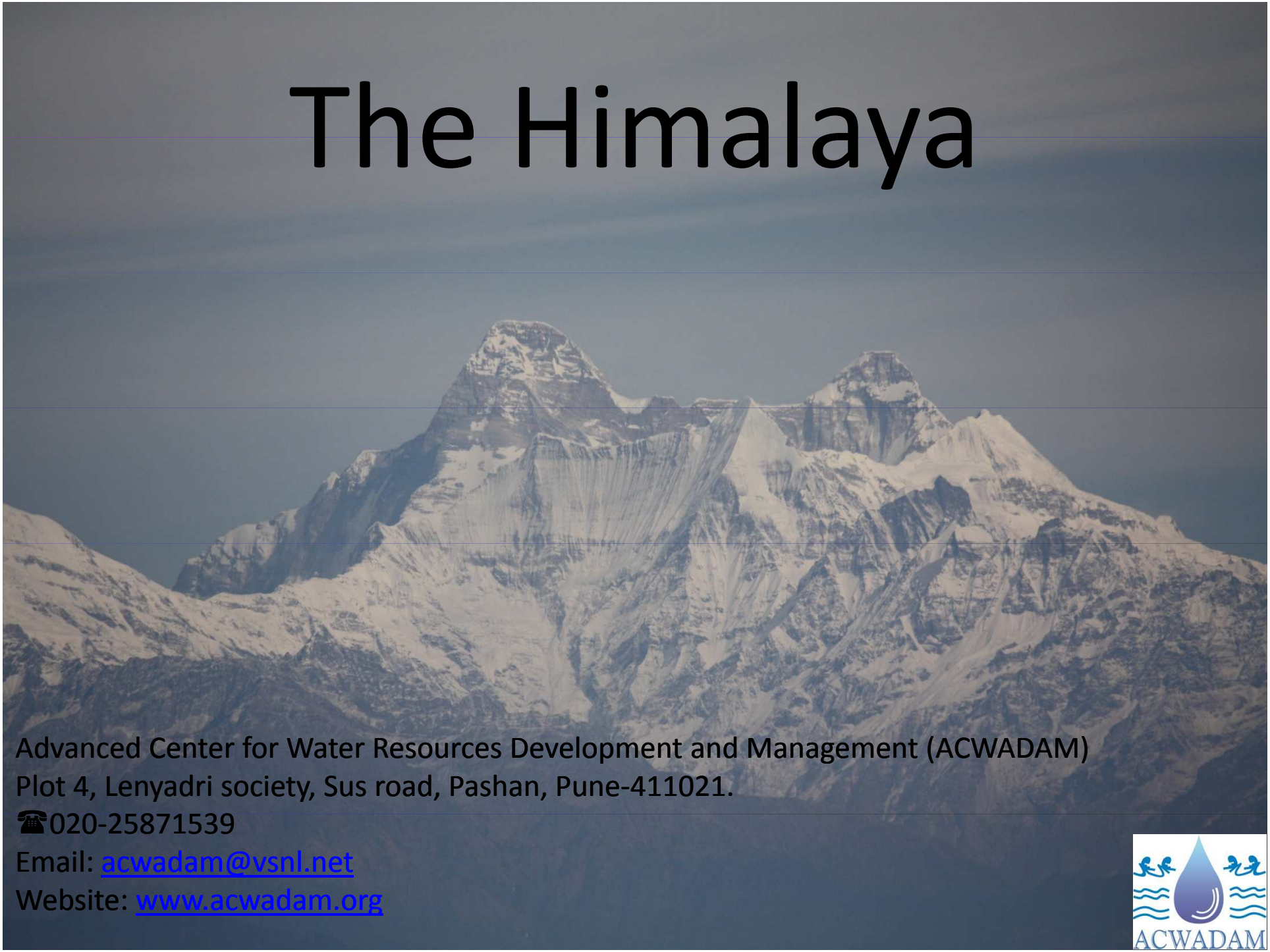
The Himalaya



Advanced Center for Water Resources Development and Management (ACWADAM)
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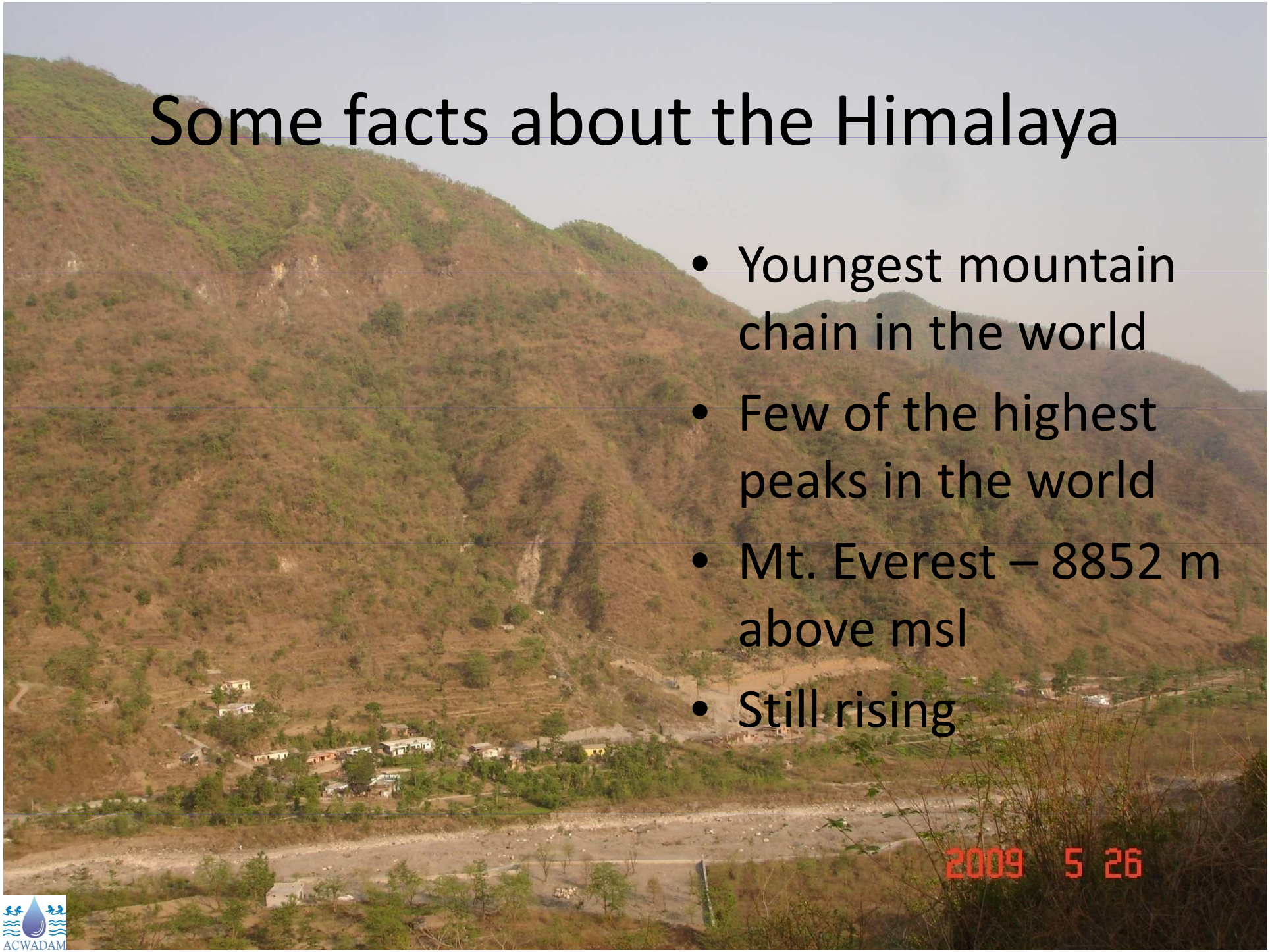
Some facts about the Himalaya



- Youngest mountain chain in the world
- Few of the highest peaks in the world
- Mt. Everest – 8852 m above msl
- Still rising

