

STATUS OF MOUNT KINABALU WATER CATCHMENTS AFTER THE JUNE 2015 RANAU EARTHQUAKE – LESSONS LEARNED

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Outline of Presentation

- 1. Introduction**
- 2. Mount Kinabalu Water Catchment**
- 3. The Ranau Earthquake**
- 4. Impact of Ranau Earthquake on the Water Catchment**
- 5. Impact on Communities**
- 6. Lessons Learned**
- 7. Concluding Remark**

1. Introduction

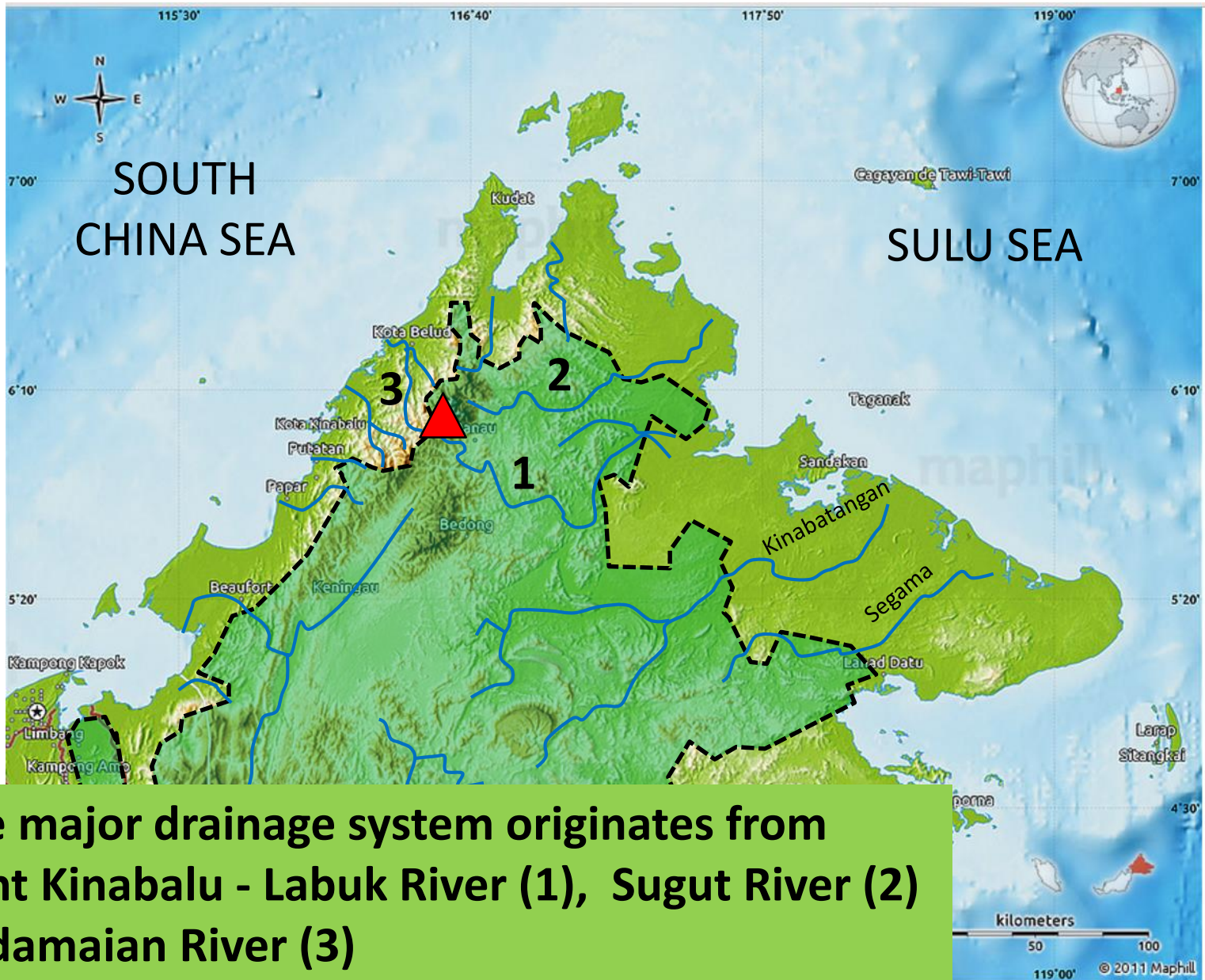
Introduction



Mount Kinabalu and Crocker Range region is a major contributor to the Heart of Borneo ecosystems in Sabah.

Several major drainage system originates from this region. Provides important life support system for people.

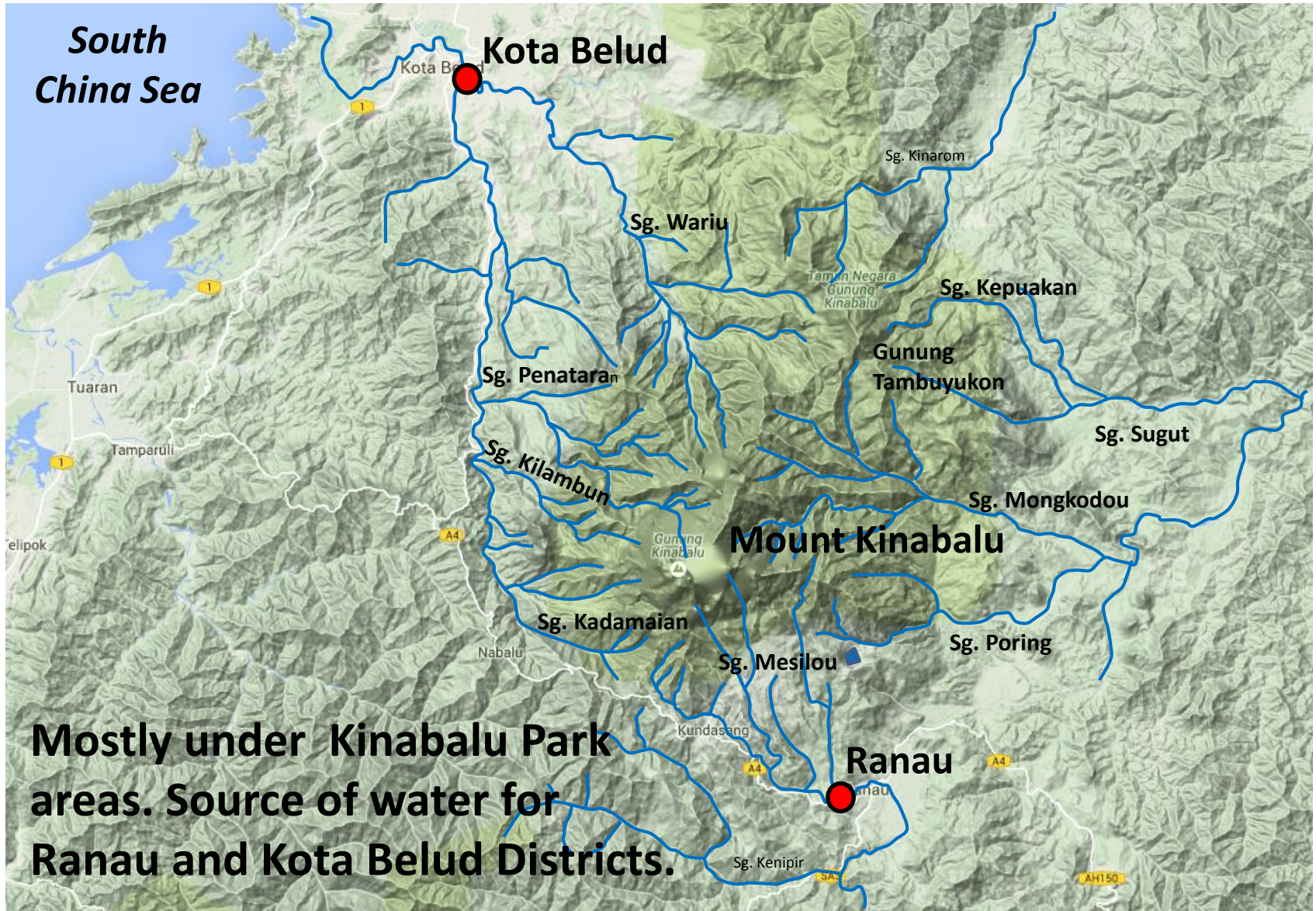
Introduction



Three major drainage system originates from Mount Kinabalu - Labuk River (1), Sugut River (2) & Kadamaian River (3)

2. Mount Kinabalu Water Catchment

Mount Kinabalu Water Catchment



Mostly under Kinabalu Park areas. Source of water for Ranau and Kota Belud Districts.

