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Adaptation Pathways to Reduce Avalanche Risk

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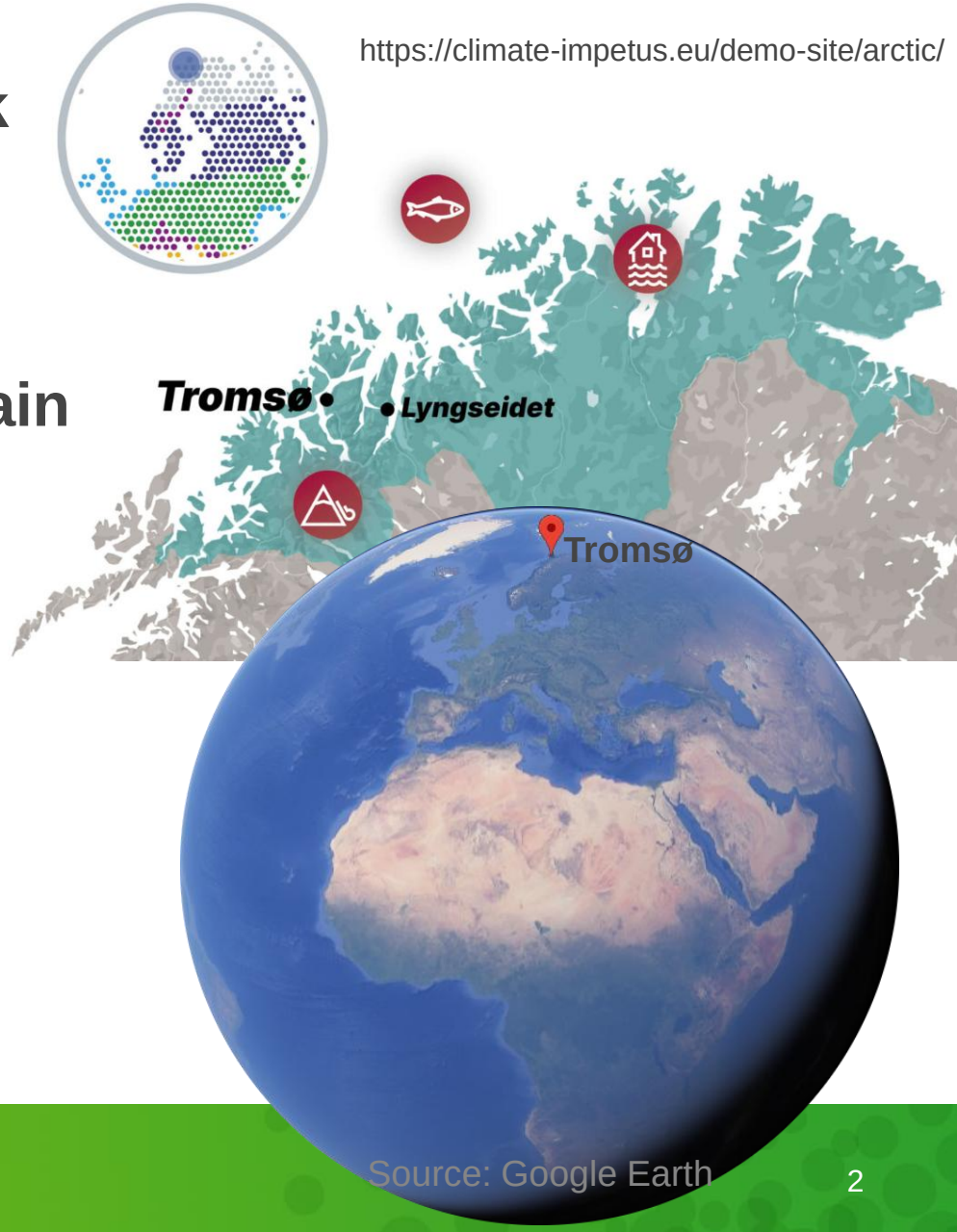
climate-impetus.eu

