What is Landslide?

Movement of considerable mass of soil or rock along with the vegetation from higher elevation to lower elevation under the influence of gravity.

http://en.wikipedia.org/wiki/Landslide

Types of landslides

Key component

Crown: Is the upper most part of the sliding terrain from where it is originated

Body: Sliding mass

Toe: lower most part of the landslide

Source: http://www.eoearth.org/article/Landslide

Landslide vulnerability of Sri Lanka

Total area of the Land: 65,000 km²

Area prone to landslides: 20,000 km²

Annual Time Series Distribution of Landslides

Source: desinventar.lk

Nearly 30% of the country is vulnerable to landslides
Landslides can be triggered by

**Natural**
- Steepness of the hill slope
- Intensity of the precipitation
- Flood and reservoirs in hilly area
- Deep weathering of rock materials and the depth of the weathered rock
- Type of the rock materials
- Earthquake triggering factors
- etc. . .

**Manmade**
- Unplanned land use
- Inappropriate construction methods
- Human intervention
- etc. . .

Landslides do not occur usually due to a single reason, but it is the net effect of several, process and factors, persisting for long period of time.

**Major Losses**
- Damage to life and property
- Damage to economically important facilities
- Damage to water, electricity and communication systems
- Effect on education and health
- Transportation difficulties
- Etc...

The damage caused to the natural environment is irreversible and can not be estimated and perhaps will never be known.

**Landslides in Sri Lanka (Overall view)**

**Effect of Monsoon pattern**

**Seasonal Distributions of Landslides**

- **Annual rainfall in Sri Lanka**
  - *Source: desinventar.lk*

- **Rainy Seasons**
  - South West Monsoon: May to August
  - North East Monsoon: November to February

**Note**
- According to Sri Lanka Building Research Organization:
  - 200 mm of precipitation within 3 days is susceptible for landslides
  - Due to poor land use practice 75-100 mm for a 2 days period is sufficient to trigger landslides
**Human Interaction**

**Flood and reservoirs in hilly terrain**

1. Ground water level changed after flood
2. Natural drainage patterns are charged
3. Increase pore water pressure
4. Accumulation of water in slopes
5. Weight increase
6. Landslide

**Impact of Vibration**

- There are no earthquakes or volcanoes in Sri Lanka.
- However, the failure of slopes associated with the up country railway is very common in Sri Lanka.

**People Affected Due to Landslides**

![Graph showing people affected by landslides over the years.](source: desinventar.lk)
Mitigation Measures

Mitigation of Peradeniya Landslide

The applied structural mitigation measures include

- Trimming and benching
- Rock blasting
- Soil nailing
- Rock bolting
- Construction of surface drainage
- Turfing

Project cost:
Rs. 87 Million


Mitigation of Padiyapallella Landslide

The applied structural mitigation measures include

- Construction of retaining structures
- Construction of surface drainage

Project cost:
Rs. 51.38 Million

Mitigation Measures

Mitigation of Malhewa Rockfall

Mitigation structures consisting

- Trenches
- Bunds
- Fences


Recommendations

- Landslide hazard zonation mapping
- Landslide hazard identification and assessment of landslide risk
- Application method for landslide investigations (local community)
- Guidelines for construction and land use planning in hilly areas
- Innovative methods for Landslide mitigation
- Awareness and training programmes
- Landslide early warning systems

Thank you for your kind attention!

ありがとうございました……!