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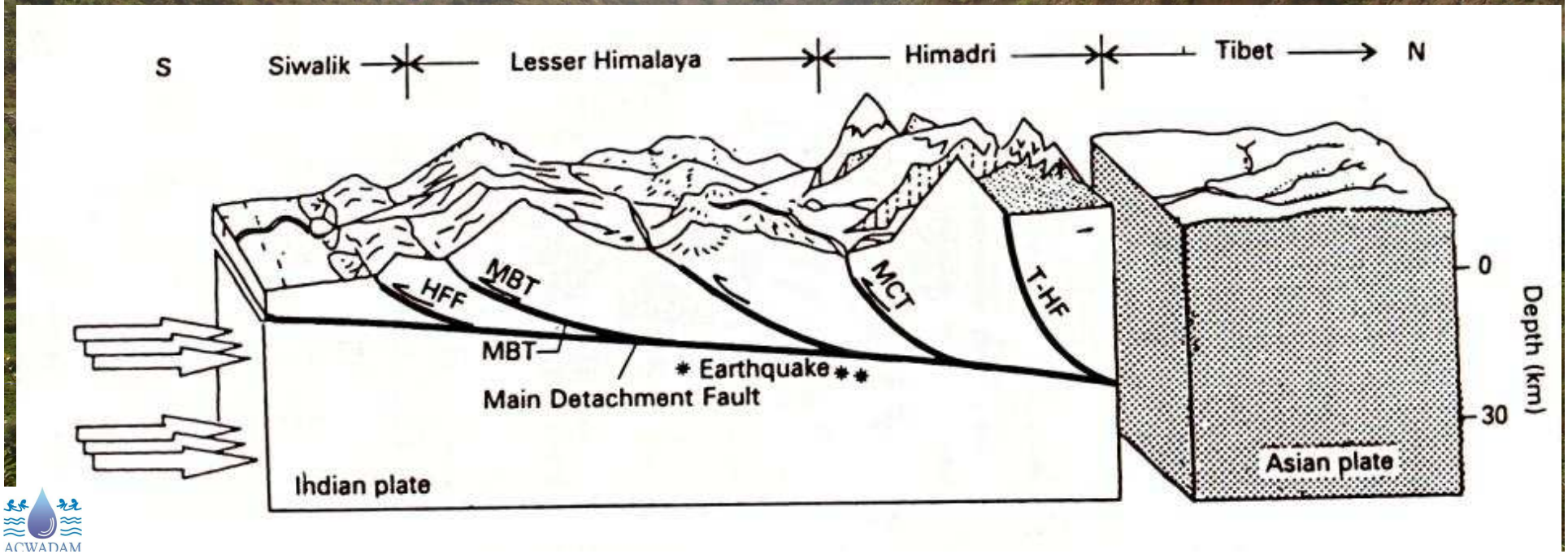
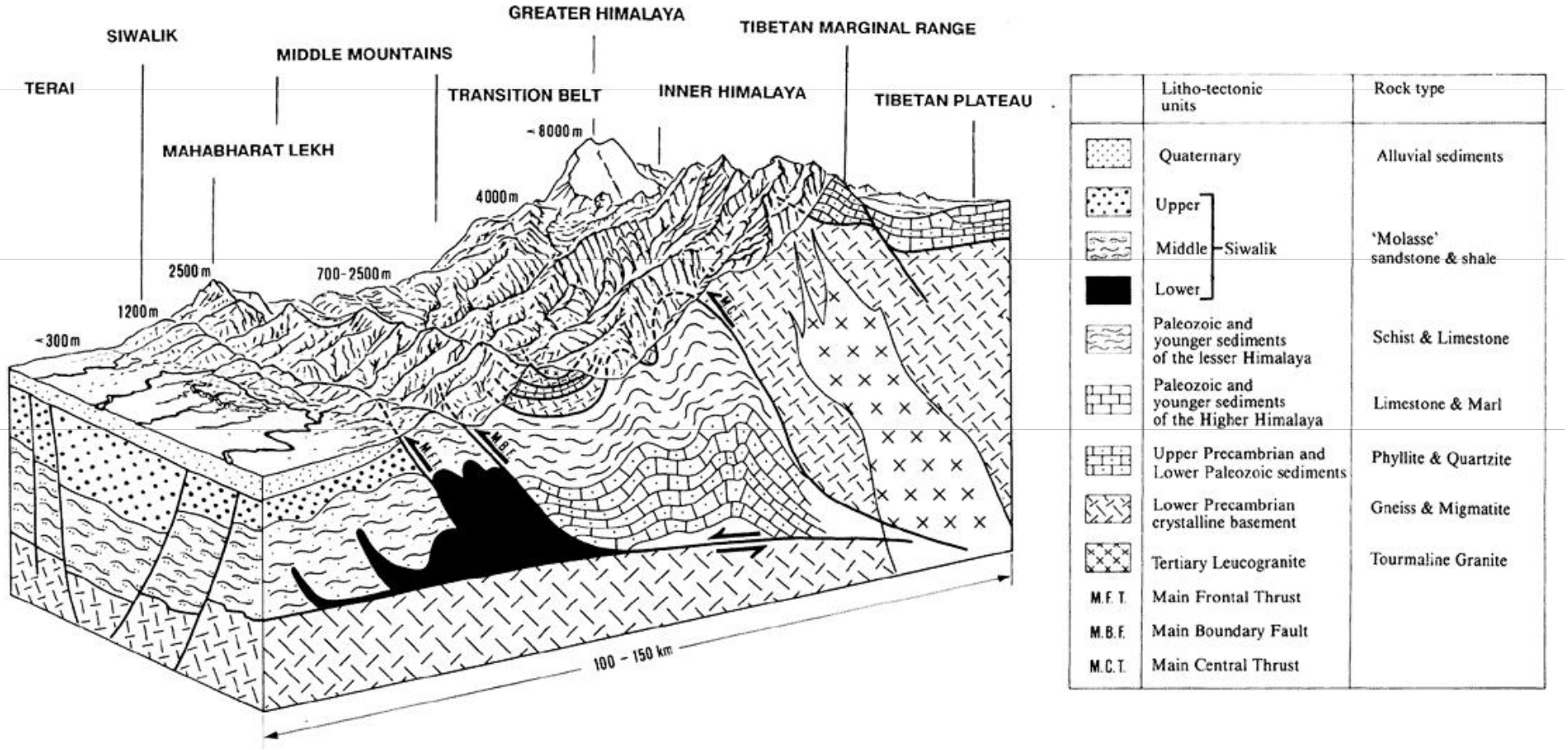
Himalaya can be divided into

- The Siwalik Foothills
- The Lesser Himalaya



Schematic cross-section of the Nepal Himalaya: geology, Daniel Vuichard, Institute of Mineralogy, University of Berne; topography, modified after W. J. H. Ramsay.



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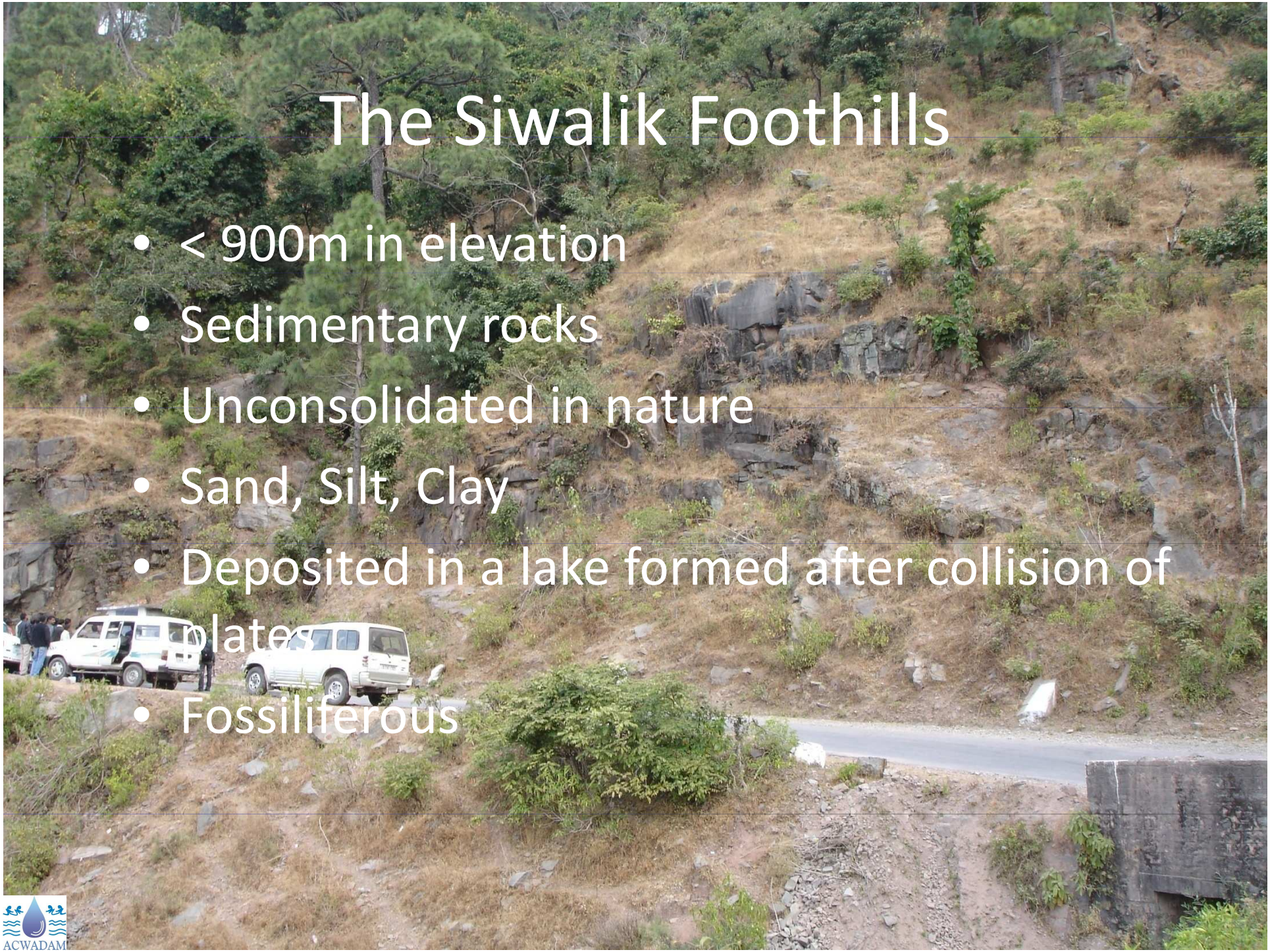
The Siwalik Foothills

