Managing Geological Hazards in PNG

Geohazards Management Division
Department of Mineral Policy & Geohazards Management (DMPGM)
Outline

• Introduction
• Background
• Monitoring of geological hazards
• CTBT operation
• Integration with Goals of Government
• Information dissemination
• Flow on effects
• Challengers
• Summary
Introduction

- PNG occupies a region of intense and complex geodynamic activity.
- Geological hazards represent a significant threat in PNG.
- Monitoring, assessment and reporting on the prevalent & potential geological hazards is essential in efforts to mitigate the impacts of geological hazard events.
- Mitigating the hazards will lead to long term sustainable development and economic growth in PNG.
Department of Mineral Policy and Geohazards Management (DMPGM):  
Two core functions;  

1. Economic Mandate - Mineral Policy & Legislation Division  
2. Social Mandate - Geohazards Management Division  

Geohazards Management Division  

Responsible for monitoring & assessment of geological hazards like Volcano, Earthquakes, Tsunamis and Landslide plus other forms of mass movements  

Rabaul Volcanological Observatory (RVO)  
Port Moresby Geophysical Observatory (PMGO)  
Engineering Geology Branch (EGB)  

The Division provides advice on mitigation measures to relevant authorities and communities and where possible provide early warnings of the effects of these hazards.
Seismicity map of the PNG region

Volcanoes in PNG
Landslide prone areas in PNG

PNG coastline prone to tsunami

People on the coastlines marked with a heavy black line may expect TSUNAMIS
Monitoring of geological hazards; RVO - hazard assessments

- Airfall ash
- Pyroclastic flows
- Lava flows
- Lahars (mudflows)
- Geodectic surveys
- Seismic monitoring
Monitoring of geological hazard; PMGO - hazard assessments

- Source zones
- Earthquake activity rates
- Strong motion data
- Ground motion prediction equations
- Near-surface geology
Monitoring of geological hazard; PMGO - hazard assessments

- Deep-water bathymetry
- Near-shore bathymetry
- On-shore topography
- Historical tsunami impact data
- Subduction zones and other shallow submarine sources
- Volcano collapse or eruption
- Submarine/sub-aerial landslides
EGB - hazard assessments

♦ Landslide Assessment
♦ Geotechnical Assessment
♦ Site / Foundation Investigations
♦ Soil / Materials Testing
♦ Application of Drone Imaging

COMMON TYPES of LANDSLIDES in PNG

SLUMPS

Debris/Mudflow

Rock/Debris Slide

Soil Creep

Secondary effects of landslides
- Landslide delta
- Tsunami if landslide occurs underwater or entering the sea

Landslide is the movement of a mass of rock, earth, debris down a slope due to the influence of gravity. Ranging from rapid moving catastrophic rock avalanches and debris flows to insidious processes to move slowly moving soil slips. Some landslides move slowly and cause damages gradually while others move so rapidly and can cause damage suddenly and unexpectedly. Fast moving landslides are extremely dangerous if they occur in populated areas.

Factors that trigger landslides include rainfall, vibrations by earthquakes, volcanic eruptions, strong waves from tsunami, or drought. Gradual and continuous processes create steady flow of water from natural drainage or water from artificial drainage. Landslides are typically associated with heavy rainfall and tend to occur at the edges of Godzina and mountainous areas, rain in steep walled, native valleys causing back water flooding and catastrophic damage downstream when breached.

Debris/Mudflow is a mixture of soil, debris, and water that travels downhill slowly or rapidly. It can flow at a rate of 2 to 100 feet per second or faster. Mudflows can be extremely destructive, especially in densely populated areas. They can cause significant damage to structures, roads, and vegetation.

Landslide Prone Areas of Papua New Guinea:
- Southern Highlands
- Western Highlands
- Eastern Highlands
- Kimbe Bay
- Milne Bay
- Madang
- Morobe
- Central Province
- Western Province
- East Sepik
- Morning.

Landslide Prone Areas:
- Sagai, Madang
- Kabadula, Milne Bay
- Tambourina, West New Britain
- Mount Hagen, Eastern Highlands
- Cole's Creek, Central Province
- Nambas, Morobe
- Salamaua, Madang

Landslides Feat.
- Debris/Mudflow
- Rock/Debris Slide
- Soil Creep
- Global Rockslide
- Global Creep
- Global Colluviation
Monitoring of Nuclear activities – Enforcing CTBT’s Test-Ban Treaty within the Pacific region

• PNG is host to three of the four technologies utilised for the monitoring of nuclear activities

• GMD /DMPGM is host to two of the monitoring technologies

• PNGNWS is a host to another
Integration with goals of Government and MTDP priorities

• Accommodating all aspects of geohazards risk mitigation measures leads to improved infrastructure and in a longer term, support & contribute towards achieving:

– Goals/KRAs of the MTDP priorities
  ➢ Example - Assistance to preparedness & effective response when dealing with natural disasters for community safety.

– PNGDSP 2010-2030
  ➢ Example - Revision of the Seismic Loading Standard for the PNG Building Code to enable sustainable infrastructure developments.
Dissemination of geohazards information

• Division annually carry out awareness campaigns to at risk communities

• Emergencies relating to the hazards are address in collaboration with PNG National Disaster Centre and relevant Provincial authorities, line agencies, etc.,

• GMD → PNGNDC:
  • Provincial authorities
  • News media
  • Line agencies
  • General public

• Geohazards website of DMPGM will soon come online to ensure hazard information is widely disseminated
Flow on effects

- Key outcomes of effective management of geological hazards are safer communities, and more sustainable development.
- Risk mitigation strategies are then formulated to ensure compliance and conformity.
- Well informed citizens are prepared appropriately to deal with disasters.
- Law and order issues are minimised.
- Businesses are not subjected to unnecessary risk.
- Normalcy is achieved sooner.
Challengers in managing geological hazards

- Volcanological hazards
  - Volcanoes - spread over many kilometres

- Earthquake hazard
  - Earthquakes – no proper implementation of building code

- Tsunami hazard
  - Tsunamis – enforcing evacuation routes is difficult

- Landslide hazard
  - Landslides – land use planning difficult to enforce
Summary

• Geological hazards monitoring and assessment requires a collaborative approach

• Enforcement of risk mitigation measures needs strengthening

• Awareness on geological hazards is required at all levels of governance
Thank you & God Bless ...