

International Civil Aviation Organization

ICAO

WORKING PAPER**ICAO Asia and Pacific (APAC)**Twenty-Eighth Meeting of the Meteorology Sub-Group
(MET SG/28)

Bangkok, Thailand, 08 to 12 July 2024

Agenda Item 6: Research, development and other initiatives**EARTHQUAKE AND TSUNAMI INFORMATION HANDLING FOR AVIATION**

(Presented by Indonesia)

SUMMARY

This paper shares Indonesia's experience and practice in integrating Earthquake and Tsunami Information into Aerodrome warnings information to ensure safety in the aerodrome and flight operation.

1. INTRODUCTION

1.1 As the NMHS of Indonesia, BMKG has the responsibility to provide and disseminate earthquake information. We are deeply concerned about effectively relaying information regarding destructive-scale earthquakes to pilots in the air and aviation stakeholders, especially those impacting airports and their facilities, as exemplified by the significant earthquake in Palu in 2018, which not only destroyed the ATC tower and airport facilities but also caused fatalities among airport personnel.

1.2 Indonesia has developed an integrated system to disseminate Earthquake information to airport display systems that was called Warning Receiver System (WRS). The WRS system was installed on terminal displays, airport information control center, Air Traffic Services (ATS) tower displays, and also can be accessed through the website <https://inatews.bmkg.go.id/wrs/index.html>. The example of WRS that was installed at the airport attached in Appendix A.

1.3 BMKG, Airport authority, and ATS unit synchronized and formulated the policy about how to respond, disseminate, and mitigate people in the occurrence of earthquakes and tsunamis at the aerodrome and flight operation.

2. DISCUSSION

Indonesia Practice on the Respond of Earthquake and Tsunami in aerodrome

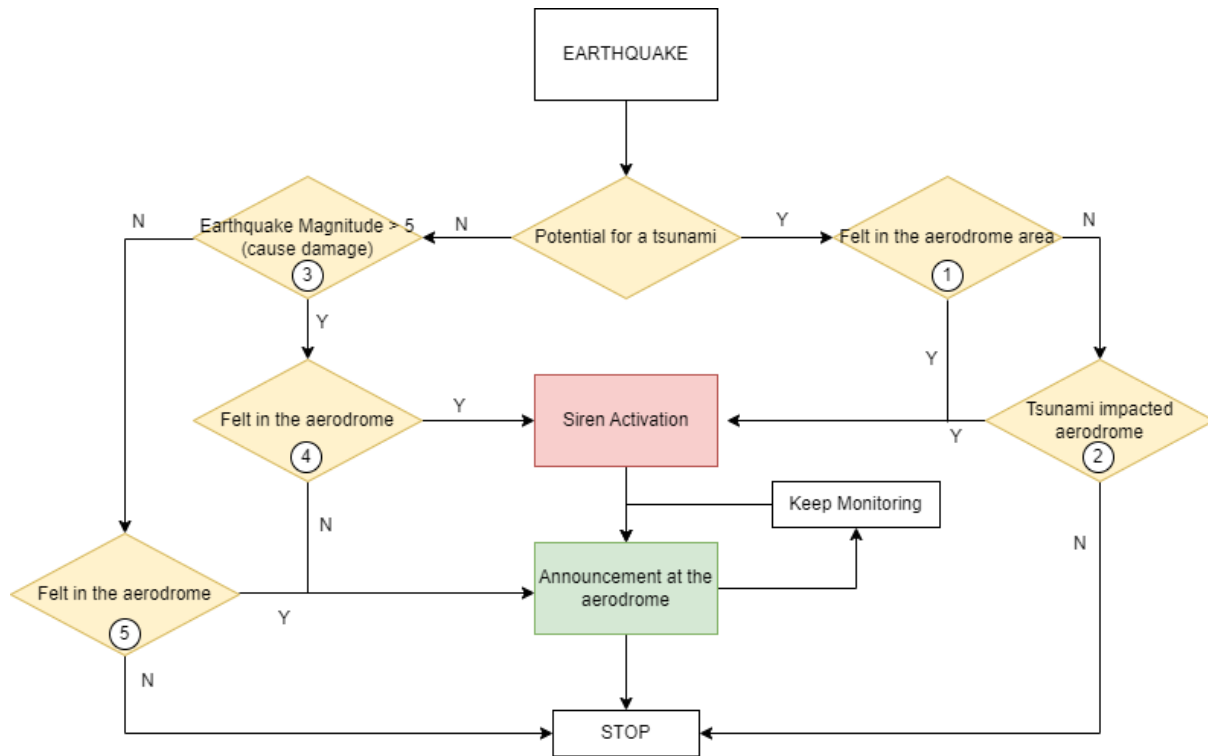


Figure 1. Indonesia Standard Operating Procedure to Respond to Earthquake and Tsunami at the aerodrome

