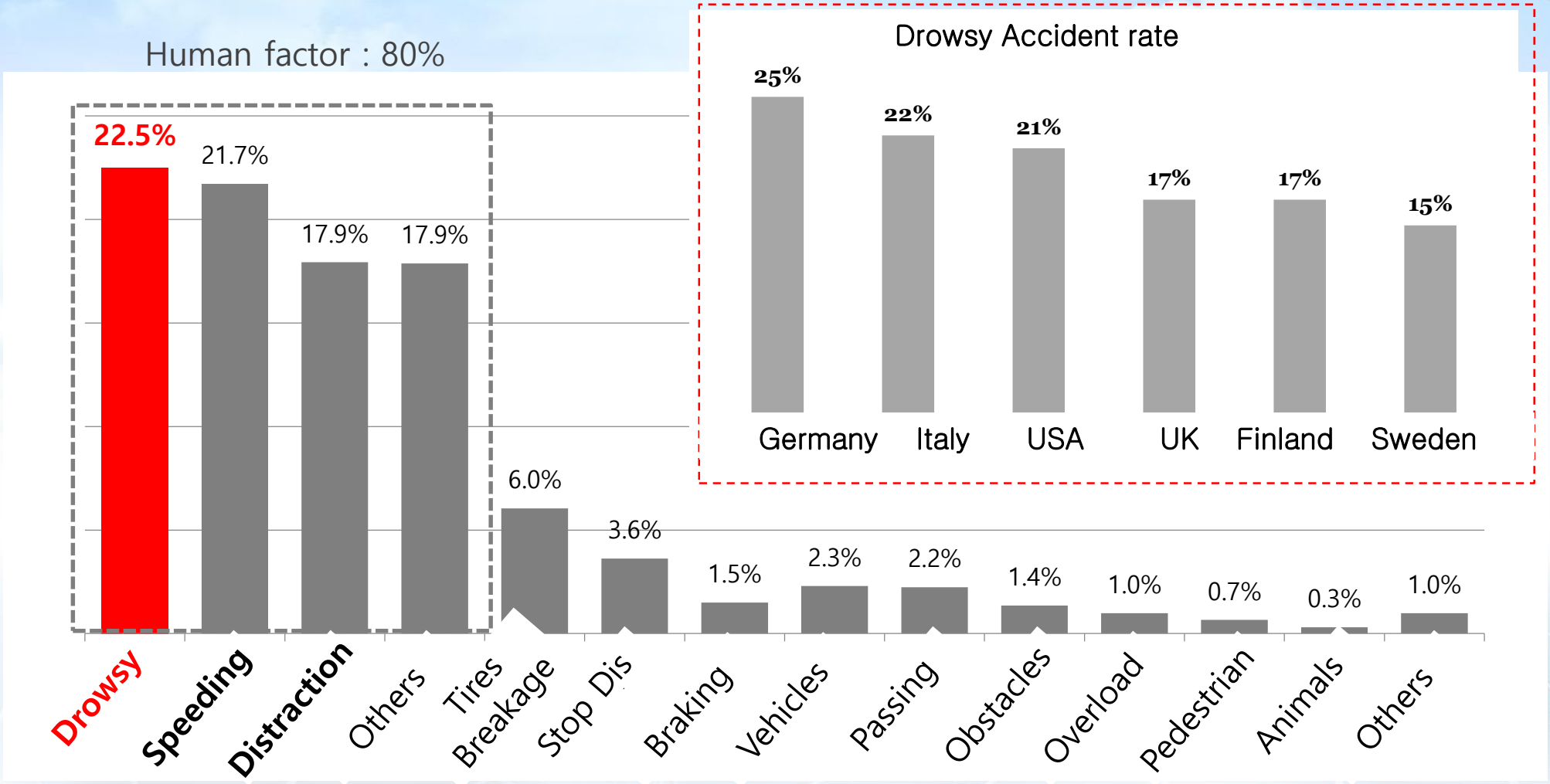
Causes For Traffic Accidents



Drowsy Driving

- How Big is the problem of Drowsy Driving?

  Drowsy driving related accidents are on the increase

  - England—About 20%; 30% on some roads
  - Australia—Between 15-20% of all crashes
  - New Zealand—13% of fatal crashes
  - Germany—35% of fatal motorway crashes
  - France—About 10%

The Washington Post

FRIDAY, SEPTEMBER 19, 1997

Drowsy Driver Gets Five-Year Sentence

Judge Sends Message After Reckless Act Killed Two in Pr. William

By Justin Blum
Washington Post Staff Writer

Neal Edward Semich was feeling drowsy as he drove his Dodge sedan to a business meeting in February. He opened up a vent to stay alert.

But Semich, 35, of Fredericksburg, Va., dozed off anyway. He crossed a double yellow line on Route 28 in Prince William County, startling an oncoming driver who lost control of his car and struck another vehicle. Two people died in the crash.

Semich drove away, later saying he was unaware he had caused the accident.

Yesterday in Manassas, as Semich begged for leniency and choked backed tears, Prince William Circuit Court Judge Richard B. Potter sentenced him to five years in prison.

The judge said he was exceeding state sentencing guidelines, which recommend a maximum term of six months, because of the nature of the crime and to send a message.

"If you're tired and falling asleep as you drive, you need to get off the road," Potter said. For drivers who may consider getting on the road when they're drowsy, he said, "the lesson from this case is you go to jail."

Semich, an electrical engineer for the Navy, had pleaded guilty in June to two counts of reckless driving and one felony hit-and-run.

See DRIVER, A14, Col. 1

FILE PHOTO/PRINCE WILLIAM POLICE

Neal Edward Semich, seeking leniency, said he has sleep apnea.

- What are the Characteristics of Drowsy Driving Crashes?

In Korea, drowsy driving is not punished for violation of the traffic regulations

Recently there have been legislative efforts to reduce the number of drowsy drivers on the road

In united states, when the driver involved in a fatal accident without sleep for 24 consecutive, he was sentenced five-year

Drowsy drivers are going to be punished when they cause fatal accidents

Distracted Driving

- Attention dispersion behavior

- Traces, avoidance of danger
  - Some arousal

- No traces, No skid mark
  - Complete carelessness

- Sleeplessness for 18 hours = a blood-alcohol level 0.05%

※ doubled reaction time, suspension of license

- Sleeplessness for 24 hours = a blood-alcohol level 0.15%

※ four times in reaction time , revocation of license

Road Safety Facilities to prevent Drowsy Driving

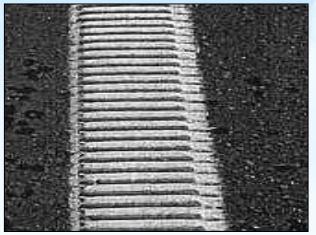
Warning by *sight*, *hearing*, *touch*

these measures have no effect

[Pinwheel]

[Baner]

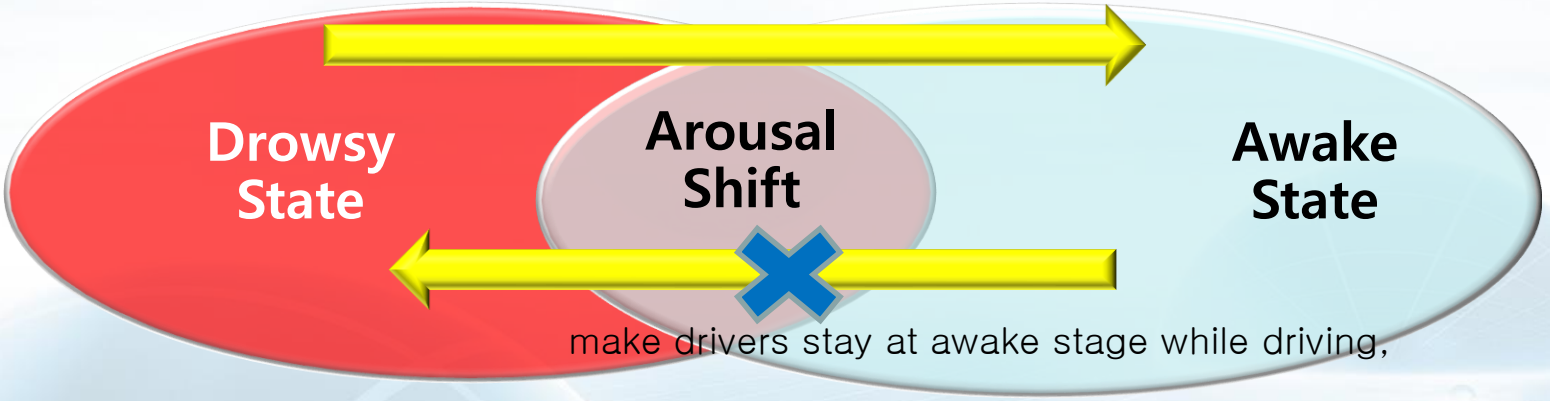
[Siren]



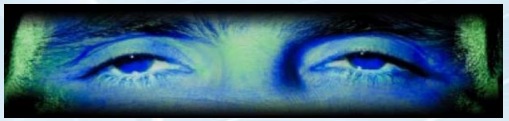
[Rublestrip]

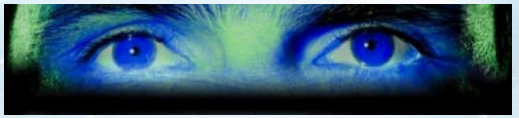
[Raised Marking]

wake drowsy drivers from drowsy state to awake state



make drivers stay at awake stage while driving,





100km/h (3seconds, 100m)

Pre-emptive Measures

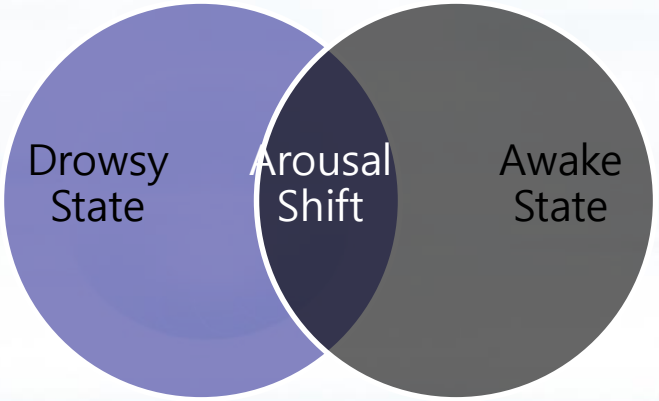
Pre-Emptive Measures to prevent Drowsy Driving, 4E

