Preserving past tsunami information for future preparedness in Indonesia and the Philippines

Ardito Marzoeqi Kodijat^{1,*}, Bernardo Aliaga Rossel², Admiral Musa Julius³, Litanya Octonovrilna³, and Aprilia Puspita Cahyaningrum¹

¹ IOC UNESCO Indian Ocean Tsunami Information Centre, Jl. Galuh II No. 5 Kebayoran Baru, DKI Jakarta, 12110, Indonesia

² IOC UNESCO Technical Secretary ICG/PTWS, 7 Place de Fontenoy 75732, Paris Cedex 07, France

³ The Agency for Meteorology, Climatology, and Geophysics, IOTIC-BMKG Programme Jl. Angkasa 1 No. 2, Kemayoran, DKI Jakarta

Abstract. Recent tsunamis, especially after the 2004 Indian Ocean tsunami, provided a better understanding and knowledge of tsunami science as well as on how to build awareness and preparedness. However, tsunamis that happened before 2004, there is limited and/or scattered data, information, records, and reports of the events. In addition, there is either limited or no eyewitness's story documented, including pictures and videos. The lack of information makes it difficult for policymakers, researchers, and other institutions to disseminate local and contextualized information to the public in raising awareness and education on disaster preparation and mitigation. If a tsunami has happened in the past, it is most likely to happen again in the future. It is imperative that we learn from the past and prepare for the future. This study aims to improve the knowledge of the impact of the tsunami in selected sites in Indonesia and the Philippines prior to 2004, through investigation of historical documents and archives, as well as documentation of eyewitness accounts. The result of this study is expected to be a more effective way to build awareness and to educate the local community. Having evidence-based of past tsunami event in the area will motivate stronger preparedness. It will also provide a better understanding to the local policymakers, disaster management agencies, as well as the community as it is based on local eyewitness accounts and other local sources, as opposed to using examples from other sites, districts, countries or regions.

1 Introduction

The tsunami can be devastating for the coasts and their communities, often resulting in lasting and damaging effects on marine ecosystems and coastal landscape, causing long-term coastal erosion. Disaster preparation for tsunami events can save lives and livelihoods. Disaster preparedness means to predict, prevent (where possible) disasters, mitigate their impact on vulnerable populations and effectively cope with their consequences. The 2004 Indian Ocean tsunami and the 2011 Great East Japan Earthquake tsunami caused devastating damage in the countries they hit, affecting the most vulnerable communities, despite progress made in seismic and tsunami science in the last 50 years.

Indonesia and the Philippines are located on the Pacific Ring of Fire, an area with a high degree of tectonic activity. They have to deal with the constant risk of volcanic eruptions, earthquakes, floods, and tsunamis. If a Tsunami has happened in the past, it is most likely to happen again in the future. Thus, it is not a matter of if a tsunami will occur, but when it will happen. Because of that, it is imperative that the society learns from the past and prepare for the future. Science research on recent tsunamis, especially after the 2004 Indian Ocean

tsunami, have much improved our knowledge on tsunami science and preparedness. However, on tsunamis that happened before 2004, there is limited and/or scattered data, information, records, and reports of the events. In addition, there is either limited or no documented eyewitness's story, including pictures and videos. As tsunamis are infrequent, the lack of localised information makes it challenging the sustained public awareness about this "forgotten danger" [3].

Fig. 1. Area of study in Indonesia and the Philippines

* Corresponding author: a.kodijat@unesco.org

The overall objectives of this project are: (1) Communicating the effects of past tsunami. (2) Collecting, documenting and organizing available documents, government papers, newspaper reports and eyewitness accounts of the past tsunami. (3) Ensuring the information is available to the public (online with interactive features, such as videos, maps, and infographics). (4) Develop public awareness, education, and preparedness based on real events. (5) Becoming a one-stop collection of information of past tsunami events. This project aims to improve the knowledge of the impact of Tsunamis in Indonesia and the Philippines prior to 2004 (Image 1), through investigation of historical documents and archives, as well as documentation of eyewitness accounts. This activity focuses on building tsunami awareness and preparedness by preserving the past, educating the present and preparing for the future. The result of the study also become factual information to support policy-making at the national and local level of the affected country / sub-region such as the disaster management organisations, agencies responsible for tsunami warning, educational institutions and universities involved in research and training. Policy decisions by local and regional disaster management agencies in the affected sites will be more effective based on local eyewitness accounts and other local sources, as opposed to using examples from distant sites, districts, countries or regions. Primary sources are important for research as well as authoritative evidence to motivate preparedness at the local level.

The information gathered in the document search is made available publically through the IOC-UNESCO Indian Ocean Tsunami Information Centre (IOTIC) website to inform as well as increase tsunami awareness and preparedness throughout the region. The end users including the populations living in the affected areas of the project, to enhance their awareness, education, and preparedness for future tsunami events.

