



第三届联合国教科文组织名录遗产与可持续发展黄山对话会
The 3rd Huangshan Dialogue on UNESCO Sites and Sustainable Development

中国·黄山
HUANGSHAN·CHINA

主题：UNESCO名录遗产可持续发展
Theme: UNESCO Sites facilitating Sustainable Development

Treatment of Natural Hazard at UNESCO World Heritage site

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When we think of UNESCO site...







About 30 years ago...



Debris encroaching into the Xiajijie Lake

- Max at 7m per year



Debris on the Road



Shuzheng Lake

Local Residence

Debris flow threat local residence and transportation

Debris flow destroy forest
along Kezhe Gully



Geology

- High glacial activity land
- major belt Plate
- Earth land
- Carbon tufa shastra



2017 Earthquake by 中国军网

Principles of Treatment at Scenery Site



- **Protect** the landscape and ecological system
- Keep **harmony** between engineering works and landscape
- Ensure the **safety** of tourist and transportation

Protect the ecological system and landscape

- Identify the key element to protect
- Combine ecological and engineering measure
- Reduce the impact of construction works



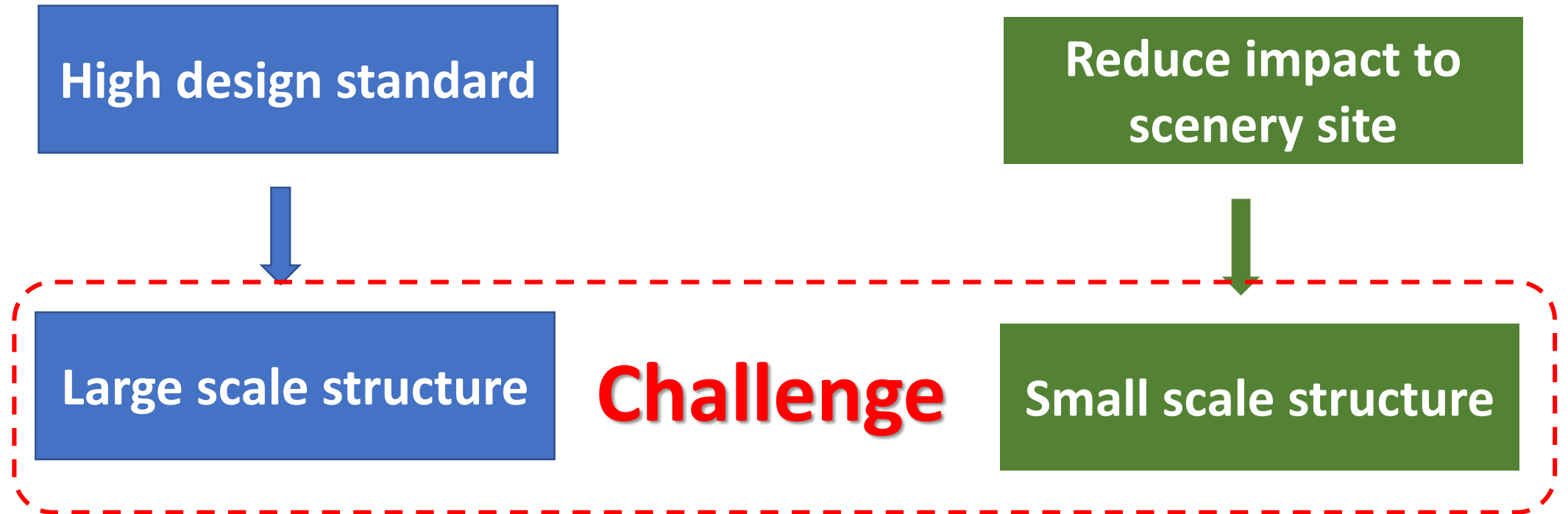
Harmony between engineering and landscape

- Hide the structures out of sight
- Reduce the size of structures
- Design structures to be part of the landscape



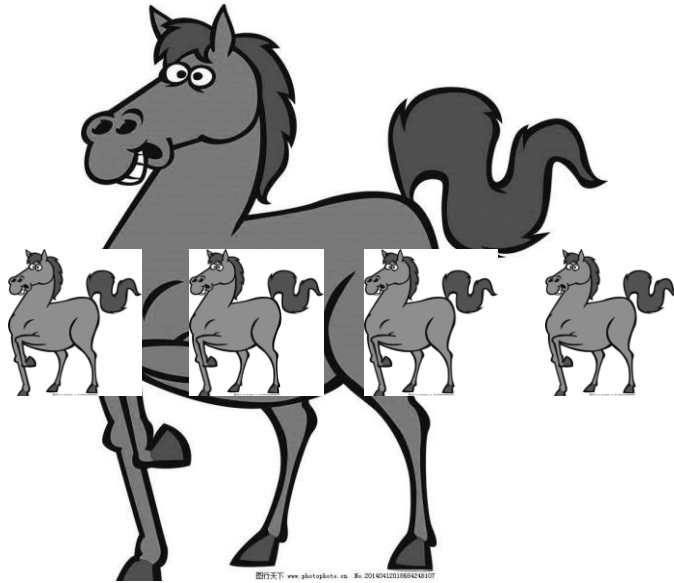
Ensure the safety of tourist and transportation

