



Study on the Relief Response of Cross-Regional Natural Disaster Risk Lessons from the 2018 M 7.4 Earthquake and Tsunami in Central Sulawesi, Indonesia

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Abstract. Risk reduction of natural disaster is a global priority. It is necessary to consider the characteristics of local natural hazards, the diversity of disaster-bearing environments and the gaps in economic development levels, and explore response models of multiple collaborative relief at international, regional and local scales, which will effectively reduce disaster losses and promote sustainable development of social security. This paper takes the Sulawesi 7.4-magnitude earthquake and tsunami in 2018 as an example, which arouses wide attention of the international community. It aims to sort out the new mode of international humanitarian response led by the state, coordinated by the region, and supported by society, thereby summarizing the cooperation trend of emergency response. The ultimate purpose is to explore more efficient ways of humanitarian assistance on the field of disaster reduction and relief under the multilateral framework of regional organizations, especially cooperation and interoperability between China and ASEAN countries in the area of disaster relief.

Keywords: disaster risk · multivariate collaboration · relief coordination

1 Introduction

Among the countries and regions along the “Belt and Road”, Southeast Asia is one of the high-risk areas for major natural disasters which is subject to tsunamis, earthquakes, floods, mudslides, volcanoes, typhoons and other major disasters all year round. The disasters seriously threaten the safety of life and property of local people, and cause great impacts to the society, ecology and environment [1, 2]. In the context of globalization today, major natural disasters bring a great challenge not only to a single country, but also to neighboring countries and even regional area [3].

A series of studies have been conducted in the field of natural disaster risk management, especially along the “Belt and Road”. By analyzing the factors related to earthquake risk, Wu X. Y. et al. constructed a multi-level evaluation index system and

made a specific comprehensive assessment of the city's earthquake preparedness [4]. Kong F. et al. evaluated the risk situation of natural disasters along the "Belt and Road" and gave corresponding policy recommendations [5]. Cui P. et al. proposed a multi-level, multi-body collaborative management model covering the whole cycle of disaster management for natural disaster risk management in the "Belt and Road" region [6]. Zhou S. T. et al. reviewed the current research models of urban natural disaster risk assessment and illustrated that the research results in the field of disaster science came apart with the current public safety management at the urban scale [7]. The current risk study mainly focused on pre-disaster emergency preparedness instead the actual relief response after disasters. Taking the response process of the 7.4 magnitude earthquake in Central Sulawesi, Indonesia in 2018 as an example, this paper illustrates a new model of international humanitarian disaster risk response in the leadership of a state, coordinated by the whole region and socially supported, and explores its practical application suggestions.

2 Case Study

On September 28, 2018, at 17:02 local time, an earthquake measuring 7.4 on the Richter scale struck central Sulawesi, Indonesia, triggering a strong tsunami hitting Palu, the capital of Sulawesi province, and the coasts of Donggala and Sigi. Secondary disasters such as widespread landslides and sand liquefaction caused great difficulties for rescue. According to the National Disaster Management Agency of Indonesia, 2,226 people were killed and 220,000 people were displaced by October 21 [8, 9]. Known as the largest sand liquefaction in the world's history, and one of the most serious disasters of the year, it attracted global attention [10].

In addition to the severe disaster risk, another reason why this disaster response is remarkable is the bold exploration of the "localization" policy, a "local-led" humanitarian aid model adopted by Indonesia in its response. The "localization" of humanitarian aid initiative was proposed at the 2016 World Humanitarian Summit in Istanbul to encourage international NGOs to work with local organizations in the affected countries while limiting their access to the affected areas [11]. The "localization" of aid means transferring financial, resource, and decision-making authority from international organizations to the affected areas, so as to improve the effectiveness and sustainability of humanitarian response [12, 13]. The highly localized response to the 2018 Central Sulawesi earthquake in Indonesia is a good practice of regional response [14, 15]. Indonesia is a member of the Association of Southeast Asian Nations (ASEAN), and the ASEAN Coordination Center for Humanitarian Relief in Disaster Management plays an important role in this regional coordination.

