A COST EFFECTIVE TECHNOLOGY FOR REDUCING LANDSLIDE RISK

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Cost effective approach of landslide risk reduction is important concern as landslides related incidences impact lives and livelihoods in Nepal every year. After the 2015 Gorkha Earthquake, landslides events are increased in terms of **aggravation of already existing slides or initiation of new slides** due to fragility of ground conditions and **periodic torrential rains** in various parts of the country (e.g. recent days July 2020 events in Myagdi, Tanahun etc.)

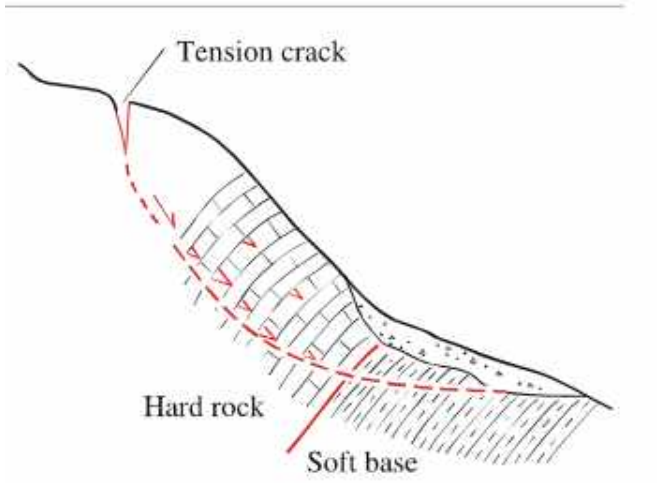
LOSS DUE TO LANDSLIDES

- Many peoples have lost life due to landslides
- Many people are missing
- Many families are affected

Damage Type	1971-2007	2011/20	2020/7/13
Persons Dead	3987	904	10
Affected Families	479972	6796	-
Missing	517	233	39

LANDSLIDES

- Tension cracks
- These facilitate the infiltration of surface runoff into weak surfaces
- These raise groundwater levels
- Once the shear strength falls below a critical value, failure surface will occur along the stratum boundary.
- Landslide occurs



Source :Huang, 2015

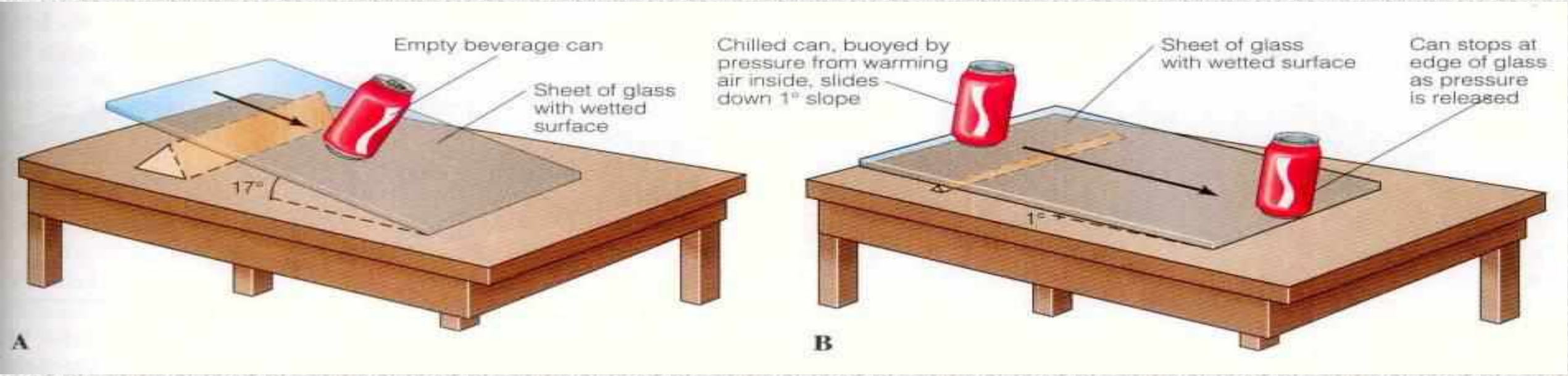
Cost Effective Community-based: Landslide Risk Reduction

