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2. Current Efforts to Make Roads Safer
1. History of Road Safety in Japan

1) Changes in Road Traffic Accident
2) Laws and Action Programs for Road Safety
3) Results of Past Efforts
1. History of Road Safety in Japan

- "Traffic war" led by motorization became a social problem in the 1960s.
- Fatalities reached a record high of 16,765 in 1970.
- In 2016, the number decreased down to 25% of the 1970-level.

Fig-1  Changes in Road Traffic Accident Fatalities within 24 hours*

*"Fatalities within 24 hours" means those who, died within 24 hours due to an accident that was caused by the traffic of trains and vehicles.
1. History of Road Safety in Japan

- Accidents and injuries in around 2000 were more than in “Traffic war” years.
- Number of cars is about 4.5 times the 1970-level.

"Traffic war" years

1) Changes in Road Traffic Accident
--- Accidents, Fatalities, Casualties, Cars Ownership

Fatalities

Injuries

Accidents

Registered Cars

Data from National Police Agency

Fig-2 Changes in Road Traffic Accidents and Number of Cars, etc.

"Fatalities within 24 hours" means those who, died within 24 hours due to an accident that was caused by the traffic of trains and vehicles.
1. History of Road Safety in Japan

- Current accident rate is less than one third of the 1970’s rate, although the number of accidents is same level with the 1970’s.

Data from Ministry of Land, Infrastructure, Transport and Tourism

Fig-3 Accident Rate and Road Traffic Accidents
### 2) Laws and Action Programs for Road Safety

- Laws and action programs were established from the view points of all traffics and road traffic.

<table>
<thead>
<tr>
<th>Year</th>
<th>Law</th>
<th>Action Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>Road Traffic Law</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2011 The 9th Fundamental Traffic Safety Program</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2012 Priority Policy Plan on Infrastructure Development</td>
</tr>
</tbody>
</table>
The results were introduced by cooperative implementation among related fields

**Engineering**
- Increased road safety facilities (Sidewalk, Pedestrian overpass, Guardrail, Center strip, Lighting, Traffic signal, .. )
- Development of expressway
- Enhancement of vehicle safety

**Enforcement**
- Decline in drunk driving
- Increased use of seatbelts

**Education**
- Increased awareness to traffic rules

Decrease of Road Accidents
3) Results of Past Efforts --- e.g. Sidewalks

- The construction of sidewalks introduced safety for especially children.

---

Fig.- 4 The Effectiveness of Sidewalk Construction on 2-lane roads (Accident data : 2000-2003)

- (a) All age-groups: Without sidewalks, there were 473 accidents; with sidewalks, there were 327 accidents, a 31% reduction.
- (b) 0-15 years: Without sidewalks, there were 172 accidents; with sidewalks, there were 71 accidents, a 59% reduction.
- (c) >65 years: Without sidewalks, there were 146 accidents; with sidewalks, there were 110 accidents, a 25% reduction.

Source : Integrated accident DB
3) Results of Past Efforts --- e.g. Road Lightings

- The installation of road lightings were more effective against vehicle-pedestrian and head-on collisions.

Fig.-5 The Effectiveness of Road Lighting Installation on Non-intersections

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Vehicle – Pedestrian Collisions</td>
<td>219</td>
<td>137</td>
<td>37.4%</td>
</tr>
<tr>
<td>(b) Head-on Collisions</td>
<td>103</td>
<td>60</td>
<td>41.7%</td>
</tr>
<tr>
<td>(c) Rear-end collisions</td>
<td>2689</td>
<td>2479</td>
<td>7.8%</td>
</tr>
<tr>
<td>(d) Single-vehicle accidents</td>
<td>294</td>
<td>240</td>
<td>18.4%</td>
</tr>
</tbody>
</table>

Source: Integrated accident DB
3) Results of Past Efforts
--- e.g. Expressways and Arterial Roads

- The construction of expressways and arterial roads contributed improvement of road safety.

