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Impact Assessment of Landslides on Traffic Infrastructure

Capacity building sessions

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Impact Assessment of Landslides on Traffic Infrastructure

1. Introduction
2. Problem Statement
3. Examples
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5. Findings

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1. Introduction

The company nast consulting is mainly active in the field of traffic engineering.

Since 2004 we are participating in various research and development projects on a national and international level.

One branch of activities covers projects for disaster management. Pre-works for submissions of new proposals focus on the Impact Assessment of Landslides on Traffic Infrastructure that I would like to share today.

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2. Problem Statement

Landslides can have a severe impact on traffic infrastructure affecting different surrounding areas ranging from a local to an international level. Bearing in mind the current climatic situation several events can take place during a short period of time.

Consequently, a continuous monitoring is required especially for high-risk sections of roads, railways and waterways.

The idea of the session is to give the project team some material and ideas for discussions with relevant stakeholders to support the implementation of monitoring activities.

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3. Examples

Taking into account our mobility platform KI.M https://kim-projekt.at/ we have selected some past examples to show the impact of landslides on traffic infrastructure.

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Landslides on Road and Railway Infrastructure

- recent events (2023-2024)
- 8 case examples from Austria, Croatia, France and Italy
- country roads, community roads & railways
- road and railway closures: different durations (hours → months or years)
- economic impact

Overview of Case Examples

Case Example

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Zagorje, Croatia

- May 11th 2023
- village of Gornji Jesenje (Zagorje region)
- state road DC74 burried by landslide
- thousands of cubic meters of earth were shifted
- Possible causes:
  - shift of wintertime groundwater
  - seismic disturbance in Croatia

(source: www.total-croatia-news.com)

Weinstraße (Styria), Austria

- Graßnitzberg/Zieregg
- May 15th 2023
- Country road L613 was closed due to landslide
- 600.000 EUR cost to restore the road
- Additional damage to wine yard
- Legal aftermath with wine maker

(source: kleinezeitung.at)

France-Italy (1/2) Frejus Railway

- August 27th 2023
- main rail border crossing between Italy and France (“Frejus Railway“)
- Line between Chambéry and Turin
- massive landslide
- closed for 1 year; full reopening expected Q1 2025
- massive damage for the operators and the railway sector
- alternative re-routings for rail freight transport via Switzerland and Germany
- French first and last-mile operators need state aid to survive Frejus closure

(source: www.railfreight.com)

France-Italy (2/2) Frejus Railway

- complex process of clearing and securing the Praz Cliff
- extensive unstable cavities in the central area of the slope has complicated the situation
- Ongoing purging, anchoring, and fencing work
- Only after the mountain section is fully secured works on restoring the railway infrastructure can begin

(source: www.railfreight.com)

Pians (Tyrolia), Austria

- December 2023
- Country road B 171
- Road closed for more than a week due to landslide
- catch basin prevented the landslide from causing massive damage to the road
- drainage system of the embankment was damaged
- B 171 road had to be partially dug up

(source: tirol.gv.at)

Wachau, Lower Austria (1/2)

- Aggsbach, June 3rd 2024
- 13,000 m³ of rock thundered onto the B33 country road and a bicycle way
- No one was injured
- Landslide was filmed
- VIDEO: https://www.diepresse.com/18531144/hangrutsch-gefilmt-massiver-felssturz-in-der-wachau

(source: orf.at, diepresse.com, kurier.at)

Wachau, Lower Austria (2/2)

- Area is closed since June 2024 and a at least until the end of 2024 (no solution found yet)
- Big economic impact as bicycle way is a main tourism hotspot (Donauradweg)
  - special fundings to help tourism businesses affected
  - Special bus transportation for bike tourists

(source: orf.at, diepresse.com, kurier.at)

Landeck (Tyrolia), Austria

- June 3rd 2024
- country road L 312 closed
- Several rocks (boulders) fell onto the road (each approx. 0.25 m³)
- Village cut off from the outside world

(source: unsertirol24.com)

Voitsberg (Styria), Austria

- June 10th 2024
- Landslide with damage to community road
- Road had to be closed for traffic
- Road relocated and drained