Mount Kinabalu Water Catchment

Kadamaian River



Mount Kinabalu Water Catchment

Kadamaian River



Mount Kinabalu Water Catchment

Kadamaian River



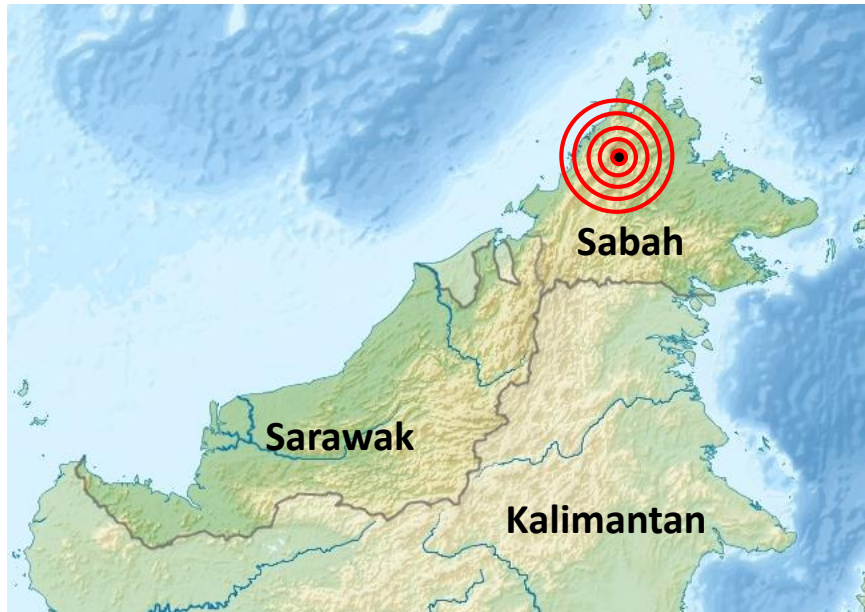
Mount Kinabalu Water Catchment

Kadamaian River



3. The Ranau Earthquake

The Ranau Earthquake



The 5 June 2015 Ranau Earthquake, Sabah

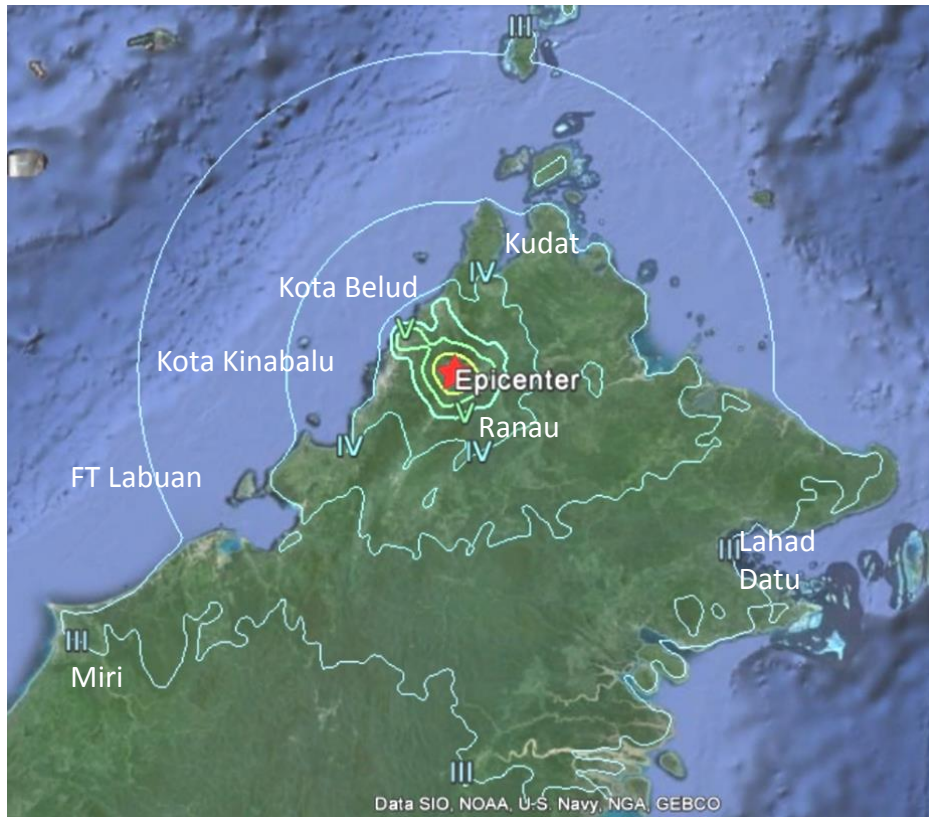
Magnitude	6.0 mww
Location uncertainty	5.987°N 116.541°E ± 5.1 km
Depth uncertainty	10.0 km ± 1.6
Origin Time	2015-06-04 23:15:43.910 UTC

More than 120 aftershocks. The last aftershock of M2.6 was on 11 November 2015.

18 people died on Mount Kinabalu due to rockfalls with most of the deaths being Singaporean students while about 137 other people who were climbing the mountain were stranded, but were subsequently rescued.

Out of the 18 deaths, 9 were from Singapore, 6 from Malaysia, 1 from China, 1 from Japan and 1 from the Philippines.

The Ranau Earthquake



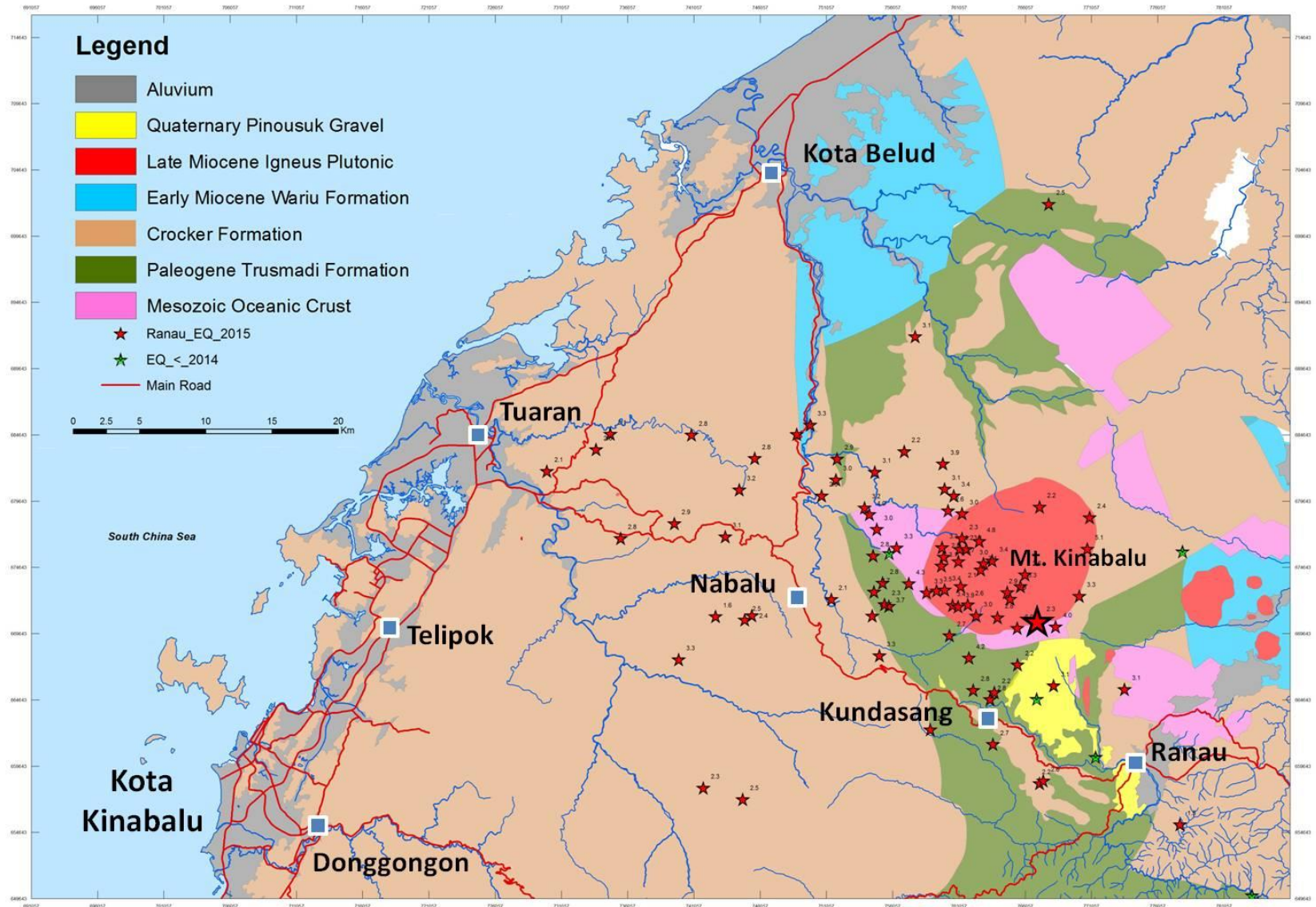
The earthquake which was the strongest to affect Malaysia since the last 1976 earthquake in Lahad Datu, Sabah were felt in several districts in Sabah and as far afield as FT Labuan, Miri in Sarawak and Bandar Seri Begawan in Brunei.