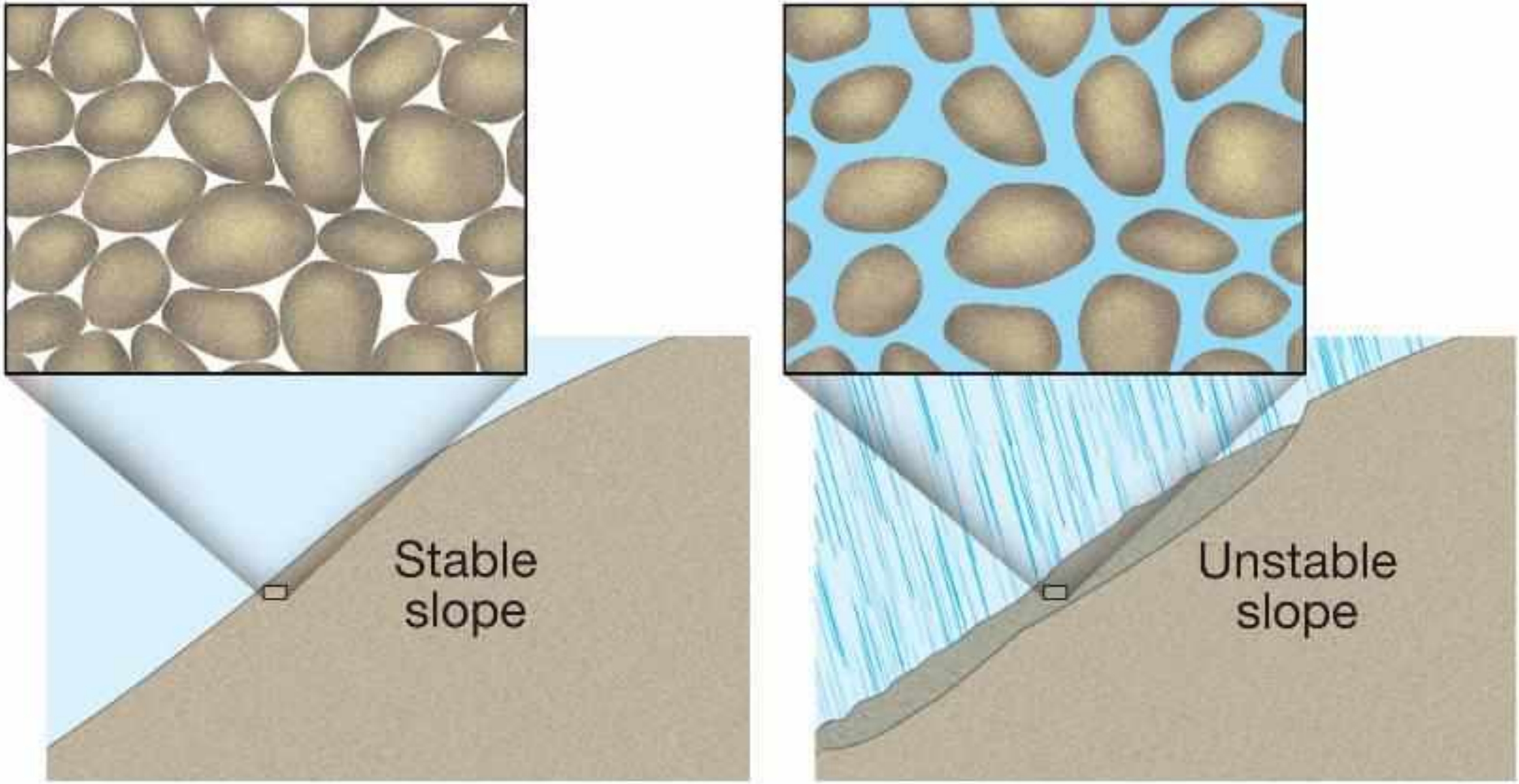
- Holding meeting with administrative officer of study area
- Meeting with community people to know landslide situation
- Identification of probable landslide area upstream and downstream of community
- Identification of tension cracks of landslides
- Sealing tension crack
  - *Removing unstable material along tension crack by digging*
  - *Preparing a ditch along tension crack about 2 ft deep and 1 ft wide*
  - *Filling ditch by fine soil (impermeable layer) of 6 inch and making compacting manually by ramming*
  - *Repeating the process up to the near surface level to put turf*
  - *Putting turf at the top of the finely compacted sealed crack with maintaining original slope*
- Holding meeting with community people for technology transfer
- Holding meeting with district authority to inform completed work