- Densely populated
- Accessibility

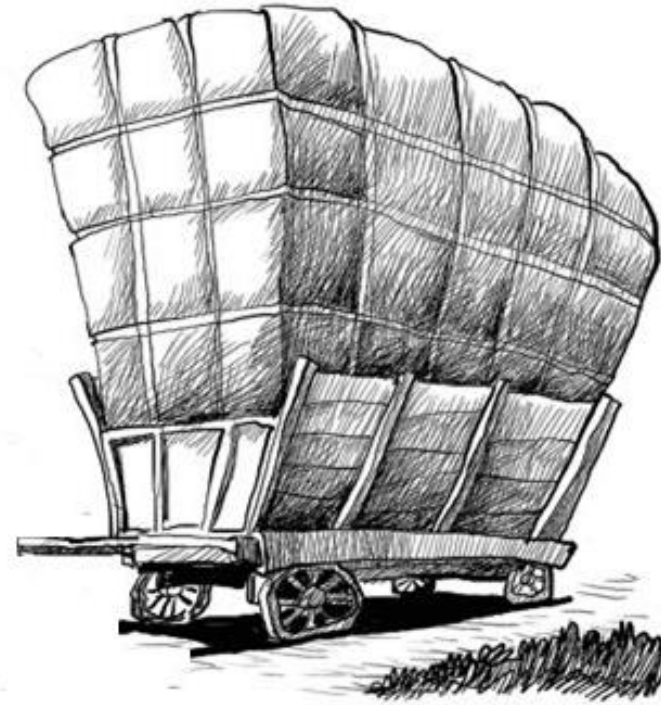


Concept: Keep everything small

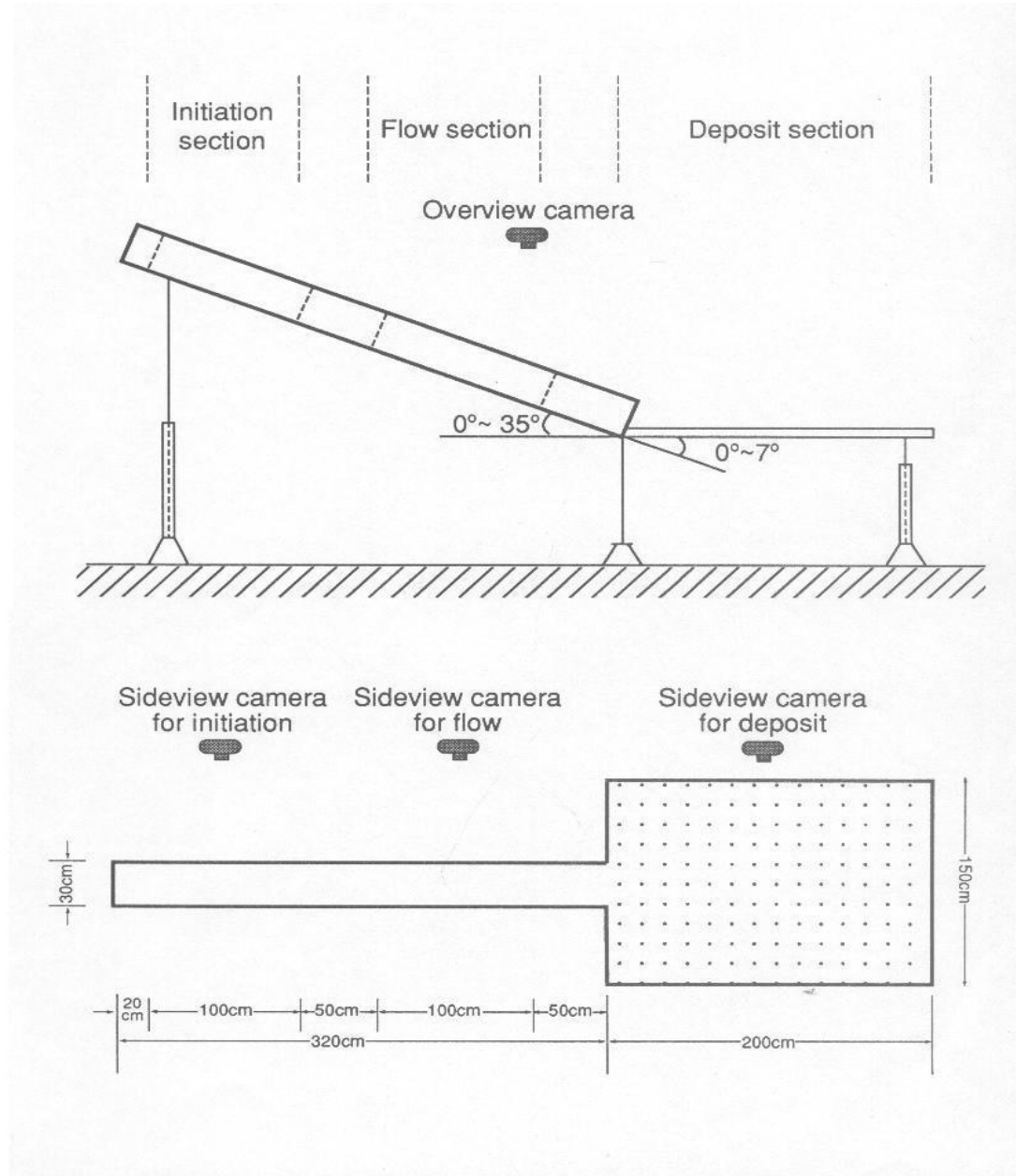
