DOST-PCIEERD S&T Initiatives on Hydrometeorological Hazards

Department of Science and Technology
Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD)

Hydrometeorological Hazards – Networking Workshop
10 October 2017
Introduction of DOST-PCIEERD

S&T Initiatives on Hydrometeorological Hazards
Premier Science and Technology Body

Mandated Function:

- Provide central direction, leadership and coordination of all scientific & technological activities
- Formulate policies, program & projects to support national development
Department of Science and Technology

DOST

3 Sectoral Planning Councils

2 Collegial Bodies

7 R&D Institutes

7 S&T Service Institutes

16 Regional Offices

PCIEERD
Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD)

Mandated Functions:

- Formulate national S&T policies, plans, programs and implementing strategies
- Program and allocate government and other external funds earmarked for advanced science, industry and energy sectors
- Provide mechanisms of assessment, evaluation and monitoring of programs and updating of national R&D plans
- Develop and implement resource generating strategies to support the programs for its sectors
Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD)

Mandated Functions:

- Support the development of institutions and R&D human resource pool
- Establish, develop and maintain local and international technical cooperation linkages
- Develop and implement programs for the optimal utilization, transfer and commercialization of technologies and other research outputs
- Establish, develop and maintain an effective system for the acquisition and dissemination of research information
NDRRMP Four Thematic Areas leading to the attainment of the country’s overall DRRM vision (NDRRMP, 2011)

- Disaster Preparedness
  - DILG
- Disaster Response
  - DSWD
- Disaster Prevention & Mitigation
  - DOST
- Disaster Rehabilitation and Recovery
  - NEDA

Safer, adaptive and resilient Filipino communities towards sustainable development

DOST as Lead Responsible Agency for Disaster Prevention & Mitigation
DRR - CCA S&T Program

End-to-End Early Warning
- Hydro-meteorological Hazard notification
- Earthquake and Tsunami Hazard notification
- Early Warning Communication Protocol
- Multi-natural Hazard Mapping

CCA-DRR Knowledge Management System
- Interconnectivity, operability and harmonized CCA-DRR database sharing

CCA-DRR Proofing of Critical Infrastructures
- Re-engineering and retrofitting of critical infrastructures
- Natural hazard barriers

Community Preparedness
- S&T-advised evacuation plan
- Contingency plan for multi-hazard scenarios
- Mainstream CCA-DRR Land-Use Plan & Zoning
Project NOAH provides:

- flood mitigation system, specifically providing flood early warning system for communities along major river systems;
- enhancement of geohazard maps and;
- enhancement of storm surge vulnerability maps.
More than 1000 Automated Weather Stations, Rain Gauges and Water Level Sensors
\[ PCOR = \int_{-\pi}^{\pi} \int_{-\pi}^{\pi} (IR_{160} \cdot WV_{240}) \, dx \, dy + \Pi(1 - z) + \mu(l) + \tau(t) \]

Rainfall statistics

Monthly accumulated rainfall

<table>
<thead>
<tr>
<th>Time: 1600</th>
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<tbody>
<tr>
<td>800</td>
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<tr>
<td>700</td>
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<td>600</td>
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<td>500</td>
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<tr>
<td>400</td>
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<td>300</td>
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<tr>
<td>200</td>
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<tr>
<td>100</td>
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<td>0</td>
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<table>
<thead>
<tr>
<th>CITY</th>
<th>Total (%)</th>
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<tr>
<td></td>
<td>1 hour</td>
</tr>
<tr>
<td>Cebu City</td>
<td>28</td>
</tr>
<tr>
<td>Davao City</td>
<td>25</td>
</tr>
<tr>
<td>Laoag</td>
<td>20</td>
</tr>
<tr>
<td>Legazpi</td>
<td>78</td>
</tr>
<tr>
<td>Manila</td>
<td>58</td>
</tr>
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</table>
Components of airborne LIDAR survey:
- GPS
- IMU
- Laser Rangefinder
Flood models can be used as part of an early warning system that may provide lead time for evacuation.
Enhancing Landslide Hazard Maps

IFSAR DIGITAL ELEVATION MODEL
SHALLOW LANDSLIDES
LANDSLIDE INVENTORIES
STRUCTURALLY CONTROLLED LANDSLIDES
BARANGAY BORDER
POSSIBLE LANDSLIDE EXTENTS

<table>
<thead>
<tr>
<th>Landslide Hazard Type</th>
<th>Current map</th>
<th>Enhanced map</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>62.53%</td>
<td>28.34%</td>
</tr>
<tr>
<td>Moderate</td>
<td>10.54%</td>
<td>19.91%</td>
</tr>
<tr>
<td>Low</td>
<td>20.61%</td>
<td>4.22%</td>
</tr>
<tr>
<td>Safe</td>
<td>6.32%</td>
<td>47.54%</td>
</tr>
</tbody>
</table>
Safe Areas: 0.01%
Based on Flood and Landslide Hazard Maps only