Engineering : Car company, Private sector

- V2V, V2I
- Gadget in vehicles
  - detect drowsy state and give warning

Education : Government

- White book for anti-drowsy
- Campaign



Environment : Road management

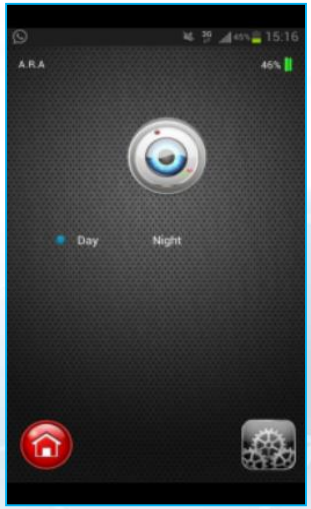
- Rest area

Enforcement : Government

- Punishment
- Driving hours limit for freight car

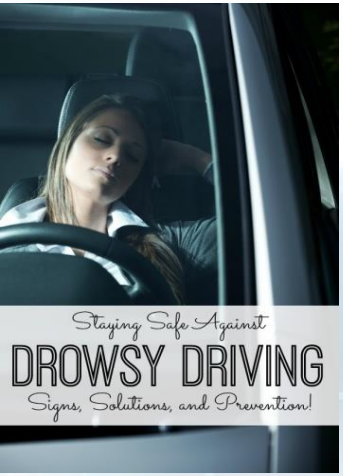
Engineering Technology

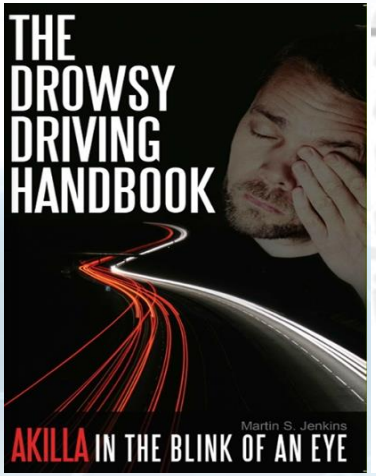
- Road-based : Warning of drowsy driving risk areas (installation of facilities, etc.)
- Driver-based : Detects drowsiness through driving behavior and pupil condition
- Vehicle-based : Detect/control drowsiness through front/rear distance and driving behavior
- **Others**: Device and app-based drowsiness detection/warning

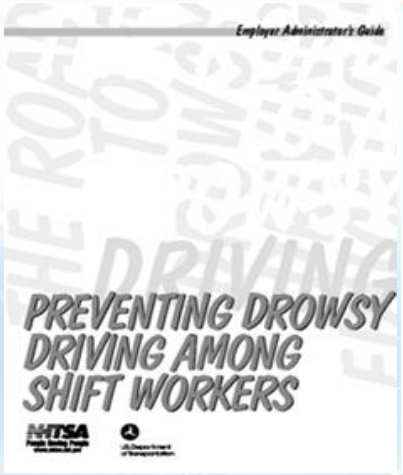


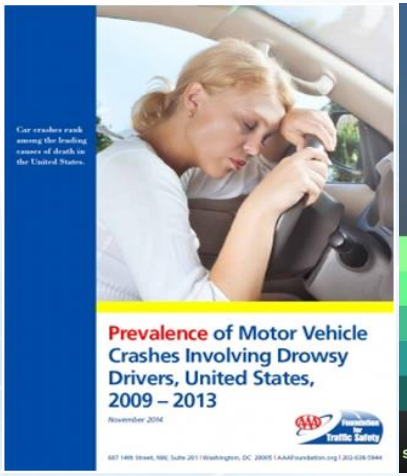
Education

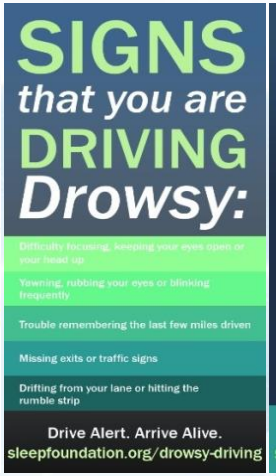
- Vulnerable group : the younger, male, shift worker









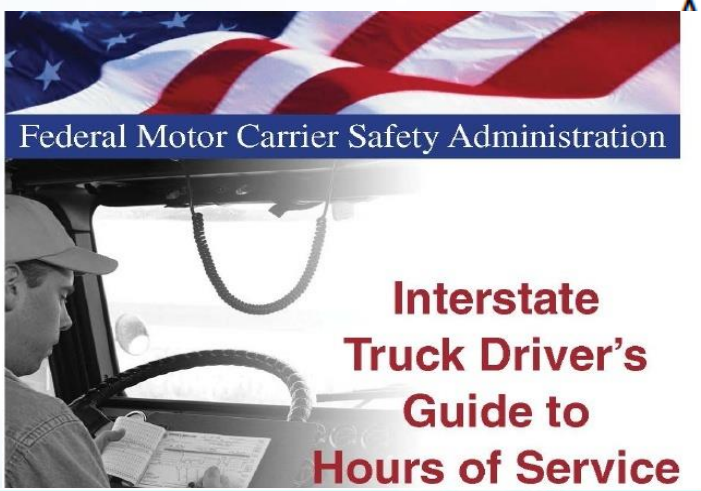


White book for anti-drowsy

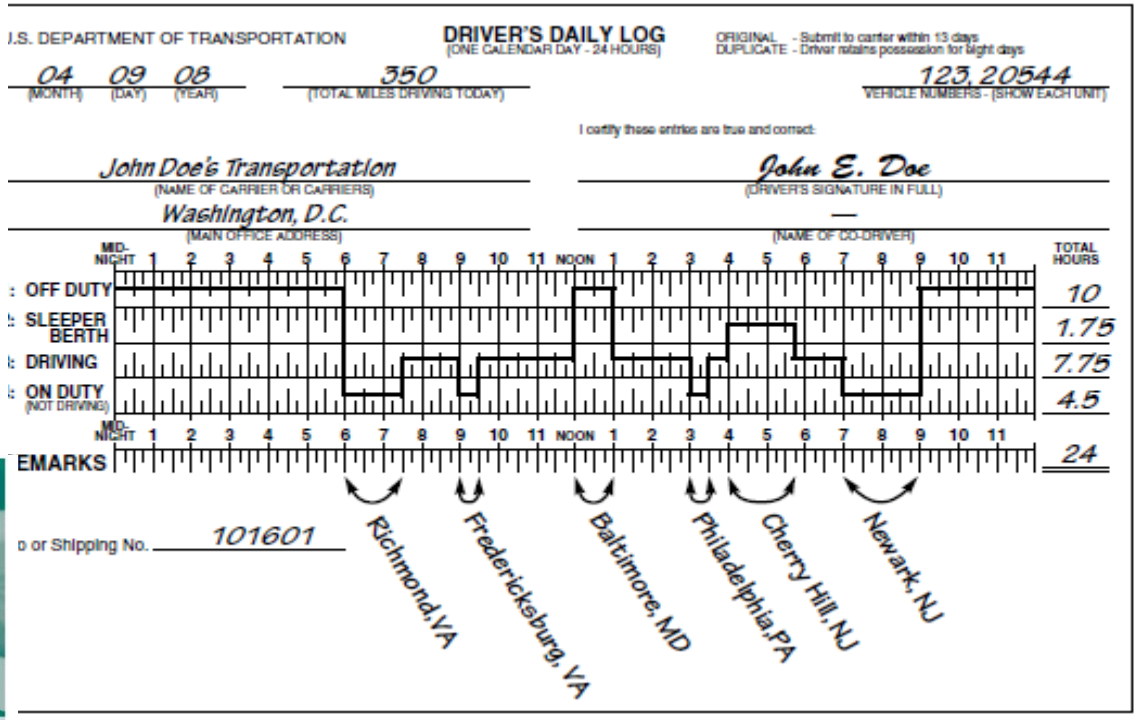
Enforcement

- “Maggie’s Law”(New Jersey, 2003)
- “Rob’s Law”(Massachusetts, 2005)

amount of driving hour a day and continuous driving time



Completed Log



Drowsy Driving Strategy

	[Existing]	[Implications and Directions for Improvement]
[How to apply]	Facility element centered	Human factor centered
[Response Case]	Sleep stage	Awakening/Transformation Stage
[Implementation Measures]	Stimulus centered	Inducing behavior change

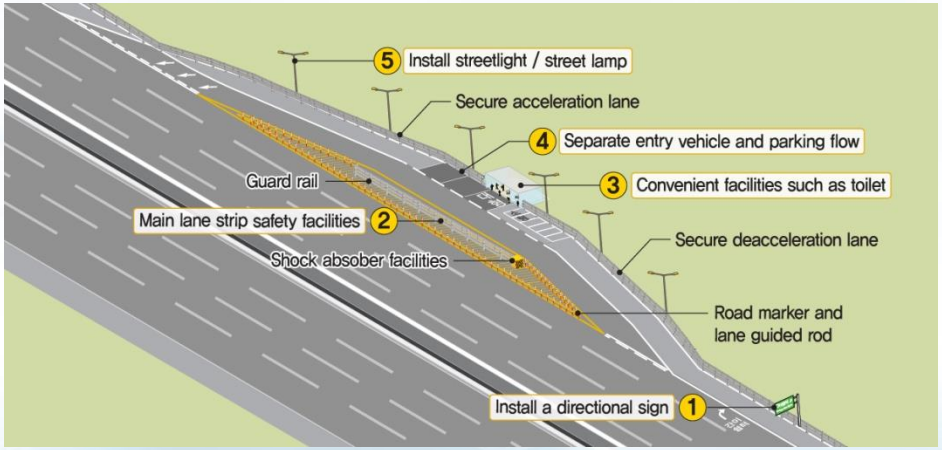
❖ Setting the direction of propulsion

A method to wake up from drowsiness → (A change of perspective) → A method to prevent drowsiness

Stimulus-Based Approach	Direction for domestic Improvement
Road Facilities (Rumble Strips) Non-standard Installations (e.g., Pinwheels) Auditory Alerts (e.g., Drowsiness Alarms)	Strategies to Encourage Increased Rest Improvement of Access to Rest Areas Establishment of Drowsiness Prevention Guidelines

Shelter (small-sized rest area) for drowsy drivers

- Installed on a section where the distance between rest areas exceeds 15km
- Amenities : Parking lots, Pergola, Benches, etc.
- 45% reduction in traffic accident caused by driver's drowsiness (340 -> 188)
- As of 2018, total of 218 shelters are in operation



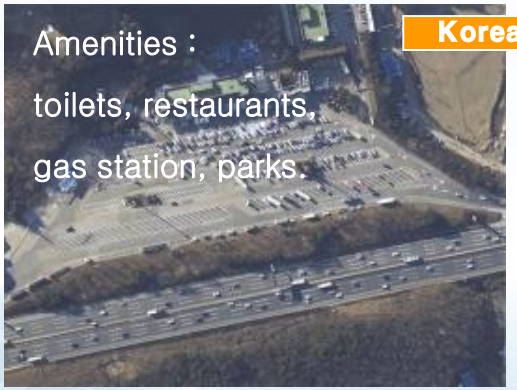
Sleeping Banner

Classification	2014 JUN~SEP	2015 JUN~SEP	Change
Total number of traffic accidents	798	679	-119
Total traffic fatalities	81	84	+3
Number of accidents due to drowsiness	155	123	-32
Number of deaths due to drowsy driving	24	23	-1
Fatality rate due to drowsy driving(%)	15	19	+4%

Classification	2015년								
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Total number of traffic accidents	229	191	217	213	203	170	177	160	172
Total traffic fatalities	15	12	19	14	16	23	21	20	20
Number of accidents due to drowsiness	31	46	32	33	40	37	22	31	33
Number of deaths due to drowsy driving	8	6	2	7	4	8	2	8	5
Fatality rate due to drowsy driving(%)	26	13	6	21	10	22	9	26	15

Rest Areas

completely separated from the main road



a new rest area, which located above the expressway in the air

In Korea, every 40km on expressway

there are some problems about the safety in our rest area

an access road to the rest area is a little short

Safety Problems in Rest Areas

For 3 years, 200 accidents at the rest area causing 15 fatalities

As a vehicle enters the rest area, a vehicle is supposed to start reducing its speed

And as it approaches the parking lot, its speed should be reduced down to 20km/h.

