Road Safety Audit
Experiences in Korea

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Chief Researcher  Hyunjin Kim
khj2047@ts2020.kr
Korea Transportation Safety Authority
I. Road Safety Situation in Korea

II. Road Safety Audits in Korea

III. TS-UNESCAP Black Spot Project
I. Road Safety Situation in Korea

1. Road Traffic Accidents
1. Road Traffic Accidents(1)

- **Road traffic accidents last 21 years**

  ![Graph showing the number of traffic accidents and traffic fatalities over 21 years.](image)

  - **Number of traffic accidents**: 265,964 (1991) → 221,711 (2011), 17% decrease (0.9% average annual decrease)
  - **Traffic fatalities**: 13,429 (1991) → 5,229 (2011), 61% decrease (4.6% average annual decrease)
1. Road Traffic Accidents (2)

Road Traffic Accident (2011)

- Number: 221,711
- Fatalities: 5,229
- Injuries: 341,391

International Comparison

- Number of fatalities per 10,000 vehicles (2010):
  - Korea: 2.64

Fatalities for the last 8 years (2004~2011)

- 25,432 persons for 4 years
- 22,442 persons for 4 years (△11.8%)

- 6,563, 6,376, 6,327, 6,166, 5,870, 5,838, 5,505, 5,229


※ Number of fatalities per 10,000 vehicles (2010):
  - OECD: 1.5
  - Korea: 2.8

- Number of fatalities for 4 years: △11.8%

- 221,711 persons

- Fatalities: 5,229
- Injuries: 341,391

- 2006: 6,376
- 2007: 6,166
- 2008: 5,870
- 2009: 5,838
- 2010: 5,505
- 2011: 5,229

- 2004: 6,563
- 2005: 6,376
- 2006: 6,327
- 2007: 6,166
- 2008: 5,870
- 2009: 5,838
- 2010: 5,505
- 2011: 5,229

- 2004~2011
1. Road Traffic Accidents (3)

Problems of road traffic accidents in Korea (2011)

- Vehicle alone accidents fatality rate (1,128 persons, 22%)
- The old accidents fatality rate (1,724 persons, 33%)
- Pedestrian accidents fatality rate (2,044 persons, 39%)
- Drunken accidents fatality rate (733 persons, 14%)
The main risk factors

- Human factors (93%)
- Road environment factors (34%)
- Vehicle factors (13%)

Treat, 1979
II. Road Safety Audits in Korea

1. Road Safety Projects
2. The UN Decade of Action
3. Overview of RSA
4. New Methods for RSA
1. Road Safety Projects

- **Main projects in Korea**
  - Black spot program: Selecting sections where traffic accidents occur at a high frequency (After)
  - Project for structural improvement of the dangerous roads: Improving the road structure (After)
  - Road Safety Audits (Before)
  - Road safety inspection (After)

2. The UN Decade of Action (1)

National activities

- Pillar 1: Road safety management
  - Lead agency
  - Strategy
  - Targets
  - Funding

- Pillar 2: Infrastructure
  - Improved road design for all users
  - Road infrastructure rating

- Pillar 3: Safe vehicles
  - Global harmonization
  - Vehicle standards
  - NCAP
  - All cars equipped with seat-belts
  - "Intelligent" vehicles
  - R&D safety for VRU

- Pillar 4: Road user behaviour
  - BAC laws
  - Seat-belts & child restraints
  - Motorcycle helmets
  - Speed management
  - ISO 39001

- Pillar 5: Post crash care
  - Prehospital care
  - Trauma care and rehabilitation
  - Quality assurance

Road Safety Audits
2. The UN Decade of Action (2)

**WHO Report (2013)**

GLOBAL STATUS REPORT ON ROAD SAFETY 2013
SUPPORTING A DECADE OF ACTION

RSAs in UNESACAP 39/53

REPUBLIC OF KOREA

Population: 48 183 586
Income group: High
Gross national income per capita: US$ 19 720

