Storm surge and high wave disaster experience and risk management policy in the Philippines

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Academic Background

Graduate Degrees:

Doctor of Philosophy in Engineering (Coastal Engineering)
Kagoshima University
Kagoshima, Japan

鹿児島大学 大学院 理工学研究科
Graduate School of Science and Engineering, Kagoshima University

Master of Engineering Specializing in Environmental Science and Technology
IHE Delft Institute for Water Education
Delft, the Netherlands

Undergraduate Degree:

Bachelor of Science in Civil Engineerin
University of San Carlos
Cebu, Philippines

Employment Record

1991 – 1994	Affiliation:	Primary Structures Corporation
	Position:	Cadet Engineer, Fabrications Engineer
1994 – 2011	Affiliation:	University of San Carlos
	Position:	Assistant Professor and Chairman Civil Engineering Department
2011 – present	Affiliation:	De La Salle University
	Position:	Associate Professor and Vice Chairman Civil Engineering Department

Outline of the Presentation

- Introduction (Disaster Hazards, Risks and Exposure in the Philippines)
- Storm Surge (Typhoon Haiyan) 2013 Experience
- Risk Management Policy in the Philippines

Disaster Hazards, Risk and Exposure in the Philippines

- An Overview and Introduction

Table 1. World Risk Index 2020 Overview

Classification	WorldRiskIndex	Exposure	Vulnerability	Susceptibility	Lack of coping capacities	Lack of adaptive capacities
very low	0.31 - 3.29	0.91 - 9.55	22.81 - 34.13	8.32 - 16.75	37.36 - 59.21	14.59 - 24.65
low	3.30 - 5.67	9.56 - 12.13	34.14 - 42.38	16.76 - 20.97	59.22 - 71.76	24.66 - 34.35
medium	5.68 - 7.58	12.14 - 14.64	42.39 - 48.12	20.98 - 27.93	71.77 - 78.01	34.36 - 40.64
high	7.59 - 10.75	14.65 - 19.69	48.13 - 61.49	27.94 - 45.13	78.02 - 85.20	40.65 - 52.72
very high	10.76 - 49.74	19.70 - 86.77	61.50 - 76.34	45.14 - 70.83	85.21 - 93.80	52.73 - 69.72

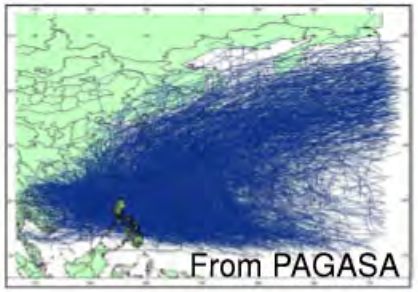
Max. value = 100, classification according to the quintile method

Rank	Country	WorldRiskIndex	Exposure	Vulnerability	Susceptibility	Lack of coping capacities	Lack of adaptive capacities
1.	Vanuatu			57.32	38.81	52.42	80.23
2.	Tonga			48.56	28.36	37.08	79.65
3.	Dominica			45.38	26.12	38.82	71.21
4.	Antigua and Barbuda			39.62	23.33	32.83	63.31
5.	Solomon Islands			60.56			81.21
6.	Guyana			50.60	27.33	47.33	77.55
7.	Brunei Darussalam			38.70	14.75	33.35	67.99
8.	Papua New Guinea						
9.	Philippines			49.55	28.97	39.32	80.27
10.	Guatemala			56.82	33.09	46.26	
11.	Cape Verde			47.61	29.35	40.65	72.84
12.	Costa Rica			39.67	20.03	30.68	68.89
13.	Bangladesh			57.08	33.21		
14.	Djibouti			60.60	32.81		84.39
15.	Fiji			46.21	21.98	40.46	76.24
16.	Cambodia			58.82	38.94	56.57	
17.	El Salvador			48.39	24.67	42.44	78.05
18.	Kiribati			57.56	39.27	50.04	82.77
19.	Comoros						84.45
20.	Nicaragua			57.05	32.00		83.26
20.	Timor-Leste			56.74	42.33	51.41	76.49
22.	Haiti						
23.	Niger						
24.	Guinea-Bissau						
25.	Nigeria						
26.	Cameroon						
27.	Uruguay			34.56	19.23	30.60	53.85
28.	Gambia				43.60		83.32
29.	Jamaica			46.39	25.34	39.50	74.52
30.	Chile			36.07	17.83	28.02	62.35
31.	Chad		35.25				
32.	Dominican Republic			46.57	24.03	37.46	78.23
33.	Benin		17.50				81.20
34.	Burkina Faso		16.54				84.22
35.	Honduras			54.43	32.71	46.45	84.21
36.	Togo		16.59				
37.	Mali		16.68				

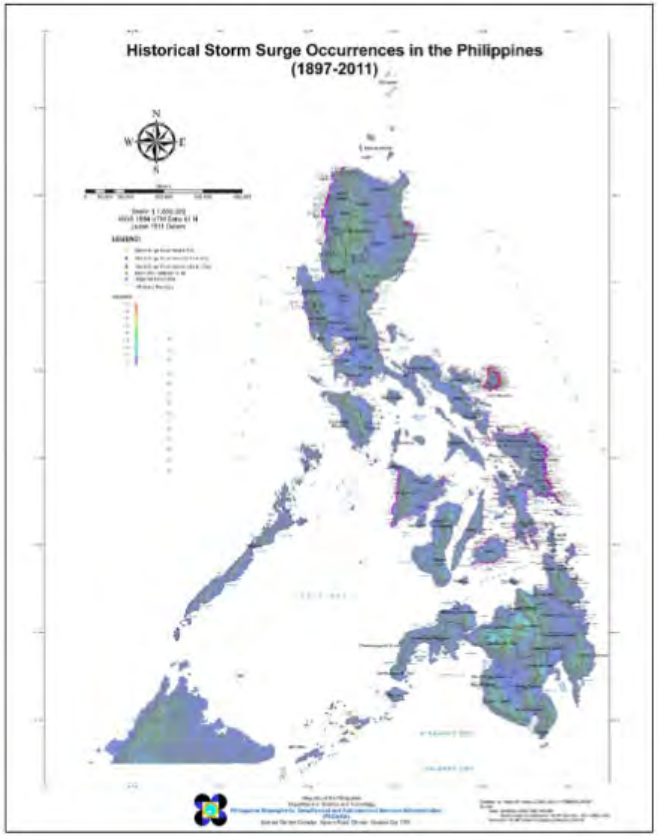
Source: World Risk Report 2020

HYDROMETEOROLOGICAL HAZARDS

- An average of 20 tropical cyclones affects the country annually
- These are accompanied by heavy rains and strong winds that may produce **floods**, **landslides** and **storm surges**
- Other weather systems bring rains



Source: DOST Philippines



Source: DOST Philippines

IMPACTS of Storm Surge : TY YOLANDA 2013

A. Casualties (TAB A)

- As of 03 April 2014, 6,293 individuals were reported dead, 28,689 injured and 1,061 are still missing
- A total of twenty-five (25) persons in Tacloban City were added to the list of dead individuals

B. Affected Population (Tab B) - No changes from the previous SitRep

- A total of 3,424,593 families / 16,078,181 persons were affected in 12,139 barangays in 44 provinces, 591 municipalities and 57 cities of Regions IV-A, IV-B, V, VI, VII, VIII, X, XI, and CARAGA

E. Cost of Damages (Tab D) - No changes from the previous SitRep

- The total cost of damages increased at PhP39,821,497,852.17 with PhP19,559,379,136.11 for infrastructures and PhP20,262,118,716.06 for agriculture in Regions IV-A, IV-B, V, VI, VII, VIII, and CARAGA

Damages to Infrastructure:

Roads/Bridges and other structures:	PhP15,746,727,686.11
Flood Control:	PhP 230,393,000.00
Health Facilities:	PhP 1,272,434,800.00
Schools:	PhP 2,309,823,650.00

Damages to Agriculture:

Crops (rice, corn other crops):	PhP 9,491,493,471.47
Livestock:	PhP 2,890,306,123.20
Fisheries:	PhP 5,996,896,091.39
Irrigation facilities:	PhP 231,000,000.00
Other agricultural infrastructure:	PhP 1,652,423,030.00

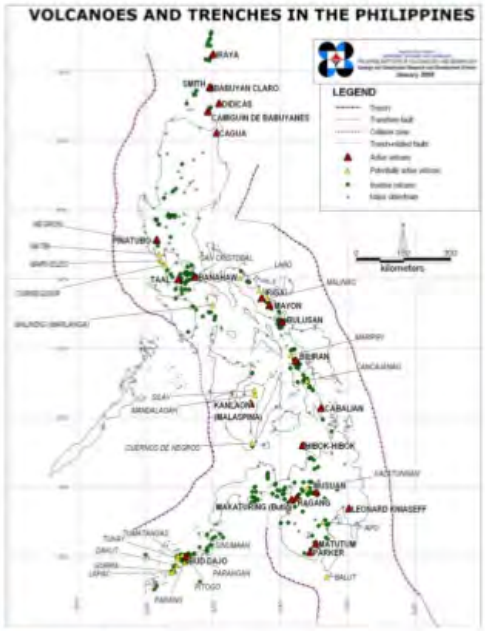
SOURCE :

NDRRMC UPDATE

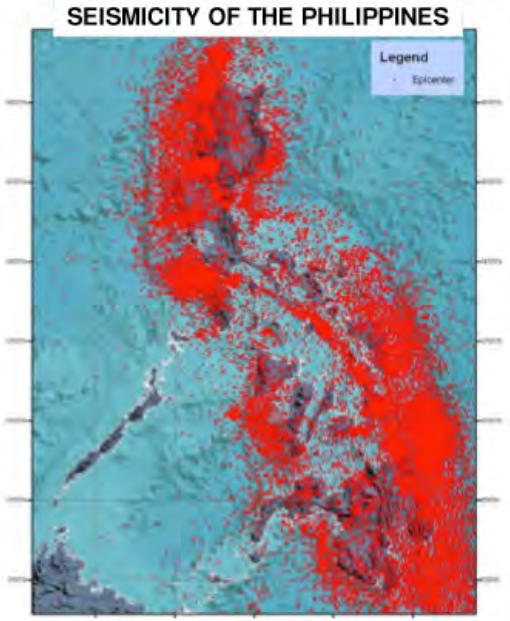
SitRep No. 108 Effects of Typhoon "YOLANDA" (HAIYAN)

Source: DOST Philippines

GEOLOGICAL HAZARDS



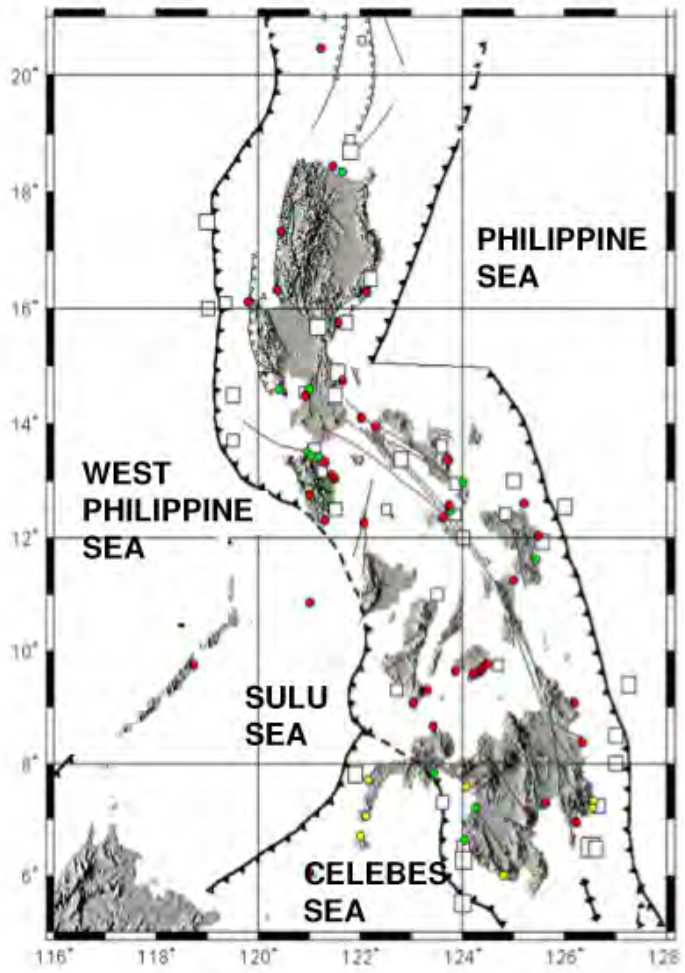
The country hosts ~300 volcanoes, of which, 24 considered active



Around 20 earthquakes recorded a day, around 100 destructive earthquakes

Source: DOST Philippines

Local Tsunami-Affected Areas in the Philippines



Local Tsunami in the Philippines

(~ 40 tsunamis for past 400 years – 1 in 10 years)

0 1 3 5 8 10
HEIGHT RANGE IN METERS

□ Epicenter of tsunamigenic earthquake

Coastal areas at eastern and western margins fronting major seas and inland seas have been affected by tsunamis

Source: DOST Philippines

17 August 1976 Moro Gulf Earthquake & Tsunami

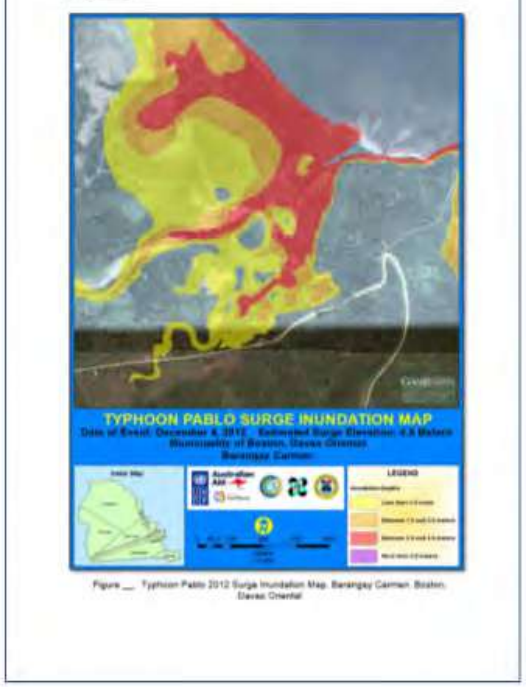
Village inundated by tsunami

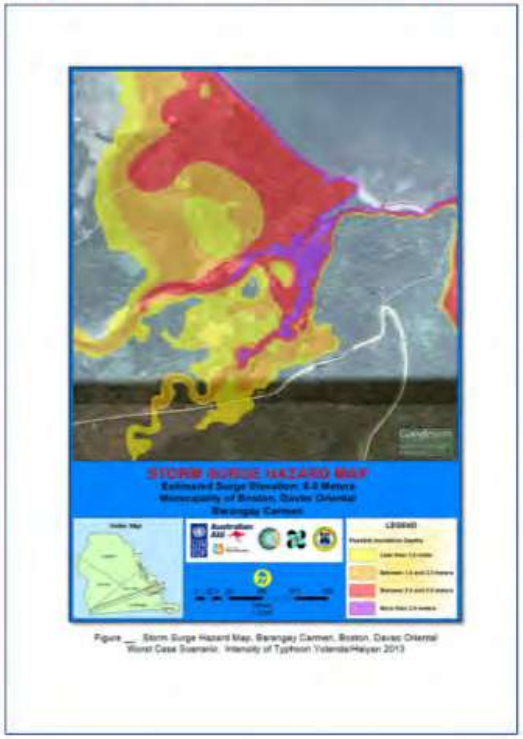
Boats carried inland (Pagadian)