But most of the vehicles entering the rest area don't reduce their speed,

so the average measured speed is 40~50km/h

Safety Problems in Rest Areas

Overseas Case

✓Through channelization of entry part,

Separation of flow and parking compartments by vehicle type

Netherlands

Japan

✓ Depending on the site and the type of approach,

various rest area arrangements

Japan

UK

✓Installation of ***user-centered guidance systems and walking facilities***

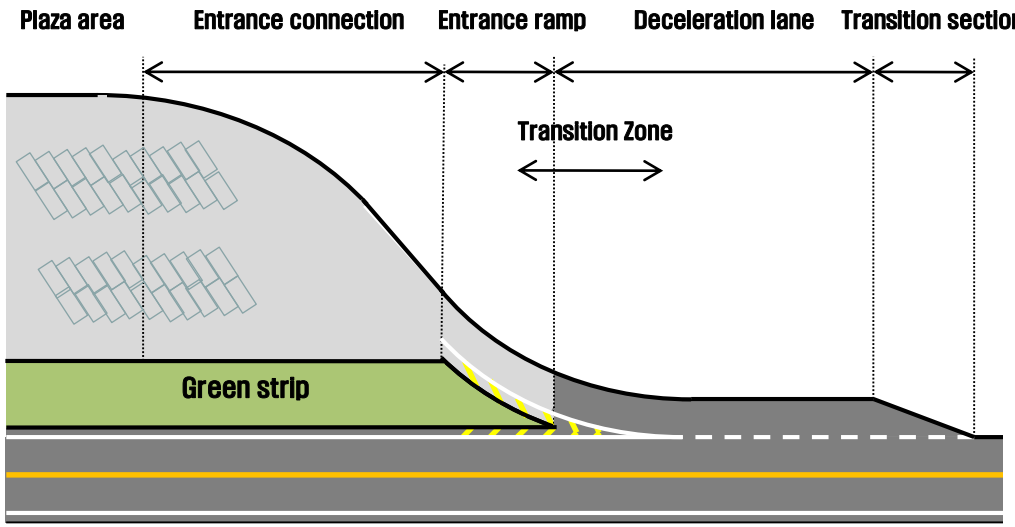
pedestrians road Shelter

empty car Information System

Parking lot sidewalk

Safety Problems in Rest Areas

Ramp Geometry



✓ Current Status length of rest area ramp

Classification		Not Installed	30m or less	30~60m	60~90m	90~120m	120~150m	150m or more	Total
Entrance ramp	Status(locations)	15	18	34	32	18	7	11	135
	Ratio(%)	11.1	13.3	25.2	23.7	13.3	5.2	8.1	100.0
Exit ramp	Status(locations)	8	15	55	19	14	10	14	135
	Ratio(%)	5.9	11.1	40.7	14.1	10.4	7.4	10.4	100.0

✓ Current Status installation angles of rest area ramp

Classification	Missing	Less than 5°	5° ~10°	10° ~15°	15° ~20°	20° and more	Total
Status(locations)	3	12	37	47	28	8	135
Ratio(%)	2.2	8.9	27.4	34.8	20.7	5.9	100.0

Safety Problems in Rest Areas

Entrance Connection of Plaza

✓ Installation type of separation facility at the point of Entrance connection

– Plaza-type connections(Type 1) without guidance facilities is the majority, about 110 locations(81.5%)

Classification	Type 1 : Absence of guidance facilities (Plaza type)	Type 2 : Installation of guidance facilities (Road marking guidance)	Type 3 : Installation of guidance facilities (Traffic island type)
			
locations (%)	110(81.5)	23(17.0)	2(1.5)

✓ Status of parking space installation at the Entrance connection

– 57 rest areas (42.2%) are operating with parking spaces installed within the connection area

⇒ *Parking raw linkage(35 locations, 25.9%)* ⇒ *Additional installation of separate parking spaces(22 locations, 16.3%)*

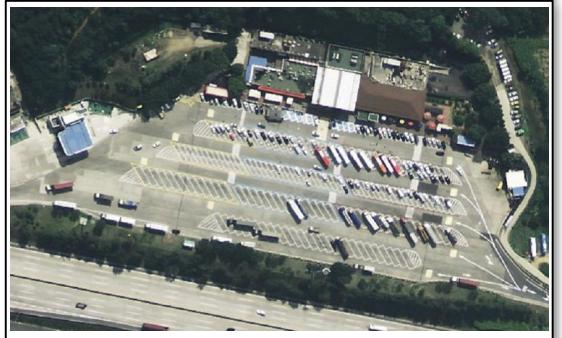
Classification	Type 1 : No parking space installed at the connection point	Type 2 : Installation of parking lot with connection section (Parking lot linked)	Type 3 : Installation of parking lot with connection section (Additional installation of separate parking space)
			
locations (%)	78(57.8)	35(25.9)	22(16.3)

Safety Problems in Rest Areas

Pedestrian Flow

- ✓ Indiscriminate pedestrian access to the entire rest area : conflict with vehicles passing through the parking lot, inconvenience to pedestrian
  - ⇒ It is necessary to minimize conflict points with vehicles by installing Pedestrian-Vehicle Separation and pedestrian guidance facilities
- ✓ Most of the parking plazas in domestic rest areas only install parking surface classification and crosswalk road markings by road markings
  - ⇒ Effective pedestrian guidance is not being implemented

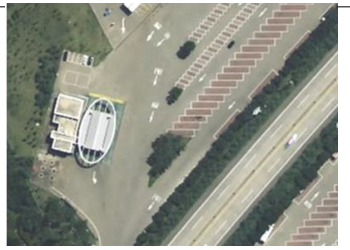
Domestic pedestrian facility installation type

Crosswalk pavement markings	Crosswalk in the form of a pedestrian walkway	Pedestrian facilities connected to sidewalks/green spaces
		
28 locations (17%)	24 locations (14%)	10 locations (6%)

Safety Problems in Rest Areas

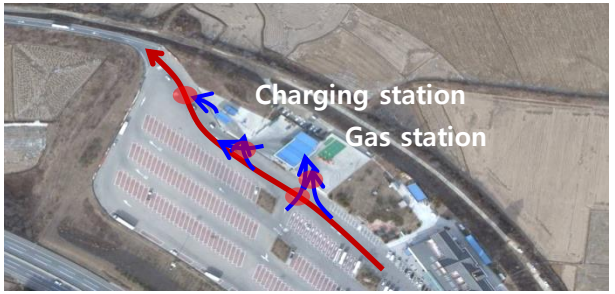
Exit connection

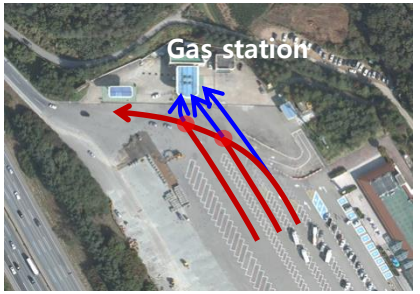
✓ 85 Plaza-type access points without guidance facilities, and 46 locations with a phased merging system using channelization facilities

Classification	Type 1 Plaza	Type 2 Route differentiation markings	Type 3 Lane + Channelization facility (Phased merging system))
			
Locations (%)	85(62.9)	4(3.0)	46(34.1)

✓ Most domestic rest areas have exit-type gas stations (159 locations, 98%)

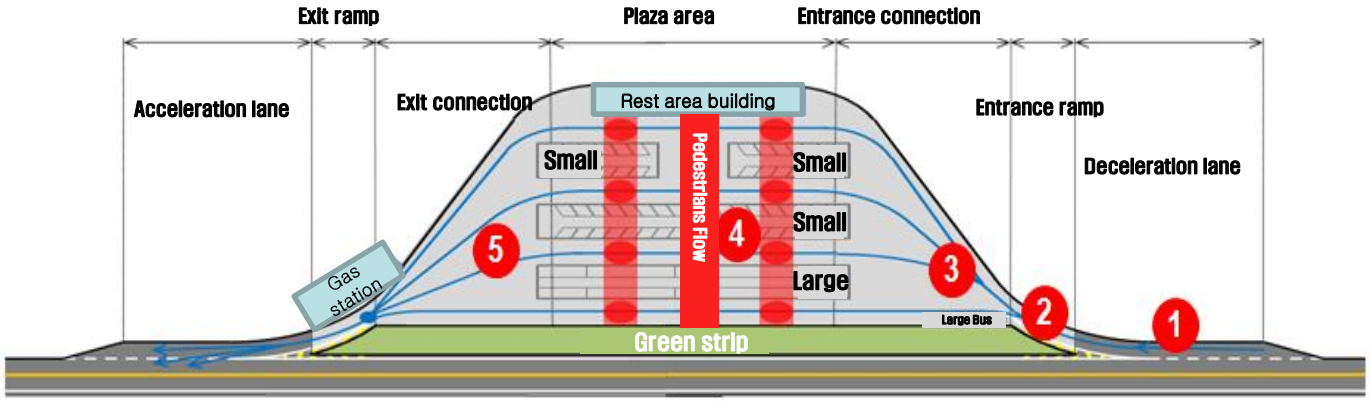
✓ Depending on the location of the gas station, unreasonable vehicle traffic patterns such as Crossing, Weaving, and driving in the opposite direction may occur.





Safety Problems in Rest Areas

Problem Analysis(Entrance connection)



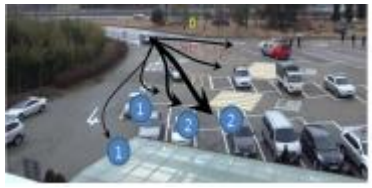
✓ Insufficient deceleration function of deceleration lane (①) and Entrance ramp (②) → Speeding when entering rest area

– On-site measurements show that most vehicles exceed the speed limit when passing through the entry nose section

⇒ Actual average driving speed (V) : 60 ~ 70km/h (design speed 40km/h)

✓ Unclear vehicle path at the Entrance connection(③) –> Abnormal driving path occurs

※ Driving behavior of entering vehicles at plaza-type connection without guidance facilities



- Route ① : normal entry through circular driving(70%)
- Route ② : Straight-line route passing through the center of the Entrance connection (30%)

