

December
2017

Impact Assessment Report

Mt. Agung, Bali, Indonesia



Conducted by:
ADRA Indonesia
HelpAge International

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ACRONYMS

No.	Acronym	Bahasa Indonesia	English
1	ADRA		Adventist Development and Relief Agency
2	BASARNAS	Badan SAR Nasional; Badan Nasional Pencarian dan Pertolongan	National Search and Rescue Agency
3	BMKG	Badan Meteorologi, Klimatologi dan Geofisika	
4	BNPB	Badan Nasional Penanggulangan Bencana	National Disaster Management Authority
	BPBD	Badan Penanggulangan Bencana Daerah	Regional Authority for Disaster Management (Province/Regency/ City)
5	BPPSPAM	Badan Peningkatan Penyelenggaraan Sistem Penyediaan Air Minum	Agency for the Improvement of Drinking Water Supply Systems
6	BTS		Base Transceiver Station
7	CHC	Pusat Kesehatan Masyarakat (Puskesmas)	Community Health Center
8	ECB		Emergency Capacity Building
9	EWS	Sistem Peringatan Dini	Early Warning System
10	HFI		Humanitarian Forum Indonesia (Faith-based Humanitarian NGOs/ Organizations)
11	HDI	Indeks Pembangunan Manusia	Human Development Index
12	HT		Handy Talky
13	IDP	Pengungsi	Internally Displaced Persons
14	ISPA	Infeksi Saluran Pernafasan Akut	Acute Respiratory Tract Infection
15	JNA	Kajian Kebutuhan Bersama	Joint Needs Assessment
16	PDAM	Perusahaan Daerah Air Minum	Regional Enterprise of Drinking Water
17	PHBS	Perilaku Hidup Bersih dan Sehat	Clean and Healthy Life Behavior
18	PLN	Perusahaan Listrik Negara	National Electricity Enterprise
19	PMI	Palang Merah Indonesia	Indonesian Red Cross Society
20	PPE	Alat Pelindung Diri	Personal Protective Equipment
21	PUPR	Pekerjaan Umum dan Perumahan Rakyat	Public Works and Civil Housing/Residence
22	PVMBG	Pusat Vulkanologi dan Mitigasi Bencana Geologi	Center for Volcanology and Geological Disaster Mitigation
23	WITA	Waktu Indonesia Tengah	Central Indonesia Time (GMT+8)

ACKNOWLEDGEMENTS

Key to the development of this report was the commitment of the assessment team, who was led by D'Karlo Purba and supported by Ralfie Ch Maringka and Kyriakos E. Erlan. Marthen Leuna and Bobby Kikhau provided logistical support to the team, and Dr. Juma Khudonazarov and Robert Patton technical advice.

Much of the detail contained in this report would not have been possible without the willingness of government departments and state-owned companies' staff who gave of their time to provide information through interviews and to share key documents (see Section B in the report for details).

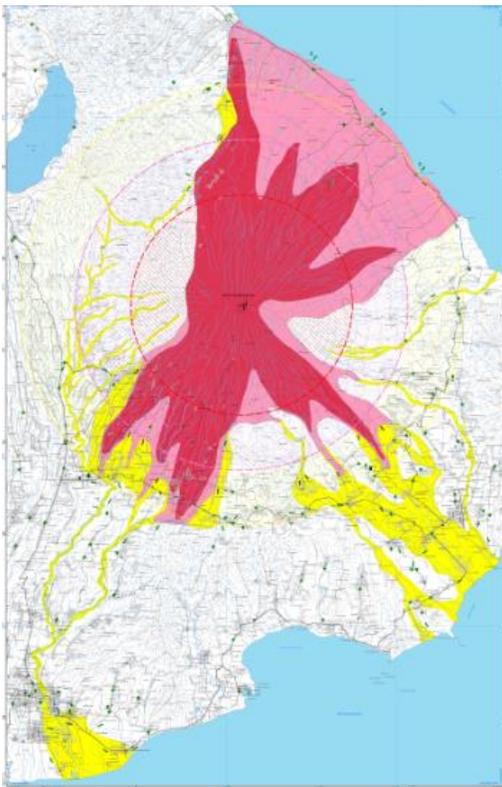
Additionally, there was the Denpasar Seventh-day Adventist Church and Permata Ibu Seventh-day Adventist Elementary School that was used as a basecamp by the assessment team, YAKKUM Emergency Unit, who helped with contacts and basic key information, Wahana Visi Indonesia (partner of World Vision Indonesia) who informed the Shelter cluster about the plan for the Impact assessment work, and Sinduwati, Sangkan Gunung, Tangkup, Wisma Kerta Village Heads and volunteer team, and the Rending Agriculture Camp Managers.

