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► **To cite this version:**

Mujiburrahman Thontowi. Bumikita Mobile Application: The Starting Point of a Children-Centred Approach for Multi Hazard Early Warning System in Indonesia. 5th International Conference on Information Technology in Disaster Risk Reduction (ITDRR), Dec 2020, Sofia, Bulgaria. pp.102-115, 10.1007/978-3-030-81469-4\_9 . hal-03761631

**HAL Id: hal-03761631**

**<https://inria.hal.science/hal-03761631>**

Submitted on 26 Aug 2022

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# **Bumikita Mobile Application: The starting point of a Children-Centred Approach for Multi Hazard Early Warning System in Indonesia**

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**Abstract.** Across the Indonesia Archipelago, children are affected by multiple disasters such as floods, earthquake, tsunami, forest fires and now exacerbated by the Covid-19 pandemic. Children and schools should be protected from disasters. During 1967 – 2020, 37,430 schools are damaged due to natural disasters in Indonesia. Since, March 16, 2020 virtually days without going to school. This research aims to unfold the convergence of Children Centred Approach and Multi Hazard Early Warning Systems in Indonesia as an effort to build resilience. This research is a case study of the mobile application called BUMIKITA which is translated to OUR WORLD by Save the Children in Indonesia. The location of the research is at the provincial level in Jakarta, West Java, Bali, and West Nusa Tenggara. The mobile app is potential to be developed into a Children Centred Multi Hazard Early Warning System. Currently there is still a few numbers of downloads with about 1000 users within a couple of months. Aggressive promotions are needed with an opportunity to collaborate with government agencies such as the Ministry of Education and Disaster Management Agencies to proliferate the mobile app to be utilized by parents, teachers, and children.

**Keywords:** Multi Hazard Approach, Early Warning Systems, Child-Centred Approach, Indonesia.

## **1 Introduction**

Many children affected by natural disasters in Indonesia. Data from the National Disaster Management Agencies state that 60% to 70% of disaster effected people are women, children and the elderly [1]. Besides facing deaths, injury or becoming displaced because of losing their homes, the access to education is jeopardized by a disaster according to various publication on disaster impact on education. During 1967 – 2020, 37,430 schools are damaged due to disasters in Indonesia [2]. Covid-19 has worsened the access of children to attain good education. Since March 16, 2020 the start of virtually days without going to school and all classes are online [3]. There is a high exposure to school in disaster prone regions from Single Hazard to Multiple Hazards Early Warnings. Sendai Framework for Disaster Risk Reduction emphasizes the importance of a multi hazard early warning system availability. The objective the early

warning systems is generally to save lives, but specifically to save children lives through a child-centred early warning system.

Large disaster should be perceived as a momentum for policy change and even as an evaluation to improve the existing early warning System. The current regulations of disaster management law need to be majorly revised. This can be an entry point for government officials the legislative to listen to the voice of children and to amend the law accordingly. Second, this is a good opportunity to develop a platform for children's engagement in the early warning process. One promising development is crowd sourcing such as Hackathon by Humanitarian Open Street Map, Citizen Reporting by Petabencana.id and Bumikita by Save the Children Indonesia. This research aims to unfold the convergence of Children Centred Approach and Multi Hazard Early Warning Systems in Indonesia as an effort to build resilience. Below is the schematic design of a multi-hazard early warning by WMO in 2018.