(source: meinbezirk.at)

Proleb (Styria), Austria

- June 13th 2024
- Country road L122 closed
- Damage to the road on 50 meter long strech
- Bus services were no longer possible (3 stops not reachable)
- heavy rainfall in the previous days had softened the ground and triggered the landslide
- Remedial measures
  - 120 m³ of landslide mass and woodland excavated
  - 1.2-metre-high concrete barriers erected

(source: kleinezeitung.at)

4. Impact and Severity

Impact (Examples)

- General public
  - Injuries and Fatalities during the event
  - Villages being isolated (requirement of air supplies) after the event
  - Emissions (noise, pollution) due to detour traffic after the event
- Public transport services (Bus/Rail)
- First and last-mile operators (railway operations between terminals)
- Tourism – affected routes could be tourism routes
- Problems based on legal aftermath

4. Impact and Severity

High risk sections

Road/Rail with high volumes and frequencies

- International passenger and freight corridors of the TEN-Network
- Additional international and national passenger and freight corridors

4. Impact and Severity

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4. Impact and Severity

Corridors (Annex 3)

- Atlantic
- North Sea - Rhine - Mediterranean
- North Sea - Baltic
- Scandinavian - Mediterranean
- Baltic Sea - Adriatic Sea
- Rhine - Danube
- Mediterranean
- Western Balkans - Eastern Mediterranean
- Baltic Sea - Black Sea - Aegean Sea

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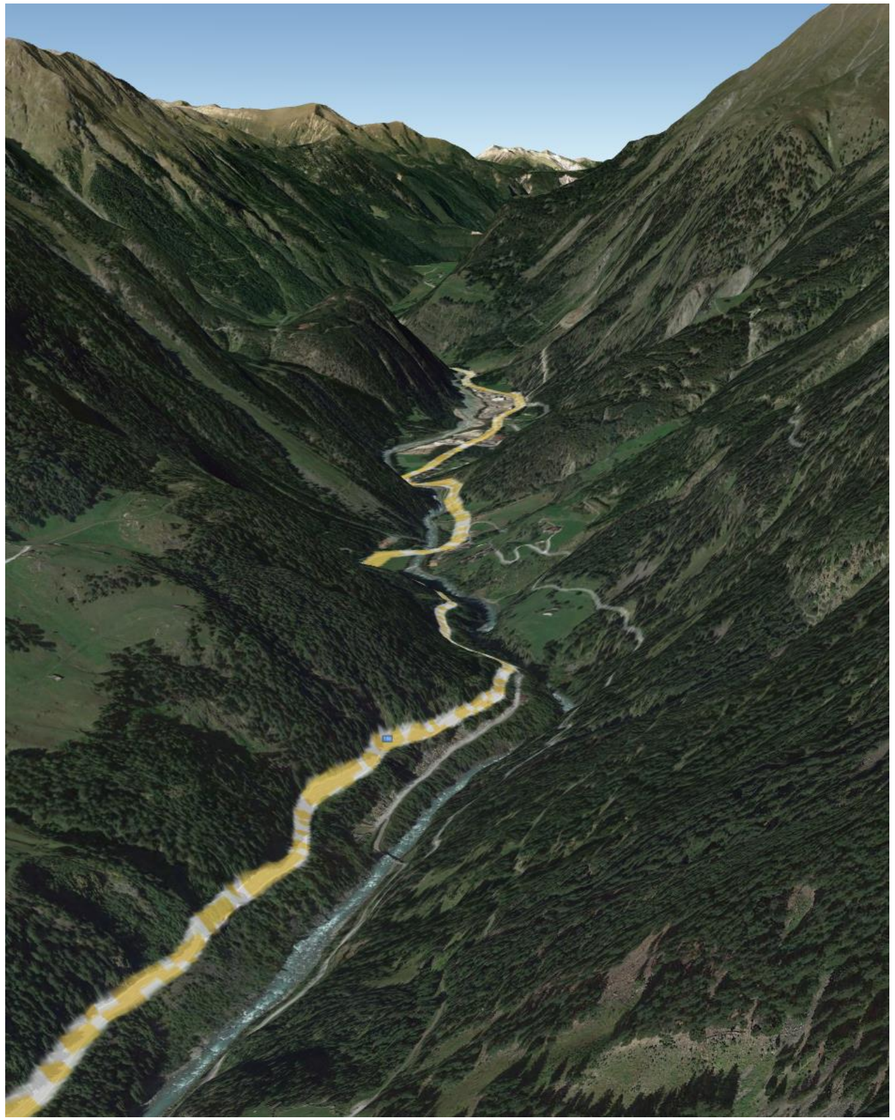
4. Impact and Severity