- < 900m in elevation
- Sedimentary rocks
- Unconsolidated in nature
- Sand, Silt, Clay
- Deposited in a lake formed after collision of plates
- Fossiliferous



The Lesser Himalaya

- 900 – 3000 m in elevation
- Slightly metamorphosed sedimentary rocks
- Quartzites, Slates, Phyllites, Limestones
- Unfossiliferous

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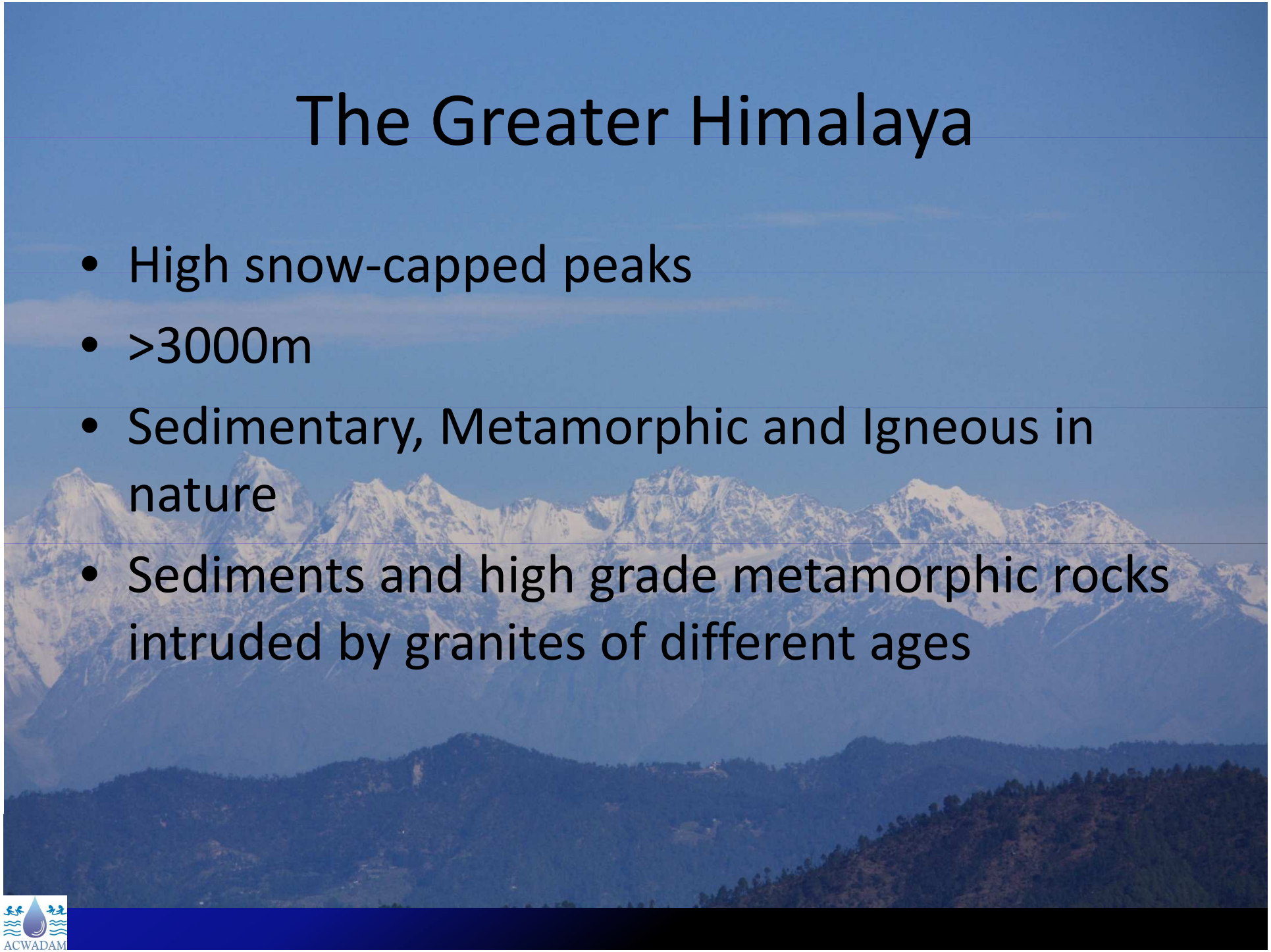
The Greater Himalaya

- High snow-capped peaks
- >3000m
- Sedimentary, Metamorphic and Igneous in nature
- Sediments and high grade metamorphic rocks intruded by granites of different ages



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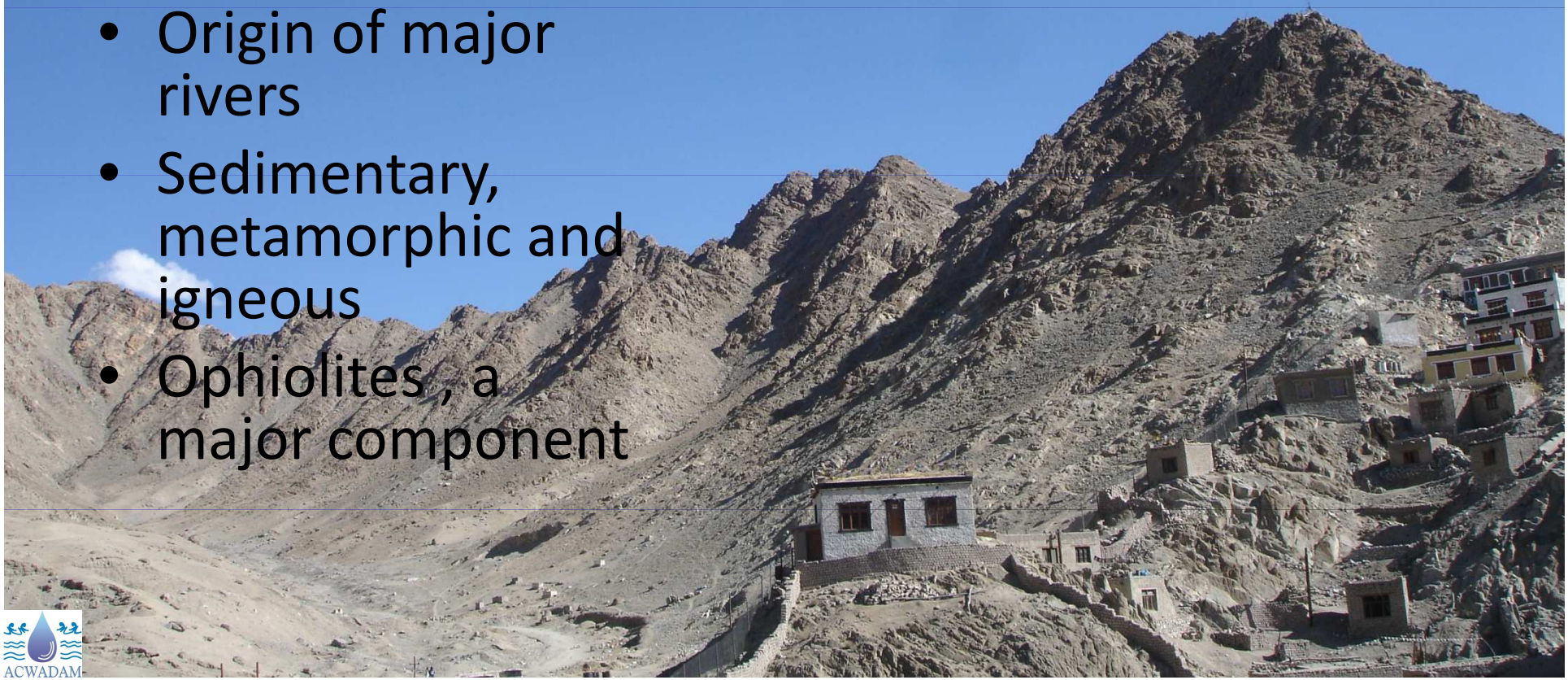
The Trans-/Tethys Himalaya

