



Tsunami Evacuation Plan for Kelurahan Kuta, Bali

A Documentation of the Process and Results of Tsunami Evacuation Planning

developed by

Evacuation Planning Working Group of Kelurahan Kuta

with support from

District Government of Badung
The Adminstration of Kelurahan Kuta
Bali Hotel Association (BHA)
The Indonesian Red Cross, Bali Chapter
South Kuta Beach Business Association (SKBBA)
The Community Empowerment Organisation Kuta
(Lembaga Pemberdayaan Masyarakat - LPM)

Facilitation and technical advisory by

GTZ IS - GITEWS



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Table of Contents

	Preface	5
I	Some basic considerations for tsunami evacuation planning in Kelurahan Kuta	7
II	Brief description of Kelurahan Kuta	9
Ш	The Strategy and the Procedures for Kelurahan Kuta	11
	1. Two Zone Concept	11
	2. Modes of Evacuation	12
	3. Evacuation Routes	13
	4. Trigger for Evacuation and Dissemination of Warning & Guidance	13
	5. Evacuation Signage	14
IV	Recommendations for next steps	15
	1. Recommendations regarding assembly areas and vertical shelter buildings	15
	2. Recommendations for further involvement of relevant sectors and stakeholder	15
	3. Recommendations for Local Capacity Building and Socialization	16
V	The Evacuation Map for Kelurahan Kuta	19
	Annexes	
1	The Roles and Responsibilities of Local Institutions	20
2	Contact Data	21

Preface

Evacuation of people in risk areas is the first priority once a tsunami early warning is received or natural warning signs indicate the immediate arrival of a tsunami wave. The available time span between a warning and the impact of a tsunami wave is very short. Tsunami evacuation planning – as part of tsunami preparedness – assures that evacuation maps and procedures are in place and understood long before a tsunami strikes so that as many people as possible are prepared and get a chance to evacuate quickly in the case of emergency.

In order to improve local preparedness in Kelurahan Kuta, a working group with representatives from local authorities, private sector and civil society developed an overall tsunami evacuation plan that contains an evacuation map, a strategy and procedures for tsunami evacuation in Kuta. The process was supported by the German Technical Cooperation (GTZ) in the frame of the German Indonesian Cooperation for a Tsunami Early Warning System project (GITEWS) providing process facilitation and technical advisory.

The results of this effort are summarized in this document. It describes the process and considerations, which led to a tsunami evacuation plan for Kelurahan Kuta. The inputs, the process and the final product were agreed upon by the stakeholders of the planning process. The evacuation plan contains an evacuation map and describes the evacuation strategy and procedures at the level of the Kelurahan Kuta that have been determined until February 2010. The document provides a basis and guidance for more detailed planning at sub-village level, by community institutions and the private sector.

Though an agreement on an evacuation strategy, evacuation zones and general procedures has been reached during the recent planning process, these achievements are only considered a first step to establish adequate and detailed procedures for the complex issue of tsunami evacuation planning in the highly populated area of Kelurahan Kuta.

To support this follow up and to improve evacuation planning in Kuta and neighboring areas, the document provides a series of recommendations for further planning and implementation.

Lurah of Kuta

Team Leader of GTZ IS-GITEWS

I. Some basic considerations for tsunami evacuation planning in Kelurahan Kuta

Kuta is one of the most popular destinations in Indonesia for domestic and international tourists. It is considered the center of tourism activities in Bali. An estimated number of 60.000 - 70.000 people visit Kuta on average every month. The area is densely populated and struggles with the same problems like many other urban areas in Indonesia: an overloaded traffic system, absent urban planning and unplanned rising number of population.

Kuta lies on the shores of the Indian Ocean and a mayor attraction are it's sandy beaches. Less known by the visitors and public in general is the fact that the same coastline is also prone to tsunamis, as Bali is located close to the collision zone between the Indian-Australian Plate and the Eurasian Plate which represents the main source area for local tsunamis that might affect the island. It has to be expected that tsunami waves will need only 20 to 80 minutes to reach the coast. Areas in southern Bali which are threatened by tsunamis have been identified and mapped during a hazard assessment process in 2008 / 2009¹.





Figures 1 and 2: Location of Subduction Zone / Tsunami Hazard Map for southern Bali

Tsunami evacuation planning deals with the time span before and during a tsunami event. When facing local tsunami threat, evacuation procedures most possibly will have the character of a "runaway" effort. The primary objective is to bring as many people as possible out of the reach of the wave's impact to safe or "relative safe" areas. Due to the short warning time people shouldn't expect to receive much support during the evacuation process from public institutions and self protection arrangements play a vital role. Therefore all the necessary steps have to be taken in advance to enable and support the community at risk to protect themselves, whether at home, at the working place or in public areas.