High risk sections

Roads with missing alternatives

- Roads through narrow valleys
- Roads with missing opportunities for the detour of heavy vehicles (trailing curves, height and weight limitations)



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5. Findings

The initial review revealed that based on the current climatic situation several problems can occur at nearly the same time.

Examples have shown the impact and severity of different events in the past years.

Additional research needs to be carried out to evaluate the impact and severity. Furthermore, sections should be identified with high risks were monitoring should be carried out.

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interreg-danube.eu/projects/geonetsee

Thanks for your attention

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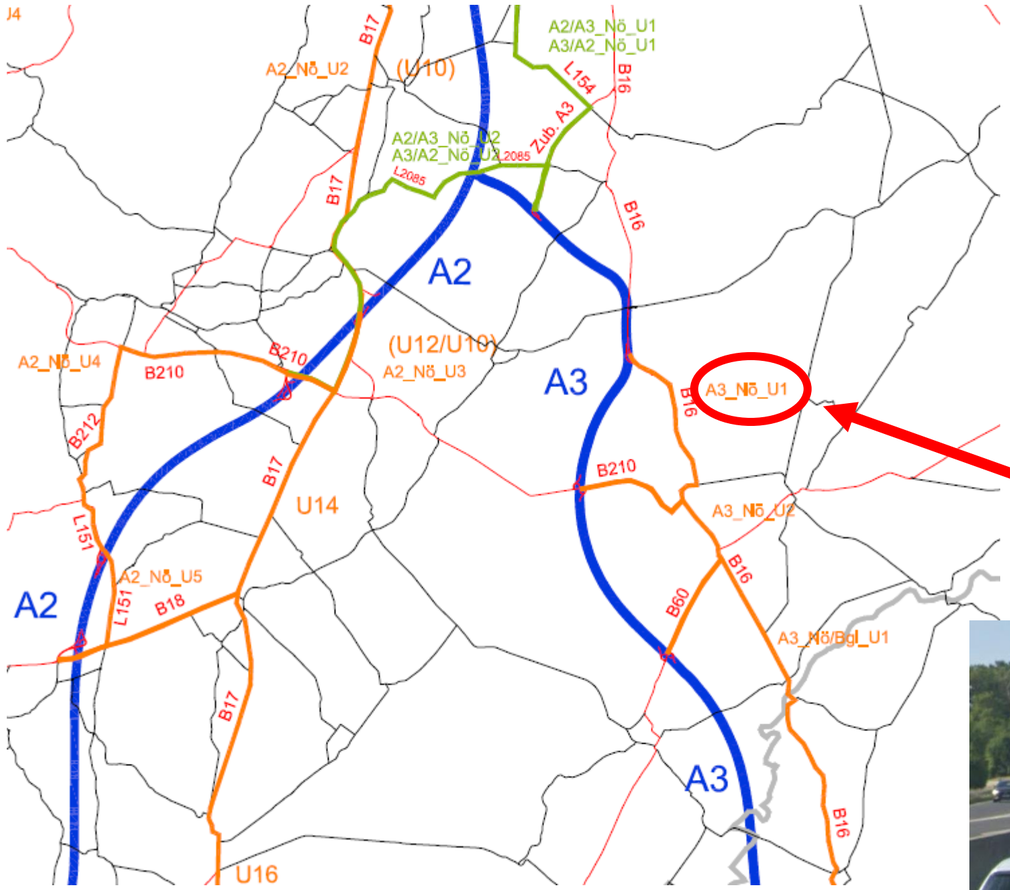
Appendix

Organisational measures – alternative traffic route concepts



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