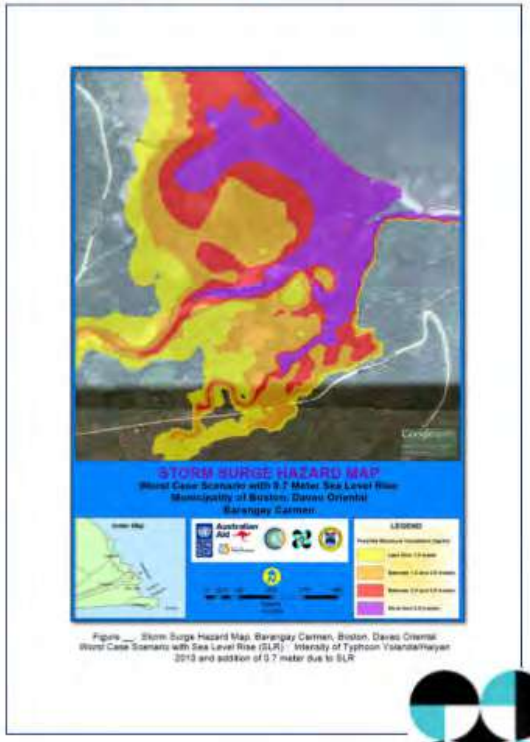
- 12:11AM, Magnitude 7.9, Shallow depth (<33 km)
- First tsunami wave reported within 2 to 5 minutes of the main shock
- Series of waves (~3- 7 waves reported), 1-5 minutes apart
- Tsunami height up to 9 meters
- Death ~8000
- Rendered homeless ~90,000
- Damage PhP400 million (1976 value)

Source: DOST Philippines

Storm Surge Hazard Maps (PAGASA)



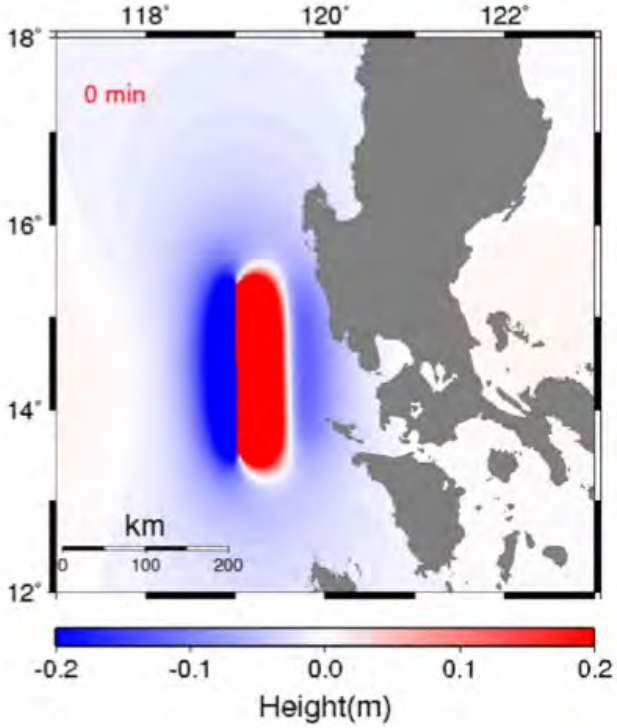


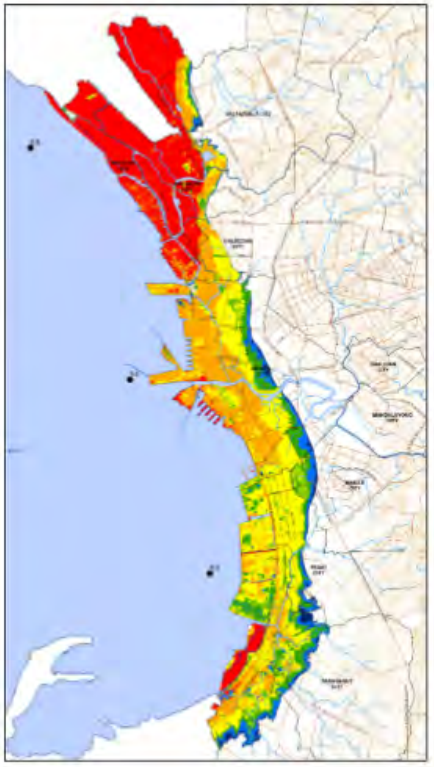


Source: DOST Philippines

Tsunami Scenario (PHIVOLCS)

M8.3 Earthquake from Manila Trench





Estimated Tsunami Height in Manila Bay:

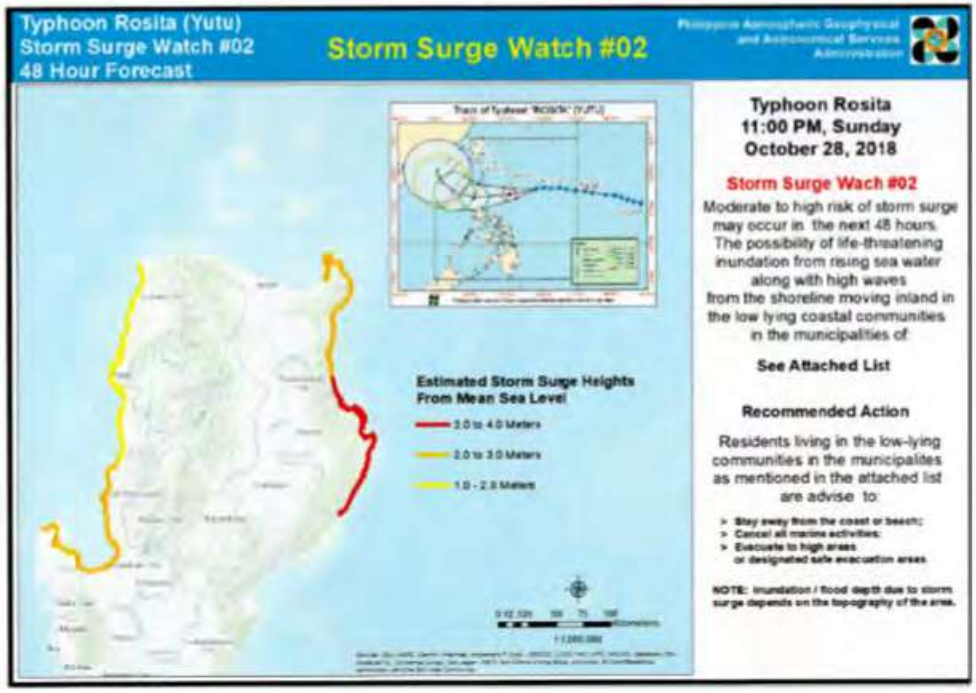
- 3.5 meters to 5.5 meters

Arrival Time:

- ≥ 1 hour

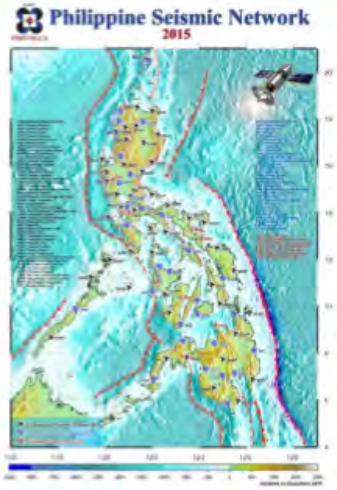
Source: DOST Philippines

Sample Storm Surge Watch (Issued 48 hours before landfall)



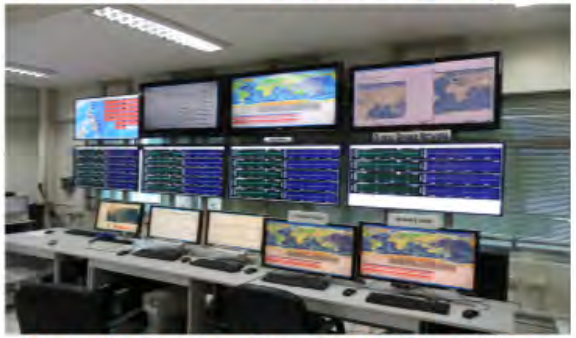
Source: DOST Philippines

EARTHQUAKE MONITORING NETWORK



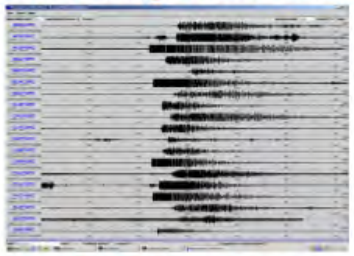
- **100**-station network (seismographs)

- 30 manned seismic stations, 64unmanned seismic stations with satellite telemetry communication, 6 volcano-seismic station with satellite telemetry



Data Receiving Center at Main Office

Unmanned stations with satellite communication



Digital Seismic Record

Source: DOST Philippines

Sea Level Monitoring Network

Network	Existing
Real-time tide gauges	*19 (PHIVOLCS thru JICA) 5 (PTWC, RIMES, GLOSS)
Community tsunami detection and warning system	10 (PHIVOLCS)

○ PHIVOLCS thru JICA

★ PHIVOLCS Community Tsunami Detection

Source: DOST Philippines

COMMUNITY TSUNAMI PREPAREDNESS ACTIVITIES

Familiarization with Hazard and Evacuation Maps

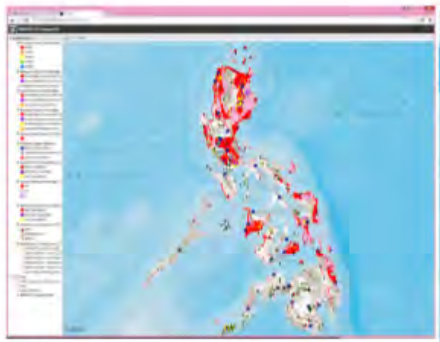
Tsunami Signage

Tsunami Drill

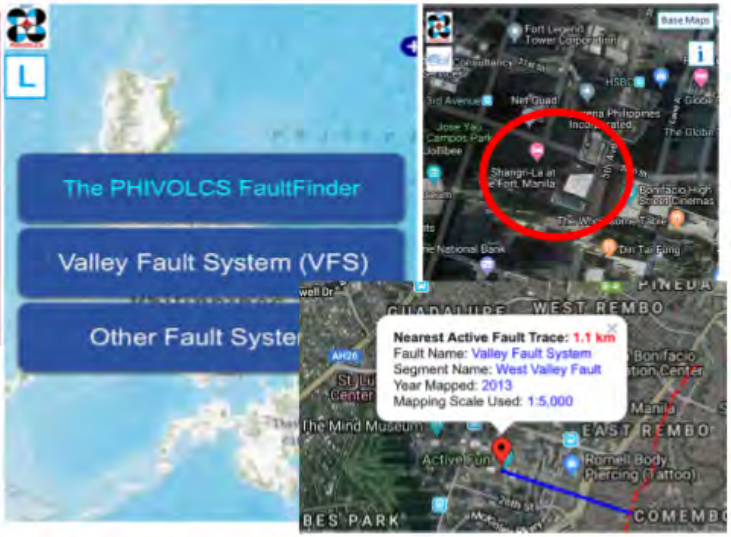
Source: DOST Philippines

WARNING AND RISK COMMUNICATION

bagong.pagasa.dost.gov.ph



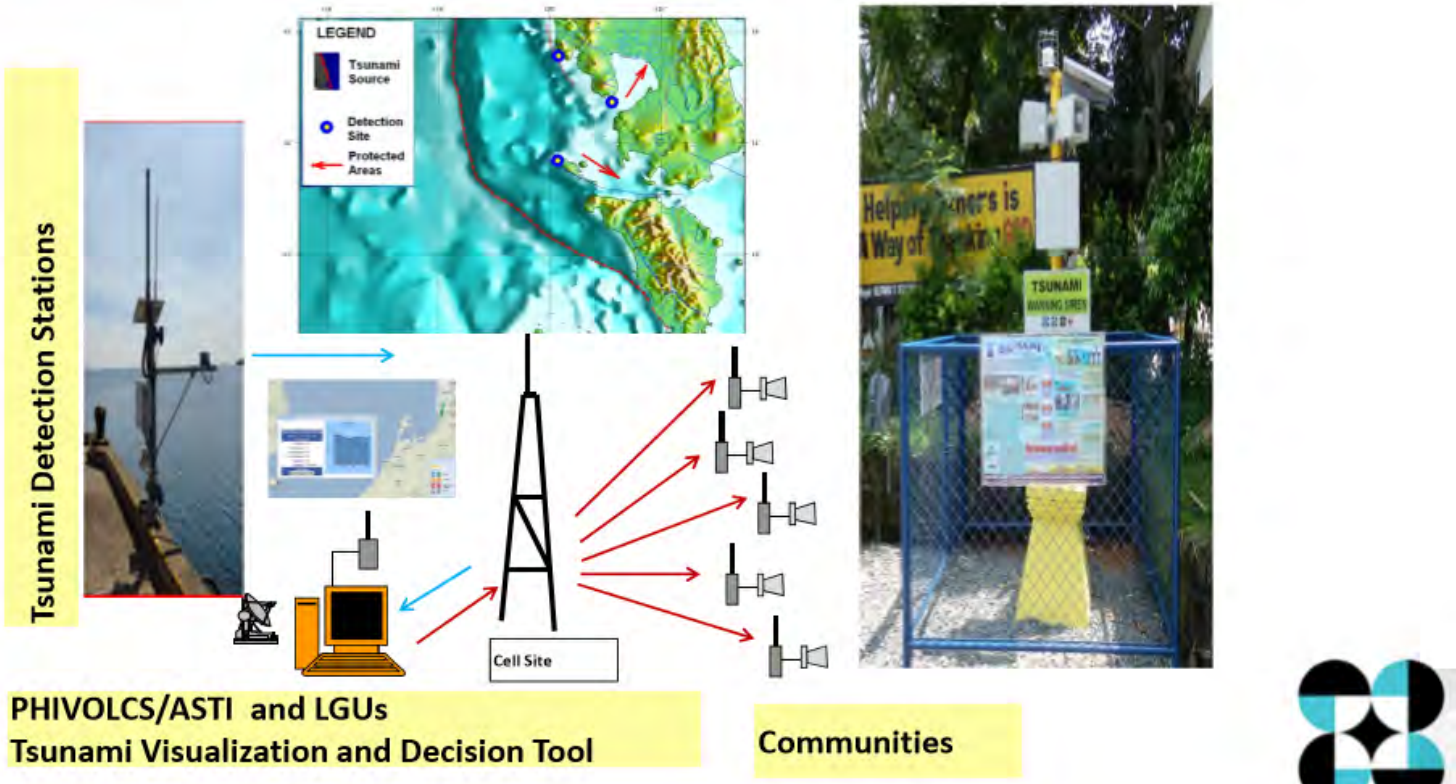
The **PHIVOLCS Geoportal** (web-GIS based portal, to view and collate multi- hazard and risk maps); gisweb.phivolcs.dost.gov.ph/hazardmap



The **PHIVOLCS FaultFinder** (locate the nearest active fault from a specified location or village); faultfinder. phivolcs.dost.gov.ph

