Lessons Learned from Palu Tsunami Assessment on the Last Mile's Response

Ahmad Arif
(Kompas/UNISDR)

Ardito Kodijat
(IOC/UNESCO - Indian Ocean Tsunami Information Centre - UNESCO Office Jakarta)

Irina Rafliana
(ICIAR/Pusat Penelitian Oseanografi LIPI)

Syarifah Dalimunthe
(Pusat Penelitian Kependudukan LIPI)/Nagoya University)

UNISDR
United Nations Office for Disaster Risk Reduction

United Nations Educational Scientific and Cultural Organization · Intergovernmental Oceanographic Commission · Indian Ocean Tsunami Information Centre

LIPI

Background

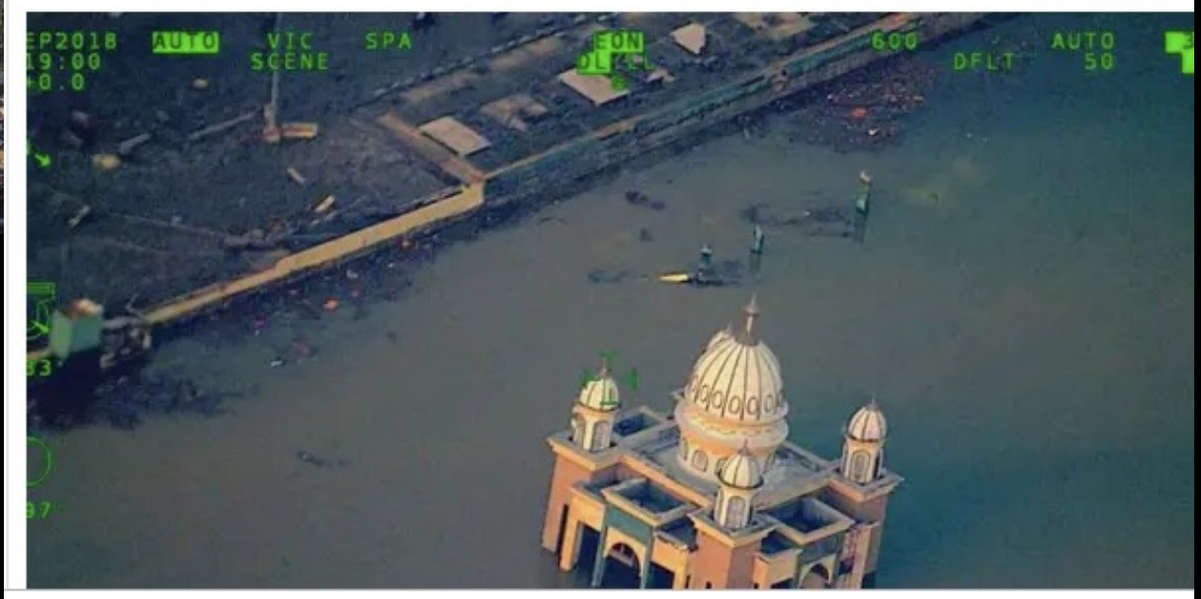
The New York Times

What Went Wrong With Indonesia's Tsunami Early Warning System

By ANJALI SINGHVI, BEDEL SAGET and JASMINE C. LEE OCT. 2, 2018

Indonesia's geophysics agency under fire for lifting tsunami warning

Warning lifted after 34 minutes, with agency saying it had no data at the town of Palu, where hundreds died



Background

KOMPAS, SABTU, 13 OKTOBER 2018

Opini | 7

Peringatan Dini Tsunami Tidak Gagal

Daryono
Kepala Bidang Informasi Gempa Bumi dan Peringatan Dini Tsunami BMKG

Peristiwa gempa dahsyat berkekuatan M 7,4 yang mengguncang Palu dan Donggala pada 28 September 2018, selain merusak ribuan rumah, juga memicu bencana ikutan ("collateral hazard"), yaitu tsunami destruktif.

Tsunami melanda hampir seluruh wilayah Teluk Palu. Terjangan tsunami tidak saja merusak permukiman penduduk, tetapi juga menelan korban jiwa. Segera setelah peristiwa tsunami terjadi, berita kurang sedap bergulir.

Ada tuduhan bahwa Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) telah gagal dalam memberikan peringatan dini tsunami. Alasannya, peringatan dini tsunami terlalu cepat diakhiri sehingga menyebabkan jatuhnya korban jiwa.

Tentu saja berita yang berkembang dan viral di masyarakat tersebut tidak benar. BMKG dalam memberikan pelayanan informasi gempa bumi dan peringatan dini tsunami selalu mengikuti prosedur standar operasi (SOP) yang sudah ditetapkan. Tidak ada *human error* dan *instrument error* oleh BMKG dalam memberikan peringatan dini tsunami di Palu.