Safety Problems in Rest Areas

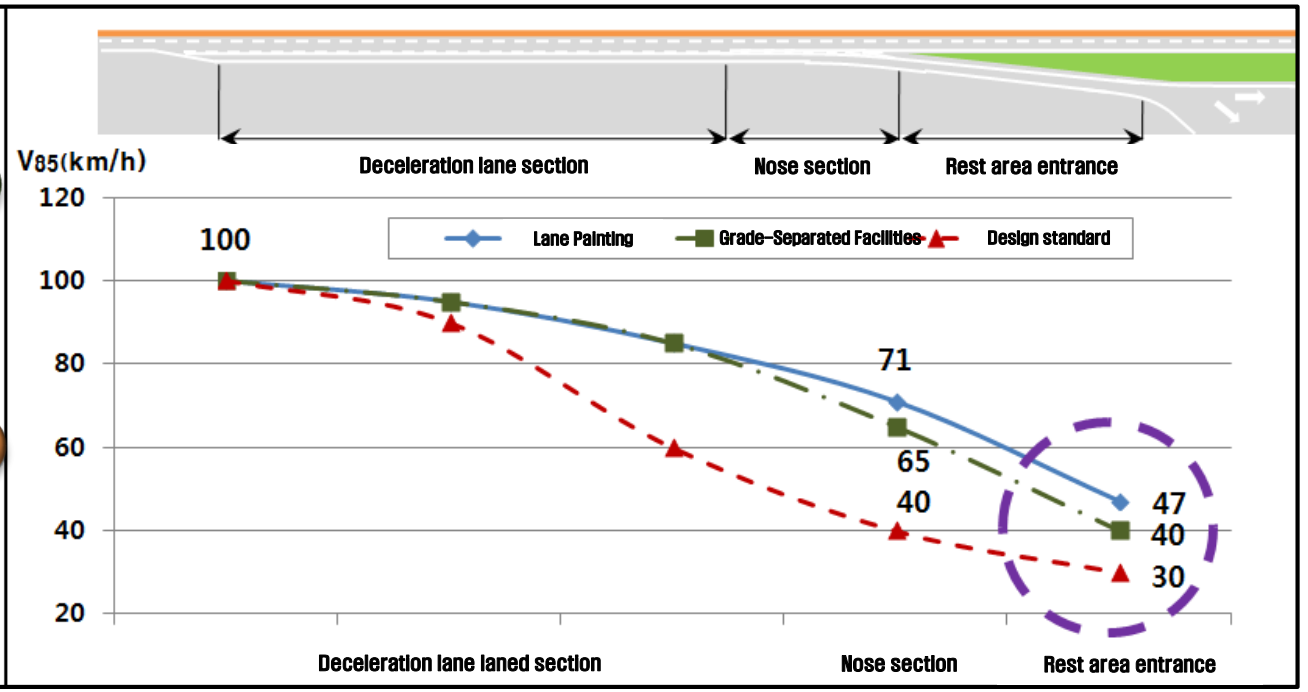
Problem Analysis(Entrance connection)

✓ At the rest area entrance, grade-separated facilities are installed to slow down vehicles and separate traffic flows by vehicle type and direction to guide driving paths

⇒ When installing a Grade-Separated Facilities at the entrance, the speed of entering the rest area is reduced and the separation of traffic lines is improved

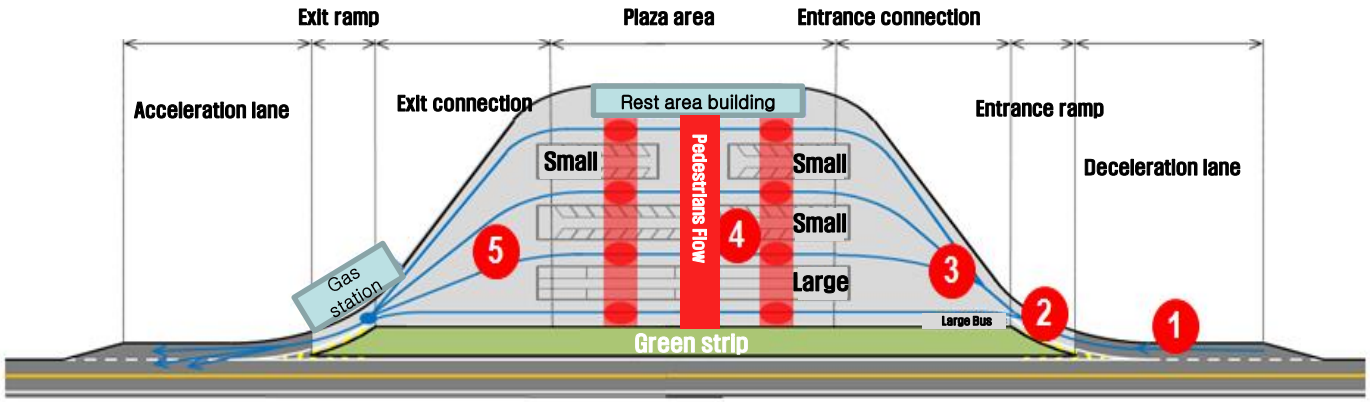
Before the installation of Grade-Separated Facilities

After the installation of Grade-Separated Facilities



Safety Problems in Rest Areas

Problem Analysis(Plaza area)



✓ Conflict between vehicles and pedestrians in the plaza area(④)

– It provides space rather than path, so it is impossible to predict the point of conflict

- If the parking aisle is wide, the vehicle's driving path becomes unpredictable.
- Pedestrian crossing points cannot be anticipated

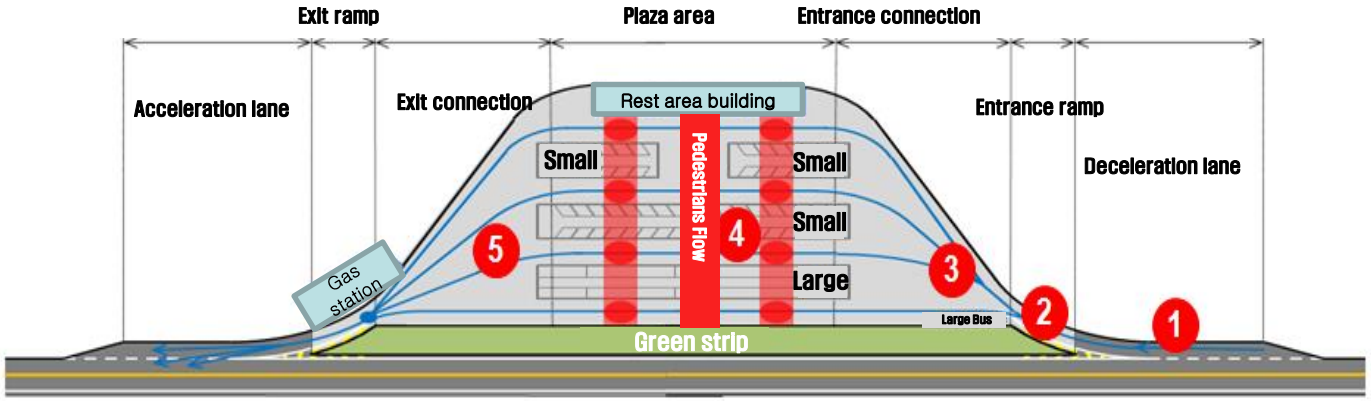
Direction for Improvement (Plaza area)

Painting of lane markings on the driving path to make the vehicle passage in the plaza area clear

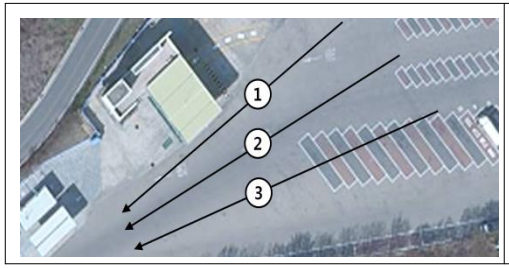
– Speed bumps and pedestrian pathways are installed to limit the driving speed within the plaza area to 20 km/h or less

Safety Problems in Rest Areas

Problem Analysis(Exit connection)



✓ At the exit connection (⑤), the exit traffic flow is unclear, leading to conflicts with refueling vehicles



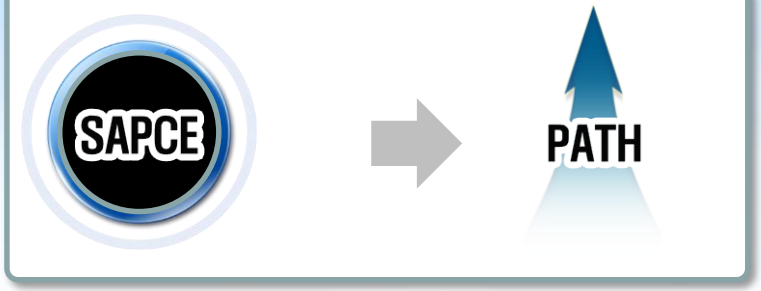
- Traffic flow ①, ②: Normal exit (70%)
- Traffic flow ③: Abnormal straight driving path (30%), cutting across empty parking spaces and passing through the center of the exit connection.

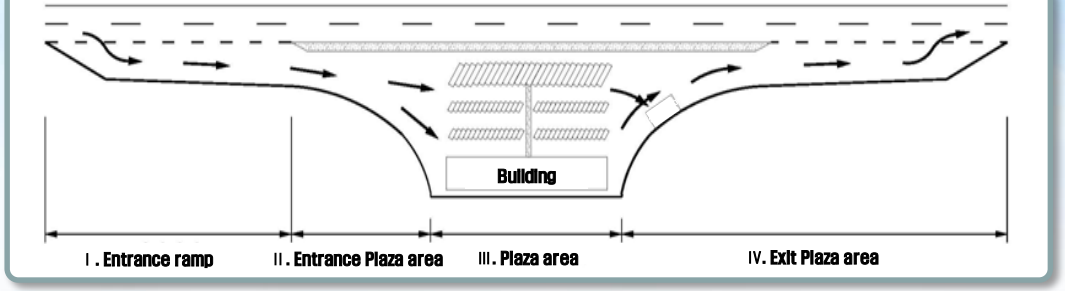
Direction for Improvement (Exit connection)

✓ Grade-separated channelization facilities are installed to guide phased merging based on vehicle paths and reduce the number of conflict points

Safety Problems in Rest Areas

Direction for Establishing Guidelines





Entrance Ramp Speed Reduction Measures	✓ Step-by-step speed reduction measures ✓ Implementation of safety facilities
Plaza Entrance Section Clarification of Vehicle Traffic Flow	✓ Systematic organization of entry vehicle paths ✓ Grade-separated channelization measures
Rest Area Plaza Section Improvement of Vehicle-Pedestrian Conflicts	✓ Pedestrian guidance facility measures ✓ Parking layout and parking space improvement measures ✓ Traffic flow improvement for buses and large vehicles
Rest Area Exit Section Reduction of Conflicts Between Exiting Vehicles	✓ Systematic organization of exit vehicle paths ✓ Reduction of conflicts with refueling vehicles

Safety Improvements in Rest Areas

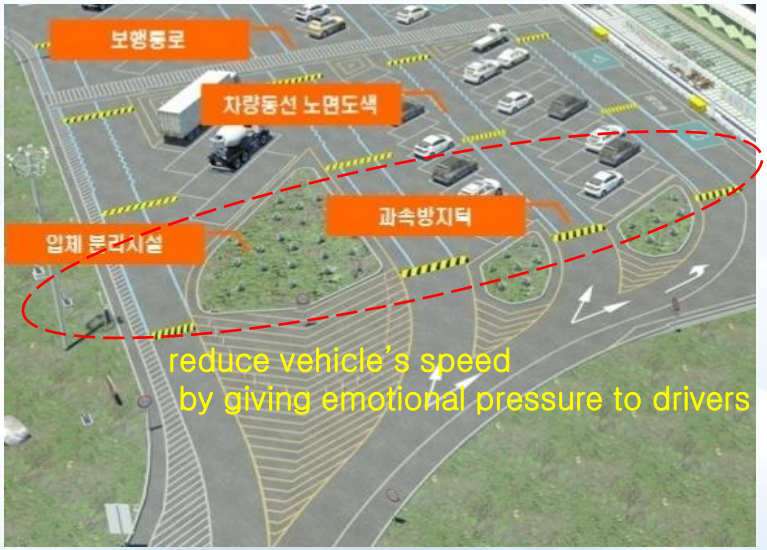
road markings on the surface to make drivers reduce their speed

