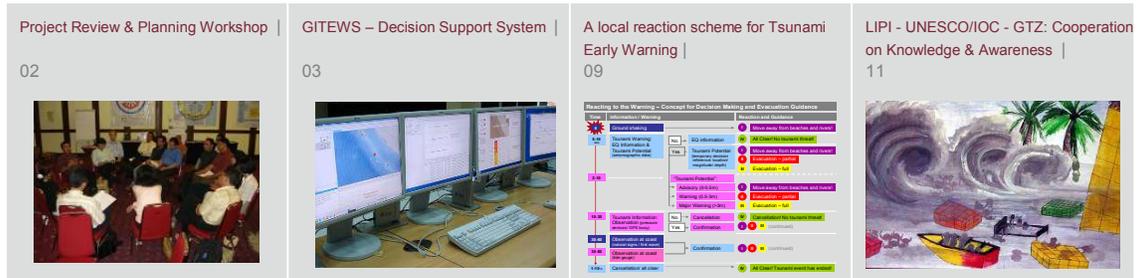


# Capacity Building in Local Communities

## German-Indonesian Cooperation for Tsunami Early Warning System



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## Editorial

The Indonesian Tsunami Early Warning System provides local communities with vital information in order to prevent that a tsunami will take them again by surprise. This is a very important step forward, but at the same time it also represents a big challenge for local governments and stakeholder, as they are the ones who are in charge to translate warnings into guidance to the community at risk.

BMG as a national warning provider already deliver warnings directly to the district level in a time span as short as 5 to 7 minutes after an earthquake - but do not give any guidance or instructions to the local communities how to react on it. That is where local governments have to take over. They will have to set up a communication system and procedures which enable them to receive BMG warnings on a 24/7 basis, take decisions and disseminate guidance messages to the community at risk in the shortest time possible.

Until now only few districts recognize their role in warning dissemination, decision making and evacuation guidance, and actually started defining the warning chain at the local level. Our project is accompanying several districts to develop and implement early warning procedures at community level. In this edition of our newsletter we would like to share experiences from these processes and provide updates regarding the Indonesian Tsunami Warning Chain.

Best regards  
Harald Spahn, Team Leader GTZ-IS.



## Project Review and Planning Workshop

The Project “**Capacity Building in Local Communities**” implemented by GTZ-IS and partners from local and national level called for a Project Review and Planning Workshop followed by a Team Building Workshop in Sanur, Bali from 28<sup>th</sup> January to 2<sup>nd</sup> February 2008. Three main objectives were addressed: (1) review of the project strategy, tools and progress, (2) discussion of further cooperation with partners in Pilot Areas and from national level and (3) looking ahead to the dissemination of experiences, tools and lessons learnt to other communities in tsunami risk areas.

### Participants & Programme

The workshop was attended by representatives from the GITEWS Pilot Areas (local governments, local NGOs, private sector, PMI), national partners (RISTEK, LIPI, BMG, DKP, BAKORNAS, ITB, Ministry of Home Affairs), international partners (UNESCO-IOC, IFRC, GRC, FRC) as well as other GITEWS work packages (BGR, InWENT, DLR and UNU-EHS)

The project team wish to thank all participants for their dedication and constructive contributions during the workshop which have led to significant recommendations for further project development and new cooperation.

The whole event was divided into three blocks: the first two days addressed the review and planning of tool development and cooperation, the second block (day 3 and 4) focussed on cooperation and planning in the three pilot areas, while the last two days were reserved for a GTZ-IS team building meeting.

### Review of project strategy and progress

The first two days of the workshop brought together our local, national and international partners. Following an overview of the project context and strategy the main technical topics (project outputs) were discussed in facilitated working groups.

A fishbowl session examined the role of local governments, decision making and how to deal with related uncertainties.

### Cooperation with partners in Pilot Areas and at national level

On day 3 and 4 the Pilot Areas took the lead in defining the 2008 road map for each area, the working process and technical support needed. The emphasis was on hazard mapping, warning chain development and its SOPs, local communication and dissemination technology as well as legal framework.

Representatives from the Pilot Areas also raised issues that require clarification and information exchange between local and national level as well as cooperation among districts in order to make the system work properly.

### Dissemination of experiences, tools and lessons learnt to other communities in tsunami risk areas

The experiences and products from the work in the Pilot Areas are translated into „project outputs“ in the form of tools, guidelines and process documents, which shall enable other communities to link themselves to the TEWS and improve their preparedness. The workshop identified important aspects regarding the involved actors, their activities as well as the challenges and recommendations for cooperation and working plan 2008 for each output.

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### Highlighted Issues

**Update on the future BMG warning scheme** to be introduced by mid 2009: it will be based on three warning levels: **Advisory** (wave height < 0.5 m), **Warning** (wave height 0.5 - 3 m), and **Major Warning** (wave height > 3 m).

**Role of local governments** (district and *kota* level) to react instantly on BMG warning, issue guidance for evacuation to community at risk and coordinate evacuation. Local 24/7 warning centers have to be established and will be in charge of decision making and “pushing the button”.

**General guidelines** for local communities and decision makers are currently being prepared by RISTEK. These guidelines shall support TEWS development down to the local level, standardization (where appropriate), and transfer of knowledge and crucial information to local stakeholders.



### Open Questions

**Warning without Guidance:** what is the expected reaction to a BMG warning disseminated by public media (TV, Radio) which is **not accompanied by a clear guidance** from local authorities?