- 3000 - 5000m
- Beyond the Greater Himalaya
- Origin of major rivers
- Sedimentary, metamorphic and igneous
- Ophiolites , a major component



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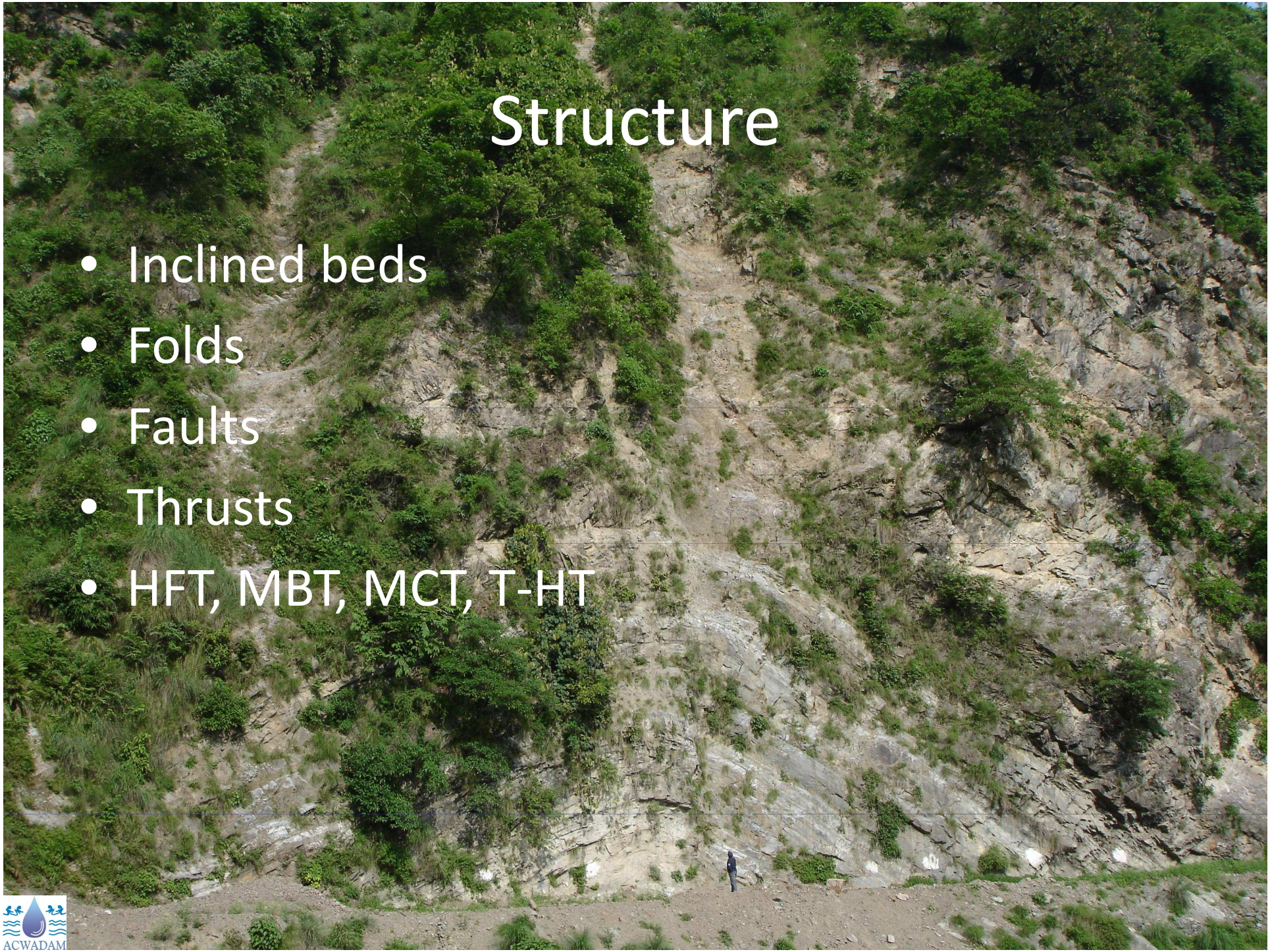
Structure



- Inclined beds
- Folds
- Faults
- Thrusts
- HFT, MBT, MCT, T-HT

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Groudwater in the Himalaya

-
-
- T

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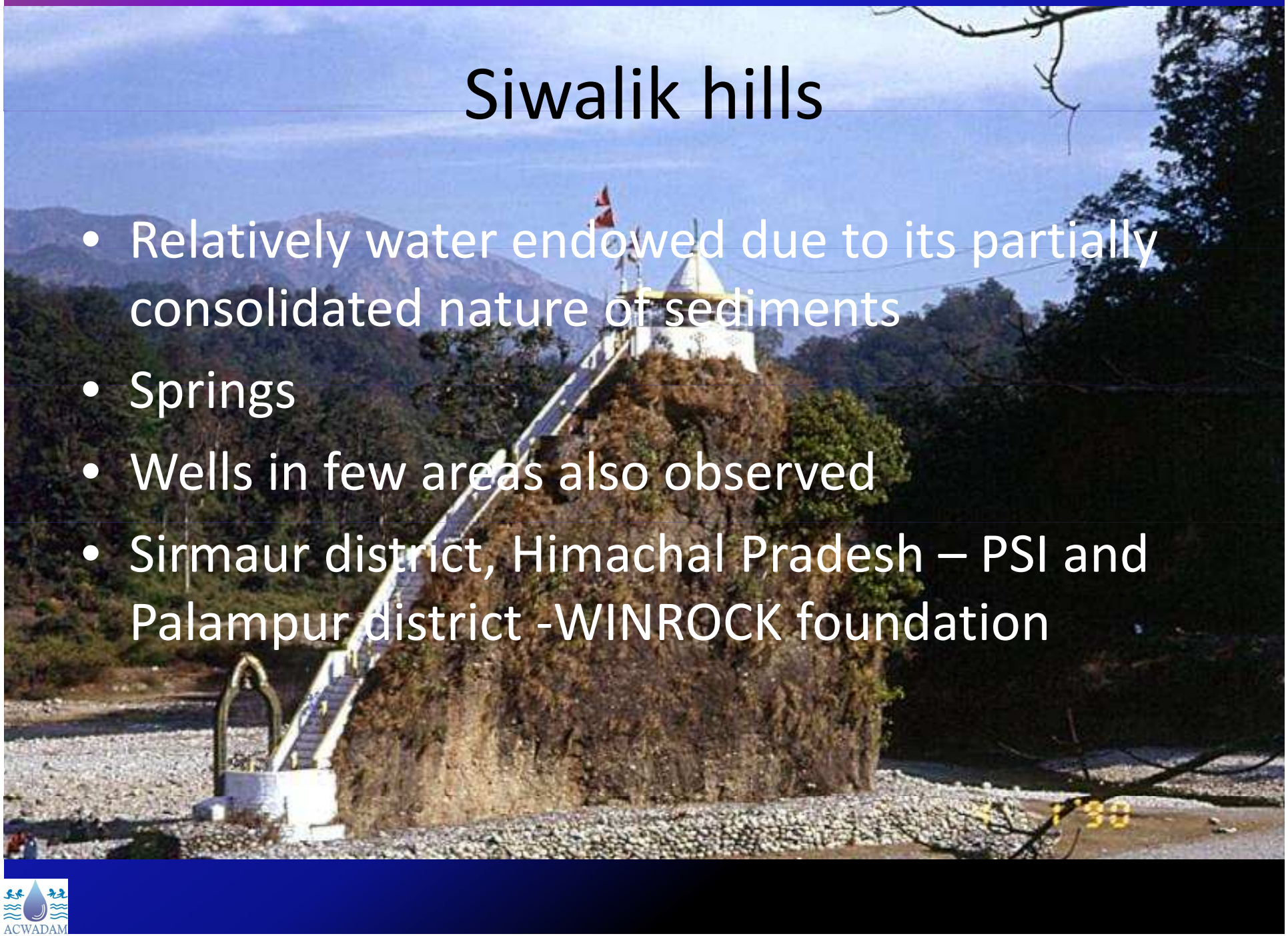
Siwalik hills



- Relatively water endowed due to its partially consolidated nature of sediments
- Springs
- Wells in few areas also observed
- Sirmaur district, Himachal Pradesh – PSI and Palampur district -WINROCK foundation

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Lesser Himalaya

- Springs – main source of water
- Reducing discharges a major concern
- Chirag, Himmotthan work areas