Funding support from the START Network enabled all of the activities required to produce this report.

A. INTRODUCTION

This report presents the outcome of a Rapid Impact Assessment of communities and key infrastructural elements that are exposed to an eruption of Mt. Agung on the island of Bali, Indonesia. The assessment was jointly conducted by ADRA Indonesia and HelpAge International from 17 – 21 December 2017. The purpose of the assessment was to identify the current impact of the Mt. Agung eruption since 21st November 2017, and to project the likely impact of an eruption similar to, but not greater than, the 1963 eruption. The Impact Assessment was based on a Potential Impact Map prepared by PVMBG that was being used by BNPB and which was widely publicised. The assessment was limited to the Karangasem Regency.

Potential Impact Map



Karangasem Regency Map



ADRA Indonesia personnel directly involved in the data collection were D’Karlo Purba, Ralfie Ch Maringka, and Kyriakos Erlan, with logistic support provided by Marthen Leuna, ADRA’s representative in Bali. Robert Patton, Emergency Management Technical Advisor from ADRA Asia Regional Office, assisted the team in providing a generic assessment tool as a guide for collecting data and advising the team during the assessment.

The team conducted the assessment from 17 to 21 December 2017, attending meetings, conducting interviews, and collecting data in Karangasem Regency and from the Bali Province Centre of Statistics Bureau in Denpasar City. Juma Khudonazarov from HelpAge International, who was in Bali for a needs assessment focused on the elderly, provided technical advice to the ADRA team on likely key data sources.

B. DATA COLLECTION

To identify the maximum credible eruption event and the consequential impact of such an eruption, team members identified key sources of data, interviewed key persons at government agencies and relevant state-owned companies and reviewed key documents. The following individuals were contacted and interviewed:

1. Lieut. Col. Benny Rahardian, Incident Commander at Tanah Ampo, Mt. Agung's Response Operation Command Centre, Karangasem Regency
2. Mr. Sangtu Adi Sanjaya, Bali Province BPBD's Operation Control Centre Staff
3. Mr. Ketut Arimbawa, Karangasem Regency BPBD Head/Chief Operation Officer
4. Mr. I Gede Pawana, Chief of Pasebaya (a representative for a communication forum consisting of the 28 villages within the danger zones)
5. Mr. Weda, Secretary of Karangasem Regency Department of Public Works and Civil Housing
6. Karangasem Regency Department of Education Staff
7. I Ketut Subawa and Nikomang Artini, Department of Health of Karangasem
8. Mr. Agung and Mr. Sigit Padmono, National Disaster Management Authority's (BNPB) Mitigation and Preparedness Deputy Staff
9. Mr. I Made Ari Susanto, Department of Livestock and Animal Health, Deputy Head
10. Mr. Surya Admaja, State-owned, National Electricity Company's (PLN) Karangasem Field Office Manager
11. Mr. Gusti Singarsih, State-owned, Regional Drinking Water Company's Director
12. Mr. Sukarba, Section Head of Karangasem Regency Department of Housing and Residence.

The government documents, mostly in digital form, that were obtained from the National Statistics Centre offices in Bali Province and Karangasem Regency, and from specific departments that were contacted for this assessment are:

1. Karangasem Regency Contingency Plan
2. Public Works and Civil Housing Department's Emergency Operation Plan
3. Health Cluster Emergency Operation Plan
4. Minutes of Meeting of Tanah Ampo Command Centre's Daily Evaluation
5. Karangasem Regency's Department of Health Profile year 2017, e-book and e-report
6. Karangasem Regency in Figures year 2017, e-book
7. Eight e-books Sub-district in Figures year 2017 (8 sub-districts within Karangasem Regency)
8. Bali Province in Figures year 2017
9. Local and national News sources post-eruption of 21st November 2017
10. Several thematic maps sourced from BNPB website

All these documents and interviews enabled the ADRA Indonesia assessment team to identify the likely impact in the event of an eruption of Mt. Agung consistent with the 1963 eruption.¹

¹ BNPB's Thematic maps: <http://geospasial.bnpb.go.id/category/peta-tematik/gunungapi-peta-tematik/>
with presentation of Sub-district and village offices: <http://geospasial.bnpb.go.id/wp-content/uploads/2017/10/PETA-SEBARAN-PERKANTORAN-DI-SEKITAR-GUNUNG-AGUNGG.jpg>

C. ASSESSMENT FINDINGS

C.1 Update of Mt. Agung²

The current period of volcanic activity at Mt. Agung was first noted in early August when volcanic earthquakes were recorded. The intensity of these increased, along with some volcanic plumes that were visible. This resulted in BNPB declaring a 12km exclusion zone around the volcano on 24 September that resulted in the evacuation of about 120,000 people. By late October volcanic activity had decreased significantly, so that on 29 October the alert status was lowered to 3 (with 4 being the highest level).