Source: DOST Philippines

Community Tsunami early Warning System

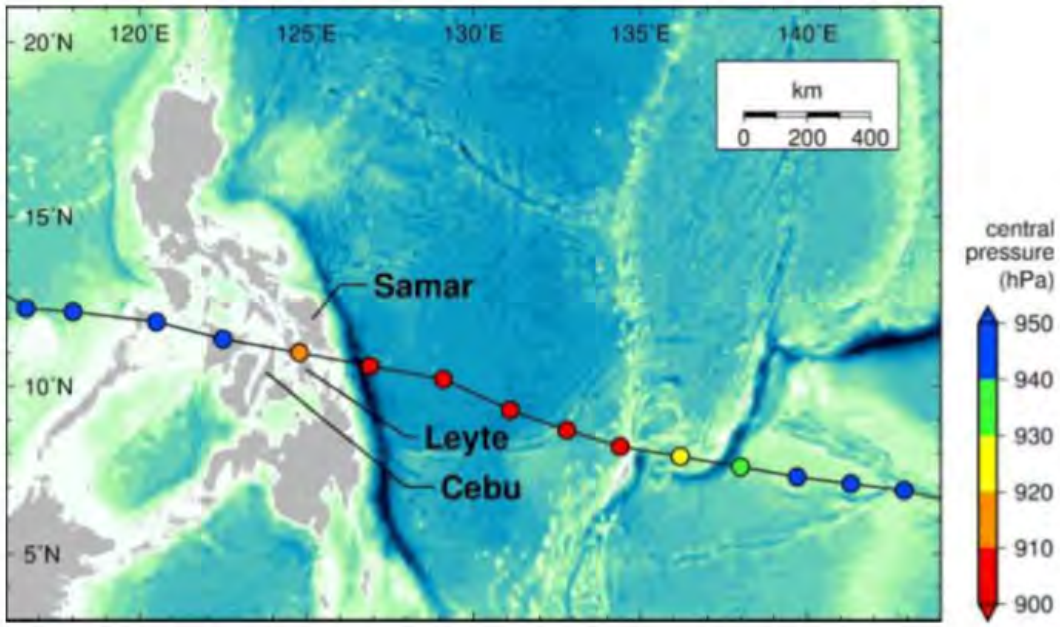


Source: DOST Philippines

Typhoon Haiyan 2013 Storm Surge: Coastal Disaster Research

"Joint Field Survey Team of Coastal Engineers and Researchers from Japan (Waseda University, Tokyo Institute of Technology, University of Tokyo, Toyo University), Vietnam (Ho Chi Minh University) and the Philippines (De La Salle University)"

Storm Surge Yolanda: About Typhoon Yolanda



Time of Generation:
2013-11-04 00:00 UTC

Time of Disappearance:
2013-11-11 06:00 UTC

Minimum Pressure: 895 hPa

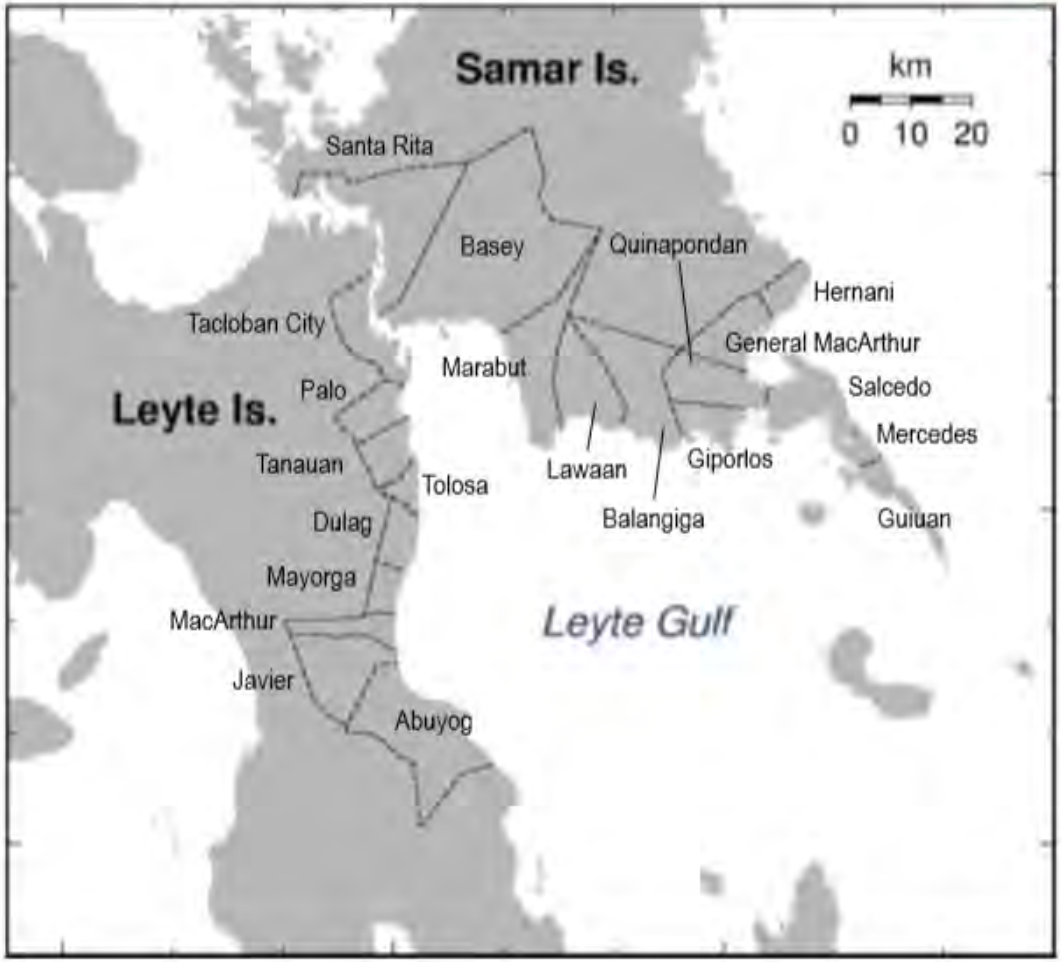
Maximum Wind Speed: 64.3 m/s

Victims: 6300

Unknowns: 1061

Track Data: Japan Meteorological Agency website [http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/besttrack.html]
Topography: The GEBCO Digital Atlas published by the British Oceanographic Data Centre on behalf of IOC and IHO, 2003

Storm Surge Yolanda: Leyte and Samar Islands, Philippines



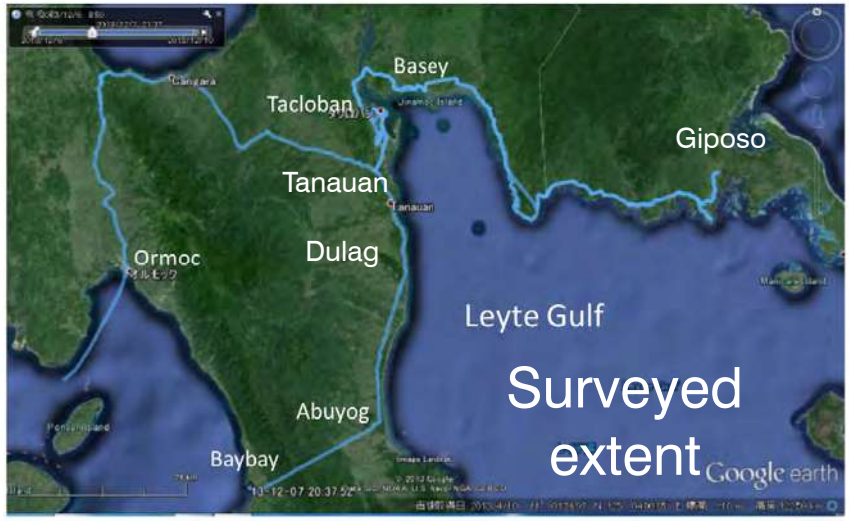
Storm Surge Yolanda: Cities and Municipality Dead and Missing

Province	City/Municipality	Population	Dead	Missing	%
Leyte	Tacloban City	221,174	2,524	594	1.41 %
	Palo	62,727	1,089	292	2.20 %
	Tanauan	50,119	1,252	754	4.00 %
Samar	Basey	50,423	194	38	0.46 %
Eastern Samar	Guiuan	47,037	106	16	0.26 %
	Hernani	8,070	72	4	0.94 %

