MINISTRY
OF NATIONAL DEVELOPMENT
HUNGARY

2nd Session of Group of Experts on Safety at Level Crossings

Low cost solutions to improve safety at level crossings in Hungary

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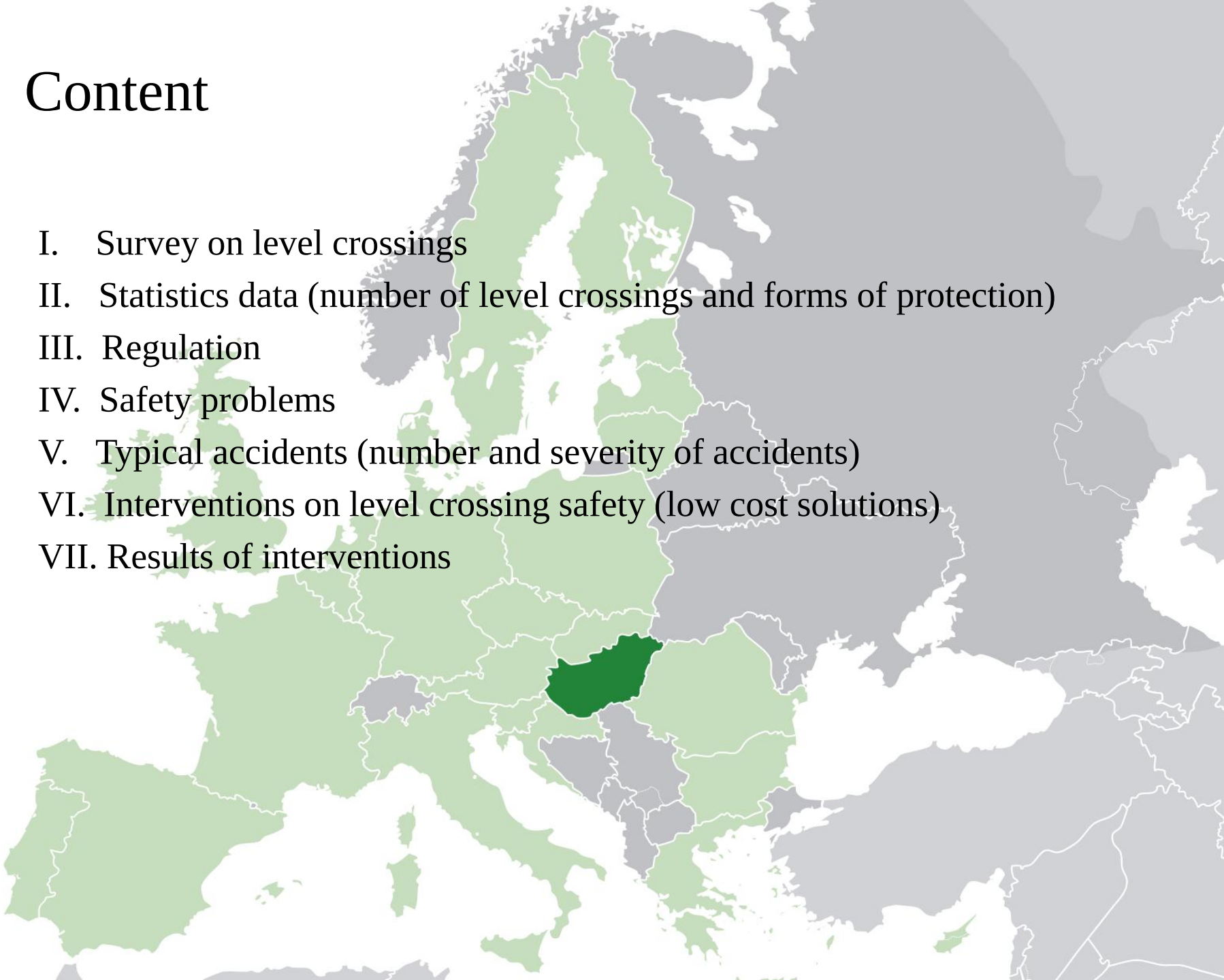


I. Survey on level crossings

Survey is conducted by Institute for Transport Sciences Non-Profit Ltd. (Hungary)