For a realistic tsunami evacuation planning it need to be clear what actually will cause people to start (self) evacuation. It has to be expected, and in fact it is intended, that ground shaking from a strong earthquake triggers a self-evacuation process. The mandate for an official call

¹ Multi-scenario Tsunami Hazard Maps for Bali with zoning based on wave height at coast (in line with the InaTEWS warning levels) as well as probability of areas being affected by a tsunami. DLR / GTZ, Updated Version August 2009

for evacuation is with the local authorities based on warnings issued by the National Tsunami Warning Center operated by BMKG in Jakarta. The decision making process to call for evacuation has been delegated to an Emergency Operation Center (PUSDALOPS) at Province level. An official call for evacuation will be announced via siren with a 3 minute steady sound as well as via public radio and TV.

The hereby presented plan has been developed at Kelurahan level. It is intended to recognize it as the official evacuation plan for Kelurahan Kuta and aims to provide the community at risk with the necessary reference, guidance and information. This plan indicates hazard and safe zones, critical and vulnerable infrastructures and the overall evacuation strategy. Furthermore, more detailed tsunami evacuation plans are needed at subsidiary levels. Therefore individual, neighborhood and institutional evacuation plans need to be developed to assure that everyone is able to act independently and as quick as possible as soon an emergency arises

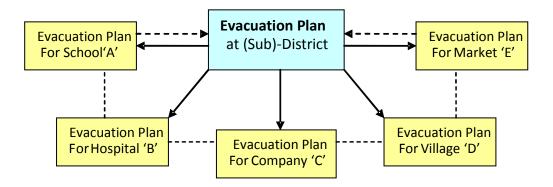


Figure 3: different levels for tsunami evacuation planning

II. Brief description of Kelurahan Kuta

Kelurahan Kuta is part of Badung District, and located in the southwestern part of the district. Its size is 6,7 square kilometers. Elevation according to topographic maps does not exceed 3 m. The total length of Kuta's coastline is approximately 3 kilometers, bordering with Kelurahan Tuban to the south and Kelurahan Legian to the north.

The whole area is densely populated. The population of Kelurahan Kuta is characterized by a mix of local residents, commuters and tourists. The number of the actual population is difficult to estimate and varies sharply between day and night. Local people are those who are administratively registered with the Kelurahan office. According to the local administration currently 2,748 families consisting of 12,587 people are registered in Kuta. Additionally there is a considerable number of commuters (non-resident in Kuta, but staying there for business or working reasons. According the local tourism agency DIPARDA the number of visitors (tourists) to Kuta is estimated up to 60.00 -70.000/month. According to a study regarding population density and distribution the highest population concentration can be found in areas where local and tourist population have common activities like the mixed commercial areas (Mueck, 2007)².

An important observation, especially for pedestrian evacuation, is related to the road infrastructure near the coast. Only a few roads in the North and in the centre of the area lead directly to the beach, whereas in the South only some small lanes connect the beach area with the main road infrastructure. Main traffic junctions are located in the eastern centre and in the south of the area.

Relevant actors in Kelurahan Kuta

The local administration is headed by a Lurah who is appointed by the Head of the District. The Lurah's task is to provide administrative functions to support the government's development programs. The Lurah supervises several neighborhood chiefs (Kepala Lingkungan). Kelurahan Kuta consists of 12 Lingkungan.

Beside the local administration structure, Kelurahan Kuta has also a customary structure called Adat Village whose leader are called Jero Bendesa Adat. Under this leadership there are several banjars headed by Kelian Banjar Adat. This customary structure has a special function for religious ceremonies, including preservation of customary traditions.

There are three main associations related to the tourism sector: the Bali Hotels Association (BHA), the South Kuta Beach Business Association (SKBBA) and the Kuta Executive Club (KEC).

² Matthias Mueck: Tsunami Evacuation Modeling - Development and application of a spatial information system supporting tsunami evacuation planning in South-West Bali, Thesis, University Regensburg, 2008

BALAWISTA is an life guard organization established by the Badung Local Government. The main task is to watch the beaches and to provide information regarding safe area for swimming and water sports. SATGAS Pantai Kuta is a task force established by the Desa Adat to provide security and safety within the community groups and also control local activities of merchants.