Engineering measures

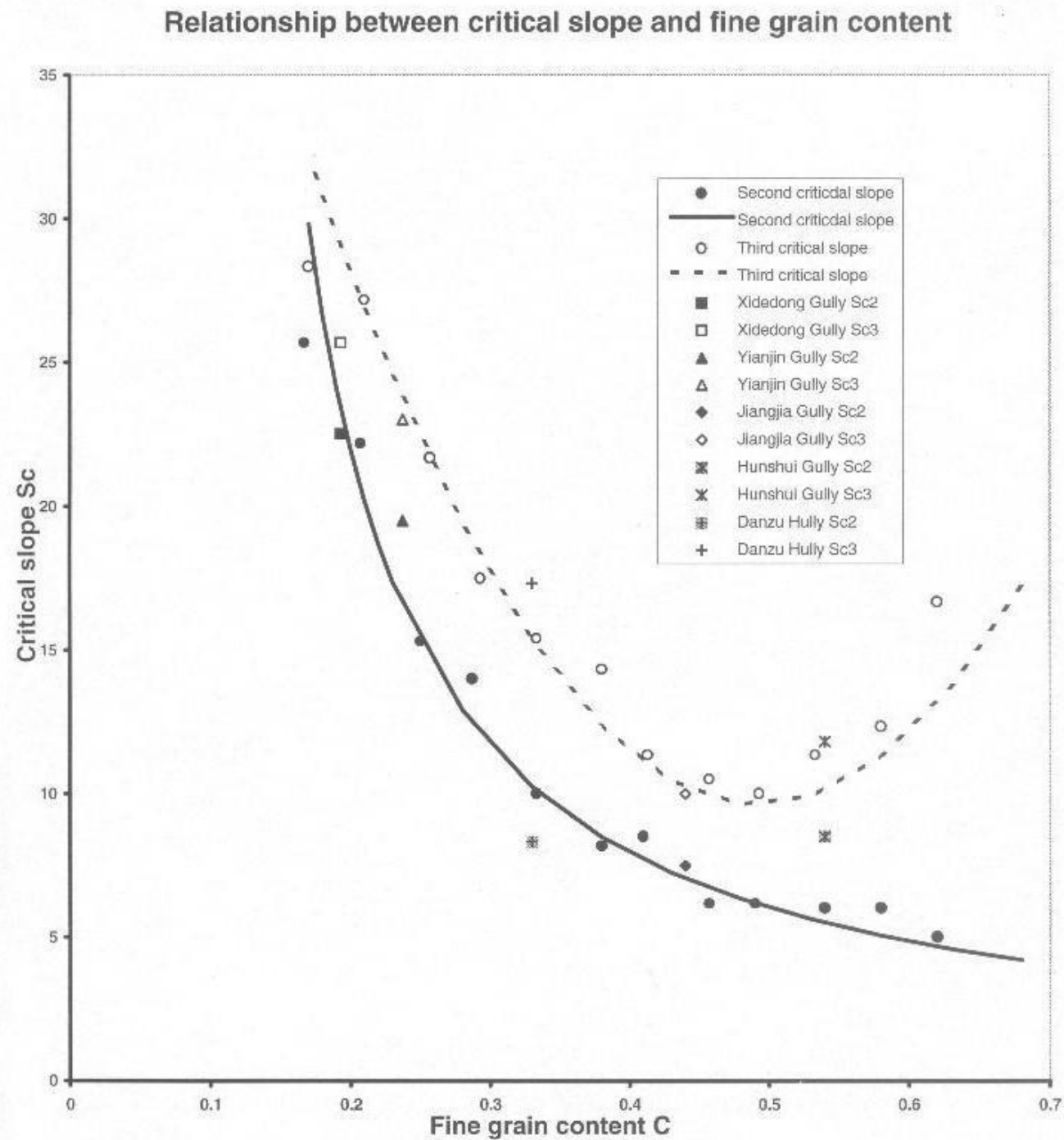
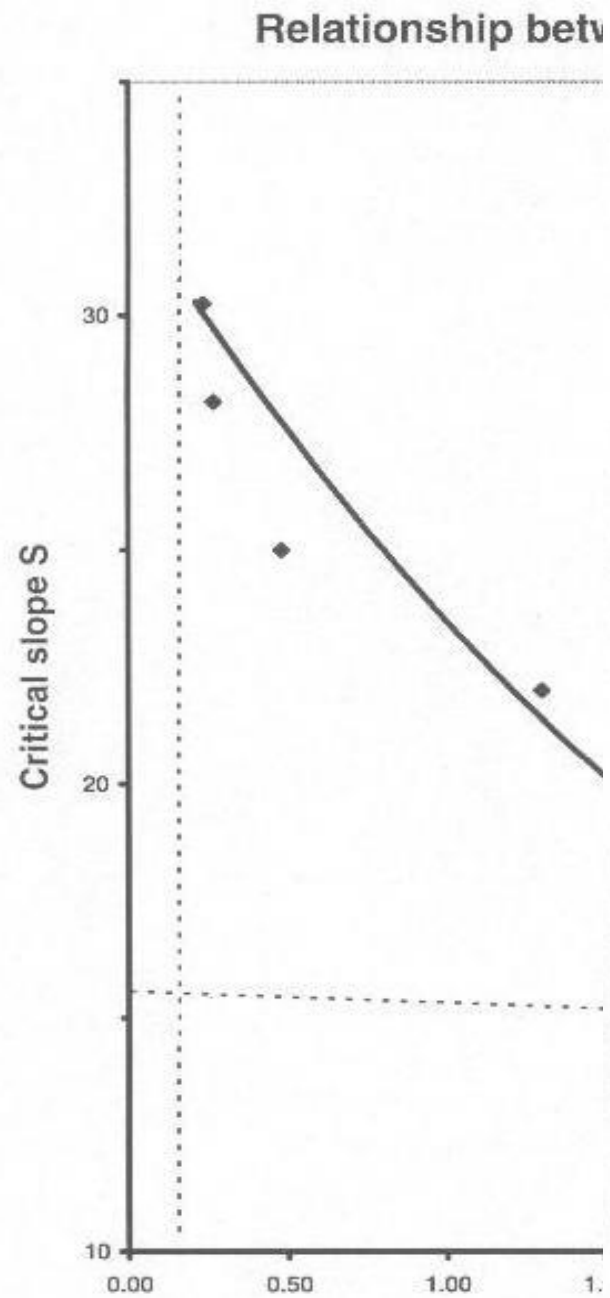
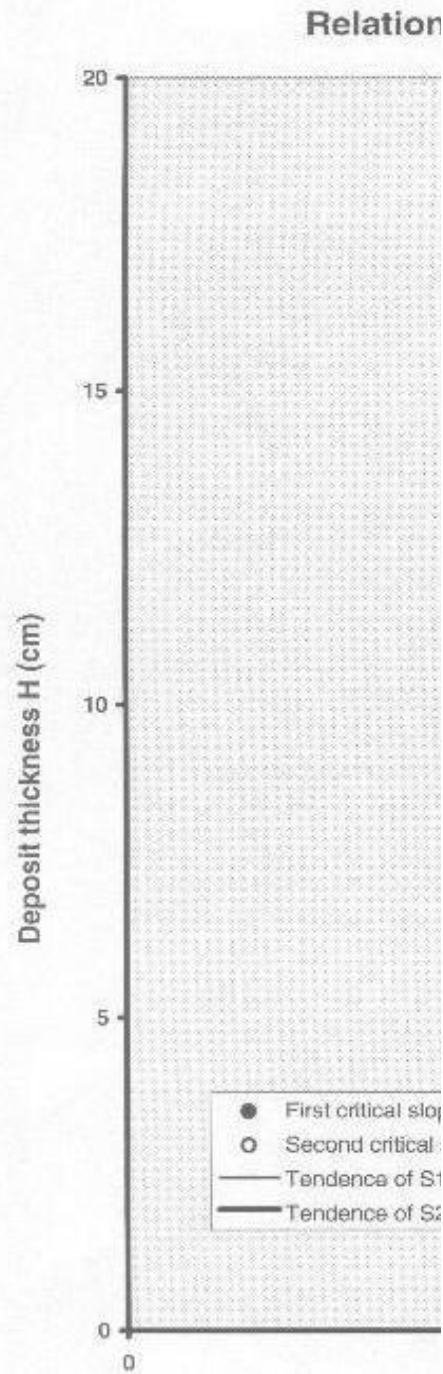