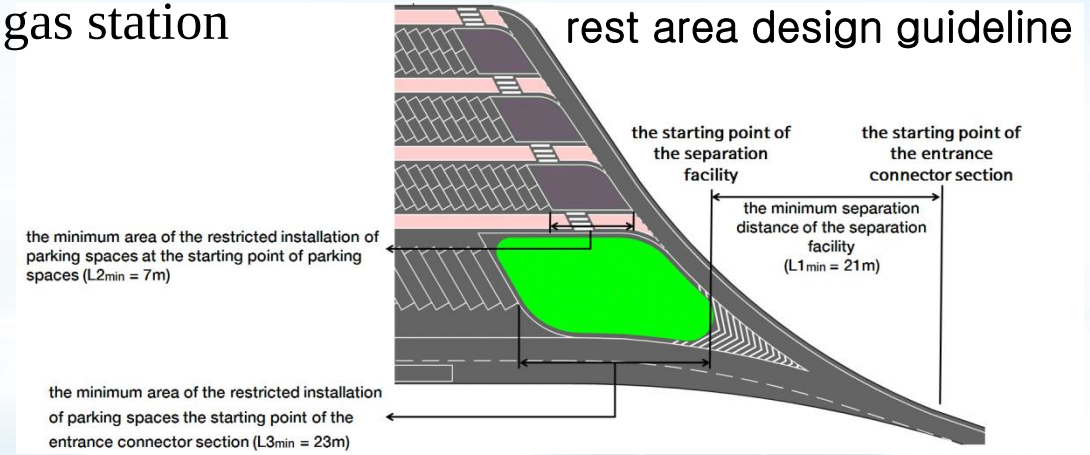
separate facilities such as traffic island to separate small vehicles and large vehicle.

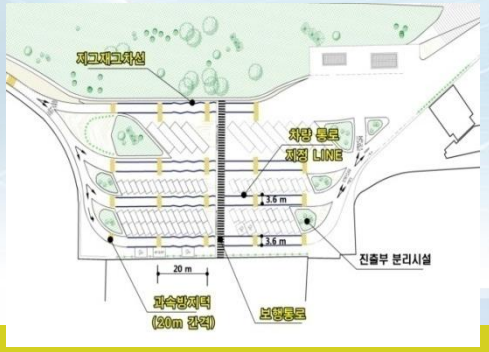
real humps and zigzag road markings at the constant interval

paths for pedestrians to ensure safe access into facilities.

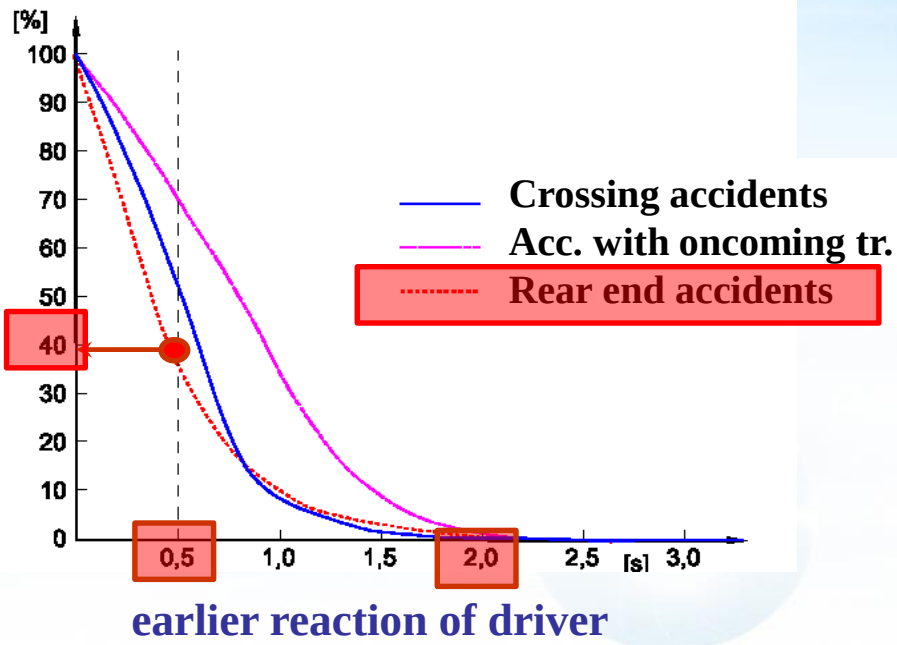
traffic islands assign paths for exit and gas station







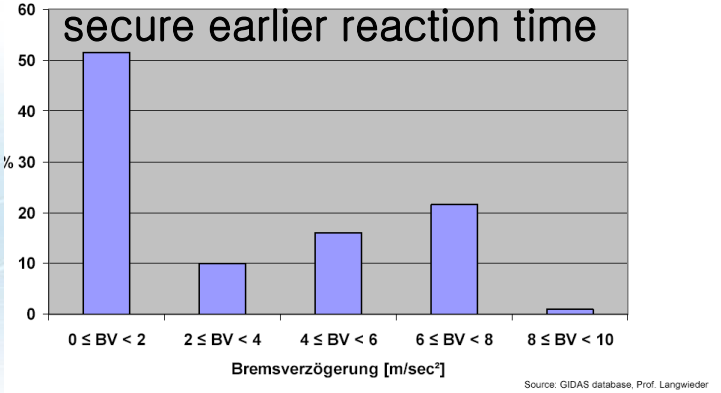
Earlier Reaction



A study from Enke shows that compared to crossing accidents and accidents with oncoming traffic, rear end accidents (or forward collision accidents) have the highest potential for driver warning systems.

If people would react 0.5s earlier, more than 60% of the accidents could be prevented.

A study from Langwieder, based on GIDAS, the German In-Depth Accident Study, analysed the braking behaviour before an accident happened. Result: more than 50% did not brake at all (0-2 m/s^2).



Advanced Driver Assistance System

Lane Departure Warning warns the drivers when breaching the lane marking

secure earlier reaction time

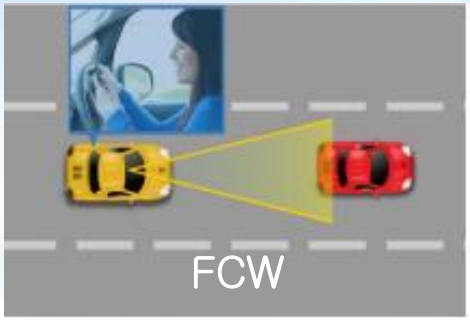
Forward Collision Warning warns the drivers if frontal collision is imminent

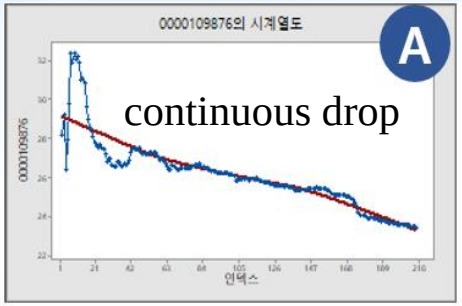
enough time for a drivers to react like braking to reduce speed

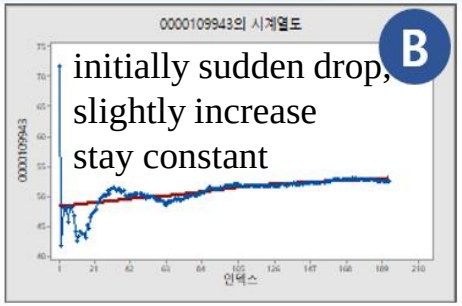
Effects of FCW, LDW

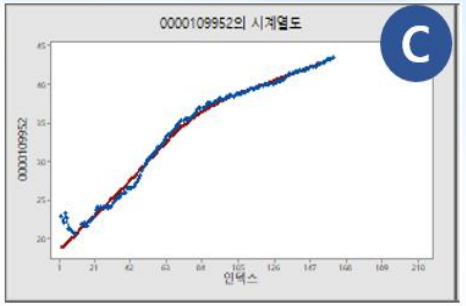
100 trucks were equipped with these system and all warning alarms were monitored for 6 months

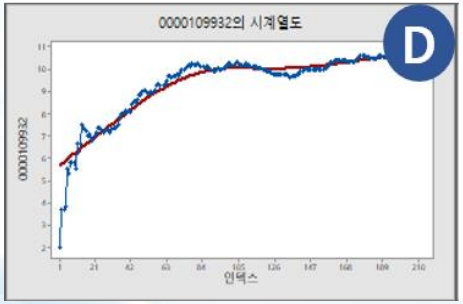
Frequency of warning alarms

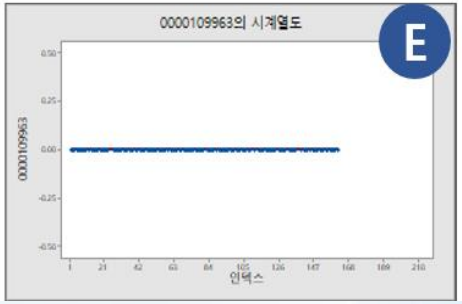


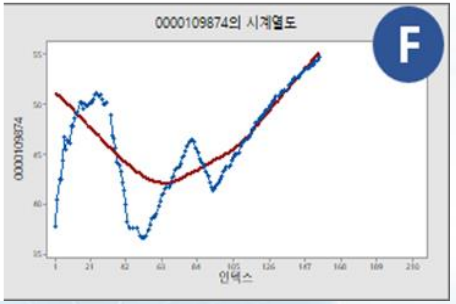












Types	Ⓐ		Ⓑ		Ⓒ		Ⓓ		Ⓔ		Ⓕ	
	#	%	#	%	#	%	#	%	#	%	#	%
FCW	1	1.3	35	45.5	6	7.8	27	35.1	8	10.4	0	0.0
LDW	4	5.2	27	35.1	12	15.6	26	33.8	6	7.8	2	2.6

one of the two may receive help from these LDW and FCW

☞ providing Lower insurance premiums

Measures to Prevent Drowsy Driving

- **Drowsy Driving Experience (recent 1 year) : 72.7%**
- **What happened owing to Drowsy Driving?**