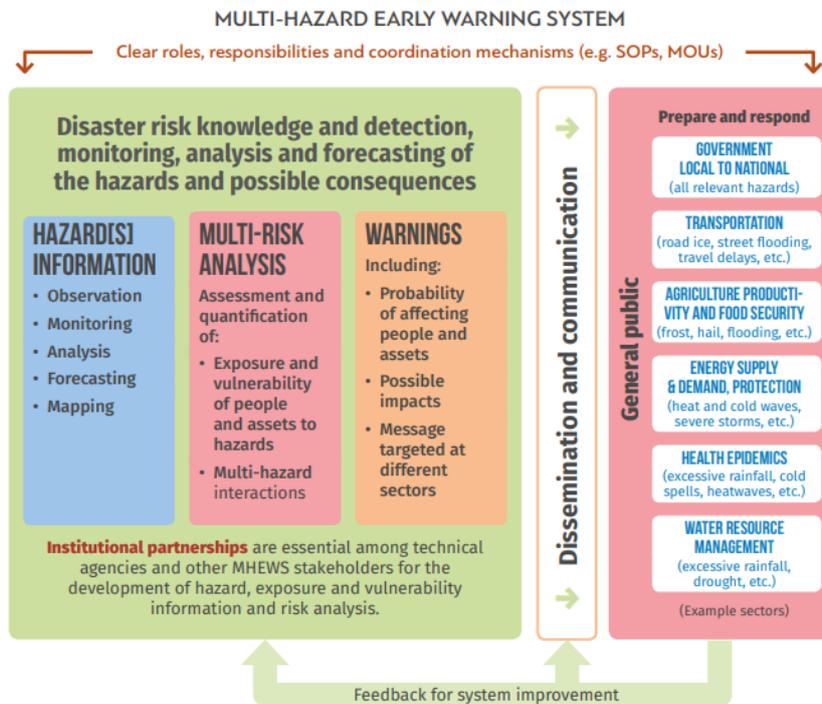
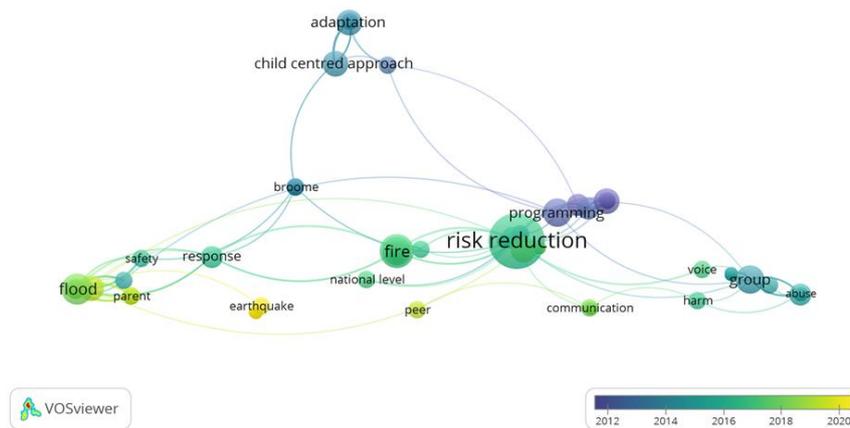


Fig. 1. Schematic of a multi-hazard early warning system WMO [4]

## 2 Gaps in Children Centred Approach for Multi Hazard Early Warnings

A solid body of literature on Child-Centred Disaster Risk Reduction has gradually evolved in recent years. It serves as a guiding framework for international and national

child-rights organizations [5]. The international community's concerns about children centred disaster risk reduction has grown significantly for instance the European Union and ASEAN [6]. 16 articles on child centred disaster risk reduction were gathered from explain from 2012 to 2020 using Scopus database. The following text analysis is developed by using VOS Viewer based on the 16 articles extracted from the title, abstract and key words:



**Fig. 2.** Text analysis of Children Centred Disaster Risk Reduction (2012-2020)

Referring to the figure, we can find that risk reduction is central to the study of child centred approach. Previously, Amri in 2017, [7] provides an explanation on bridging the divided between studies on disaster risk reduction education and child-centred disaster risk reduction. His disaster studies were conducted from 2001 to 2015. Multiple hazards have been frequently discussed in various researches on natural hazards such as fire [8], typhoon [9] flood [10] and earthquake [11]. Man-made hazards, harm, and abuse to children are also elaborated in these papers. These studies on child centred DRR poses a single hazard approach and have not adopted the multi hazard approach. Efforts to break through the concept of “working in silos” stresses the importance of communication between children and their families before and after disaster by reviewing multi-disciplinary literature from 2015 to 2017[12]. It becomes an imperative need of multi-disciplinary and multi-hazard approach for future uncertain and complex disaster that children will face.