Kronologi

Untuk memahami apa yang sebenarnya terjadi diperlukan penjelasan kronologis detail sejak terjadi gempa, kemudian BMKG mengeluarkan peringatan dini, hingga peringatan dini tsunami diakhiri.

Gempa pembuka berkekuatan M 6,0 terjadi pada pukul 15.00 Wita, selanjutnya disusul terjadinya gempa utama berkekuatan M 7,4 pada pukul 18.02 Wita. Selanjutnya, pada pukul 18.02-18.04 Wita sistem kecerdasan artifisial (*artificial intelligence*) di ruang Indonesia Tsunami Early Warning System (InaTEWS) BMKG secara otomatis menganalisis gelombang seismik dari sensor-sensor untuk mengetahui parameter gempa yang terjadi. Secara otomatis sistem mengambil pemodelan tsunami dari 18.000 skenario basis data model tsunami untuk mengestimasi waktu tiba dan tinggi tsunami di pantai yang kemungkinan terdampak.

Hasil pemodelan menunjukkan bahwa tsunami tiba di Teluk Palu pukul 18.22 Wita dengan tinggi maksimum 3 meter, sementara tsunami akan tiba di Mamuju pukul 18.26 Wita dengan tinggi maksimum 0,5 meter. Berdasarkan informasi dari saksi mata pegiwai BMKG Palu yang sedang menyurvei kerusakan gempa, tsunami terjadi sekitar pukul 18.10 Wita. Rekaman video juga menunjukkan adanya tsunami yang menerjang pantai sebanyak tiga kali.

Selanjutnya, pada pukul 18.27 Wita, diperoleh informasi bahwa hasil observasi muka laut dari sensor pasang surut milik Badan Informasi Geospasial (BIG) di Mamuju menunjukkan bahwa tinggi tsunami di Pantai Mamuju hanya 6 sentimeter.

Catatan hasil pencarian fakta (*fact finding*) oleh pegiwai BMKG Palu menunjukkan bahwa pada pukul 18.27 Wita tinggi genangan tsunami di Pelabuhan Pantoloan sekitar 30 sentimeter. Lokasi ini berada pada jarak sekitar 200 meter dari pantai. Sementara pada pukul 18.30 Wita, tinggi genangan air di Kantor Ikea dan Cukai Pantoloan hanya sekitar 10 sentimeter dan dijumpai adanya kapal yang terdampar menutup jalan raya.

Data pasang surut di Pelabuhan Pantoloan Palu yang menjadi data kunci kejadian tsunami ternyata tidak rusak. Terhentinya aliran data saat gempa diakibatkan oleh terganggunya jaringan komunikasi. Berdasarkan rekaman mariygram di Pantoloan ini diketahui bahwa gempa terjadi pada pukul 18.02 Wita.

Air laut surut terjadi pukul 18.08 Wita dan tsunami maksimum terjadi pukul 18.10 Wita dengan ketinggian 1,8 meter, sementara BMKG mengakhiri peringatan dini tsunami pukul 18.36 Wita.

Berdasarkan *fact finding* di lapangan dan hasil pemodelan tsunami yang tervalidasi data observasi muka laut, menunjukkan waktu tiba tsunami di pantai sudah berlalu. Ini menjadi dasar BMKG mengeluarkan pengakhiran peringatan dini tsunami pada pukul 18.36 Wita untuk memberi kesempatan upaya pertolongan bagi korban tsunami.

BMKG dinilai sudah tepat mengeluarkan peringatan dini pada menit kelima setelah gempa. Jika dilihat dari data pasang surut laut di Pantoloan, menunjukkan tsunami terbesar yang terbentuk di teluk sudah terlewati saat BMKG melakukan pengakhiran peringatan dini. Berdasarkan hasil pemodelan, observasi, dan kronologi di atas, tampak bahwa sebenarnya tidak ada permasalahan dengan operasional peringatan dini tsunami.

SUPRIYANTO

Dalam hal ini, BMKG tidak gagal atau kecolongan dalam memberikan peringatan dini. BMKG dapat disebut gagal atau kecolongan bilamana terjadi tsunami tetapi tidak mampu memberikan peringatan dini.

Dalam kasus tsunami Palu, BMKG bekerja lebih baik dibandingkan dengan lembaga peringatan dini tsunami lainnya. Japan Meteorological Agency (JMA) dan Pacific Tsunami Warning Center (PTWC) yang berpusat di Hawaii malah tidak mengeluarkan peringatan dini tsunami untuk Palu.

Pada dasarnya lembaga penyedia peringatan dini tsunami sangat beralasan jika tidak mengeluarkan peringatan (*warning*). Seperti halnya BMKG menghentikan peringatan tsunami dalam 30 menit karena gempa yang terjadi memiliki mekanisme gerakan mendatar. Secara historis gempa-gempa dengan penyesaran mendatar umumnya tidak akan membangkitkan tsunami signifikan. Jika ternyata pada akhirnya terjadi tsunami signifikan, tampaknya ada pemicu tsunami akibat faktor lain, misalnya longsoran dasar laut.