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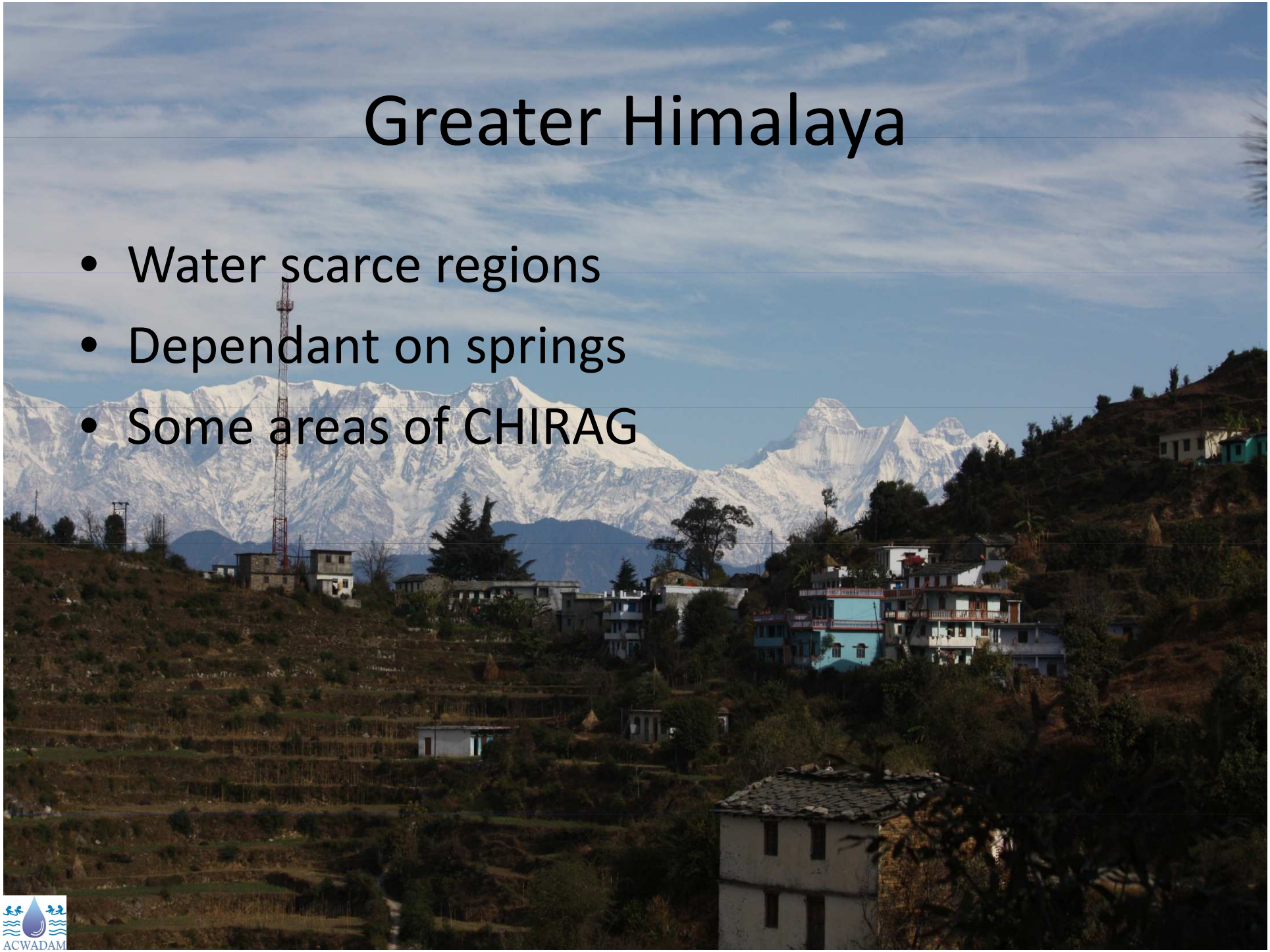
Greater Himalaya

- Water scarce regions
- Dependant on springs
- Some areas of CHIRAG



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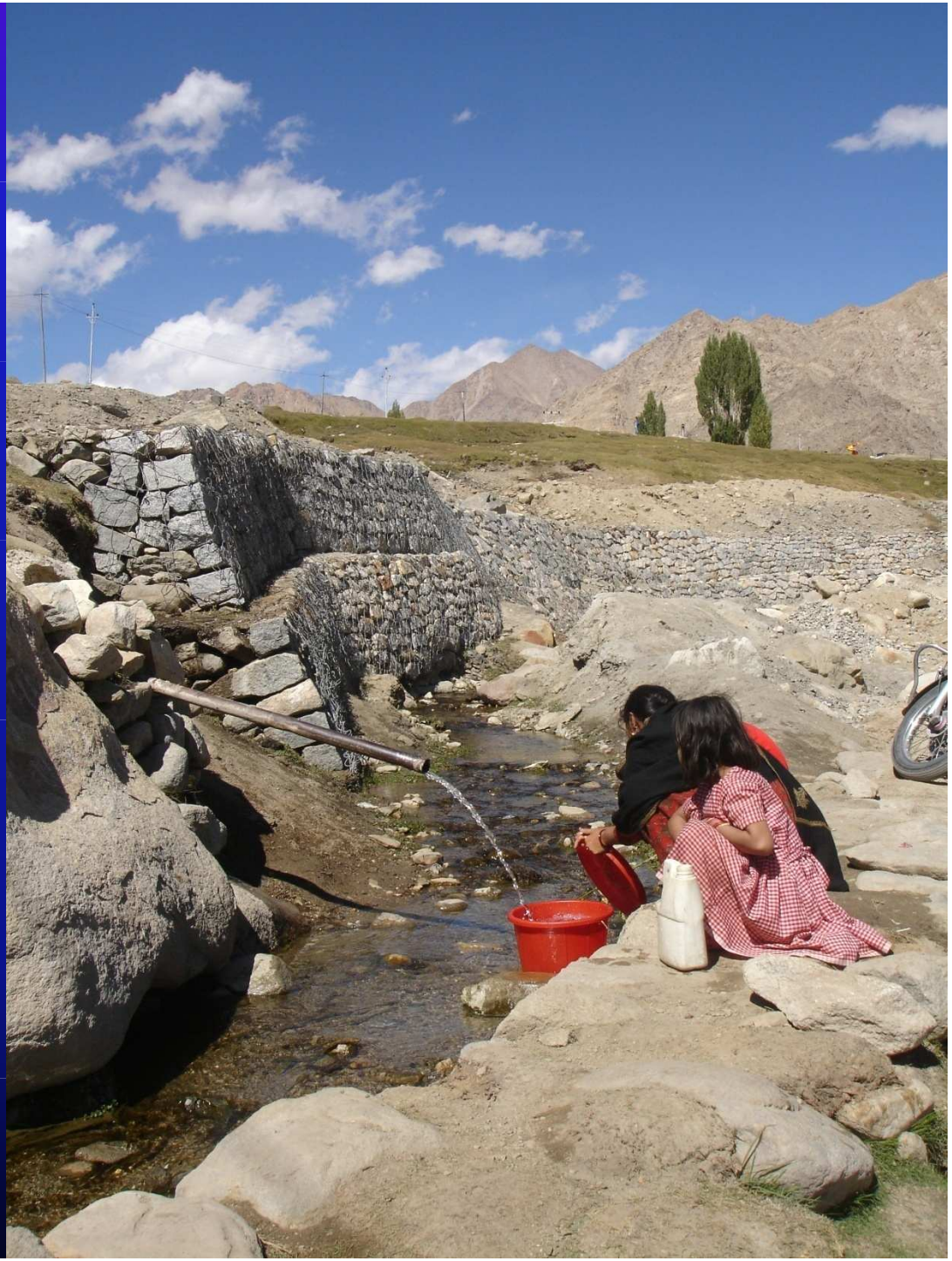
Tethys Himalaya

- Traditionally dependant on Springs
- Bore-wells- the new face of groundwater
- Over-exploitation
- LEDeG - Leh



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Hydrogeology Of Sikkim Springs