Natural Hazard need to be controlled

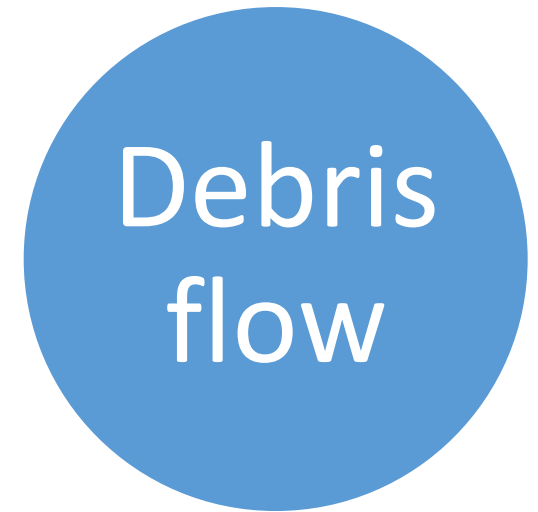
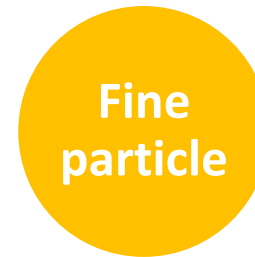
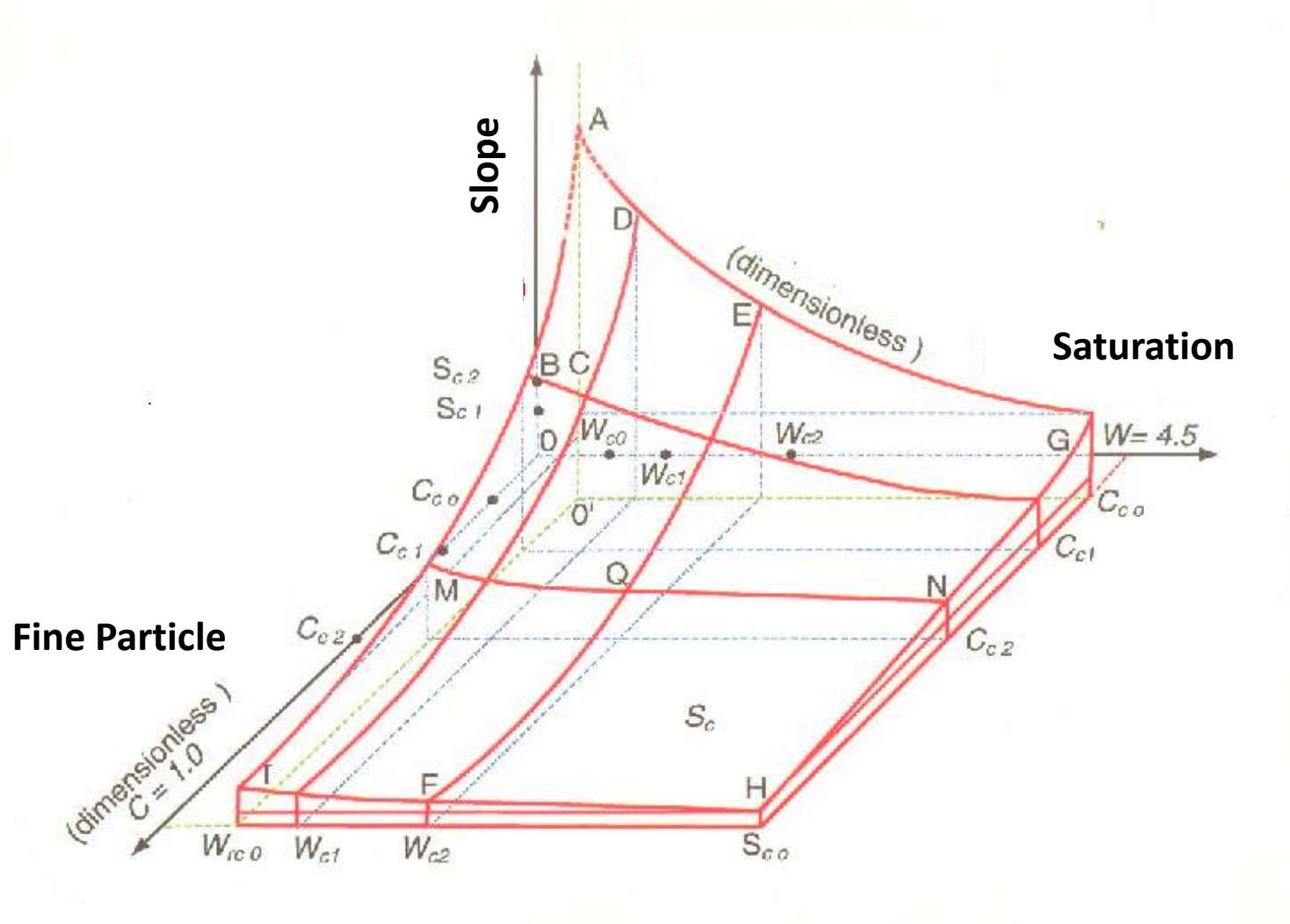


Experiment study on Debris Flow initiation





- Theory behind the debris flow control



Example 1: Treatment of Niujin Gully

Problem:

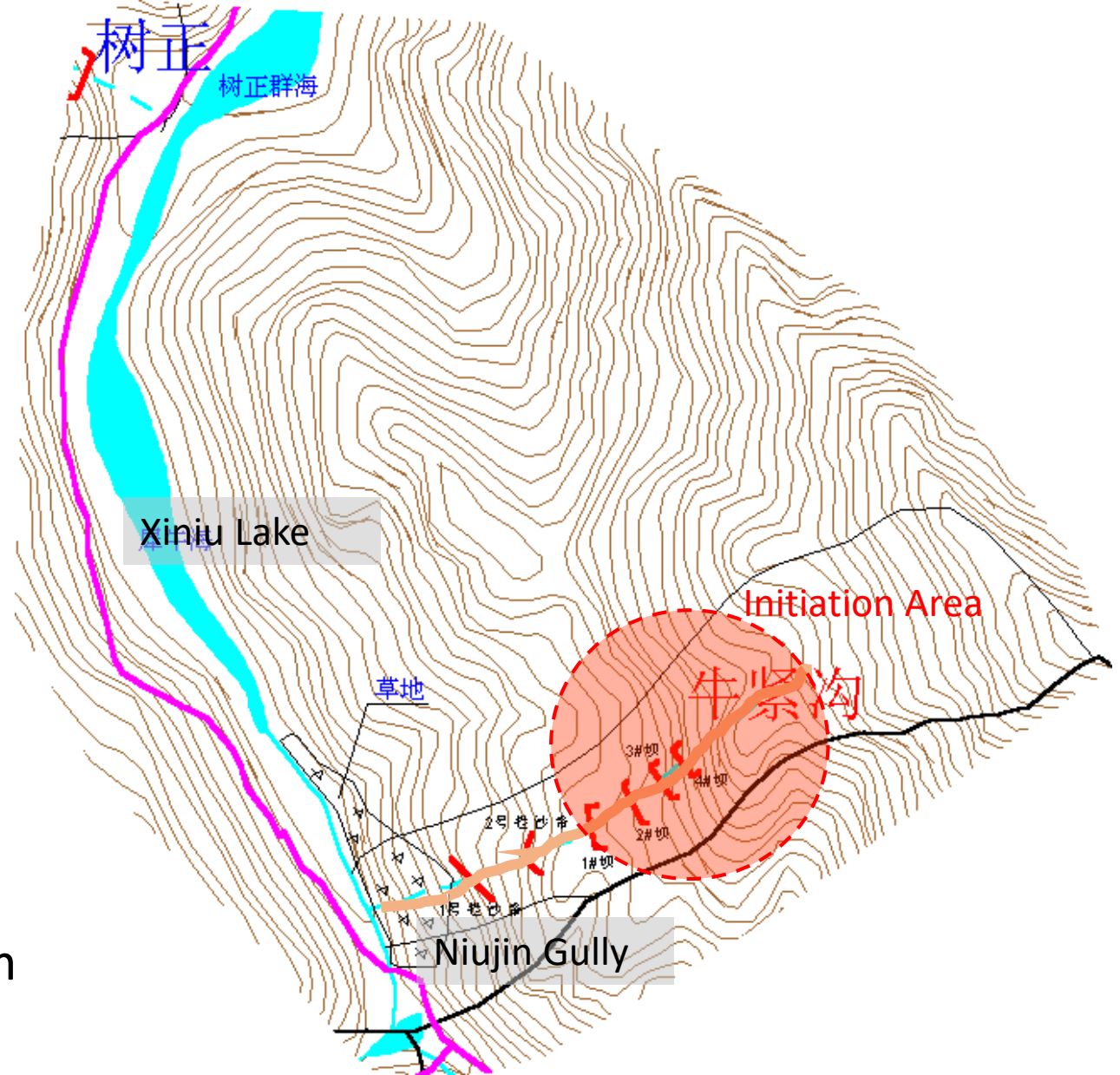
- Close to human settlements
- Highly exposed location to tourist
- Debris deposition in Xiniu Lake

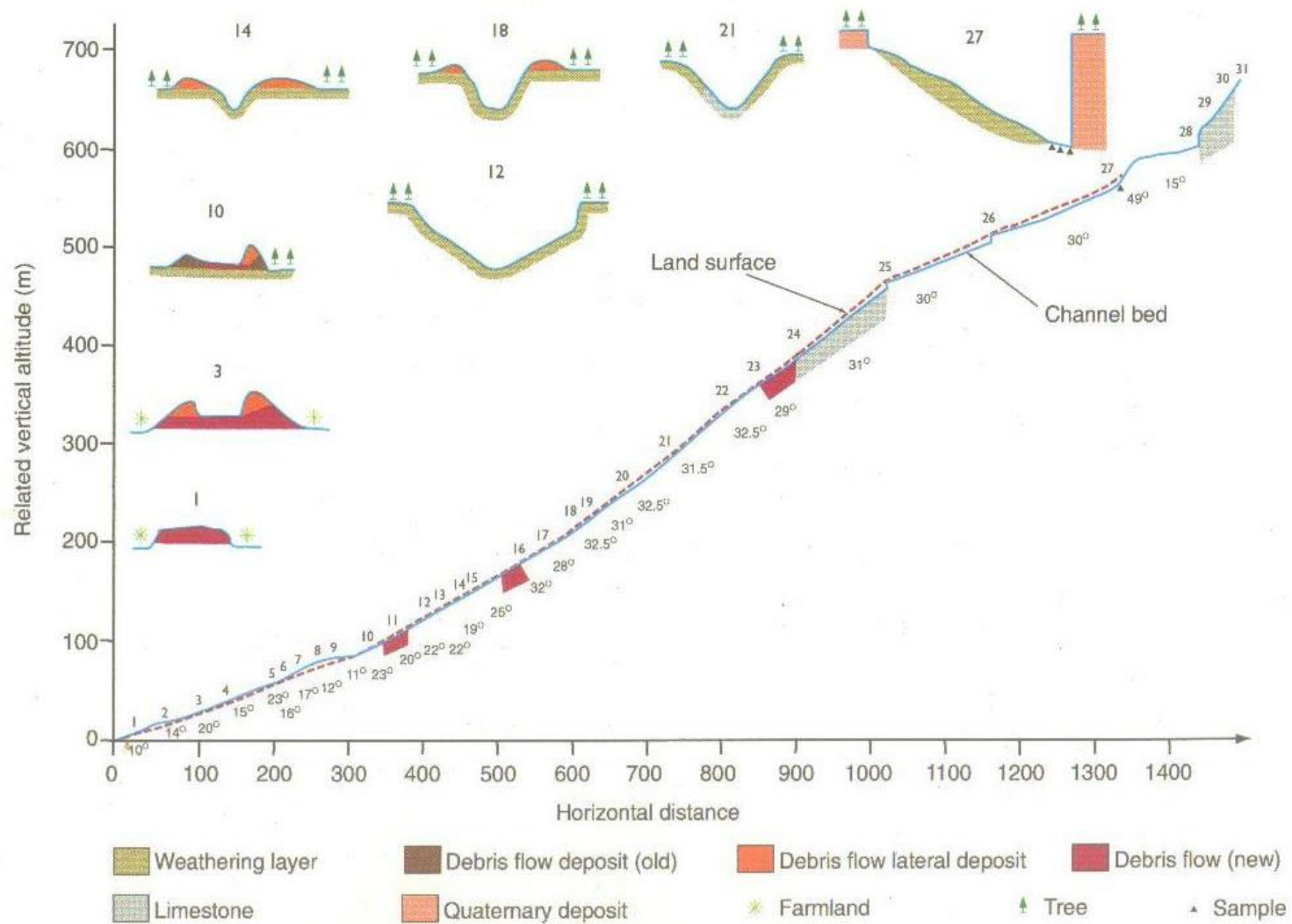
Objective:

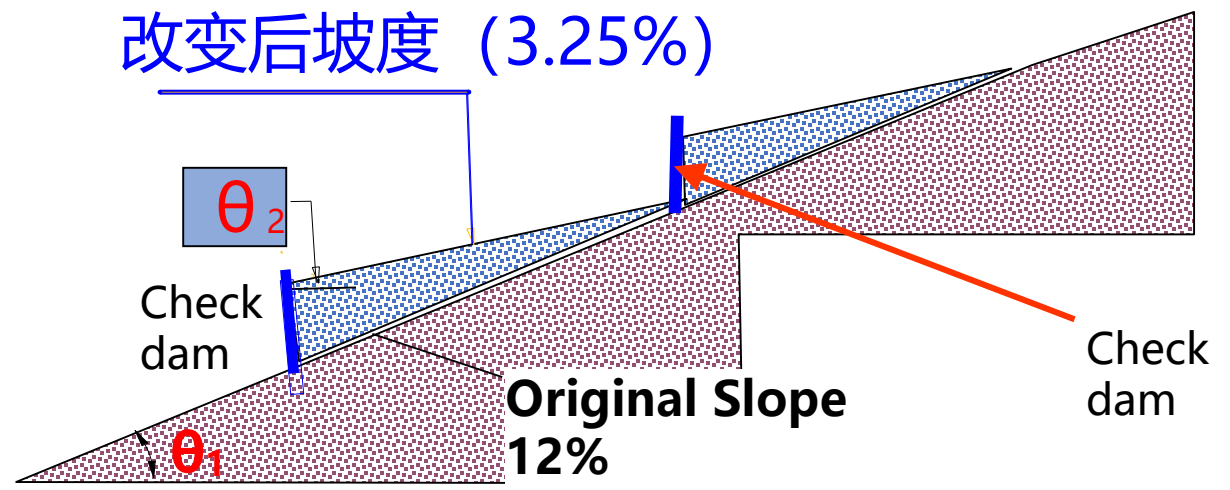
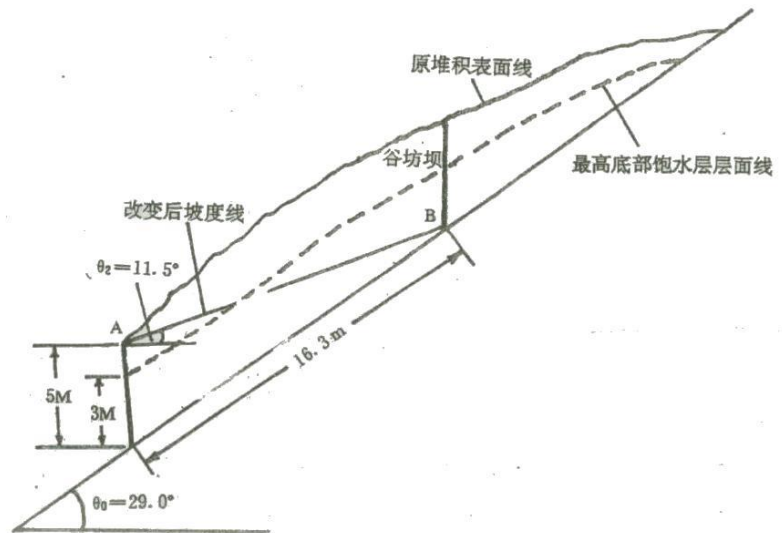
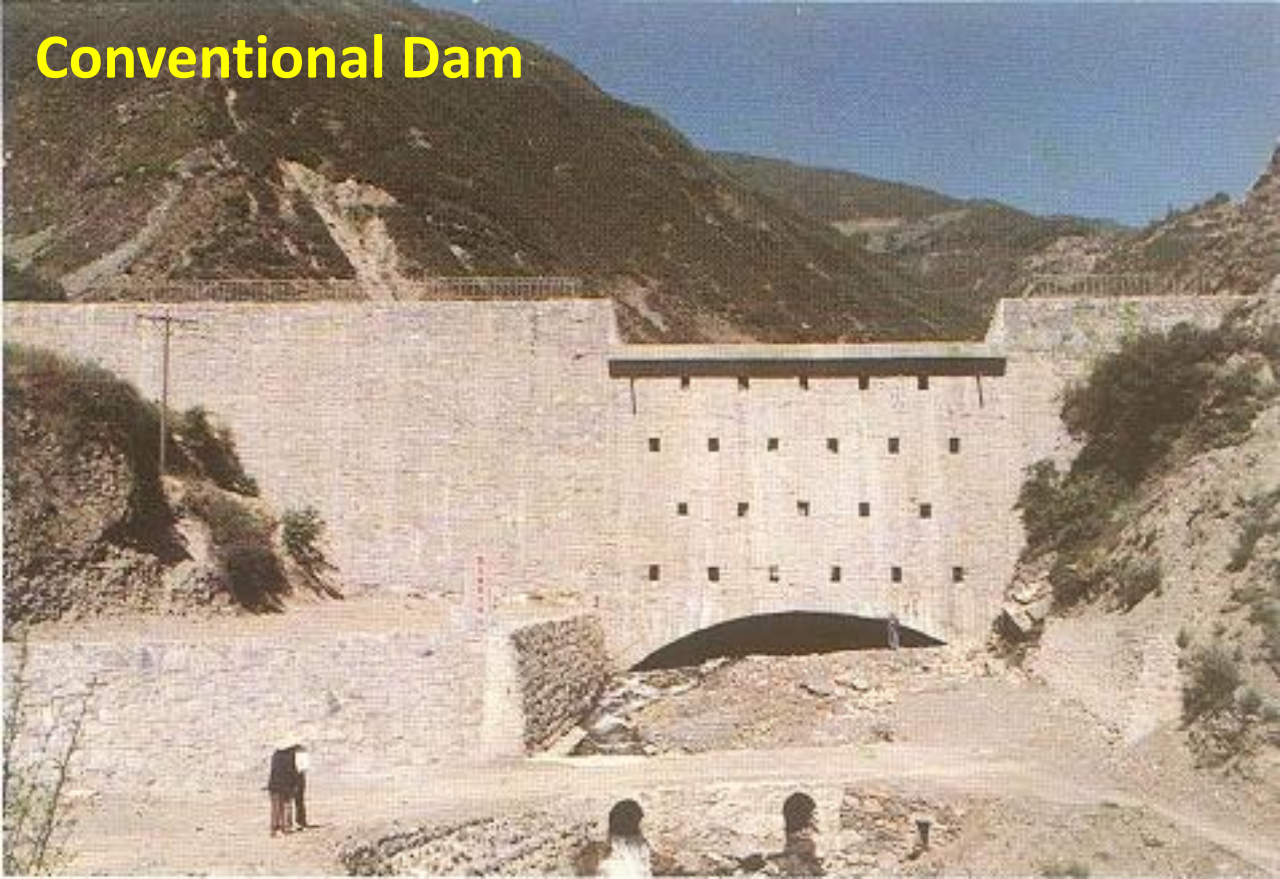
- Prevent debris deposition
- Safety of settlement
- Minimum visibility

Key concept:

- Control the debris flow at initiation stage
- Systematic control by series of check dam with minimum size







Xiniu Lake now



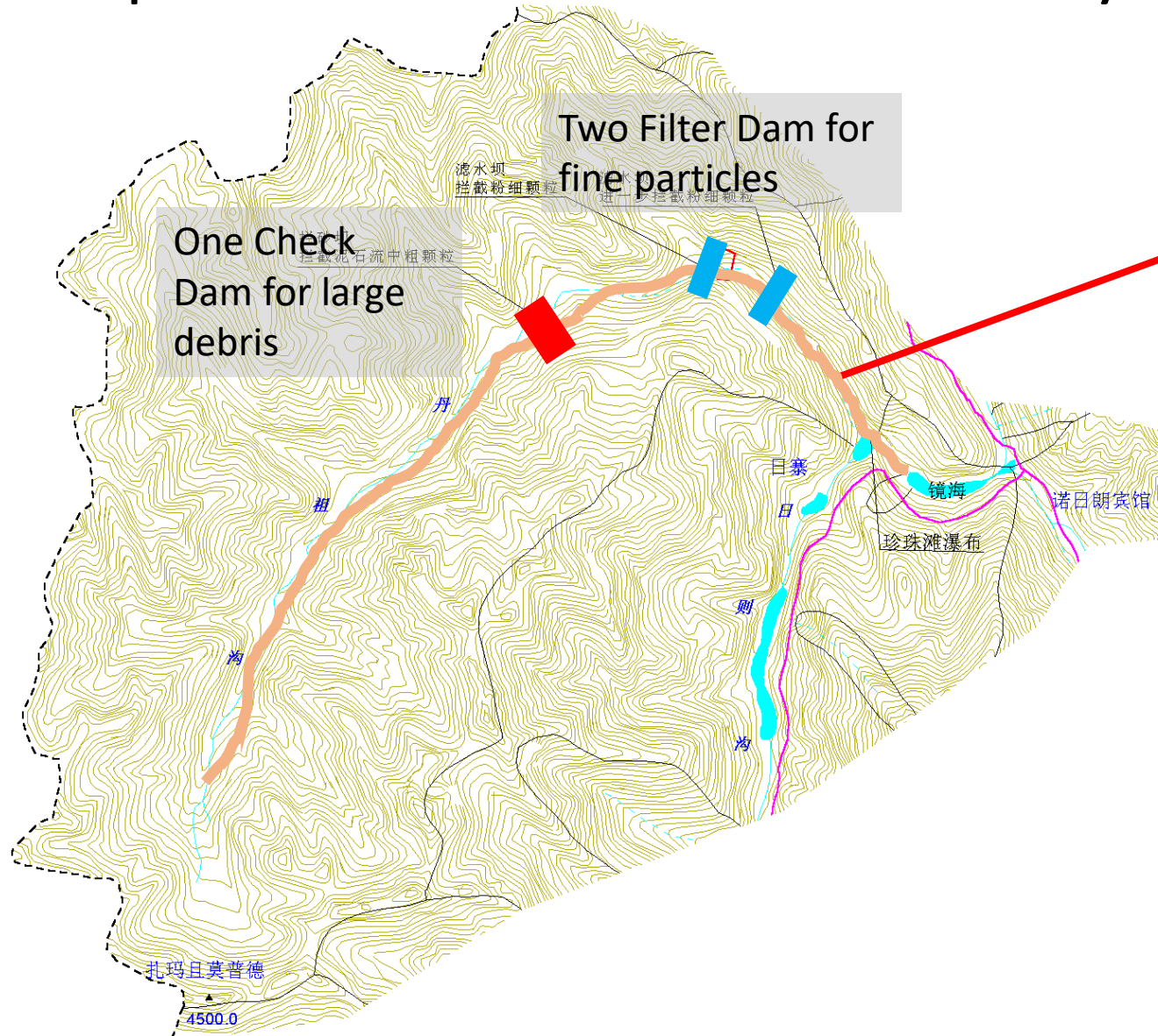
Hidden Dam 1



Hidden Dam 2



Example 2: Treatment of Danzhu Gully



Problem:

- Debris flow deposited into the lake
- Lake surface reduce, 20m during debris flow active year
- Muddy water

Objective:

- Prevent debris deposition
- Only clear water allow to discharge to the lake

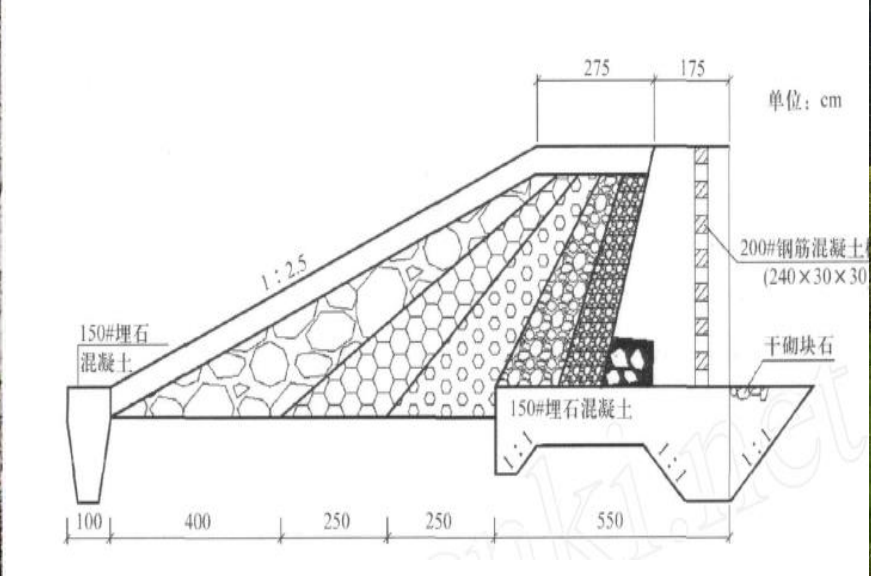
1993 filter dam 1



2017 Filter dam 1

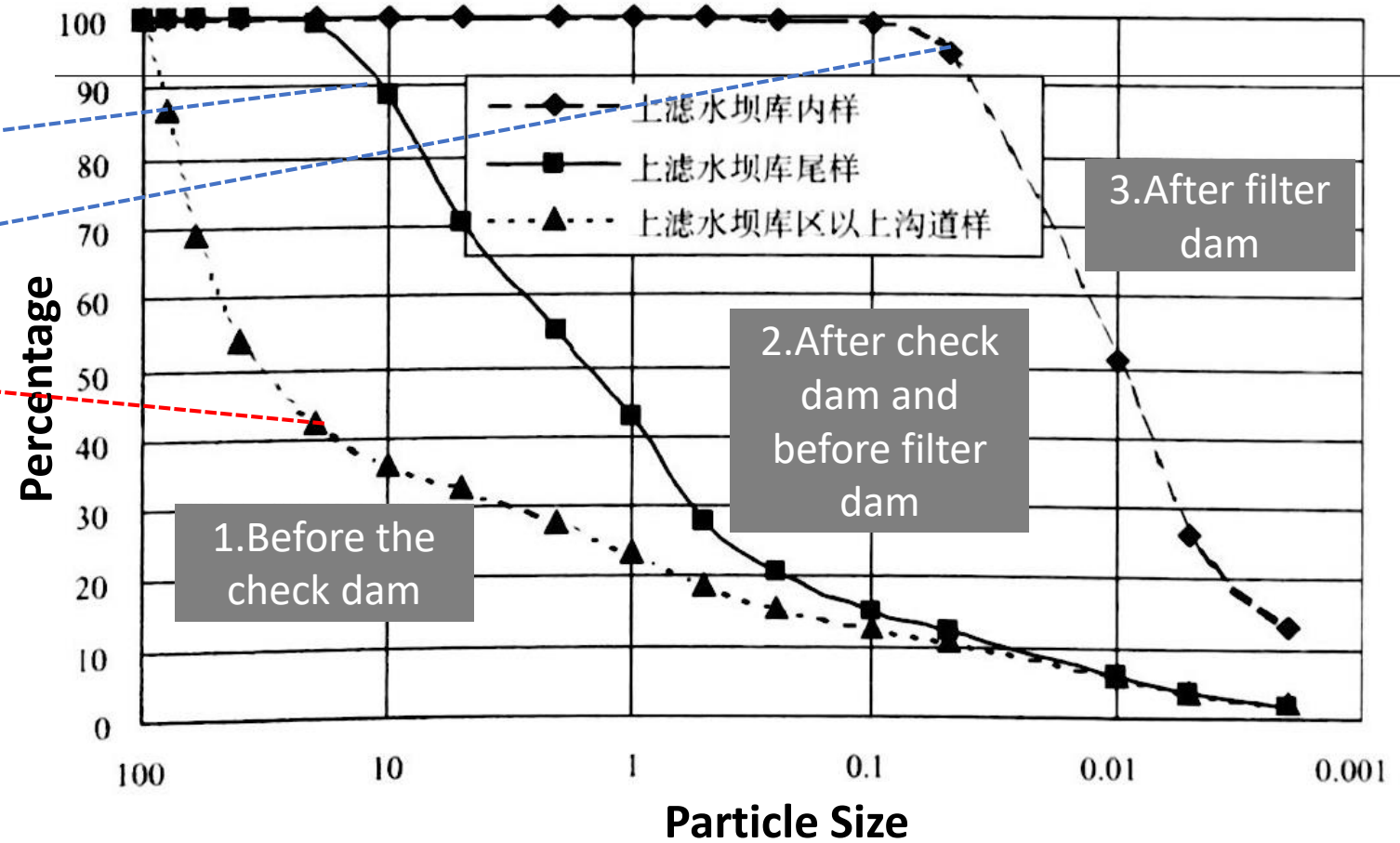
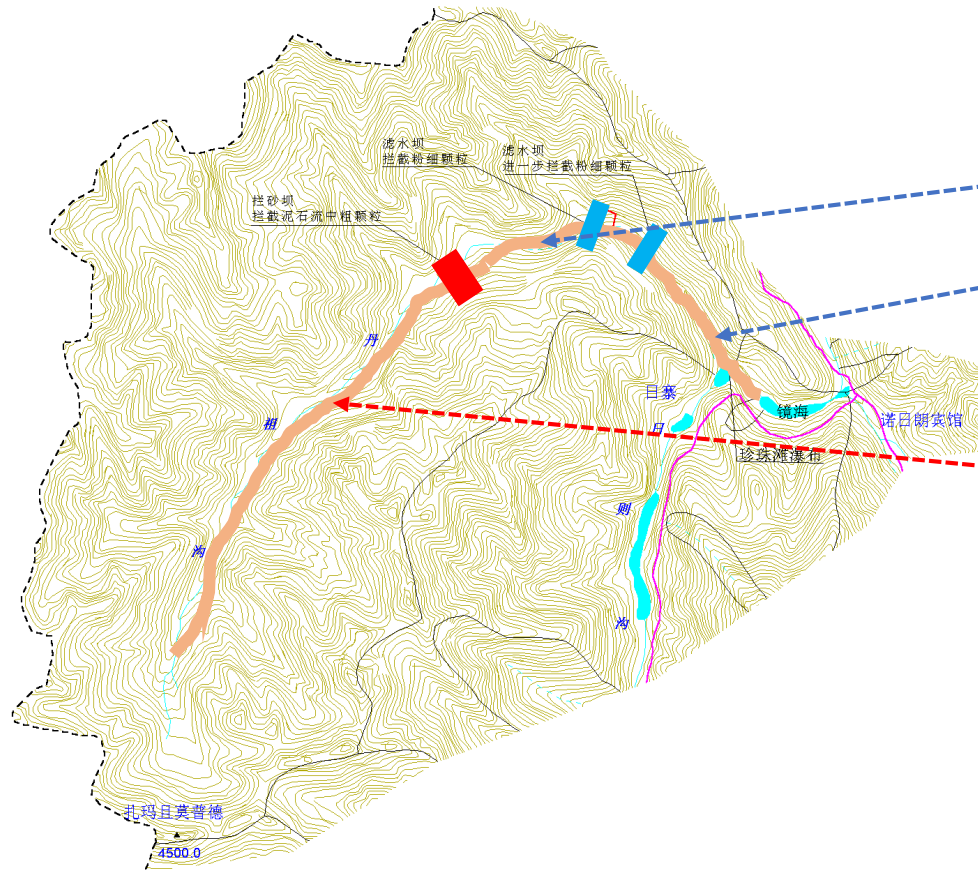


1993



2017 Filter dam 2

Effect of Treatment



2017

Before





From Jiuzhaigou
National Park

Baishui River

Treatment of
Jiuzhaigou
National Park is
complete in
1993 and now
running for 20
years

- No affected scenery site
- No damage to human settlement
- No incident

Remarks

- There is no universal solution to all
- Advance understanding of the natural hazard in concern
- Identification of the element at risk
- Forensic study on the protection site
- Develop new technology suitable to the local condition



Thank you