3 Response Led by the Government

Immediately after the earthquake, the local government organized evacuations and directed people to take shelter in safe outdoor areas to avoid the risk of aftershocks and landslides. The province of Sulawesi then declared an initial 14-day emergency response period from Sept. 28 to Oct. 11. Indonesia's National Disaster Management

Ministry (BNPB), Police and Force Forces (TNI), National Search and Rescue Agency (Basarnas) and related ministries responded quickly to the affected area to carry out rescue work, focusing on evacuating trapped people, conducting rapid disaster assessment, and distributing food and relief supplies; activating field hospitals to provide good medical and health services, and conducting mass burials to avoid the spread of diseases; accelerating the recovery of infrastructure such as roads, seaports and airports, and the restoration of key services such as electricity and telecommunications [16].

In terms of international assistance, on the third day after the disaster, the Indonesian government made a public appeal for international assistance through BNPB and the Ministry of Foreign Affairs (MOFA). As the scale of response expanded, the government gradually adjusted its principles of receiving international aid (see Table 1), eliminating international search and rescue teams and emergency medical teams from disaster response and limiting their access while asking them work in cooperation with Indonesian national and local organizations [17]. The Ministry of Political, Legal, and Security Affairs, the MOFA, and BNPB formed a task force to review international aid and seize the “initiative” in the overall relief work, which gradually emerged as a nation-led, region-coordinated, and society supported post-disaster response model.

4 Relief Coordinated by the Region

As the attention and involvement of international stakeholders have increased significantly, there is an urgent need to establish a well-functioning and efficient coordination mechanism for the rational distribution of relief resources. As an important part of the “One ASEAN, One Response” framework, the ASEAN Coordinating Centre for Humanitarian Assistance in Disaster Management (AHA Centre) was firstly designated by the affected country, Indonesia, to support BNPB in assuming the role of an international relief coordination hub [16], serving as a entry point for international aid at the policy level (Jakarta) and at the operational level as the core of coordination and management of on-site assistance (Palu and Balikpapan). To some extent, it also reflects the new trend of current response to major disasters, i.e., countries are no longer relying simply on administrative forces to respond to crises, and further sinks their management focus to maximize the mobilization of NGO resources for a coordinated response, which also brings opportunities and challenges for regional and social forces to participate in disaster risk relief.

4.1 Receive of International Assistance

In terms of receiving international assistance, the Indonesian government has adopted two approaches: one is to provide assistance by MOFA through intergovernmental bilateral relations; the other is to fill out the standard operating procedure for regional standby arrangements “Assistance Proposal Form”. Finally, the AHA Centre summarizes the aid acceptance recommendations based on the guidelines issued by the Indonesian government and submits them to the International Aid Review Task Force for final determination (see Fig. 1).

Table 1. The post-disaster response led by Indonesian government

Date	Actors	Activities
28 Sep.	Indonesian Government	Coordinate with relevant agencies and NGOs to conduct rapid impact assessment and quick emergency response.
29 Sep.	BNPB	Senior officers have been dispatched to the disaster area and a special website has been set up to release information to the public and media.
	National Armed Forces	Mobilize forces to support emergency response in Palu and Donggala.
	Indonesian Police	Mobilize personnel, logistic, equipment, and medical to provide emergency response operation.
	Ministry of Energy and Mineral Resources	Carry out impact mapping, including building damages, land displacement, landslides, etc.
	Ministry of Communication and Information	Coordinate with telecommunication companies for the restoration of communication network.
	Ministry of Transportation	Mobilize personnel and equipment to repair airport runways and infrastructure.
	Ministry of Health	Mobilize medical teams and stand by the community health center in the area.
	Electricity Company	Mobilize personnel and logistical supplies in the Sulawesi region and start the investigation of sub-stations and electrical transmission
	Ministry of Tourism	Activate the Tourism Crisis Center for 24-h situation monitoring and coordinate relevant parties to collect disaster information of tourism industry.
	Ministry of Social Affairs	Deliver food, tents, blankets, and other supplies from back-up warehouses.
30 Sep.	Indonesian Government	Seven external emergency needs were proposed according to the ASEAN's Joint Disaster Response Plan.
	Ministry of Social Affairs	Coordinate the protection of displaced populations.