Relevant aspects to consider for tsunami evacuation planning in Kuta

The following conditions had been considered during the discussions regarding realistic evacuation procedures:

- Every tsunami is different! Kuta might suffer the impact of a smaller tsunami but also the worst case might happen. Due to the infrequent occurrence of tsunamis, information regarding their possible impact, occurrence and run up heights is very uncertain. It must be assumed that no reasonable action can take into account all possible risk.
- Due to the threat of near field tsunamis the warning time and hence time for evacuation is very short. A tsunami hazard assessment reveals estimated arrival times (ETA) between 20 to 80 minutes.
- Kuta is a low lying coastal plain area. No higher natural ground can be reached in reasonable time.
- Kuta counts with a considerable number of big and strong hotel buildings, which can play an important role for vertical evacuation.
- Kuta is a highly populated area with a narrow street network which suffers severe traffic
 congestion already in "normal" times. Streets leading out from the hazard zone are few
 and also narrow.
- Kuta is visited by big number of tourists who in general are not very familiar with the location and the tsunami threat.
- Many hotels related to the BHA have already started to develop own procedures to take care of their guests.

Based on this considerations the working group concluded that the short time frame and the geographical features will not allow a complete evacuation of people from the hazard zone to safe zones which are at higher areas or outside the inundation area further inland. Therefore vertical evacuation has to be considered as an important element of the strategy. It was also concluded that the involvement of the private (tourism) sector is crucial for the development of a realistic evacuation strategy and procedures. All these considerations and conclusions have been taken into account for the development the overall strategy and procedures of tsunami evacuation for Kelurahan Kuta.

III. The Strategy and the Procedures for Kelurahan Kuta

The tsunami evacuation strategy in Kelurahan Kuta enclose the following elements:

1. Two Zone Concept

The hazard zone is divided into a red and a yellow zone. The red zone is considered the most dangerous zone with a high probability to be affected by tsunami waves. The yellow zone is considered to be safe in most cases, except "worse case scenarios" with magnitudes similar to the Aceh Tsunami 2004. This cases are considered less probable but can not be excluded.

The zoning is based on inundation areas visualized in the official Tsunami Hazard Map for southern Bali.

The division between the two zones goes along easy to remember landmarks like bigger streets. The border runs along Legian Street, Bunisari Street, Singosari Street and Raya Kuta.

The zoning and evacuation strategy is related to the three warning levels of InaTEWS and the occurrence of natural warning signs. As a general rule people in the risk areas should move away from beaches and riverbanks close to the coast whenever experiencing ground shaking from an earthquake.

In Keluraha Kuta the agreed procedures in case of earthquakes or tsunami warnings are:

- 1. For slightly felt earthquakes and the InaTEWS Advisory level (WASPADA): leave the beach and riverbanks immediately. Further evacuation is not considered necessary and no official call for evacuation will be issued.
- 2. In cases of strong felt earthquakes and InaTEWS warning level 1 (PERINGATAN): evacuate immediately the red zone or look for shelter in higher buildings. The yellow zone is considered 'Safe Area' during Warning Level 1
- 3. In case of InaTEWS warning level 2 (AWAS) a call for "full scale evacuation" will be announced. Evacuate immediately the red zone or look for shelter in higher buildings. People in the yellow zone also go for shelter in higher floors.

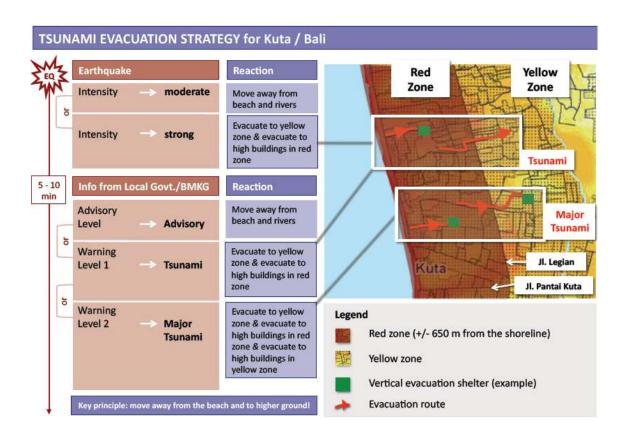


Figure 4: Overall tsunami evacuation strategy for Kelurahan Kuta

2. Modes of Evacuation

Due to the short warning times and the narrow street network a mix between horizontal and vertical evacuation is recommended. People who are able to leave the red zone within short time should do so, whereas for all others it is recommended to seek shelter on higher floors (3rd floor or higher) in strong buildings. If seeking shelter in hotel buildings located at the shoreline the shelter area should be located in a part of the building which is as high and as distant to the shoreline as possible.