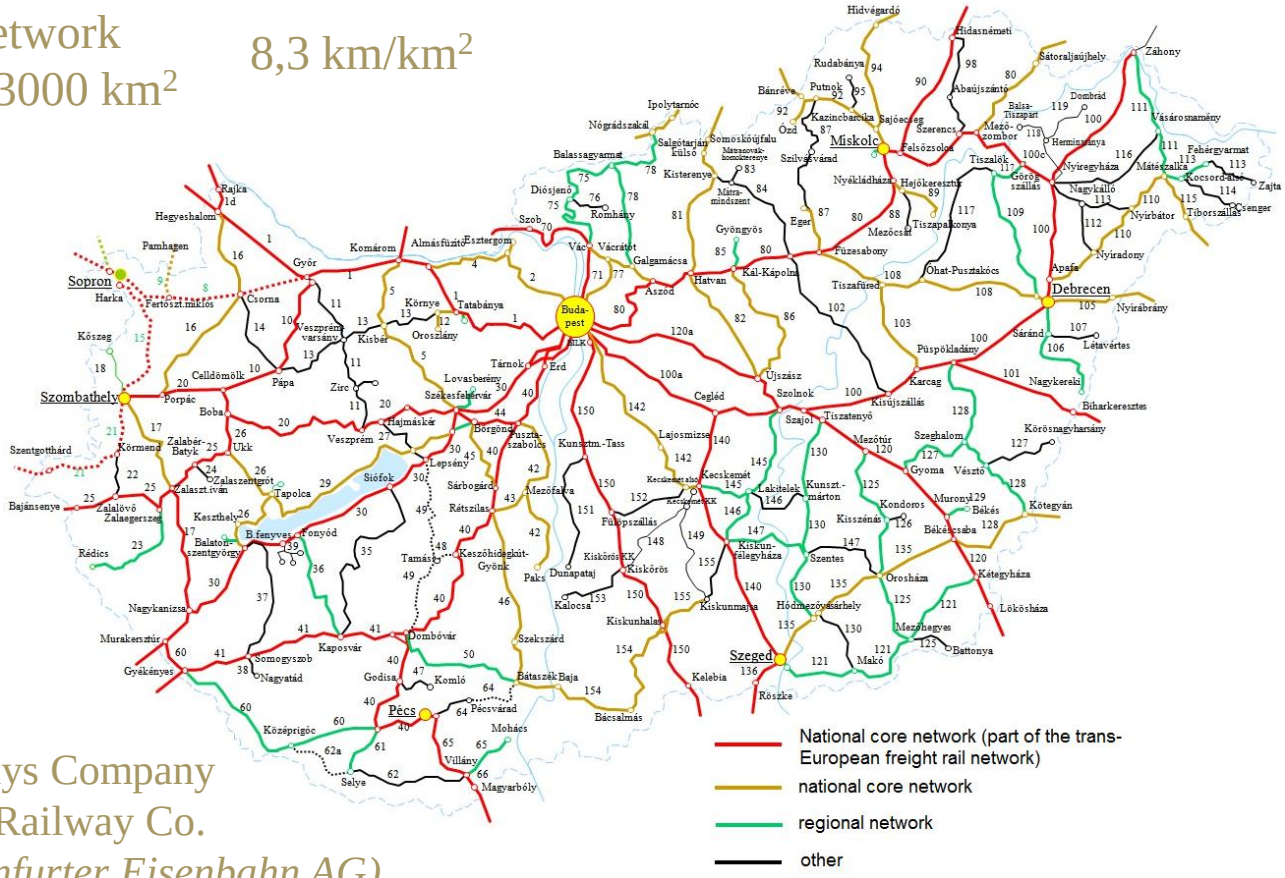
The project has 5 main chapters as follows:

1. Owerview on the amendment of national technical regulation of level crossings,
2. Preparation of literature study of international experiences on level crossings design and regulation,
3. Technical evaluation and preparation of proposals for further development of level crossings,
4. Preparation of new methodologies to define hazard ranking,
5. Preparation of proposals to upgrading legislations and technical standards on level crossings.

II. Statistics data

- **7718 km** of railway network
- Area of the country: 93000 km^2

8,3 km/km^2



Two main operators:

- Hungarian State Railways Company
- Győr-Sopron-Ebenfurt Railway Co.
  (Raab–Oedenburg–Ebenfurter Eisenbahn AG)

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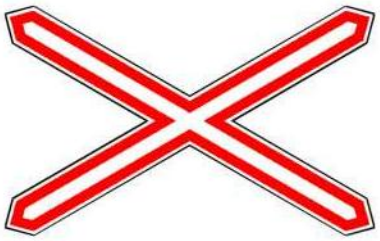
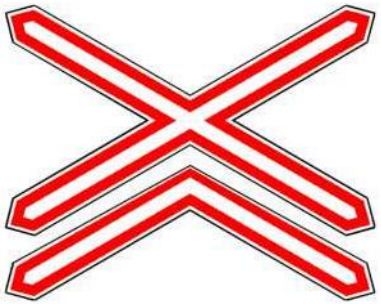
Number of level crossings