Intensity of the Earthquake

MMI	City	Pop.
VI	Ranau	19k
V	Kota Belud	13k
IV	Papar	19k
IV	Putatan	78k
IV	Kota Kinabalu	457k
IV	Kinarut	16k
III	Bandar Seri Begawan	64k
III	Victoria	74k
III	Sandakan	392k
III	Tawau	306k
III	Miri	228k
IV	Donggongon	72k
IV	Keningau	78k
IV	Kudat	32k
IV	Beaufort	16k

The Ranau Earthquake

Ranau Mainshock and Aftershocks

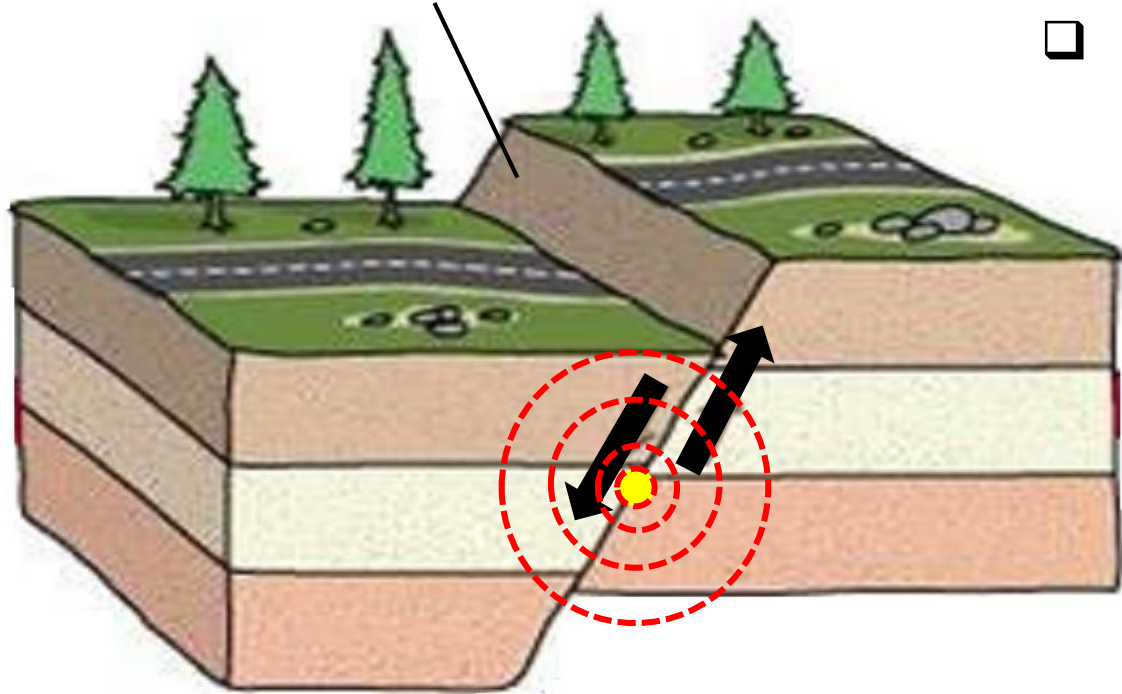


The Ranau Earthquake

What Caused the Ranau Earthquake?

Normal Fault

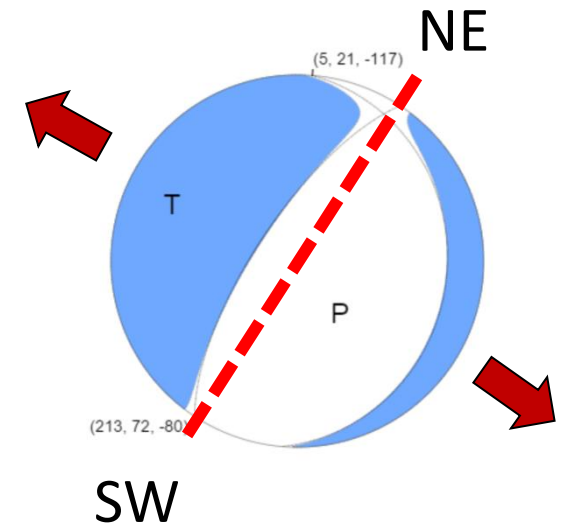
Fault Plane



← Extension →

Lobou-lobou Fault

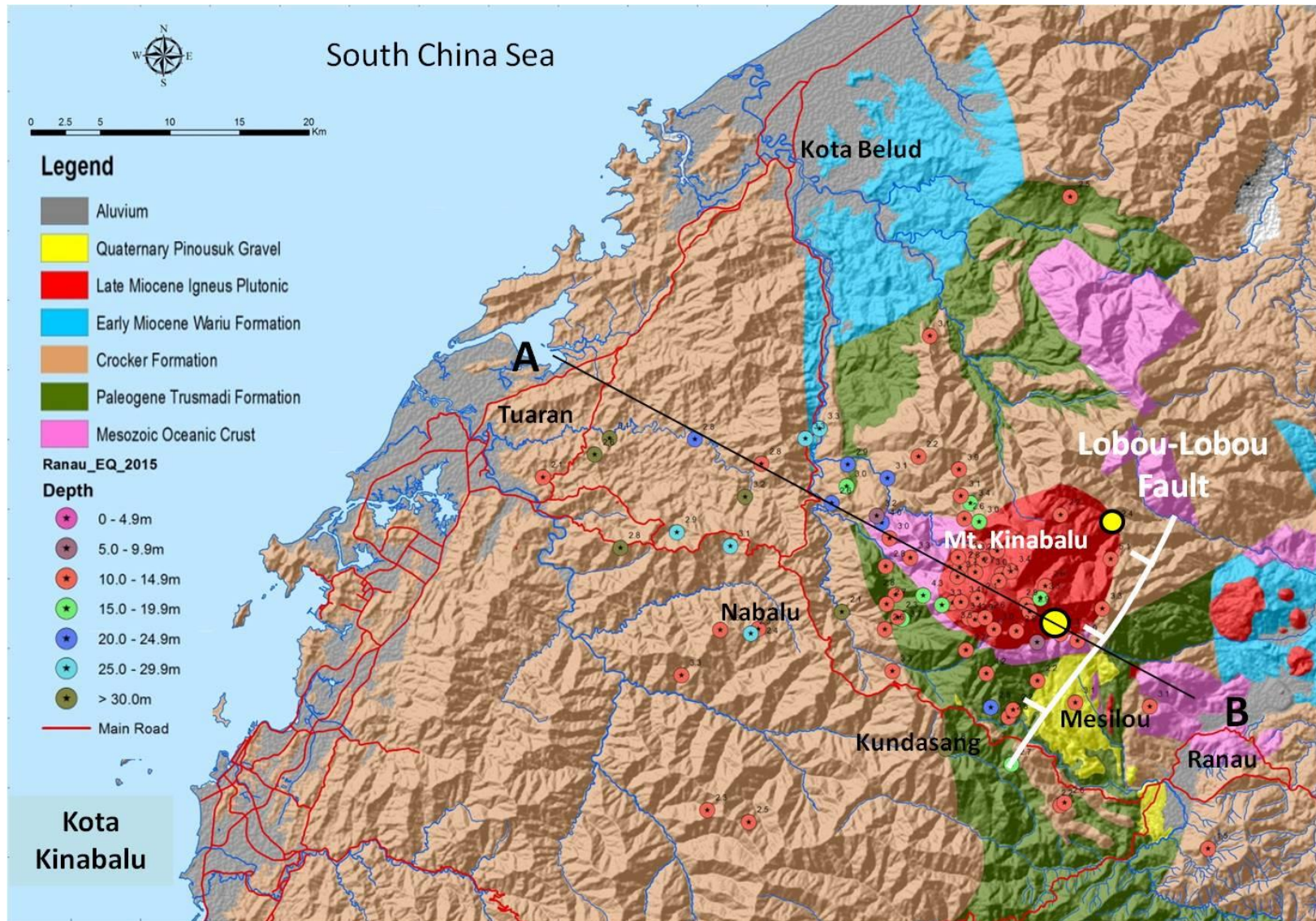
- Oriented NE-SW
- Dipping 70 degrees NW
- Length around 10 km
- Displacement around 0.5 m



