Developing a common methodology and platform for data collection and sharing - Global Landslide Catalogue

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Motivation

• Knowing where and when landslides have occurred in the past is a key determinant of where they likely will occur in the future

• Landslide inventories underlie nearly all aspects of landslide hazard assessment and modeling

• While local and regional inventories exist in some areas, there are few systematic landslide inventories with which to conduct hazard analyses

Photo Credits: USGS

Above: Widespread ridgetop landsliding in Gorkha district
Below: Rockfalls in Urkin Kangari Valley
Global Landslide Catalog

- Database of rainfall-triggered landslides reported in the media, disaster databases, and other sources
- Compile information on date, time, location (nominal, lat/lon), impacts, trigger, landslide type
- Catalog events in online system, open database that can be added/edited
GLC Statistics

- **6790** landslide reports (2007-2015)
- Over **25,000** Fatalities (1779 events with reported fatalities, ~25%)
- **136** Countries
- Biases: Reports primarily in English, regional/political biases, location accuracy
- **Need for more local reporting**

Landslide Reports and Fatalities in Nepal (2007-2015) from GLC

![Graph showing landslide reports and fatalities in Nepal from GLC](image)

Kirschbaum et al. (2015)
Online System: http://ojo-streamer.herokuapp.com
Landslides and Susceptibility in Nepal
Gorkha Earthquake Volunteer Image Analysis

- Volunteer global campaign to assist with earthquake disaster, coordinated by the University of Arizona
- Six areas of interest were defined according to river valley. Expert researchers from 9 nations contributed to the satellite image analysis.
- NASA data: Landsat, ASTER, EO-1 ALI, SRTM data; (+ DigitalGlobe, WorldView images through commercial partnership).
- Aided NASA, USGS and NGA in the targeting of satellite imaging
Gorkha Earthquake: Langtang Valley landslides, Nepal

- Image analysis by volunteer group validated and qualified effects of the disaster in Langtang and other affected regions
- Information relayed to authorities resulted in relief helicopter missions to the valley

Walter Immerzeel (U Utrecht)  
Philip Kraaijenbrink (U Utrecht)  
Thomas Painter (NASA JPL)

Photos by Volunteer David Breashears.  
Mosaic by Dan Shugar.
NASA-USGS-ICIMOD Volunteer Mapping

- ~4,300 landslides mapped by team of 50 scientists
- Coordinated with other inventory groups on frequent calls (ICIMOD, BGS/Durham)
- Challenges:
  - No uniform cataloging methodology (initiation point, deposit, point vs. polygon)
  - No collective place to accumulate mapped entries
  - Manual process using available imagery
Sudden Landslide Identification Product (SLIP) DEVELOP Project

- Method to automatically detect landslides and track physical change over time
- Landsat 8 sensor (30 meters, with 15-meter pan) was chosen for this study
- SLIP automatically detects the location of landslides by calculating the relative spectral reflectance of the visible blue, green, and red bands (2, 3, 4) of the Landsat 8 sensor
- The smallest landslide expected to be identified could be approximately 60 square meters

Hazard Assessment

- Near real-time precipitation information (Global Precipitation Measurement, 0.1 degree, 30 minute resolution with 4-6 hr latency)
- Regional landslide susceptibility information
- Near real-time hazard “nowcasts”: Prototype developed for Nepal
Nepal Hazard Prototype Website
Next Steps/Recommendations

• Working with ICIMOD on re-calibrating rainfall thresholds for the near real-time hazard model
  • Need rain gauge information to inform rainfall thresholds

• Collaborating with ICIMOD and other groups on potential landslide inventory projects to ultimately construct a national landslide inventory (need where, when, and area?)
  • Need guidelines and strategy for collection

• Look forward to continuing a dialogue on how we can help advance landslide hazard assessment and inventories in Nepal
Thank you!

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http://ojo-streamer.herokuapp.com

http://ojo-streamer.herokuapp.com/nepal
Open Global Landslide Catalog and Event Editor

• The GLC events are available on an interactive, searchable, exportable portal

• An Event Editor allows people to add and edit events

• Wiki provides documentation

http://ojo-streamer.herokuapp.com/
Regional Near real-time capabilities

- Near real-time precipitation
- Landslide “nowcasts”
- Flood forecasts and streamflow assessment
- Continued landslide mapping

http://ojo-streamer.herokuapp.com

Huan Wu/Robert Adler, U of Maryland: GFMS