People staying on the beach should immediately head towards the next vertical evacuation building. Some few buildings have been already identified as vertical evacuation shelter for the general public. More should be identified in the next future. Hotel guests shall follow procedures and guidance provided by their hotels.

People in the red area should do evacuation by foot only. It is not recommended to use vehicles and motorcycles as it can be expected that all roads will be blocked by traffic jam.

3. Evacuation Routes

Main evacuation routes from the red to the yellow zone are Jalan Benesari, Jalan Lusa, Jalan Popies 1, Jalan Popies 2, Jalan Pantai Kuta, Jalan Kuburan and Jalan Wana Segara.

At several strategic locations Traffic Control Points have been determined, to prevent that traffic can flow into the red zone during a tsunami emergency. The traffic flow in one way streets heading towards the coast shall be stopped and reversed where possible.

4. Trigger for Evacuation and Dissemination of Warning & Guidance

As a general rule it is agreed that people in the risk areas should move away from beaches and riverbanks close to the coast whenever experiencing ground shaking from an earthquake. In cases of strong felt earthquakes people should leave the red zone or look for shelter in higher buildings.

Official calls for evacuation will be based on warning messages from the National Tsunami Warning Center at BMKG in Jakarta. Tsunami warning will be provided by the National Tsunami Warning Center at BMKG Jakarta within 5 minutes after the occurrence of a tsunamigenic earthquake. Warnings are broadcasted via national TV and radio.

BMKG will distinguish between 3 different warning levels³ as follow:

- 1. Advisory level / WASPADA: if the predicted wave height is less than 0,5 meter
- 2. Warning level 1 / **PERINGATAN**: predicted wave heights between 0,5 3 meter
- 3. Warning level 2 / AWAS: predicted wave heights bigger than 3 meter

In Bali the official call for evacuation will be made by the Province Emergency Operation Center in Denpasar. The call for evacuation will be announced via the siren (3 minutes continuous sounding) and local media.

The BHA has already established an own communication network to provide guidance to the associated hotels.

At village level it is recommended to promote the use traditional means (wodden gongs) to inform the local residents

³ The 3 Levels warning scheme is expected to be introduced by mid 2010. Until then a 1 level warning scheme will stay in place

5. Evacuation Signage

The working group suggests installing Information Signboards along the beach of Kelurahan Kuta to disseminate tsunami evacuation information to the public. The signboards should also inform about early warning procedures.

Vertical evacuation shelter buildings, which are officially recognized, should be identified clearly by the respective signage.





Figure 5: tsunami evacuation signage for vertical evacuation shelter building and horizontal evacuation

It was also suggested not to set up tsunami evacuations signage all over the city to mark tsunami evacuation routes. Only in selected strategic location tsunami evacuations signage will be placed to indicate evacuation routes. As an alternative, this kind of information will be displayed on Information Signboards and disseminated via leaflets.

IV. Recommendations for next steps

Even though an agreement on an evacuation strategy, evacuation zones and general procedures has been reached during the recent planning process, these achievements are only considered a first step to establish adequate and detailed procedures for the complex issue of tsunami evacuation planning in the highly populated area of Kelurahan Kuta. Additional expertise from science, engineering and related fields of disaster management should be sought after to achieve this goal.

To support the follow up and to improve evacuation planning in Kuta and neighboring areas, this chapter provides some recommendations for further planning and implementation.

1. Recommendations regarding assembly areas and vertical shelter buildings

The evacuation strategy for Kelurahan Kuta foresees a mix between horizontal and vertical evacuation modes. For both modes it is still necessary to identify and validate sufficient shelter and assembly areas.

So far only two buildings for vertical evacuation have been identified and mapped. To assign a building as vertical shelter it is necessary not only to check the structural design of the building and the general suitability for evacuation purposes (accessibility, capacity) but also to negotiate agreements with the owner and define procedures for the emergency case.

To receive people evacuating from the red to the yellow zone and to provide first assistance, assembly areas should be designated in the yellow zone.