Adaptation Pathway Methodology

https://climate-impetus.eu/demo-site/arctic/

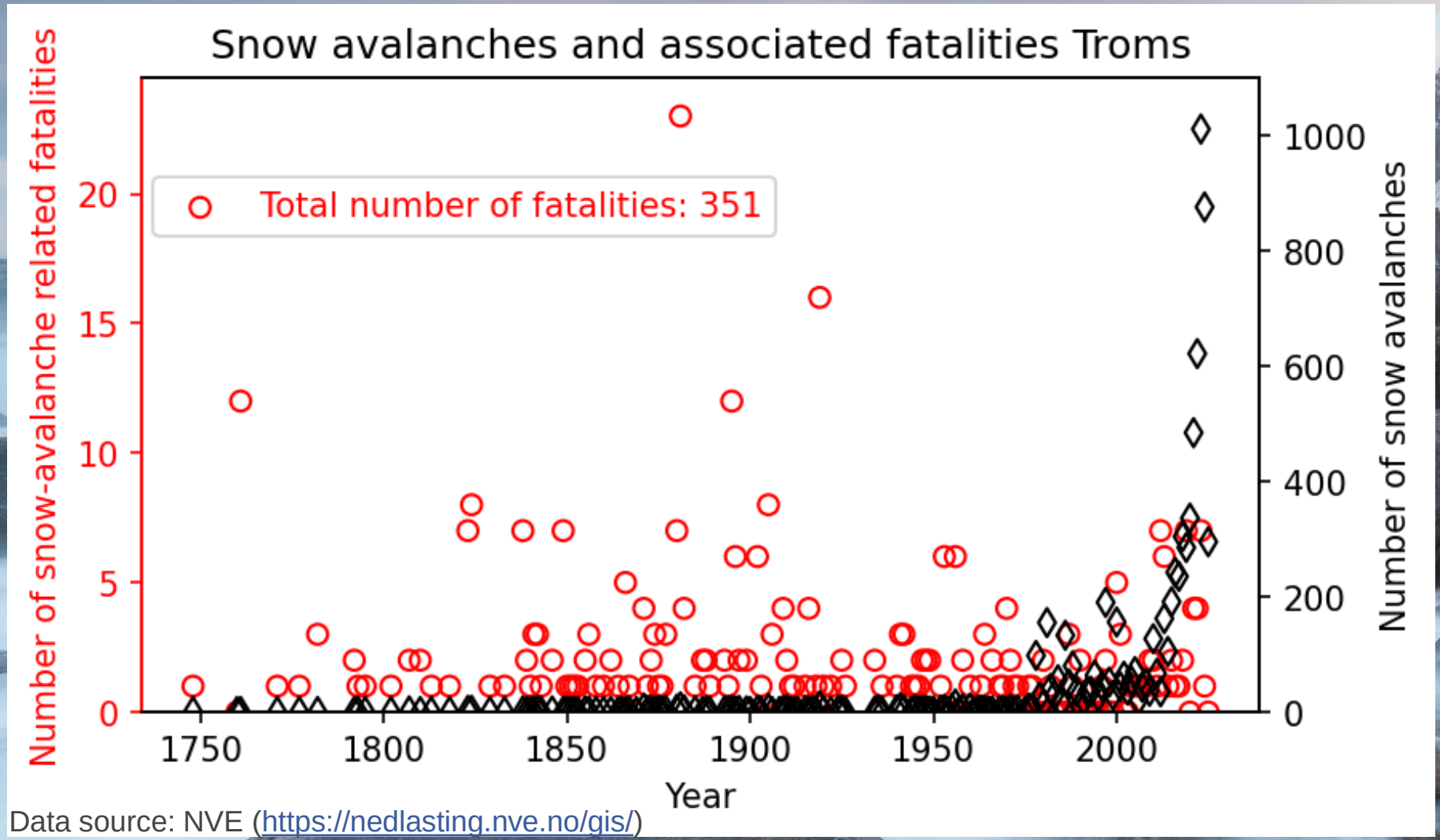
1. **Set the objective and identify the climate risk**
   - reduce the risk associated with avalanches
   - climate risk: avalanche increase
2. **Analyse the problem and build an impact chain**
3. **Define tipping points**
   - very difficult in our case
4. **Identify and assess adaptation options**
5. **Sequence the adaptation options**
6. **Identify and assess alternative pathways**



