Island Geoscience

Geoscience issues as they relate to water, land and air protection on Vancouver Island

Vol. 03, No. 01 – Winter 2006

Living with Risk

Winter draws to a close and I find myself on an airplane returning from the scene of the catastrophic rock avalanche that buried the town of Guinsaugon in the Philippines on February 17, 2006. This landslide event has several lessons for the applications of geoscience in mountainous terrain: what does it mean to live with risk? How do we accommodate the many conflicting interests and what can we do, as geoscientists, to improve the quality and communication of data to decision makers? A preliminary description of the event and thoughts on living with risks follow.

On a related theme, the Ministry technical handbook, Lakeshore Erosion Hazard Mapping is now available.

In this issue we introduce, as promised, one of the Ministry of Environment hydrologists, Scott Babikaioff of the Surry office.

As usual there are other tidbits throughout, including information on a CWRA geomorphology workshop this fall, targeted not just at geoscientists but decision makers at all levels.

As always, if you have any comments on any of the articles, or the newsletter, please contact me at:

richard.guthrie@gov.bc.ca

If you have recent work that seems to fit the overall theme of this newsletter, let me know and I will certainly consider it.

Past issues of Island Geoscience are catalogued at the Ministry of Forests Library:

http://www.for.gov.bc.ca/hfd/LIBRARY/Island_Geoscience.htm

We're all inundated with Email. If you are getting this newsletter and *do not* want it, please send me an Email at the above address and let me know. I will take you off the list. On the other hand, if you know someone who would like to be on it, again, please let me know.

Continued thanks to all the folks who send me feedback, or pass this newsletter on to a friend or colleague.

Until June,

Rick.

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Catastrophic Rock Avalanche in Southern Leyte Province, Philippines.

The Philippine Islands are densely populated: 87 million people scattered across 7127 islands, on a total landmass of 300000 km^2, 10 times larger than Vancouver Island, and less than a third the size of British Columbia. Of this land, much is relatively unusable and the majority of living is concentrated along low lying coastal areas. Only about 16000 km^2 of land is irrigated.

Sometime between 10:30 and 10:45 AM on February 17th, 2006, approximately 10 × $10^6 m^3$ of rock and debris failed

catastrophically in the Southern Leyte Province of the Philippines (Figure 1). The mass collapsed from a mountain ridge associated with the tectonically active Philippine fault, travelling downslope and across the valley floor engulfing everything in its path, coming to rest almost 4 km distant from the point of initiation.

Figure 1. Location of the Philippines and the landslide in Guinsaugon.

Tragically, the rock avalanche engulfed the town of Guinsaugon, as well as smaller outlier villages making it the most devastating single event landslide to occur in the last decade worldwide, and possibly the most devastating single event landslide ever recorded in tropical mountains. Nine hundred and seventy five dead are named, and others are expected that were visiting the area for the day, putting the death toll at approximately 1000 people.

In response, Canadian Foreign Affairs sponsored two Canadian specialists from the University of Waterloo Landslide Research Program to conduct a technical mission to the Philippines. The mission was led by Professor Stephen Evans (University of Waterloo) and we left for Southern Leyte Province with on the 6th of March.

In conjunction with local geologists from the Mines and Geoscience Bureau of the Philippines, we spent the next several days crawling around the landslide, talking with locals, meeting with dignitaries and politicians and eventually, presenting preliminary findings to interested groups including the main university in Tacloban.

Early imagery and news reports suggested to us that this was some type of mud slide or debris slide. Within moments, however, of breaking through the palm tree jungle to the landslide itself, we realized that it was a massive rock avalanche. News reports also frequently attributed the event to logging, however, no logging in the area had actually occurred, and the failure initiation was of a type and scale that generally precluded impacts by man.

Finally the failure was generally attributed to a storm that had subsided 5 days earlier having released about 591 mm of rain between the 8th and 12th of February. While we can suggest that the storm *triggered* the failure, it would be a mistake to suggest that it *caused* it. The locals described the climate of Southern Leyte as having two faces: wet and very wet. The precipitation, while significant, was not unprecedented.

Figure 2. Massive rock avalanche in the Southern Leyte Province of the Philippines

The initiation was a combination of geological factors acting along an active fault surface causing deep cracks and sheared bedrock and preconditioning the slope for failure.

In contrast, however, the runout *was* extended considerably by human habitation. Rice paddies created a lubricating layer for the portion of the rock avalanche that extended to the valley floor. The material extended an additional kilometre or more as a consequence.