Cultures, language, and geographic differences contribute to the variety of Child Centred Disaster Risk Reduction. Most of papers explain about child centred disaster risk reduction in Australia, followed by the United States and United Kingdom. In Australia, Towers studied the progress, gaps and opportunities [13]. Then children perception and adaptive behaviors response to seasonal change and extreme weather [14].

Furthermore, research to understand how a disaster resilience program reduce risk and how to increase the resilience of children and households in the region are critical

[15] These researches coincide with the Millennium Development Goals and the Sustainable Development Goals as well as from the Hyogo framework for action to the Sendai framework for action.

Studies focusing on the Asian and African regions specifically for CCDRR are limited. In Asia region, there are best practices from India, the Philippines, and India. In India, the research was developed based on the 2015 South Indian floods [16]. In the Philippines, translating children voices into action for resilience based on Haiyan typhoon [17]. Finally, Indonesian children experienced earthquake disaster in Lombok. The research draws attention to children rights violations such as basic survival, freedom from abuse and exploitation, access to health and education [18]. In South America a research was conducted to listen to Ecuadorian children about disaster [19]. In Africa, a research related to the establishment of a child centred disaster management framework in Zimbabwe was carried out in 2015[20]. One of the rights which was not discussed in the study is the right to information or warning system for children, even though preparedness activities was reported lacking in schools and minimal involvement of children.

Realizing the gaps of the previous researches, it is important to understand the convergence of Child centred approach and Multi Hazard Approach within the context of Multi hazard early warning systems in Indonesia. Especially, by looking deeper into the digital disaster risk management ecosystem which is central to the Bumikita mobile application. The purposes of this research are as follow:

1. Understand the development, features and convergence of Children Centred Approach and Multi Hazard Approach through the mobile apps Bumikita
2. Map out the feedback for continuous improvements and development the embryo of a children centred multi hazard early warnings
3. Identify the stakeholders in the penta-helix to support the mainstreaming of child centred disaster risk reduction

### **3 Methodology**

A mix method design was deployed in this qualitative method for description based from interviews and focus group discussion. Furthermore, quantitative methods were applied by using a feedback form which distributed via online after 6 socializations webinars and workshops for the apps Bumikita organized by Save the Children Indonesia. The analytics from android apps was collected from seeing the download rate daily from April – October 2020. A total of 340 participants submitted the feedback forms and a total of 2118 times the have been downloaded from android devices from various version such as 435 users in Android 8.1, 178 users in Android 7.1, 686 users in Android 9 and 311 users in Android 10 and 508 users unspecified.

Case Study was used to understand the usage Bumikita apps. The location of this research is at provincial level in Jakarta and Bandung, West Java. Interviews with Government Agencies and Focus Groups Discussion with Save the Children and its partners such as Humanitarian Forum Indonesia. Field research was conducted in Bali and West Nusa Tenggara.

Primary Data was collected through interview with government officials of BNPB, Education Department in Jakarta, Education Department in Lombok and Education Department in Bali. Focus Groups with Save the Children at National Headquarters – Concerning MHEWS and Save the Children at Sub-national Level Lombok – MHEWS. Finally, Observations webinar by Save the Children via Socialization of Bumikita, Voice of Children to International Forum and Voice of Children at National Forum – to Legislator and National Government Agencies.