Di mana pun, sistem peringatan dini tsunami belum melibatkan faktor lain di luar aktivitas gempa tektonik.

Apa pun tampaknya tetap perlu ada evaluasi yang objektif sekalipun sistem teknologi dari InaTEWS sudah bekerja dengan baik, tetapi subsistem yang menghubungkan ke masyarakat (*downstream*) tidak kalah penting karena ini justru menjadi kunci penyelamatan masyarakat.

Evaluasi

Ada beberapa catatan penting yang perlu diperhatikan sebagai evaluasi dalam operasional peringatan dini dan mitigasi tsunami kita. Diakui, memang masih banyak yang perlu diperbaiki dan ditingkatkan, khususnya kemampuan infrastruktur diseminasi peringatan dini di masyarakat.

Dalam kasus tsunami Palu, peringatan dari BMKG terbukti telah dikirim melalui multimoda diseminasi meski ternyata pesan singkat (SMS) peringatan dini ternyata tidak sampai ke masyarakat Palu dan Donggala karena penyedia layanan SMS mengalami gangguan akibat gempa kuat. Sementara itu, dengan status ancaman *Siaga*, maka estimasi tinggi tsunami berkisar 0,5-3,0 meter. Semestinya sirene tsunami di Teluk Palu dibunyikan oleh pemerintah daerah sebagai perintah evakuasi, tetapi sirene juga tidak berbunyi.

Tampaknya peralatan penerima peringatan WRS-DVB milik BMKG yang ditempatkan di BPBD Palu juga bermasalah akibat gempa. Untuk itu, ke depan, perlu dicari cara dan teknologi yang mampu menjamin peringatan dini tsunami sampai ke masyarakat.

Di wilayah pesisir yang sumber gempanya dekat dengan pantai, peringatan dini tsunami memang kurang bekerja efektif. Sebagai contoh, waktu tiba tsunami di Palu sangat singkat, sekitar 8 menit setelah gempa. Artinya, hanya tersedia waktu 3 menit bagi masyarakat pantai untuk evakuasi. Dalam hal ini peringatan dini memang masih bermanfaat sebagai informasi potensi tsunami dan pengakhiran peringatan dini.

Untuk itu, tidak ada pilihan lain bagi masyarakat di daerah dengan "*golden time*" sangat singkat kecuali menerapkan evakuasi mandiri. Konsep evakuasi mandiri sangat efektif dalam melindungi masyarakat pesisir dari ancaman tsunami dengan cara menjadikan gempa kuat sebagai peringatan dini tsunami.

Apakah tsunami terjadi atau tidak, itu urusan belakangan, yang penting begitu terjadi gempa kuat segera menjauh dari pantai dan jiwa selamat. Di wilayah Indonesia timur di mana sebagian besar pesisir pantai berdekatan dengan sumber gempa, maka evakuasi mandiri menjadi pilihan tepat untuk diterapkan.

Berdasarkan karakteristiknya, tsunami kita lebih banyak tsunami dekat (*local tsunami*) karena sumber gempa yang dekat dengan pantai. Untuk itu, keberadaan stasiun pasang surut laut sebagai sarana konfirmasi terjadinya tsunami sangat penting untuk dibangun di pantai-pantai rawan tsunami.

Alat ini mendukung sempurnanya peringatan dini, termasuk mendukung keputusan kapan berakhirnya ancaman tsunami. Sementara itu, untuk meningkatkan akurasi dan kecepatan penentuan parameter gempa, jaringan sensor gempa harus ditambah.

Terkait respons peringatan, masih ada permasalahan mendasar yang dari dulu hingga sekarang belum terselesaikan. Antara peringatan yang dikeluarkan BMKG dan respons pemerintah daerah serta masyarakat masih banyak masalah. Solusinya, pemerintah daerah harus memahami rantai peringatan dini tsunami dan memiliki SOP pengambilan keputusan dalam merespons status ancaman tsunami, selain terus memperkuat kapasitas mitigasi masyarakat.

Dengan memperkecil permasalahan tersebut di atas, kiranya akan membantu BMKG dalam mencapai tujuannya untuk menyelamatkan jiwa masyarakat pesisir. Untuk itu, permasalahan yang ada harus segera diberahi bersama-sama supaya tidak jatuh korban lagi saat terjadi tsunami.

TheJakartaPost THURSDAY October 4, 2018

InaTEWS: About more than technology

Harald Spahn and Jörn Lauterjung
POTSDAM, GERMANY

Harsh criticism over Indonesia's tsunami early warning system (InaTEWS) seems to be dominating the current discourse in the aftermath of the Sulawesi earthquakes and tsunami. A recurring topic is the allegedly malfunctioning of the system, particularly in regard to vandalized buoys and the need for more monitoring technology to improve warnings.