Leyte Bay

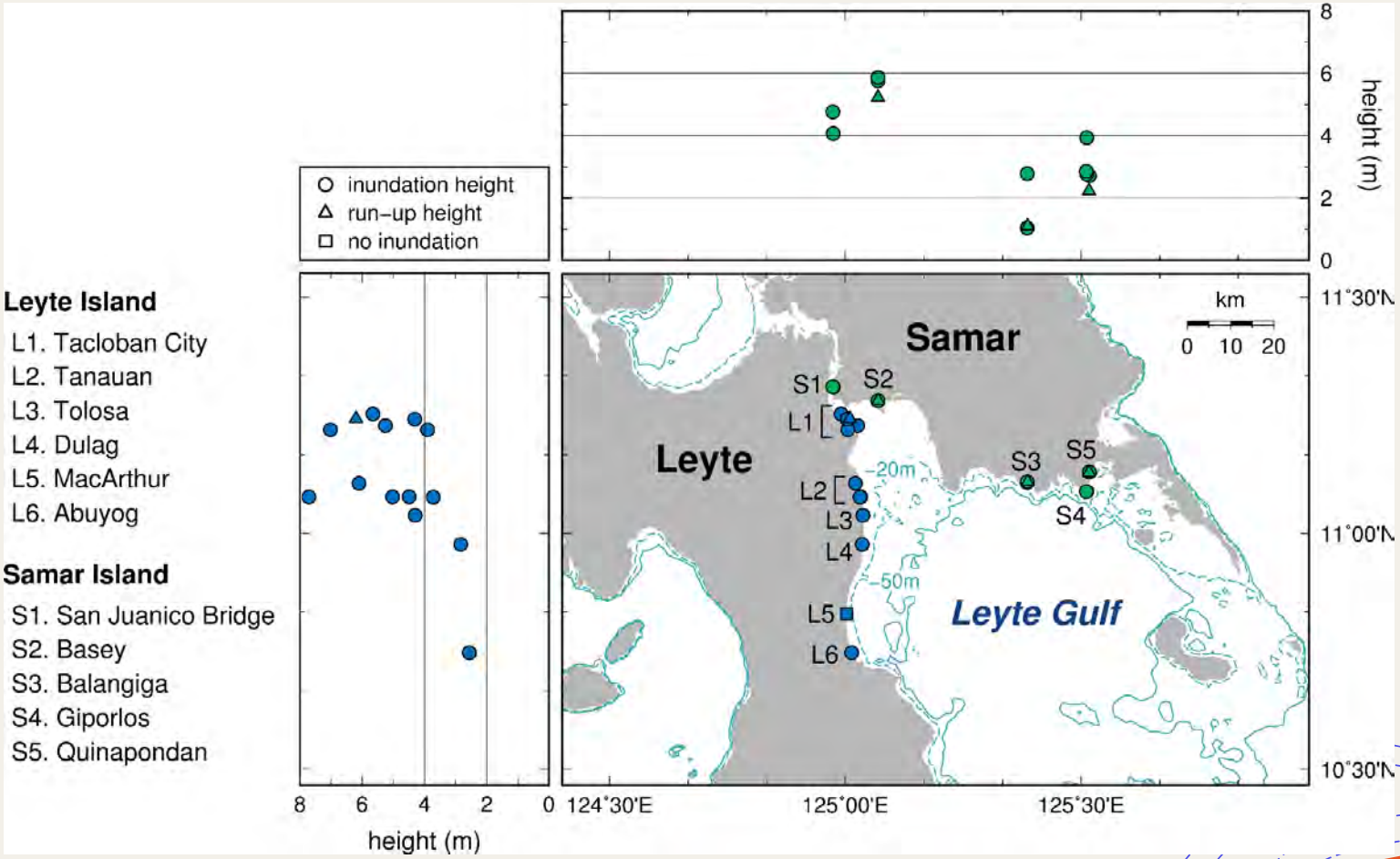
Outer Ocean

Post-disaster Survey in the Philippines after Yolanda



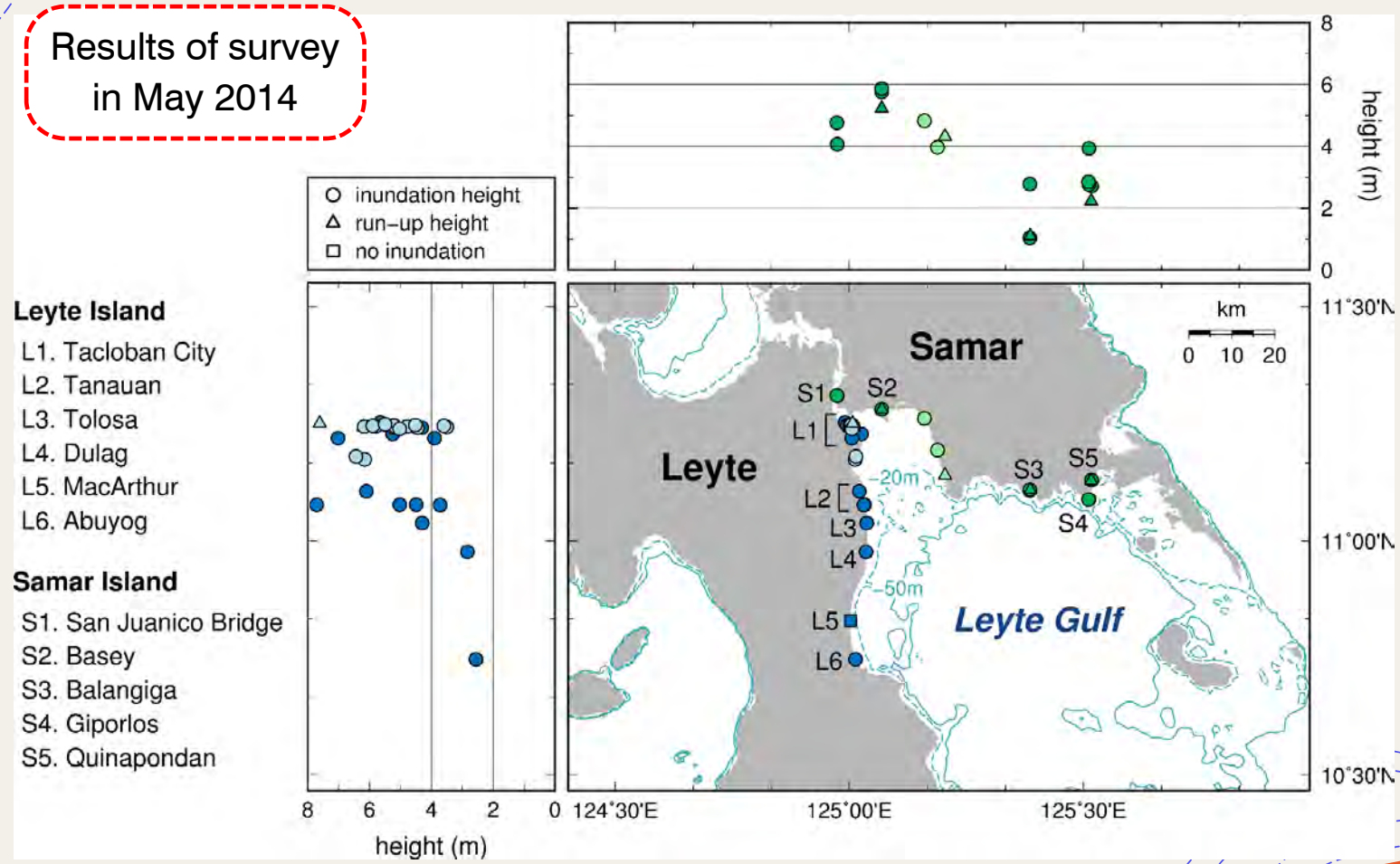
Storm Surge Height Measurements

Storm Surge Height Distribution

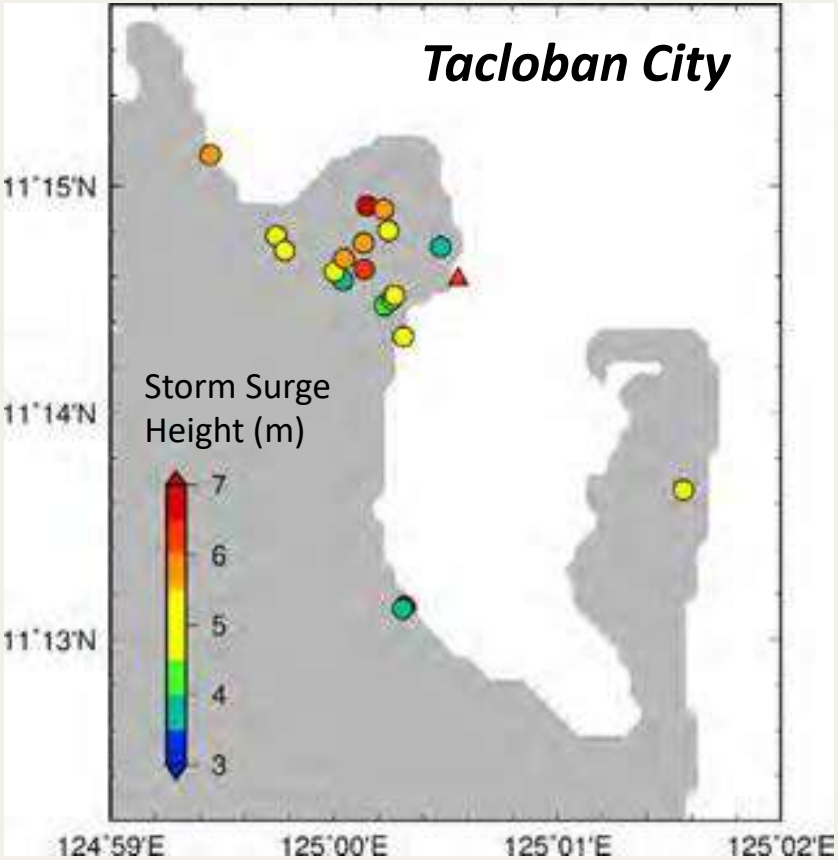


Storm Surge Height Distribution

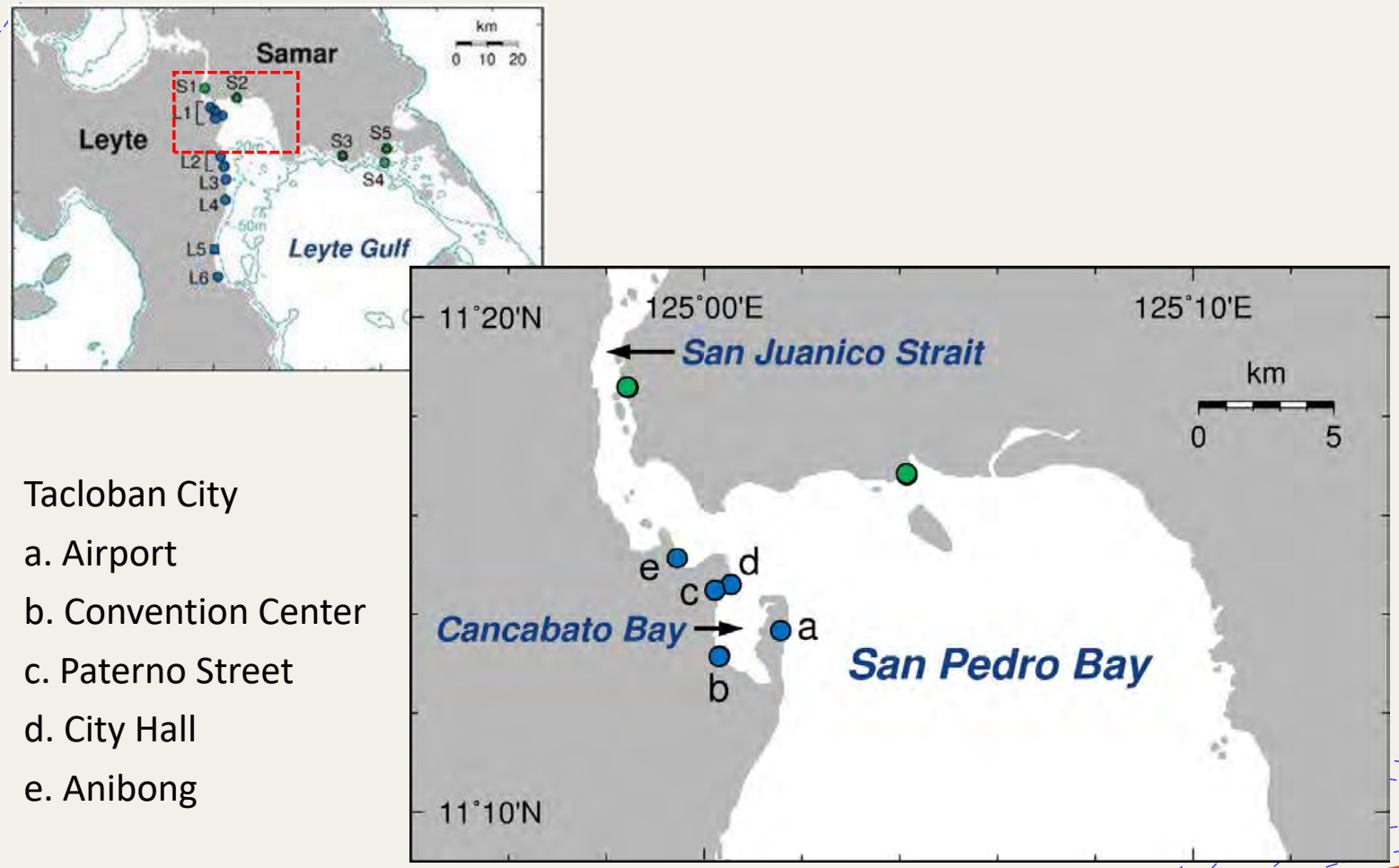
Results of survey in May 2014



Storm Surge Height Distribution



Surveyed Points (San Pedro Bay)



Tacloban City

a. Airport

b. Convention Center

c. Paterno Street

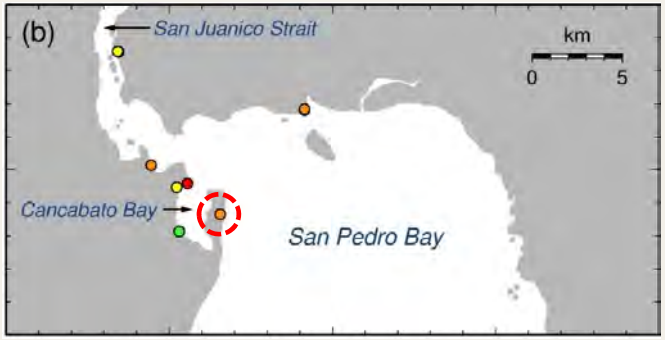
d. City Hall

e. Anibong

Survey Results — Airport, Tacloban City

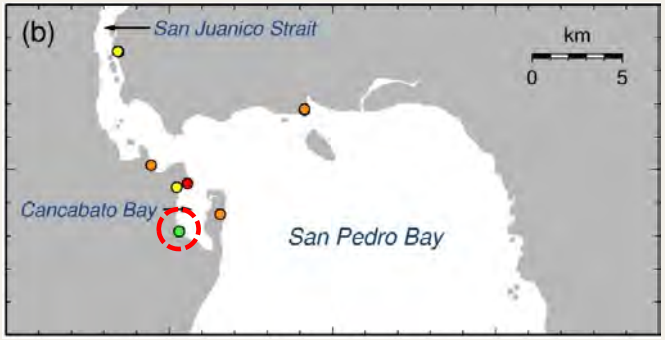
- Located in a narrow low-lying peninsula
- Airport worker (remained at the airport during the event) “the water level reached the location of the air conditioning unit”

  ⇒ Height: 5.25m (Depth: 3.45m)



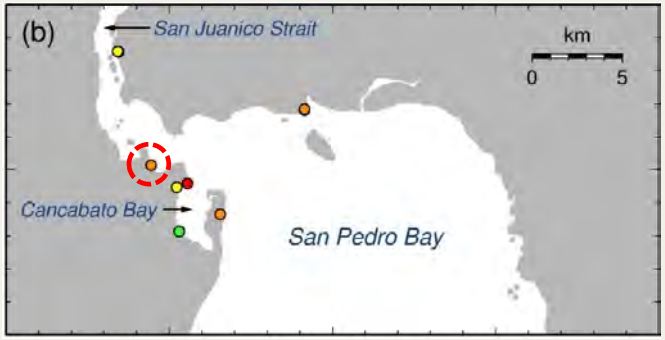
Survey Results — Tacloban City

- Height: more than 3.90m (at Hotel)
- Height: 7.02m (2nd floor of a house)
- It was difficult to estimate the maximum storm surge height around this area.



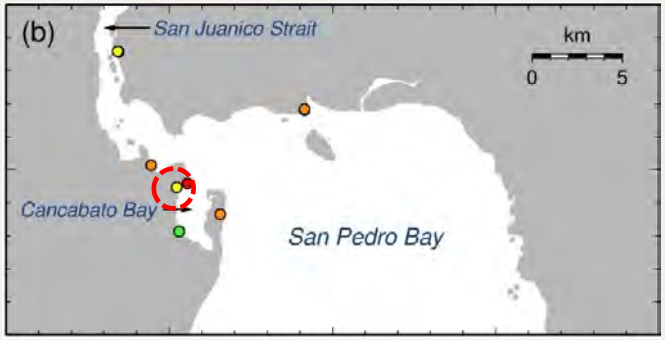
Survey Results — Anibong, Tacloban City

- Height : 5.65m (residents evacuated to a hill behind the house).
- Storm surge attacked densely populated area.
- Ships were washed inland (this area is next to a port area).



Survey Results — Alejandro Hotel, Tacloban City

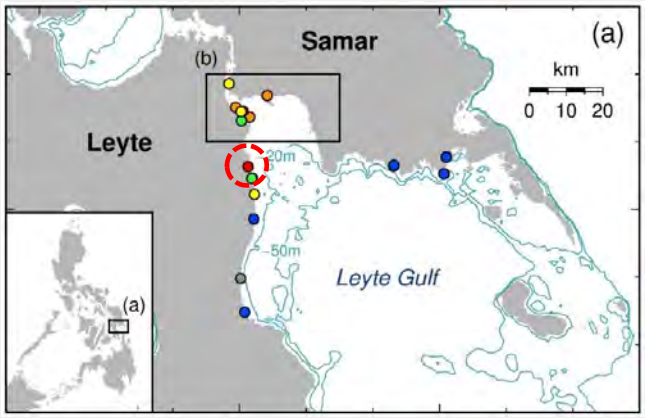
- Height: 4.31m (350m from the coast)
- Video footage during storm surge
- “The inundation started at 7:30AM and family decided to evacuate after the sea water reached waist level.”



Source: YouTube, http://www.youtube.com/watch?v=4wrgrJwYdy8

Survey Results — Edible Oil Mfg., Tanauan

- Height: 6.10m (100m from the coast)
- Oil tanks were displaced by the storm surge and the high waves.

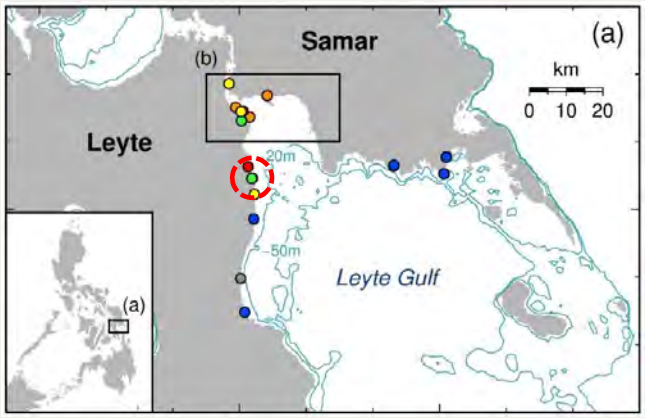


2012/02/23

2013/11/10

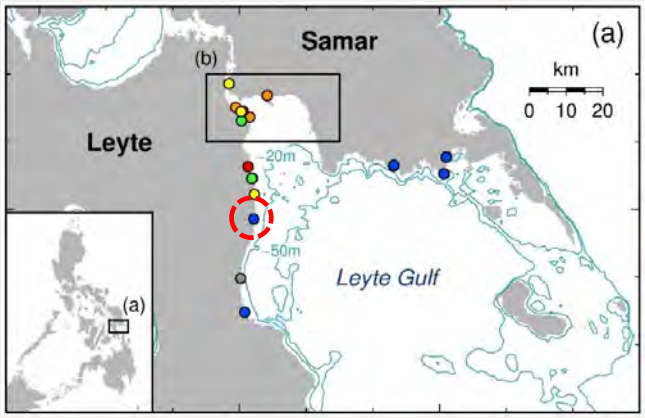
Survey Results — Bislig, Tanauan

- Height: 7.71m (near the coast)
- Height: 3.72m (290m from the coast)
- The water carried a great deal of garbage with it (flow was like “washing machine”).



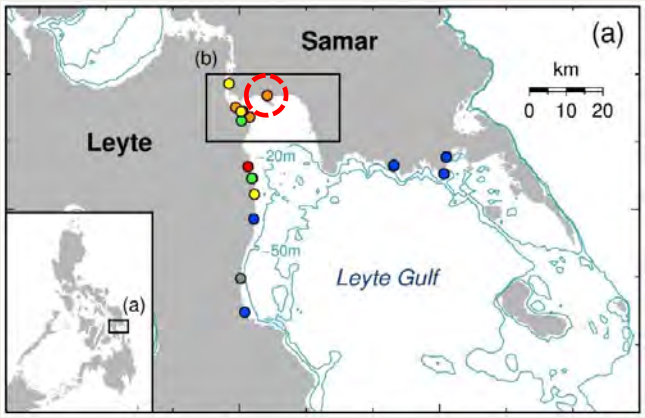
Survey Results — Luan, Dulag

- Height: 2.84m (300m from the coast)
- When the typhoon came, residents evacuated to an elementary school (designated evacuation site).
- Storm surge reached this school (depth was 80cm).