Ground cracking (tension cracks) serves as avenue of water infiltration

Identification of Tension cracks at the crown of landslide

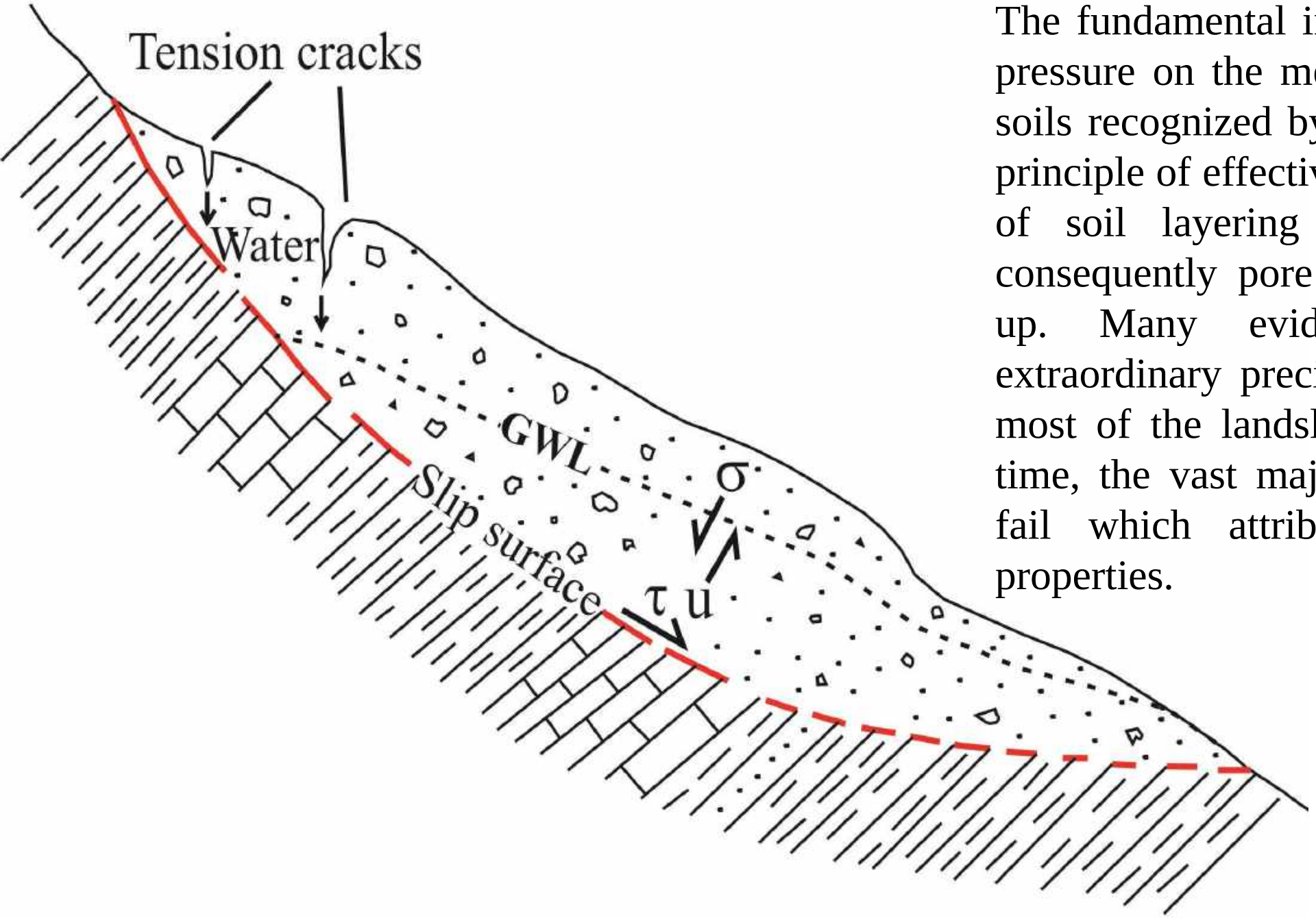
During rainfall, infiltrated water causes the increase in pore water pressure that ultimately lead to landslides