Figure 3. The Philippine flag raised at the presumed location of a school buried during the landslide. The deposit extends more than a kilometre in the distance across rice paddy flats.

Filippinos live in a terrain that is a geological crossroads of volcanic activity, crustal movement, earthquakes and landslides, combined with climatic conditions that create typhoons, tsunamis and frequent floods. It is nevertheless their home.

Figure 4. A house remains mostly intact near the edge of the landslide.

How then do we advise the residents? With so many hazards, what place is really safe for them to live? What lessons can we carry to other regions? How can we minimize risks to lives and infrastructure?

In 2004, the United Nations and the International Strategy for Disaster Reduction produced a document called Living with Risk that deals with these same questions.

The document acknowledges that we live with risks daily. It supports a shift from only humanitarian response to an increase in technical response, ultimately reducing the actual numbers of those affected by natural hazards. In all cases, the technical response requires an increased understanding of the hazard in question, followed by an increase in public education about causes, impacts and management of the hazard, including relocation at times of increased risk.

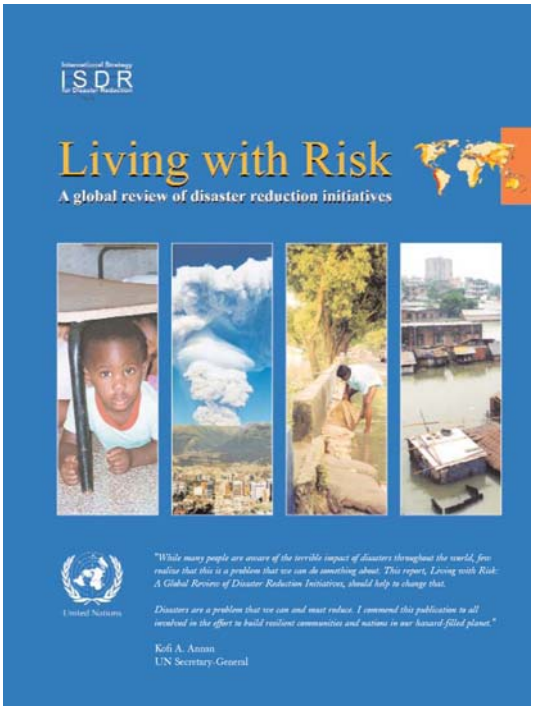


Figure 5. Living with Risk, a document produced by the International Strategy for Disaster Reduction, United Nations, 2004, Geneva Switzerland.

Despite the enormity and apparent randomness of the rock avalanche in Philippines in February, we believe that with our increased understanding of the geology, geomorphology and the hazard itself, combined with some participation from the local population and government, we can reduce the likelihood of a repeat event having the same impact.

“Despite the enormity and apparent randomness of the rock avalanche in Philippines in February, we believe … we can reduce the likelihood of a repeat event having the same impact.”

Back at home, our challenges as geoscientists are essentially the same. Where there are risks to lives and infrastructure or risks to the environment we have an obligation to understand clearly the hazards around us: their nature and recurrence intervals, which practices may influence them and how, and what may be done to prevent, reduce or mitigate the hazard. We perform a service when we can lay out clear understanding of the hazards and risks and propose various solutions to decision makers aimed at reducing the ultimate impact of an activity, whether passive (occupying a space) or active (development of land).

-RHG

Figure 6. Time out with the children of a neighboring village to Guinsaugon coming to view the landslide.

Lakeshore Erosion Hazard Mapping

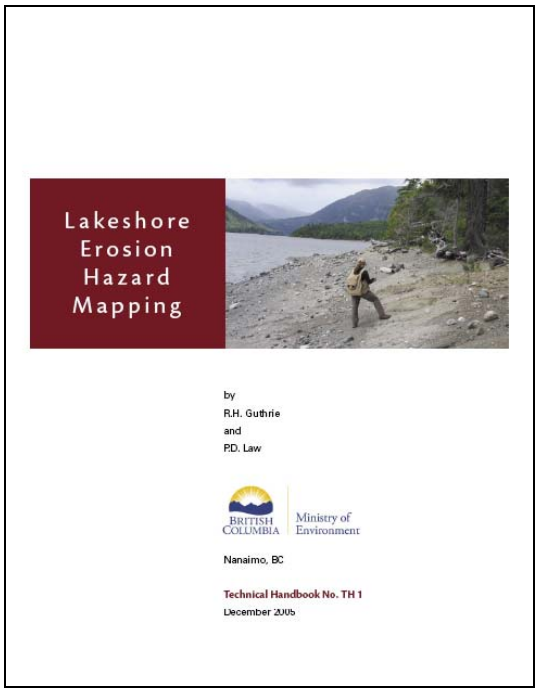
Living with risks means developing strategies to reduce potential impacts. That is what the Lakeshore Erosion Hazard Mapping handbook is about. The handbook looks at the need to protect private property from erosion, while retaining the integrity of environmental values around the lake. It is freely available online at:

http://wlapwww.gov.bc.ca/wld/documents/lakeshore.pdf

Abstract

Lakes offer opportunities for residential and recreational use. Shoreline developments,

however, can negatively affect fish and fish habitat, the foreshore, and the very setting that makes them attractive to people in the first place. This is particularly true for lakes that have fluctuating water levels. The vulnerability of the lakeshore to erosion is varied, but erosion protection measures tend to be applied in a blanket approach—an approach that is neither cost effective, environmentally friendly nor typically required.



This report presents a method for determining and mapping the shoreline erosion hazard around a lake and suggests appropriate protection measures. It is meant to help lakeshore owners and planners choose where to place their protection efforts, and offers alternatives that will help maintain the ecological integrity of the land-water interface, while protecting property and property owners. The first part of the report describes the methodology for determining and mapping lakeshore erosion hazards; the second is a conceptual tool kit for dealing with erosion where it occurs in a manner that retains some of the biological integrity of the lakeshore. The report does not specifically address individual concerns, nor is it meant to restrict the possibility of other innovative designs not considered in the tool kit.

Upcoming Conference

The BC branch of the Canadian Water Resources Association is hosting their annual fall conference from October 26-27 2006:

Water under pressure: Balancing values, demands and extremes

http://www.cwra.org/About_CWRA/CWRA_Branches/British_Columbia/british_columbia.html

In 2005 the BC branch of the CWRA formed a geomorphology subcommittee with representatives from government, academics and industry. Look for us to make an appearance at this conference providing a day of presentations and talks (including some excellent keynote talks) highlighting practical applications of the science of geomorphology to water problems.

At this time we are also looking for conference submissions that follow the general theme from an applied geomorphological context. Abstracts limited to 350 words should be submitted to Sean Fleming at sean@aquaticinformatics.com before May 05, 2006. Detailed instructions should be available on the web site shortly.

In the meantime, if you have further questions, you can contact Channa Pelpola at channa.pelpola@jacqueswhitford.com or myself (Rick Guthrie) at richard.guthrie@gov.bc.ca.

Recent research

Bound colour copies of the Ministry of Environment research reports RR01 and RR02 (Geomorphology of Vancouver Island: Mass Wasting Potential and Extended legends respectively) are now available from Government Publications for $26.06 and $17.50 each, not including the maps. You can have the maps printed individually at either of the scales with a cost of $49.95 per map sheet (full colour E-sized map sheets,

34”x44”). Contact Government Publications at 1-800-663-6905 or www.publications.gov.bc.ca

The reports remain free to download online from:

http://wlapwww.gov.bc.ca/wld/documents/techpub/rr01/rr01_geom_vi.html

and

http://wlapwww.gov.bc.ca/wld/documents/techpub/rr02/rr02_geom_vi.html

Introducing:

Scott Babakaiff is a Professional Geoscientist and fluvial geomorphologist working for the Ministry of Environment in the Surrey office. He holds a Bachelors degree from UBC and a Masters from Simon Fraser where he examined surface flow structures in the Squamish River Estuary.

He consulted for several years prior to joining government and spent much of his professional time doing stream restoration work. His expertise in this area is well regarded both locally and as far away as Australia and New Zealand.

For the last couple of years, Scott has been working extensively with small hydropower developments at all stages of the projects including reviews of hydraulic models, monitoring proposals and providing hydrologic input to fisheries and benthic invertebrate studies.

Scott can be contacted in the Surrey office at scott.babakaiff@gov.bc.ca

Next issue:

The stream crossing guidelines study was pushed forward to make room for the Philippines report. Hopefully we will have it next issue. We will continue to introduce the ministry’s hydrologists or geoscientists.

-RHG

Editor’s note: If you have an article or research paper that you would like to see here next time, please let me know at richard.guthrie@gems6.gov.bc.ca

Field work: Morning in San Juan, Southern Leyte Province, Philippines