- **5838** level crossings in 2010 (1 level crossing/1,3 km of railway)
  - **3196** open level crossings without barriers or flashing signals
  - **1476** open level crossings with flashing signals
  - **918** level crossings with half-barrier and flashing signals
  - **248** level crossings with full-barrier

100%
55%
25%
16%
4%





III. Regulation

Establishment of level crossing is allowed where $V_{train} \leq 160\ ^{km}/_{h}$

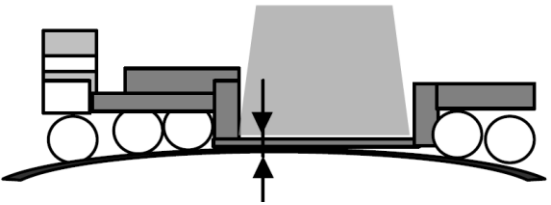
Legislative act	Standards, technical specification
Decree no. **20/1984. (XII. 21.)** – about road traffic regulation and placement of road signs	**e-ÚT 03.06.11** – technical specification about establishment of level crossings

- Other regulations which affects level crossings indirectly

IV. Safety problems

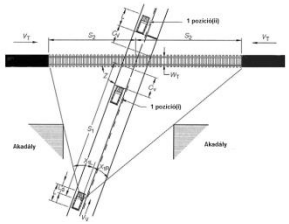
$$\frac{\text{Number of injuries}}{\text{Number of accidents with only material damage}} = \text{on road: ~20\%, at level crossing: ~100 \%}$$

- Risk of grounding of long low vehicles.



