

Landslide Characteristics and Societal Impacts of Roadside Towns along Sino-Nepal Transportation Corridor

A Case of Kathmandu-Kyirong Highway

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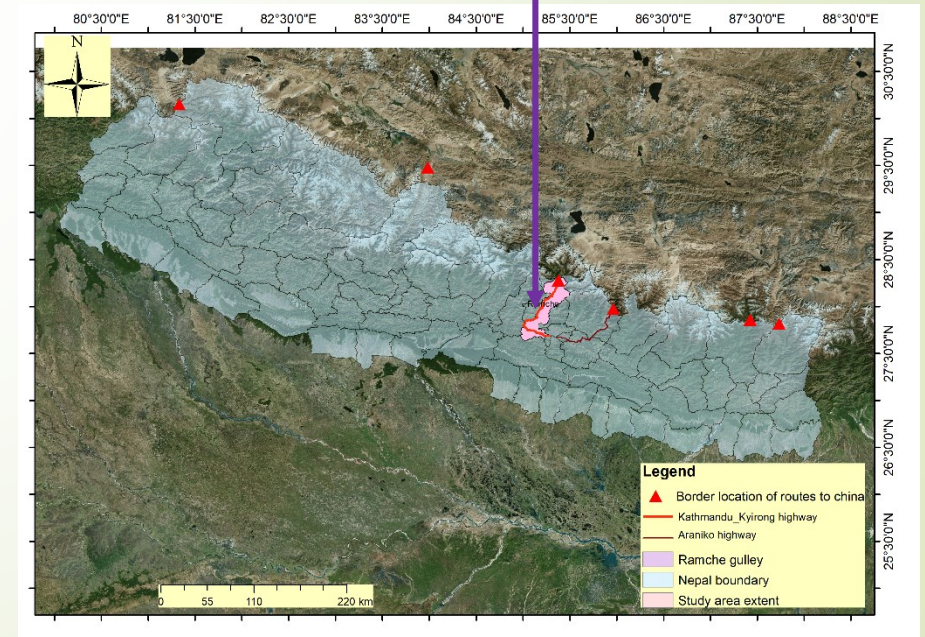
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Overview

- ❑ Kathmandu Kyirong highway (KKH) is a strategic motorway built in the terrain of high tectonic and river incision belt, weak geological settings, and extreme monsoonal climate system
- ❑ It suffers from **frequent landslide hazard** annually