**Coordination and Link** mechanism between national institution and local level regarding TEWS should be improved, particularly in clarifying roles and responsibilities as well as for provision of the necessary support regarding the legal framework, hazard mapping and warning chain development.

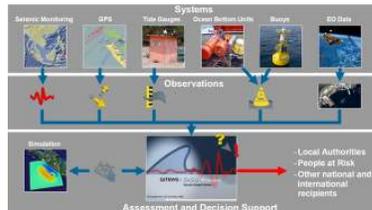


## GITEWS Decision Support System

German Aerospace Center, Oberpfaffenhofen, Germany – DLR

The GITEWS multi-sensor approach utilizes a number of different state-of-the-art land-based and oceanographic sensor technologies to detect indicators or evidences for a (potential) tsunami, among them the Earthquake Monitoring System (EMS) SeisComp3, which is already operational at BMG. Two additional components complete the GITEWS warning centre concept: the tsunami Simulation System (SIM) which uses a huge repository of pre-calculated tsunami scenarios and the Decision Support System (DSS) which receives all sensor data for further analysis and decision support. The DSS is also responsible for the generation of warning and other messages (products) once the decision to warn has been made. GITEWS is designed to be able to integrate additional sensor systems and further tsunami scenarios.

The GITEWS sensor systems continuously monitor and process the incoming sensor data and provide valuable information for the tsunami early warning process. SeisComp3, developed by the GeoForschungs-Zentrum (GFZ) in Potsdam provides earthquake information very quickly (see also GTZ-IS News No. 4), whereas other sensor types like tide gauges, buoy systems and GPS-Systems possibly need to be put into an alarm mode by the DSS unless they haven't detect an anomaly independently.

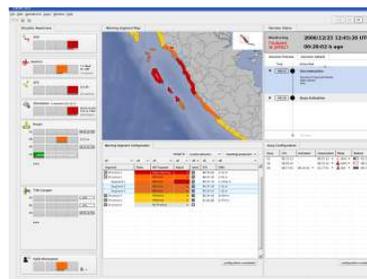


The activation of the sensor systems is indispensable, because under everyday conditions GPS, tide gauges and the buoy sensor systems send their data only periodically, due to physical, technological or other constraints.

The main decision whether a tsunami warning shall be issued has to be taken within 5 minutes after an earthquake. This decision has to be made on the basis of all available sensor and simulation data. In order to assist and support the decision maker (called Chief Officer on Duty, COOD) in this difficult situation, the GITEWS Decision Support System will fulfil several major tasks:

- Generate and update an overall situational picture (situation awareness),
- Generate and update decision proposals regarding whether to warn or not, what warn levels to apply, etc.
- Generate warning products and initiate their dissemination according to decisions being made by the COOD.

In order to achieve the best situation awareness, a huge, scenario-based repository of a-priori knowledge is compiled: A Simulation System (SIM) developed by the Alfred Wegener Institute for Polar and Marine Research (AWI) in Bremerhaven generates a large number of precalculated tsunami scenarios; in case of a potential tsunami, sensor observations need to be compared and matched with these scenarios in order to find the most likely tsunami scenario descriptions. A risk and vulnerability analysis component determines probable consequences and impacts on coastal communities exposed to tsunamis, including the determination of potentially endangered coastal regions (hazard impact analysis) and the vulnerability assessment of society and the environment.



The DSS collects, aggregates, analyzes all these inputs together with the results from the SIM and presents it to the COOD on the Graphical User Interface (GUI). If the COOD decides to disseminate warnings, the DSS will generate the appropriate warning messages based on predefined templates and provides them to the BMG dissemination system, which is responsible for the dissemination process. Other products, like maps and reports, will be available, too.

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### Milestones and Future Activities

Prototype versions of the GITEWS DSS, SIM and the EMS have been successfully presented during the GITEWS Steering Committee Meeting in November 2007.

In January 2008, the teams of DLR and GFZ deployed an identical prototype system (hardware and software) in the new BMG building in Jakarta. The installation consists of the DSS Prototype, the SIM Prototype, a prototype version of the sensor integration platform by GFZ, including a scenario player.

During the three-week training course "Seismology, Data Analysis and Tsunami Detection" in January/February 2008 in Jakarta, DLR staff gave a four-day introduction to the DSS, its concepts and functionality. Due to the timely deployment of the DSS prototype, it was possible to include a DSS practice day with hands-on exercises at the DSS prototype. Additionally a training course on "Geospatial Data Analysis" was given by DLR.

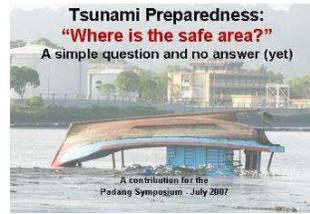
In November 2008, the DSS and the other GITEWS systems will be fully deployed and ready to start the test and commissioning phase which will ensure that all systems work well and all requirements are met. Indonesian sensor stations, buoys and ITB tsunami scenarios will be integrated in 2009 as well. During the test and commissioning phase, BMG operators and staff will be trained and test and other activities are performed jointly, including the dissemination of test messages.

Until successful completion of the test and commissioning phase, the tsunami warnings will be provided by the current BMG warning system consisting of the operational SeisComp3 system connected to the BMG "5-in-1" dissemination system.

After successful completion of the test and commissioning phase, the DSS will be set into operation and the new warning products become available.