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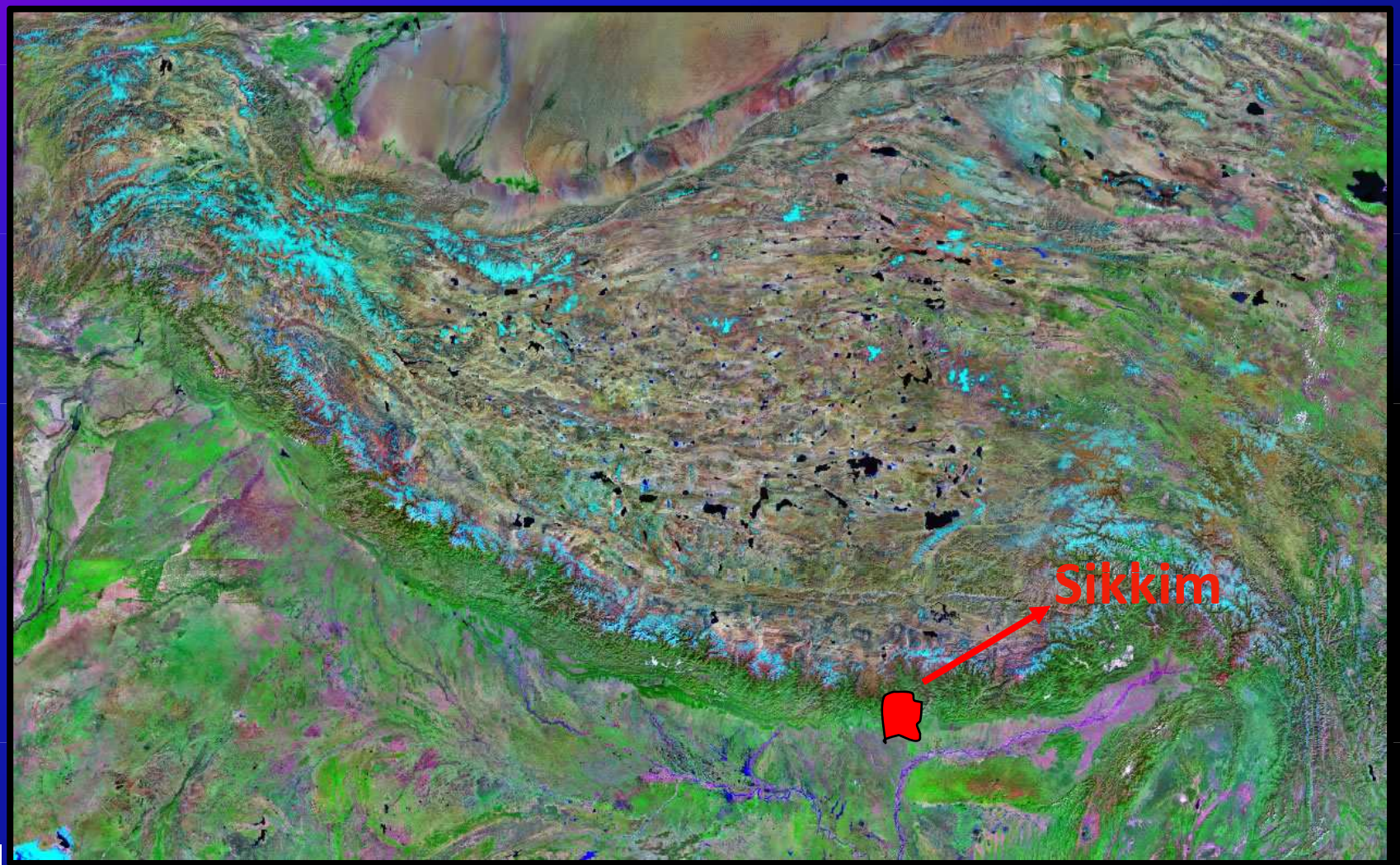
Sikkim Himalaya

Small and Beautiful



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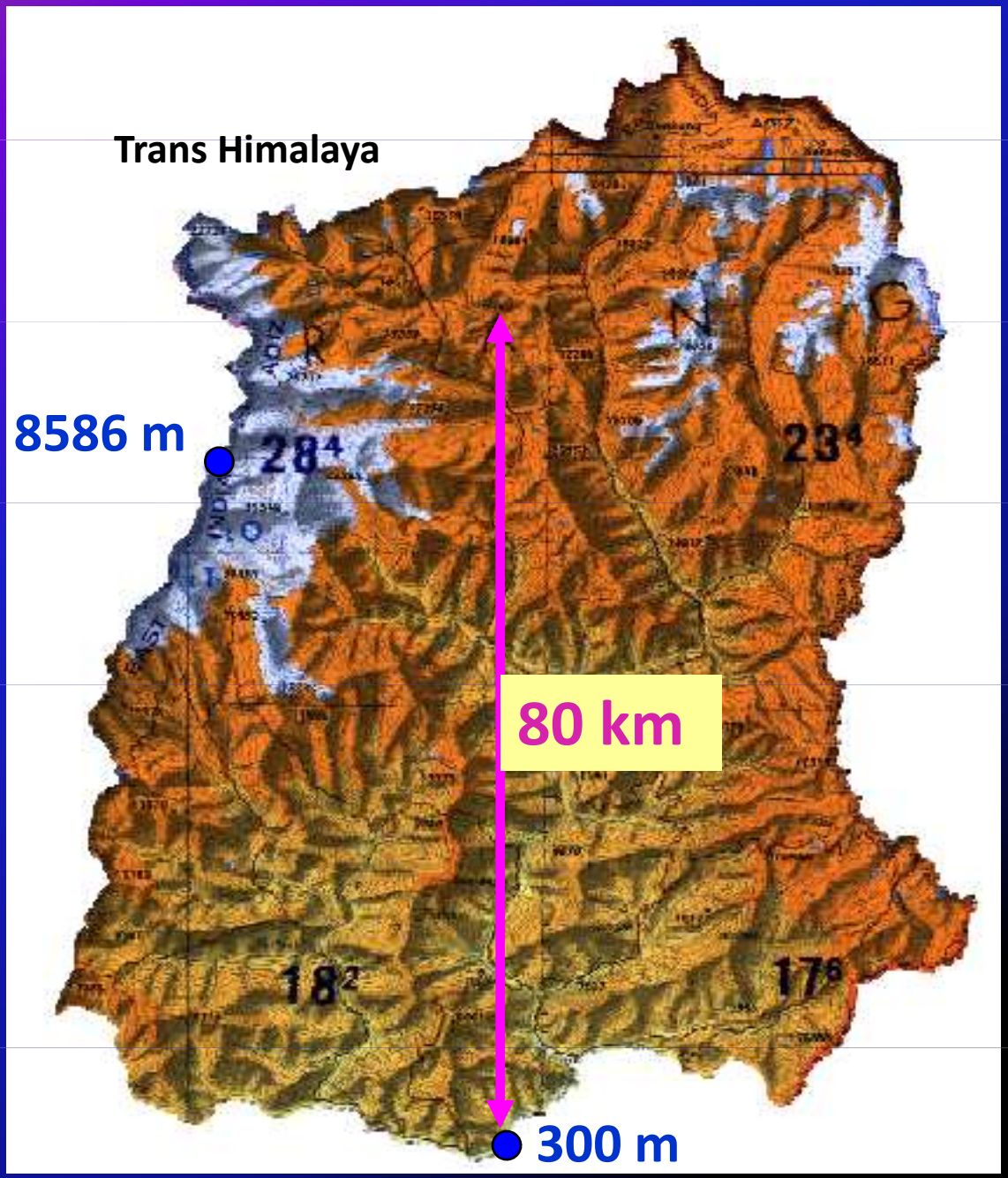
SIKKIM HIMALAYA



Highest,

Steepest &

Remotest

Landscape
in the country

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Sikkim: Vital Statistics

Landlocked Indian state nestled in Eastern Himalayas

It is the least populous state in India, Population: 0.55 million

Second-smallest in area after Goa, Area: 7096 sq. km.

84% of the land is under forestry landuse

Climate: Long monsoon followed by long winter

Home to ethnically diverse communities – Bhutia, Lepcha and Nepali

The predominant religions are Hinduism and Buddhism

Gangtok is the capital and largest town

A popular tourist destination famous for its culture, scenic beauty, ecotourism and biodiversity

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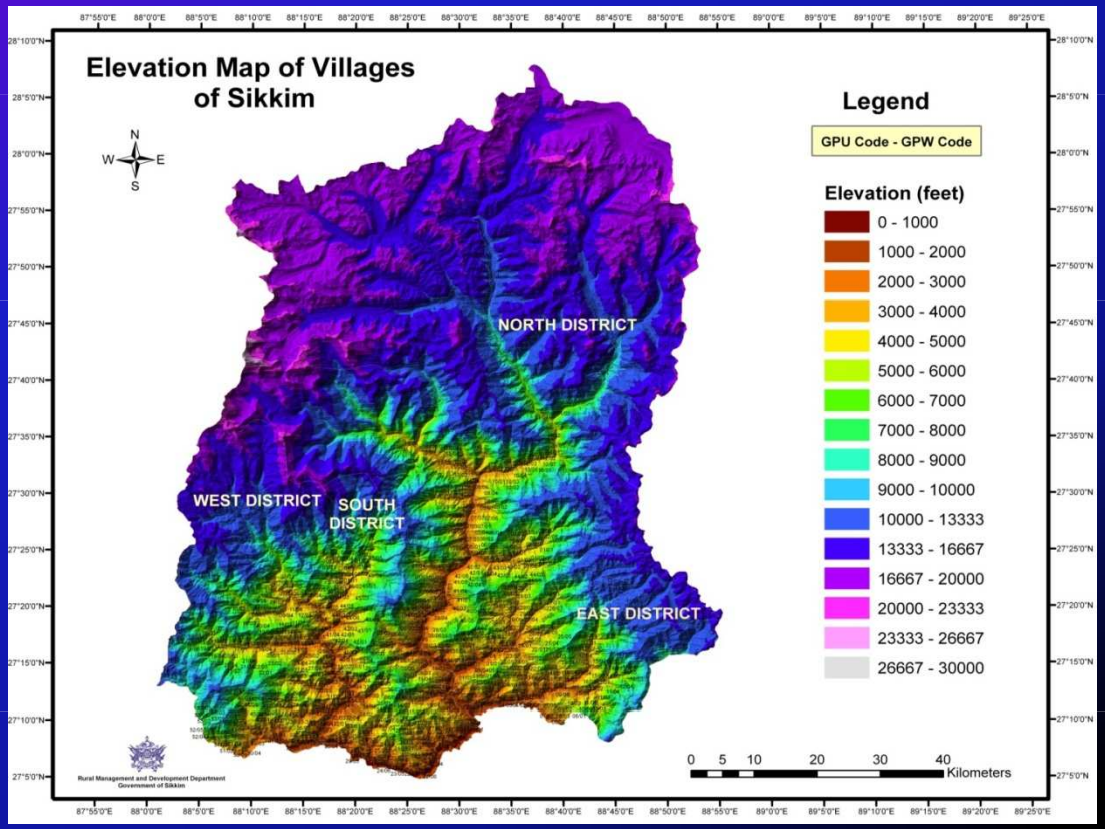
About Sikkim

- There are 4 districts in Sikkim.