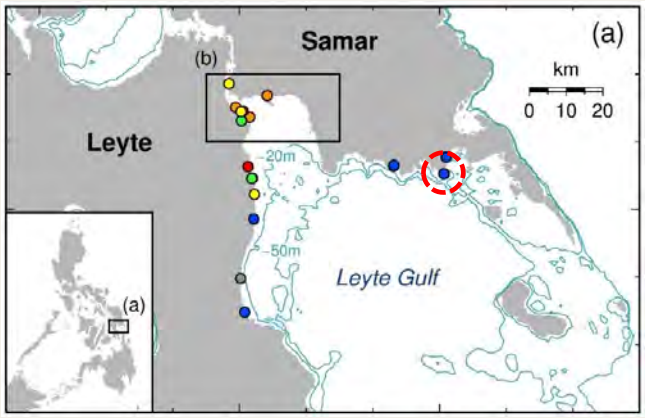
Survey Results — Basey

- Height: 5.87m (City Hall)
- Height: 5.22m (behind the City Hall)
- 1st floor was flooded
- Strong winds started around 5AM
  → the water started to recede 6AM
  → the storm surge started 7AM



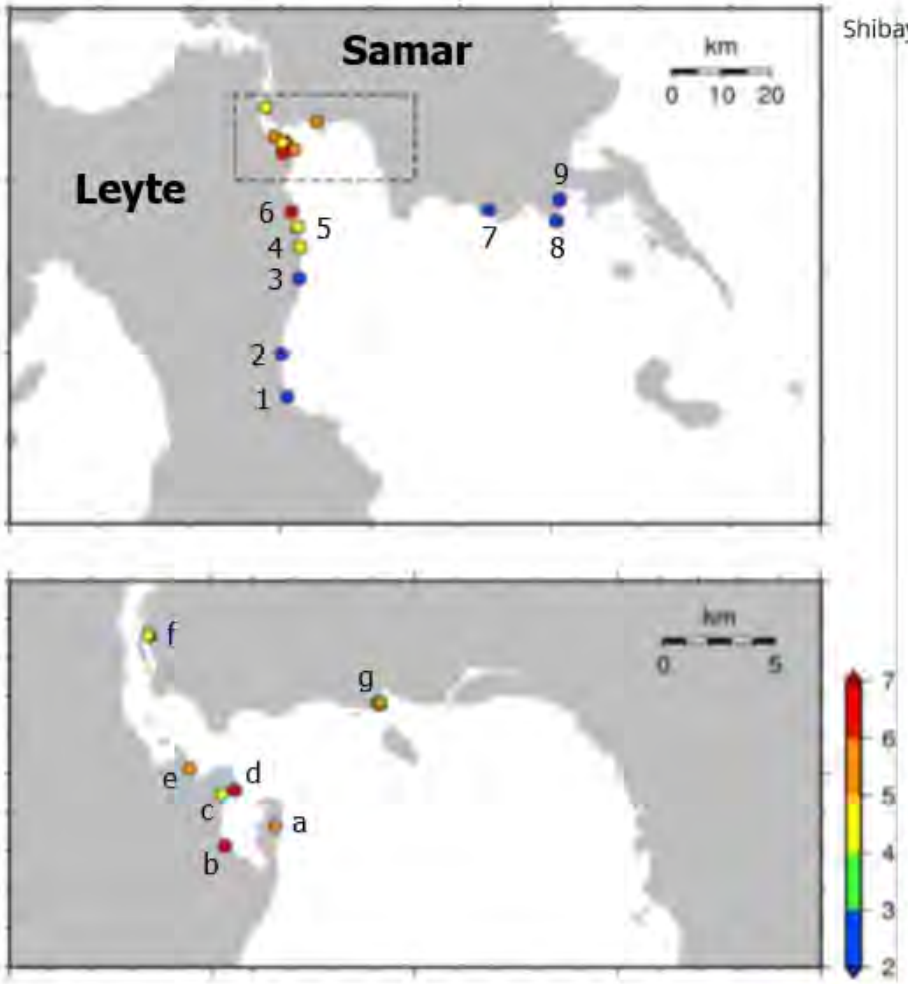
Survey Results – Gigoso, Giporlos

- The mayor brought us to the most affected barangay.
- Height: 3.93m (near the coast)
- 1st floor was flooded and the water reached up to the 2nd floor (wind waves?).



Storm Surge Yolanda: Measured Storm Surge Height

早稲田大学 WASEDA University



Shibayama et al., 2014

Storm Surge Yolanda: Survey Results – Alejandro Hotel, Tacloban City

早稲田大学 WASEDA University

- Surge height : 4.31m (350m from the shoreline)

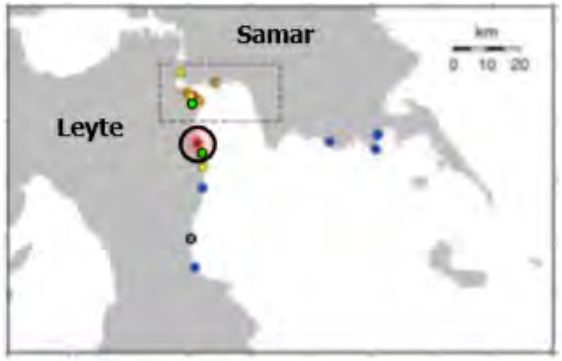
The family watch themselves on YouTube after the field survey team located them in the Philippines.

YouTube stills courtesy of Mr. Josh Morgerman, iCyclone [https://www.youtube.com/watch?v=4wrgrJwYdy8]

Storm Surge Yolanda: Survey Results – Edible Oil Mfg., Tanauan

早稲田大学 WASEDA University

- Flood height : 6.10m (100m from the shoreline)
- Empty oil tanks are transported 150m inland



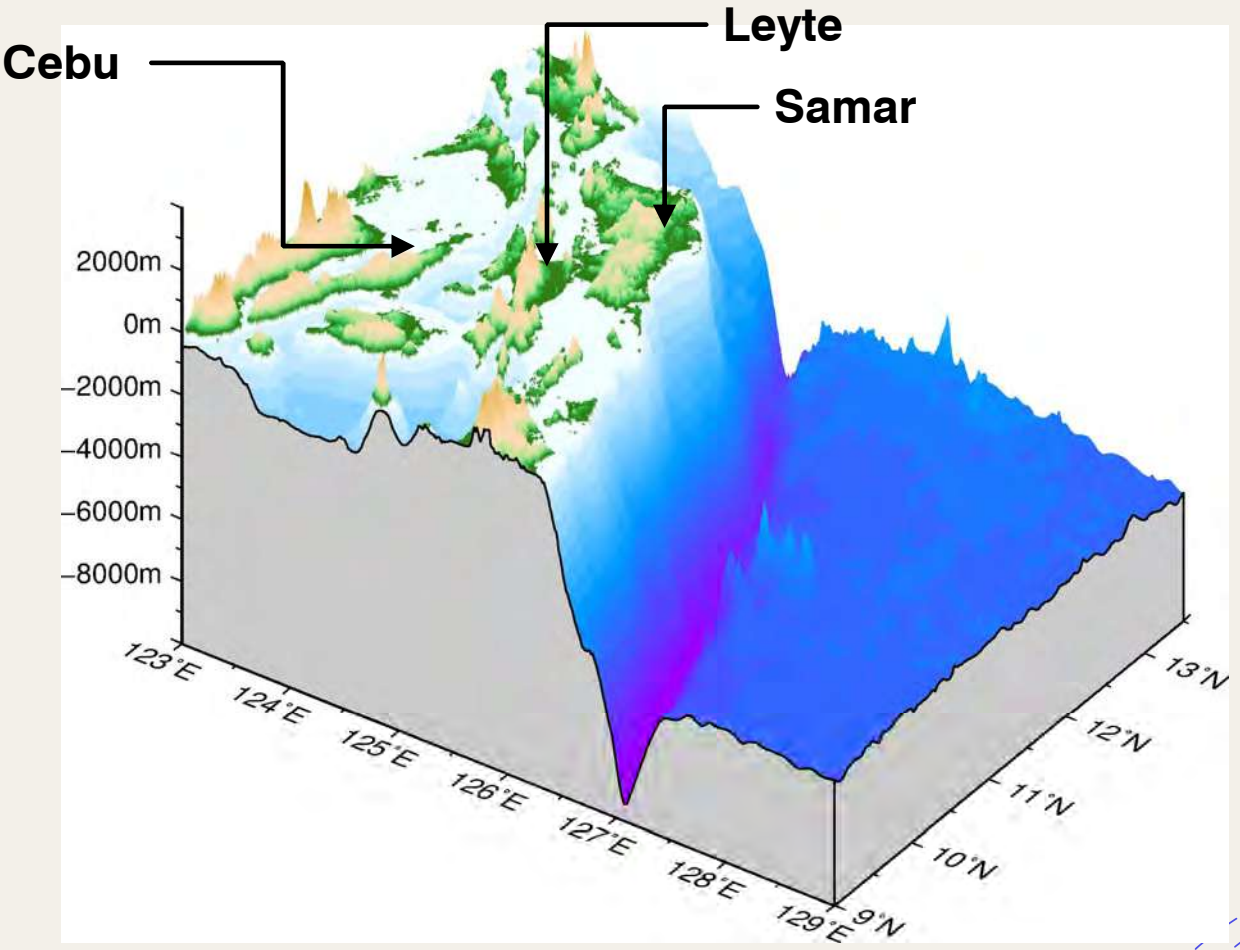
Map Data: Google Earth, Image © Digital Globe 2015

Map Data: Google Earth, Image © Digital Globe 2016

Storm Surge Model

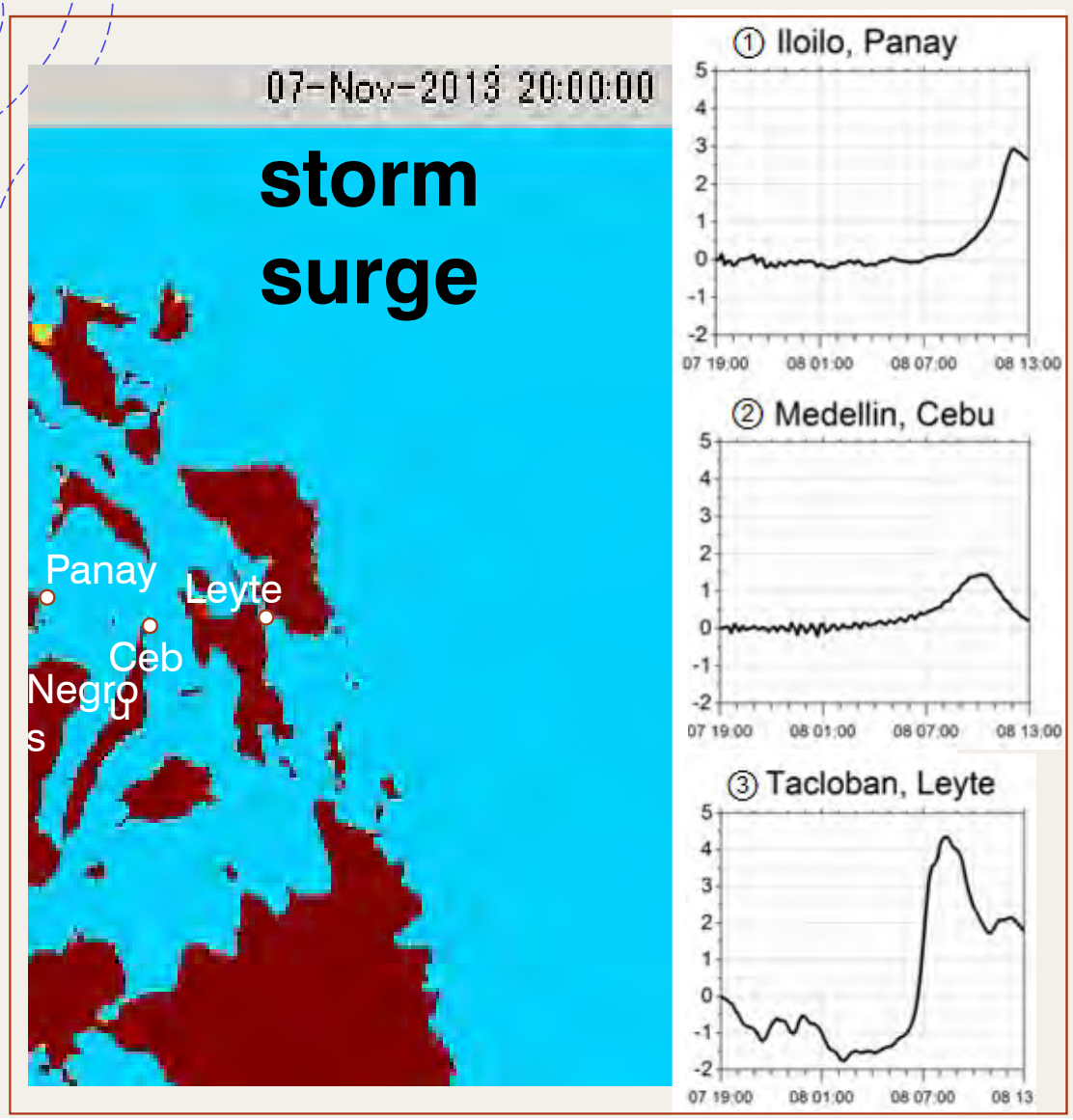
Typhoon Path	**JMA Typhoon Best Track**
Typhoon Model	**Pressure: Myers Formula, Wind: Gradient winds considering Super-gradient wind effect**
Fluid Dynamics Model	**Nonlinear shallow water equation**
Computational Domain	**Cartesian (UTM51N), grid @3000m (Philippines), @100m (San Pedro Bay)**
Bathymetry	**GEBCO_08 Grid (Philippines) Chart by NAMRIA (San Pedro Bay)**
Terrain Data	**ASTER GDEM (Satellite Data) Tacloban, measured by the team**
Manning's *n* value	**Ocean: 0.025, Land: 0.060**

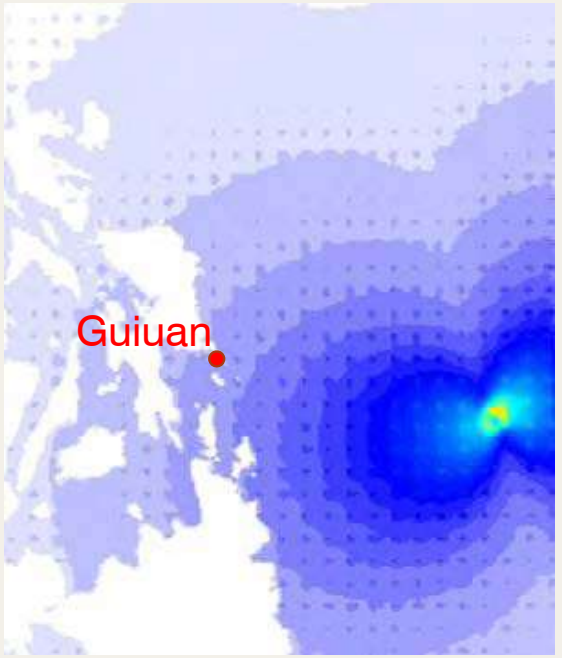
Bathymetry around Leyte and Samar



Data: GEBCO_08 Grid, GEBCO (General Bathymetric Chart of the Oceans)