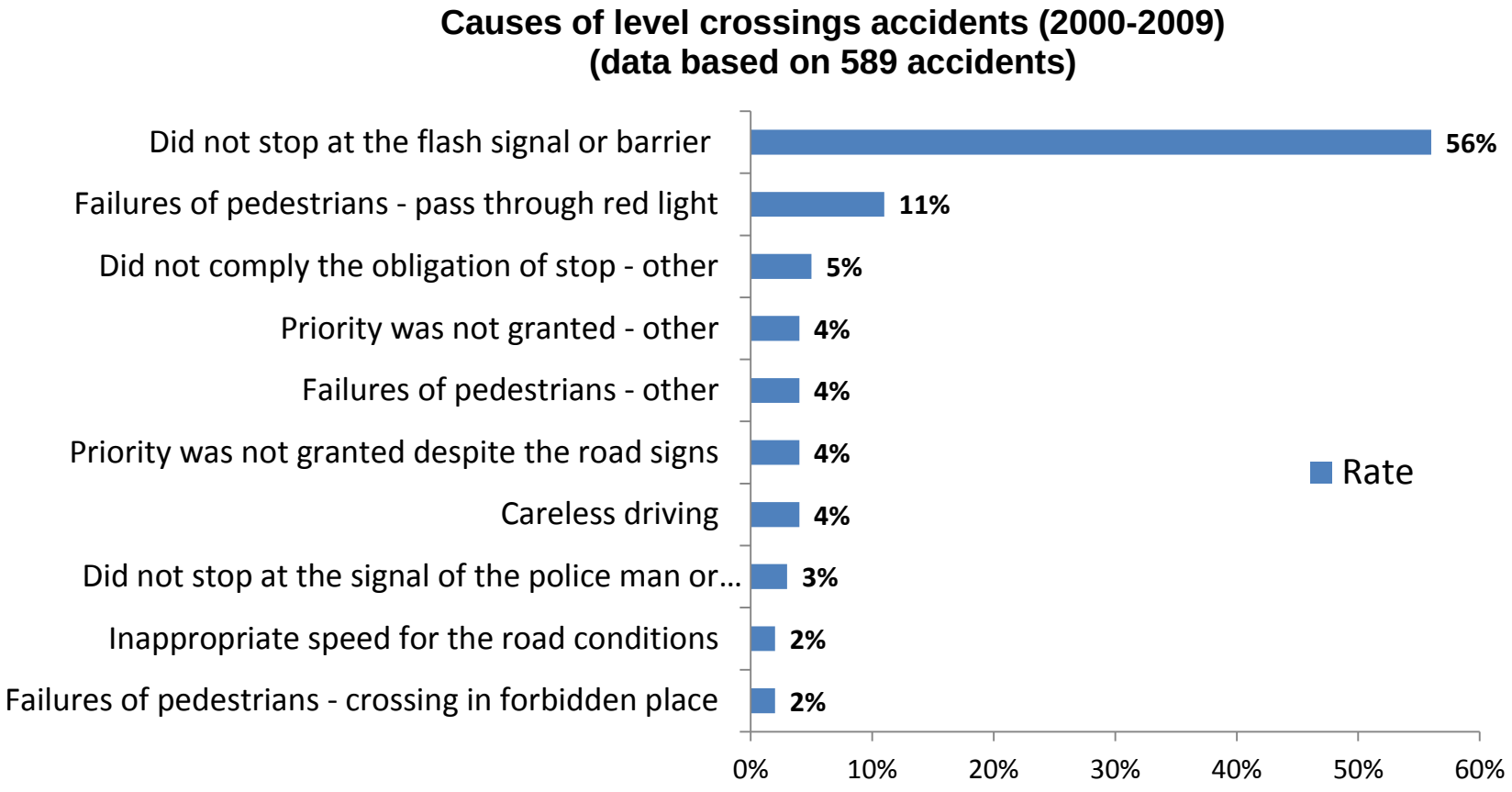
Before

After



- Insufficient clear sight triangle
- Remove contradictions between regulations

V. Typical accidents



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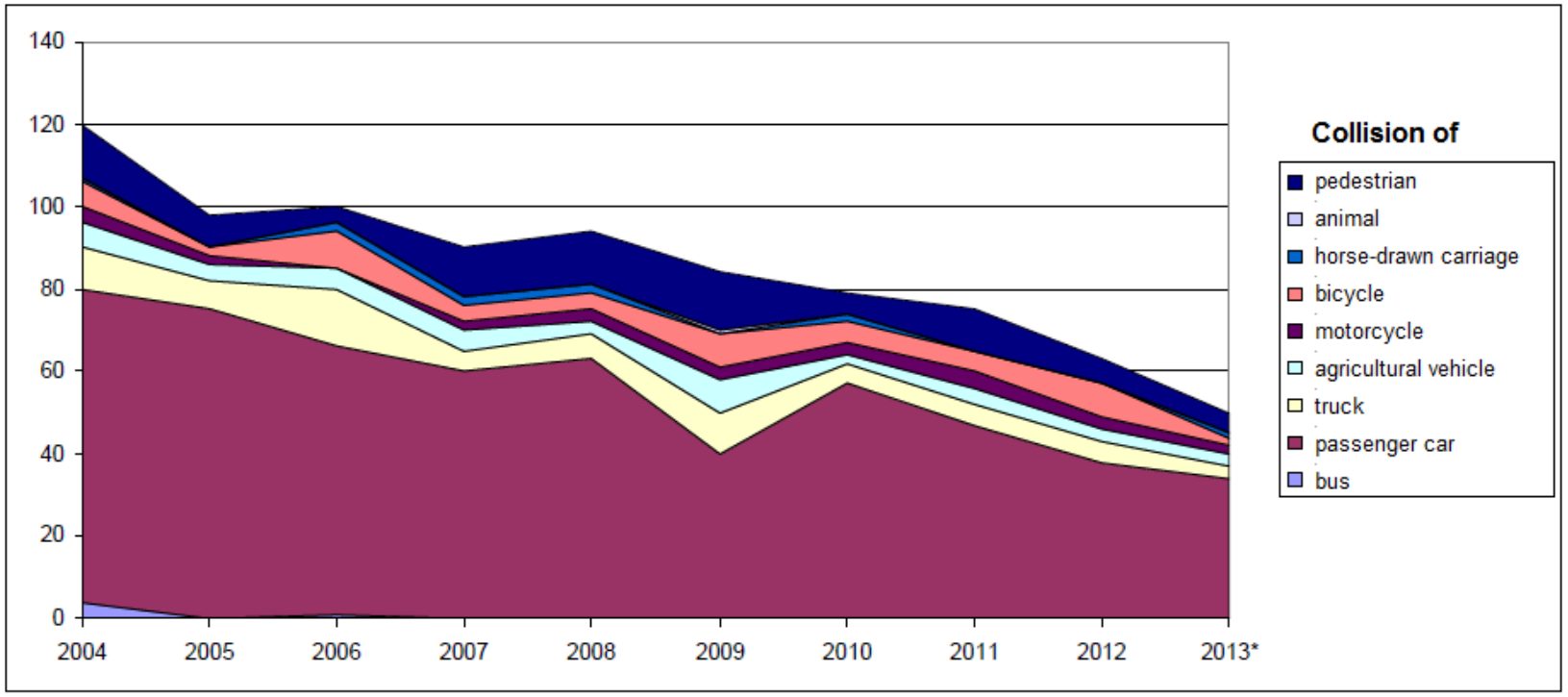
Collisions at level crossing depending on the participation form in the road traffic