Padang Consultative Group Meeting – Rack with RABAB Technology



## News from Pilot Areas

### Padang

The development of preparedness strategies for a big city like Padang is not an easy task. First of all it requires a good understanding of the hazard. The Padang Symposium organized by Andalas University in July 2007 recognized that the development of recommendations and guidelines for tsunami preparedness planning in Padang can only be achieved if scientific knowledge is combined with local knowledge and principal political decisions. This was the main reason for PEMKO Padang to initiate the establishment of the **Padang Consultative Group (PCG)** involving scientist and experts from various backgrounds.

The first meeting was held from January 12<sup>th</sup> to 13<sup>th</sup>, 2007 in Padang. The objectives of the meeting were to achieve a better understanding of Tsunami Hazard and the possible impacts for Padang and develop recommendations for official policies and guidance.

#### Main results

A lot of initiatives and projects by different institutions and organizations are currently executed or prepared to provide inputs for tsunami preparedness and mitigation in Padang. It seems that there are several parallel initiatives, which are working on the same topics, but without (much) coordination. The science group recommended PEMKO Padang to establish a coordination mechanism in order to assess, what results already exists, what projects are currently executed or planned and what additional initiatives are needed.

Results from modeling and historical data show a big variety of possible scenarios for Padang. It was agreed that the Scenario 3 (Mw 9.3, slip 20 m) as described in Borrero et al "Tsunami Inundation Modeling for

Western Sumatra", 2006 would be considered as reference for future preparedness planning as worst case scenario.

As several maps related to Tsunami Hazard, Risk and evacuation planning are currently circulating in Padang, it was agreed that an "official" Hazard Map is needed as a common reference. It should be distinguished between different types of maps (hazard, vulnerability, risk, evacuation...) and their purposes.

The existing zoned map of KOGAMI / UNESCO should be updated using the results from modeling based on the Borrero et al. scenarios to define red, yellow and green zone. This 2<sup>nd</sup> Generation Map will be elaborated on the short run to provide a more realistic base for future preparedness planning in Padang. Additionally detailed maps especially for evacuation planning are needed.

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### RABAB System

Padang Working Group developed a local tsunami warning dissemination system called RABAB. The system gives local authorities (Mayor, Police, Army) the possibility to send out information (audio voice and sound) by a normal FM Radio. The Mayor speaks through a mobile radio (handy talkie) and will be re-transmitted by a repeater at the normal FM Radio frequency 99.9 Mhz.

Advantages of the system are:

- Works automatically
- 24x7 standby function and battery backup
- Decoded to avoid any unauthorized use
- Can be connected to public facilities speaker systems (offices, mosques, etc)
- Audio voice and pre-recorded digital sound possible
- Received by normal FM Radios and wide coverage area
- Cheap in maintenance and control

The system has been installed on the 1<sup>st</sup> January 2008 at the Indosiar Tower of Bukit Gado-Gado and now is in the testing period. The RABAB system is a local development sponsored and supported by GTZ, PEMKO Padang and RAPI.

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### Next steps in Padang

- Coordination meeting between Padang City and West Sumatra Province on roles & responsibilities regarding tsunami early warning dissemination and decision making.
- Development of the 2<sup>nd</sup> generation Hazard Map based on PCG meeting results.
- Socialization of RABAB to related stakeholders and communities.





Consultation Meeting between Province and District Level – Denpasar – 05 February 2008

## Bali

Implementing 24/7 services on local level to receive early warning and providing guidance to the community at risk is a big challenge. Bali province and district governments are now taking actions.

### Visit of German Delegation to Bali

Mid January a German Delegation including Mrs. Heyn (German Embassy), Mr. Ollig (BMBF), Mr. Lauterjung (GITEWS Project Manager, GFZ), Mr. Rottmann (as representative from UNESCO-IOC Office Jakarta) and Mr. Behrens (AWI) visited the Pilot Area Bali to give a presentation of the latest results from GITEWS Inundation Modeling to the Governor and representatives from GITEWS partners in Bali. The delegation was accompanied by Mr. Jantzen (German Honorary Consul in Bali).

Mr. Behrens presented results from different scenarios regarding magnitude and location of possible tsunamigenic earthquakes for southern Bali. Results from Inundation Modeling are important inputs for the development of tsunami hazard maps. As follow up it was suggested to bring together representatives from different scientific institutions who are involved in tsunami hazard assessment for Bali and local decision maker in order to get a wider picture and to agree on the development process of an official hazard map.

A meeting with members of the working groups from Province Level and Badung District provided an opportunity for the German delegation to learn about the progress and challenges regarding the implementation of TEW in Bali.

### A coordination meeting between representatives from Province and District level

was held on the 5<sup>th</sup> of February in Denpasar to discuss the division of roles and responsibilities regarding tsunami early warning between the two levels. It was agreed that districts will be in charge to decide on evacuation guidance once a warning will be disseminated by BMG. It was also stated that the province level will have an important role in coordination of policies and procedures for early warning and might provide temporary services until the districts have implemented their 24/7 mechanism and procedures.



After the meeting a visit of the 24/7 facility in KESBANGLINMAS in Badung district was scheduled in order to assess the current conditions and discuss about a training approach in order to implement procedures for tsunami early warning.

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### Training for 24/7 facilities in Badung District

The 24/7 service for TEW in Badung district will be provided by the KESBANGLINMAS office using the existing SATLAK staff. It was agreed that the 24/7 office would focus during the next month on tsunami early warning. However the perspective is to convert it into a multi-hazard warning center that will be integrated into the new institutional set up for disaster management (BPBD) once it becomes operational.



The training will be implemented in three steps and includes the development of SOP for decision making and dissemination of guidance to the community at risk. Participants come from SATLAK member institutions as well as from the province level and neighbouring Denpasar City administration.