Mt. Agung erupted again on 21 November 2017, resulting in wider cracks on the crater and other indications of rising magma. A second eruption followed on Saturday 25 November, with magmatic eruptions in bright, reddish yellow lava that continued until the next morning. These eruptions were not as large as that of 1963. The volcano's activity can be seen live, plus related information from the Observatory Post at Rendang Sub-district and Command Centre at Tanah Ampo via this link:

<https://www.youtube.com/watch?v=vIr-RmByqN4>.

The Centre of Volcanology and Geological Hazard Mitigation (PVMBG) reported that since December 4, the volcano could be seen spewing whitish to greyish smoke with a medium pressure up to 1,500 metres above the crater towards the east and west, with tremors continuing to be recorded. PVMBG flew a drone over the volcano in mid-December to take aerial photographs and it was identified that around one third of the crater is now filled with lava. PVMBG is unable to conclude whether the magma will continue to move up the crater or will go down. According to the Head of Division for Mitigation PVMBG, Gede Suantika, it would take years to completely fill the crater with lava with the speed of current magma movement into the crater. PVMBG continues to monitor the volcano and regularly provides updates on the status of Mt. Agung.

Since December 21, visually the volcano has been covered by a veil of cloud. Whitish to greyish smoke with medium pressure is rising up to 500 – 1,000 metres from the crater towards the east and west. At night the lava flare from the peak of the volcano continues to be seen. PVMBG emphasized that the estimated danger zone, with no increase in activity, remains at 8 km radius from Mt. Agung crater, with a sectoral extension to the north-northeast and southeast-south-southwest as far as 10 km from the crater. Outside these areas all normal activities can and should continue. PVMBG still maintains the alert status at Level IV for the volcano. The Government of Indonesia is doing its utmost to boost tourism in Bali Island and requests other stakeholders' support. On Saturday, 23rd December 2017 at 11.57am local time, Mt. Agung erupted again, with the volcanic plume reaching to a height of 2,500 metres. This was just a day after President Joko Widodo (Jokowi) conducted a limited cabinet meeting in Bali. One of the agenda items was to end the emergency response period status of Mt. Agung.

The Head of the Meteorological, Hydrological and Geophysical Agency, (BMKG), Prof. Dr. Dwikorita Karnawati, explained that until February 2018 the wind is predicted to blow eastward, expectedly driving Mt. Agung volcanic materials away from Ngurah Rai International Airport. In March 2018, the wind is predicted to change its direction towards the southwest. As the rainy season is underway, BMKG predicts that medium to heavy rains will fall in some areas in Bali. It is predicted that the rain will fall at an altitude above the volcanic ash and will help to clear the air of ash. With heavy rainfall there is an increased risk of lahars forming on the slopes of Mt. Agung.

² Information collected from BNPB website and email received from Head of UNOCHA; update on Mount Agung as at 15 December 2017.

C.2 Evacuation Centres and IDPs

BNPB recorded that as of 21 December 2017 at 18:00 WITA (Central Indonesia Time) the number of evacuees had reached 71,109 persons who are being accommodated at 239 evacuation sites:

No.	Regency or City	No. of IDPs	No. of Evac. Centres
1	Karangasem Regency	43,093	133
2	Klungkung Regency	11,441	43
3	Buleleng Regency	9,796	9
4	Bangli Regency	978	4
5	Gianyar Regency	3,502	8
6	Tabanan Regency	770	9
7	Denpasar City	734	5
8	Badung Regency	590	5
9	Jembrana Regency	205	23
	TOTAL	71,109	239

BNPB maintains a website that provides up-to-date data on the evacuation sites and the number of IDPs: <https://bnpb.go.id/data-pengungsi>

The majority of the temporary shelters are tribal village halls (banjar), which are typically used for cultural ceremonies, weddings, worships and community programs. When the IDPs cannot be accommodated in banjars, the government has provided tents.

BNPB estimates that if all the population in the red zone were to evacuate, there would be a total of 90 – 100,000 IDPs. Based on current population demographics, it is estimated that if a 1963-type eruption occurred, the number of evacuated people could be as many as 180,000.

To identify the priority needs of IDPs, the shelter cluster initiated and coordinated a Joint Needs Assessment from 3 to 5 December in five regencies that canvassed 45 IDP camps. Based on the result of the JNA³ by ECD and HFI and their partners, they identified there are six basic needs still unfulfilled:

- 1) tarpaulins for shelters
- 2) although rice, the staple food, is available, however side dishes such as protein-based foods and vegetables are not enough
- 3) bedding (mat/mattress and blanket), especially for the pregnant women and elderly people
- 4) special compartment/room for pregnant women, breastfeeding mothers and elderly people
- 5) schooling/learning equipment/tools
- 6) help with livelihoods, since many IDPs are now unproductive and stressed during their stay in the camps; they need to generate incomes for supporting their family.