Simulation for a wide area of the Philippines

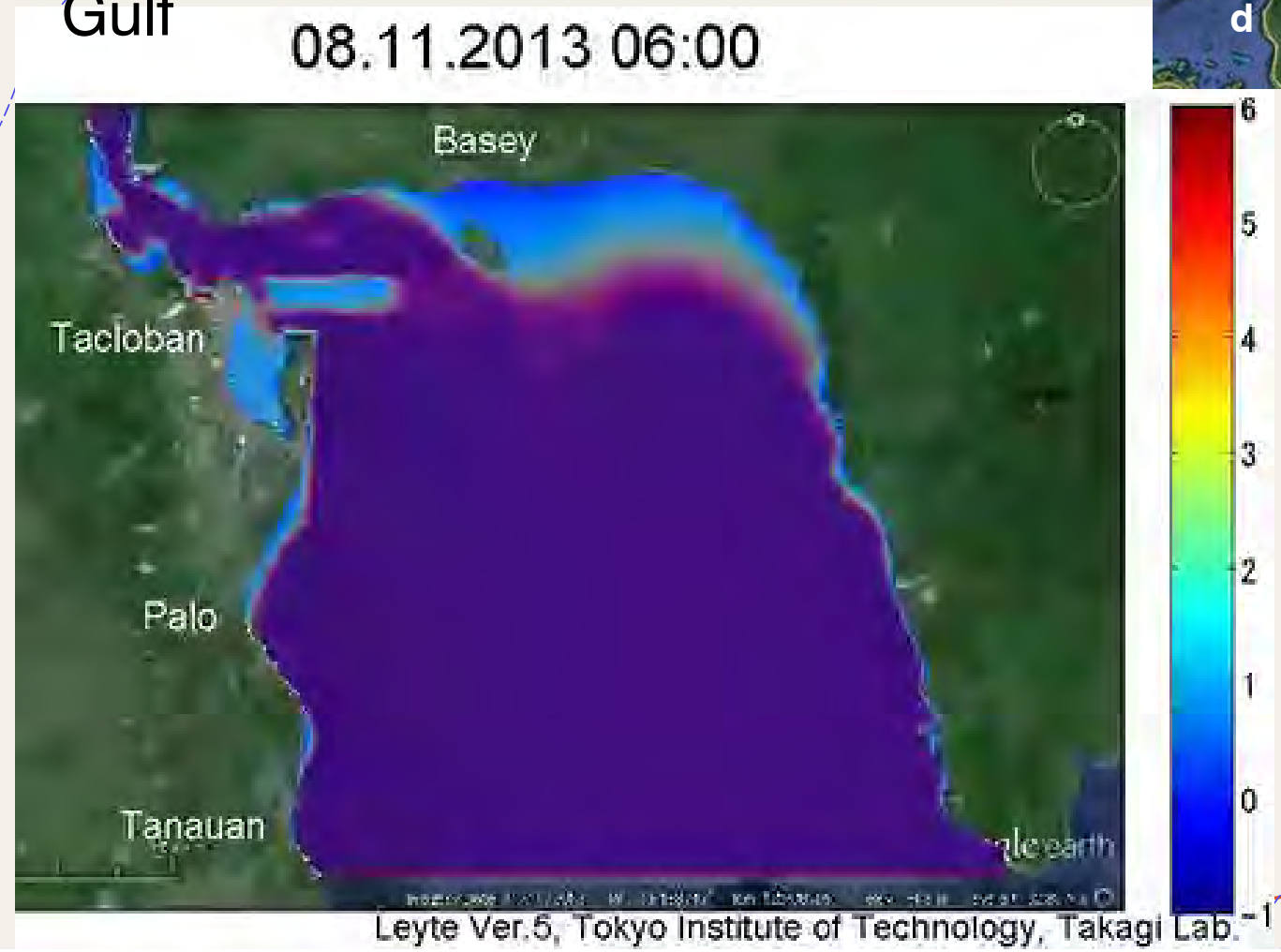




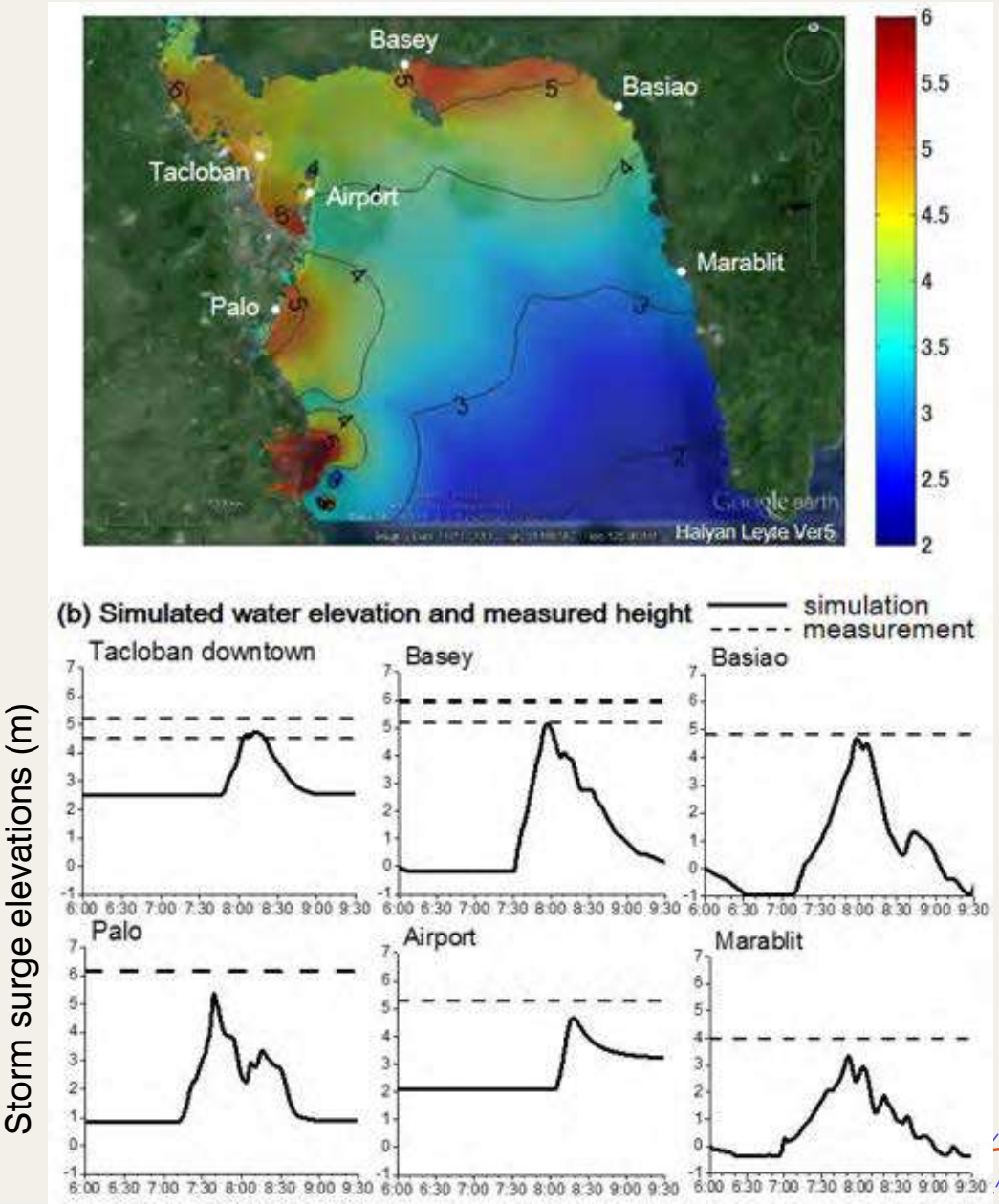
Wave

movie embedded

Detailed simulation focusing on Leyte Gulf



Leyte Ver.5, Tokyo Institute of Technology, Takagi Lab.


Basey
Basiao
Tacloban
Airport
Marablit
Palo
Google earth
Haiyan Leyte Ver5
6
5.5
5
4.5
4
3.5
3
2.5
2
(b) Simulated water elevation and measured height
simulation
measurement
Tacloban downtown
Basey
Basiao
Palo
Airport
Marablit
Storm surge elevations (m)
6:00 6:30 7:00 7:30 8:00 8:30 9:00 9:30

Receding of water observed in Basey, which was reproduced by the simulation as well.

movie embedded

Detail simulation focusing on the downtown Tacloban

ntense field survey

(a) Inundation height

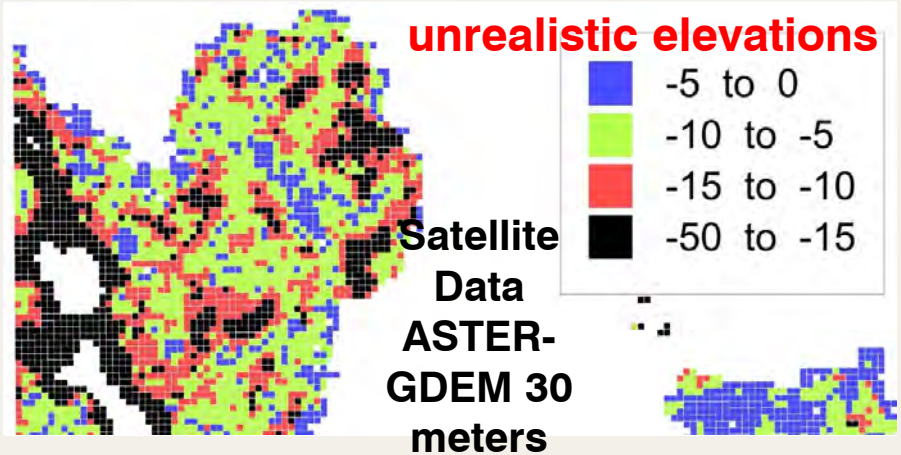
(b) Inundation height

(c) Inundation height

(d) Topographical survey

Topographical survey in the downtown Tacloban

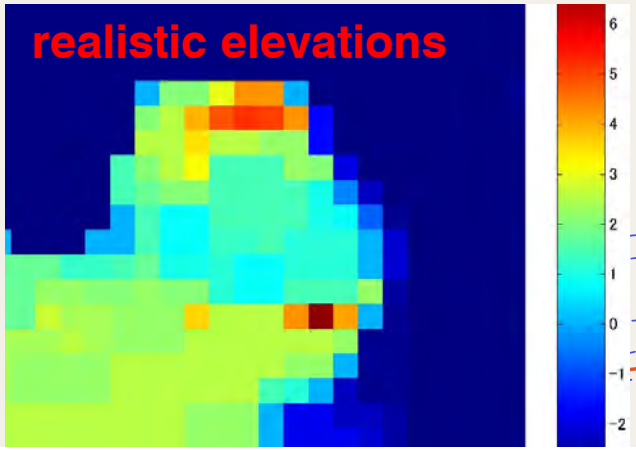
The precise ground elevation is a key to a reliable simulation



modified

Refined elevation data of Tacloban City

topographical survey



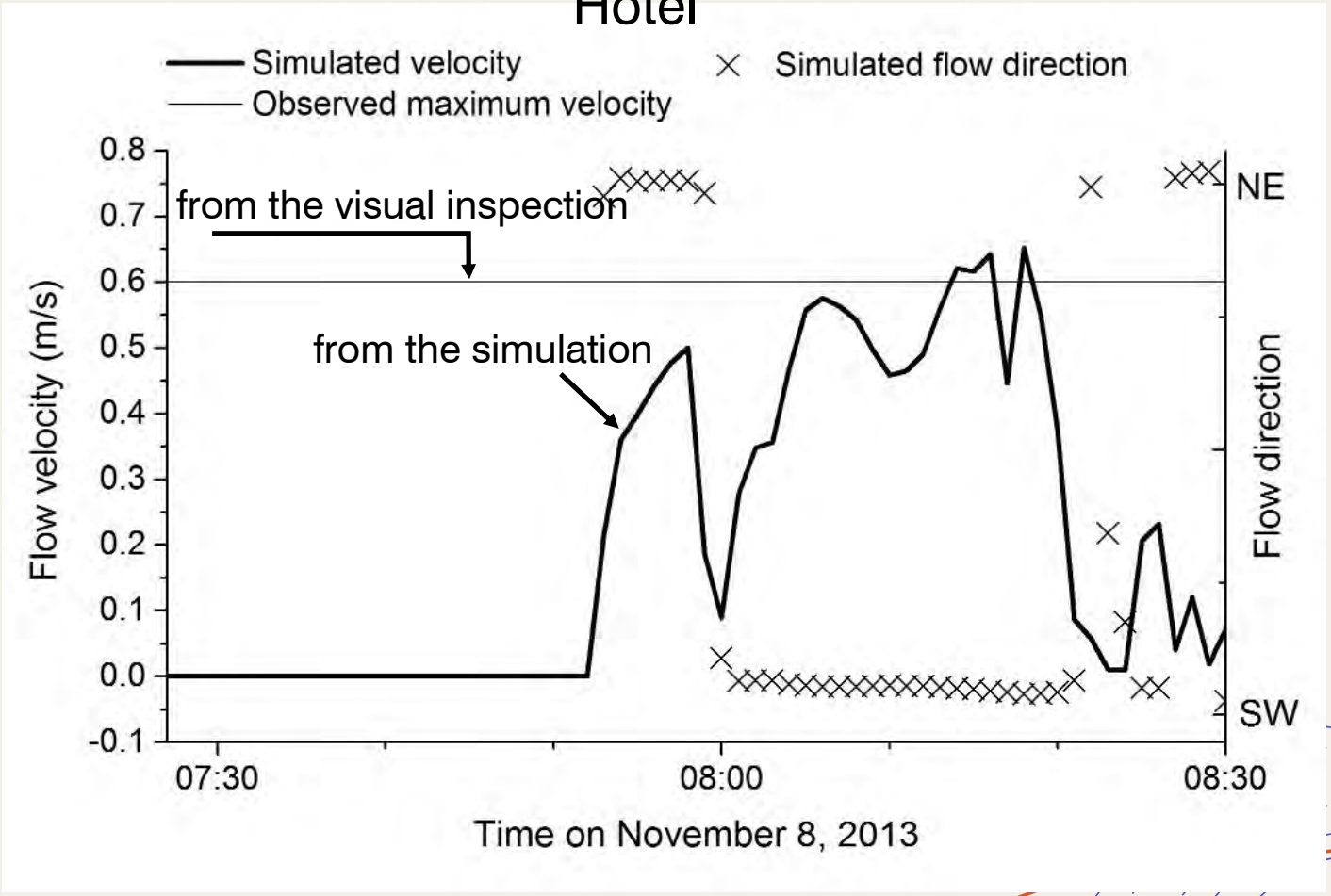
Storm surge heights from the sea surface (black) and inundation depths from the ground (blue) (unit: meter)