Source: Google Earth

Arctic
Troms and Finmark, Norway

1. Set the objective and identify the climate risk



Data source: NVE (https://nedlasting.nve.no/gis/)

- objective:
  - ➢ reduce the risk associated with avalanches
- climate risk:
  - ➢ avalanche increase

Image: Michal, AdobeStock (under license)

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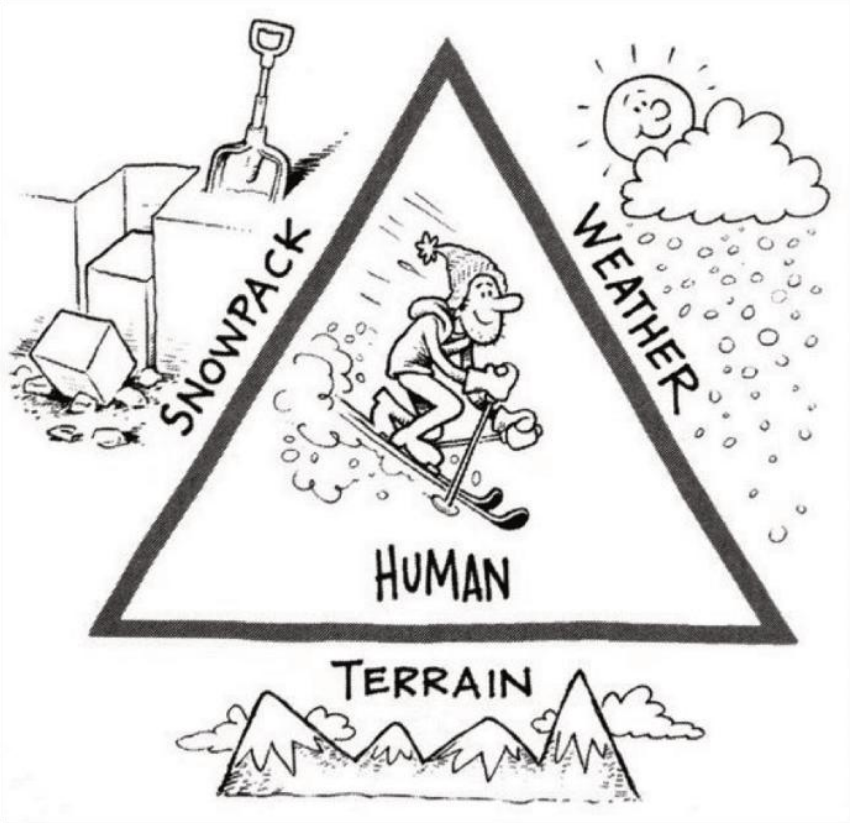
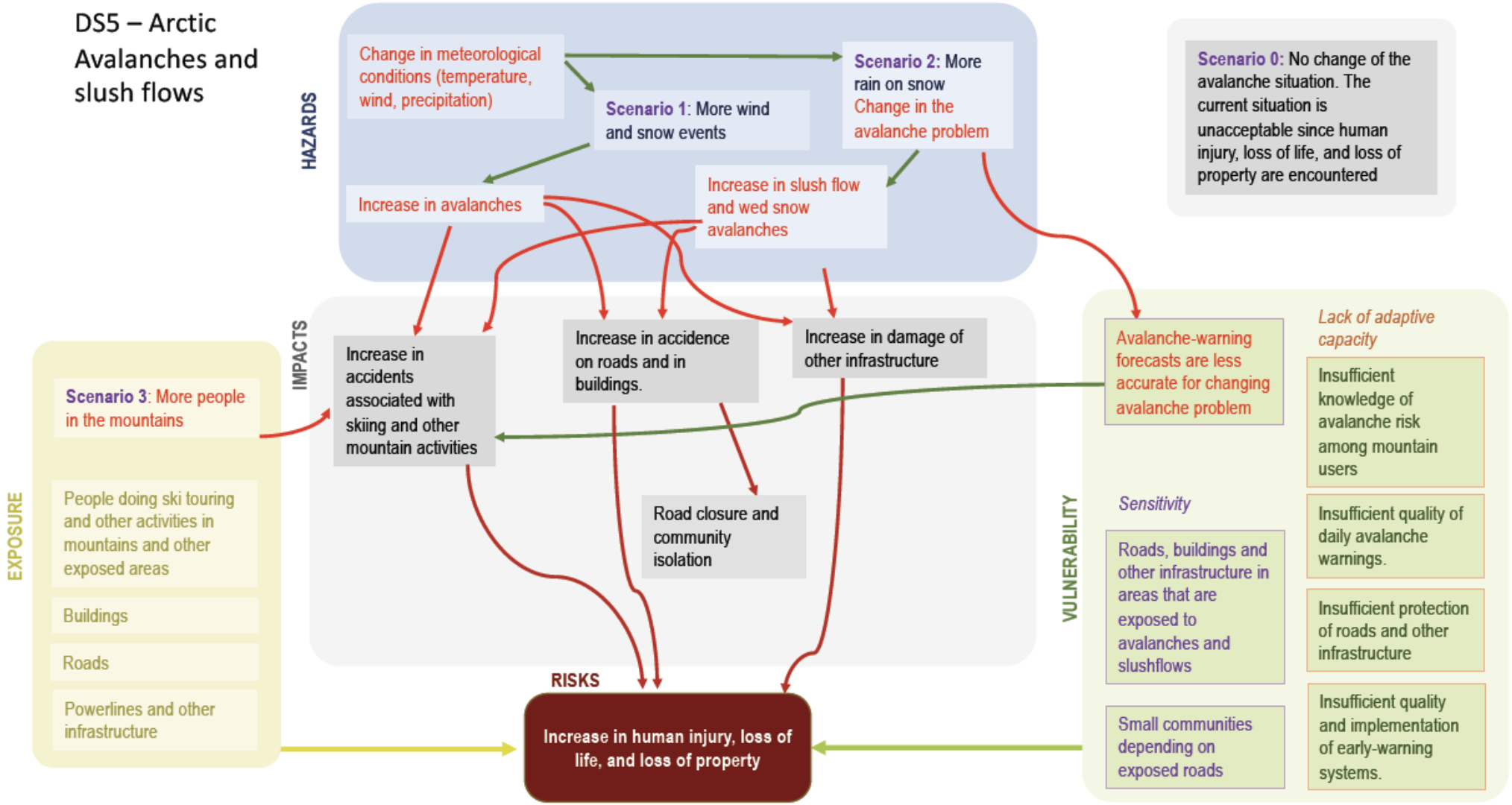
2. Analyse the problem and build an impact chain