For a more detailed report on these needs, please refer to the JNA Report.

³ Humanitarian Forum Indonesia (HFI), Emergency Capacity Building (ECB) dan Mitra Lembaga yang terlibat: CARE International Indonesia, Mercy Corps Indonesia, Yayasan Sayangi Tunas Cilik, Catholic Relief Services, Wahana Visi Indonesia, PLAN, Muhammadiyah Disaster Management Center, PKPU-HI, YAKKUM Emergency Unit, BTB, Rumah Zakat dan LBH APIK mitra OXFAM. JNA was conducted on 3-7 December 2017 using CommCare, Android-based mobile app used by CRS for developing and using JNA tool.

C.3 Electricity Supplies

All electricity within the area of Karangasem is currently supplied through the Main Powerhouse located at urban Kecicang Village, Amlapura. The region of Amlapura is prone to lahar flow (as impact map shows), while the National Electricity (PLN) Field Office and Main Powerhouse is close to the river which is prone to lahar flows. The PLN Field Office will shut off the electricity in the event of an eruption and lahar flows threatening the Main Powerhouse. If this was to happen, then around 48,223 customers will be affected. When the early warning sirens are activated from Tanah Ampo Command Center, PLN Field Office will also cut off the electricity current to all the hazard zones.

When the volcano erupted on 21st November 2017, several transformers failed due to volcanic ash exposure causing the power to go off in many areas. Currently, there are 3 powerhouse units that are shut down within the radius of 6-8 km. PLN have provided assurances that outside the exclusion zones there will be electricity, as there are 8 generators with large capacity at the sub-districts of Abang, Karangasem, Seraya, and Amed, which are highly populated. For greater evacuation, PLN has prepared a plan to supply electricity to the camps. Thirteen generators are ready for use at Manggis, Sidemen, Klungkung, Rendang and Tejakula camps. A number of current camps already have generators in situ. The capacity of these generators will only provide for lighting, radios and charging of phones and similar low amp items. It is reported there have been issues experienced as IDPs have carried electrical items with them, such as rice cookers. These have resulted in a failure of the electricity supply from the generator.

C.4 Fuel Supplies

Pertamina Distribution center for fuels (liquid and gas) in Karangasem Regency is located at Manggis Depot, at the southern coastal area of Karangasem. There is no risk for either lahar flows or volcanic ash in this area. Nevertheless, the road might be cut off to the western area of Karangasem, blocking the distribution access. An alternative option is to distribute it through Psanggaran Depot at Denpasar, supported by Tanjungani Depot at Banyuwangi, East Java by sea. Denpasar Depot will then distribute the fuels to gas stations along the west regions of Bali from Buleleng Regency down to Tabanan Regency. So far, only one gas station at Nusu Village, Kubu Sub-district, has closed due its location in the red zone.

The Incident Command Center at Tanah Ampo is quite near to Pertamina's Manggis Depot.⁴ This is beneficial, knowing that it will ease the coordination and mobilization, especially when a massive evacuation is required and fuels are needed in large quantity.

C.5 Communication Systems

Telecommunication providers such as Telkomsel, XL, Tri and Indosat are widely used by people in Karangasem Regency. Though almost all of Karangasem is covered by these providers, there are still areas where a mobile phone network signal cannot be accessed due to its hilly landscape. To anticipate communication traffic overload and the impact an eruption might have on existing mobile towers, some providers have pre-positioned Compact Mobile Base Stations (Combat) or mobile BTS (Base Transceiver Stations) and prepared generators for power backup to ensure continuity of the mobile network.

⁴ <https://www.google.co.id/maps/place/Posko+Komando+Tanah+Ampo/@-8.495955,115.455737,12.67z/data=!4m5!3m4!1s0x2dd20fab0fe7361b:0x8a29c11b0f2d5aa!8m2!3d-8.5059137!4d115.5169479>

BNPB has set up a community based radio communication system and installed 6 siren units for an early warning system (EWS). Since 17th November 2017, Pasebaya Forum has been formed by 28 villages within the hazard zones. Having 700 volunteers, the forum aims to ease the challenge of communication and coordination between village leaders, providing information related to all hazards and the updates on volcanic activity is livestreamed through radio. On 18th December 2017, BNPB handed over equipment that included 4 Repeaters, 4 Rigs, 20 Batteries, 4 Solar cells, and 140 Handy Talky units (HTs) to the Pasebaya Forum, providing each village with 3 HTs. Volunteers will use this equipment to quickly evacuate the villagers. Pasebaya Forum works with ORARI (Indonesian Amateur Radio Organization) and directly communicates with the Command Centre at Tanah Ampo. Radio Coverage,⁵ Sirens⁶ and Warning and Evacuation Signs⁷ for the early warning system are now in-place. Sirens can be controlled directly by the Command Centre. Information about the system and what to do when the sirens are heard is still being circulated to community members. The activation of the sirens can only be authorised by the IC (Incident commander) at Tanah Ampo Command Centre.

