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IMPACT OF CLIMATE CHANGE ON ROAD PERFORMANCE

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1. BACKGROUND

- Climate change → challenge to national economy branches, including road engineering
- Climate model for Hungary with changes above average
- World-wide efforts to mitigation and/or adaptation, e.g. RIMAROCC: Risk Management for Roads in a Changing Climate (ERA-NET ROAD, 2010)

2. HUNGARIAN MITIGATION AND ADAPTATION STRATEGIES I.

Mitigation strategies and measures:

- carbon taxation (fuel tax),
- CO_2-emission trading,
- harmonisation of the policies for energy, climate change and sustainability,
- safer energy supply by motor fuel diversification,
- improvement of energy efficiency of vehicles (by 20% by 2020),
- reduction in greenhouse gas emission (by 20% by 2020)

2. HUNGARIAN MITIGATION AND ADAPTATION STRATEGIES II.

Adaptation measures:

- risk based approaches for investment decisions,
- inventory of critical roads vulnerable to the effects of climate change,
- integration of extreme weather information into public information systems,
- adaptation programmes for vehicle fleets and road infrastructures,
- integration of emergency planning into operation,
- renewal of aged vehicle fleets, introduction of new efficient technologies.

3. ADAPTATION OF ROAD INFRASTRUCTURES TO CLIMATE CHANGE I.

Dangerous climate change elements:

- extreme high air temperature,
- extreme low air temperature,
- extreme precipitation,
- extreme hydrological features,
- extreme wind storms.

3. ADAPTATION OF ROAD INFRASTRUCTURES TO CLIMATE CHANGE II.

Extreme high temperatures:

concrete pavements; asphalt pavements with harder bitumen type and/or lower binder content

Extreme low temperatures:

concrete pavements; avoiding frost-susceptible sub-grade; → less harmful freeze-thaw cycles

Intensive rainfall:

hydraulically bound layers; effective drainage system; high-level maintenance against slipperiness, rutting, potholing etc.

3. ADAPTATION OF ROAD INFRASTRUCTURES TO CLIMATE CHANGE III.

Snow and wind:

snow fences; plantation for snow and wind protection

Hot and dry periods:

lower bitumen content in asphalt; warm (not hot) asphalt layers with quick opening of the road to traffic; protected (paved) slope surfaces

Unfavourable hydraulic conditions:

granular sub-grade; very effective drainage system

Severe wind-storms:

monitoring, short-term stopping of construction and maintenance work; additional road safety measures

3. ADAPTATION OF ROAD INFRASTRUCTURES TO CLIMATE CHANGE IV.

Possible modification of specifications

- Assessment of Hungarian road related standards and technical specifications for the need of further development
- Identification of critical issues
- Proposal for the direction of changes to the criteria in broad terms.
- Committees for performing the required changes in standards (Medium-term adaptation measures to climate change).

4. CASE STUDIES IN HUNGARY I.

Motorway M1 in 2009

Extreme rainfall

→ too much water to culvert under M1 → erosion → caving-in of pavement structure → traffic closure for 4 days

4. CASE STUDIES IN HUNGARY II.

Motorway M6 in 2010

Extreme rainfall → too much water into improperly compacted shoulder of M6 → erosion of hard shoulder and slope → traffic restriction for 1 week

4. CASE STUDIES IN HUNGARY III.

Calculation on the motorway network (1300 km)

Cost structure of road closures due to extreme climate events (Timár, 2011)

- Delays 35%
- Detours 45%
- Infrastructure costs 20%

11.5 % of accidents under extreme climate conditions

Increase of accident costs

5. CONCLUDING REMARKS

- Climate change → challenge to road sector
- Mitigation and adaptation strategies and measures, also in Hungary.
- Co-operation of all stakeholders is needed for the efficiency of efforts.

THANK YOU FOR YOUR KIND ATTENTION !

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