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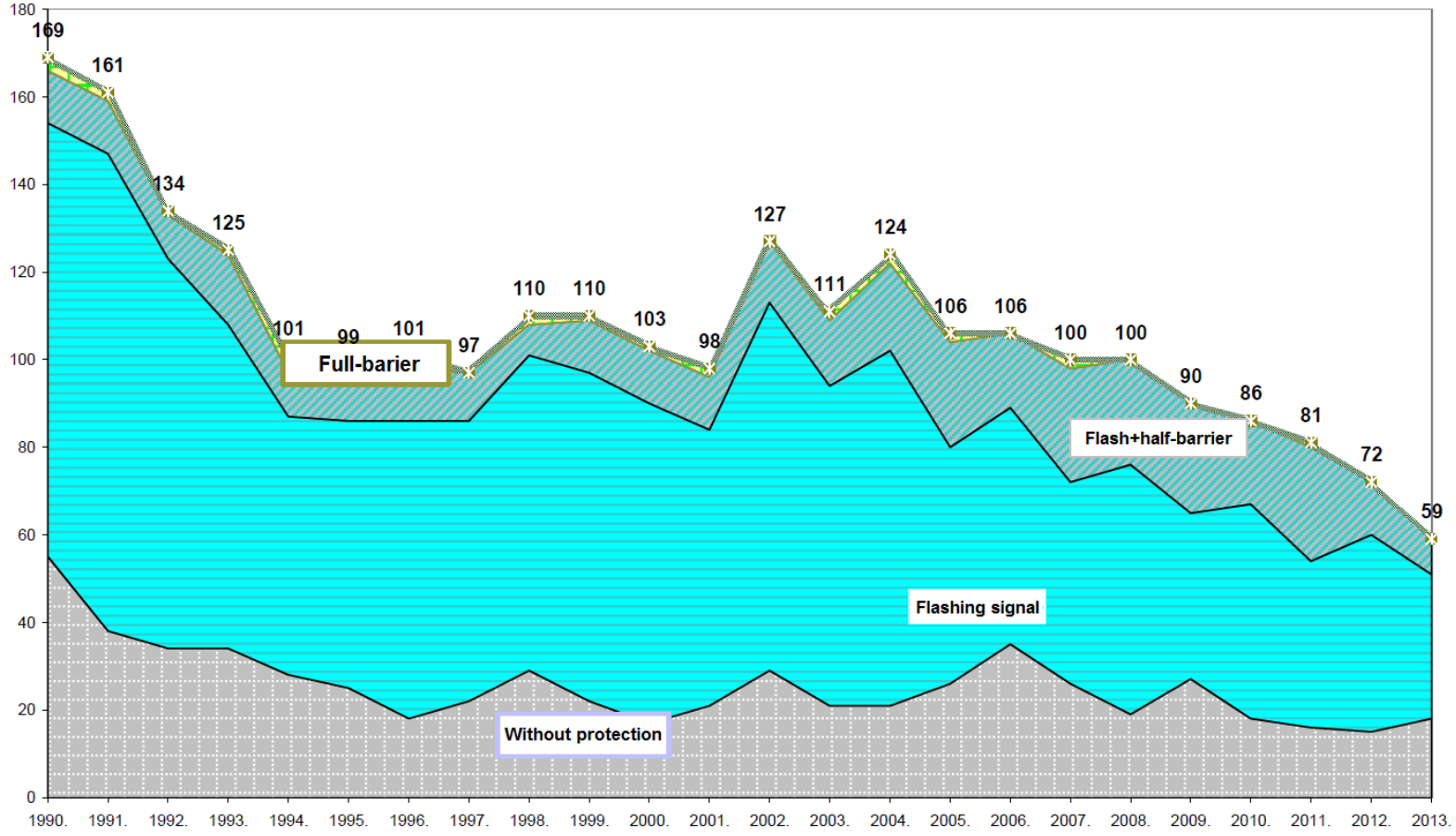
Collisions of rail and road vehicles at level crossings depending on the type of protection (1990-2013)



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Severity of accidents (2006-2012)

VI. Interventions on level crossing safety

Safety improvements:

- Reconstruction of unfavorable longitudinal section of level crossing to prevent suspension of low chassis vehicles,
- Barrier program,
- Modernization of train detection system,
- Establishing event-driven cameras,
- Installation of vehicle diagnostic and monitoring systems (to minimize the subjectivity of the diagnostic results to decrease the risk of accidents),
- Level crossing campains.