C.6 Clean Water Supplies

A magmatic eruption on 25th November 2017, followed by lahars, damaged water pipes, cutting off the water supply from the springs in Rendang, Karangasem. This has caused more than ten thousand families to experience a water shortage at Semarapura City, Klungkung Regency. At the time of the assessment the pipes had not been repaired, due to difficulty in reaching the location of the damaged pipes. PDAM Klungkung is currently looking at alternatives to bypass the broken water pipes.

Water from the Yeh Unda river is the main source of water for PDAM Klungkung, the adjacent regency to Karangasem. The Yeh Unda River is a wide river streaming from several water springs in Rendang and Sideman Sub-districts through Semarapura City. This 20-km-long river has a high potential to be the channel for lahar flows that could impact the city.

Another large river that could likely channel lahars is the Telaga Waja River. Telaga Waja River is the source of water for PDAM Karangasem. The water-collecting reservoir from the river has a capacity of 10,000 cubic metres and is located in Menanga Village, Rendang Sub-district. It is currently closed as it has been abandoned by the staff as they are afraid to stay at the operating site. Water from the Telaga Waja district is distributed to about 15,000 consumers via a gravity-fed system. The piping network is 87-km long with a pipe diameter of 70-cm.



A lahar on 25 Nov. covered this house halfway up the walls and destroyed crops in its path

⁵ geospasial.bnpb.go.id/2017/10/04/peta-jaringan-komunikasi-radio-gunungapi-kabupaten-karangasem-prov-bali/

⁶ geospasial.bnpb.go.id/wp-content/uploads/2017/10/PETA-SEBARAN-RAMBU-PERINGATAN-GUNUNG-API-v3-1.jpg

⁷ geospasial.bnpb.go.id/wp-content/uploads/2017/10/PETA-PEMASANGAN-SIRINE-DI-SEKITAR-GUNUNG-AGUNG-v2.jpg

As the majority of the reticulated water supply to Karangasem is provided from river sources and relies on a piping network that runs near rivers, it makes it highly susceptible to the impact of lahar flows. Rivers that were affected by the lahar flows on 25th November 2017 are:

- 1) Kubu Sub-district: Dalem River (Ban Village down to Sukadana Village) along 12 km
- 2) Selat Sub-district: Bambang Biaung River (Duda Utara and Desa Duda Villages) along 10 km and flowing to Tunjung Penyalin River ended in Unda River, while also another overflow along the Sebudi River (Sebudi Village)
- 3) Bebandem Sub-district: Nang-ka River (Bhuana Giri Village)
- 4) Klungkung Sub-district: Yeh Unda River (Tangkas Village), the second largest river in Karangasem Regency

Knowing the above risks to the water supplies, PDAM took several actions, such creating more borehole wells in several areas, e.g. borewell with capacity of 20 litre per second at Akah Village, and borewells with capacity of 5-10 litres per second located in 6 additional areas. Currently, 55% of Karangasem Regency population (**224,884**) are dependent on PDAM piped water supply, while 80,000 people rely on rain-harvest water (19.55%) as their source of clean water. More detailed information on family water sources can be seen from the table below.⁸

No	Sub-district	Number	Population Not Connected to PDAM						Population linked to Piping (PDAM, BPPSPAM)	Population with Sustainable Access to Potable Water	
			Total Population	Protected Dug Wells	Dug Wells with Pump	Bore Well with Pump	Water Stations	Protected Springs		Rain-harvest Tanks	Number
1	Manggis	45,430	8,351	1,740	359	1,846	6,065	1,441	26,584	43,734	96.00
2	Sidemen	32,820	120	-	70	-	13,239	-	19,391	32,820	100.00
3	Selat	39,380	9,139	-	-	-	10,553	5655	14,033	39,380	100.00
4	Rendang	39,250	-	-	-	-	315	8343	22,625	31,255	79.60
5	Bebandem	46,070	17,073	-	-	-	-	12789	21,747	45,771	99.40
6	Karangasem	86,780	4,882	-	221	-	36	8,430	79,332	86,780	100.00
7	Abang	62,350	10,307	3,040	900	-	3,293	4,616	36,398	57,428	92.11
8	Kubu	58,720	8,939	-	2,525	-	3,891	39,043	4,774	40,838	69.55
JUMLAH		410,800	58,811	4,780	4,075	1,846	37,392	80,317	224,884	378,006	92.02