60% were not free from risks

10% had an accident

Nearly run off road	Nearly collision	No Risk	Collision with facilities	Run off road	Collision with vehicles
47.7%	9.1%	33.1%	5.5%	1.3%	2.9%

drowsy driving accidents can increase at any time

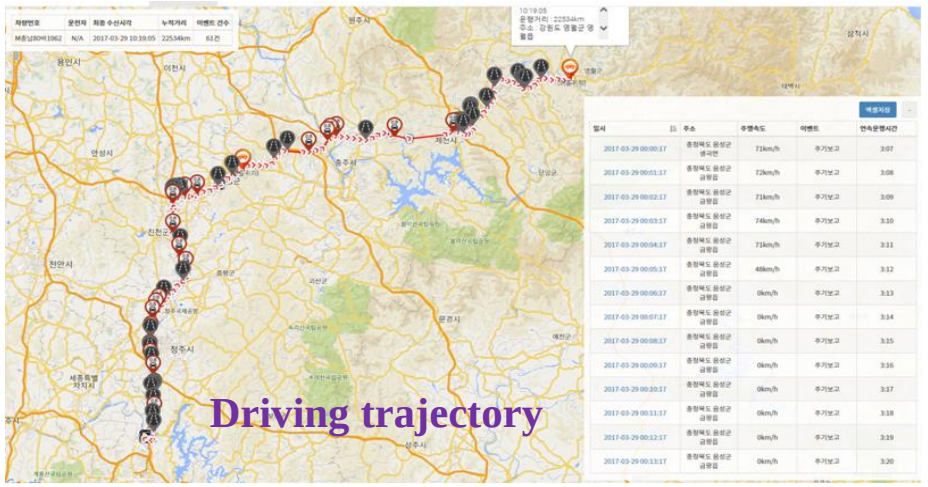
drowsy driving on the highway is much more dangerous than it appears

banners warning the danger of drowsy driving

rumble strips or road signs alerting the danger of drowsy driving

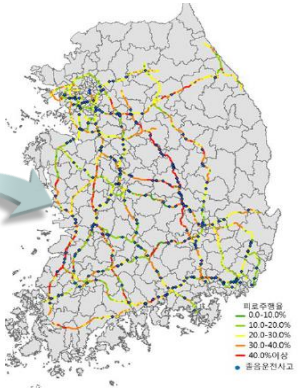
Risk of Drowsy Driving

Preemptive actions for sections with a high risk of drowsy driving accidents, if risk is shown in objective and quantitative figures



map

half a million drivers use mobile navigation apps in a day



GPS position of each vehicle every second

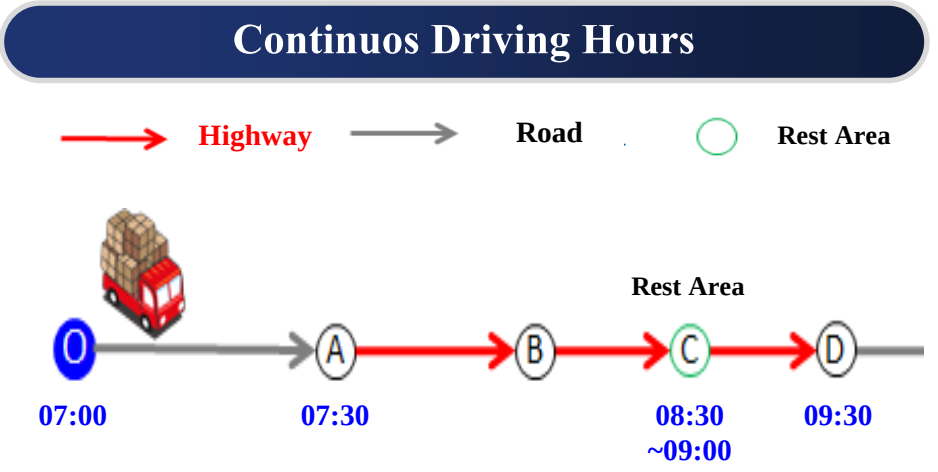
trajectory data is matched with the GIS map

how long the driver has been driving, how long he took a break at a rest area

Travel Path / Speed

Stay Time on Rest Area

Continuos Driving Hours



How many hours without rest on the expressway?

continuous driving time index

data on the time and number of vehicles driving more than two hours without rest

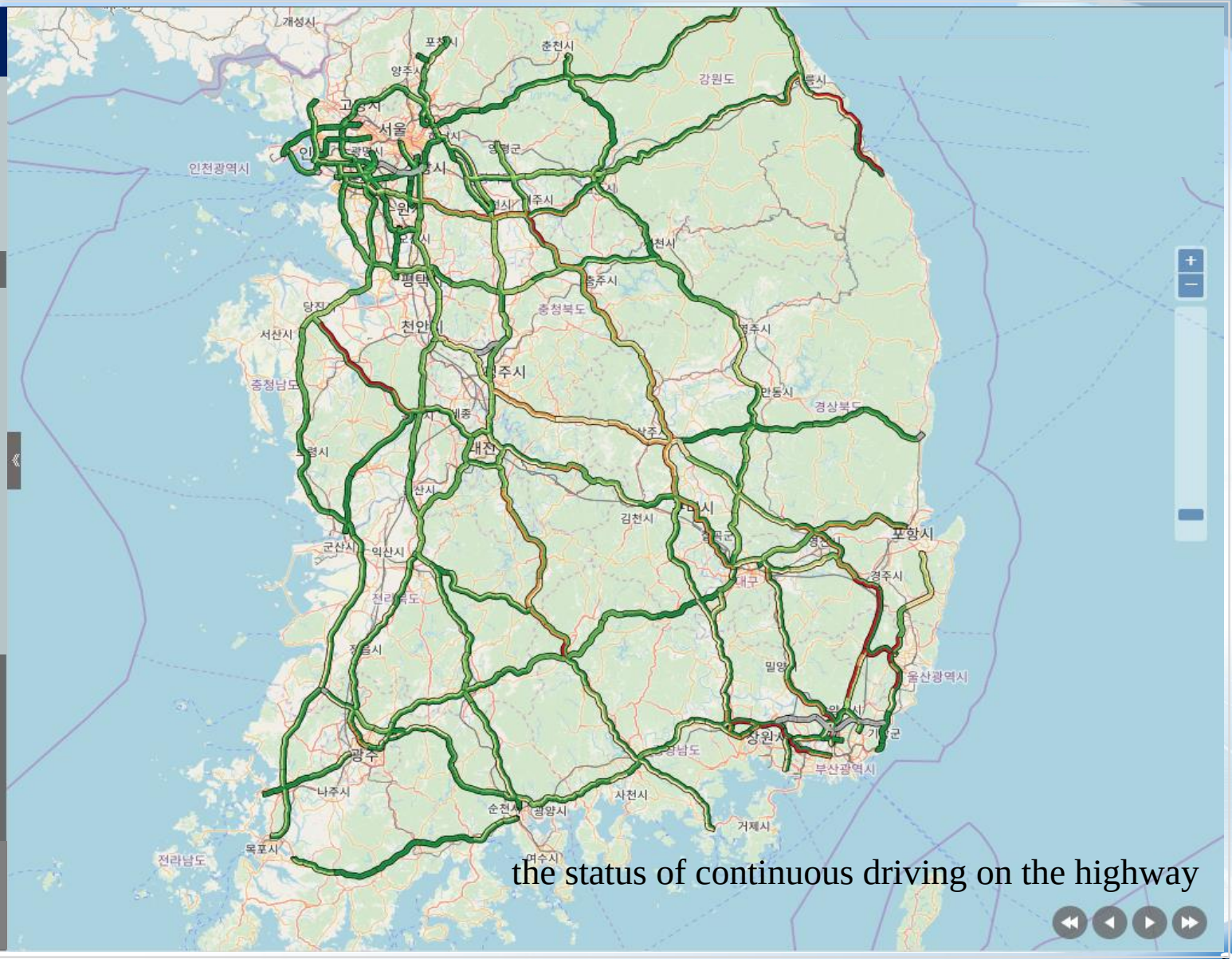
07 ~ 08

index value on an hourly basis to analyze time variability

whole year's data to understand monthly and seasonal variability.

1	0~120	0~5	0~5
2	120~150	5~10	5~10
3	150~180	10~15	10~15
4	180~210	15~20	15~20
5	210~240	20~25	20~25
6	240 이상	25 이상	25 이상

percentage of drivers who drive without rest for more than 2 hours



the status of continuous driving on the highway

How many hours without rest on the expressway?

- **Average Continuous Driving Hours Index : 2.5**
- **Higher index value means that more drivers continuously drive without a break**

Continuous Driving Hours Index 2~3	
Average Continuous Driving Hours for Upper 1% Vehicles	201 Minutes
Average Continuous Driving Hours for Upper 5% Vehicles	155 Minutes
Ratio of more than 2 Hours Continuous Driving	6.6%
Number of Vehicles more than 2 Hours Continuous Driving	3.4

Continuous Driving Hours Index 10~11	
Average Continuous Driving Hours for Upper 1% Vehicles	237 Minutes
Average Continuous Driving Hours for Upper 5% Vehicles	184 Minutes
Ratio of more than 2 Hours Continuous Driving	10.3%
Number of Vehicles more than 2 Hours Continuous Driving	124

Continuous Driving Hours Index	# of Samples	Accumulation Rate	Average Continuous Driving Hour for Upper 1% Vehicles (Minutes)	Average Continuous Driving Hour for Upper 5% Vehicles (Minutes)	Ratio of more than 2 Hours Continuous Driving	Number of Vehicles more than 2 Hours Continuous Driving
0	722,205	31.50%	75	67	0.05%	0
0 ~ 1	680,046	61.30%	143	117	4.30%	10
1 ~ 2	285,105	73.70%	183	143	5.70%	22
2 ~ 3	157,473	80.60%	201	155	6.60%	34
3 ~ 4	99,150	84.90%	212	163	7.40%	46
4 ~ 5	66,731	87.80%	220	169	8.00%	57
5 ~ 6	47,321	89.90%	223	172	8.50%	69
6 ~ 7	35,431	91.40%	227	175	8.90%	80
7 ~ 8	27,690	92.70%	230	178	9.40%	91
8 ~ 9	22,553	93.60%	235	181	9.70%	102
9 ~ 10	17,946	94.40%	235	182	10.00%	113
10 ~ 11	**15,057**	**95.10%**	**237**	**184**	**10.30%**	**124**
⋮	⋮	⋮	⋮	⋮	⋮	⋮

road managers' preemptive actions are also required beyond individuals' effort.

High Continuous Driving Hours Index means High Accidents?