2.1 In order to respond to earthquake and tsunami, Indonesia categorized the occurrence of earthquake and tsunami into four types category as follows:

1. If the earthquake feels strong, there is the potential for a tsunami to impact the aerodrome (estimated tsunami arrival time is less than 30 minutes);
2. If an earthquake occurs that is not felt in the aerodrome area but BMKG informs that the earthquake has the potential for a tsunami (the source of the earthquake is located far from the aerodrome, the estimated arrival time for the tsunami is more than 30 minutes);
3. If an earthquake does not have the potential for a tsunami but is felt at the aerodrome has a magnitude of more than 5 and causes damage to the aerodrome facilities including runways and terminal buildings;
4. If an earthquake does not have the potential for a tsunami but is felt at the aerodrome has has a magnitude of less than 5;
5. If an earthquake does not have the potential for a tsunami and is not felt at the aerodrome, no response will be made by the aerodrome.

The details of responsibility for each authority in response to the earthquake and tsunami at the aerodrome are attached in Appendix A.

2.2 For occurrences 1 and 2, BMKG has the responsibility to check communication systems such as Radio, HT, DVB, and social media to keep informed of the phenomena updates. Furthermore, after getting a warning from WRS, the meteorological station provides information via available channels/networks to Air Traffic Control (ATC) and Apron Movement Control (AMC) units in MWO format, for example: **WAHI AD WRNG 1 O32300/040100 TSUNAMI FSCT.**

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2.3 For occurrences 3 and 4, when a tsunami is not predicted to impact the aerodrome, the airport authority only makes an announcement via a terminal speaker. Meteorology Station does not make an Aerodrome Warning since there is no guidance for issuing an Earthquake Aerodrome Warning. In this case, we thought an earthquake which caused damage to the airport and flight operation could be considered a significant hazard. So, warning information of an earthquake above 5 M (cause damage) at the Aerodrome must be immediately disseminated, one of which is through an Aerodrome warning.

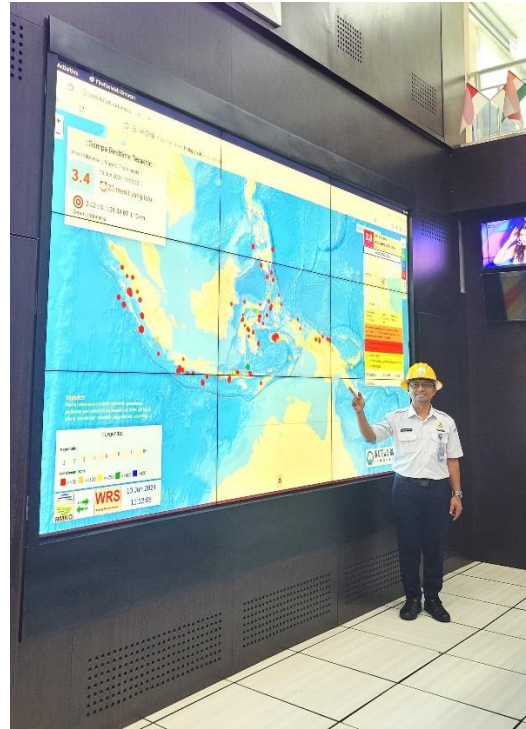
2.4 According to our experience and practice in responding to earthquake and tsunami, and also the fact that tsunami are already included in the Aerodrome warning phenomena, So, in this occasion, we would like to have further discussion about the possibility of including Earthquake as the one of the Aerodrome Warning Phenomena.

3. ACTION BY THE MEETING

3.1 The meeting is invited to

- a) note the information contained in this paper;
- b) to explore the inclusion of discussed local practices in the relevant guidance or document; and
- c) discuss any relevant matter as appropriate.

APPENDIX A: Display WRS at the aerodrome.



APPENDIX B: Standard Operating Procedure (SOP) of Aerodrome Respond to Earthquake and Tsunami in the Term of Flight Operation.