VI. Interventions on level crossing safety

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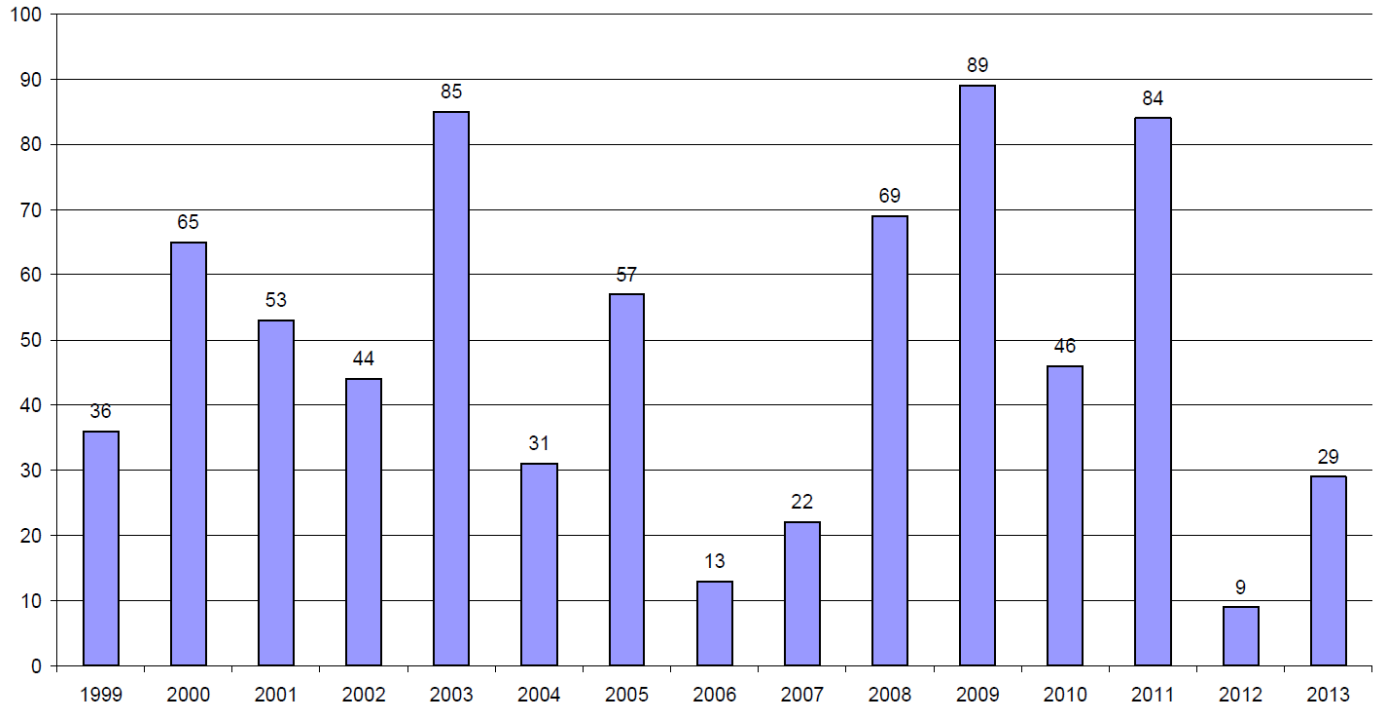
Annual number of interventions to improve safety on the railway network (1999-2013)