Source: USGS

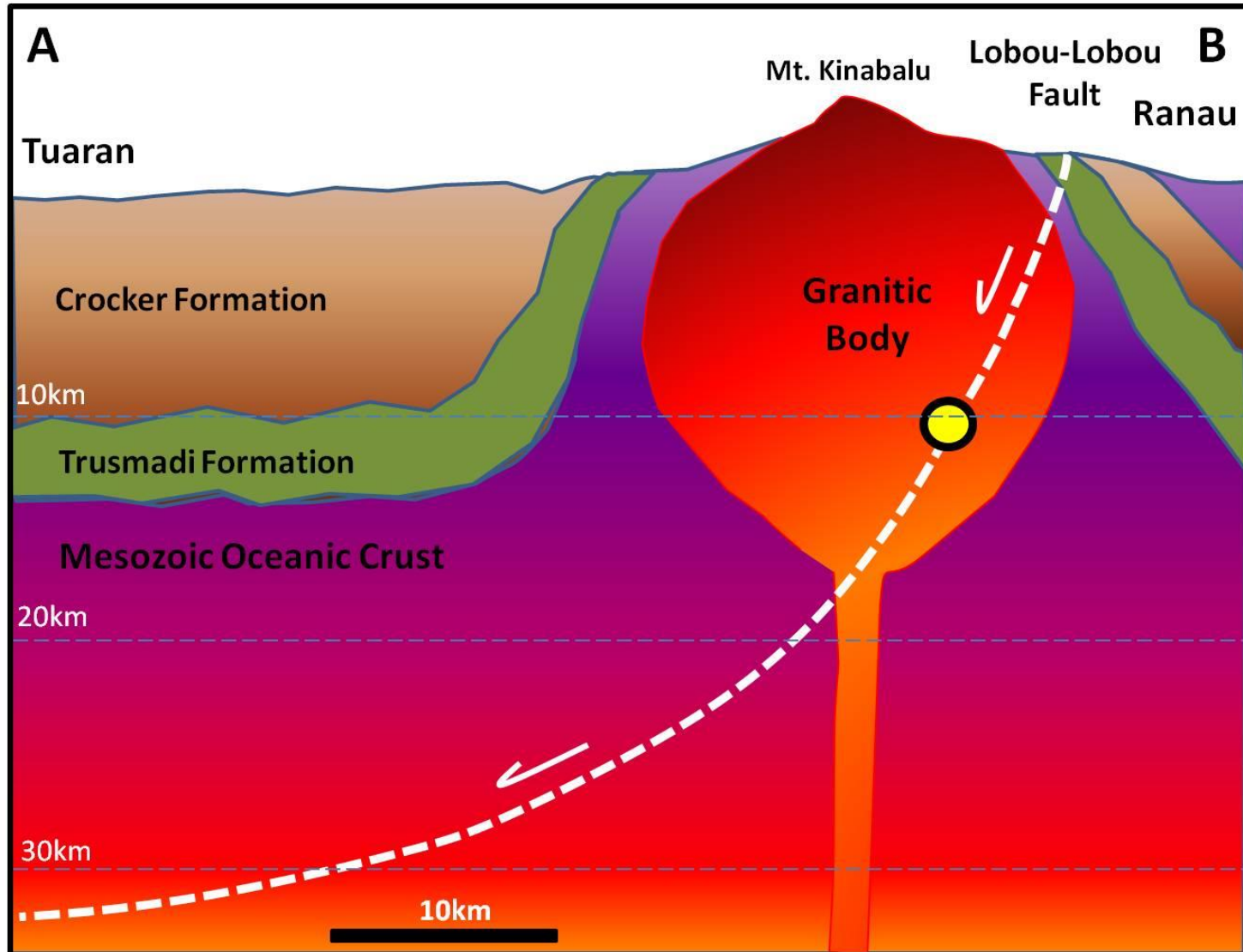
The Ranau Earthquake

Earthquake-generating Fault - Lobou-Lobou Fault



The Ranau Earthquake

Earthquake-generating Fault - Lobou-Lobou Fault

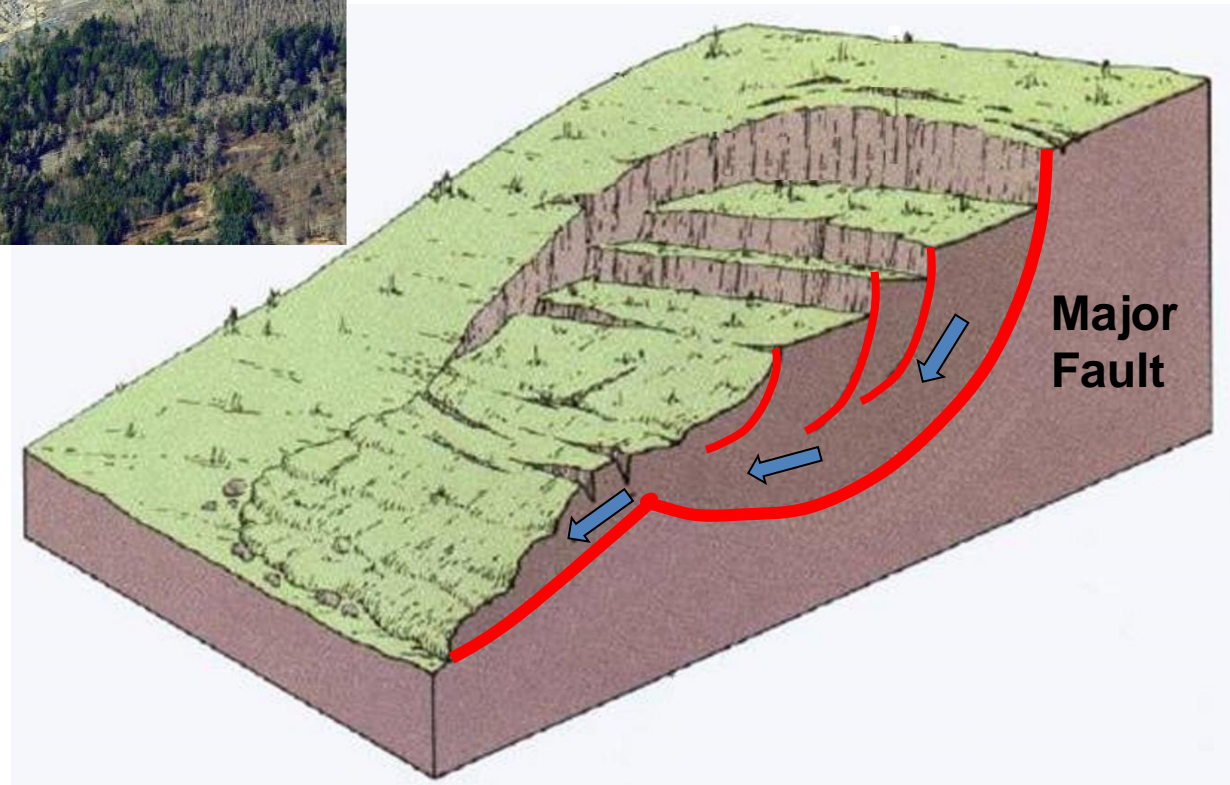


The Ranau Earthquake

Mechanism for Normal Faulting

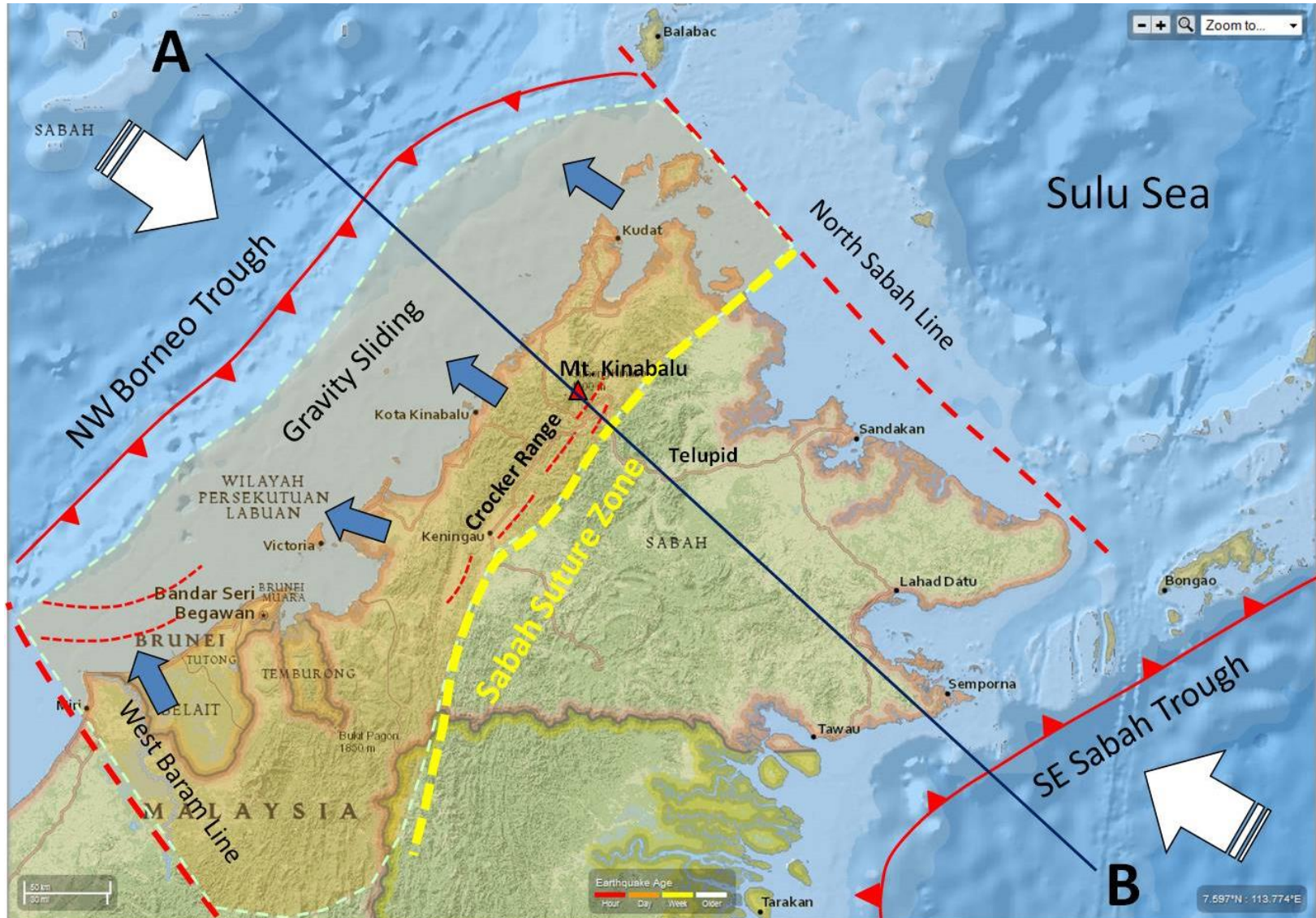