The “avalanche triangle” (avalanche.org).

- based on earlier studies and our own preliminary work we have built four scenarios:
  - Scenario 0: Baseline – Avalanche activity unchanged
  - Scenario 1: Avalanche activity increases
  - Scenario 2: Avalanche problem changes
  - Scenario 3: Shift in human activity

*2. Analyse the problem and **build an impact chain***



3. Define tipping points

- difficult to define “sharp” tipping points

- any avalanche-related fatalities are already unacceptable → arguably a tipping point has already been reached

- otherwise: try to related the tipping points to measurable quantities:
  - number of avalanche accidents > one standard deviation of the previous 20 years
  - avalanche forecast more often wrong than right

4. Identify and assess adaptation options

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- catalogue of 15 **adaptation options** has been produced; three categories:

1. Improvement of avalanche warnings (with NVE)
2. Improvement of danger and risk communication (with CARE)
3. Hazard mapping and regulations (with Tromsø municipality)

Category 1

- implementing a machine-learning model
- implementing a snowpack model
- increasing spatial resolution of avalanche warnings

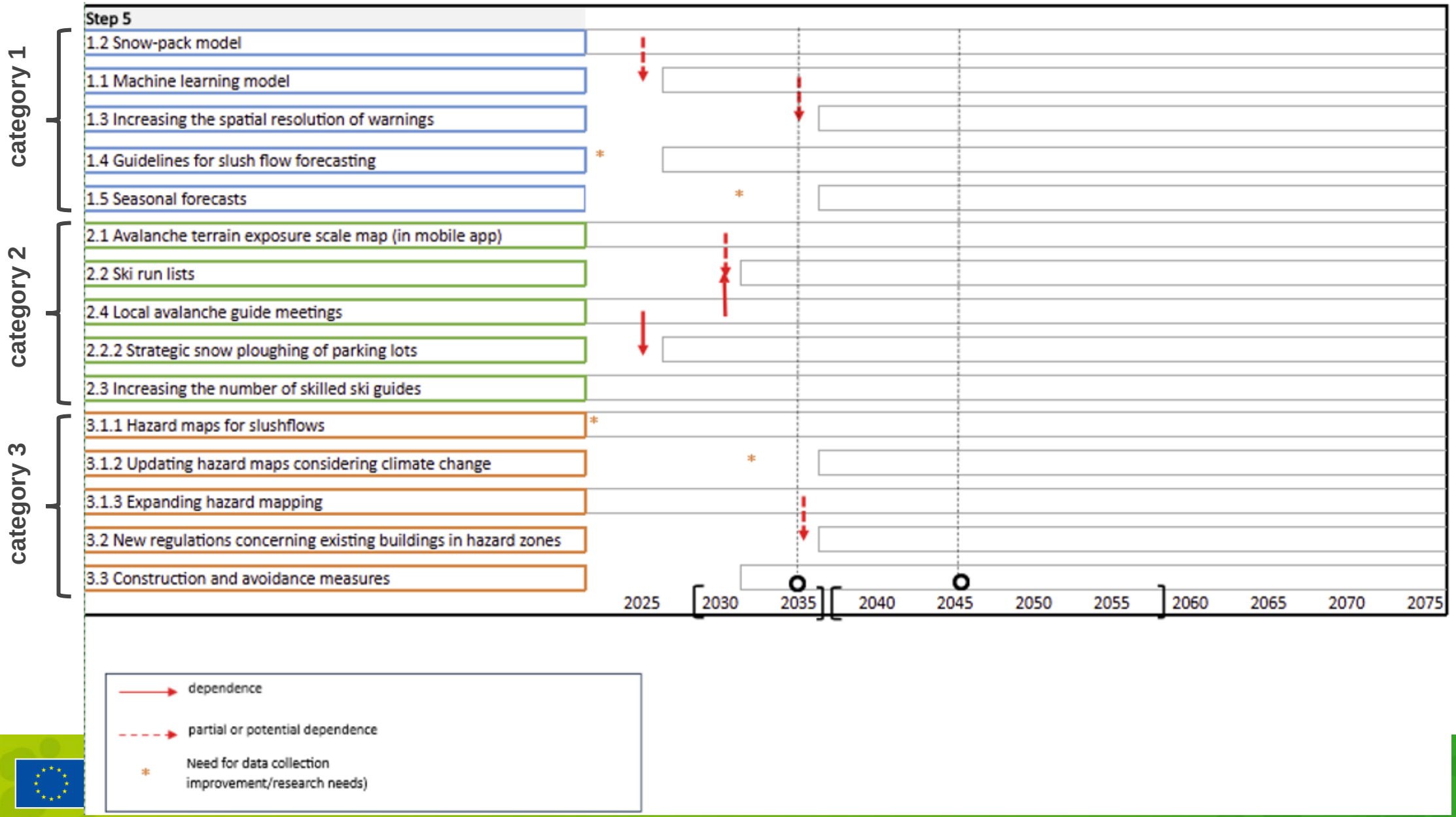
Category 2

- avalanche terrain exposure scale map (mobile app)
- local avalanche guide meetings
- ski-run lists (mobile app)
- strategic plaughing of parking lots

Category 3

- hazard maps for slush flows
- new regulations concerning existing buildings
- construction and avoidance measures