It is expected that the office in Badung will be operational by End of June 2008.

### Next steps in Bali

- Consultation Workshop between science and politics to advance on hazard mapping
- SOP development for local 24/7



Workshop participants observing explanations regarding hazard mapping – Technicians of SAR at work, installing radio equipment – Presentation by BAPPEDA Cilacap

**Java**

The completion of two activities signified the entrance into the year 2008 in the Java Pilot Area: the Workshop VII finalised the Hazard Maps and the Warning Chain Schemes for the three districts. Additionally Search and Rescue (SAR) of Bantul and Kebumen accomplished the installation of the radio communication network for their districts.

**Workshop VII in Baturraden**

GTZ conducted the Workshop VII with the three Working Groups of Cilacap, Kebumen and Bantul from 13<sup>th</sup> to 15<sup>th</sup> of February 2008. This workshop was perceived as particularly special since the participants could enjoy the completion of the Hazard Maps and the Warning Schemes with a lot of fresh air in the scenic surroundings of the workshop venue Baturraden.

Special guests present during the workshop were the Heads of Kesbanglinmas Bantul (Mr. Jundan) and Kebumen (Mr. Joko Waluyo) as well as the representatives of Bappeda Cilacap (Mr. Mulyadi) and Kebumen (Mrs. Pudjirahayu). The guests expressed that they are pleased with the project outputs to date, and assured to include implementation of TEWS in the on-going and future planning and budgeting in their districts.

**Hazard Maps**

During the workshop, the Working Groups and GTZ conducted a final quality check on the base maps, and agreed on scenarios. This discussion led to Multi-Scenario Hazard Maps that are currently finalized by Mrs. Estuning Tyas from Gajdah Mada University (UGM), Yogyakarta. Digital maps and hard copies are planned to be completed by end of March.

The existence of these Hazard Maps provides the basis to continue preparedness planning and supports the next steps: evacuation planning and mapping.

**Local Warning Chain**

Having conducted a series of discussions in the last workshops and working session in each district, the concepts for the Local Warning Chain for each district were eventually completed by the Working Groups (see also Features on page 8 & 9).

The concept for the Local Warning Chain describes the role of the 24/7 units and clarifies advisory/ warning and guidance messages to the people in case of a potential tsunami event, covering the current and future national warning scheme. It states the reactions expected from the population in risk areas and institutions involved in early warning upon reception of information/ warnings from the 24/7 unit as warning centre and central decision making body at local level. Eventually the concept specifies the communication link between local warning centre and communities at risk (see figure 1).



Fig 1: Suggested Communication Link from Local Warning Centre to Community (source: Working Group)

In a move towards implementation, the Working Groups will summarise the concepts as recommendation to be proposed to the local decision makers in their respective districts.

**Equipment for Working Groups**

A set of working equipment comprising of a laptop, a LCD projector, pin boards and facilitation equipment (*ZOPP-Koffer*) were handed over by GTZ to each of the Working Groups. Such equipment is expected to support the activities of the working groups, and ease the facilitation process during future awareness raising activities at community level.

**Communication Network**

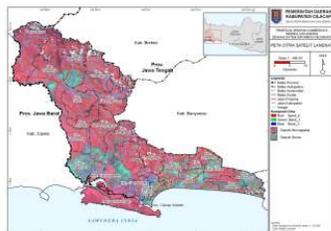
SAR Bantul and Kebumen were pleased with the installation and testing of the radio communication equipment, conducted in February and supported by GITEWS. The improved radio communication combined with training on TEWS for operators is expected to support the dissemination of advisory/ warning messages to the communities in the risk areas.

This network will soon be introduced to the communities and the users of the communication radio will agree on basic rules.

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**Next steps in Java**

- Discussions during the next training activities will focus on SOPs and Evacuation Planning. Workshop VIII will be held End of March and hosted by the Local Government of Bantul.
- A set of radio communication equipment is to be installed in Cilacap.



Mr. Yayan Rusyawan, the Secretary of Satlak PB, encourages the Working Group to learn about TEWS and apply it in Cilacap.

## Latest Development of TEWS in Cilacap District

The **District of Cilacap** is characterised by urban communities and an industrial site, where a number of national assets are located adjacent to the coast. The positive attitude of the community has encouraged a range of activities to implement Tsunami Early Warning System by different national and international institutions. All of the activities are expected to eventually assist the community to build their preparedness and resilient capacities in anticipation of any possible tsunami hazard.

### Tsunami Modelling

In late February, a team of BPPT (Agency for the Assessment and Application of Technology) and DHI (Danish Hydraulic International) visited Cilacap and observed several locations of their interest. The team met with the TEWS Working Group of Cilacap. Mr. Widjo Kongko of BPPT and Dr. Ole Larsen of DHI explained that they intend to assess the existing data base particularly related to the coastal areas and the contour in Cilacap for the future development of tsunami modelling for Cilacap. The minimum data available may present a challenge to produce an ideal modelling. BPKSA the official agency in charge of with environmental issues in Segara Anakan facilitated the initial survey.

As a next step, BPPT and DHI planned to survey the bathymetry of the territorial water from Teluk Penyu to Segara Anakan Lagoon, and the existing constructions in the city of Cilacap.

### TEWS Working Group of Cilacap

The Working Group of Cilacap was established to implement the cooperation between the Local Government of Cilacap and GTZ to implement the tsunami early warning system in Cilacap (08.07) endorsed by Bupati Decree (360/298/14/2007)

The ten members represent different government and non-government institutions concerned with disaster. The members have consistently been active and present in the series of training on TEWS, facilitated by GTZ.