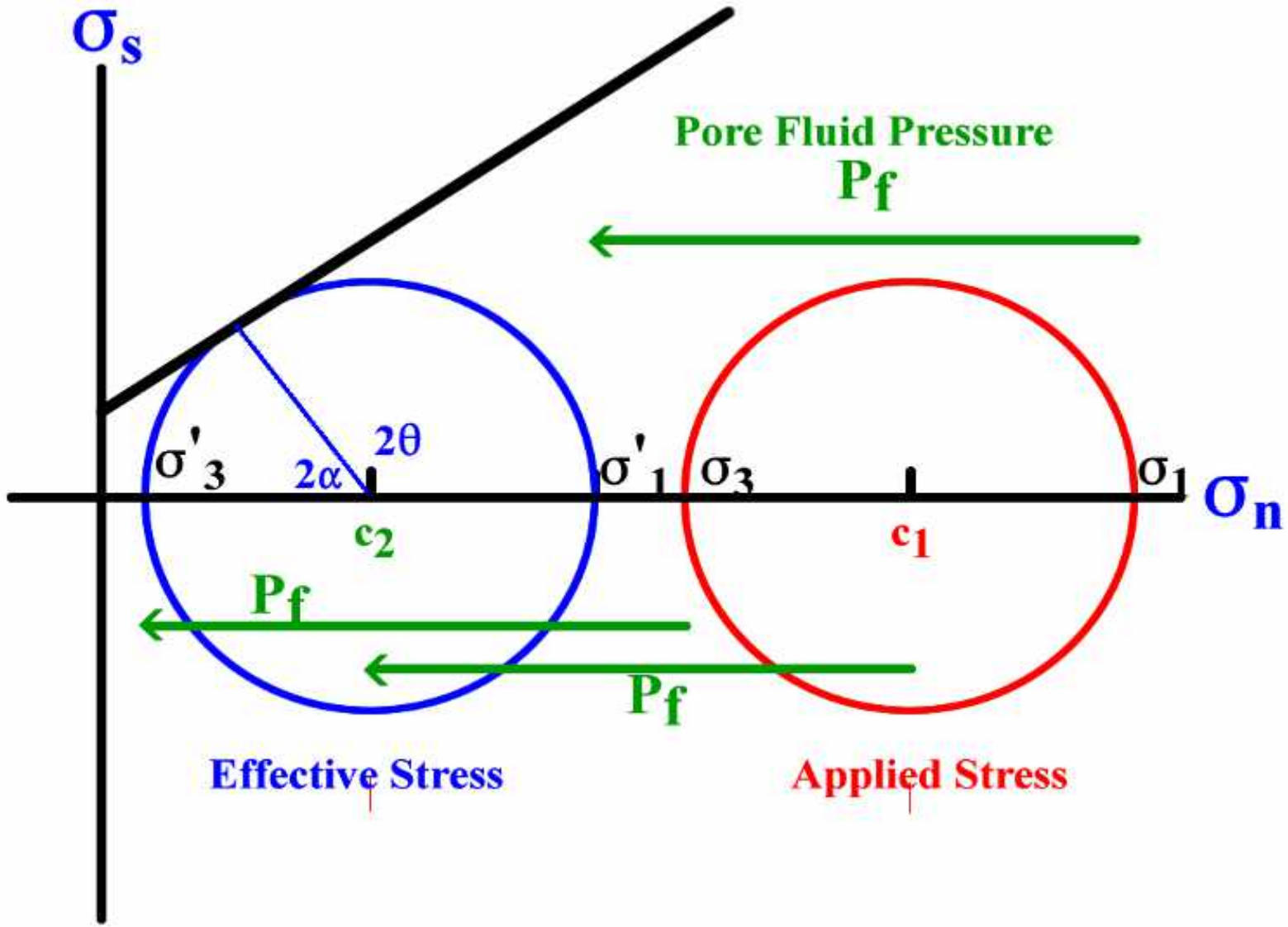
A. Dry soil–high friction

B. Saturated soil



The fundamental influence of pore water pressure on the mechanical properties of soils recognized by Terzaghi (1923) with principle of effective stress. The influence of soil layering on flow paths and consequently pore water pressure build-up. Many evidences showed that extraordinary precipitation events trigger most of the landslides, but, at the same time, the vast majority of slopes do not fail which attributed to geo-material properties.