**Fig. 3.** Multi Hazard Map National Disaster Management Agency Indonesia (BNPB) at [inarisk.bnpb.go.id](http://inarisk.bnpb.go.id)

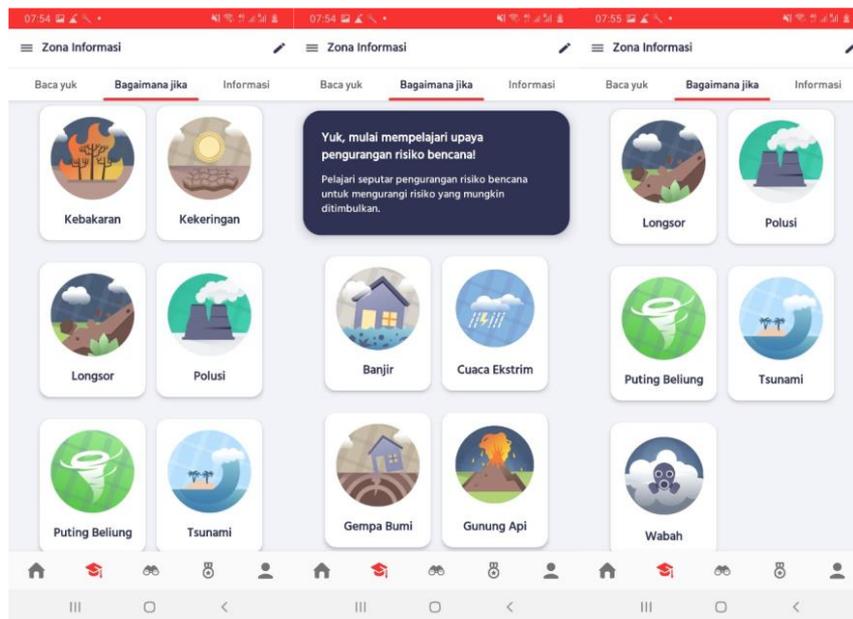
## 4 Research Findings

This section will discuss about the convergence of a child centred approach and Multi-hazard early warning system. The findings show that the Apps Bumikita is a starting point for a Children Centred Multi Hazard Early Warning System. Currently, there is a few numbers of downloads which is about 1825 users within the first two months with 70% of active accounts. Aggressive promotions are needed. There is an opportunity of collaboration with government agencies such as the Ministry of Education and Disaster Management Agencies to proliferate the mobile app and to be used by children at the later stage. Bumikita is a free online mobile application which provides information about multi hazards in Indonesia.

The features of the apps are: Monitoring zone, Information zone, Leader board, Lets read, How if and People stories. There is a push notification called “REPORT DISASTER” that the user can report and trace all disasters in Indonesia. The feature includes report first an active hazard in your location, a page about education concerning Disaster Risk Reduction and Mitigation; second, “How if” an interactive game play on how to prevent and face an incoming hazard; third, a map to the nearest disaster management agency/post; fourth, a leader board that counts the experience points of the user. Below is the first feature appearance.

The above monitoring of hazards zones and information zones are beneficial to be the foundations of a child centred multi hazard early warning system. It is visually pleasing and appealing to children. Currently, this apps is connected to the earthquake

and tsunami warning systems. In the future, it needs to link up to the forest fires from the SIPONGI Apps by the Ministry of Environment and Magma Indonesia from the PGMBG.



**Fig. 4.** Multiple hazards for understanding risk for children in the information zone.

Socialization of the Bumikita apps includes 1) meeting with the national disaster management agency on explaining the platform and apps, especially the helpdesk and Bumikita app. Support BNPB for the in the 1 million face mask movement by providing donation of face mask. 2) The usage of YouTube to launch the Apps via a video. 3) The usage of Facebook to share the developments of BUMIKITA apps using a webinar format. An opportunity for children voice to be head by international and national policy makers. The figure below shows the daily downloads of Bumikita Apps.

The rise of downloads is closely related to the activities conducted by save the children such as the apps dissemination. The month of August and September 2020 have a significant increase of user acquisitions. The most users are using the version of Android 9, android 8.1, android 7 and final android 10 still minimal users. A more active participation is needed to be conducted by children before a disaster strike by utilizing the Bumikita Apps.