Various expertises owned by the participating members in the group facilitate the acquisition of new knowledge, skills and technology, and in turn to implement it accordingly.

*TEWS Working Group  
Kabupaten Cilacap*



The active members of Cilacap Working Group.

### Installation of a Tide Gauge

In February 08, the TEWS Working Group observed that a tide gauge has been installed in the water of Teluk Penyu by Bakosurtanal (the National Coordinating Agency for Surveys and Mapping) to monitor sea water tide in Cilacap.

### Installation of Ranet

The Working Group also confirmed the installation of Ranet by BMG and Pelindo III in the Admin Compound of Tanjung Intan Port. Ranet operates 24 hours/day, and is expected to help provide information on wave height in certain water locations and daily weather condition for local fishermen.



### Donation to Satlak

The Secretariat of Satlak PB received a number of equipment from the Department of Internal Affairs, consisting of a double-cabin vehicle for SAR, a fibre motor-boat, a motorbike, a set of computer and fund. The fund is planned to construct a building dedicated for the Secretariat of Disaster Management (operational centre), which will be erected by end of 2008. The head of Cilacap District, Mr. H. Probo Yulastoro, stated that the donation is to mark the achievement made by Secretariat of Satlak PB in handling disaster to date.



Information/ warning flow from national to local level – BMG National Warning Centre – Warning dissemination – A community at risk: Kuta, Bali

## Getting the Warning to the Community at Risk

### A Review of the Current and Future Warning Scheme of INA-TEWS

Indonesia is prone to local tsunamis with very limited time for reaction—within minutes not hours. Getting the warning to the community at risk as quick and direct as possible is priority objective. Evacuation has to take place after the first warning from BMG. Appropriate reaction requires a clear understanding of the hazard and the warning system. It is the challenging task of local authorities to develop this understanding and the local system, create awareness, and, in case of emergency, translate warning into clear guidance for reaction.

#### The Tsunami Warning Framework

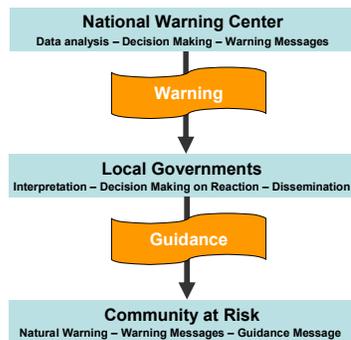


Fig 1: INA-TEWS Framework

The official source of earthquake (EQ) information and tsunami warnings is BMG, the National Meteorological and Geophysical Agency. Upon reception of a warning, local government authorities are in charge of taking the decision whether an evacuation is required or not, and if so, translating the warning into guidance for evacuation.

#### Current & Future Warning Scheme

Until mid-2009 the decision making reference for local governments is limited to EQ data (i.e. magnitude, time, location, depth) and information whether the EQ had the potential to trigger a tsunami (*potensi tsunami*). This first warning is the only information from BMG prior to a potential tsunami impact at the coast. In the current scheme (see figure 2) the second information from BMG is 'Cancellation'— in case no tsunami has been observed at the coast—or 'All Clear' indicating that the tsunami event has ended.

The future scheme based on EQ data and data from ocean floor sensors, GPS buoys, tide gauges and the tsunami data base linked to the Decision Support System will produce more detailed information (see DSS article on page 3).

The first warning message will distinguish between three warning levels referring to an estimated wave height of a potential tsunami occurrence:

- I. Tsunami Advisory (estimated wave height 0-0.5 m)
- II. Tsunami Warning (estimated wave height 0.5-3m)
- III. Major Tsunami Warning (estimated wave height >3m)

Additionally, it will provide information about potentially affected areas.

Data from pressure sensors and GPS buoys will confirm a tsunami occurrence and enable BMG to send out a confirmation (or cancellation in case that no tsunami was triggered) message.

Current Warning Scheme	Future Warning Scheme
5-10 min Earthquake data and tsunami warning (tsunami potential or not)	2-10 Tsunami warning: 1. Advisory (0-0.5m) 2. Warning (0.5-3m) 3. Major Warning (>3m) (earthquake data and DSS)
30-60 Observation: Natural warning signs/ Arrival of first wave	10-30 Tsunami confirmation or cancellation (pressure sensors, GPS buoys)
1-10 hrs Cancellation or all Clear	30-60 Tsunami information (tide gauges)
	1-10 Cancellation or All Clear

Fig 2: Current & Future Warning Scheme

#### Guidance and Decision Making

Local authorities rely entirely on the reference provided by BMG. They need to be ready to receive the warning, interpret and translate it into guidance, disseminate the message and activate the local warning chain. Guidance for evacuation—now and in the future—has to be delivered upon reception of the first warning: *potensi tsunami*.

Some uncertainty will always be part of the system. However, instant reaction is inevitable in order to save life—in case the potential tsunami turns into a very real wave approaching the shore.

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#### What does all this mean for local governments?

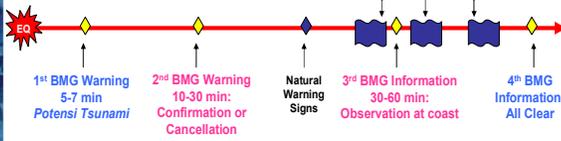
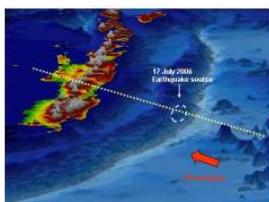
In order to make the local warning chain work every district has to establish "warning centres" for receiving and interpreting information and warnings from BMG and disseminate warning plus guidance to the communities at risk.