(continued)

Table 1. (continued)

Date	Actors	Activities
	Governor of Central Sulawesi	Announced an initial 14 days of emergency response period, dated from 28 September to 11 October 2018.
	Indonesian National Board for Meteorology, Climate and Geophysics	Dispatched a team to Palu to conduct microseismic, macroseismic, microzonation and post-tsunami surveys.
	Indonesian Government	After the Vice President visited the disaster-stricken area, the MOFA issued a statement on international assistance.
1 Oct.	Indonesian Government	Appeal of international assistance through BNPB and MOFA.
	BNPB	Strongly stated that humanitarian partners should make concrete and written recommendations first.
	Indonesian Government	Specific needs from search and rescue teams (USAR) and emergency medical teams (EMTs) are in discussions by OCHA, WHO and the local government.
	BNPB	Setup National Assisting Post.
2 Oct.	Indonesian Government	International USAR teams are requested to stand down. The need for international EMTs will be re-assessed by relevant authorities.
	BNPB	Subsequent stage of coordinated assessment will be done led by BNPB with the support of ERAT and other partners.
3 Oct.	Indonesian Government	Established a task-force for reviewing offers of international assistance.
	Basarnas	The Palu Search and Rescue Team acted as the lead agency for on-site operations.
4 Oct.	BNPB	Setup the Joint Operations and Coordination Center for International Assistance (JOCCIA), which co-located with BNPB's National Assisting Post.
	Customs immigration and quarantine (CIQ)	CIQ facilities and process for international assistance can only be done at Balikpapan Airport

(continued)

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Date	Actors	Activities
5 Oct.	BNPB and MOFA	Issued the decision on limiting presence of foreign humanitarian workers in the affected areas.
	Indonesian Government	The Vice President visited the affected city of Palu and outlined emergency response priorities.
	Geospatial Information Agency	Provided relevant layers for mapping through the website.
7 Oct.	The Bulog Public Corporation	Ready to distribute at least 200 tons rice reserve per province and 100 tons per city.
	Indonesia electricity company	Mobilized 1,141 personnel, and the electrical network is currently 90% restored.
	Ministry of Communication and Information	2G to 4G services is restored up to 60%.
10 Oct.	Indonesian Government	A total of 10,875 rescue troops were deployed, including 7,108 armed forces, 2,208 police, and 1,560 civilians.
11 Oct.	Governor of Central Sulawesi	The search and rescue operation ended on Oct. 11.
12 Oct.	Governor of Central Sulawesi	The disaster emergency response for Central Sulawesi was extended from October 13 to October 26.
18 Oct.	Indonesian Government	A total of 14,604 Indonesian armed forces, police and volunteers were mobilized to participate in the emergency response.
22 Oct.	BNPB	The portal for the registration of international aid assistance was closed as of 22 October 2018.
	Ministry of Health	A total of 5.5 tons of medicine, 2.81 tons of food for pregnant women, 3 tons of food for children, and surgical masks have been delivered.
26 Oct.	Customs immigration and quarantine (CIQ)	The Balikpapan airbridge was extended for an additional two weeks till 26 October.
	BNPB	The effort will then shift from emergency response to early recovery efforts.