Model to show formation of normal faults by surface gravity sliding



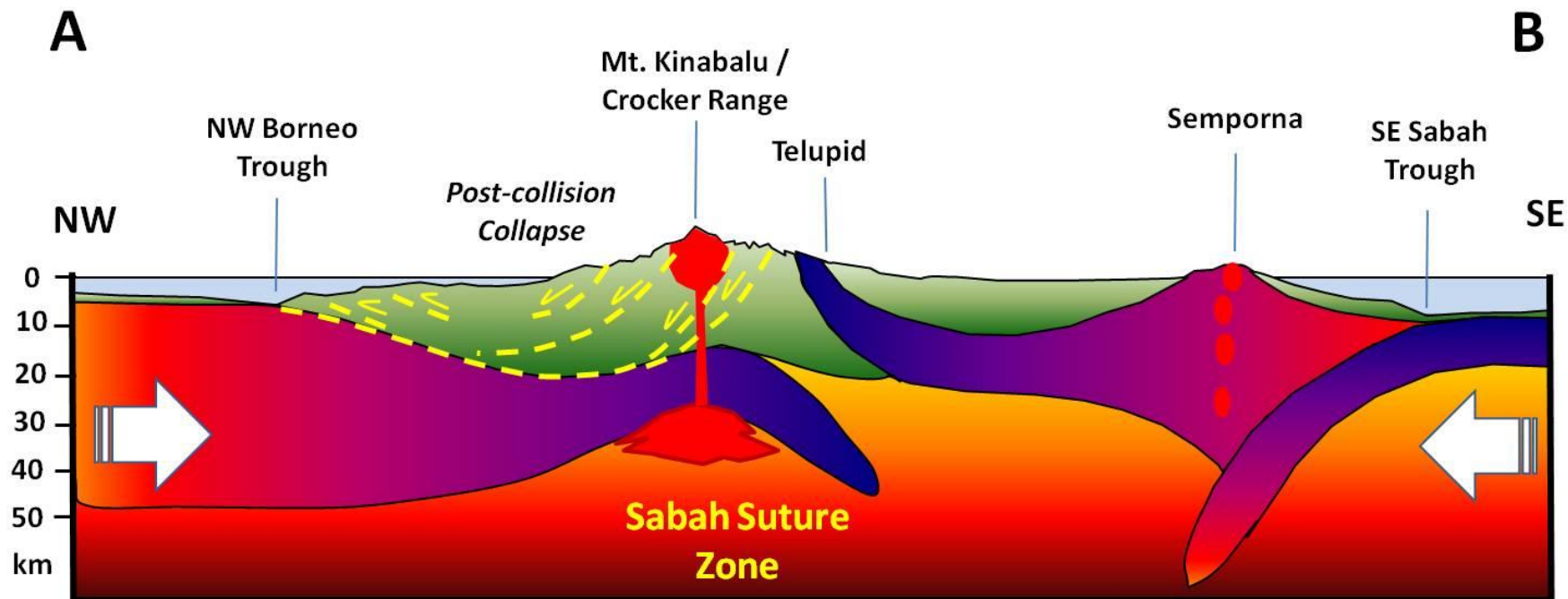
The Ranau Earthquake

Gravity Sliding in Sabah



The Ranau Earthquake

Gravity Sliding in Sabah



Sedimentary Rocks



Igneous Rocks



Oceanic Crust



Lower Crust

100 km

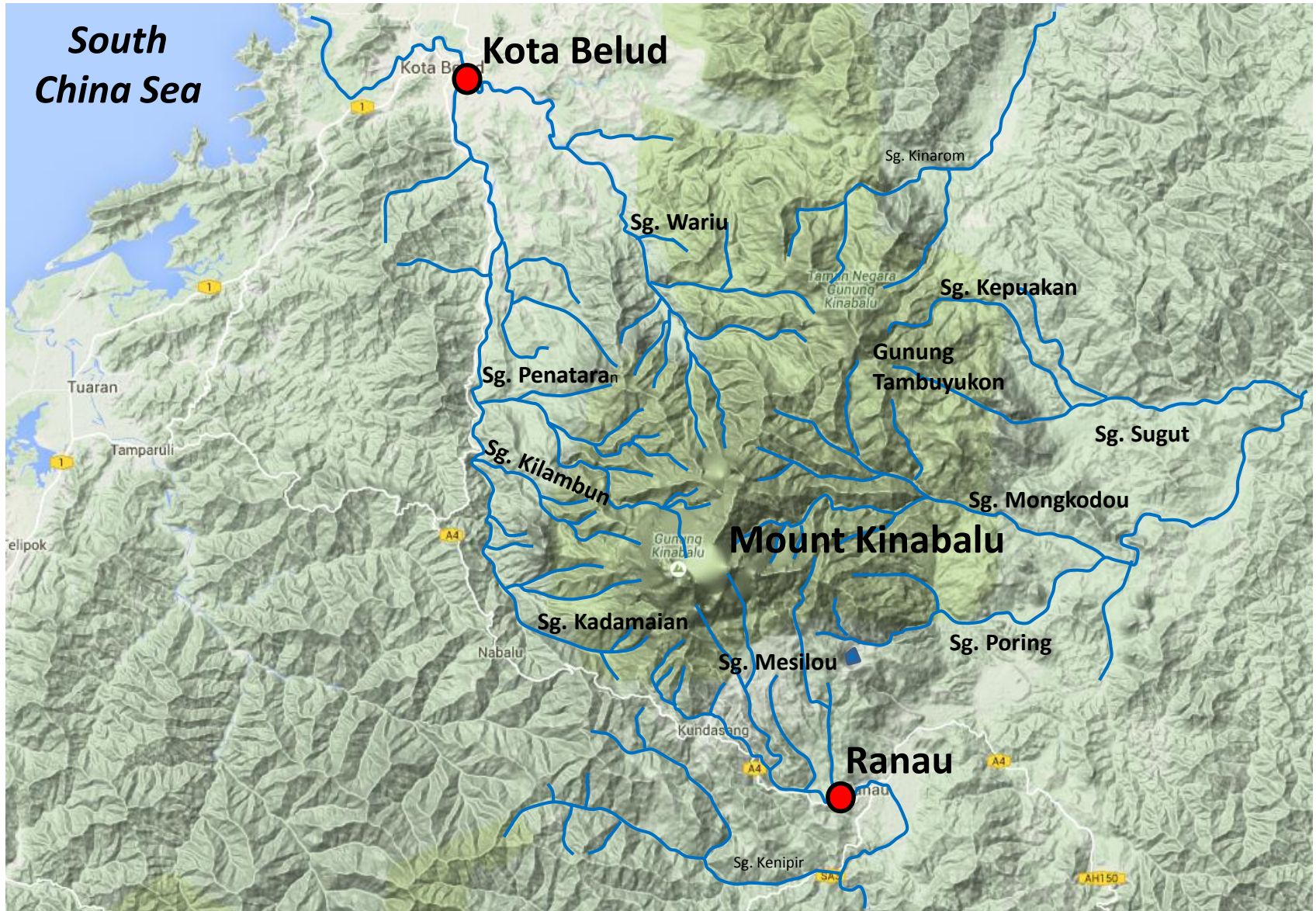
3. Impact of Ranau Earthquake on the Water Catchment