If an earthquake occurs, BMKG sends or disseminates earthquake information to the aerodrome via Warning Receiver System (WRS) in real-time within a time span of 2 - 5 minutes. This information can be received on devices that have WRS installed, including at the terminal displayed in the waiting room, received at the aerodrome information control center, and also received at the ATS unit tower. Then, the information sent by BMKG consists of the time of the earthquake, the strength of the earthquake, the location of the epicenter, the depth of the earthquake source, the distance to the nearest city/district or other vital objects including information explaining whether there is a potential for a tsunami or not.

1. If the earthquake feels strong, there is the potential for a tsunami to impact the aerodrome (estimated tsunami arrival time is less than 30 minutes);

- a. Airport officers who have received information from BMKG via WRS in the information room immediately activate the sirens with real tsunami tones (real tsunami tones and tsunami test tones are available). Then from the information control room, tsunami warning information was conveyed via speakers in the terminals. Information announced as follows (example):

“There was a tectonic earthquake at....., with strength....., epicenter at.... South latitude east longitude, depth.....km, location.....km from..., the earthquake has the potential for a tsunami with the estimated arrival time of the tsunami at airport at..., with the estimated tsunami height...m, airport visitors are requested to evacuate to the location or a higher location, namely at.....” (siren and announcements are made repeatedly).”

Henceforth, the announcement will continue while monitoring the development of information from BMKG via the WRS device until there is a statement from BMKG that the tsunami early warning is declared over.

- b. ATS unit at the tower receives Tsunami Early Warning information in code form from the BMKG Meteorological Station at the aerodrome (Annex3 ICAO), so the officer is responsible for:
- i. Coordinate with airport management to prepare for tsunami hazards at the airport, including runways, taxiways, and aprons;
 - ii. Diverting airplanes that will land at the related airport;
 - iii. Hasten the airplanes that will take off from the airport if possible;
 - iv. Postponing flights to and from a related airport in accordance with the NOTAM submitted by the airport to the related Aeronautical Information Services (AIS) Center;
 - v. Termination of NOTAMs can be carried out based on updated information from BMKG and coordination with related parties;
 - vi. In the future, ATS unit officers will continue to monitor developments in information from BMKG until there is a statement from BMKG that the tsunami early warning is declared over;
- c. Airline crews with Airport Operation Land Side dan Terminal (AOLT) officers
- i. Receive Tsunami Early warning information from airport management if they are still at the airport, or receive information from the ATS unit if they are already on a flight;
 - ii. If it is not possible to take off, coordination is carried out with airport management to immediately evacuate passengers to return to the departure terminal;
 - iii. If it is not possible to land, the aircraft will be given an alternative to land at the departure airport or according to the pilot's request;
 - iv. When the airplane has landed, the pilot immediately coordinates with the airport management and directs passengers to immediately go to the departure terminal, by following the evacuation routes that have been prepared and avoiding the aerobridge if a tsunami is preceded by an earthquake which damages/weakens the aerobridge structure. However, if a tsunami occurs without being preceded by an earthquake and

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the aerobridge is not damaged, it can still be used for evacuation to the departure terminal;

- v. Henceforth, they can continue to monitor developments in information from BMKG via airport management until there is a statement from BMKG that the tsunami early warning was declared over
- d. MET station at the airport
 - i. Checking communication equipment such as Radio, Handy Talky (HT), Digital Video Broadcasting (DVB) and Social Media;
 - ii. After receiving the first early warning information, provide information via available communication channels/networks to ATC and AMC in WMO format, for example: WAHI AD WRNG 1 O32300/040100 TSUNAMI FSCT;
 - iii. Henceforth, continue to monitor the development of information from BMKG via the WRS device until there is a statement from BMKG that the tsunami early warning is declared over.

2. If an earthquake occurs that is not felt in the aerodrome area but BMKG informs that the earthquake has the potential for a tsunami (the source of the earthquake is located far from the aerodrome, the estimated arrival time for the tsunami is more than 30 minutes);

- a. Airport officers who have received information from BMKG via WRS in the information room immediately activate the sirens with real tsunami tones (real tsunami tones and tsunami test tones are available). Then from the information control room, tsunami warning information was conveyed via speakers in the terminals. Information announced as follows (example):

“There was a tectonic earthquake at....., with strength....., epicenter at.... South latitude east longitude, depth.....km, location.....km from..., the earthquake has the potential for a tsunami with the estimated arrival time of the tsunami at airport at..., with the estimated tsunami height...m, airport visitors are requested to evacuate to the location or a higher location, namely at.....” (siren and announcements are made repeatedly).”