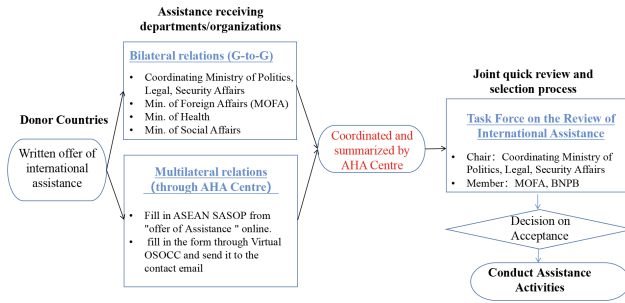


Fig. 1. The International Assistance Review Process

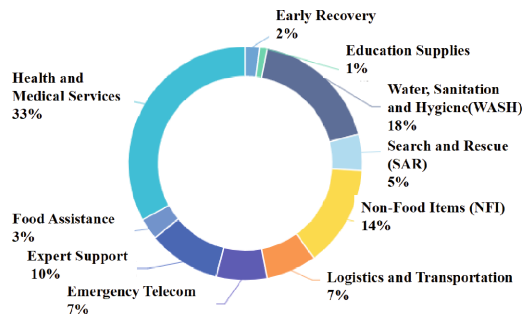


Fig. 2. Types of international assistance received by the Indonesian government as of October 13

As of October 13, the Indonesian government had received assistance from 112 countries and agencies, including international NGOs, intergovernmental organizations, international agencies, international private companies, and individuals (see Fig. 2). Assistance from urban search and rescue teams and emergency medical teams were declined, accounting for 39% of total assistance; the main categories of assistance received included water, environment, and sanitation (WASH, 18%), non-food item (NFI, 14%), expert support (10%), logistics and transportation (7%), emergency communications (7%), and food aid (3%), approximately 59% in total [18].

4.2 Coordination of On-site Assistance

The AHA Centre, as a relief coordination hub within the ASEAN region, led on-site coordination of rescue operations, disaster assessment and logistics, under the guidance of the Indonesian National Joint Task Force and the National Search and Rescue Agency.

First, in the field of rescue coordination, it penetrated into the scene of the most serious disaster in Palu and dispatched the ASEAN Emergency Response and Assessment Team (ERAT) to support BNPB in establishing the Joint Operations and Coordination Center for International Rescue (JOCCIA). AHA Centre coordinated joint disaster relief and emergency response including international aid forces, organizing operations such as search and rescue of personnel, information management, and distribution of humanitarian supplies. ERAT was mobilized to station at Balikpapan International Airport, the

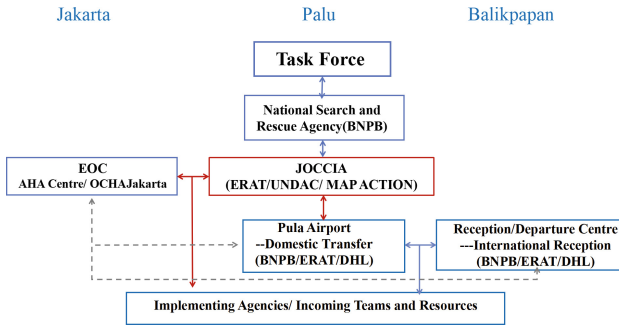


Fig. 3. The on-site rescue coordination workflow

entry point for international aid designated by the Indonesian government, and facilitate the rapid entry of international aid, register, track incoming relief supplies. What’s more, it supported the Indonesian government, organized diplomatic missions and humanitarian partners, held relief coordination meetings to inform the latest disaster situation and operational progress. Figure 3 shows the on-site rescue coordination structure established across Palu, Balikpapan Airport and Jakarta to facilitate an orderly post-disaster response.

Second, in the area of assessment and coordination, an information management working group led by BNPB, supported by AHA Centre was formed to conducted joint assessment of needs and data analysis. The working group also analyzed the potential demand for goods and services including water, food, sanitation, medical care, shelters, and response plans for special groups in order to support the Indonesian government’s timely adjustment of international aid reception guidance, coordinate the distribution of goods on the ground, and cooperate with the government’s post-disaster recovery efforts.

Thirdly, in the area of logistics coordination, AHA Centre mobilized the Disaster Emergency Logistic System for ASEAN (DELSA) to Palu and other affected areas with a total value of about US\$116,000, including tents, generators, fuel, etc. Two ASEAN Mobile Storage Units (MSUs) were dispatched and located near Palu Airport to provide temporary storage space for the large influx of supplies.