The introductory workshops on Bumikita are conducted from July to September 2020 with a total of 7 events: 18 July with the Youth Red Cross, 25 July with U-inspire, 26 July PMI DKI, 27 July with Pramuka / Scouts and 30 July with Bali Red Cross. Another activity is a training for Bumikita Champions. Two activities were held to build champions for Bumikita on 17 September – Training for Bumikita Champions and 30

September – Training for Bumikita Champion. Additional Champaign from Youtube upload was also used to promote Bumikita and a guideline of how to use Bumikita apps.

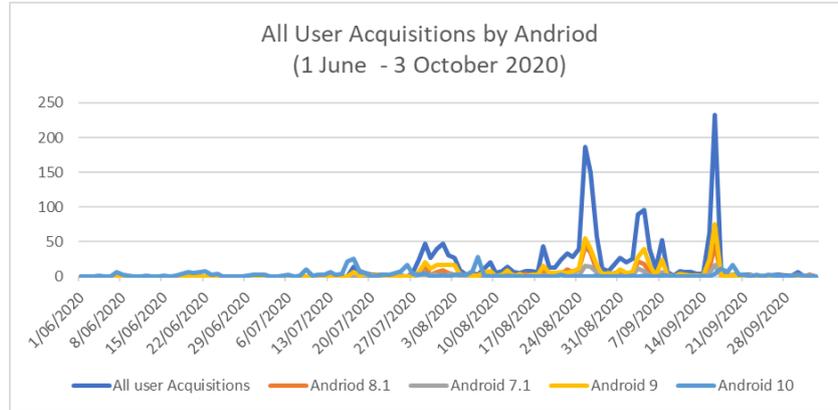


Fig. 5. Daily Downloads of Bumikita App

Table 1. Feedback about the participation on socialization and training

Question	1	2	3	4	5	6	7	Total
<b>Participants</b>	18 July	25 July	26 July	27 July	30 July	17 Sep	30 Sep	340
<b>How do you feel about participation</b>	120	17	94	55	21	21	12	
Happy	31	x	23	13	10	5	6	88
Very happy	87	x	70	42	11	15	6	231
Normal	2	x	1	0	0	0	0	3
<b>Do you feel that the materials is useful?</b>								
Useful	24	13	10	13	7	3	5	75
Very Useful	96	4	83	42	14	17	7	263
Normal	0	0	0	0	0	0	0	0

The participants feel happy and useful about the socialization and training of the Bumikita. This needs to be spread to other regions. Socialization for disaster preparedness was also conducted in other locations and other organizations. Interview results with head of education department in Karangasem, Bali explain the importance of the cooperation with Save the Children Indonesia during the Mount Agung Volcano Eruption. Besides teachers training and establishment of contingency plan for education in emergency, evacuation after a warning and disaster simulations. On the other hand, During the FGD results, Bali Red Cross conducted similar activities with schools such as disaster preparedness schools (Sekolah Siaga Bencana), activities with the youth red cross and recruitment of volunteers, before, during and after a disaster. They used various apps to monitor disaster such as the official apps form the government such as Info BMKG, Magma Indonesia and InaRisk. Focus group with Save the children Lombok provided examples of work with children before, during and after the earthquake. They relied on official information from official agencies apps and even using WhatsApp. Lombok island is also a potential region to share the BUMIKITA apps, socializations, and training of champions.

Online feedback about the apps. The general review on google play store was positive from people who downloaded the apps. There is a total of 32 reviews with the majority providing 5 stars, 4 stars and 3 stars. There was no review that provided a 1 or 2 stars for the Bumikita apps. For the reviewer that provide a score of 3 and 4 stars stated that: “Sorry I was asked to download. Even though my storage is low “ (8 August 2020). “How do you use it, I don’t understand, I ASK FOR GOD FORGIVENESS, I’m sorry I uninstalled but I give a star, okay” (19 September 2020). “ I was also told to download this app but if you want to be safe from natural disasters all you need to do is pray and throw your rubbish away in an appropriate place, what is so hard about that?” 19 September 2020). A reviewer that provided a 5 star also felt forced to download the app stating that: “For the sake of the webinar, I was forced to install the app, it does not matter for the developer to make money” – 8 August 2020.