The centres have to operate around the clock: 24 hours, 7 days/ week. Equipped with reception and dissemination technology, the 24/7 units must employ a sufficient number of skilled personnel trained on Standard Operating Procedures (SOPs).

The limited time for reaction precludes the possibility of lengthy discussions as well as consultation of the usual decision makers, i.e. regent or governor. 24/7 units require a clear mandate for decision making on behalf of local authorities.

"Prefabricated" decisions have to be agreed upon and documented in SOPs. In case a warning comes in, the personnel of the warning centre will follow SOPs in order to decide whether communities should evacuate or not and disseminate guidance to the people at risk.

A concept for a local reaction scheme has been developed in the Pilot Area of Java (see also articles on page 9 and 6)



EQ-Epicenter of Pangandaran Tsunami – Time line (legend: already in place / in place by mid-2009) – Ponds being flooded by 1<sup>st</sup> wave of the Pangandaran-Tsunami

## A Local Reaction Scheme for Tsunami Early Warning

### Warning Chain Development in the Pilot Area Java

Several working sessions in Java have resulted in a concept for decision making and evacuation guidance that will be recommended for implementation in the Districts of Bantul, Kebumen, and Cilacap and serve as a model for other areas. Designed jointly with the working groups, the scheme provides a standardized instrument for decision making on tsunami warnings, considering both the current and future national warning scheme and natural warning signs. A simple time line-tool supported the systematic development of the reaction scheme.

#### Time is limited...

Capacity Building is both: a learning and a development process. Understanding the tight time frame associated with local tsunami hazard creates the basis for developing an efficient warning chain. The "time line" (see header) is a practical tool to achieve both. It displays incoming information at different times after the EQ and shows information available in the current and future warning scheme as well as natural warning signs. It built awareness and guided the discussion about reactions expected from decision making body and community at risk upon receiving tsunami warnings.

#### ...and requires standardized reaction...

The reaction scheme for the Pilot Area Java (see below) also refers to the time line: People are expected to react

on ground shaking (probably the first warning sign) by moving away from beaches and rivers. In the future, the first warning from BMG will contain different warning levels according to estimated wave heights of a potential tsunami event. Upon reception of this information, local 24/7 decision making bodies are expected to provide specific guidance to the communities according to the three warning levels.

#### ...instantly!

Guidance for evacuation should be issued upon the first BMG warning in order not to waste precious time. The future confirmation message should only be used to reinforce or cancel evacuation efforts. Local Governments should not wait for this confirmation message to start with evacuation since it will not leave enough time to do so.

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### CHALLENGES AND STEPS

#### Set up of 24/7 units

Possibly one of the biggest challenges for the local government is the setting up of 24/7 warning centres and introducing a new decision making model (based on SOP). Especially since the implementation of institutional reform for disaster management (following Law 24) is still pending.

#### A temporary reference for decision making

The current scheme still lacks data on potentially affected areas and differentiated warning levels. Until the future scheme is in place, local authorities need a simple reference for decision making—because an 8.5 magnitude EQ might require a different reaction than a 7.0 one. Training staff of local warning centres on how to interpret earthquake data (i.e. magnitude, location, and depth) and how it might translate into a potential impact, is a major task for the upcoming months.

#### Message understood

Communities at risk might first receive a BMG warning ("Potensi Tsunami") via public media before they get clear guidance from local authorities. In other cases they may not get local guidance at all. It is crucial to develop a concerted local system in which messages are understood. People at risk have to know how to react on which information.

### Reacting to the Warning – Concept for Decision Making and Evacuation Guidance

Time	Information / Warning	Reaction and Guidance
0	Ground shaking	I Move away from beaches and rivers!
5-10 min	Tsunami Warning: EQ Information & Tsunami Potential (seismographic data)	No → EQ information IV All Clear! No tsunami threat! Yes → Tsunami Potential (temporary decision reference: location/magnitude/ depth) I Move away from beaches and rivers! II Evacuation – partial III Evacuation – full
2-10	"Tsunami Potential": Advisory (0-0.5m) Warning (0.5-3m) Major Warning (>3m)	I Move away from beaches and rivers! II Evacuation – partial III Evacuation – full
10-30	Tsunami Information: Observation (pressure sensors/ GPS buoy)	No → Cancellation IV Cancellation! No tsunami threat! Yes → Confirmation I II III (continued)
30-60	Observation at coast (natural signs / first wave)	I II III (continued)
30-60	Observation at coast (tide gauge)	I II III (continued)
1-10 h	Cancellation/ all clear	IV All Clear! Tsunami event has ended!

Legend: Natural Warning Signs / Information from Current Warning Scheme / Information from Future Warning Scheme, available by mid-2009

Info Gempa  
Mag: 7.9 SR,  
12-Sept-2007,  
18:10:23 WIB,  
Lok: 4.67 LS -  
101.13 BT  
(159 km barat daya  
Bengkulu),  
Kedlmn: 10 km,  
Potensi TSUNAMI  
utk drtskn pd msyrkt  
:::BMG



BMG Tsunami Warning after first Bengkulu-EQ – Impact of the series of EQ that struck Padang and its surroundings on 12 and 13 Sep 2007

## “Waspada ...”

Results from an Explorative Survey on TEW Experiences in Padang

“**Staying on alert ...**” was the reaction to strong ground shaking and a potential tsunami threat by most respondents interviewed during a survey conducted in Padang after strong earthquakes (EQ) struck West Sumatra. Considering the potential threat to the coastline of Padang by these major EQ – up to 7.9 SR (BMG) – the question arises whether the reaction was sufficient. GTZ-IS took the opportunity to learn more about tsunami preparedness and interviewed 200 Padang citizens about their experience on Sep 12, 2007, when at 18:10 hrs local time the first EQ struck.