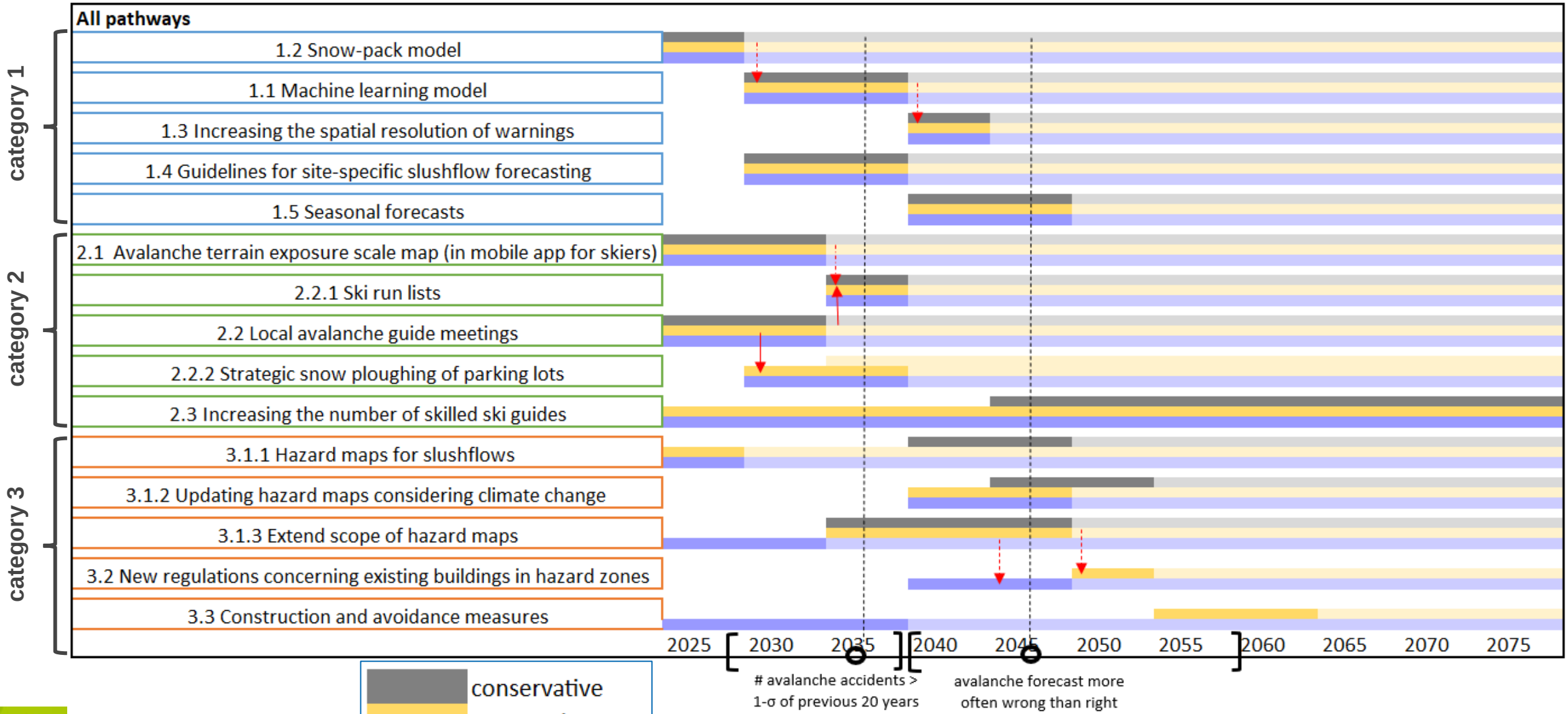
5. Sequence adaptation options



6. Identify and assess alternative adaptation pathways

- adaptation options are sequenced into **adaptation pathways**
- three pathways were developed depending on the level of intervention:
  - conservative (non-interventionist)
  - progressive (mixed)
  - transformational (interventionist)

6. Identify and assess alternative adaptation pathways



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Turning climate commitments into action

Thank you

Any questions?

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