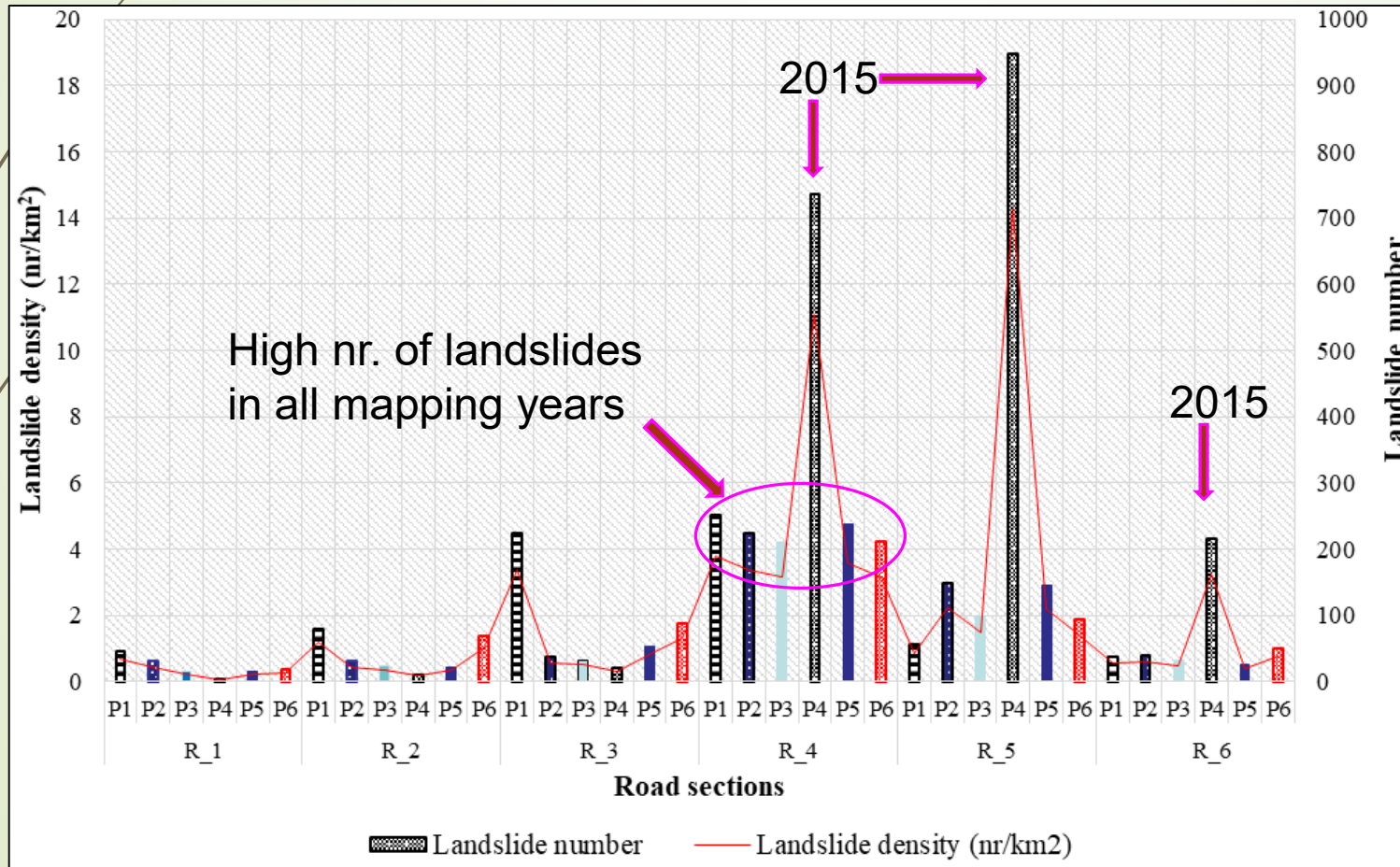
Landslide characteristics

Period	Nr.	Density/ha	Area (ha)			
			Min	Max	Mean	Total
2004 &older	694	0.383	0.003	110.139	0.928	643.691
2005-2009/2010	510	0.339	0.017	44.167	1.119	570.765
2011-2014	413	0.177	0.010	54.989	0.723	298.553
2015	1934	0.637	0.004	12.656	0.554	1071.463
2016	498	0.161	0.010	26.093	0.547	271.628
2017 &2018	528	0.186	0.004	31.215	0.591	312.152
Total	4,577					3,168.252

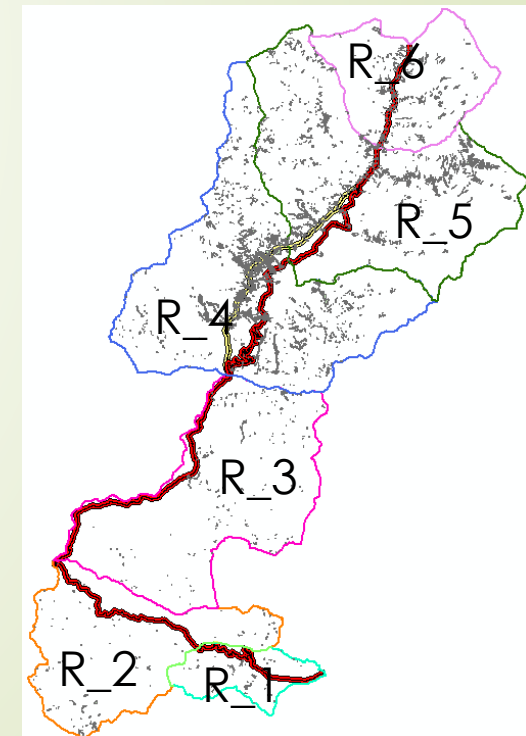
Continuously active area more than two periods is **626.5** ha

Landslide characteristics

Landslides number and density (nr/km²) in different sections of the highway corridor