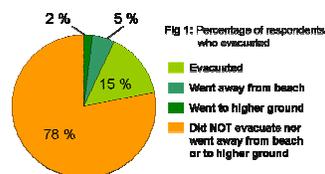
### Background

4 min and 41 sec after the first EQ a tsunami warning from BMG reached decision makers in Padang. About 10 min later, the mayor of Padang could be heard on FM radio announcing guidance to the community.

One and a half months later, the survey explored the warning reception process and reaction of 200 randomly selected citizens who live and/or have been in the red zone of Padang (elevation < 5 m) during the first EQ.

### Main Findings

*How did the respondents react to ground shaking and a potential tsunami threat?*



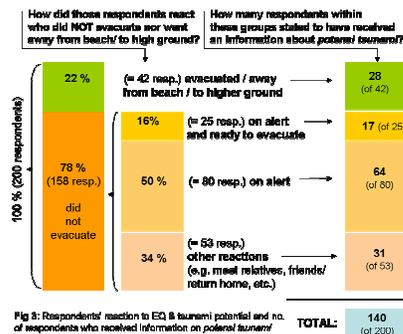
As a matter of fact, of the 200 respondents only 22% evacuated/ went away from beach/ or to higher ground while the majority of 78% performed none of the above actions at any time after the first EQ. The reaction time line of those who have “evacuated” (only 15%) shows how long it took them to do so:

Minutes after EQ:	<5	<10	<15	<20	<25	<30	<45	<60	>60
No. of respondents evacuated:	1	1	7	5	1	3	5	4	2
% accumulated over time:			48%		62%				100%

Fig 2: Min after EQ respondents needed to evacuate

Of the few respondents who actually evacuated, only a few reacted in a timely manner. Most respondents needed more than 20 minutes to start moving.

*What did the majority of respondents do after the EQ had ended?*



“Stay on alert” or “Stay on alert and ready to evacuate” were the major reactions within the group (of 78%) who did NOT evacuate/ go away from beach/ or to high ground (fig 3).

*How did the respondents receive and perceive warning and guidance?*

In total 140 respondents (70%) said to have received the information about a potential tsunami (“*potensi tsunami*”). It came relatively quick. However, the perceived content of the warning and guidance varied and most people seem to not have “heard” guidance for evacuation.

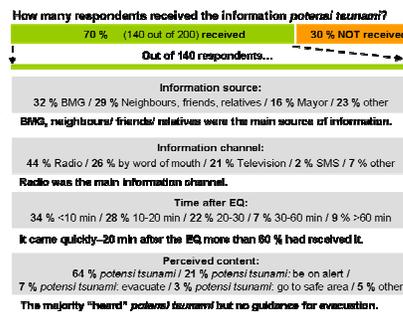


Fig 4: Source, channel, timing, perception of information

### Conclusions

The information of a potential tsunami reached the majority of respondents (70%). However, most people only stayed on alert. They did not perceive the messages as a call to take action and evacuate. This confirms that **warning without clear guidance does not trigger consistent reaction.**

Apparently, many people received the BMG warning message (without guidance) via public media, SMS or by word-of-mouth from friends and neighbours.

The current BMG warning scheme does not offer any guidance for evacuation nor does it give information on potentially affected areas and possible impact. This leads to a high level of uncertainty for people who must decide whether to evacuate or not.

The BMG warning was not perceived as information about an imminent threat that requires immediate reaction. The wording *potensi tsunami* used by BMG is correct from the factual/ scientific point of view (as a tsunami is yet to be confirmed) but perceived by most people as information that needs to be confirmed before taking action.

Since only few people “heard” evacuation guidance and understood they should move to safe ground, the question arises whether people at risk in Padang clearly understand the warning and guidance messages, i.e. whether they know how to react once a warning and guidance message has been issued.

*The survey findings will be published in the Working Document Series of GTZ-IS.*

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## GTZ-LIPI-UNESCO/IOC Joint Cooperation for Knowledge & Awareness

**TEWS is probably one of the most demanding warning system**, especially if it has to cope with local tsunamis. It comprises an 'End to End' approach, which is currently developed and implemented in Indonesia. The main target of an 'End to End' TEWS is to enable the communities at risk to take necessary actions on their own as soon as warning or guidance are received. Early Warning is an intersection point of science, technology, sociology, and human psychology.

Assessments conducted by various agencies concluded that mostly people still do not recognize the importance of EWS and information about tsunami risk is scarce or not accessible to local community and there is limited knowledge and awareness among many local decision maker.

Due to that, increasing Knowledge and Awareness regarding preparedness and the Tsunami Early Warning System is considered essential to contribute to the individual and institutional capacity development, particularly of local decision maker. GTZ-IS, LIPI, and UNESCO-IOC have agreed on the following cooperation for 2008:

1. Basic references on Tsunami Hazard & Early Warning in form of short video presentations on selected topics. The short video clips can be used at the beginning of training activities. The introductory videos (about 10 minutes length each) would cover Earthquake and Tsunami Hazard, Tsunami Early Warning System, Disaster Preparedness and Mitigation, SOPs, Simulation and Drills.
2. Standardized TEWS campaign kits. There will be two different kits as the target group are decision makers and multipliers. A reference list with validated documents and materials for awareness and knowledge campaigns will be developed

Possibilities and topics for further cooperation between the three institutions regarding Knowledge & Awareness raising has already been outlined and will be followed up once the above mentioned activities have been concluded.