Viz. North, East, West and South.



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Geology

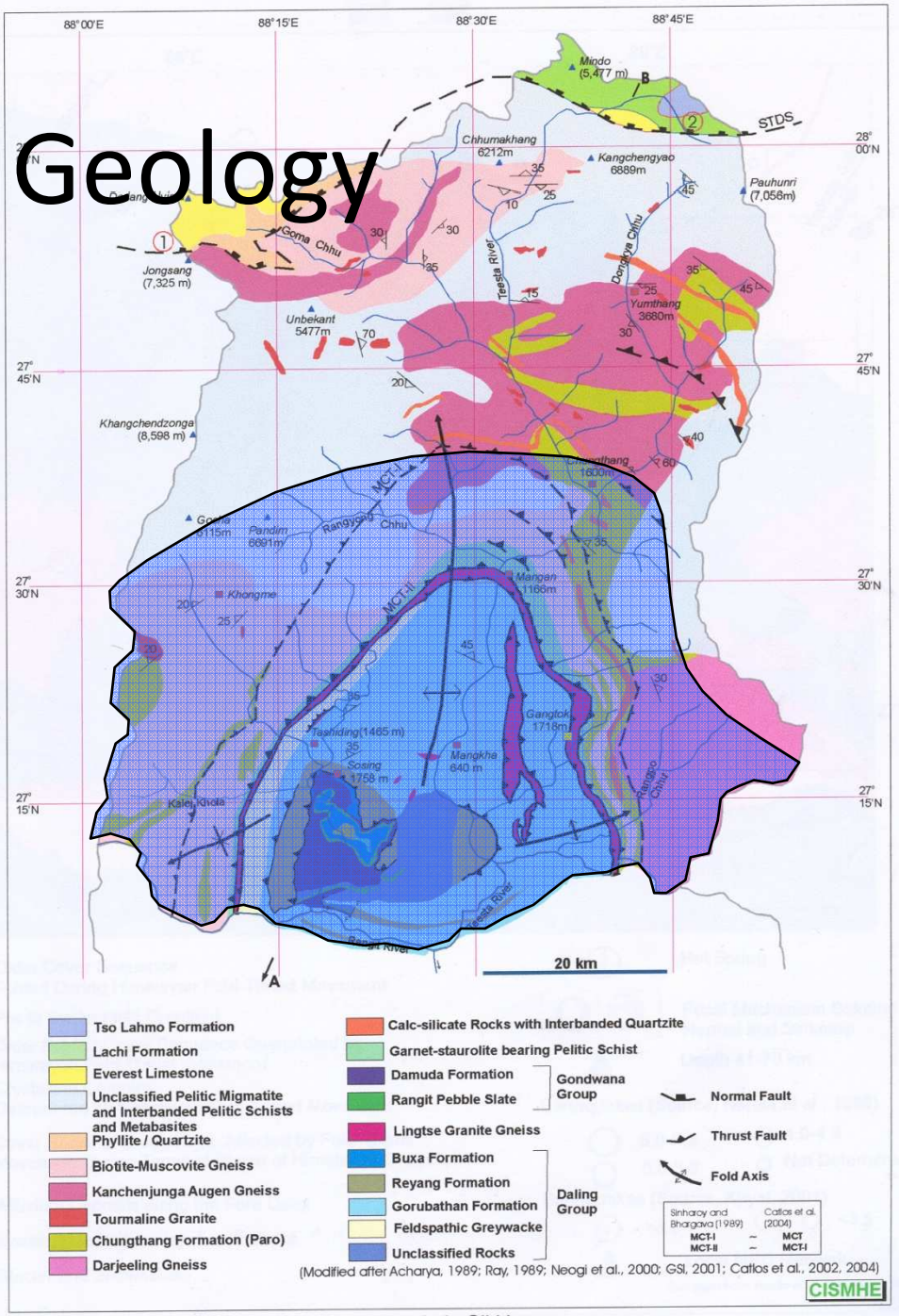

Fig.7 Geology and stratigraphy of Teesta basin in Sikkim

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Hydrogeology

- Due to high relief and steep gradient springs are the main source of water in the region
- Due to higher slope most of the precipitation flows off as surface runoff through streams, *kholas*, and seasonal springs
- Direct infiltration of rainfall through joints, fractures, weathered zones of the rocks is principal mode of recharge of the springs
- The movement of ground water in Sikkim is mainly controlled by the structural set up of the area and physiography
- There are no wells or dugwells in Sikkim. The dependency is totally on springs

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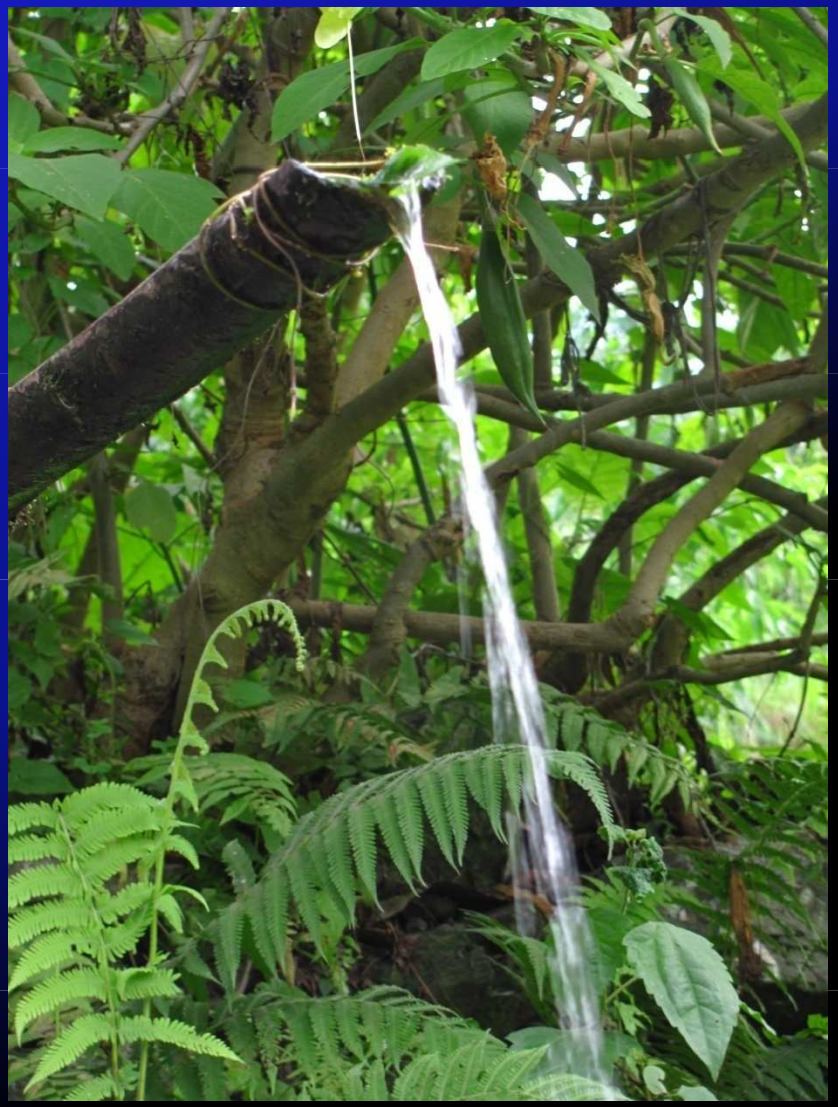
Eastern District

- Kanchenjunga gneiss, Darjeeling gneiss, Chunthang Schists and gneiss, Lingtse granite gneiss and Daling group of rocks consisting of Phyllite, slates, quartzites and schist of Pre-Cambrian age
- N-S, E-W, NE-SW, ENE-WSW and NW-SE directions - Principle foliation directions
- Dik Chhu, Rate Chhu and Rangpo Chhu- tributaries of Teesta river