![Accident Rates by Road Types](image)

**Fig. -6 Accident Rates by Road Types (Accident data : 2011)**

Data from Ministry of Land, Infrastructure, Transport and Tourism
3) Results of Past Efforts --- e.g. Drunk Driving

### The penal regulations for the drunk driving

The penal regulations for the drunk driving from 2007

<table>
<thead>
<tr>
<th></th>
<th>Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver</td>
<td></td>
</tr>
<tr>
<td>Drunken Driver</td>
<td>Imprisonment with work for not more than 5 years or <strong>1,000,000 yen</strong></td>
</tr>
<tr>
<td>Driving under the influence of alcohol</td>
<td>Imprisonment with work for not more than 3 years or <strong>500,000 yen</strong></td>
</tr>
<tr>
<td>Refusal to take a breath test</td>
<td>Imprisonment with work for not more than <strong>3 months</strong> or a fine of not more than <strong>50,000 yen</strong></td>
</tr>
<tr>
<td>Person who provided a vehicle</td>
<td></td>
</tr>
<tr>
<td>Drunken Driver (Driver)</td>
<td>Imprisonment with work for not more than 5 years or <strong>1,000,000 yen</strong></td>
</tr>
<tr>
<td>Driving under the influence of alcohol (Driver)</td>
<td>Imprisonment with work for not more than <strong>500,000 yen</strong></td>
</tr>
<tr>
<td>Person who provided alcohol, Person who recommended drinking,</td>
<td></td>
</tr>
<tr>
<td>Drunken Driver (Driver)</td>
<td>Imprisonment with work for not more than 3 years or <strong>500,000 yen</strong></td>
</tr>
<tr>
<td>Driving under the influence of alcohol (Driver)</td>
<td>Imprisonment with work for not more than <strong>300,000 yen</strong></td>
</tr>
<tr>
<td>Passenger</td>
<td></td>
</tr>
<tr>
<td>Drunken Driver (Driver)</td>
<td>Imprisonment with work for not more than 3 years or <strong>500,000 yen</strong></td>
</tr>
<tr>
<td>Driving under the influence of alcohol (Driver)</td>
<td>Imprisonment with work for not more than <strong>300,000 yen</strong></td>
</tr>
</tbody>
</table>

- **Drunken Driver**: The driver clearly appears to be intoxicated in the opinion of the police officer enforcing the law.
- **Driving under the influence of alcohol**: The driver’s breath alcohol content exceeds 0.15mg/l.
3) Results of Past Efforts --- e.g. Drunk Driving

The penal regulations for the drunk driving

The number of accidents concerning with drunk driving

- **Accident**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>16,376</td>
</tr>
<tr>
<td>2004</td>
<td>15,180</td>
</tr>
<tr>
<td>2005</td>
<td>13,878</td>
</tr>
<tr>
<td>2006</td>
<td>11,626</td>
</tr>
<tr>
<td>2007</td>
<td>9,561</td>
</tr>
<tr>
<td>2008</td>
<td>7,219</td>
</tr>
<tr>
<td>2009</td>
<td>6,334</td>
</tr>
<tr>
<td>2010</td>
<td>4,334</td>
</tr>
<tr>
<td>2011</td>
<td>3,030</td>
</tr>
<tr>
<td>2012</td>
<td>2,928</td>
</tr>
<tr>
<td>2013</td>
<td>2,701</td>
</tr>
<tr>
<td>2014</td>
<td>2,380</td>
</tr>
</tbody>
</table>

The number of fatal accidents concerning with drunk driving

- **Fatal accident**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Fatal Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>781</td>
</tr>
<tr>
<td>2004</td>
<td>712</td>
</tr>
<tr>
<td>2005</td>
<td>709</td>
</tr>
<tr>
<td>2006</td>
<td>611</td>
</tr>
<tr>
<td>2007</td>
<td>433</td>
</tr>
<tr>
<td>2008</td>
<td>305</td>
</tr>
<tr>
<td>2009</td>
<td>292</td>
</tr>
<tr>
<td>2010</td>
<td>290</td>
</tr>
<tr>
<td>2011</td>
<td>270</td>
</tr>
<tr>
<td>2012</td>
<td>256</td>
</tr>
<tr>
<td>2013</td>
<td>238</td>
</tr>
<tr>
<td>2014</td>
<td>227</td>
</tr>
</tbody>
</table>

Data from National Police Agency
2. Current Efforts to Make Roads Safer

2.1 Targets in 2020 and Future Priority Policies
   - *in The 10th Fundamental Traffic Safety Program*

2.2 Efforts to Improve the Effectiveness of Road Improvements
--- The 10th Fundamental Traffic Safety Program ---

**Target in 2020**

(1) Fatalities is less than 2,500.

(2) Injuries is less than 0.5 million.