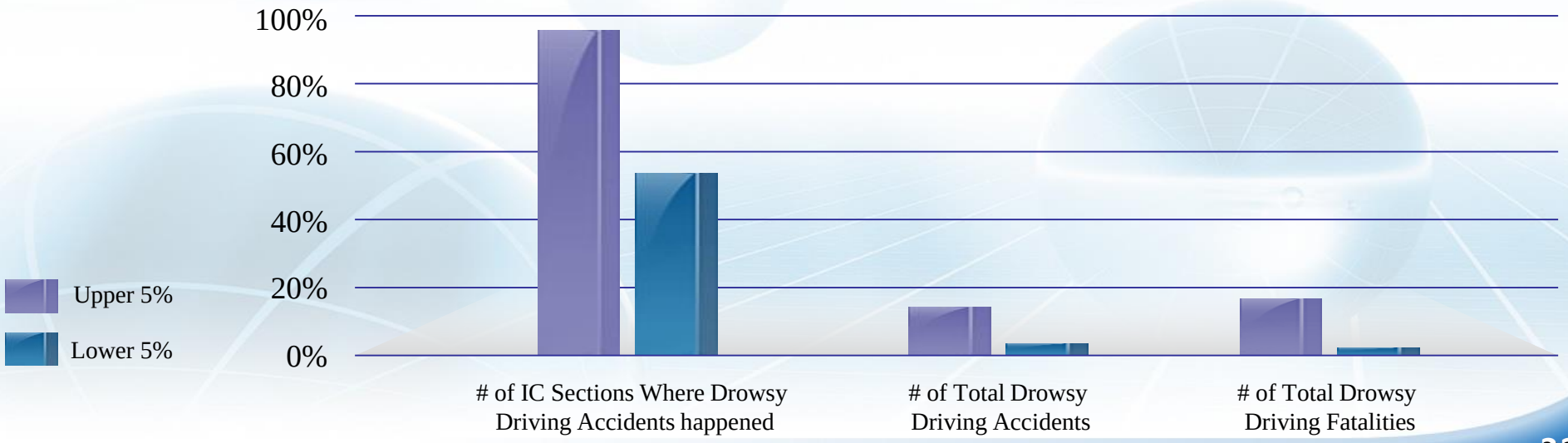
- **Place IC : 1,360**
- **Sections in order of continuous driving hours index from highest to lowest**

  # of Total IC Sections : 1,360

  # of upper 5% IC Sections : 68, # of lower 5% IC Sections : 68

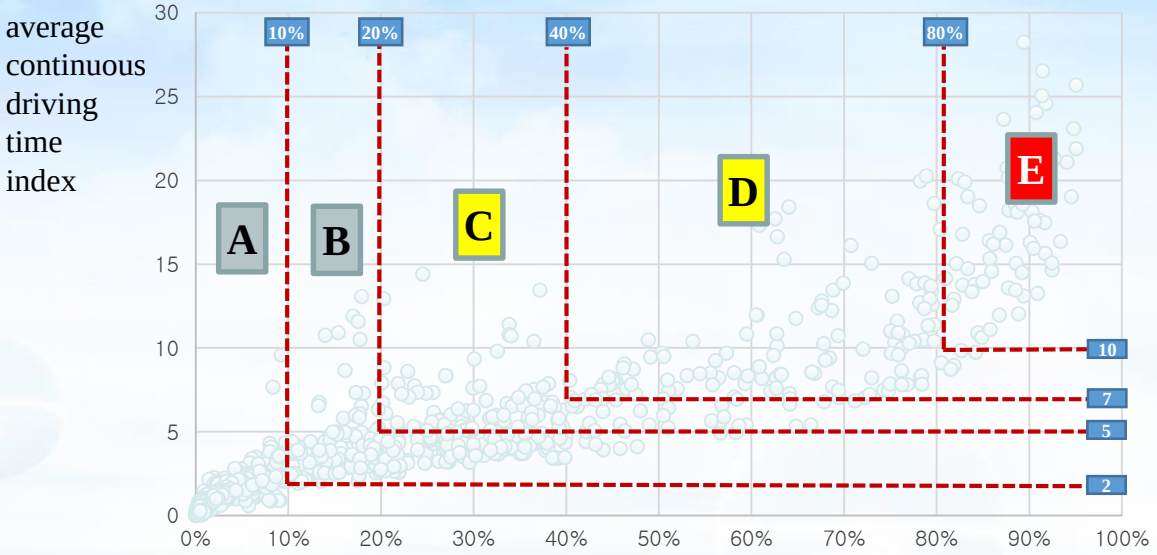
IC Sections	# of IC Sections	# of IC Sections Where Drowsy Driving Accidents happened	# of Total Drowsy Driving Accidents (Rate)	# of Total Drowsy Driving Fatalities (Rate)
Upper 5%	68	64 (94.1%)	3,089 (12.0%)	69 (14.1%)
Lowe 5%	68	37 (54.4%)	169 (2.35%)	5 (1.02%)

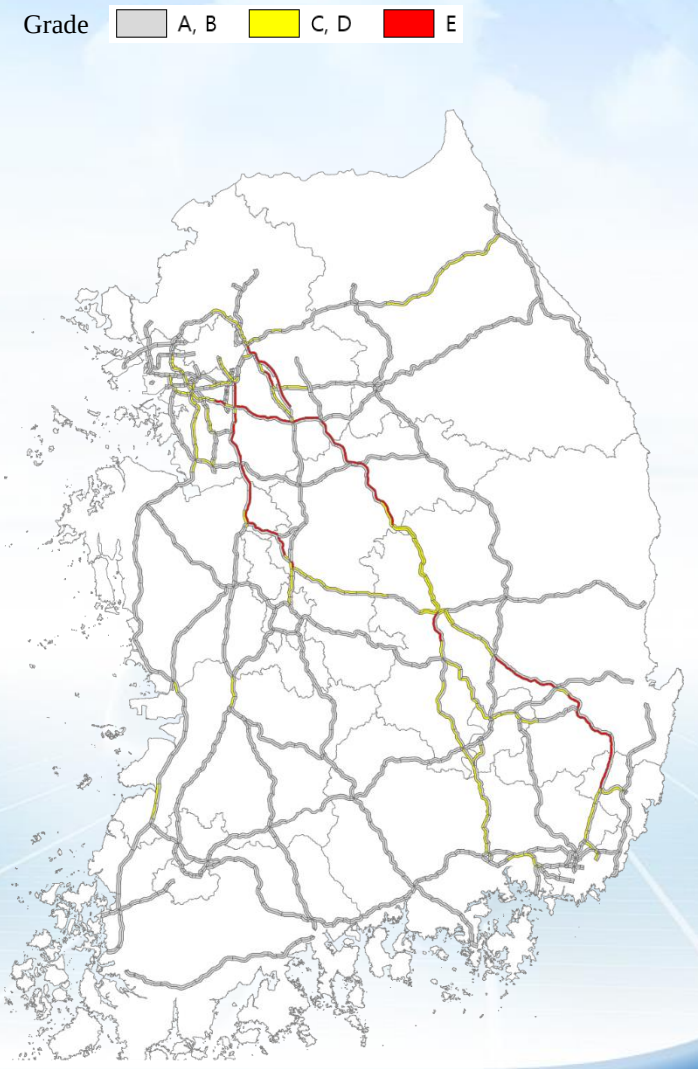
It would be more effective to install road facilities on the sections with a high continuous driving time index than on random zones to prevent drowsy driving accidents.



Risk of Drowsy Driving : scale and frequency of each index value

how large an index value is, how often the large index value occurs over a year

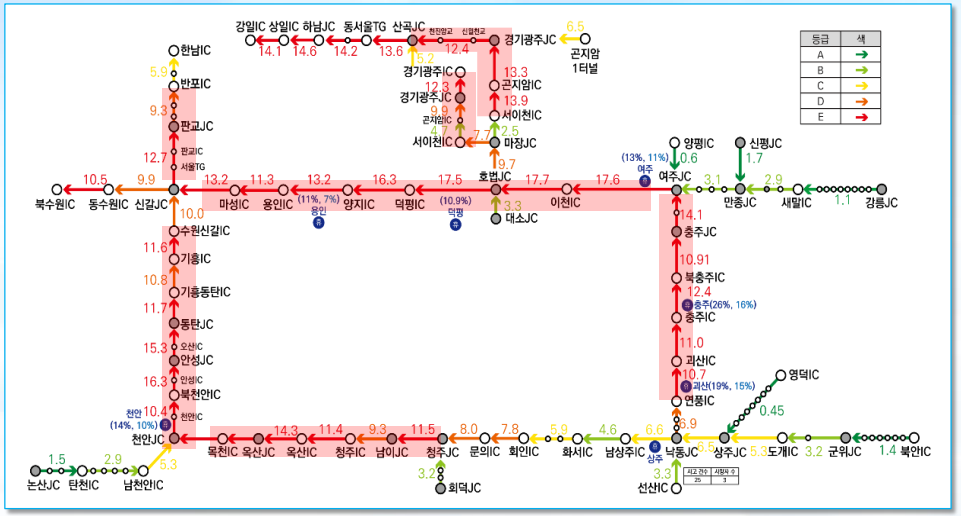


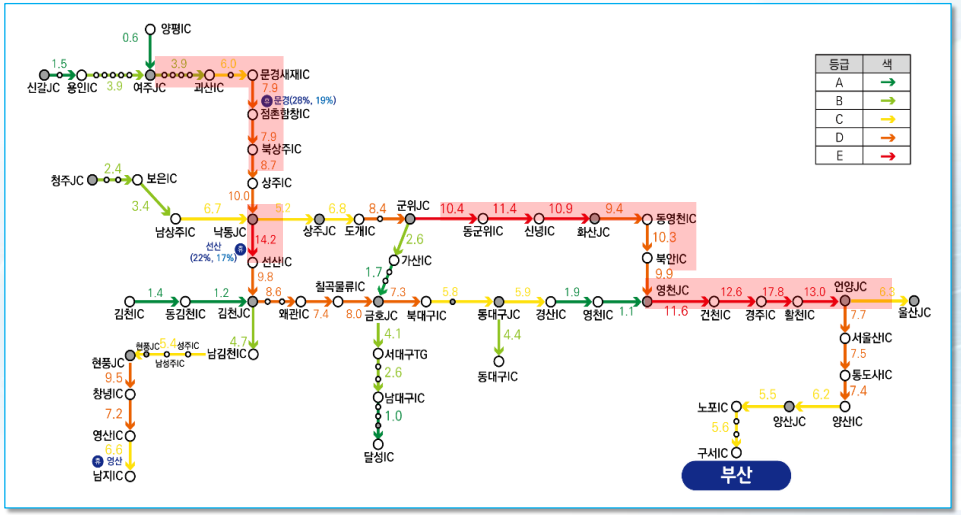


Grade	# of Sections	Average Continuous Driving Hours Index	Number of Vehicles more than 2 Hours Continuous Driving	Ratio of more than 2 Hours Continuous Driving	Average Continuous Driving Hours (Minutes)	
					Upper1%	Lower 5%
A	851	0.8	3	2.6%	124	100
B	327	3.2	10	6.3%	174	141
C	88	5.9	17	7.9%	192	154
D	64	8.8	24	8.4%	205	160
E	**49 (4%)**	**13.3**	**35**	**9.8%**	**220**	**173**

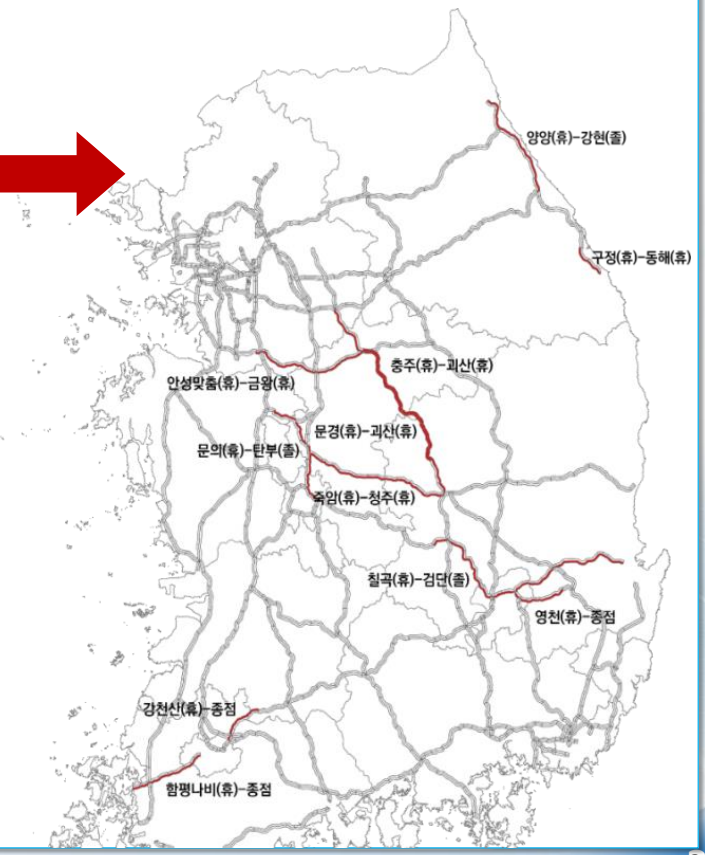
Drowsy Driving Danger Areas : Long Driving + Congestion