<table>
<thead>
<tr>
<th>INSTITUTIONAL FRAMEWORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead agency</td>
</tr>
<tr>
<td>National road safety strategy</td>
</tr>
<tr>
<td>Funding to implement strategy</td>
</tr>
<tr>
<td>Fatality reduction targets set</td>
</tr>
<tr>
<td>Fatality reduction target</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAFER ROADS AND MOBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal audits required for new road construction</td>
</tr>
<tr>
<td>Regular inspections of existing road infrastructure</td>
</tr>
<tr>
<td>Policies to promote walking or cycling</td>
</tr>
<tr>
<td>Policies to encourage investment in public transport</td>
</tr>
<tr>
<td>Policies to separate road users to protect VRUs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAFER VEHICLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total registered vehicles (2010)</td>
</tr>
<tr>
<td>Cars and 4-wheeled light vehicles</td>
</tr>
<tr>
<td>Motorized 2- and 3-wheelers</td>
</tr>
<tr>
<td>Heavy trucks</td>
</tr>
<tr>
<td>Buses</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>
3. Overview of RSA(1)

- Definition
  - A formal examination of a future road or traffic project, an existing road, or any project which interacts with road users, in which an independent, qualified team reports on the project’s accident potential and safety performance. (Austroads guideline, 2010)
3. Overview of RSA(2)

- **History of RSA in Korea**
    - Road Safety Audits legislated
  - Road Safety Audits started (July 2008)
  - Road Safety Audits Guidelines official announcement (Oct. 2008)
  - Conducting RSAs (2009~2013) : more than 80 audits

- **Type of RSA in Korea**
  - General RSA : Design stage
  - Special RSA : Opening & existing road
### 3. Overview of RSA(3)

#### Projects for RSA in Korea

<table>
<thead>
<tr>
<th>Project</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>• National Land Planning and Utilization Act</td>
<td>• Expressway, National Highway</td>
</tr>
<tr>
<td>• Road Act</td>
<td>: more than 5km</td>
</tr>
<tr>
<td>⇒ New Road construction</td>
<td>• Special / Metropolitan city,</td>
</tr>
<tr>
<td></td>
<td>Provincial Road</td>
</tr>
<tr>
<td></td>
<td>: more than 3km</td>
</tr>
<tr>
<td></td>
<td>• City, Country, District Road</td>
</tr>
<tr>
<td></td>
<td>: more than 1km</td>
</tr>
</tbody>
</table>

• Excl. projects conducted Traffic Impact Assessment(Sept. 2012)
3. Overview of RSA(4)

- **Training course in Korea**
  - Training auditors by Germany and UK (2006)
  - Training RSA teachers through marathon workshop (2007)
  - Training auditors (2008~2013) : more than 500 auditors

<table>
<thead>
<tr>
<th>Classification</th>
<th>Method</th>
<th>Contents</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RSA Basics (General/Special, Urban/Rural)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accident Investigation</td>
<td></td>
</tr>
<tr>
<td>Road / Facilities</td>
<td>Presentation / Seminar / Discussion</td>
<td>Cross-section Elements &amp; Alignment</td>
<td>1.5 ~ 2 day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intersection (Signal)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interchange</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road / Traffic Safety Facilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban Road Design</td>
<td></td>
</tr>
<tr>
<td>Traffic / Operation</td>
<td>Presentation / Seminar / Discussion</td>
<td>Speed &amp; Safety</td>
<td>0.5 ~ 1 day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pedestrian &amp; Bicycle Safety</td>
<td></td>
</tr>
<tr>
<td>RSA procedure / Practice</td>
<td>Presentation / Seminar / Discussion</td>
<td>RSA procedure &amp; Writing the Report</td>
<td>1.5 ~ 2 day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RSA practice (General/Special, Urban/Rural)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practice / Discussion</td>
<td>Presentation &amp; Feedback</td>
<td></td>
</tr>
</tbody>
</table>
3. Overview of RSA(5)