**Future Priority Policies**

(1) Ensure safety of the elderly and, pedestrians and cyclists, on community Roads.

(2) Priority issues to create an environment with fewer accidents.

   a. Promoting the use of advanced technologies

   b. Promoting carefully planned measures based on actual traffic conditions, etc.

   c. Promoting traffic safety measures encompassing entire regions.

*"Fatalities within 24 hours" means those who, died within 24 hours due to an accident that was caused by the traffic of trains and vehicles."
69% of all accidents on arterial roads are concentrated on 20% of all arterial road sections.

69% of all accidents on arterial roads are concentrated on 20% of all non-intersections and intersections.
The 65 or more years age-group fatalities per population is more than other age-groups, furthermore this group is high compared with other countries.

**Fig. -8  Fatalities by Age-group per Population**

*“Fatalities within 24 hours” means those who, died within 30 days due to an accident that was caused by the traffic of trains and vehicles.*
The proportion of pedestrian and cyclist fatalities is about half, this is very high compared to other countries.

**Fig. 9** Fatalities by Type of Parties per Population

*"Fatalities within 24 hours" means those who died within 30 days due to an accident that was caused by the traffic of trains and vehicles.*
The proportion of pedestrian and cyclist fatalities is about half, this is very high compared to other countries.

**Characteristics of Current Road Traffic Accident**

<table>
<thead>
<tr>
<th>Country</th>
<th>Pedestrians</th>
<th>Bicyclists</th>
<th>Motorized 2-wheels</th>
<th>Vehicles occupants</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>1,575</td>
<td>674</td>
<td>39</td>
<td>839</td>
<td>122</td>
</tr>
<tr>
<td>France</td>
<td>1,663</td>
<td>790</td>
<td>39</td>
<td>839</td>
<td>122</td>
</tr>
<tr>
<td>Sweden</td>
<td>1,225</td>
<td>33</td>
<td>33</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>U.K.</td>
<td>839</td>
<td>353</td>
<td>353</td>
<td>1,053</td>
<td>484</td>
</tr>
<tr>
<td>U.S.</td>
<td>11,926</td>
<td>4,586</td>
<td>11,926</td>
<td>738</td>
<td>272</td>
</tr>
<tr>
<td>Japan</td>
<td>1,753</td>
<td>1,910</td>
<td>1,753</td>
<td>888</td>
<td>888</td>
</tr>
<tr>
<td>Korea</td>
<td>217</td>
<td>53</td>
<td>217</td>
<td>998</td>
<td>998</td>
</tr>
<tr>
<td>Cambodia</td>
<td>530</td>
<td>156</td>
<td>530</td>
<td>1,566</td>
<td>1,566</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1,435</td>
<td>530</td>
<td>1,435</td>
<td>4,178</td>
<td>4,178</td>
</tr>
</tbody>
</table>

"Fatalities within 24 hours" means those who died within 30 days due to an accident that was caused by the traffic of trains and vehicles.
Bicycle-bicycle and bicycle-pedestrian accidents only in 2011 increased compared to 2001, they are about 1.5 times.
2.2 Efforts to Improve the Effectiveness of Road Improvements

1) Designation of Hazardous Spots to be Improved by Priority based on Data

2) Management Cycle for Effective Implementation of Hazardous Spot Countermeasures

3) Improvement of Bicycle Travelling Space
1) Designation of Hazardous Spots to be Improved by Priority based on Data
1) Designation of Hazardous Spots to be Improved by Priority based on Data

<table>
<thead>
<tr>
<th>Year</th>
<th>Designated spot number</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>3200</td>
<td>-32.9%</td>
</tr>
<tr>
<td>2003</td>
<td>3956</td>
<td>-32.1%</td>
</tr>
<tr>
<td>2008</td>
<td>3396</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>3490</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>3125</td>
<td></td>
</tr>
</tbody>
</table>

≪Criteria in 2016≫

- 1,000 or more accidents/billion vehicle km
- 100 or more serious accidents/billion vehicle-km
- 10 or more fatal accidents/billion vehicle-km

All of the three above are satisfied.

Identify the spots

Integrated Database of Road Traffic Census and Accident
1) Designation of Hazardous Spots to be Improved by Priority based on Data

Integrated Database of Road Traffic Census and Accident

Traffic Accident Data
- Incident date and time
- Age, Sex (1st party, 2nd party)
- Num. of fatalities, serious injuries, slight injuries
- Type of accident
- Road surface condition
- Road alignment
- Law violation ・・・・・ etc.