Impact of Earthquake on Water Catchment

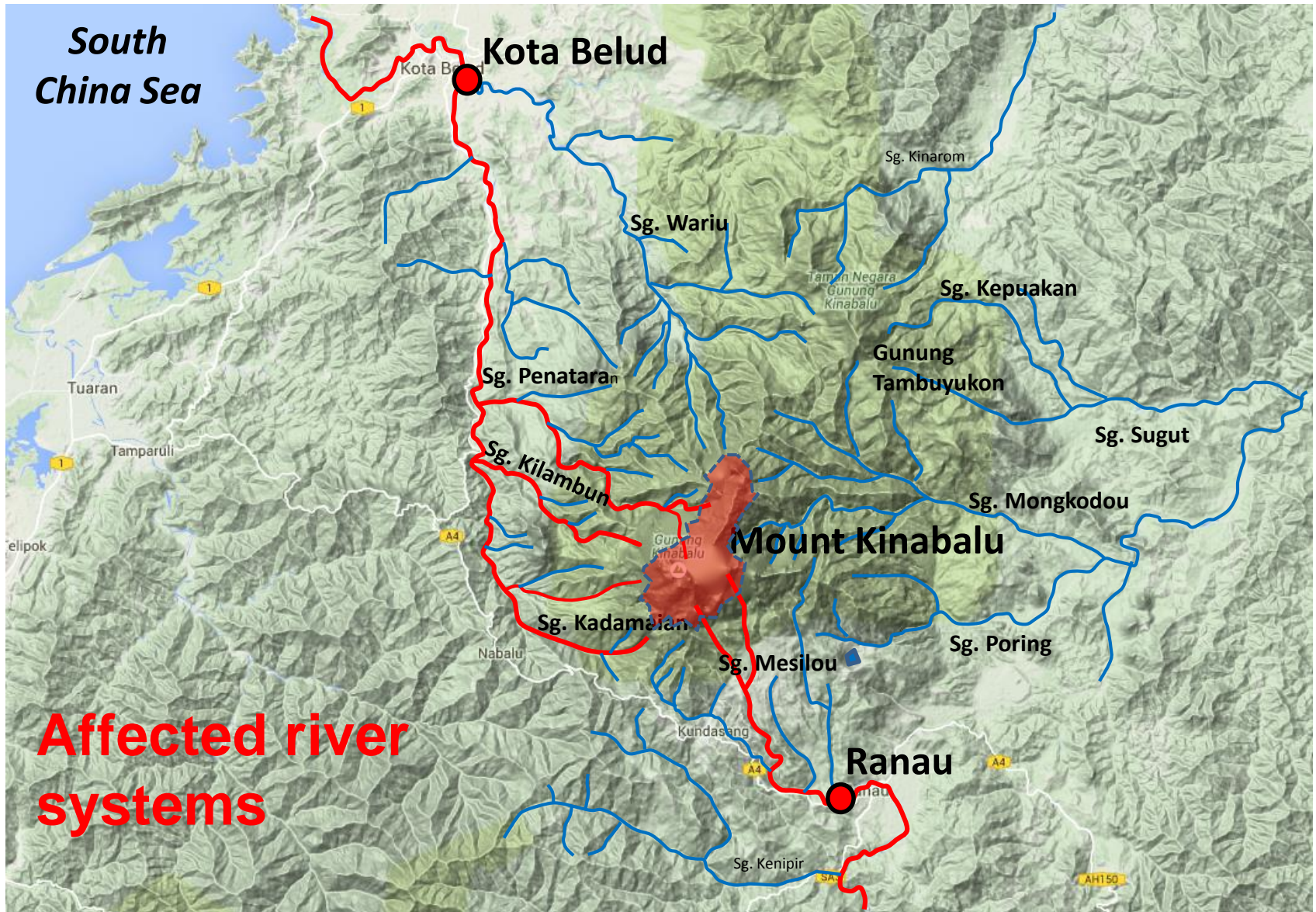
Widespread landslides resulted in the severe damage and destruction to the following river systems:

- **Sg. Mesilou**
 - **Sg. Kadamaian**
 - **Sg. Penataran**
 - **Sg. Kilambun**
-
- **Impact – reduced water resource reserve; drastic reduction in water flow; flash floods and mud flows more likely to occur.**
 - **This problem may lasts for several years.**

Impact of Earthquake on Water Catchment

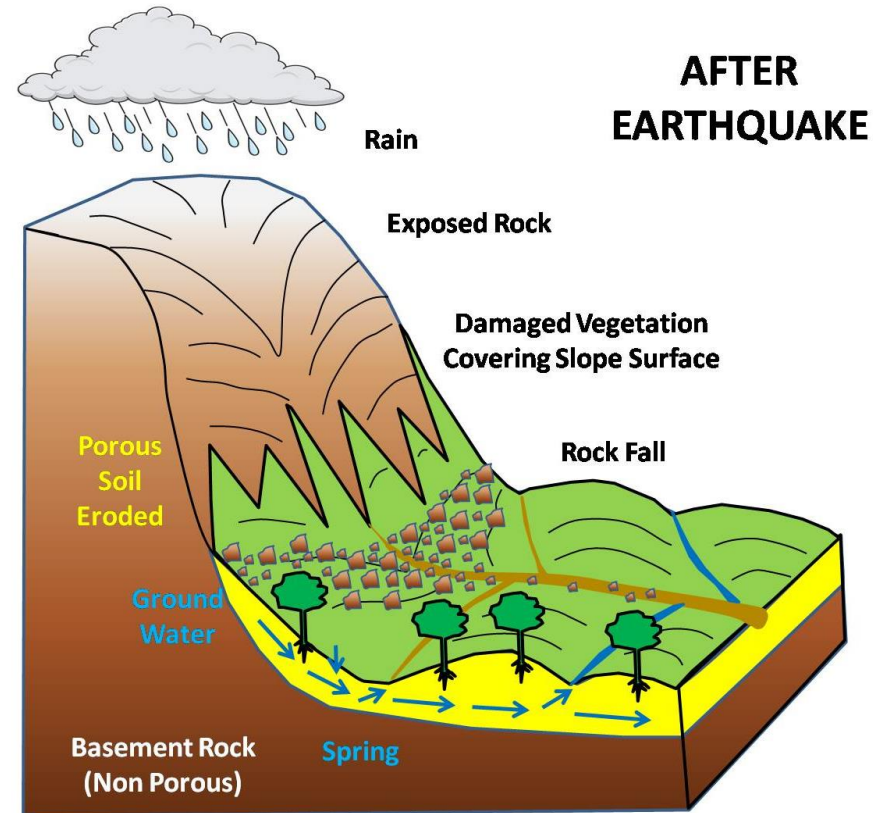
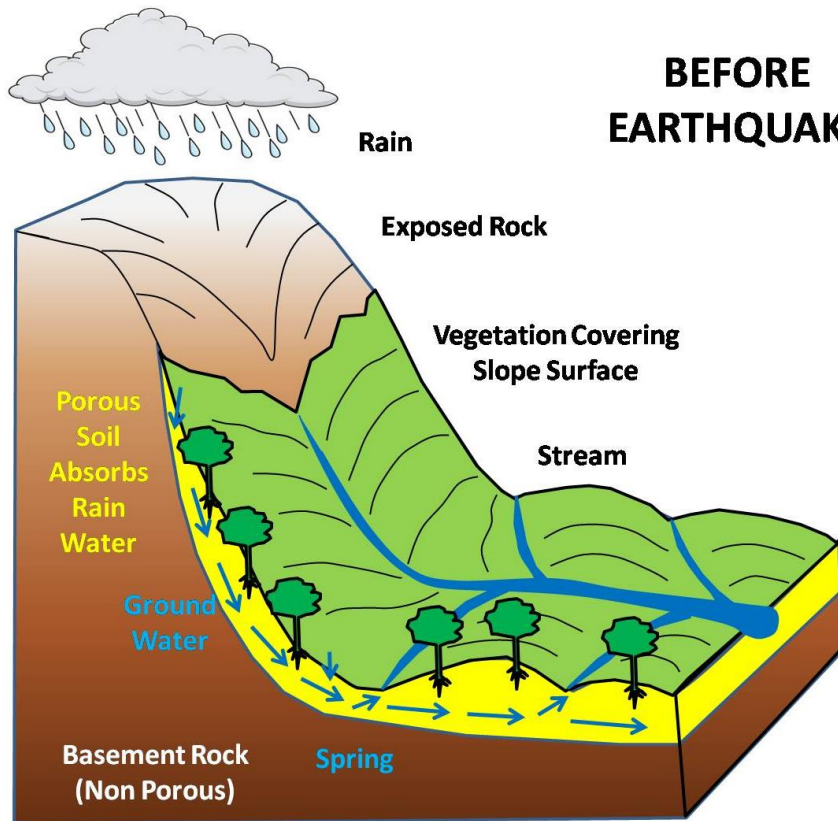