Unfortunately, not many seem to remember that it was a conscious and informed decision taken within InaTEWS in 2010 to no longer rely on the buoy system, which proved to be very vulnerable, cost intensive and not very effective in situations when short warning times caused by near-field tsunamis did occur.

Cost-benefit calculations showed that maintenance of the ocean-going buoy system would consume almost 50 percent of the overall budget for the maintenance and operation of the warning system as a whole.

It was decided to base InaTEWS on an extensive seismic network, tide gauges and GPS stations with results processed by a decision support system that includes a large database of tsunami threat scenarios. Therefore, the absence of buoys was intended and is not a symptom of a malfunctioning system.

Sadly, this controversy has been taken up extensively by international media, damaging the reputation of Indonesia and InaTEWS.

A closer look at the facts in the public via various channels, like websites and social media. So far, so good.

On the other hand, it has to be stated that the tsunami obviously took many people by surprise, indicated by the high loss of lives. This can hardly be attributed to the overhasty lifting of the warning, which is questioned for good reasons. Instead, it clearly indicates that there is a significant and deadly gap in the tsunami warning chain, which impedes the community at risk from reacting properly to the issued warnings.

This gap is not entirely new. It has been observed and pointed out on several occasions during the last several years. InaTEWS' task is to provide vital data on earthquakes and tsunamis to local governments and authorities responsible for guiding their communities' reaction and for making the decision whether or not to call for an evacuation.

In order to fulfill this task, local governments would need to set up local operation centers working on a 24/7 basis. It requires properly trained staff authorized to analyze InaTEWS warnings and to decide on an evacuation within minutes, usually while the ing decisions in case a public mass evacuation has to be ordered.

Unfortunately, the framework conditions to implement these arrangements are not available in most regions along Indonesia's tsunami-prone areas.

Most regions lack the financial and human resources as well as the capacities for them. And as long the dissemination of warnings and guidance to the community has not been established as a mandatory public service for local administrations, it merely depends on a country's political commitment, which is often not strong and persistent enough. In summary, this turns the task into a mission impossible.

Addressing this gap is the key to assure that InaTEWS achieves its goal of saving human lives. It might require a thorough review of the current arrangement of the warning chain, leaving the decision on public evacuation exclusively in the hands of institutions that have been proven to possess sufficient capabilities and resources. It has always been understood that tsunami early warning systems serve as a complementary mechanism to the warnings provided by nature.

The first line of defense — and this is a very individual one — is the reaction to ground shaking by the earthquake itself. It is hard to comprehend that people would still stick to their activities on the seashore in Palu, Central Sulawesi, after experiencing violent ground shaking and witnessing buildings collapsing just behind them. Is it pure panic that stops people from taking a ratio- sued warning was based on an expected scenario that very well matched with the observed sea level fluctuations that followed the earthquake. In this case, the BMKG issued an "advisory" for only two regions and set just one region in northern Lombok on "warning" level.

An "advisory" does not require any evacuation and there was no warning level at all for the Gili Islands. Nevertheless, people just heard "tsunami warning" and, with the Aceh scenario in mind, many panicked. But let's be honest, how many of you really know what the three InaTEWS warning levels are, what reactions are required and that the warning levels only apply to certain warning segments that mostly represent district coast lines? A large-scale public information campaign on InaTEWS basics is long overdue!

Experiences show that survival of a tsunami depends very much on the ability of the individual person to judge the respective situation, having basic but solid knowledge of tsunami characteristics, the local warning services and a simple plan of what to do in such situation. Strengthening awareness and knowledge at the community level should be definitely another important pillar and a possible solution to mitigating the loss of lives.

Our suggestion: Let us learn the right lessons from this catastrophe and, above all, put them into practice.

Harald Spahn is a geologist who worked in Indonesia in 2006-2013

- The Warning is according to the agreed SOP
- There is no Human Error nor Instrument Error

Background

Key Question: What happened at the downstream

- How did the community responded to the event.
- How did the Tsunami Early Warning affected / influenced their response.
- How could the Tsunami Early warning system work better (considering the complexticity of the local tsunami threat).