While, other he 5 Star comments are very positive and encouraging: “The application is very good ... By downloading this apk, you can know some of the actions to take when a disaster is coming ... even though you know how to cope with disasters but ... At least you can be broader in knowing what actions to take when faced with ... (26 September 2020). “Very good, very helpful in understanding risk reduction when a disaster occurs. Besides that, we can also find out what disasters are around us. Ayoo guys .. Really cool”( 24 August 2020) “like it alot, I can report the dangers in my area”- 8 August 2020 and “there are XP (experience Point) and the avatar at the start is cute the most exciting is to play what if” – 8 August 2020. The usual one-line comments such as “Very good” – (8 August 2020), “Very satisfied” – (23 June 2020), “Good” (24 September 2020) and “Great” (20 September 2020). The comments from google play store is more open compared to the comments from the webinar socialization and trainings. More open critics should be encouraging by participants especially the children and youth. The feedback from Workshops and Online Webinar Bumikita Features can be seen in the table below:

**Table 2.** Feedback about the participation on socialization and training

Question	1	2	3	4	5	6	7	Total
	18 July	25 July	26 July	27 July	30 July	17 Sep	30 Sep	
<b>Participants</b>	120	17	94	55	21	21	12	340
<b>What features do you like the most? (Can choose more than one)</b>								
Monitoring zone	51	x	32	29	4	8	0	124
Leader board	14	x	11	10	1	8	1	45
Information zone	120	x	73	40	16	13	11	273
Lets read	64	x	38	40	6	13	7	168
How if	40	x	36	17	4	10	2	109
People stories	37	x	24	12	3	8	2	86

Source: Save the Children (2020) modified by Author

First, the most voted features are the information zone, then the let’s read and monitoring zone. This is most voted based on their similarities which is the passive usage of the apps. Most users just want to learn about the app first before contributing. The next votes are followed by how if and people stories. This requires more effort and contributions from the user in this case children or youth. This can be part of the crowd sourcing and children participations in disaster risk reduction. Children can also be a content

creator using the apps telling stories or reporting disasters. This entails active children participation. The least voted is the leader board, it is probably not well explained during the socializations and training. The video tutorials on YouTube also lacks the detailed explanation about the leader board and experience point concepts.

Digital disaster risk management ecosystem from triple-helix to penta-helix. An effort for mass coverage and adoption of Bumikita. In the past the term tri-helix has been used in Indonesia's research community from describe the three main stakeholders for research innovation in the Bumikita Apps or MHEWS with are the academic institutions (ITB), government (BNPB), and private sector/Industries (Google). The tri-helix emphasise the importance of research to practice. The disaster management have adopted this concept to include additional stakeholders such as the media and community as mayor players in disaster management, hence it is called the Penta-Helix. Innovation of mobile technology withing the disaster science have been relative slowly adopted by the government, due to barriers between the researchers and industry. The lack of government incentives to support private sector in funding research on disaster management or even preparedness. The majority companies still have a mindset of providing donation during a disaster which is more favorable and gains wide media coverage than just a going a Corporate social responsibility try to eliminate the vulnerabilities in a disaster prone region or funding research at universities is still limited. It was a major a significant deal that google funded the project at save the children in Indonesia do develop the Bumikita apps.

Save the Children needs to consider maximizing the use of the media. The addition of media and community makes the cooperation for innovation more complex but on the other hand more participative. The "end users" of the technology being the community can have an important role during the co-planning, co-creating and co-implementing phases. The term "End-users" can be disregard because they become part of the innovation process from the start. While the process is tedious and takes a long time, the usability and usefulness for the community is even more valued. The jargon "people centred" has been used as a label by the government to make the early warning systems seems favorable to the public. Whereas in fact, the participation of the community is vague in the regulations and standard operating procedures. Feedback on the apps becomes an important consideration and act as an accountability.

