Integrated database for rapid mass movements in Norway

Christian Jaedicke[1], Karstein Lied[1], Halvor Juvet[1], Kalle Kronholm[1,2]
[1] Norwegian Geotechnical Institute NGI, Oslo, Norway, [2] International Centre for Geohazards ICG, Oslo, Norway

Introduction

- Norway covers large areas exposed to all kinds of rapid mass movements
- Both settlements and infrastructure are exposed to slides
- During the last 150 years, approx. 2000 people were killed by slides
- Slides have not been registered systematically
- Registration were distributed in different databases, for different institutions and field of interest
- A national database for all slide events was established within the **GeoExtreme** project
- The database should include all registered slide events
- The database will be the basis for statistical analyses and every day consulting work
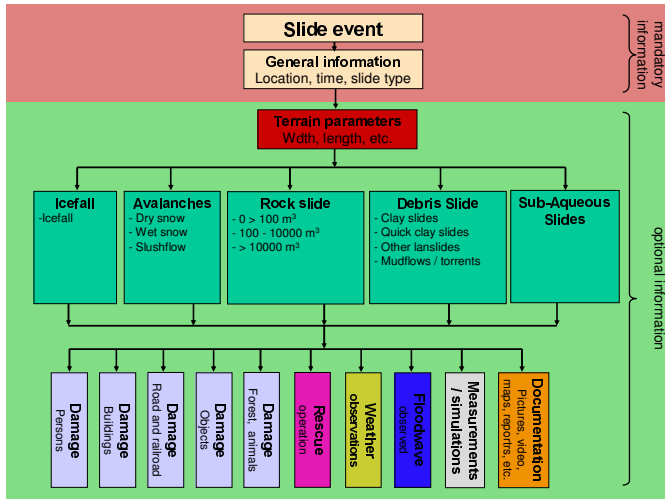
Database structure

Fig 1: Structure of the slide database

Structure

- The database is constructed for single slide events
- Only three parameters are mandatory
  - Location
  - Time
  - Type of slide
- All other information is optional

Parameters

- General parameters (e.g. slope angle, slide geometry, time, location, etc.)
- Slide specific parameters (e.g. geology, snow type, grain size, soil type etc.)
- Secondary parameters (e.g. info about rescue operation, type of damage, etc.)
- Wherever possible, parameters follow international standards

Data quality

- Each slide can have one of four quality levels
- The quality level is decided by the administrator
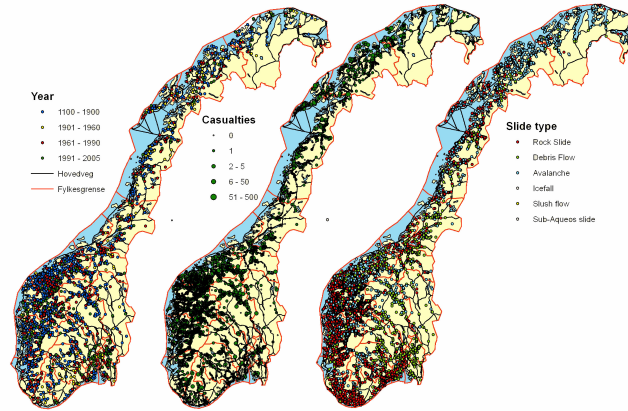- The administrator can delete slides from the database

Fig 2: Maps of Norway showing slide events classified by date, number of casualties and slide type

The graphical user interface

- Users
  - All users have to register with name and password
  - The users can have the status of layman, expert or administrator
  - A personalised page allows changes in personalia and preferences

- Registration of new slides
  - Modular hierarchy
  - Drop down menus wherever applicable
  - All number values are followed by an accuracy estimate
  - Free text comments only possible at the very end of the registration
  - Files like pictures movies etc. can be uploaded to the database

- Lists
  - Offers to look at all slides, users own slides or the last 20 registered slides
  - Each user can edit their own slides and view all other slides

- Search
  - Search strings can be constructed using all available parameters
  - The data can be viewed online or be exported to TXT or EXCEL files
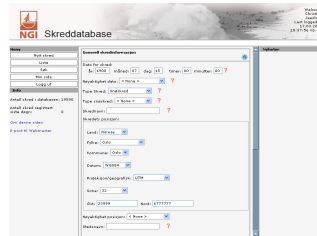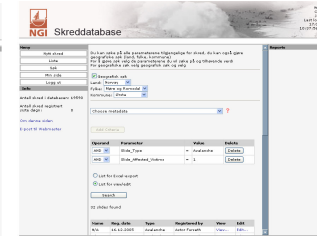

Fig 3: Screen plot of the registration page

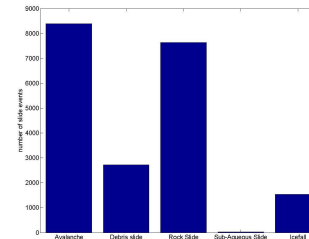**Fig 4:** Screen plot of the search page

Results

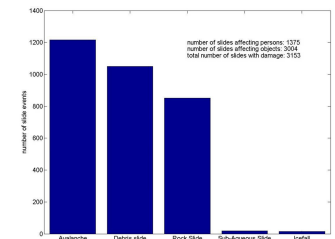**Fig 5:** Type of all avalanches in the database

Fig 6: Type of avalanches causing damages

- In total 22 000 slides are included in the database
- The majority of slides are registered by the road authorities
- Most slide events are avalanches, followed by rock slides
- Most fatalities are caused by avalanches, followed by debris slides
- Events with more than one casualty are rare
- Large events with more than 20 casualties are exceptions
- The annual distribution of slides shows:
  - High snow avalanche activity from Dec. – Apr.; exception: July
  - Debris slides equally distributed, peak in July
  - Rock slide activity highest in the winter month
- Most slide events are registered at the west coast and fjord districts
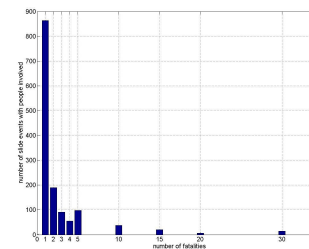- Some districts lack registrations

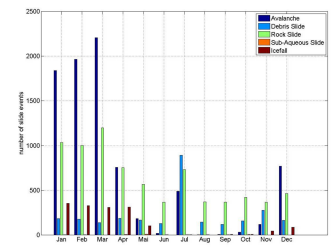**Fig 7:** Number of fatalities in a single event

Fig 8: Annual distribution of slide type

Discussion and Conclusion

- Data is spatially not well distributed
- No data in "free" nature, only along roads and settlements
- Collected parameters are very different from source to source
- Data quality and completeness strongly dependent on the observers
- Are there any double registrations?
- No data = no slides?

- The database offers a unique national collection
- Statistical analyses based on the database are possible
- The data gives a good overview over slide events in Norway
- The no-slide events are the insecure factor
- Data has to be collected more systematically
- The database will be developed further with both new and historical slides