- Hazard ranking of level crossings

VI. Interventions on level crossing safety

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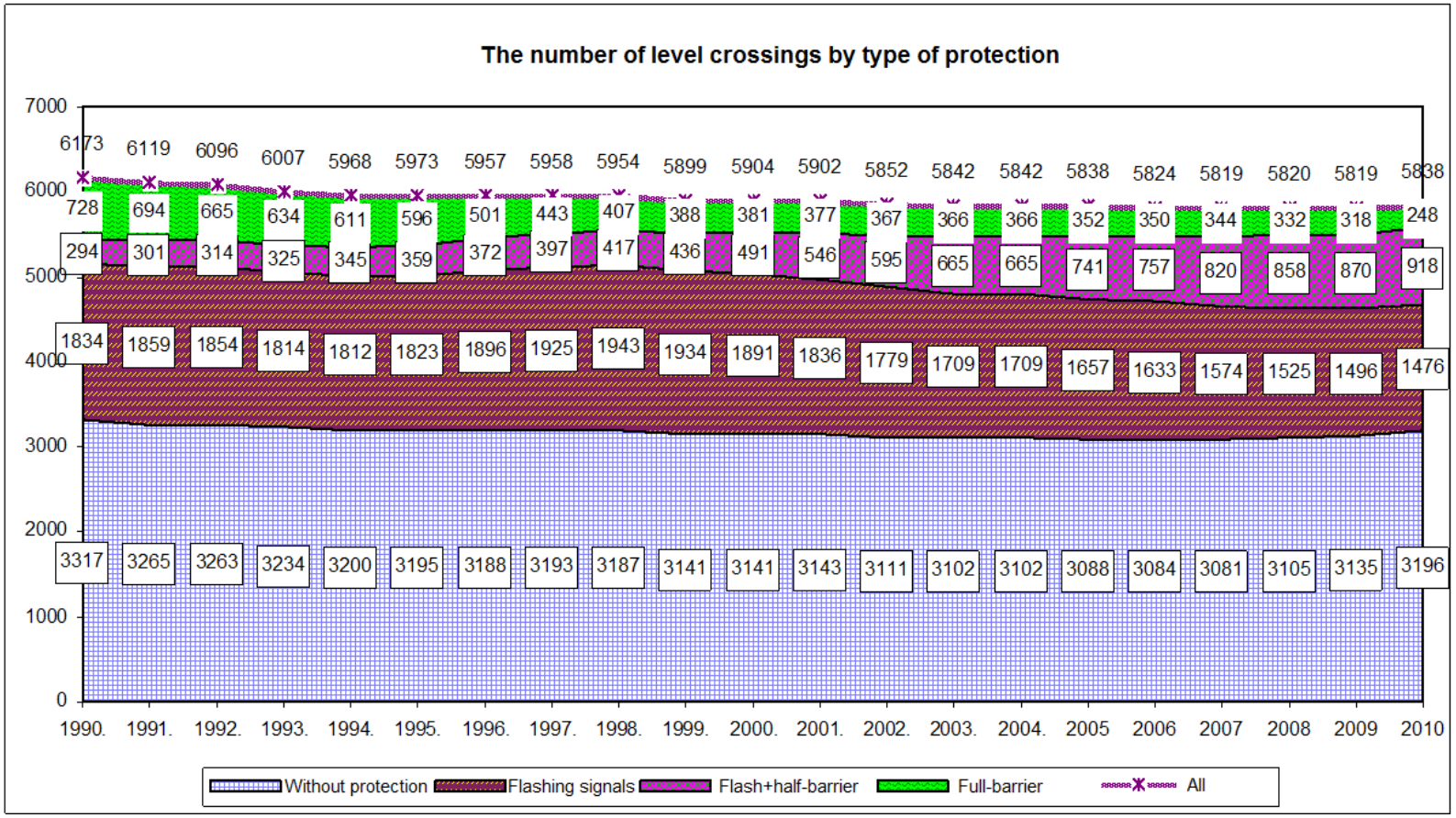
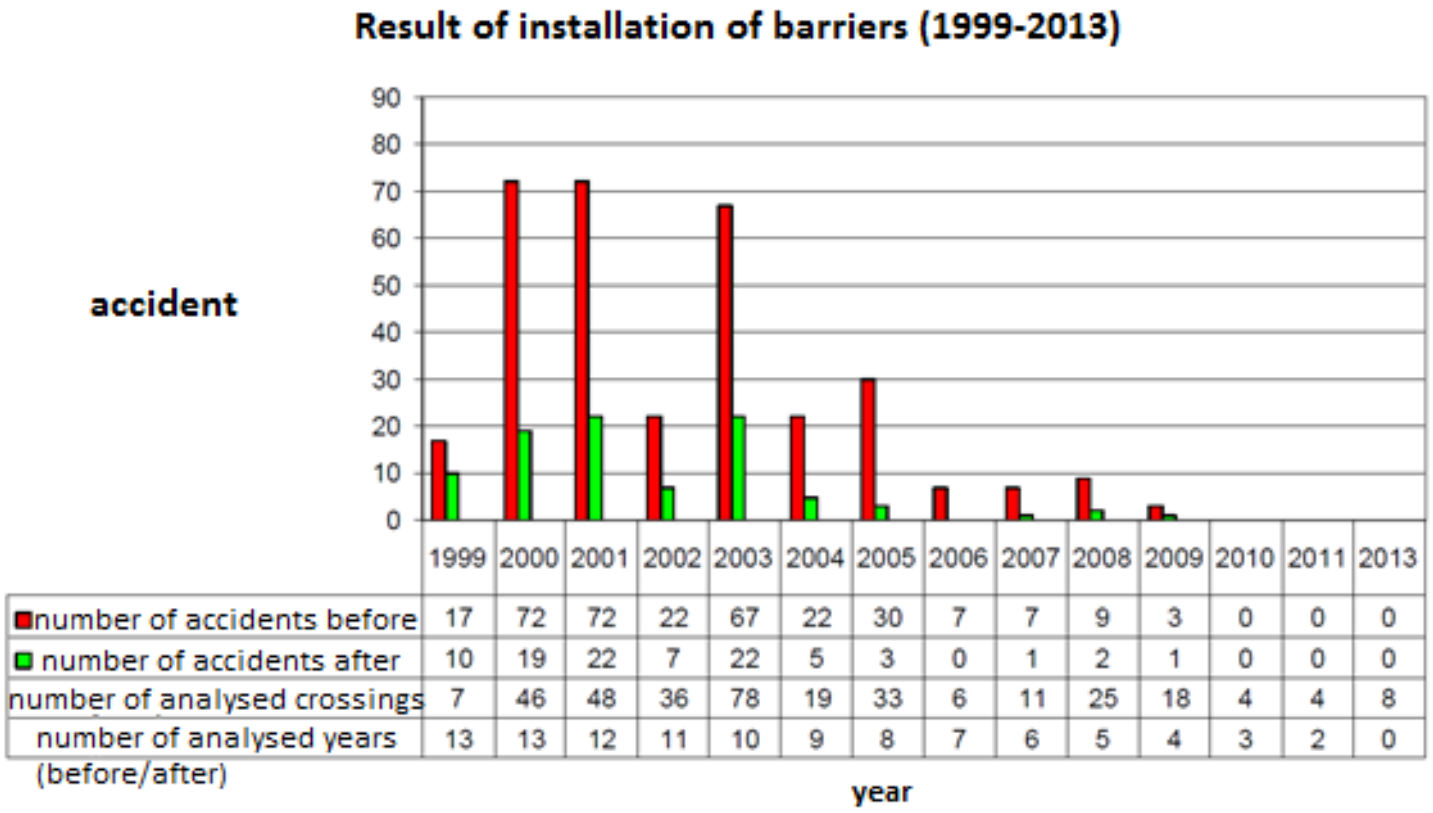