Note: PDAM (Drinking Water Regional Enterprises, a Regional State-owned company), BPPSPAM (Agency for Implementation Improvement of Drinking Water Supply System)

In response to IDPs' water needs, BNPB confirms it has created 9 new borewells, located as per the map of proposed borewells.⁹

Based on the JNA, it was found that 39 camps out of the 45 assessed have enough water supply for cooking, drinking, and to fill water tanks for bathing and latrines. The source of water is either via PDAM piped water supply or trucked in by PDAM. Based on an interview with the Director of PDAM Karangasem, he

⁸ Data source from Health Profile Year 2016, Department of Health, Karangasem Regency. The document is still in spreadsheet file format and unpublished.

⁹ geospasial.bnpb.go.id/wp-content/uploads/2017/10/PETA-USULAN-PEMASANGAN-SUMUR-BOR.jpg

informed that generally water tankers are providing water to camps every second day, however there is a feedback mechanism in place whereby a call can be made if there is a shortage of water at a camp.

However, an extreme shortage of latrines was identified. In many of the camps the government has provided temporary latrines that are connected to a waste collecting tank that needs to be emptied on a regular basis. The PUPR Department reported they only have two trucks for waste collection. There is no separation between men and women toilet facilities.

C.7 Education¹⁰

Currently, in 12 villages, there are 21 Public Elementary Schools unused as they are located in red zone (within the radius of 0-9 km from the crater) and high risk to be exposed to Pyroclastic Flow, Lava Flows & Gas, including Ash/Tephra Fallout. Also, there are 6 senior high schools in three sub-districts of red zone. Within the yellow zone, radius of 12-15 km potential to expose with Ash/Tephra fallout, there are 13 senior high schools and 1 public school with special needs in Karangasem Sub-district. There are 15 senior high schools within white zone (high risk for lahars flow) in 6 sub-districts. Provided link below is the BNPB map of the locations and distances from the hazard zones.¹¹

The table below shows number of students and schools in 22 prone villages located in the radius of 6-12 km (exposed to high risks of lava flow, gas, ash/tephra fallout, pyroclastic flow and lahars).¹²

No	Sub-District	Villages	Population			Student				School Building			
			M	F	(M+F)	KG	EM	JH	SH	KG	EM	JH	SH
		Danger zone											
1	ABANG	Ababi	5,878	5,714	11,592	116	850	-	-	4	22	-	-
2	(consist of	Pidpid	2,478	2,313	4,791	65	286	-	-	2	7	-	-
3	14 Villages)	Nawakerti	2,301	2,178	4,479	34	351	331	-	1	4	3	-
4		Datah	7,880	7,655	15,535	17	836	317	117	1	25	5	2
5	BEBANDEM	Bebandem	6,850	6,800	13,650	99	1,011	586	-	4	29	11	-
6	(consist of	Jungutan	4,800	4,728	9,528	36	606	553	542	1	18	16	14
7	8 Villages)	Buana Giri	4,326	4,241	8,567	71	619	342	-	2	21	8	-
8	KUBU	Tulamben	6,187	5,875	12,062	103	1,179	256	-	2	8	1	-
9	(consist of	Dukuh	2,569	2,477	5,046	0	462	-	-	0	4	0	-
10	9 Villages)	Kubu	2,500	2,522	5,022	81	467	883	1,035	1	4	1	1
11		Baturinggit	2,993	2,858	5,851	33	434	32	-	2	4	1	-
12		Ban	6,942	6,520	13,462	68	1,153	508	-	2	8	3	-
13		Sukadana	4,157	4,167	8,324	51	642	-	574	1	4	0	1
14	RENDANG	Menanga	3,890	4,002	7,892	27	657	249	-	3	14	1	-
15	(consist of	Besakih	4,037	3,893	7,930	111	820	41	-	7	15	1	-
16	6 Villages)	Pempatan	5,841	5,547	11,388	158	1,061	726	-	8	17	1	-

¹⁰ Data source from Department of Education at Command Center, Tanah Ampo, Karangasem Regency.

¹¹ geospasial.bnpb.go.id/wp-content/uploads/2017/10/PETA-SEBARAN-PENDIDIKAN-DI-SEKITAR-GUNUNG-AGUNGG.jpg

¹² Data presents 22 villages with their population within radius of disaster zone sourced from Bali Province BPBD's Operation Control Center. Number of students and school buildings are based on Karangasem Regency in Figures year 2017.