Henceforth, the announcement will continue while monitoring the development of information from BMKG via the WRS device until there is a statement from BMKG that the tsunami early warning is declared over.

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 - i. Coordinate with airport management to prepare for tsunami hazards at the airport, including runways, taxiways, and aprons;
 - ii. Diverting airplanes that will land at the related airport;
 - iii. Hasten the airplanes that will take off from the airport if possible;
 - iv. Postponing flights to and from a related airport in accordance with the NOTAM submitted by the airport to the related Aeronautical Information Services (AIS) Center;
 - v. Termination of NOTAMs can be carried out based on updated information from BMKG and coordination with related parties;
 - vi. In the future, ATS unit officers will continue to monitor developments in information from BMKG until there is a statement from BMKG that the tsunami early warning is declared over;
- c. Airline crews with Airport Operation Land Side dan Terminal (AOLT) officers
 - i. Receive Tsunami Early warning information from airport management if they are still at the airport, or receive information from the ATS unit if they are already on a flight;
 - ii. If it is not possible to take off, coordination is carried out with airport management to immediately evacuate passengers to return to the departure terminal;
 - iii. If it is not possible to land, the aircraft will be given an alternative to land at the departure airport or according to the pilot's request;

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- iv. When the airplane has landed, the pilot immediately coordinates with the airport management and directs passengers to immediately go to the departure terminal, by following the evacuation routes that have been prepared and avoiding the aerobridge if a tsunami is preceded by an earthquake that damages/weakens the aerobridge structure. However, if a tsunami occurs without being preceded by an earthquake and the aerobridge is not damaged, it can still be used for evacuation to the departure terminal;
- v. Henceforth, they can continue to monitor developments in information from BMKG via airport management until there is a statement from BMKG that the tsunami early warning was declared over
- e. MET station at the airport
 - i. Checking communication equipment such as Radio, Handy Talky (HT), Digital Video Broadcasting (DVB) and Social Media;
 - ii. After receiving the first early warning information, provide information via available communication channels/networks to ATC and AMC in WMO format, for example: WAHI AD WRNG 1 O32300/040100 TSUNAMI FSCT;
 - iii. Henceforth, continue to monitor the development of information from BMKG via the WRS device until there is a statement from BMKG that the tsunami early warning is declared over.

3. If an earthquake does not have the potential for a tsunami but is felt at the aerodrome has a magnitude of more than 5 and causes damage to the aerodrome facilities

- a. Airport officers who have received information from BMKG via WRS in the information room immediately activate the sirens. Then, convey earthquake information via speakers in the terminals. The information that is announced is as follows:
“There was a tectonic earthquake at..., with strength..., epicenter at.... Latitude south East longitude, depth....km, location....km from..., this earthquake does not have the potential for a tsunami. Airport visitors are requested to gather at the assembly point.”
- b. The ATS unit at the tower receives Earthquake information from the BMKG Meteorological Station, so the officer is responsible for:
 - i. Diverting airplanes that will land at the related airport;
 - ii. Hasten the airplanes that will take off from the airport if possible;
 - iii. Postponing flights to and from a related airport in accordance with the NOTAM submitted by the airport to the related Aeronautical Information Services (AIS) Center;
 - iv. Termination of NOTAMs can be carried out based on updated information from BMKG and coordination with related parties;
 - v. In the future, ATS unit officers will continue to monitor developments in information from BMKG.
- c. Airline crews with Airport Operation Land Side dan Terminal (AOLT) officers
 - i. If it is not possible to take off, coordination is carried out with airport management to immediately evacuate passengers to return to the departure terminal;
 - ii. If it is not possible to land, the aircraft will be given an alternative to land at the departure airport or according to the pilot's request;
 - iii. When the airplane has landed, the pilot immediately coordinates with the airport management and directs passengers to immediately go to the assembly point;
 - iv. In the future, ATS unit officers will continue to monitor developments in information from BMKG.

4. If an earthquake does not have the potential for a tsunami but is felt at the aerodrome has has a magnitude of less than 5

Airport officers who have received information from BMKG via WRS in the information control room immediately convey earthquake information via speakers in the terminals. The information that is announced is as follows:

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“There was a tectonic earthquake at....., with strength....., epicenter at.... Latitude south East longitude, depth.....km, location.....km from..., this earthquake does not have the potential for a tsunami. Airport visitors are requested to remain calm and be able to carry out their normal activities.”

- 5. If an earthquake does not have the potential for a tsunami and is not felt at the aerodrome, no response will be made by the aerodrome.**