Road Traffic Census Data
- Route number
- Section Length
- Num. of lanes, Carriage way width
- Length of sidewalk, center strip
- Traffic volume
- Average travel speed
- Roadside condition ・・・・・ etc.

Integrate

Integrated Database of Road Traffic Census and Accident

Accident Occurrence Characteristics on Each Intersection/Each Section with Specific Length
- Num. of accidents
- Accident rate
- Composition ratio of accident type
- Before-after/with-without effects of sidewalk/road safety facilities
- Ranking the section according to the accident rate
- Identify the spots over some criteria ・・・・・ etc.
1) Designation of Hazardous Spots to be Improved by Priority based on Data

Use of Integrated Database

Fig.-12  Accident Number in Each Section of a National Highway

Accident Number/Rate in each section
1) Designation of Hazardous Spots to be Improved by Priority based on Data

2. Current Efforts to Make Roads Safer
2.2 Efforts to Improve...

Use of Integrated Database

Concentration at specific locations

Legend
- 300 - (cases/100 million vehicle-km)
- 200 - 300 (cases/100 million vehicle-km)
- 100 - 200 (cases/100 million vehicle-km)
- 100 - (cases/100 million vehicle-km)

Fig.- 13 Distribution of Accident Rate on Road Network
2) Management Cycle for Effective Implementation of Hazardous Spot Countermeasures
2) Management Cycle for Effective Implementation of Hazardous Spot Countermeasures --- PDCA-cycle

【Plan】
- Casual Analysis at Hazardous Spot
- Planning Countermeasures

【Do】
- Implementing Countermeasures

【Act】
- Improving Original Plan

【Check】
- Identifying and Analyzing Problems
- Evaluating Effects

Fig.- 14 PDCA-cycle

Systematically organizing the procedures and the points of from planning to action.

“Guideline for Improving Road Safety at Hazardous Spots”

Organizing the methods of site observation, causal factor analysis, and countermeasure planning.

“Traffic Safety Measures and Evaluation Manual” and “Guideline for Improving Road Safety at Hazardous Spots”
2) PDCA-cycle

Consideration steps in the Guideline

1) Road structure
2) Accident Type
3) Accident process
4) Causal Environment
5) Countermeasures

Improvement of Road Safety at Hazardous Spots
2) Management Cycle for Effective Implementation of Hazardous Spot Countermeasures --- PDCA-cycle

【Plan】
- Casual Analysis at Hazardous Spot
- Planning Countermeasures

【Do】
- Implementing Countermeasures

【Act】
- Improving Original Plan
- Identifying and Analyzing Problems
- Evaluating Effects

【Check】

Registration of the contents of the road safety countermeasures at each hazardous spots

Accident Countermeasures Database

(Example of registered data)
- “Road Condition”
- “Traffic Condition”
- “Accident data”
- “Process of Planning Countermeasures”
- (Concept of Countermeasures)
- “Countermeasures”
2) Management Cycle for Effective Implementation of Hazardous Spot Countermeasures --- PDCA-cycle

Planning countermeasures in reference to the example of the individual spot
2) Management Cycle for Effective Implementation of Hazardous Spot Countermeasures --- PDCA-cycle

Guideline for improving Road Safety at Hazardous Spots
("Technical Report of Road Safety Countermeasure Planning")

Analysis

Accident Countermeasures Database
3) Improvement of Bicycle Travelling Space
4) Improvement of Bicycle Travelling Space

(a) Bicycle Path

(b) Bicycle Lane

(c) Bicycle Space in Vehicle Lane (Bicycle travel mixed with automobile)

Photo-7 Types of bicycle space
All types of bicycle travelling space reduced the accidents bicycle involved.
Accidents bicycle involved decreased particularly on roads where bicycle paths or bicycle lanes were provided.
In order to improve road safety more effectively and efficiently, important things are as follows:

1. Set of nation’s targets, and efforts by all related organizations to achieve the target.

2. Promotion of appropriate measures based on the characteristics of road accidents. In order to do so,

   1) Identification of national/regional serious road safety problems based on analysis of accident data, and challenge to solve those problems by strategic programs decided by related organizations (from the viewpoint of road improvement)

2) Identification of hazardous spots and implementation of countermeasures at those spots

3) Establishment of consideration methods of countermeasures