The media channeling the voice of voiceless who are children. The national media as a channel of information is like a two-edge sword, as a mouthpiece of the government disaster warning dissemination or as a watch dog of government policies and actions. The media is tamed by daily and monthly press conference in the National Disaster Management Agencies Headquarters in Jakarta. Even vast efforts by the national and local government to make Media Forums and Media Volunteers for Disaster Management. At times, the media will attack the government, by going investigative journalism, exposing the weakness, finding cracks in the field, far beyond the national image, like a dog biting its master. Especially media coverage concerning the failure of early warning systems to save lives. Poor journalism has also led to the increase of spread of hoax and fake news. The lines have even been more blurred by the emergence of social media and citizens journalism. The app must be able to create disaster and risk literacy, under the umbrella of media literacy. It should be a weapon to fight against hoax and

misinformation. Children and youth using Bumikita can provide important information about disaster from a children perspective.

The rise of social media platform in disaster management is a blessing in disguise. The coverage, participating and engagement of the community presence online is something that cannot done in the past. Before Facebook, twitter and YouTube was invented, the only traditional source of information from broadcast media such as TV and Radio including the printed media such as newspapers and magazine. This type of traditional media is only one way. The social media have created a hyper interaction between the knowledge producers and knowledge consumers. The drawbacks of social media are its spread of unfiltered content, such as the spread of hoax and rumors related to disaster. Even truths or scientific discoveries become bombastic headlines that creates fear and alarms in the community. In some cases, the scientist with their claims are threatened by the law to withdraw the findings and request to apologize to the community for making alarmist claims. Such research like the possibility of an earthquake and tsunami that occurs in the southern part of Java and Bali. Not only the scientist is captured by the law, the community is also in jail because of spreading hoax when an earthquake occurs, and then he spread in Facebook that after the earthquake and tsunami will come and strike the coastal area. This post caused panic in the northern part of Bali, and people run and evacuated to safety. The official report from BMKG is that there is an earthquake but no tsunami warning.

Children need to be aware of hoax about disaster. Especially with the problems with social media as a dissemination of warning is the term "Echo Chambers" "epistemic bubbles" which are used in research related to media. The Echo Chamber of government and its partners such as NGO's who work in the disaster management context. In Jakarta you can hear the term "You Again You Gain" which is a translation from "Loe Lagi Loe Lagi" or the 4L's. Since the humanitarian and disaster management sector is a closely tight groups of people, it's the same people who are concerned about disasters and early warning. While the connections and collaborations are strong, formal and informal information between spread within in the networks. Especially the activist from the 1990's, especially after the fall of the Suharto Era, after the humanitarian workers in conflict and disaster settings are still active until now, with more and more young generation joining the efforts for disaster risk reduction. From becoming students, being volunteers and joining international organizations, attain masters and doctoral degrees and returning to Indonesia to contribute to disaster management in Indonesia. Same type of people from same type of organizations. These people are from government and from non-government institutions. There are reinforcements that makes them feel that what they are going is right. Information spread in these groups and networks but not all of it di disseminate out of the disaster management groups to the wider community. Having a simple post or retweet a government dissemination and warning does not mean that it spreads to all members of the public. Maybe just between you friends and family. Your followers who are not concerned about disaster management will just disregard the post that is plied up in the timeline. In some cases, hoax spread in these groups, but it is quickly negated and followed up by an apology and removing the message or post.