In addition to the above areas with practical support, the AHA Centre also demonstrated multiple “soft strengths” in this response coordination work. On the one hand, the AHA Centre has developed a series of systems and tools based on advanced technologies, such as the Humanitarian Logistics Tracking System, which registers aid materials in real time, provides feedback on logistics gaps, and matches available storage space. On the other hand, the AHA Centre provides indispensable “think tank” support in aid coordination, including ERAT members who undertake on-site rescue tasks, data analysts who conduct joint assessment of needs and communication experts who provide real-time communication security, effectively improving the efficiency of disaster response and making the AHA Centre gradually become the focal point of coordination.

This operation was one of the largest, most complex, and most comprehensive disaster response one the AHA Centre has been involved in since its inception, and was a best practice for disaster response coordination under the “One ASEAN, One Response” vision [19].

4.3 Assistance Supported by Society

Social assistance forces have various advantages in disaster relief, such as rapid response, wide range, and strong professionalism, which greatly alleviate the pressure of government disaster relief in areas such as infrastructure repair, material supply, relocation and resettlement, psychological guidance, and health and epidemic prevention [20–22].

The international NGOs and companies that were allowed to operate in the affected area of Palu during this response had two common characteristics: first, they were able to fill gaps in their areas of expertise, such as “GER3”, the receiving international NGO, which could use heavy equipment for search and rescue within the debris as a relatively scarce specialized professional organization [23]. Another characteristic is that they are usually partners registered within Indonesia for long-term cooperation with the government. For example, the international organization “Save the Children” is qualified locally in Indonesia and has a group of local staff with professional competence and field experience to obtain first-hand information and act quickly after the disaster, adjusting as soon as possible with the priority needs issued by the Indonesian government and shifting from direct assistance to indirect technical support.

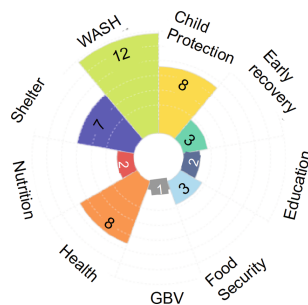


Fig. 4. The distribution of active partners as of October 16

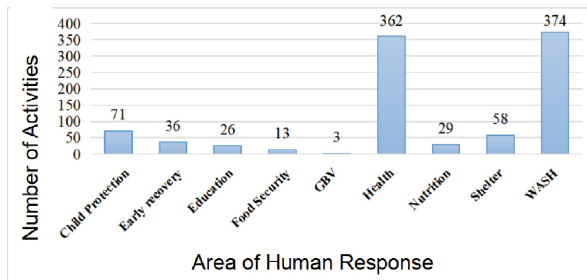


Fig. 5. The distribution of relief partners’ activities as of October 16

In addition to the received international forces, according to incomplete statistics, there are about 3000 local NGOs in Indonesia, of which about 2000 are active, which provide a wide range of services in disaster assistance response operations [23]. In order to scientifically allocate and utilize emergency resources, further utilize the respective advantages of social organizations, and avoid the problems of over-concentration of material donations and “fragmentation” of individual organizations’ actions in a loose and disorganized manner, forming a coalition with social organizations in the same field of expertise or in the same region in this operation also improves to a certain extent the influence and persuasiveness of social organizations in the dialogue with the government. The Humanitarian Forum Indonesia (HFI) is the driving force behind this initiative, which consists of 136 members from 12 local organizations, and is working through the UN humanitarian country team mechanism to unify and support the Indonesian government’s participation in joint assessment of needs on the ground, as well as logistical services for aid in the areas of medical, health, and food supplies [24]. The distribution of the number of NGOs active in the affected areas as of October 16 and the number of response actions are shown in Figs. 4 and 5. The above aid work was carried out in an orderly manner for the injured victims of the earthquake and tsunami to be treated promptly, the affected people to be properly settled, and the social order to be effectively maintained.