17	SELAT	Selat	1,611	1,610	3,221	130	259	-	-	3	6	0	-
18	(consist of	Peringsari	3,258	3,359	6,617	89	624	931	-	3	5	1	-
19	8 Villages)	Muncan	4,380	4,469	8,849	120	702	516	-	3	6	1	-
20		Duda Utara	3,807	3,650	7,457	119	576	465	-	3	4	1	-
21		Amerta Bhuana	1,800	1,819	3,619	68	368	-	-	2	3	-	-
22		Sebudi	3,077	3,114	6,191	68	507	-	-	3	4	-	-
	TOTAL				181,073	1,664	14,470	6,736	2,268	58	232	55	18

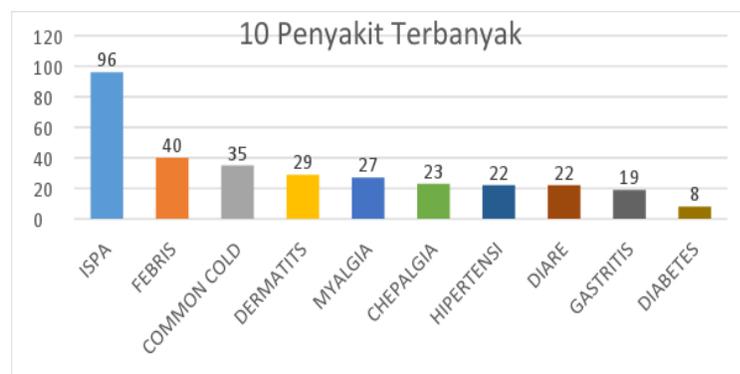
The JNA identified that most IDP students go to school at or nearby the IDP camps. The greatest need is that of school bags, books and uniforms (39.44%), stationary (38.03%), tables and chairs (12.68%) and school buildings (9.86%) at the schools to accommodate the additional students.

C.8 Health

Karangasem Regency has a government general hospital employing 38 physicians (1 paediatrician, 2 surgeons, 5 obstetricians/gynaecologists, 2 internists, 8 other specialists, and 17 general practitioners), 2 dentists, 48 midwives and 112 nurses with capacity for 218 beds. One 64-bed private hospital having 20 medical specialists, 9 general practitioners and 2 dentists, 22 midwives and 71 nurses. There are 12 community health centres (CHCs) with their 71 satellite CHCs, and 17 mobile CHCs with 51 physicians, 24 dentists, and 337 health workers including midwives, nurses, sanitarians, nutritionists and other applied health staff. There are 6 CHCs in red zones not operating due to the eruption: CHC Rendang, CHC Selat, CHC Bebandem, CHC Abang I, CHC Abang II, and CHC Kubu. (See the map of the locations of CHCs in Karangasem Regency¹³).

There is also a general hospital located at Amlapura City, capital of Karangasem Regency; it is not in the lahar risk zone. Nevertheless, if a bigger eruption happens mobilizing a greater number of IDPs, then the capacity of health workers in the hospitals and CHCs is far from sufficient. The Health Cluster is now working to have an Operational Plan together with PMI (Indonesian Red Cross Society), BASARNAS (National Search and Rescue Agency), and some referral hospitals outside of Karangasem Regency, including ambulance support and a plan to evacuate the survivors through the sea towards Denpasar City.

Below are the 10 top medical conditions suffered by the IDPs as at 13th December 2017.



¹³ <http://geospasial.bnpb.go.id/wp-content/uploads/2017/10/PETA-SEBARAN-PUSKESMAS-DI-SEKITAR-GUNUNG-AGUNGG.jpg>

Acute Respiratory Tract Infection (ISPA) is ranked the highest for IDPs in campos. This could be related to ash that is in the air, and also due to the rainy season when there is typically a higher incidence of ISPA. The Department of Health's strategy to manage these health conditions is to distribute face masks, conduct health talks to the IDPs to reduce their outdoor activities whenever possible during bad weather and for PHBS (clean and healthy lifestyle) promotions, and also providing medical treatment. The assessment team was unable to secure information as to current medical supplies, such as masks.

C.9 Livelihoods and Economy

Vulnerability to disasters increases when society's economic situation is low. Karangasem Regency has the lowest Human Development Index¹⁴ (HDI) among the 9 regencies in Bali province. In 2016, there were 27,120 poor people, making the regency ranked the poorest in Bali.

Since the increased volcanic activity of Mt. Agung in September up to December 2017, according to the Minister of Tourism, Arief Yahya, the losses within the tourism sector have reached IDR 9,000,000,000,000 (9 trillion) equivalent to around USD 663 million. While at the same period, the losses of IDR 2,000,000,000,000 (2 trillion) or USD 147 million due to bad credits of Karangasem people because they are in the IDP camps and unable to work to pay the debts.