18:06 Local Tsunami Arrives at Wani (3:30 min after EQ (CCTV of Mr. Andi

Chronology Upstream and Downstream
28 September 2018

Earthquake of 5.9 Mw — 15:00 WITA

15:00 WITA — **Earthquake felt by people in Donggala and Palu**

Many received SMS blast of the BMKG EQ Information (Ministry of Communication and Information)

Communities in Labean villages evacuated to the hills

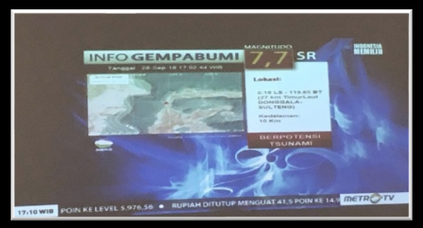
Earthquake of 7.7 Mw — 18:02 WITA

18:02 WITA — **Strong shaking, difficult to stand still**

18:04 — **Electricity and Communication cut off in Donggala and Palu**

BMKG Bulletin 1
Advisory in Palu and Warning in Donggala — 18:07 WITA

18:06 — **Tsunami Arrives Wani (CCTV Mr. Andi)**
➔ 3:30 min after EQ



TEWS Breaking News in Metro TV — 18:10 WITA

Tsunami hits Palu coast
Estimated 18:10 – 18:13

6 cm Tsunami observed in Mamuju tide gauge (±300km South) — 18:27 WITA

BMKG Bulletin 4 nd of Warning for the 7.7 EQ in Donggala — 18:36 WITA

Tsunami hits Palu videos go viral on Social Media

Areas hits by Tsunami

Images Source:
Hamzah Latief

Bappeda Palu:
Casualties in Palu 3.679 persons, **1.252 caused by tsunami** the remaining due to EQ and liquefaction.

BPBD Donggala:
Casualties in Donggala (death and missing) 212 person, **48 caused by tsunami**

Eyewitness Interviews

In-depth interviews with eyewitness and survivors:

1. Perception, knowledge, and understanding on Tsunami Early Warning System.
2. Reaction, action, and response of the community during the event.

70 eyewitnesses and survivors interviewed in Palu and Donggala

Focus Group Discussion.

Meeting with BMKG, BPBD, Electronic Media, Local academician, and Civil societies working on DRR

Main findings

- Limitations of Existing Tsunami Early Warning System
- Tsunami Early Warning Chain Failure
- False Sense of Security
- Self-Evacuation becomes the Key to Safety
- Importance of Evacuation Plans and Routes
- The Importance of Internalizing Experience and Local Knowledge
- Preparedness, Awareness, and Education Must Be Based on the Characteristics of Local Threats

Limitations of Existing Tsunami Early Warning System

1. The first wave arrives in minutes, earlier than the warning *

Images Source:
Hamzah Latief

The 7.7 Mw EQ
18:02:44
WITA

~ 3' 46"

* *Experts reported that the tsunami source was several submarine landslides very close to the coast which caused a very local tsunamis and the first arrives in very short time*

Limitations of Existing Tsunami Early Warning System

2. Electricity and communication were cut off in 2 minutes after EQ

Communities and Disaster Management Offices (Palu and Donggala) did not receive Tsunami Warning Information.

BMKG Palu Station Office
Communication and connection were cut of after the 7.7 Mw 18:02 EQ. BMKG Palu Station staff was still responding to the 5.9 Mw 15:00 EQ

BPBD Palu (Local DMO)
BPBD Palu has Warning Receiver System (WRS) and Siren. However, due to electricity cut of and the generator has been broken for a while therefore the system does not work and did not received any tsunami warning information from BMKG

BPBD Donggala (Local DMO)
Do not have WRS nor Siren. They rely information from SMS or WhatsApp messages. Due to communication cut off, they did not receive any tsunami warning information from BMKG

Tsunami Early Warning Chain Failure

3. Lack of capacity at the local disaster management office on Tsunami Early Warning System

- Dissemination of warning from Upstream to Downstream failed
- There is no local SOP for TEWS ➔ no decision making procedures
- Lack of knowledge on TEWS products
- The agreed Palu City Contingency Plan (2012) was not implemented (might be due to change of government)
- Lack of DMO human resource capacity (focus only on respond)
- Government Regulation no 21 (2008) constructed a longer warning chain for decision making that caused “golden time lost” for evacuating people at risk.

BPBD Kota Palu, 24/7 EOC on duty personnel

“…. I have worked in BPBD for 10 years but I have not received any training on the Warning Receiver System (WRS)…”

“… we have siren, but do not test this anymore (the 26th every month), we also turned the volume down to avoid panic…”

“… I did not think of sounding the siren, the electricity was cut off and I ran after the earthquake…”

False Sense of Security

4. Siren that will not safe people at risk

There is only 1 Siren installed in Palu,

Photo Yusuf Radja Muda, November 2018

- The coverage will not reach people at risk in the coastal area of Palu City
- It has not been used for several months and the volume was turned down
- No activation protocol / procedure during emergency
- People does not understand what is the siren for (although some believes having the siren protected them from the tsunami)

Photo Neni Murdani Oct 2018

"… I use to hear the sound every month but I did not pay attention and do not know what it is for, I do not think I heard it in these last few months"

"… I have been here for more or less a year now but I have never heard, I did not noticed there is a siren here"

False Sense of Security

5. Tower that is not a Siren

- Lack of knowledge on tsunami siren (a telecommunication tower believed as tsunami siren)
- People believe having siren will be safer from tsunami
- People waited for the siren to take action ➔ local tsunami

“…we were informed this is a tsunami detection tower by the people who constructed this tower. All of us (people in the village) known this as tsunami siren tower. On that day we waited for the siren but there no sound. After the tsunami the maintenance person came and said the siren does not triggered because BMKG already lifted up the warning….”