5 Discussion

Due to the suddenness and complexity of natural disaster risks, post-disaster assistance efforts at this stage are not enough to rely singly on government forces. And the domestic, regional, and even international agencies, social organizations, enterprises, and volunteers have become the backbone of the response. The response to the Central Sulawesi earthquake and tsunami in Indonesia is very different from previous sudden-onset humanitarian disaster responses and is an outstanding international case with multi-organizations involved in recent years. The Indonesian government plays a strong leading role and adopts many innovative practices in coordinating and mobilizing regional resources, such as designates for the first time a regional agency, the AHA Centre, to coordinate international and non-governmental assistance. And the Joint Operations Coordination Center for Cross-Regional Assistance (JOCCA) is changed to the Joint Operations Coordination Center for International Assistance (JOCCIA) for the orderly deployment of operations in various fields, avoiding the phenomenon of “teaming up” and “sweeping the snow in front of each door” by all responders in a rush under unexpected circumstances. It has fully reflected the high degree of centralization of the decision-making system and mobilized a wide range of participation in regional activities. At the same time, there are also problems such as weak pre-disaster risk preparation, inadequate horizontal linkage and sharing mechanism after the disaster, untimely information release, inadequate government coordination.

6 Conclusions and Suggestions

In this paper, we take a multivariate view of the “one axis, three locations, and a territory-wide risk response” in the Central Sulawesi earthquake and tsunami. Summarizing the “one axis” post-disaster relief status of the Indonesian government and related ministries at all levels, the “three locations” coordination structure is established by AHA Centre and responsive actions in the “region-wide response”. Hence, the study intends to provide useful suggestions for future disaster risk response, especially practical experience for the normalized participation of relevant parties from government, social organizations and enterprises in China.

First, expand the future cooperation under the ASEAN framework. With the improvement of national disaster risk management capabilities, the “internationally-led” disaster relief model of the Nepal and Haiti earthquakes is gradually replaced by the “national-led, regional coordination and social support” model. The “localized” access of international relief forces has gradually become mainstream, and the “multilateral” coordination within the region has gradually increased. Therefore, more efficient ways could be explored to participate in humanitarian response, with particular emphasis on promoting regional cooperation under the framework of ASEAN Forum and “10 + 1”. That is to promote understanding of institutional mechanisms and regular exchanges between the two sides in disaster “peacetime”, conduct training, drills and seminars on risk monitoring and early warning, emergency logistics, information sharing, etc., improve daily visibility and cooperation in wartime, and promote “from scratch to excellence”. It is crucial to establish effective partnerships.

Second, establish a model to flexibly form an international rescue team. It means, to re-examine the international humanitarian assistance model, increase communication with relevant international organizations, research institutions, civil society, establish a professional think tank in risk prevention fields; focus on the post-disaster response needs of the affected country, consider the entire establishment of the team to go out at the same time while taking into account the small-scale, single-module team model to implement response flexibly and practically, for example, select different experts to form small special task teams such as assessment teams, advance teams, coordination teams, communication teams; at the same time, establish rapid team application and approval process, and open application and approval fast track, etc. All of these measures aim to ensure that the rescue operation is fast, accurate and effective, which plays an important role in the field of international humanitarian risk response, demonstrating the image of China as a responsible power.