2. Recommendations for further involvement of relevant sectors and stakeholder

There are certain institutions and facilities in Kelurahan Kuta which are either particular vulnerable or play an vital during an tsunami emergency and need to be addressed in a specific way:

Special attention should be paid to schools and other educational institutions as well as health service facilities (private clinic, community clinic, hospital). They should be encouraged and supported to develop their own institutional evacuation plans and procedures. The later ones might also need special plans to be able to provide medical services during tsunami emergencies.

As a main and international tourist destination it is mandatory to involve the tourism sector institutions and organizations in the evacuation planning process. The following associations had been involved so far:

- 1. The Bali Hotel Association (BHA) has installed an own TEW communication network providing information and guidance to hotel managements in emergency situations and supports their members working among their members to define and implement tsunami preparedness and evacuation procedures.
- 2. South Kuta Beach Business Association (SKBBA) represents some hotels and restaurants located in the southern part of Kuta. The members of the association are committed to provide vertical evacuation shelter in emergency situations
- 3. Kuta Executive Club (KEC) is an organization representing members from high level tourism sector. This organization should be involved as they can provide general policies for their members.

Cooperation and agreements between communities and hotel sector prior to any tsunami emergency can help to take the edge off an predictable chaotic situation after an strong earthquake or once a tsunami warning has been issued. The experience from Tanjung Benoa could be used a reference for similar activities in Kelurahan Kuta.

The BALAWISTA (Beach Life Guards) shall be involved as they can play an important role in providing guidance to the beach visitors and supporting the evacuation process. There are 16 duty post with 6 to 8 persons each, divided into 2 shifts. They are equipped with HT communication and should be linked to the dissemination service of the local PUSDALOPS.

Related to Kuta beach activities, there are a number of community groups which could support an evacuation process. They represent small commercial activities like seller of goods (souvenirs, food) or services (beach equipment rentals, massage). These groups are controlled by the traditional structure in Kelurahan Kuta (Desa Adat). Another group to be involved is security and safety task force SATGAS, which is part of the Desa Adat.

3. Recommendations for Local Capacity Building and Socialization

Local Capacity Building and Socialization in Kelurahan Kuta is necessary as the basic strategies and procedures of the evacuation plan need to be widely known and understood. It is recommended to address community groups in order to get a broader access to the target group. There are a number of local groups and organizations which can be addressed:

a) The **Banjar Adat** has responsibility to protect the local community and culture. The Banjar Adat still has significant influence on the community and their social activities. Therefore the Banjar Adat is considered an important community element to provide guidance to the community in emergency situations.

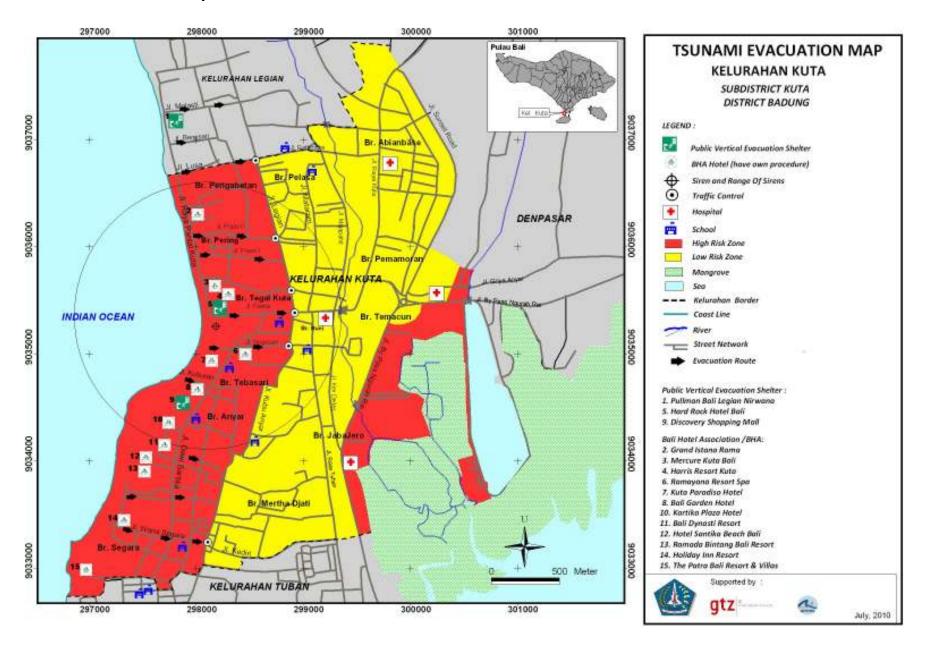
- b) **PECALANG** is a traditional security guard under the Banjar Adat structure. PECALANG has responsibility to maintain the community secure and safe during daytime.
- c) Almost each Banjar has a **youth organization**. This group might probably play an active role during the evacuation process. The youth is usually more dynamic and agile, and powerful to guide the community.
- d) **LINMAS** is a civil protection brigade under the Lurah. LINMAS has the task to maintain security and safety in general. Their contribution during an evacuation process is to guide the community together with PECALANG.
- e) The **Community Based Action Team** (CBAT) promoted by the Indonesian Red Cross (PMI) is another key actor in the field. CBAT focus on local disaster management and especially on the response phase.
- f) The **Kepala Lingkungan** (Head of community group) under the Lurah structure will have the task to mobilize the community together with other relevant actors.
- g) The **Woman Organization** (PKK) can play an important role during the response phase and to secure and protect the children.
- h) **BALAWISTA** is an organization of beach life guards with numerous members in Bali