Importance of Evacuation Plans and Routes

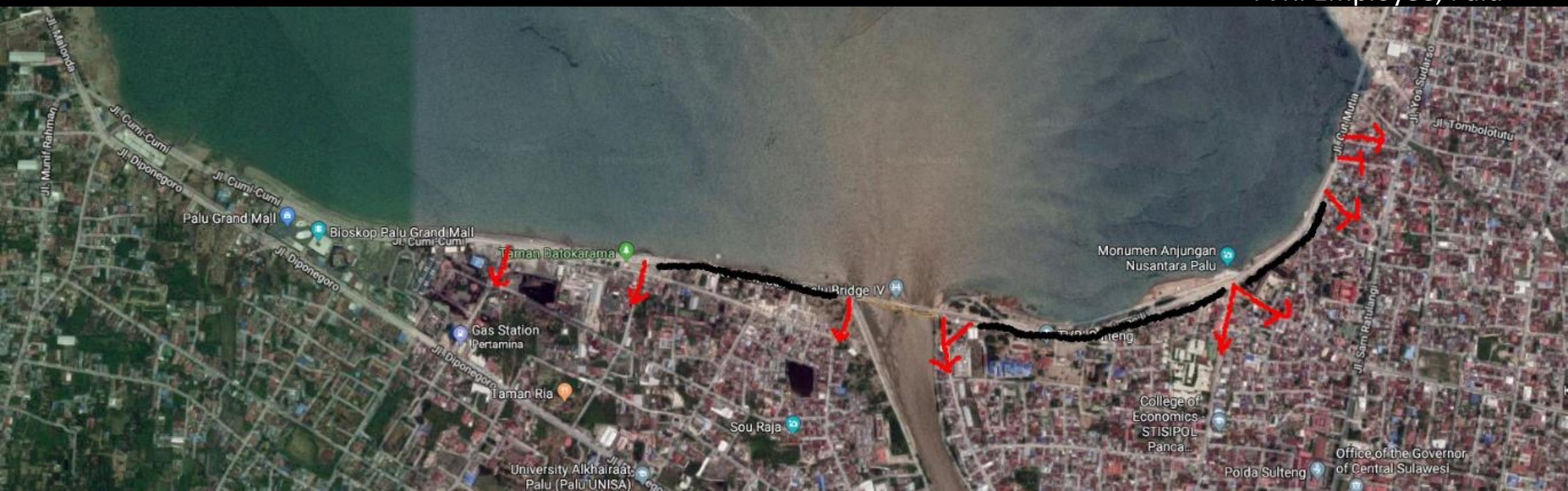
6. Access for evacuation

Donggala:
Death caused by tsunami + 48 lives
Rural area where the hills are very close to the coast, there is no barricade going to the hill from the coast

Palu:
Death caused by tsunami ± 1.252 lives.
Urban area access inward from the coast was obstructed by buildings, walls, and fences

"…there was the 2018 Palu Nomoni Festival, people already gathered in Palu coast preparing for the festival, after the earthquake and the water came people ran but could not go inward, they have to run along the coast, or, they have to climb the fence and walls, I managed to jump over the wall as the water arrives, but many could not, mostly women and children…."

TVRI Employee, Palu



The Importance of Internalizing Experience and Local Knowledge

7. Early Self Evacuation (Labean, Sirenja, Batusuya)

Many of the rural communities evacuated after the 5.9 Mw Earthquake at 15:00

- Knowledge about past tsunami (1968)
- Previous intervention

Eyewitness of 1968 tsunami
"…after that (earthquake felt at 15:00) we evacuated to the hill with the children."

Designated village disaster management personnel
"…*after the shakking (EQ at 15:00), I told everybody to run, many evacuated to the mountain (hill). Even my children and grand children went to climb the mountain. I told them to bring few clothes, food, and the (already) ripped tent..."* "

The Importance of Internalizing Experience and Local Knowledge

8. Local Knowledge that save lives, (and not…)

Many of the rural communities knows about past tsunami events (1938 and 1968) ➔ there were still eyewitnesses of the 1968 tsunami in Donggala.