Visual inspection using a movie taken from Alejandro Hotel

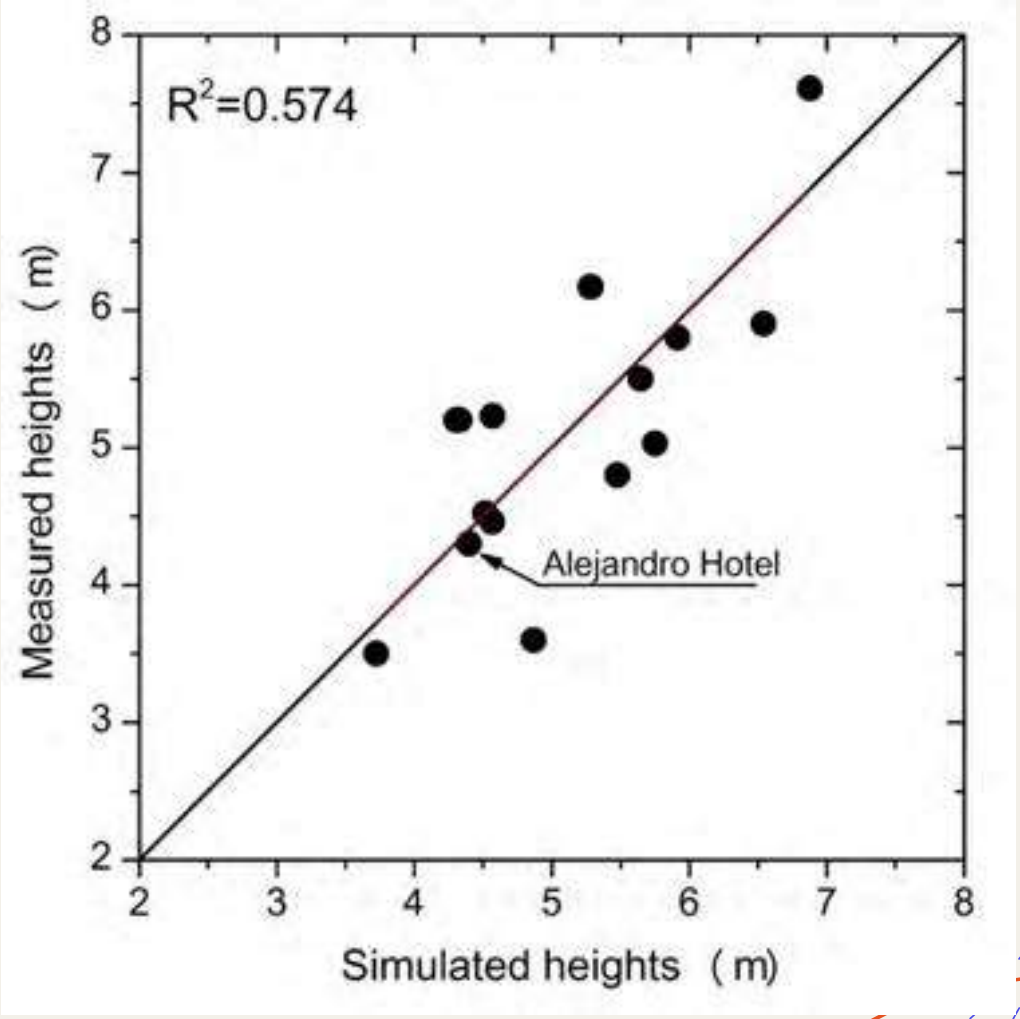
movie embedded

Comparison of flow speed between the movie and simulation

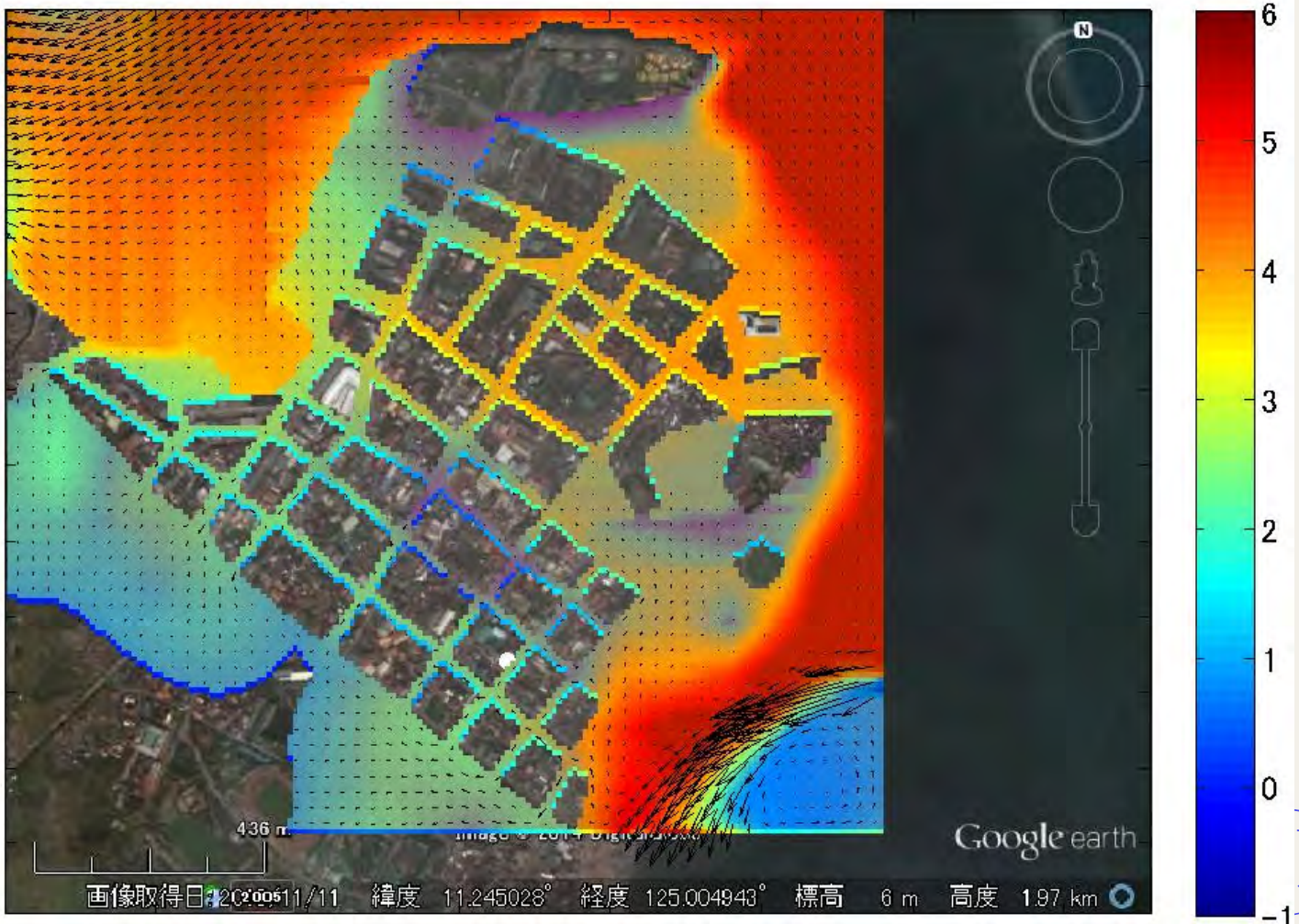
The flow speed was about 60cm/s in front of Alejandro Hotel



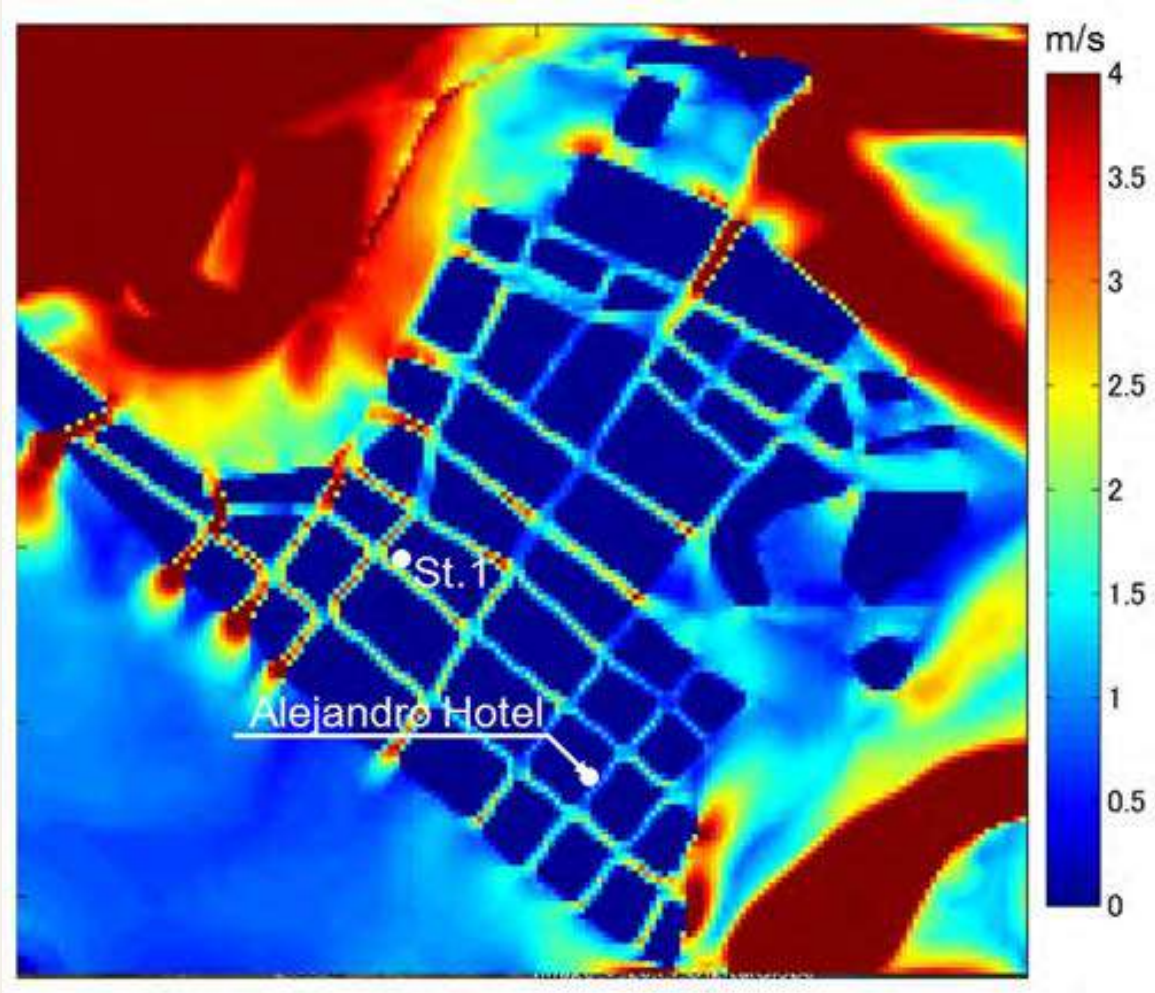
Comparison of storm surge between measured and simulated heights at 15 locations in Tacloban downtown



08.11.2013 08:04



Flow velocity was significantly fast along some streets, which reached more than 4m/s.



Risk Management Policy in the Philippines

"Excerpt from the National Disaster Risk Reduction Management Council (NDRRMC) of the Philippines Report on National Disaster Risk Reduction Management Plan (NDRRMP) 2020-2030"

Department of Civil Engineering
De La Salle University

Overview of the Plan

SCOPE

The Updated National Disaster Risk Reduction and Management Plan (NDRRMP) establishes the linkage between disaster risk reduction and management (DRRM), climate change adaptation (CCA), and human security by focusing on climate and disaster risks. It aims to achieve the shared goals of *Ambisyon Natin* 2040, NDRRMP, National Climate Change Action Plan (NCCAP), and National Security Strategy (NSS) in risk reduction, resilience building, human security, and sustainable development.

PURPOSE

The Updated NDRRMP intends to:

- provide strategic direction and guidance to national government agencies (NGAs), local government units (LGUs), civil society organizations (CSOs), private sector, and development partners on disaster and climate-resilience actions in the Philippines;
- strengthen disaster and climate risk governance by clarifying the roles, accountabilities, strategies, and activities of disaster risk reduction and management (DRRM) stakeholders at all levels;
- strengthen linkages and interoperability of the DRRM thematic pillars;
- ensure the convergence of and synergy between DRRM and CCA; and,
- contribute to the achievement and coherence of ***global*** (Sendai Framework for Disaster Risk Reduction 2015 - 2030, Paris Agreement, United Nations Sustainable Development Goals 2015 - 2030, International Health Regulations (IHR), New Urban Agenda), ***regional*** (Asia-Pacific Economic Cooperation Disaster Risk Reduction Framework, ASEAN Agreement on Disaster Management and Emergency Response, Asia Regional Plan for Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030), and ***national*** (*Ambisyon Natin* 2040, Philippine Development Plan 2017 – 2022, National Framework Strategy on Climate Change (NFSCC), NCCAP 2011 - 2028, and NSS) development and policy agenda.

Figure 3. The National Disaster Risk Reduction and Management Framework 2020-2030

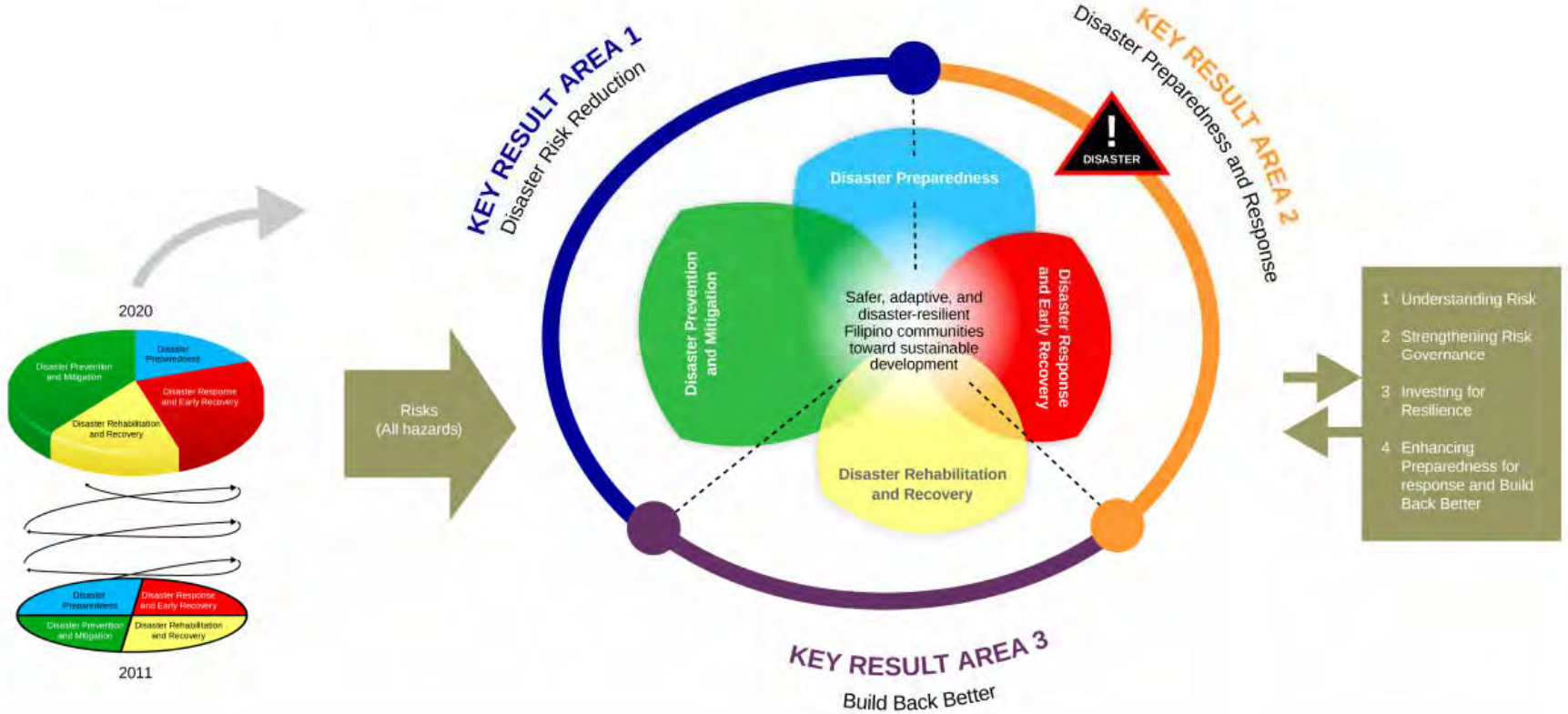
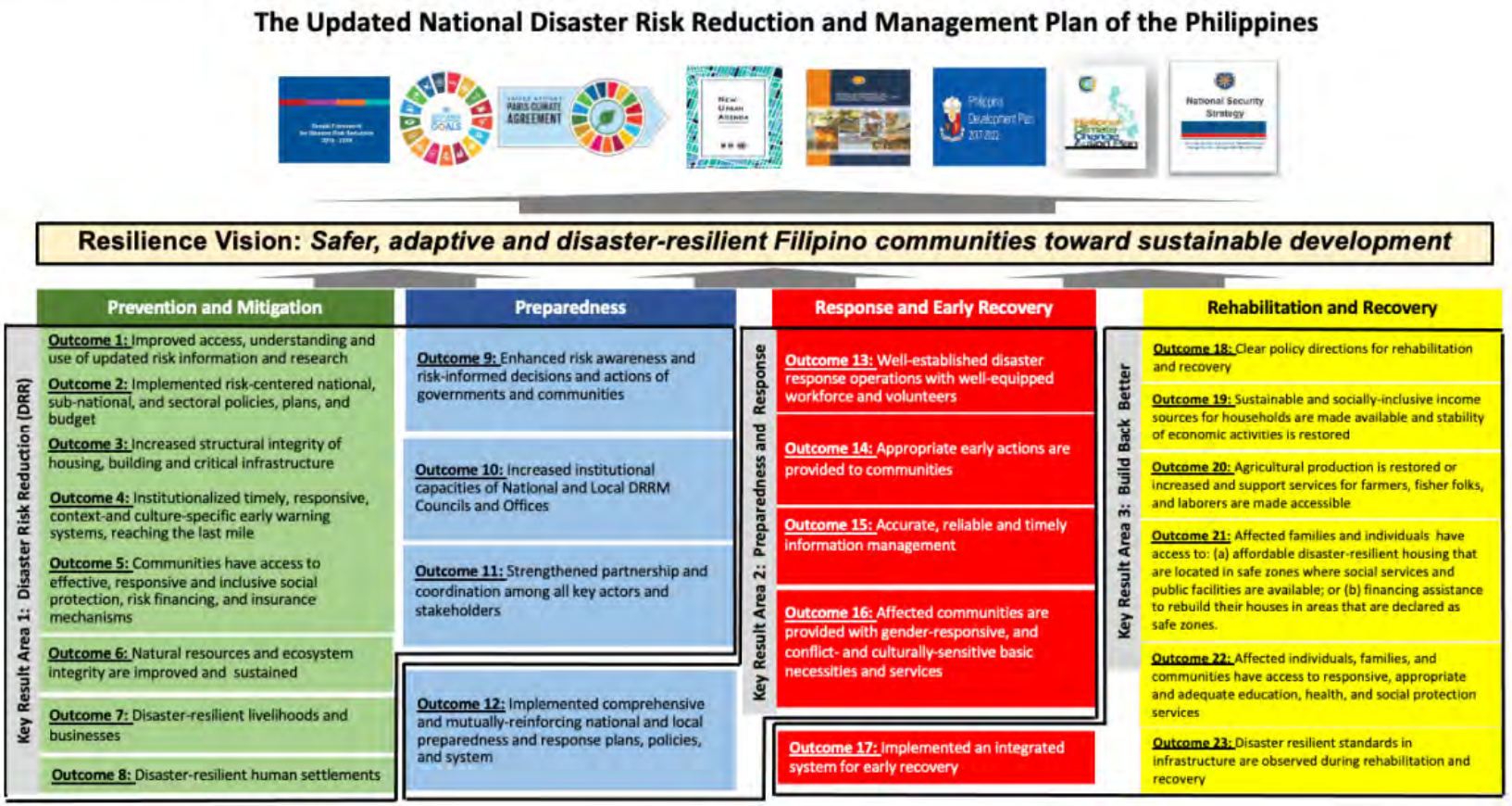


Figure 4: The Summary of National Disaster Risk Reduction and Management Plan 2020 - 2030



THEMATIC AREA I –

DISASTER PREVENTION AND MITIGATION

Overall steering and leadership – Department of Science and Technology (DOST)

Disaster Prevention and Mitigation is about understanding risk and ensuring that policies, plans and budget are risk-informed and provide an enabling environment for sustained actions aimed at addressing current and reducing future risks. It is about access, use and application of science in risk reduction and management work – from assessment to early warning actions. Also, this thematic pillar is about the institutionalization of risk financing mechanisms for both *ex ante* and *ex post* actions, emphasizing the complementarity of resources to help strengthen resilience.