Pore fluid pressure causes decrease in Normal stress (holding force) and ultimate failure



Ditching along tension cracks to remove unstable soil

Final ditch about 2 feet deep and base ramming
And layer by layer compaction

After filling and proceed to turf

Putting turf

Completion meeting with community

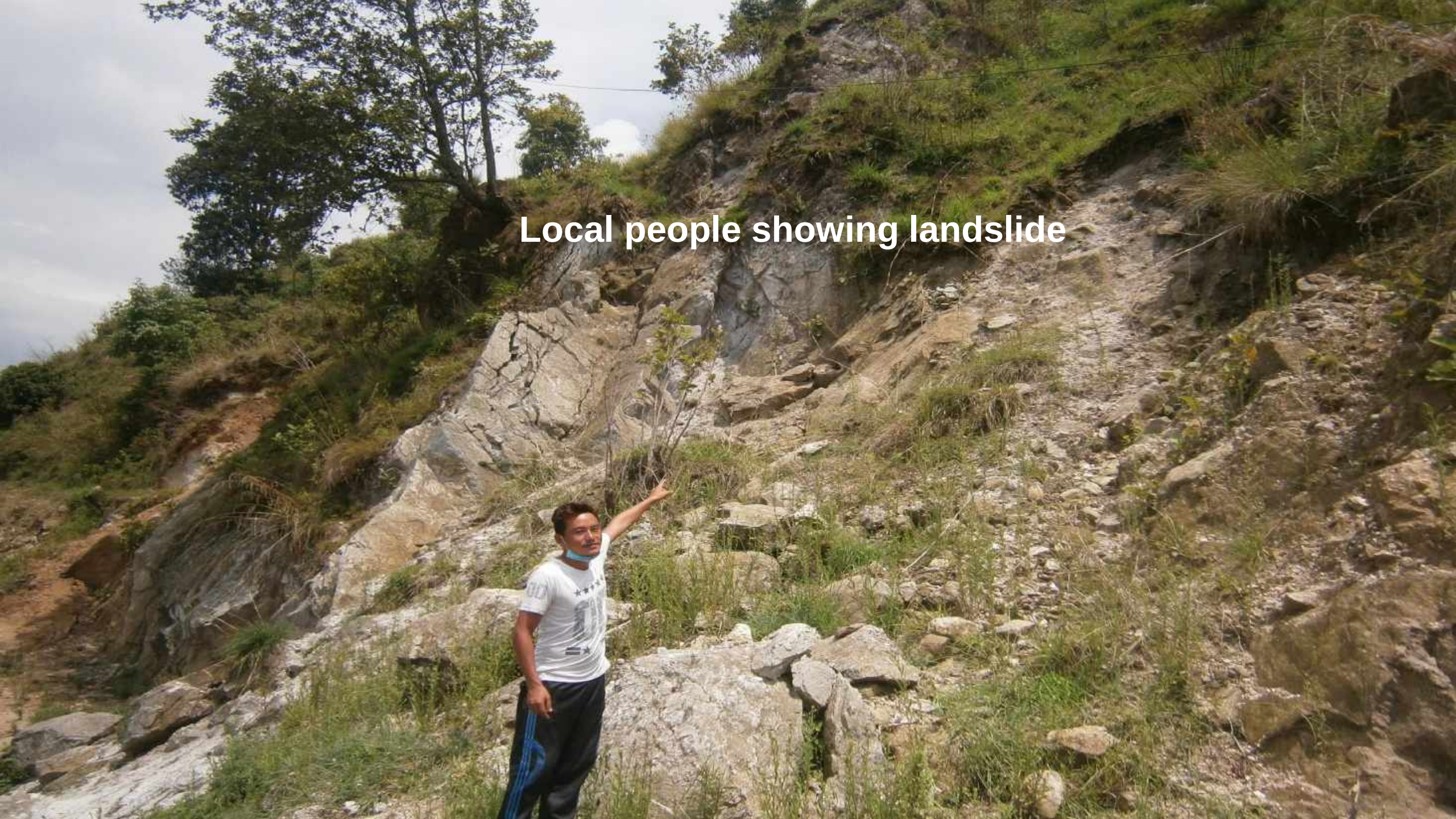
Technical explanation

Observation of technique by local community

Transect walk to find more cracks

More cracks found surrounding the village

Exploring more landslides



Local people showing landslide

HILLY SETTLEMENTS IN NEPAL

Laser scanning of landslide

- X Ray glasses are available these days
- They could be mounted on drones and cracks could be located

Thank you very much!