Impact of Earthquake on Water Catchment



Impact of Earthquake on Water Catchment

Reduced capacity to absorb and retain rain water



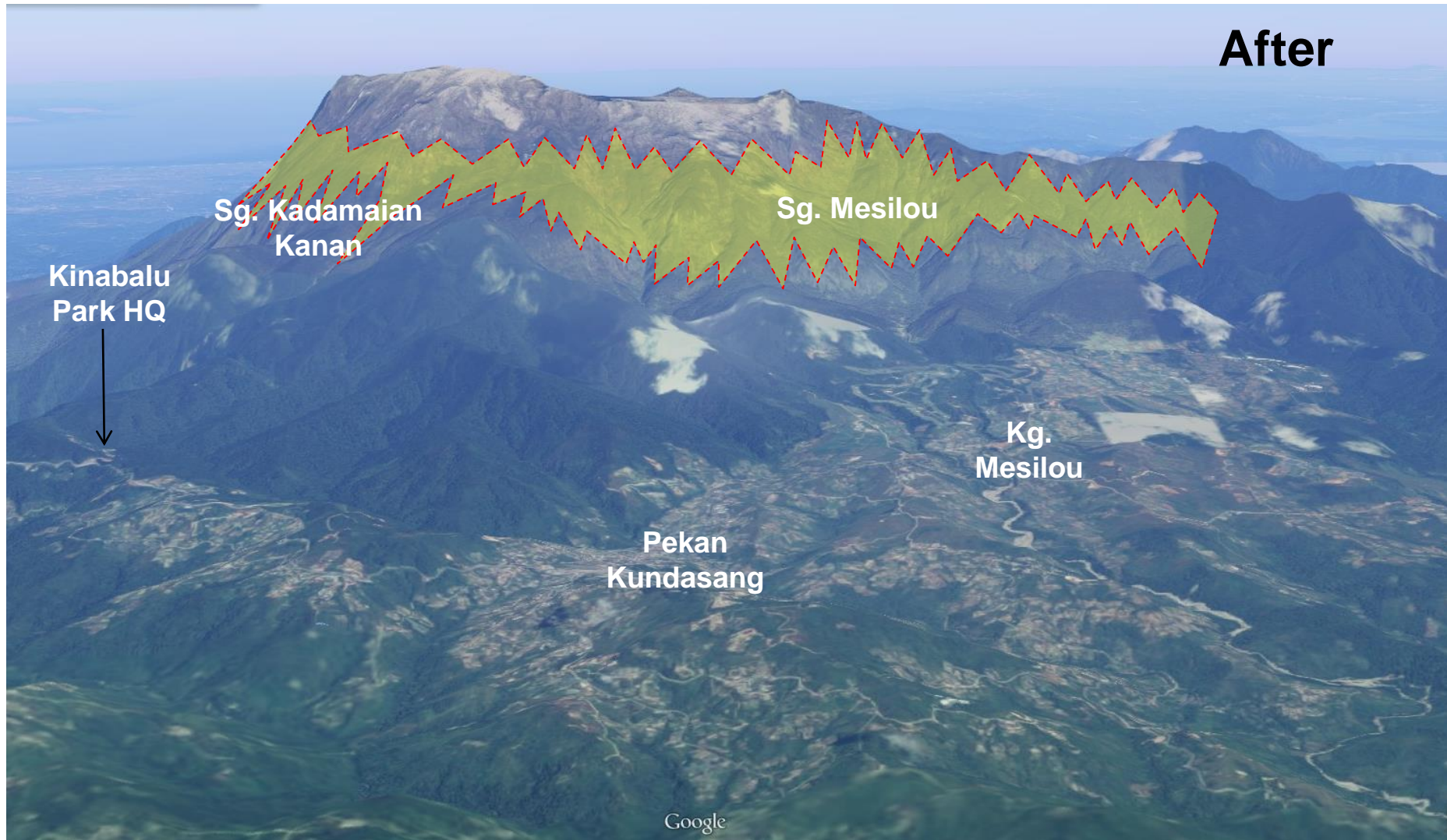
Impact of Earthquake on Water Catchment

Massive landslide occurred around Mount Kinabalu, except on the northeast side



Impact of Earthquake on Water Catchment

Massive landslide occurred around Mount Kinabalu, except on the northeast side



Impact of Earthquake on Water Catchment

Destruction of water catchments



Impact of Earthquake on Water Catchment

Destruction of water catchments



Sg. Mesilou Kanan

Impact of Earthquake on Water Catchment

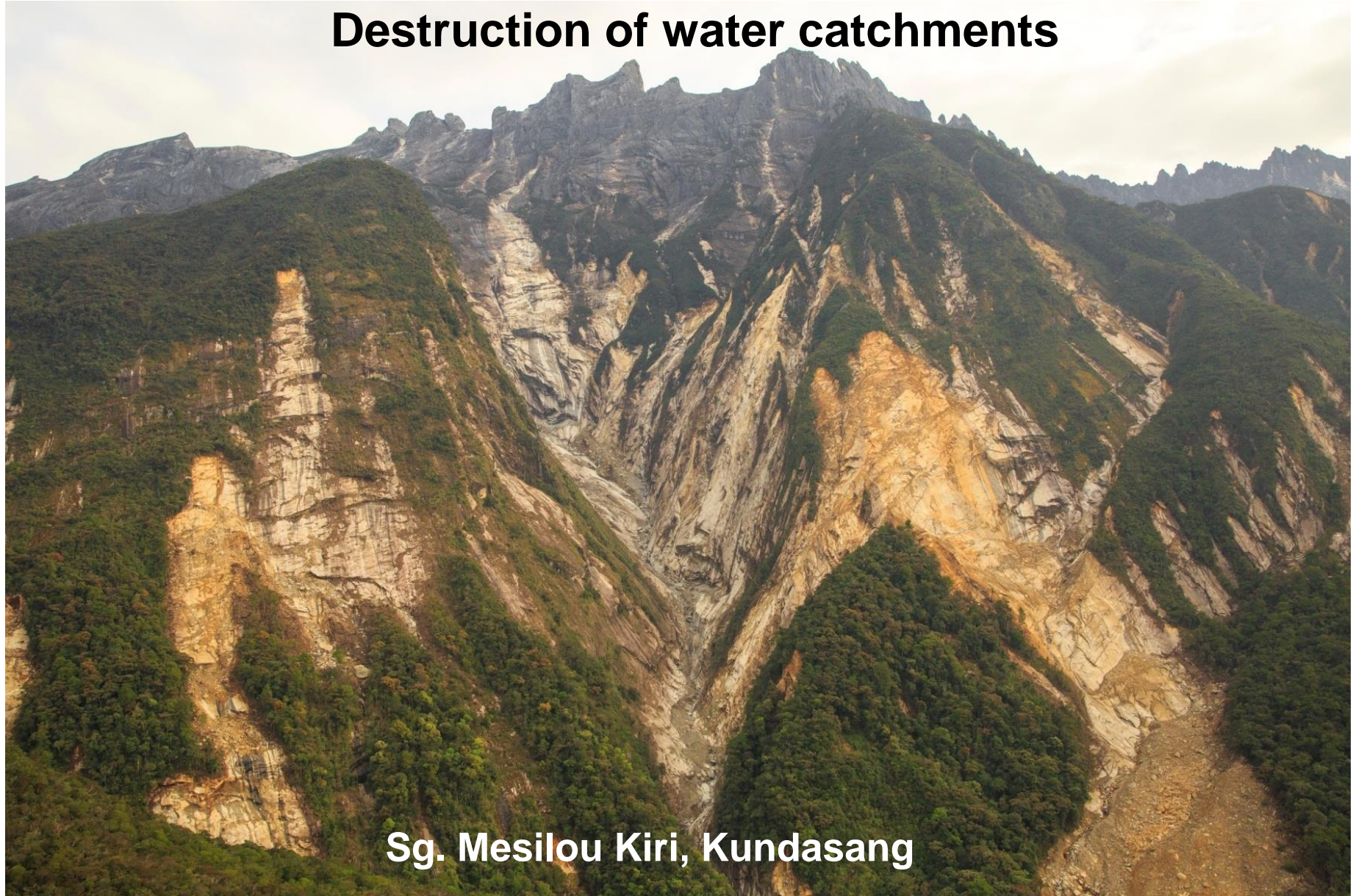
Destruction of water catchments



Sg. Mesilou Kanan

Impact of Earthquake on Water Catchment

Destruction of water catchments



Sg. Mesilou Kiri, Kundasang

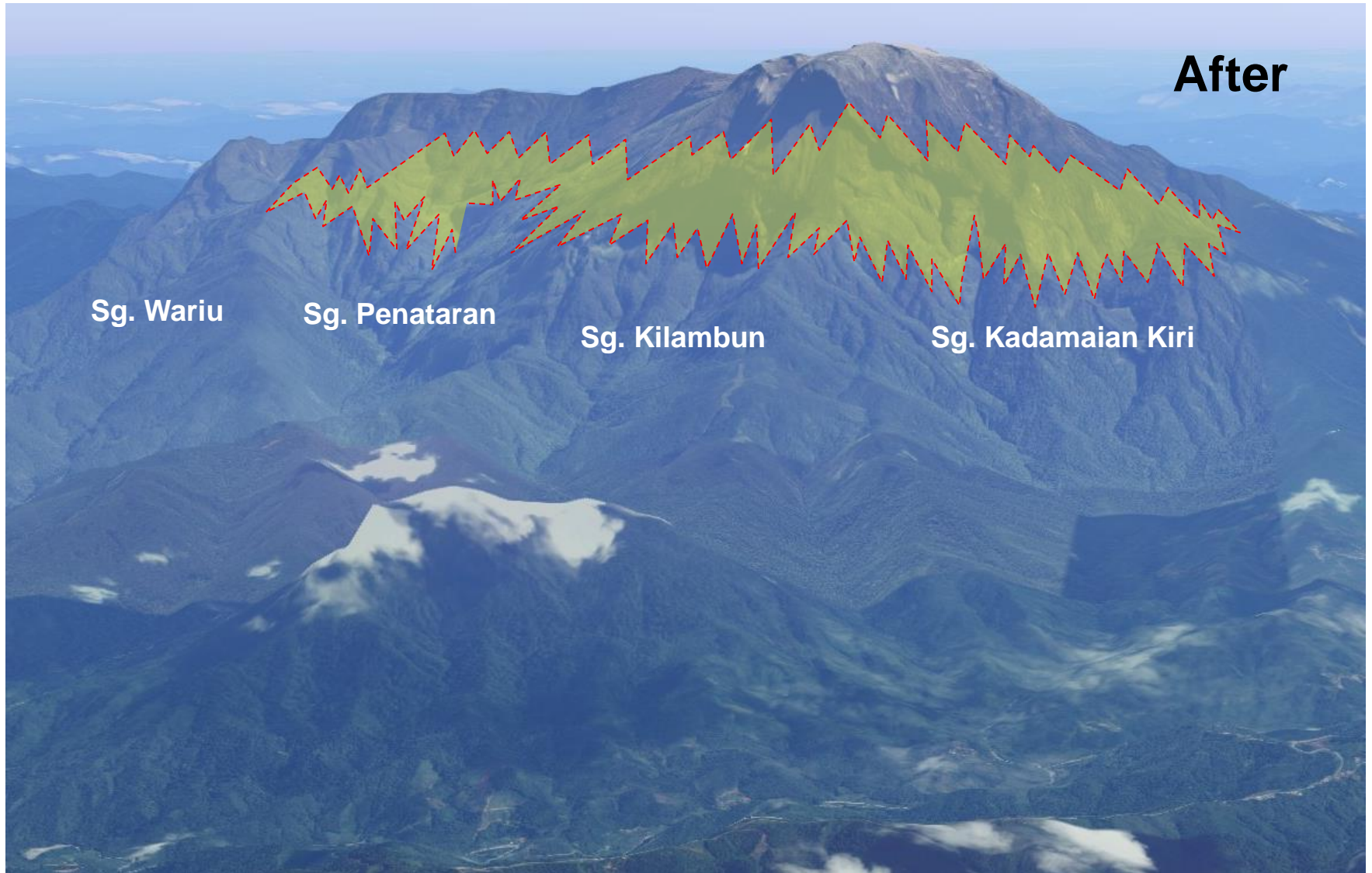
Impact of Earthquake on Water Catchment

Landslide occurrence on the West side of the mountain.



Impact of Earthquake on Water Catchment

Landslide occurrence on the West side of the mountain.



Impact of Earthquake on Water Catchment

Destruction of water catchments



Sg. Kadamaian Kiri

Sg. Kadamaian
Kanan

Kg. Kiau Nulu

Impact of Earthquake on Water Catchment

Destruction of water catchments



Sg. Kadamaian Kiri

Impact of Earthquake on Water Catchment

Landslide occurrence on the NW of the mountain.



Kota Belud

Impact of Earthquake on Water Catchment

Destruction of water catchments



Impact of Earthquake on Water Catchment

Destruction of water catchments



Sg. Kilambun

Impact of Earthquake on Water Catchment

Drastic change in river valley profile - Deepened



Impact of Earthquake on Water Catchment

Drastic change in river valley profile – Widened



**River bed
widened**

Impact of Earthquake on Water Catchment

Drastic change in flow water regime – Recurrent mud flow



Sg. Mesilou

Impact of Earthquake on Water Catchment

Drastic change in flow water regime – reduced volume



Sg. Mesilou,
Kundasang

Impact of Earthquake on Water Catchment

Drastic change in flow water regime – reduced volume



**Sg. Mesilou,
Kundasang**

Impact of Earthquake on Water Catchment

Drastic change in flow water regime – reduced quality



Impact of Earthquake on Water Catchment

Drastic change in flow water regime – reduced quality



Sg. Kadamaian, Kota Belud

4. Impact on Communities