Among the suggested topics for future cooperation are joint activities for international exhibitions and drills on community level. Additionally, the need for coordination with the Ministry of Home Affairs and the National Agency for Disaster Management (BNPB) regarding guideline development for capacity building in local communities was identified.

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### Knowledge Exchange I

NATIONAL CONFERENCE ON MAINSTREAMING  
DISASTER RISK REDUCTION IN LOCAL GOVERNANCE  
DUREIT HOTEL, MAKATI CITY, PHILIPPINES, MARCH 4 - 6, 2008

Makati City, Metro Manila, Philippines

The NCDRR conference (4-6 March 2008) brought together more than 100 government representatives and disaster management practitioners as well as researchers and international resource persons to share and discuss experiences and successful approaches of mainstreaming disaster risk reduction in local governance. The organisation of the conference was supported by the GTZ through the Sector Project "Disaster Risk Management in Development Cooperation" on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). Additional financial support was provided by the Disaster Preparedness Programme of the European Commission's Humanitarian Aid Office (DIPECHO). Invited by the Department of Interior and Local Government and GTZ, **Mrs. Denny Hidayati**, Researcher of PPK - LIPI, Jakarta, Indonesia presented lessons learnt from Indonesia regarding the Tsunami Early Warning System. Her contribution was intensively discussed and appreciated as an extremely valuable experience within the conference.

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### Knowledge Exchange II Tourism & Early Warning

The tourism sector in the GITEWS Pilot Area Bali plays an important role in the implementation of an „End to End“ system. In order to learn how the Thai tourism sector is handling Early Warning an exchange of experiences with Phuket Tourism sector and other involved stakeholder was initiated.



The Central Government determines the form and location of evacuation signs.

Several meetings with representatives from the Thai Tourism and Disaster Management i.e **DDPM** (Department for Disaster Prevention and Mitigation of Phuket), Phuket Hotel and Tourist Association, **NDWC** (National Disaster Warning Center of Thailand), **TRC**, **RCHB** (Thai Red Cross, Relief and Community Health Bureau), and **ADPC** (Asian Disaster Preparedness Center) revealed interesting insights into the national strategy for disaster management, the tourism sector strategy for TEW and preparedness, the implementation of TEWS and preparedness mechanism at community level and the warning chain and its development.



Local 24/7 Disaster Prevention & Mitigation Office in Phuket already established

**ICG/IOTWS Working Group  
on Mitigation, Preparedness  
and Response**

**Regional Workshop  
in Mahè Seychelles  
27– 29. Feb. 2008**

GTZ-IS was invited to the ICG/IOTWS Working Group 6 Regional Workshop on "Approaches to Coastal Community Resilience" and has been given the opportunity to share experience regarding Capacity Building in Local Communities

The objective of the workshop was to exchange knowledge on and analyse experiences with tools and practices for enhanced coastal community resilience. The workshop was also intended to be a learning exercise on various methods used in the Indian Ocean Region and aims to enhance common approaches to coastal community resilience.

Representatives from Governments and organisations around the Indian Ocean region were invited to present and review case studies on coastal community resilience.

GTZ shared lessons learnt and best practises from the GITEWS Pilot Areas and highlighted especially the experiences regarding the development of warning chains and local tsunami preparedness strategies. Other experiences from Indonesia were presented by LIPI and UNESCO/IOC Jakarta office.

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**Farewell**

Iskandar Leman (**Iskandar**)  
[hleman@yahoo.com](mailto:hleman@yahoo.com)



The first involvement of Iskandar in the project was in September 2006 as a facilitator of a Project Planning Workshop. Since then he was assigned as consultant for Bali Pilot Area until February 2008. We are grateful for his services in providing the project with his valuable experiences and we sincerely wish him all the best for his future activities in disaster management.

Cosima Goepfert (**Cosima**)  
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She was Head of Administration and Finances since February 2006. As a very proactive and hardworking person, she never hesitated helping anyone. We are grateful for her support to the project and we wish her all the best for more success stories on her career and in family hood.

**Welcome**

Gede Sudiarta (**Gede**)  
[gede\\_sudiarta@yahoo.com](mailto:gede_sudiarta@yahoo.com)



Gede Sudiarta started his assignment as Local Adviser for Bali Pilot Areas in March 2008. He gained his skills and expertise on disaster response especially for relief & logistic and CBDP during his engagement with the Red Cross over 24 years both inside and outside the country. In his spare time, as a father of 4 kids, he likes sports, traveling, reading and collecting books.

Dr. Doreen Warwel (**Doreen**)  
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Doreen is the new Head of Administration and Finances for GTZ IS Jakarta. She has three years working experiences in the private sector. Working in an international environmental is a great opportunity for her to learn about other cultures as well as about herself.

**Supporting Us**



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Estuning Tyas Wulan Mei, S.Si., M.Si., M.Sc. has an educational background on Geo-Information for Spatial Planning and Disaster Risk Management (UGM & ITC). Aside from giving lecture at UGM, Estu involves in many practical field work and research activities conducted by UGM. Estu - representing PSBA / Geography UGM, contributed important ideas during the hazard mapping exercise for Java Pilot Area, and assists to finalize digitalizing the maps.

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