P1: 2004 & older
P2: 2009/2010
P3: 2014
P4: 2015
P5: 2016
P6: 2017/2018



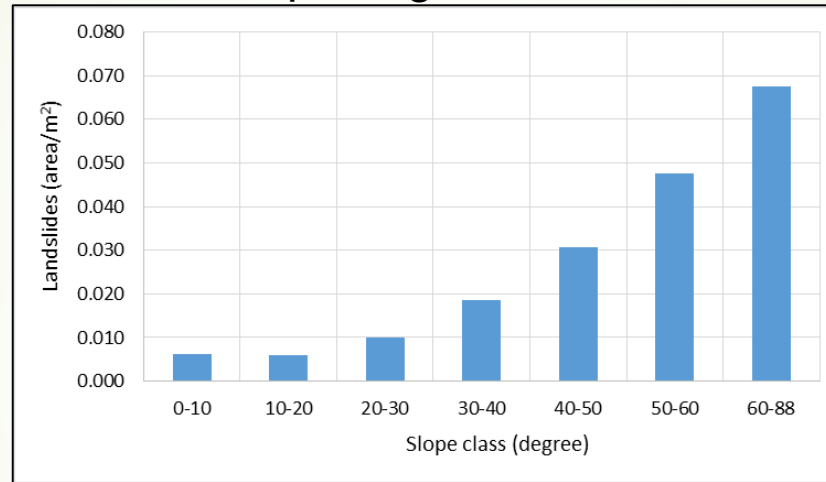
Landslide characteristics

Landslide and causative factors

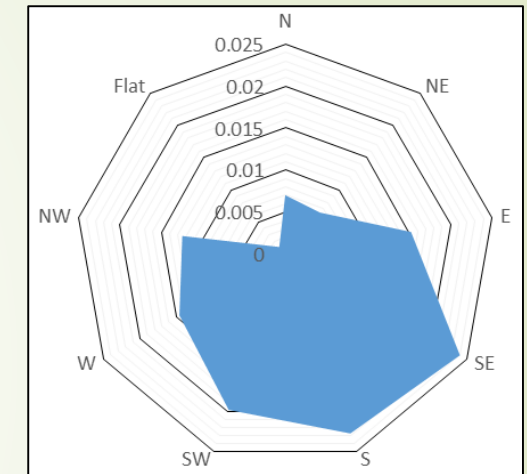
Landslides are

- ❑ increased with incremental slope and relative relief
- ❑ more in late Paleozoic and pre-Cambrian lithological formations
- ❑ more in southern slope aspect
- ❑ more in grass lands, bushes and barren lands
- ❑ more closer to earthquake epicenters as well as streams
- ❑ more in 2000 -2500 mm rain zone (pre-quake) and more in dry steep slopes (co-seismic)
- ❑ more in the area far from roads; it is because most of the roads are in urban and sub-urban flat locations

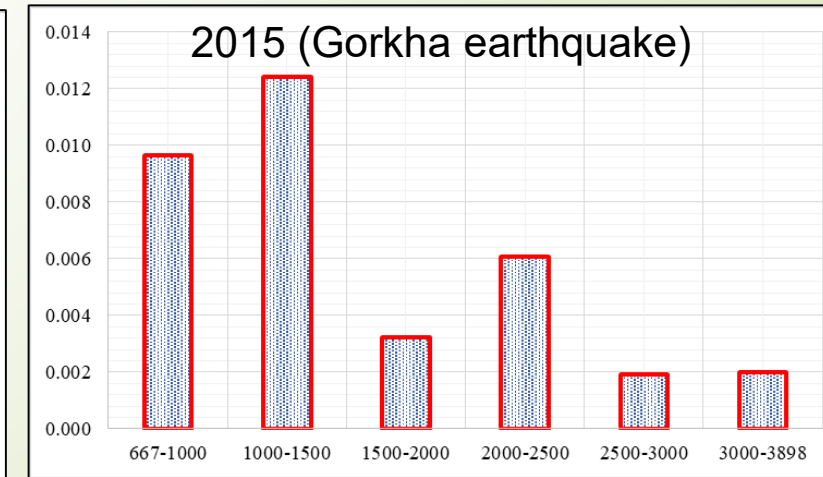
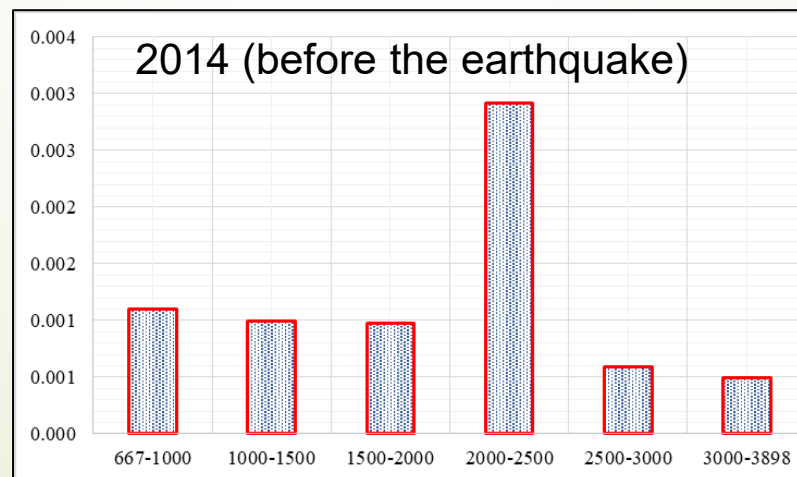
Slope angle