Impact on Communities

Mud flow caused destruction of buildings



Kg. Kiau, Kota Belud



Impact on Communities

Mud flow caused destruction of buildings



Kg. Kaung, Kota Belud

Impact on Communities

Mud flow caused destruction of buildings



Kg. Malangkap, Kota Belud

Impact on Communities

Mud flow caused destruction of farm land



Kg. Kaung, Kota Belud

Impact on Communities

Mud flow caused destruction of ecotourism sites

Before Earthquake



After Earthquake



Kg. Tombotuon, Kota Belud
“Tagal System” - Famous Ecotourism Site

Impact on Communities

Before Earthquake



Kg. Tombotuon, Kota Belud

Impact on Communities

After Earthquake



Kg. Tombotuon, Kota Belud

Impact on Communities

Mud flow destroyed fish resource



Impact on Communities

Serious shortage of clean water for household needs.



Nation [Home > News > Nation](#)

Published: Sunday July 12, 2015 MYT 12:00:00 AM

Updated: Sunday July 12, 2015 MYT 7:19:08 AM

Acute water shortage in Kota Belud and Ranau as rivers become muddy



hot news | commentary | voices | singapore | daily focus

world

For villagers of quake-hit Sabah, nightmare continues as aftershocks, mudslides cut water supply

Sabah

Families in Ranau and Kota Belud face water shortage, flood

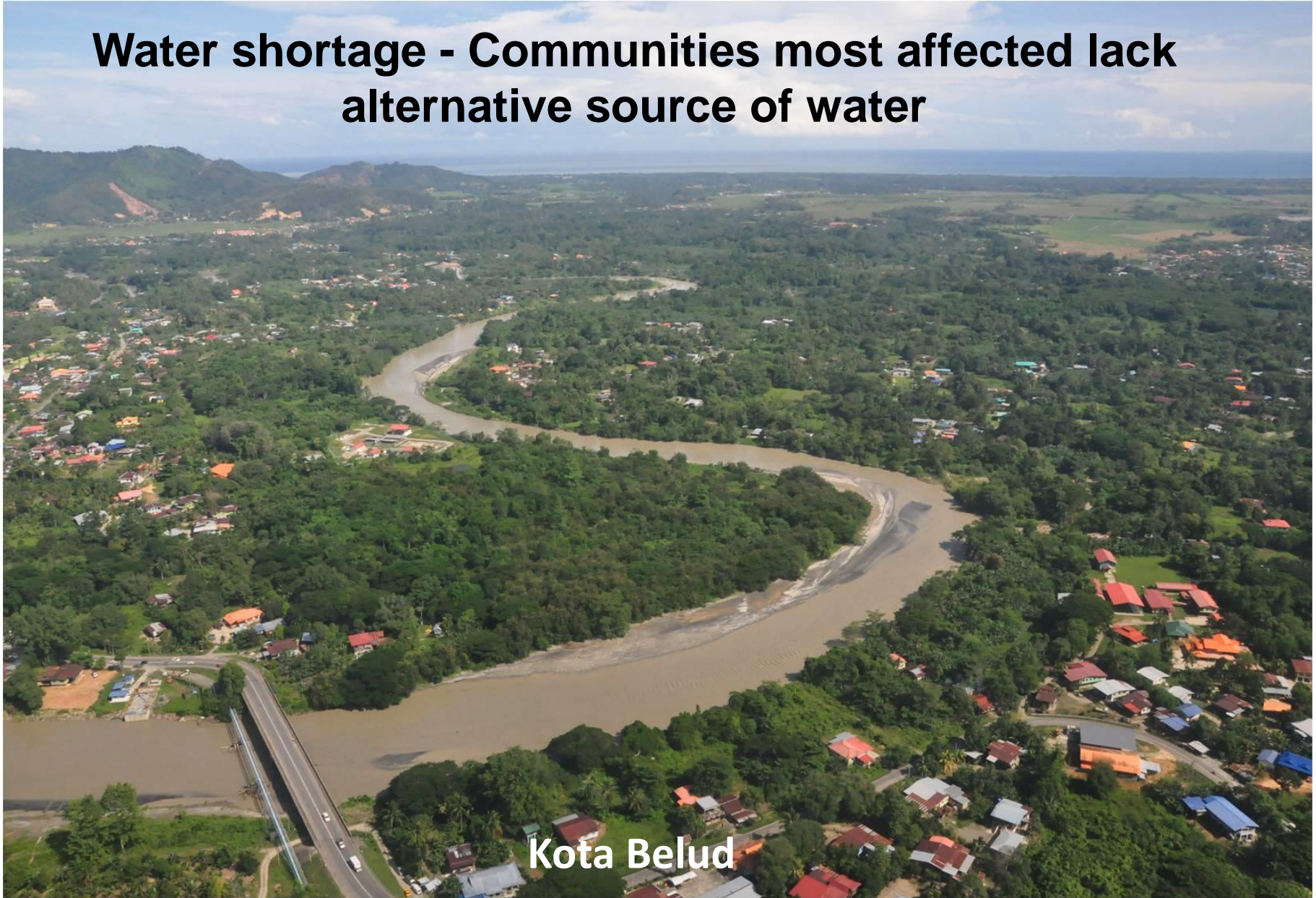
June 17, 2015, Wednesday



5. Lessons Learned

Lessons Learned

Water shortage - Communities most affected lack alternative source of water



Kota Belud

Lessons Learned

Communities who totally depended on the Kadamaian River neglected to look after local water catchments



Kota Belud

Lessons Learned

Neglected water catchments along Kadamaian River



Lessons Learned

Neglected water catchments around Mount Kinabalu



Kota Belud

Lessons Learned

Destroyed water catchments around Mount Kinabalu



Kundasang, Ranau

Lessons Learned

Destroyed water catchment

Destroyed water catchments around Mount Kinabalu



Lessons Learned

Destroyed water catchments in other parts of Sabah



6. Concluding Remark

Concluding Remarks

- ❑ Water catchments are very sensitive to environmental changes, both natural and human-induced. Therefore we cannot take them for granted.**
- ❑ No water catchment is too small or insignificant to be neglected or destroyed.**
- ❑ Deteriorating water catchments within and outside the Heart of Borneo must be equally given attention.**

Thank you