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Western District

- Daling group, Gondwana group, Darjeeling Group
- Gneisses, schists, phyllites, quartzites
- Rangit river, Rongbong khola

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Southern District

- Recent alluvium (terrace deposit), Gondwana, Daling group of rocks
- Shale, sandstone, quartzite, coal, schists, quartzites
- Water quality problems-Iron
- Teesta, Rangit and many perrenial kholas

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Northern District

- Highly metamorphic rocks, Trans-Himalayan sedimentary sequences
- Glacial recharge to springs
- Teesta river and major lakes

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Typologies of Spring

- Typology 1: Springs from the Northern District
- Typology 2: Springs located in the high grade metamorphic rocks
- Typology 3: Springs located in the low grade sedimentary rocks
- Typology 4: Springs located in the sedimentary rocks and alluvium

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Hilltop Lakes

- Located at Hilltops or on the slopes near the tops
- Recharge to springs downstream
- Commercial value
- New interventions in lakes

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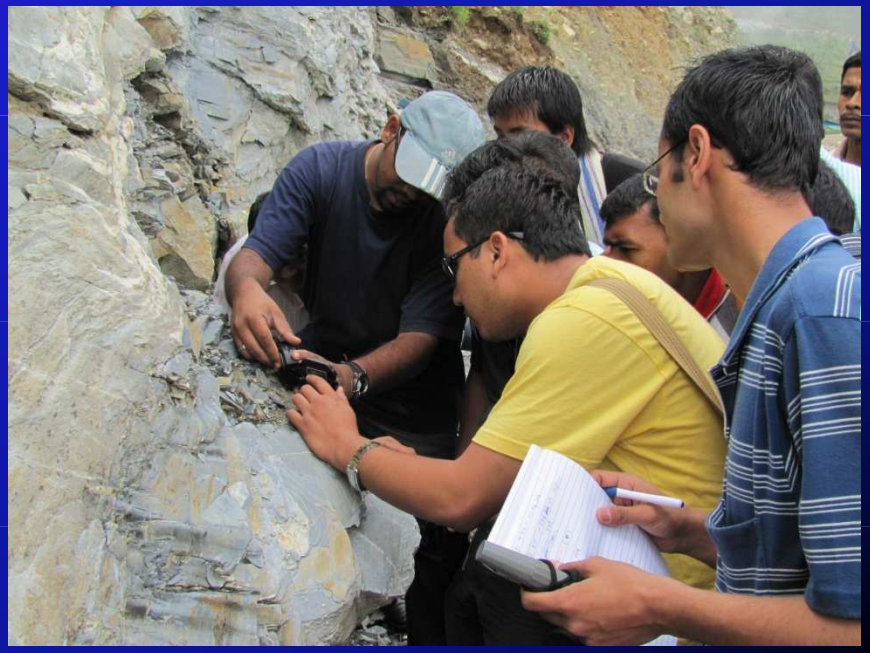
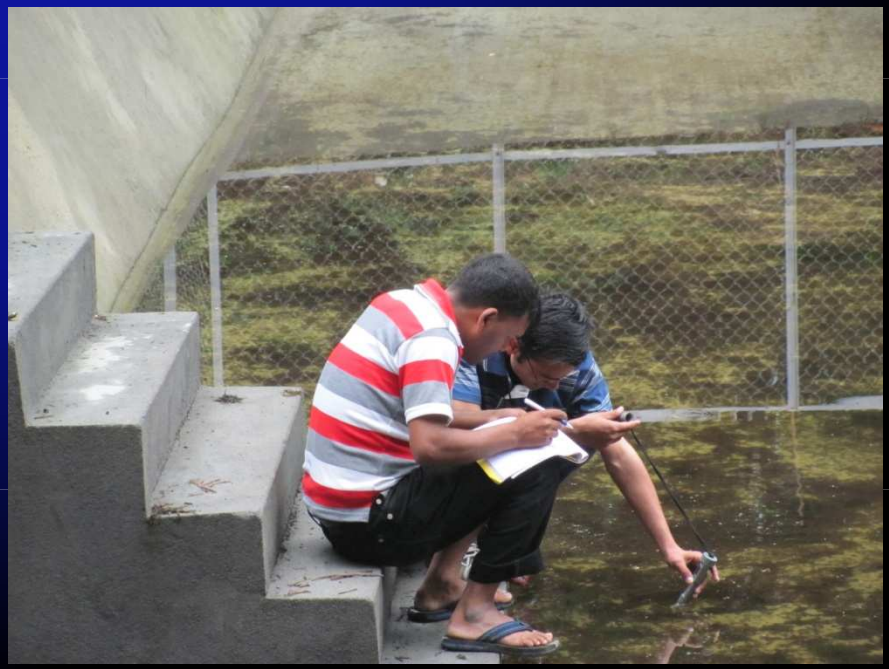
Future Work

- Selection of 30 springs for Dhara-Vikas
- Selection of 3 lakes for revival
- Selection of Perennial streams/waterfalls for surface storage and distribution
- 3 months





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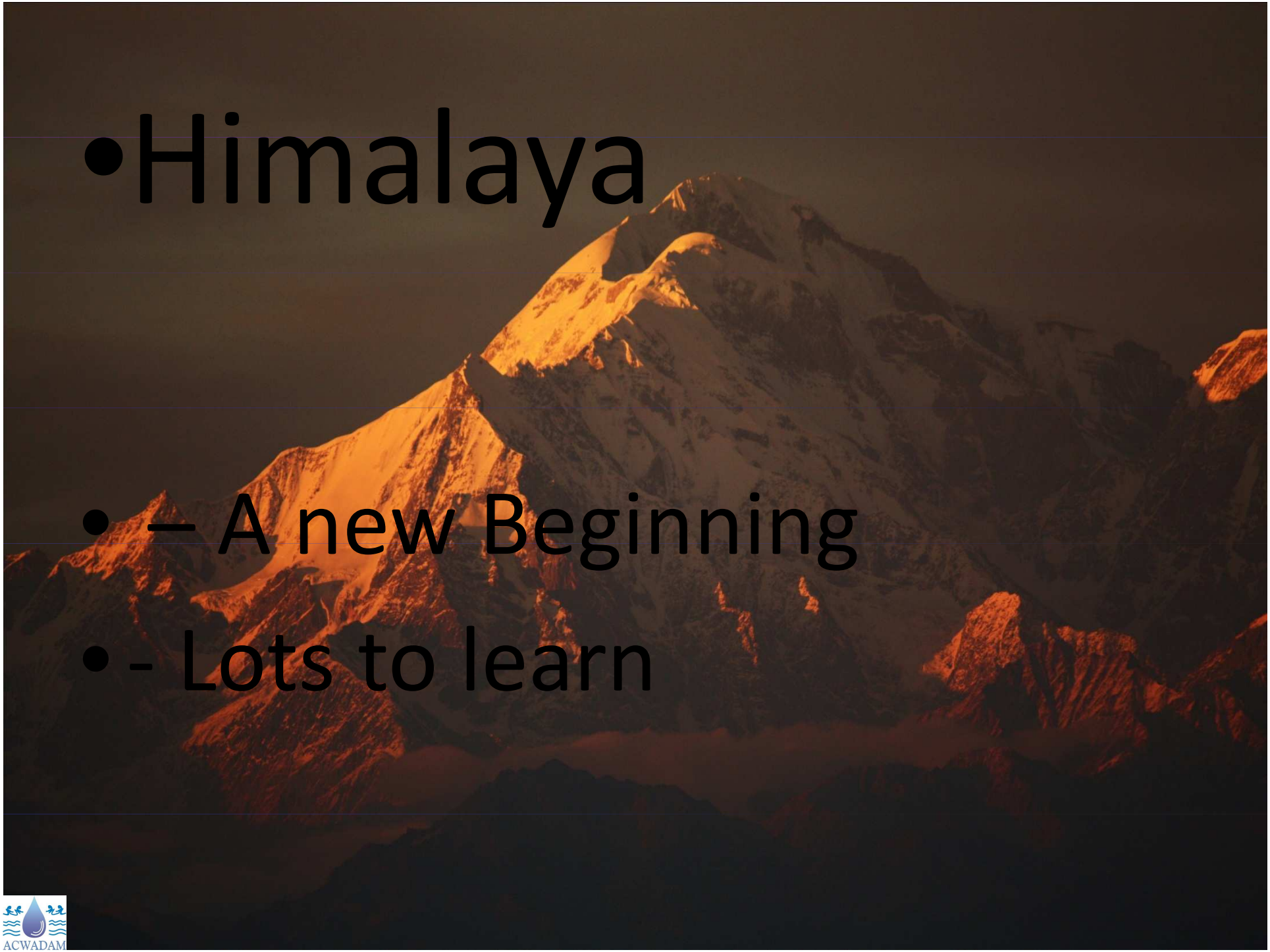

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