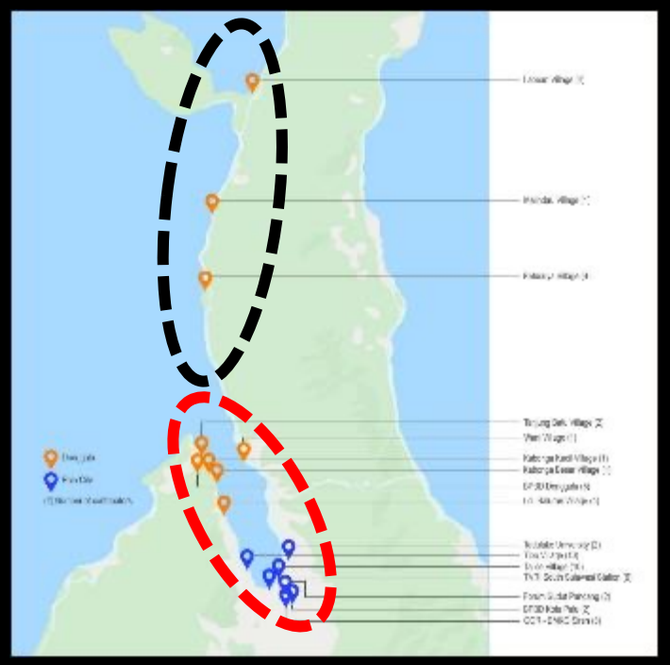
Local languages for tsunami from past events:
Kelli tribe:
- bulumba bose (Big waves)
- balumba latollu (Three waves)

Mandar tribe:
- lembo talu (Three waves)

Bugis tribe:
- bomba tellu (Three waves)

Experienced 3 tsunamis in a life time 1938 (he was 8 years old), 1968 and 2018

- Although most of the eyewitness have heard of the past tsunami that hits Palu (1938 and 1968), many of them considered this as story from the past that will not happened again.
- Many believe with all the advancement of technology, tsunami will not happened in Palu
- Experience of the 6.8 Mw 2005 EQ, where there was no tsunami, they considered that Palu Bay is safe from Tsunami



The Importance of Internalizing Experience and Local Knowledge

9. Natural signs that trigger actions

- Many people on the coast saw strange phenomenon of the sea that trigger them to evacuate from the beach
- Strange behavior of animals (Cows, Goats, and Cats) direct the people to evacuate

"… I was working on my boat when the earth shook when I looked at the sea I saw bubbles on the surface looks like the water is boiling. Short after, I ran and telling people to also run, then the wave came, I continued to tell people to run as I remembered about the three waves. The tsunami destroyed my children's house"

Nurdin (46)
Loli Saluran Village, Banawa
Sub district, Donggala

"…I was doing my ablution, preparing for the Maghreb prayer, when I felt the earth shook. I ran outside to the street, then I saw all the goats running across the street to the hills, also all the birds fly away from the mangrove trees behind my house. The goats ran while the earth was still shaking, after the shaking stops I heard people running from the coast yelling the sea water is rising !!"

Suhardin (37)
Kabonga Kecil Village,
Banawa Sub district, Donggala

"…while it was shaking I tried to go out from the house. I can barely stand, then I saw the cows are running away from the coast along the street in front of my house. I started to run along with them and was almost stamped down by these cows!"

Eli (63)
Labean Village
Sub district, Donggala

Preparedness, Awareness, and Education Must Be Based on the Characteristics of Local Threats

10. Education Materials versus Reality

- Education materials was based on 2004 Aceh Tsunami does not correspond to local threat
- Tsunami Drills always started with siren
- Tsunami started with the sea water receded
- Siren will be activated when tsunami occurs
- No public knowledge of other potential source of tsunamis *
- The lead time for tsunami to arrive in Palu is around 20-30 minutes
- Most people in Palu (even the intellectuals) were convinced that Palu bay is not facing tsunami threat

""…. this must be a false tsunami. There's no siren. No water receding. We thought this should only be a hoax… what happened was different than what we learned 6 years ago…"

A youth group for disaster preparedness that was trained in 2012

*This was based on tsunami drill exercise where the scenarios is based on tectonic EQ outside the Palu bay
This scenario is adopted in the Palu City Contingency plan

The Importance of Internalizing Experience and Local Knowledge

10. Education Materials versus Reality

- The land collapsed to the sea
  In the coast of Palu (Pantai Talise) and Tanjung, Donggala, the land collapsed to the sea as the earthquake happened and the water came immediately

"… I was on the quay in Talise Beach, preparing may vendor stall for the Festival, I felt the afternoon EQ (15:00) and I had bad feeling about it, but I decided to stay. As evening EQ (18:00) happened the quay where I was on collapsed, I fell into the sea. I struggled to stay afloat but the wave kept on pulling me down, I felt like I am inside a blender being spin around under water. Until suddenly I was tossed up to the surface and able to hold on to a plank around my neck. I was then drifted to a fallen tree where I can climb. I hold on there until somebody helped me…."