VII. Results of interventions



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2013
number of accidents before	17	72	72	22	67	22	30	7	7	9	3	0	0	0
number of accidents after	10	19	22	7	22	5	3	0	1	2	1	0	0	0
number of analysed crossings	7	46	48	36	78	19	33	6	11	25	18	4	4	8
number of analysed years (before/after)	13	13	12	11	10	9	8	7	6	5	4	3	2	0

VII. Results of interventions

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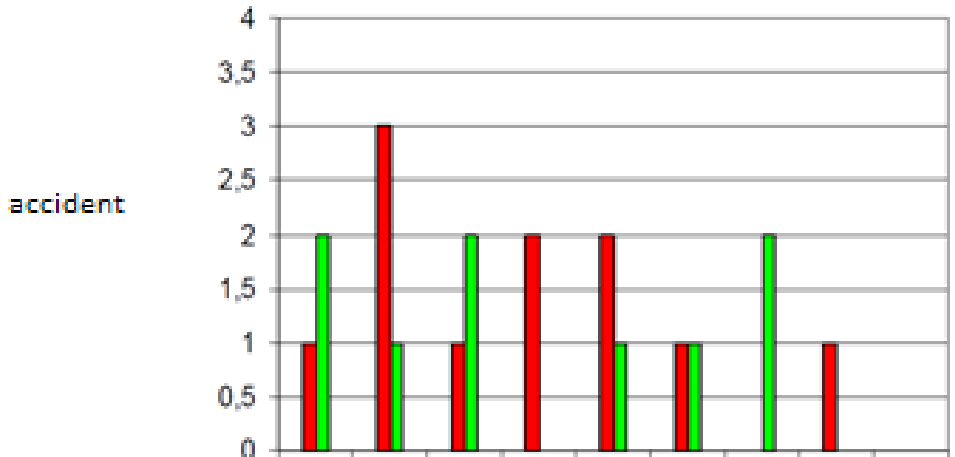
Instalation of LED technology



	2003	2004	2006	2008	2009	2010	2011	2012	2013
no. of analysed crossings	1	3	4	2	3	23	46	3	24
number of accidents before	1	3	1	2	2	1	0	1	0
number of accidents after	2	1	2	0	1	1	2	0	0
number of analysed years (before/after)	8	7	6	4	4	3	2	1	0

Pictures of tipical level crossings in Hungary

Level crossing without protection

Level crossing with flashing signal

Level crossing with flashing signal

Level crossing with flashing signal

Level crossing with full-barrier

Level crossing with half-barrier and flashing signal

Level crossing
For vehicles: with half-barrier and flashing signal
For pedestrian: flashing signal

Level crossing with half-barrier and flashing signal

Level crossing with half-barrier and flashing signal for all of users

Level crossing
For vehicles: with half-barrier and flashing signal
For pedestrian: flashing signal

What does not exist can not go out of order and cause problem.

...the most effective way to avoid accidents on level crossing is to not establish them, but we can not avoid them in any case. If we already have them, we must work to have it safety.