Goal	Objectives	Outcomes
Address current and reduce future risks of communities and government through mainstreaming integrated risk management into science, policy and practice.	1. Improve access, understanding, and use of updated risk information, DRR-related statistics, and research; 2. Apply integrated risk management assessment tools; 3. Implement risk-centered national, sub-national and sectoral policies, plans and budgets; 4. Institutionalize timely, responsive, context- and culture-specific early warning systems; 5. Access to effective, responsive and inclusive risk financing and insurance mechanisms 6. Improve and protect ecosystem integrity; 7. Build resilience of livelihoods and businesses; and 8. Disaster-resilient human settlements	1. Improved access, understanding and use of updated risk information and research 2. Implemented risk-centered national, sub-national, and sectoral policies, plans, and budgets 3. Increased structural integrity of housing, building, and critical infrastructure 4. Institutionalized timely, responsive, context- and culture-specific early warning systems reaching the last-mile 5. Communities have access to effective, responsive and inclusive social protection, risk financing and insurance mechanisms 6. Natural resources and ecosystem integrity are improved and sustained 7. Disaster-resilient livelihoods and businesses 8. Disaster-resilient human settlements

Roles and Responsibilities

Lead Agency

In adherence to RA 10121, the DOST is the overall lead for disaster prevention and mitigation activities as Vice-Chairperson for disaster prevention and mitigation in the NDRRMC. DOST will work closely with the OCD and various government agencies and stakeholders to ensure that the outcomes, outputs and activities under the disaster prevention and mitigation pillar are achieved. Specifically, DOST will play a key role in providing oversight for the generation and dissemination of science-informed disaster and climate risk information to all sectors and levels, and the horizontal and vertical integration of DRRM-CCA in policy, planning and budgeting, among others.

Implementing Agencies/ Institutions/ Organizations

The implementing agencies comprised of NGAs, LDRRMCs, LGUs, CSOs, private sector, and other stakeholders will cooperate and complement each other by supporting and engaging in activities that are relevant to the outcomes. Through the guidance of the DOST, the implementing agencies will work together to identify specific programs and projects and allocate corresponding budget to harmonize their efforts and investments toward realizing the goal of addressing current and reduce future risks of communities and government through mainstreaming integrated risk management into science, policy and practice. To monitor the progress and contribution of implementing agencies to the achievement of the outcomes, they will submit accomplishment and activity reports to the lead agency on a regular basis.

Under the disaster prevention and mitigation pillar, the implementing agencies and partners will engage in activities related to risk assessment, early warning systems, DRRM-CCA strategies and plans, resilient infrastructure, and ecosystem integrity, among others.

Other Agencies

As key stakeholders in the pillar, other agencies are encouraged to initiate actions that will contribute to the achievement of the outcomes. Their actions should be done in consideration of their respective mandates.

THEMATIC AREA II –

DISASTER PREPAREDNESS

Overall steering and leadership – Department of the Interior and Local Government (DILG)

Disaster Preparedness provides for key strategic actions that give importance to community awareness and understanding, contingency planning, conduct of local drills, competency building for survival and rescue, and the development of needed disaster preparedness and response plans. In preparing communities and governments for possible disasters, pre-determined needs based on information available are crucial. Risk-related information coming from the Prevention and Mitigation aspect is necessary in order for preparedness activities to be responsive to the needs of the people and situation on the ground. Also, policies, budget, and institutional mechanisms established under the Disaster Prevention and Mitigation aspect will be further enhanced through capacity building activities, development of coordination mechanisms, among others. Through these, coordination, complementation, and interoperability of work in DRRM operations and essential services will be ensured.

Considering the diversity of risks confronting the country in recent years, the need for stronger mechanisms on preparedness for response is also underscored in this pillar. The activities identified under this pillar also seek to ensure functional and responsive systems that are ready in the event of disasters. The crafting of operational guidelines and protocols for the implementation of forecast-based early actions is deemed necessary to bolster the capacities and expand the assets of national, regional, and local actors to effectively and efficiently prepare for and respond to disasters.

Goal	Objectives	Outcomes
Establish and strengthen capacities of governments, communities, CSOs, and private sector to anticipate, cope, and recover from the adverse impacts of hazards and potential cascading disasters, and minimize losses and disruption of daily life.	1. Increase the level of awareness and understanding of governments and communities of hazards, exposure, and vulnerabilities; 2. Equip governments, institutions, communities, families, and individuals with the necessary skills to respond and cope with the adverse impacts of disasters; 3. Increase the capacity of institutions for risk governance to avert loss of lives and assets; 4. Strengthen partnership among all key actors and stakeholders; and, 5. Develop and implement comprehensive and mutually-reinforcing national and local disaster preparedness and response plans and systems.	9. Enhanced risk awareness and risk-informed decisions and actions of governments and communities 10. Increased institutional capacities of National and Local DRRM Councils and Offices 11. Strengthened partnership and coordination among all key actors and stakeholders 12. Implemented comprehensive and mutually-reinforcing national and local preparedness and response plans, policies, and system

Roles and Responsibilities

Lead Agencies

In adherence to RA 10121, the DILG, as Vice-Chairperson for disaster preparedness in the NDRRMC, will be the overall lead for disaster preparedness interventions and activities at the national level. As the focal agency for this thematic pillar, DILG will work closely with the OCD and various government agencies and stakeholders to ensure that the identified outcomes under disaster preparedness are realized. Specifically, DILG will play a fundamental role in facilitating synergy of activities and strategies designed for communities, local government, CSOs, private sector, and other relevant stakeholders in at-risk areas to effectively anticipate, avoid, respond to, and recover from disasters.

Implementing Agencies/ Institutions/ Organizations

The implementing agencies comprised of NGAs, LDRRMCs, LGUs, CSOs, private sector, and other stakeholders will cooperate and complement each other to advance safe and resilient communities through supporting and engaging in activities that are relevant to the outcomes. Through the supervision of DILG as the overall coordinator, the implementing agencies will work together to identify specific programs and projects and allocate corresponding budget to harmonize their efforts and investments toward realizing the goal of the disaster preparedness pillar at all levels. To monitor the progress and contribution of implementing agencies to the achievement of the outcomes, they will submit accomplishment and activity reports to the lead agency on a regular basis.

Under the disaster preparedness pillar, the implementing agencies and partners will engage in activities which may include, but not limited to, IEC campaign, capacity building, partnership building, planning, preparedness for response, and continuity of essential services.

Other Agencies

As key stakeholders in the pillar, they are encouraged to initiate actions that will contribute to the achievement of the outcomes. Their actions should be done in view of their respective mandates.

THEMATIC AREA III –

DISASTER RESPONSE AND EARLY RECOVERY

Overall steering and leadership – Department of Social Welfare and Development (DSWD)

Disaster Response provides for key actions that give importance to activities during the actual disaster response operations such as needs assessment, search and rescue, relief operations, and early recovery activities. The activities identified below will be done either before the actual response operations or during the disaster event. For those activities that need to be completed prior to actual response operations, they will be linked to activities earlier identified in the preparedness aspect. However, to ensure that the proper response "lens" is issued in doing said activities, they have been included in this aspect. Overall, the success and realization of this priority area rely heavily on the completion of the activities under both the prevention and mitigation and preparedness aspects.

Goal	Objectives	Outcomes
Provide risk-based, timely and anticipatory response actions to address basic, life-preservation and immediate needs of communities and government. Also, affected communities/ populations are able to continue life with dignity and prevent or minimize exacerbation of emergency situations.	1. To activate emergency operations center equipped with response workforce and volunteers; 2. To activate risk and forecast-based financing to forecasted affected communities; 3. To evacuate safely, preemptively and immediately, affected communities and ensure their safety; 4. To ensure the timely, effective and well-coordinated response action and humanitarian logistics among cluster members and other actors; 5. To ensure adequate, prompt and well-coordinated assessment of needs and damages; 6. To immediately and temporarily restore basic needs; and, 7. To establish and implement an integrated system for early recovery.	13. Well-established disaster response operations with well-equipped workforce and volunteers 14. Accurate, reliable and timely information management 15. Appropriate early actions are provided to communities 16. Affected communities are provided with gender- and conflict-sensitive basic necessities and services 17. Implemented an integrated system for early recovery

This aspect includes Early Recovery, which means, under the Implementing Rules and Regulations (IRR) Rule 2 Section 1, the multi-dimensional process of recovery that begins in a humanitarian setting. It is guided by development principles that seek to build on humanitarian programmes and catalyze sustainable development opportunities. It aims to generate self-sustaining, nationally-owned, and resilient processes for post-crisis recovery. Early recovery encompasses the restoration of basic services, livelihoods, governance, security and rule of law, environment and social dimensions, including reintegration and social and emotional rehabilitation of displaced populations.

For the priority area of Disaster Response, Operational Timelines are used primarily to give an overall guidance on the "rapid" time element in undertaking appropriate anticipatory and early actions based on forecasts and risk assessments and providing humanitarian assistance and early recovery actions. Likewise, the operational timelines will guide the plan's implementation and monitoring of activities for response preparedness, response and early recovery. These operational timelines are as follows:

Anticipatory Actions - This refers to initiatives to be carried out in anticipation of a disaster event based on forecasts and risk assessments.

One (1) to 7 days - Life-saving and life-sustaining actions; meet the essential emergency needs

One (1) to 3 months - Early recovery

Beyond 3 months - Actions toward transitioning to long-term recovery

Roles and Responsibilities

Lead Agency	In adherence to RA 10121, the DSWD, as Vice-Chairperson for disaster response in the NDRRMC, will be the overall lead for the pillar's interventions and activities at the national level. As the focal agency for this thematic pillar, DSWD will work closely with the OCD and various government agencies and stakeholders to ensure that the identified outcomes under the pillar are realized.
Implementing Agencies/ Institutions/ Organizations	As key actors in the pillar, the implementing agencies are expected to contribute to the achievement of the outcomes, particularly to ensure prevention of casualties and that life-saving and life-sustaining actions are carried out. Their actions should be done in view of their respective mandates.
Other Agencies	As key stakeholders in the pillar, they are encouraged to initiate actions that will contribute to the achievement of the outcomes. Their actions should be done in view of their respective mandates.

THEMATIC AREA IV –

DISASTER REHABILITATION AND RECOVERY

Overall steering and leadership – National Economic and Development Authority (NEDA)

The Disaster Rehabilitation and Recovery aspect covers recovery efforts related to employment and livelihoods, infrastructure and lifeline facilities, and housing and resettlement to bring the affected area back to normal as quickly as possible.

Specifically for the Priority Area of Disaster Response and Rehabilitation and Recovery, **Operational Timelines** are used primarily to give an overall guidance on the "rapid" time element in providing humanitarian activities and recovering from disasters. Likewise, the operational timelines will guide the plan's implementation and monitoring activities for the two priority areas. These operational timelines for disaster rehabilitation and recovery are as follows:

Immediate Term (IT)	Within 1 year after the occurrence of the disaster
Short-term (ST)	Within 1 to 3 years after the occurrence of the disaster
Medium-term (MT)	Within 3 to 6 years after the occurrence of the disaster
Long-term (LT)	Beyond 6 years after the occurrence of the disaster

Goal	Objectives	Outcomes
Speed up recovery from disaster losses through rehabilitation and recovery programs that are aligned to sustainable development and "build back better" principle	1. Assess damage, losses, and damage needs during disasters as basis for the formulation of rehabilitation and recovery program; and, 2. Develop short- and medium-term rehabilitation and recovery plans, aligned with or contributing to the national medium- and long-term national, regional, or local development plan.	18. Clear policy directions for rehabilitation and recovery 19. Sustainable and socially inclusive income sources for households are made available and stability of economic activities restored 20. Agricultural production is restored or increased and support services for farmers, fisher folks, and laborers are made accessible 21. Affected families or individuals have access to: (a) affordable disaster-resilient housing that are located in safe zones where social services and public facilities are available; or, (b) financial assistance to rebuild houses in areas that are declared safe zones 22. Affected individuals, families, and communities have access to responsive, appropriate and adequate education, health, and social protection services 23. Disaster resilient standards in infrastructure are observed during rehabilitation and recovery

Lead Agency

In adherence to RA 10121, NEDA is the overall lead for disaster rehabilitation and recovery activities as Vice-Chairperson for disaster rehabilitation and recovery in the NDRRMC. NEDA will work closely with the OCD and various government agencies and stakeholders to ensure that the outcomes, outputs and activities under the disaster rehabilitation and recovery pillar are achieved. Specifically, NEDA will play a key role in providing oversight to the activities on the development and implementation of rehabilitation and recovery programs.

Implementing Agencies/Institutions/ Organizations

The implementing agencies comprised of NGAs, LDRRMCs, LGUs, CSOs, private sector, and other stakeholders will cooperate and complement each other by supporting and engaging in activities that are relevant to the outcomes. Through the guidance of NEDA, the implementing agencies will work together to identify specific programs and projects that are aligned to sustainable development and the "build back better" principle. To monitor the progress and contribution of implementing agencies to the achievement of the outcomes, they will submit accomplishment and activity reports to OCD for consolidation and reporting to the NDRRMC.

Under the disaster rehabilitation and recovery pillar, the implementing agencies and partners will engage in activities related to post-disaster needs assessment, financial assistance to jumpstart economic activities, shelter assistance, and social services and social protection, among others.

Other Agencies

As key stakeholders in the pillar, other agencies are encouraged to initiate actions that will contribute to the achievement of the outcomes. Their actions should be done in consideration of their respective mandates.

Acknowledgement

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Prof. Takahito Mikami, Tokyo City University
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    Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA)
    Philippine Institute of Volcanology and Seismology (PHIVOLCS)
National Disaster Risk Reduction and Management Council (NDRRMC)

Thank you very much.