Slope aspect



Annual normal rainfall

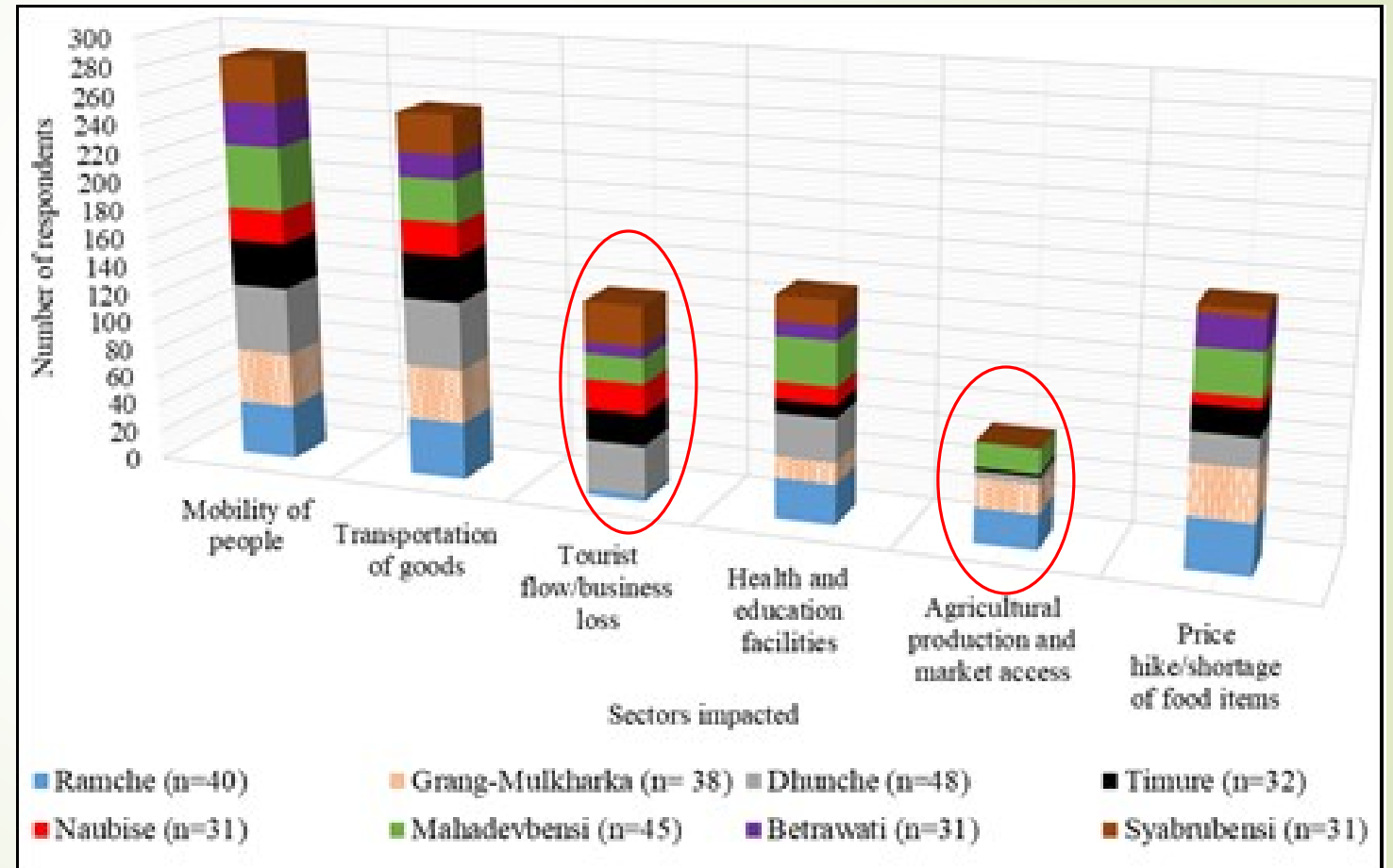


Societal Impacts

Eight roadside towns, n=296)

Six major sectors are highly impacted -
transportation, price hike, and shortage of stuffs

Livelihood options -
agriculture, and tourism and private business



Coping mechanism

Local residents are smart enough to cope with the hardship that brings by slope instability

The mechanism of coping are:

- ☐ One way transportation and walk in damaged area
- ☐ Carry goods by foot from nearby market
- ☐ Mentally prepare to reach nearby workplaces by walking
- ☐ Keep stock of goods at home
- ☐ Use savings to buy expensive stuffs in local market
- ☐ Helicopter lifting during emergency

Summary

- ❑ Mass failure is **common hazard** along Kathmandu Kyirong highway corridor
- ❑ Slope angle, relative elevation, slope aspect, lithology, land cover, stream and epicenter proximity, and rainfall have remarkable influence on mass failure
- ❑ landslides have remarkable impact not only on **road condition** but also on **livelihood** of roadside residents
- ❑ Locals are **aware** of the **devastation** that comes with mass failure, thus acceptable risk is high
- ❑ People are **resilient** though they have very limited resources



Thank you