It is important to make sure that all local specific contents for socialization activities are in line with the concepts and strategies discussed and approved by the local community and administration. The basis for all detailed evacuation planning in Kelurahan Kuta should be the approved reference map (see next page)

For the public in general and especially visitors it is required to provide short and concise information about evacuation procedures and routes in different languages. For this purpose it is intended to put up billboards on strategic locations along Kuta beach. Leaflets are another possibility to disseminate basic information. The hotel sector should be involved to provide information to their guests.

For local residents and local institutions concepts and materials for tsunami awareness campaigns (socialization) have been developed. First socialization events are currently implemented. During the awareness campaigns the communities will receive locally specific and relevant information regarding the tsunami threat, early warning system and evacuation procedures and are encouraged to define own preparedness procedures and local evacuation maps. For the implementation of the awareness campaigns a group of Balinese Master Trainer and local facilitators have been prepared. For Kelurahan Kuta 4 local facilitators are available (contact data in Annex 2).

V. The Evacuation Map for Kelurahan Kuta



Annex 1: The Roles and Responsibilities of Local Institutions

No.	Main Task	Key Institutions	Supporting Institutions	Detailed Tasks
1.	Receive warnings from BMKG or PUSDALOPS	Office of Lurah Kuta (validated by Lurah Kuta) BHA network in Kelurahan Kuta	 Coast Guard Village Community Protection Police Force Armed Force 	 Receive and assess warnings Forward the guidance issued by the District or Provincial Government via PUSDALOPS to the community
2.	Disseminate warnings to community and visitors/tourists	 Office of Lurah Local media BHA network Police TNI 	Kuta Beach Management Unit (SATGAS pantai) and merchant associations in the Kuta Beach BALAWISTA	 Disseminate warnings received Provide guidance for the people
3.	Guide and direct community and visitors/tourists	 SAMAPTA Police Village Supervisory (SAMAPTA) TNI Head Banjar (Kelian Banjar) PECALANG (Traditional security) Teachers (for students that need to be evacuated) PMI CBAT 	 Hotel security personnel Management of assigned hotels Kelian Banjar and their apparatus 	 Guide the public to evacuation routes and safe places Cooperate with institutions responsible for safety and security to secure evacuation routes
4.	Traffic management	 Traffic police Dinas Perhubungan (Office of Transportation) 	 Hotel security personnel Pecalang Linmas 	Direct traffic in and out of the beach areaSecure evacuation routes
5.	Safety and security	 Police Pecalang Kelian Banjar 	TNI Community Protection personnel (LINMAS)	 Generally responsible for the safety and security of the people
6.	Services at the temporary shelter	Under Lurah Kuta's supervision: 1. Kuta Community Clinic 2. Private hospitals in the vicinity of Kelurahan Kuta 3. PMI CBAT		 Provide basic health services (first aid) Provision for basic needs if necessary

Annex 2: Contact Data

Institution	Representative	Phone	Email
Lurah Kelurahan Kuta	I Gede Suparta	Mobile : +6281 236 166 77 Office : Phone/Fax : +361.751814	
Bali Hotel Association (BHA)	Alexander Kesper	Mobile: +62811172947	Alex.kesper@gmail.com
PMI Bali Chapter	I Putu Sastra Atmaja	Mobile: +6285238726005	sastra@pmibali.or.id
South Kuta Beach Business Association (SKBBA)	Hadi Taryoto	+62811399739	
Lembaga Pemberdayaan Masyarakat (LPM) Kuta	I Nengah Darwi	081 338 480 563	

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