This study in Indonesia and the Philippines builds on the project on the investigation of written and oral history from the 1945 tsunami event that occurred in the Makran Coastal Region. This project, coordinated by IOTIC and IOTWMS and funded by UNESCAP. The project aimed to acquire and improve knowledge regarding the impact of the 1945 tsunami in Pakistan, Iran, India, and Oman by searching for historical documents in each of these countries. Interviews and oral investigations were conducted in India with three tsunami eyewitness, Iran (17 interviews), Oman (11 interviews), and Pakistan (81 interviews). A booklet containing oral historical records of the 1945 tsunami's eyewitnesses and survivors has been produced entitled "Remembering the 1945 Makran Tsunami – Interviews with Survivors besides the Arabian Sea". Comprehensive information and data about this project are available to the public from the IOTIC website: <http://iotic.ioc-unesco.org/1945makrantsunami/> [1].

In Indonesia, the preservation of tsunami events started with the 1950 tsunami that occurred in Ambon, Maluku Province. This tsunami, which had unique characteristics, affected three villages; however, information about this event is very limited. No

scientific and governmental reports could be found, with only a few news reports describing the actual event. To document the information of what happened on the day; twenty-eight eyewitnesses were interviewed in the villages of Galala, Hative Kecil, and Hutumuri. Eyewitnesses were in the range of 70-80 years old at the time of the interview and would have been approximately 5-15 years of age at the time of the tsunami, back in 1950. An awareness and education booklet titled "Air Turun Naik di Tiga Desa, Mengingat Ambon Tsunami 1950" (Tsunami in Three Villages, Remembering the 1950 Tsunami in Ambon) has been published in Bahasa Indonesia. In addition to the interviews with eyewitnesses, the booklet provides scientific analysis and modelling of how the tsunami was generated, as well as efforts already employed by the City of Ambon to strengthen tsunami preparedness in the area. This booklet also illustrates the historical record of tsunamis in the Maluku Islands starting from the 17th century highlighting that the city of Ambon, and in particular the Maluku islands, are areas that are prone to tsunamis. Comprehensive information and data about this project are available from <http://iotic.ioc-unesco.org/1950ambontsunami/> [2].

2 Material and method

The first step in this study is to identify past tsunami events, focusing on tsunamis before 2004, where eyewitness of the event could still be found. A desk study was done to look at past tsunami events prior to 2004, with the criteria that an eyewitness to the event could still be found and interviewed, using the NGDC/WDS Global Historical Tsunami Database <https://www.ngdc.noaa.gov/hazard/tsu.s HTML>.

In addition, further consultation with tsunami experts in the country was done to confirm these events. Seventeen past tsunamis in Indonesia, in the period of 1959 – 2000, where there are possibilities of living eyewitness have been identified. In the Philippines 3 past tsunamis have also been identified.

Data collection and desk studies follow the identification of the tsunami events. Information was collected from a different source such as the National Library, the National Archives, and the National News Agency, Universities, Research Institutes, Government Offices. This project developed a special cataloguing methodology to ensure the source of information is well recorded. This cataloguing is very important especially if the research involves many researchers as well as cross-boundary areas as in the study of the 1945 Makran tsunami that involved researchers from India, Iran, Oman, and Pakistan. For a number of these past tsunamis, there have been field survey conducted by tsunami experts and ITST (International Tsunami Survey Team). It is important to review these reports to give a clearer, detailed information, as most of these surveys were done a few days after the tsunami hit the area [1].

To be able to understand what has happened in the past, a tsunami modelling and analysis was done prior to visiting the site and meeting with the eyewitness. Based

on the earthquake information and parameters the tsunami modelling can give a preliminary and rough understanding of what happened. This modelling helps the study during discussion and interview with the eyewitnesses to give confirmation and to clarify issues arises during the interviews. Once the basic information of past tsunamis is clear and analysed, field survey planning could start. It is important to involve the local government in identifying the eyewitnesses. In Indonesia, the study was done in coordination and cooperation with the local Disaster Management Offices and the Local / Regional Agency for Meteorology, Climatology, and Geophysics. It is also important to identify the eyewitness from different gender and demographic segregation (age, location, job/employment, etc.) in consideration of when the tsunami event happened as well as the present situation. This is to ensure it reflects the demographic and socio-economic aspects of the community. Selecting the eyewitness also need to be based on the damage caused during this past event as well as to be able to descriptions of a representative portion of the area affected by the tsunami. The number of the eyewitness will depend on the availability of the living survivors, but the more eyewitness is the better [2].

Personal interview with eyewitnesses was done separately and documented in videos. Documenting video of the eyewitness is very important, as this will help the people in the community to learn first-hand from their ancestors, who lived in the area, of how earthquake and tsunami have affected the area and their lives. All of these videos are made available on CD as part of public awareness materials. All survey and information are geo-tagged to know location coordinates based on their story and information about when the actual tsunami happened. An interview standard format and its associated guideline are made available to the researcher to ensure there is consistency in the information. The standard format is also to help the interviewer to clarify and check information from the literature, news information, and other written sources.

During the fieldwork, it is important to trace the inundated area based on the eyewitness stories. Reports by the ITST or post-event field reports and the modelling and inundation mapping will help to understand the extension of the inundated area when the actual tsunami happened. It is important to walk with the eyewitness through the area and geo-tag the location of relevant information provided by the eyewitness as they remembered. This process is very important for events where there were no post-tsunami surveys. In Indonesia, the first post-tsunami survey conducted by an ITST was conducted in 1992 on the Tsunami in Flores.