- Index value goes up as the travel distance increases
- Because of the traffic jam, the travel distance has not increased but the driving time has increased





We should prioritize these sections and manage them as dangerous zones by installing horizontal rumble strips, banners, drowsy notifications, and VMS message displays



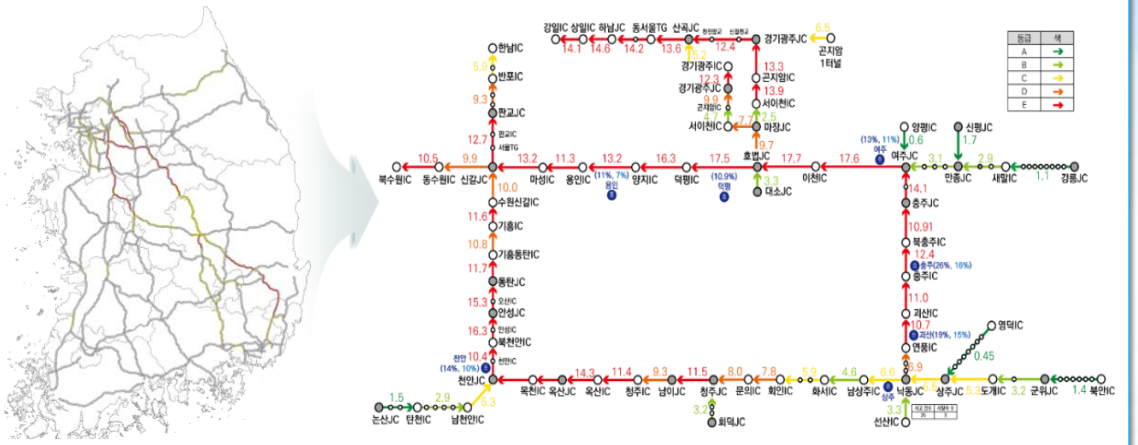
Countermeasures for Drowsy Driving

Prioritize installing the facilities on the sections with a high risk of drowsy driving

* Total sections on expressways : 1,379

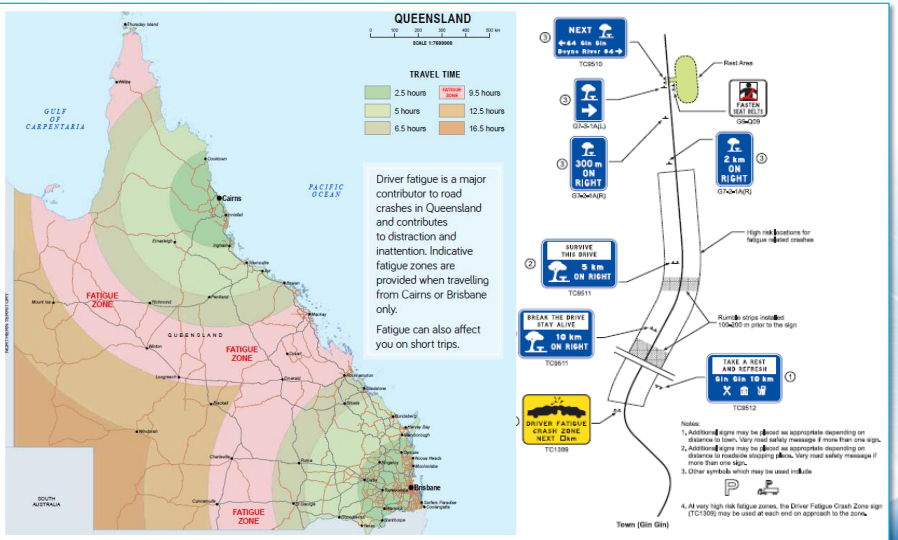
Grade	# of Sections	More than 4-Drowsy Driving Accidents		More than 2-Drowsy Driving Fatalities	
		# of Sections	Rate	# of Sections	Rate
A	851	324	38.1%	41	4.8%
B	327	180	55.0%	32	9.8%
C	88	41	46.6%	11	12.5%
D	64	39	60.9%	12	18.8%
E	49	36	73.5%	14	28.6%

* risk of drowsy driving evaluated by the continuous driving time index



- Areas where having High Continuous Driving Hours Index and and Congested, → **High Drowsy Driving Risk Area**

- Countermeasures by Characteristics for Highway Sections
  - Considering Vehicle Routing Plan,
    Reduce the interval between Rest Areas or
    Increase the numbers of Rest Areas



Driver Monitoring System

I. Overview

- **In 2024, 95% of traffic accidents were caused by 'human factors' such as inattention, drunk driving, and drowsy driving.**
- **Among highway fatalities, 70% of deaths were due to drowsy driving and inattention (based on data from 2019~2023, over 5 years).**

Year	2019	2020	2021	2022	2023
Total Fatalities (persons)	176	179	171	156	150
Drowsiness/Inattention Fatalities (persons)	120	130	121	119	101
Drowsiness/Inattention Fatality Rate (%)	68%	73%	71%	76%	67%

- **To prevent such accidents, the need for In-cabin systems is increasing alongside external vehicle systems(Out-Cabin).**
- **DMS (Driver Monitoring System) is a type of In-cabin system, and countries that have proactively adopted DMS have seen effective accident prevention.**

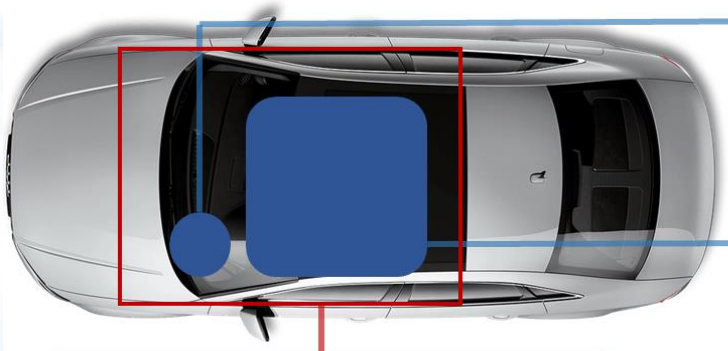
Driver Monitoring System

II. In-Cabin Sensing

In-Cabin Sensing

: **A technology that detects the state of drivers and passengers inside the vehicle to provide a safe environment.**

※ DMS, IMS, and DIMS are representative systems



DMS(Driver Monitoring System)

- ✓ Forward Inattention
- ✓ Drowsiness Alert
- ✓ Alcohol Status

IMS(Interior Monitoring System)

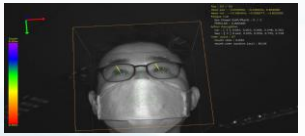
- ✓ Occupant Presence in Vehicle
- ✓ Object Detection in Vehicle
- ✓ Occupant Classification (Child, Pet, etc.)

DIMS(Driver and Interior Monitoring System)

- ✓ DMS+IMS

◎ DMS(Driver Monitoring System)

- Also called DSM (Driver State Monitoring), this system analyzes a driver's blinking, face direction, etc., using sensors installed on the dashboard to detect the driver's state



◎ IMS(Interior Monitoring System)

- Detects passengers and objects inside the vehicle using sensors to recognize occupant information, movements, and items like wallets and mobile phones.

◎ DIMS(Driver and Interior Monitoring System)

- A single system that integrates sensors from both DMS and IMS

III. International DMS Regulations and Certification Evaluations

Automobile-related regulations and certification evaluations tend to follow European trends, with UNECE and Euro NCAP being key organizations.

UNECE

(United Nations Economic Commission for Europe)

- ✓ United Nations Economic Commission for Europe
- ✓ Develops standards and best practices in various fields (trade, transportation, energy, etc.) for member countries
- ✓ Regulations are mandatory
- ✓ Most domestic automobile regulations are based on UNECE standards

Euro Ncap

(European New Car Assessment Program)

- ✓ European New Car Assessment Program
- ✓ Tests various factors defined by NCAP and classifies results into a 1-star to 5-star rating
- ✓ Certification evaluation, not mandatory
- ✓ Has significant influence on the automobile industry

III. International DMS Regulations and Certification Evaluations

Drowsy and Distracted Driving-UNECE

Installation of DMS obligations related to drowsy driving and carelessness in accordance with UNECE regulations

[DDAW(Driver Drowsiness and Attention Warning)] (Regulation 2021/1341)

- Evaluate the driver's condition by analyzing the driver's driving pattern or steering pattern
- Mandatory installation on vehicles (passengers, buses, trucks) that will be released from July 2022
- Vehicles with a maximum design speed of less than 70km/h are exempt from mandatory installation

[ADDW (Advanced Driver Distraction Warning)] (Regulation 2023/2590)

- Evaluate the driver's condition by analyzing the driver's face and gaze
- Mandatory fit on vehicles (passengers, buses, trucks) that will be released from July 2024

III. International DMS Regulations and Certification Evaluations

Drowsy and Distracted Driving-Euro Ncap

Among Euro Ncap protocols, DMS evaluation is conducted in the safe driving field

The manufacturer shall submit a document demonstrating the performance of the driver condition monitoring system and Euro & Cap will conduct a test to verify the document

<Driver status assessment type>

Distraction	Fatigue	non-response(sudden illness)
Long-term Distraction (distraction for more than 3 seconds)	Drowsiness (KSS* drowsiness level 7 or higher)	• Failure to return gaze within 3 seconds after a warning • Gaze deviates significantly from the front • Eyes closed for more than 6 seconds
Short-term Distraction repeated brief distraction)	Microsleep (Eyes closed for less than 3 seconds after drowsiness)	
Use of mobile phones (Repeatedly looking at your phone)	Sleep (Eyes closed for more than 3 seconds)	

*** KSS Drowsiness Scale: A self-reported scale for assessing the degree of drowsiness**

*** Activated when the vehicle is traveling at a speed of 10 km/h or more**

III. International DMS Regulations and Certification Evaluations

Drowsy and Distracted Driving-DOT

DOT (Department Of Transportation)

In 2021, the U.S. Department of Transportation introduced a bill to fund research on the impact of distracted driving on accident rates and the effectiveness of driver monitoring system

The bill includes provisions for reviewing regulations on implementing driver monitoring systems in new vehicles.

IV. Driving Simulator Center Experiment

Experiment on Collecting Biometric Data Related to Alcohol/Drowsiness Response (LG)

- LG Electronics AI Research Lab is developing a driver monitoring system for detecting alcohol impairment and drowsy driving.
- Since real-world alcohol/drowsy driving tests cannot be conducted, experiments are performed using a driving simulator.

Driving Simulator

한국도로공사 도로교통연구원
Korea Expressway Corporation Research Institute



Alcohol Measurement

Alcohol/Drowsiness Simulator Driving Experiment