- **Procedure**

  **Preparatory Stage**
  - General Data
    - Population
    - Related Plan
    - Connected section
  - Road & Traffic Data
    - Geometry data
    - Traffic volume
    - Site Investigation
  - Traffic Accident Data
    - Accident data of region
    - Accident data of site
    - Collision diagram

  **Implementation Stage**
  - Checklist
  - Road alignment safety analysis
  - Positive guidance
  - Simulation

  **Problems & countermeasures**
3. Overview of RSA(6)

Example

- Right-of-way unclear
  - Y-type intersection
  - Intersection area is too broad

- Improve right angle intersection
- Roundabouts
4. New Methods for RSA - Positive Guidance(1)

❖ Definition

▪ A driver can be given sufficient information where he/she needs it and in a form he/she can best use it to safely avoid a hazard.

▪ Provision of appropriate information to drivers in order to avoid making driver errors.
  - Object hazard(Fixed, Moving)
  - Highway condition hazard
  - Situation hazard
4. New Methods for RSA - Positive Guidance(2)

Procedure

- **EVALUATION** ("BEFORE")
  - HAZARD IDENTIFICATION
  - INFORMATION HANDLING ZONE DETERMINATION
  - SPEED AND PATH ANALYSIS
  - EXPECTANCY VIOLATION ANALYSIS

- **HAZARD DETECTION**
  - RECOGNITION ASSESSMENT

- **INFORMATION**
  - LOAD ANALYSIS
  - NEEDS DETERMINATION AND PRIMACY ASSESSMENT

- **CURRENT INFORMATION**
  - SYSTEM ASSESSMENT

- **PLANING AND FIELD DATA COLLECTION**

- **EVALUATION** ("AFTER")
  - APPLICABLE DEVICE IDENTIFICATION
  - DEVICE SELECTION
  - POSITIVE GUIDANCE PLAN DEVELOPMENT
  - POSITIVE GUIDANCE DESIGN REVIEW

Procedure 4. New Methods for RSA - Positive Guidance(2)
4. New Methods for RSA - Positive Guidance

Positive Guidance (Situation)

Positive Guidance (Hazard analysis)
4. New Methods for RSA - Positive Guidance(4)

Before

After

[ Hazard 열매 ]
A: 대양자로 전조등, B: 평면선형, C: 중간선형, D: 제동차 성출, E: 사림 성출, F: 표지, 산호기 제주, G: 방호달리기

[ 운행정보 ]
4. New Methods for RSA - Positive Guidance (5)

- Advanced Vehicle for Road Safety Inspection

- Analysis algorithm to the road
- Road information acquisition
- Facility information acquisition
- Geometry information acquisition
- Geometric analysis algorithms
- Hazard Profile
- Integrated Safety Analysis S/W
- Drawing S/W
- Driving characteristics
4. New Methods for RSA - Positive Guidance(6)
4. New Methods for RSA – Road Alignment

Analysis(1)

Horizontal alignment

- **Radius**

Comment & Recommend

<table>
<thead>
<tr>
<th>Comment</th>
<th>Recommend</th>
</tr>
</thead>
</table>
| ① Sharp radius R=350m  
  ② Short tangent between right bend and left bend(L=26.2m) | ① Recommend to apply R=420m  
  ② Transition curve or circular curve extension |
4. New Methods for RSA – Road Alignment

Vertical alignment

Comment & Recommend

<table>
<thead>
<tr>
<th>Comment</th>
<th>Recommend</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Poor drainage in case of rain</td>
<td></td>
</tr>
<tr>
<td>② Steep slope on the intersection</td>
<td></td>
</tr>
<tr>
<td>① Recommend to apply to minimum vertical slope value (S=0.5%)</td>
<td></td>
</tr>
<tr>
<td>② Recommend to apply to slope under 3%</td>
<td></td>
</tr>
</tbody>
</table>
4. New Methods for RSA – Road Alignment Analysis (3)