One of the important steps in the interviewing process associated with the fieldwork is the involvement of the community. The involvement of the community should be secured prior to the eyewitness survey. This will help in getting the interest, support, ownership, and facilitation of the community as well as to be able to work closely with the eyewitness. Working through the community will also help to anticipate if there are concerns that the survey team needs to be aware off, i.e.

post even traumatic experience of the people or if there are specific interesting stories that the survey team need to be aware, i.e. heroic actions, traditional knowledge, etc. A community awareness workshop jointly organized with the local disaster management office will also help to ensure the local disaster management office will take the ownership of the activity. During the study, a number of community gatherings (especially during the interviews with the eyewitnesses) need also to be organized to maintain the communication and to continue to get the full engagement of the community with the study. During these workshops and engagement, it is important to also socialize and sensitize tsunami awareness and preparedness as well as the importance of the study for their preparedness in the future by understanding the risk threatening their community. After the study is done and the education and awareness publication is published, a launching workshop in the affected community is important as a closing of the activity in the area. Personal hand over of the publication to the eyewitness and their family should also be done as a token of appreciation for their contribution to building community preparedness.

One of the objectives of this study is to communicate the effects of past tsunamis on the community in the area as well as to a wider number of stakeholders. Developing awareness, education, and preparedness material with local context (including local / national language) are very important. Having an awareness, education, and preparedness material that links directly with the community will help in getting support from all stakeholders, the community, local government, as well as from parliamentarian. It is also important to ensure all the information collected in the study (news clippings, reports, videos, maps, photos, video of an eyewitness) is made available to the public through an official website

3 Conclusions

In both study sites (Makran and Ambon) the team asked the community if they know of any tsunami, the response was nearly the same, they knew about the 2004 Indian Ocean tsunami and the 2011 Great East Japan Tsunami. None or only a few knew that a tsunami has happened in their own backyard. They did not know that their ancestors have experienced first-hand this devastating hazard. The study and activity in the field opened their eyes and understanding of tsunami risk and that the hazard is threatening their coastal areas. The availability of information that happened in their area helped local policymakers, education officers, and disaster practitioners to make use of local and contextualized materials in raising awareness and educate the local public to disaster preparedness and mitigation.

The Preserving Past Tsunamis for Future Preparedness programme under IOTIC-BMKG will continue with other identified events out of the list of the 17 tsunamis (**Table 1**) in Indonesia and 3 tsunamis (**Table 2**) in the Philippines.

Table 1. List of tsunamis in Indonesia.

No	Date	Date
1	8 October 1950	Galala, Hative Kecil, Hutumuri, Ambon
2	24 January 1965	Seram, Maluku
3	11 April 1967	Tinambung, West Sulawesi
4	14 August 1968	Tambu, Central Sulawesi
5	23 February 1969	Majene, West Sulawesi
6	19 August 1977	Sumba, East Nusa Tenggara
7	1979 (?)	Sumbawa, Bali, Lombok, West Nusa Tenggara
8	18 July 1979	Lembata Island, East Nusa Tenggara
9	25 December 1982	Larantuka, East Nusa Tenggara
10	26 November 1987	Flores Timur, P.Pantar, East Nusa Tenggara
11	31 July 1989	P. Alor, East Nusa Tenggara
12	12 December 1992	Flores, East Nusa Tenggara
13	3 June 1994	Banyuwangi, East Jawa
14	1 January 1996	Palu, Central Sulawesi
15	17 February 1996	Biak, Papua
16	29 November 1998	Taliabu, Tabuna, Maliabu, North Maluku
17	4 May 2000	Banggai, Central Sulawesi

Table 2. List of tsunamis in the Philippines

No	Date	Date
1	1 August 1968	Luzon Island
2	16 August 1976	Mindanao Island
3	14 November 1994	Mindoro

High appreciation and thankful is given by writer to the national government of Indonesia and the Philippines as permission to visit tsunami eyewitnesses in each country. The writer also expresses thankful to each National Tsunami Warning Centre (NTWC) as support and attention to finish this research.

References

1. D. M. Kakar, G. Naeem, A. Usman, A. Mengal, A. N. Beni, M. Afarin, H. Ghaffari, H. M. Fritz, F.

- Pahlevan, E. Okal, M. A. Hamzeh, J. Ghazemzadeh, N. S. Al-Balushi, G. Hofmann, A. R. S. Srinivasalu, V. Andrade, *Remembering 1945 Makran Tsun. Interviews with Surviv. Beside the Arab. Sea* (IOC-UNESCO, Paris, 2015).
2. H. Latief, A. M. Kodijat, D. O. Ismoyo, Bustamam, D. Adyasari, N. Nurbandika, H. P. Rahayu, *Air Turun Naik di Tiga Negeri, Tsunami in Three Villages* (IOC-UNESCO, Jakarta, 2016).
3. W. Proenza, G. Maul. *Tsunami Hazard and Total Risk in the Caribb. Basin* (Sci Tsunami Haz. **29**, 70 (2010))