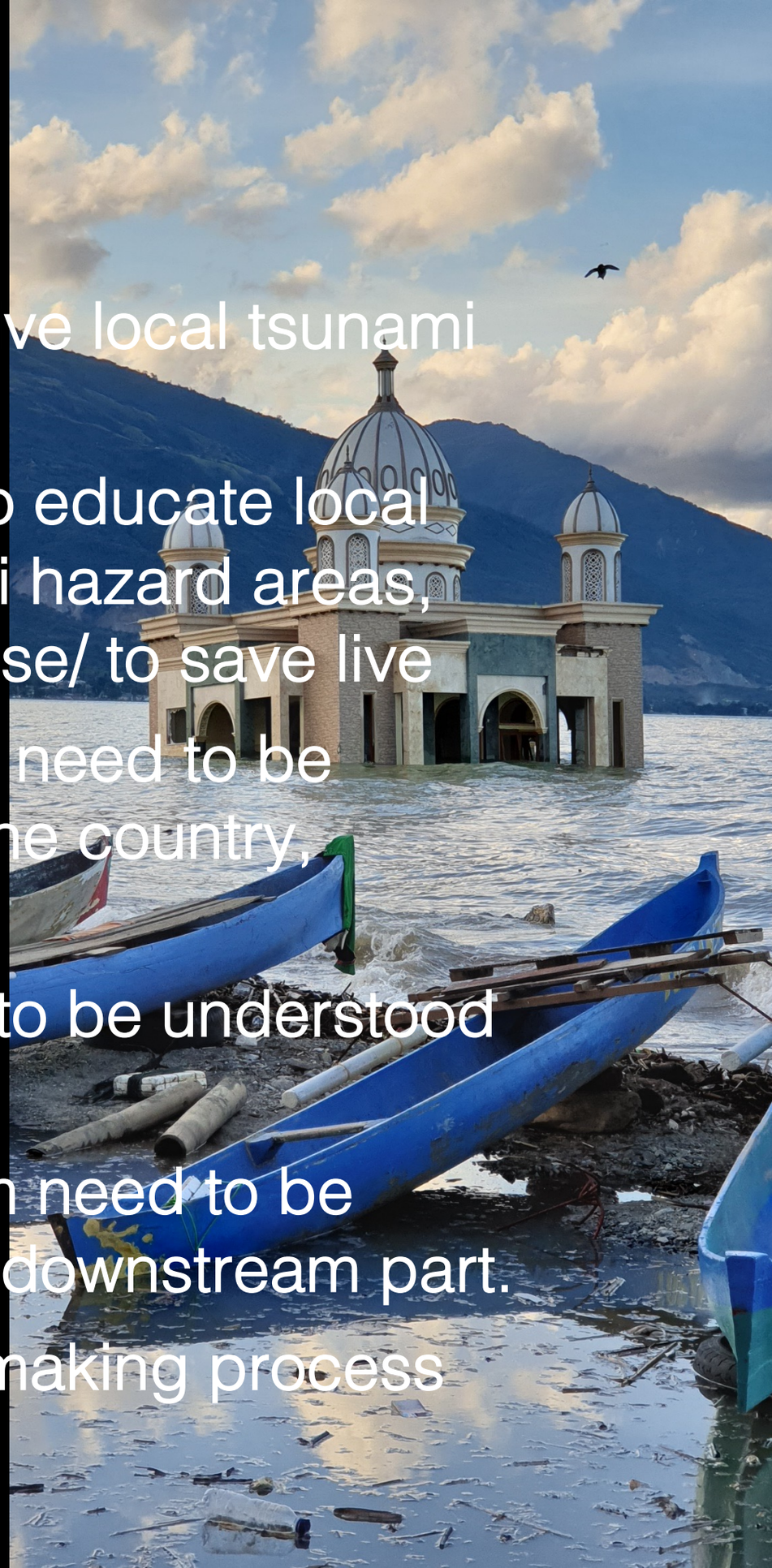
Tsunami Survivor, Kelurahan Tipo, Kecamatan Ulujadi

"…there was no sea water receded, in this area, all the houses just collapsed, sunk into the sea and the water came at the same time…"

Tanjung Batu Village, Donggala

Summary

- Self Evacuation Protocol is the key to survive local tsunami with a very short lead time.
- Local knowledge need to be capitalized to educate local community on risk understanding, tsunami hazard areas, early warning, as well as action for response/ to save live
- Education, awareness, and preparedness need to be prioritized given a high urgency (all over the country, especially areas with high tsunami threat).
- Risk understanding and knowledge need to be understood by all people in the tsunami risk area.
- End to End Tsunami Early Warning System need to be revitalized, starting and focusing from the downstream part.
- Simplify the Warning Chain and decision making process (reevaluati the PP 21 (2008)



Thank you

Ardito M. Kodijat

IOC UNESCO Indian Ocean Tsunami Information Centre
IOTIC-BMKG Programme Office

Disaster Risk Reduction and Tsunami Information Unit
UNESCO Jakarta Office

iotic.ioc-unesco.org

www.iotsunami.org

facebook.com/iotsunami

@iotsunami

youtube.com/iotsunami

iotic@unesco.org