The Effects of Severe Weather Conditions on Road Safety in Hungary

Dr. Domokos Jankó and Dr. Péter Holló

Research Engineers

Road Safety Engineering Bureau (RODS).
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1. Road traffic and safety situation in Hungary

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Fatal+Serious accidents (F+S)</th>
<th>Killed persons</th>
<th>Level of motorization (Vehicles/10^3 inhabitants)</th>
<th>Traffic performance (Vehicle.km 10^9) (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>13923</td>
<td>2432</td>
<td>240</td>
<td>24,0</td>
</tr>
<tr>
<td>1995</td>
<td>9152</td>
<td>1589</td>
<td>275</td>
<td>27,5</td>
</tr>
<tr>
<td>2000</td>
<td>7452</td>
<td>1200</td>
<td>284</td>
<td>28,4</td>
</tr>
<tr>
<td>2005</td>
<td>8149</td>
<td>1278</td>
<td>345</td>
<td>34,5</td>
</tr>
<tr>
<td>2010*</td>
<td>6500</td>
<td>900</td>
<td>398</td>
<td>39,8</td>
</tr>
</tbody>
</table>

*estimated

(Persons killed: persons died within 30 days as a result of the accident, persons seriously injured: persons sustained injuries healing beyond 8 days.)
1. Road traffic and safety situation in Hungary /2

![Fatality rate graph showing a declining trend from 1990 to 2010.](image)

Figure 1
2. Main characteristics of the Hungarian climate circumstances

Average temperatures (°C) and rainfall (mm) in Budapest by month of the year

Figure 2
3. Accidents at severe weather conditions

Figure 3

Percentage of accidents occurred at severe weather conditions

- All accidents
- Fatal accidents
3.1. Foggy weather and accidents

Foggy weather

- Decreasing visibility
- Decreasing distance
- Increasing accident risk
- Decreasing traffic volume

Main aims of warning systems:
- Traffic control instructions for road users
- Information on local weather conditions in order to change the drivers’ behaviour and to prevent accidents
3.2. Number and severity of accidents*

160,000 accidents between 2001-2008
roughly 10% occurred under adverse weather conditions (rain, snow, fog, storm, shower)

only 1.6% occurred in foggy weather

5.6% of all accidents were fatal
8.4% of accidents occurring in foggy weather were fatal

Not the number but the severity of accidents occurring in foggy weather gives reasons for installation of fog warning system

* personal injury accidents
3.3. Date of accidents occurred in foggy weather

Figure 4

Accidents in fine weather → seasonality of traffic volume

Accidents in fog → frequency of foggy periods

(mainly in December and January)
3.4. Accidents by the hours of day

accidents in favourable weather conditions: daily seasonality of traffic
(peak: 4,00-6,00 p.m.)
accidents in foggy weather: mainly in the morning “rush hour” (~7,00 a.m.)
smaller peak in the afternoon.

Figure 5
3.5. Types of accidents occurred in foggy weather

(Based on the analysis of 8 years data = 160,000 accidents)

<table>
<thead>
<tr>
<th>Accident type</th>
<th>relative frequency (%) (Accidents/all accidents)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in foggy weather</td>
</tr>
<tr>
<td>Rear-end collisions</td>
<td>11%</td>
</tr>
<tr>
<td>Head-on collisions</td>
<td><strong>17%</strong></td>
</tr>
<tr>
<td>Single-vehicle crashes</td>
<td><strong>29%</strong></td>
</tr>
<tr>
<td>Accidents at junctions</td>
<td>9%</td>
</tr>
<tr>
<td>Others</td>
<td>34%</td>
</tr>
</tbody>
</table>

Head-on collisions and single-vehicle crashes are closely correlated with speed and visibility distance. Selection of safe speed is fundamental.
### 3.6. Accidents by causers

<table>
<thead>
<tr>
<th>Accident causer</th>
<th>Relative frequency (%) (Accidents/all accidents)</th>
<th>in foggy weather</th>
<th>in fine weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>motorbike</td>
<td>0.4%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>passenger car</td>
<td>72%</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>truck</td>
<td>12%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>bicycle</td>
<td>4%</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>pedestrian</td>
<td>5%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>6.6%</td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>
3.7. Accidents inside/outside built-up areas

<table>
<thead>
<tr>
<th>Accidents on roads outside built-up areas (In Hungary 2001-2008)</th>
<th>Relative frequency % (Accidents/all accidents)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in foggy weather</td>
</tr>
<tr>
<td>Motorways</td>
<td>5%</td>
</tr>
<tr>
<td>Main roads</td>
<td>48%</td>
</tr>
<tr>
<td>Secondary roads</td>
<td>38%</td>
</tr>
<tr>
<td>Others</td>
<td>9%</td>
</tr>
</tbody>
</table>

68% of all accidents inside built-up areas
32% of all accidents outside built-up areas
62% of accidents inside built-up areas
in foggy weather occurred outside built-up areas
4. Case study for the usage of meteorological data on a Hungarian motorway

- Length of the motorway network: 1000 km
- Traffic control supported by road weather stations under development
- Fog warning system will be part of the traffic control in 2010
- 26 Vaisala visibility distance measurement devices are working on M7 motorway (on each 6 kilometres)
4. Case study for the usage of meteorological data on a Hungarian motorway

24 hours measurements of visibility distances (M7 motorway 107+500 km)
5. Tasks for the future in the field and estimation of the safety potential

The experience gained in the ROADIDEA project will be used in the development of the traffic control system on M7 motorway.
Thank you for your attention!