**Comment & Recommend**

<table>
<thead>
<tr>
<th>Comment</th>
<th>Recommend</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Poor drainage in case of rain at inflection point</td>
<td>①② Recommend to apply to big circular curve embracing vertical curve</td>
</tr>
<tr>
<td>② Horizontal inflection point at top point of crest curve</td>
<td></td>
</tr>
</tbody>
</table>
4. New Methods for RSA – Simulation(1)

Stop sight distance

[Graphs showing stop sight distance for two segments: STA 0+000 ~ 0+850 and STA 0+850 ~ 0+000.]
## 4. New Methods for RSA – Simulation(2)

### Stop sight distance

<table>
<thead>
<tr>
<th>STA. 0+160</th>
<th>STA. 0+600</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

1. Valid sight distance under the standard of sight distance
2. Recommend to apply to reduce speed limit
4. New Methods for RSA – Virtual Reality (1)

Horizontal alignment

Vertical alignment
### 4. New Methods for RSA – Virtual Reality(2)

#### Collision diagram

#### Traffic accident data (5 years)

<table>
<thead>
<tr>
<th>Year</th>
<th># of Accident</th>
<th># of Fatality</th>
<th># of Serously Injury</th>
<th># of Slightly Injury</th>
<th># of Non Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>73</td>
<td>2</td>
<td>20</td>
<td>53</td>
<td>17</td>
</tr>
<tr>
<td>2007</td>
<td>59</td>
<td>2</td>
<td>19</td>
<td>46</td>
<td>13</td>
</tr>
<tr>
<td>2008</td>
<td>65</td>
<td>3</td>
<td>20</td>
<td>39</td>
<td>17</td>
</tr>
<tr>
<td>2009</td>
<td>62</td>
<td>-</td>
<td>11</td>
<td>36</td>
<td>31</td>
</tr>
<tr>
<td>2010</td>
<td>32</td>
<td>3</td>
<td>11</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>계</td>
<td>291</td>
<td>10</td>
<td>81</td>
<td>196</td>
<td>85</td>
</tr>
</tbody>
</table>
Jaywalking & illegal left-turn

• Video analysis also reveals frequent Jaywalking and illegal left-turns as vehicles enter approach road.
Night-time site investigation revealed that some lighting facilities were defective or partially covered by trees.
4. New Methods for RSA – Virtual Reality (5)

- Median barrier
- Pedestrian bridge
- Crosswalk
- Pedestrian underpass
4. New Methods for RSA – Virtual Reality

- Median barrier
- Pedestrian bridge
- Crosswalk
- Pedestrian underpass
III. Black Spot Project

1. Overview of Black Spot Project
2. Procedure
3. Call for Participation
1. Overview of Black Spot Project(1)

❖ Definition

- Selecting site and sections where traffic accidents occur at a high frequency
- Directly target improvements to safety of roads with proven crash history or high-risk locations
1. Overview of Black Spot Project(2)

- **Title**: TS-UNESCAP Black Spot Project
- **Period**: 2013
- **Budget**: TS fund
- **Organization**: TS, UNESCAP, Selected country

**Background**

- UN Resolution 64/255, The Decade of Action (2011~2020)
- Strengthen friendship and cooperation with Asia and the Pacific nations
- Transfer of technical know-how for road safety projects
1. Overview of Black Spot Project(3)

- **Main contents**
  - Selection of country
  - Kick-off meeting and data survey
  - Selection of site and section
  - On site inspection
  - Writing the report
  - Closing meeting
2. Procedure

Kick-off Meeting
- Project description
- Collect opinions

Data Survey
- Accident data
- Basic data

Black Spot Selection
- Black Spot selection for on-site inspection

On-site Inspection
- Black Spot inspection
- Traffic facilities inspection

Writing the Report
- Deriving problems & countermeasures on the road

Closing Meeting
- Presentation & discussions about problems & countermeasures
3. Call for Participation

- **Selection of country**
  - Conducting Black Spot improvement after the project
  - Sustainable cooperation with TS
  - Accidents and basic data (traffic volume, drawings, etc.) available

*We welcome your strong interest!!*
Prevention better than cure

THANK YOU