D. SUMMARY AND RECOMMENDATIONS

1. Evacuation Centres and IDPs

The current number of IDPs at evacuation centres is about 71,000 persons. The JNA identified there are currently six unmet needs. It is estimated that a worst-case scenario could see as many as 180,000 persons evacuated. If these needs are not being met for the current IDP population, then it is highly likely it will be the same for a greater number of persons.

Planning should be completed to determine how best to meet current identified needs, and implemented. Through the process it will identify what preparations and planning will need to be put in place to meet the same needs in a larger-scale event.

2. Electricity Supplies

In the event of a large-scale volcanic eruption it is highly likely there will be widespread loss of electricity. There are contingency plans in place for the provision of emergency electricity supply via generators. Where generators are already in place in camps, issues have been experienced due to inappropriate use of the electricity supply. In the event of a wide-scale loss of electricity, the consequent loss of lighting at night raises protection issues, especially for women, girls and boys.

Educational materials about the appropriate use of electricity supply when a generator is used should be prepared. The provision of solar lights will increase the availability of a more reliable source of lighting at night.

3. Fuel Supply

¹⁴ HDI components are: Life expectancy, the expected years of schooling, the average length of school and average purchasing power parity per capita.

The assessment identified it was unlikely that fuel supplies would be adversely affected by a major volcanic eruption. This then should ensure adequate fuel supplies for evacuation vehicles and for electricity generators.

4. Communication Systems

Mobile phone companies have well developed contingency plans to ensure continuity of the mobile phone services in the event of a significant volcanic eruption. BNPB has established a radio network across the 28 villages in the hazard zone that is supported by a community forum of volunteers. The radio network primarily enables communicate to facilitate a quick evacuation. Sirens have been installed to inform communities of the need for evacuation.

All humanitarian agencies operating in the area should be familiar with the EWS and the evacuation plans for the communities. This ensures their own safety when working in the communities and also enables them to endorse the knowledge of the system and associated processes to the community. Liaison and working with Pasebaya Forum is recommended to facilitate the previous recommendations.

5. Water Supply

The reticulated water supply system and the sources of water are extremely vulnerable to damage from lahars, of which notable damage has already occurred, resulting in water shortages. More than 220,000 persons rely on this water source. PDAM and BNPB recognise the risk to water supply and have taken the mitigatory measures of installing additional borewells, however in a large-scale eruption there is a high likelihood of significant shortages of water, and the water that is available will likely require trucking as the reticulated system will not be functioning.

Planning and preparations should be put in place to enable the manage of water if water trucking is the primary means of providing water, how best to ensure the safety of drinking water and educational materials on the conservation of water.

Rainwater harvesting at the camps should be encouraged and supplies provided to facilitate this, especially as this is now the rainy season. The Incident Command Centre is endeavouring to build rainwater harvesting installations at several IDP camps. This effort should be supported by humanitarian organisations.

6. There are a significant number of schools within the hazard zones, however an assessment has identified that most displaced students have joined into the local schools nearest to the IDP camp where they are staying. The JNA identified there are some educational-related needs.

Planning should be completed to determine how best to meet current identified needs, and implemented. Through the process it should identify what preparations and planning will need to be put in place to meet the same needs in a larger-scale event.

7. Half the CHCs are currently closed in Karangasem Regency due to being located within the hazard zone. The remaining CHCs have managed to pick up the extra workload. The two general hospitals on Karangasem are not located in the hazard zone. The health sector has well developed contingency plans. It is unknown what level of medical supplies they have. During an active volcanic eruption there is likely to be an increase in injuries, respiratory disorders, eye and skin irritation, which will place an increased demand on medical services and medical supplies. Additionally, it is likely that health staff

numbers could be reduced due to inability to work, either because they cannot get to the hospital or are affected physically by the ash fall.

Humanitarian organisations either working in Bali, or those likely to respond if there was a humanitarian need as a result of a volcanic eruption, should identify what PPE they require for their staff, procure it and provide training to their staff in the correct use of the PPE. It is likely that PPE such as masks and eye goggles for distribution to the public will be in short supply. Humanitarian organisations should identify in advance vendors, and what stock they have. The Dept. of Health should be contacted to identify what information leaflets they have on protection during a volcanic eruption, and ensure all staff have access to this information.

8. Communities with low socio-economic status are more vulnerable to hazards. Karangasem Regency registers the lowest HDI in Bali. The current volcanic activity has significantly reduced income from the tourism industry, of which Bali is heavily reliant. Being displaced from their homes has also impacted on the ability to earn an income. This combination of factors has negatively impacted on the IDPs.

Identify income-generating activities that utilise and build on existing skills and are suitable for the IDP Camp context.