On the other extreme, networks or groups who are not connected to any humanitarian or disaster management sector. The spread of hoax and rumors will spread like wildfire. Sharing and sharing without anyone from the group to verify the fact about the post or message. This becomes fatal since the negation or verifications of the hoax is virtually non-existent. These occur in religious groups, village groups, women's groups, and youth groups. In these senses the efforts which have been done by the government and NGO's, but these efforts have not reached all villages and population at risk. The advancement of technology related to instant messaging have accelerated the spread of hoax from the initial usage of SMS which as a limited broadcast can only send one SMS at a time in the 90's and early turn of the millennium, to the introduction of blackberry messaging (BBM) with a maximal group size of 30 people and now with WhatsApp which can house 256 people. The future can be with even more people having capabilities to broadcast even more such as using Facebook, twitter and other open social media networks, telegram which can have super groups which can include 5000 members of a group. Bumikita Apps can be shared among social media platforms.

## 5 Conclusion

The convergence of the Children Centred Approach and Multi Hazard Approach is very important. It can be used to revise the multi hazard early warning system. We should start at a young age to make children understand about the risk around them and they should also get involved in monitoring hazards, help disseminate the warning to peers and act accordingly. They will become the future leaders. It's important to empower the children and youth. Bumikita apps is a ground-breaking app for make disaster preparedness a part of the digital ecosystem in Indonesia. It marks the starting point of a child centred-Multi Hazard Early Warning System. Second, the important of feedback from children, parents and teachers to improve the usability of the mobile apps. Finally, understanding the digital disaster risk management ecosystem which involves the 5 major sectors elaborated in the Penta helix with is government, private sector, universities, media, and community (including children).

The recommendations for the mobile apps features and feedback mechanism. Provide additional features for the BUMIKITA APP which is a "Our Surroundings". You need to know if your house is safe, if your school is safe and if your workplace is safe? These questions will make the app more relevant to everyday life. Are our house, school, and work in a disaster-prone region? Weekly updates of disaster such as the AHA center or UNOCHA weekly update. Currently is a be-weekly update of the apps. To be able to access without internet connection since not all village have access in Indonesia. Gamification aspect should be able to access without the internet connection. There should be an offline mode and online mode. The offline mode has limited capacity and features which is understandable. Language is important in terms of communicating risk. The use of local language and foreign language will make the APPS more accessible. In many project sites, the use of local language is more important that using the national language. On the hand, for guess in Indonesia, to have an English version so not for Indonesian. A possible to be scale-ed up to the Asia Pacific Region. The app

can target children tourist who are currently traveling in Indonesia and to be replicated in other save the children project sites. To increase the user numbers is by developing the app compatible to both android and apple apps devices. Further, research to get the perception and gain valuable insight to improve the BUMIKITA apps of teachers and children is advisable.

Recommendations for creating awareness about the Bumikita. The recommendation is a larger campaign to spread apps, increase people to download and use in schools. The priority of schools-based Data from DAPODIK (Database of Schools in Disaster Prone Regions from the Ministry of Education). Part of a safe school initiative for teachers to download and promote to students and parents. The apps should target University students and youths to actively download. Possible future cooperation with government agencies such as a cooperation with the National Disaster Management Agencies is recommended. It aims to have access to the INARISK database and link it to Bumikita. INARISK is for adults, but BUMIKITA can be transformed into an INARISK for Kids. It is essential to add information about volcano warning such as short updates of volcanos that erupted in Indonesia and have the distance to your location or information about hotspot in the notification. BUMIKITA can be a part of government agencies program in sharing information on disasters such as “go to school program” since many government agencies conduct activities at schools. This is an opportunity to also spread and increase the engagement and establish cooperation with google on earthquake early warning system. We need to consider the usage of social media to increase awareness and improve traffic to the website such as by putting hashtag of #bumikita #savethechildren #savebumikita #MHEWS #Childcentred. This will improve the visibility of the mobile app. This should link up to go to school programs by government and local NGOs and not just spreading in the virtual space but also in the real-world scenario.

## Acknowledgements

I would show my appreciations to Save the Children Indonesia for letting me research out Bumikita Mobile Applications and access to meetings, webinars, and data. To my scholarship funding from LPDP under the Ministry of Finance, Republic of Indonesia. Last but not least to my supervisor who provide constant support in Charles Darwin University, Northern Territory, Australia.

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