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References

1. Wei, Z. (2015) Study on the ASEAN Disaster Management. Central China Normal University.
2. Wang, H., Yang, Q. (2019) Research on Linkage Model for Disaster Prevention, Mitigation and Relief in Southeast Asia. *Crossroads: Southeast Asian Studies*, 03:45–51.
3. Wei, H. (2018) Study on China's Participation in Disaster Relief Cooperation Mechanisms in the Asia-Pacific Region. Central China Normal University Press, Wuhan.
4. Wu, X. Y. (2006) Analysis of Urban Earthquake Disaster Risk and Research of Evaluation System of Emergency Readiness Capability. Institute of Geophysics, China Earthquake Administration.
5. Kong, F., Lv L. L. (2018). Comprehensive Natural Disaster Risk Assessment and Policy Recommendations in The Belt and Road. The 35th Annual Meeting of the Chinese Meteorological Society.
6. Cui, P., Wu, S. N., Lei, Y., Zhang, Z. T., and Zou, Q. (2020) Disaster Risk Management Pattern Along the Belt and Road regions. *Science and Technology Review*, 38: 35–44.
7. Zhou, S. T., Zhai, G. F., Shi, Y. J. and Lu, Y. W. (2020) A Literature Review of Urban Natural Disaster Risk Assessment. *Journal of Catastrophology*, 35: 180–186.
8. BNPB. (2018) M 7.4 Central Sulawesi Earthquake - Impact and Response Activities.
9. AHA Centre. (2018) Situation Update No. 14 M 7.4 Earthquake & Tsunami Sulawesi, Indonesia. <https://ahacentre.org/situation-update/situation-update-no-14-sulawesi-earthquake-19-october-2018/>.
10. CWS. (2020) Rebuilding & Becoming More Resilient—Lessons from Two Years of Working Together in Central Sulawesi.
11. Caitlin, W., Barbelet, V. (2019) Localising Emergency Preparedness and Response Through Partnerships, Humanitarian Policy Group at ODI.
12. IFRC. (2018) Localization—What It Means and How to Achieve it. <https://reliefweb.int/report/world/ifrc-policy-brief-localization-what-it-means-and-how-achieve-it>.
13. OECD. (2019) Lives in Crises: What Do People Tell Us About the Humanitarian Aid They Receive? https://read.oecd-ilibrary.org/development/lives-in-crises_9d39623d-en#page1.
14. ActionAid. (2019) A Feminist Exploration of Women-Led Localization in the Central Sulawesi Response. Preliminary Findings. https://interagencystandingcommittee.org/system/files/preliminary_research_summary_women-led_localisation_0619.pdf.
15. Tufts University. (2020) “We Must be the Pioneers” Perspectives on Localization in the Response to the 2018 Sulawesi Earthquake in Indonesia. <https://reliefweb.int/report/indonesia/we-must-be-pioneers-perspectives-localization-response-2018-sulawesi-earthquake>.
16. AHA Centre. (2018) Situation Update No. 4 M 7.4 Earthquake & Tsunami Sulawesi, Indonesia. <https://ahacentre.org/situation-update/situation-update-no-4-sulawesi-earthquake-02-october-2018/>
17. AHA Centre. (2018) Situation Update No. 6 M 7.4 Earthquake & Tsunami Sulawesi, Indonesia. <https://ahacentre.org/situation-update/situation-update-no-6-sulawesi-earthquake-04-october-2018/>
18. AHA Centre. (2018) Situation Update No. 12 M 7.4 Earthquake & Tsunami Sulawesi, Indonesia. <https://ahacentre.org/situation-update/situation-update-no-12-sulawesi-earthquake-15-october-2018/>.
19. AHA Centre. (2019) ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management 2018 Annual Report. <https://ahacentre.org/publication/aha-centre-annual-report-2018/>.
20. Wilson, A. J., Oyola, A. Y. (2001) The Evolution of Emergency Management and the Advancement Towards a profession in the United States and Florida -Safety Science. *Safety Science*, 39:117–131.

21. Kang, W., Chen, X., Chen, B. (2014) Analysis of the Cooperation Network between Government and Non-governmental Organizations in Public Crisis Response Based on Social Network Theory—A Case Study on 4-20 Ya-an Earthquake. *China Soft Science Magazine*, 05:141–150.
22. Pan, Q. R. (2020) Analysis of Multi-Party Participation and Cooperation in Natural Disaster Relief: A Case Study of “6.23” Wind Disaster in Yan Cheng. *East China University of Political Science and Law*.
23. TRIAS, A. , COOK, A. (2019) Recalibrating Disaster Governance in ASEAN: Implications of the 2018 Central Sulawesi Earthquake and Tsunami. https://www.researchgate.net/publication/337784221_Recalibrating_Disaster_Governance_in_ASEAN_Implications_of_the_2018_Central_Sulawesi_Earthquake_and_Tsunami/link/5e84a777299bf130796e2d75/download.
24. AHA Centre. (2018) Situation Update No. 5 M 7.4 Earthquake & Tsunami Sulawesi, Indonesia. <https://ahacentre.org/situation-update/situation-update-no-5-sulawesi-earthquake-02-october-2018>.

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