Safe Areas: 36.87%
Based on Flood, Landslide and Storm Surge Hazard Maps
DOST NOAH Program

Provides automated satellite and radar-based rainfall forecast and 7-day weather forecast

Visualizes real-time information from more than 1,000 automated rain gauges (ARG), automated stream gauges (ASG) and automated weather stations (AWS) for flood early warning system

Displays flood inundation maps and automated flood monitoring for the 18 major river basins and 200+ river basins

Shows high-resolution 1,10:000 landslide hazard maps available for the whole country

Gives Storm Surge Advisory (SSA) warning available for the 67 coastal provinces at least 2 days in advance

Calculates the number of population exposed to a particular risk and a good tool in prepositioning and allocation of resources

Leads to the log-in page of MOSES Tablet dashboard. MOSES tablet is a ruggedized portable tablet PC which consolidates NOAH data for DRR

Comprehensive and integrated information for harnessing S&T in the country’s efforts to **prevent, mitigate, and prepare** for disasters
Failed Disaster Prevention and Mitigation vs. Disasters Averted

1999 Cherry Hills Landslides, 60 dead
2004 Dingalan Landslides (Debris Flows), 135 dead
2006 Guinsaugon Landslide, 1126 dead
2006 Durian Landslide, 1399 dead
2008 Frank Flood, 644 dead
2009 Ondoy Flood, 465 dead
2009 Pepeng Flood, 10.99 m rise in WL
2009 La Union Landslide, 465 dead
2009 Ilocos Sur Landslide, 97 dead
2011 Pedring Flood, 1268 dead
2011 Quiel Flood, 97 dead
2011 Sendong Flood, Central Luzon
2012 Habagat Flood, 0 dead
2012 Pablo Flood, 0 dead
2013 Habagat Flood, 0 dead
2014 Habagat Flood, 1664 houses totally destroyed in Brgy. Daram
2014 Ruby Storm Surge, 0 dead

Disasters Averted

1999 Cherry Hills Landslides, 60 dead
2004 Dingalan Landslides (Debris Flows), 135 dead
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2013 Habagat Flood, 0 dead
2014 Habagat Flood, 1664 houses totally destroyed in Brgy. Daram
2014 Ruby Storm Surge, 0 dead
How a small Samar town survived deadly storm surges

As the country prepares for Typhoon Chedeng, learn how a coastal town in Samar successfully weathered Typhoon Ruby by capitalizing on organized response as well as timely, specific and localized early warning information.

By DOST Project NOAH, PAGASA Storm Surge Component

This list is a revised version of PAGASA’s general advisory for storm surges and is issued more than a day ahead of Typhoon Ruby's landfall. It serves as a guideline for timely, steady and organized evacuation of communities, residents and families living in the affected areas. According to PAGASA’s Severe Weather Bulletin Number Ten, those living in coastal areas under signal no. 3 are alerted against possible occurrences of 4-meter storm surges. Do not evacuate during the typhoon as flying debris caused by strong winds can cause fatal casualties and losses.

Click on the municipality name to view the storm surge map.

<table>
<thead>
<tr>
<th>MUNICIPALITY</th>
<th>SURGE HEIGHT (meters)</th>
<th>STORM SURGE ADVISORY (SSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tawanan, Samar</td>
<td>2.8 - 4.6</td>
<td>4</td>
</tr>
<tr>
<td>Sia, Masbate, Samar</td>
<td>2.8 - 4.6</td>
<td>4</td>
</tr>
<tr>
<td>Guihna, Samar</td>
<td>2.8 - 4.6</td>
<td>4</td>
</tr>
<tr>
<td>Carles, Samar</td>
<td>2.8 - 4.6</td>
<td>4</td>
</tr>
<tr>
<td>Ucon, Masbate</td>
<td>3.4 - 4.4</td>
<td>3</td>
</tr>
<tr>
<td>Molo, Masbate</td>
<td>3.4 - 4.4</td>
<td>3</td>
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<tr>
<td>Dimasaring, Masbate</td>
<td>2.9 - 3.9</td>
<td>3</td>
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<tr>
<td>Butuan, Masbate</td>
<td>2.9 - 3.9</td>
<td>3</td>
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<tr>
<td>Pilar, Masbate</td>
<td>2.8 - 3.6</td>
<td>3</td>
</tr>
<tr>
<td>Donn, Samar</td>
<td>2.6 - 3.6</td>
<td>3</td>
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<tr>
<td>Cawayan, Masbate</td>
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<tr>
<td>Pahangas, Masbate</td>
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<tr>
<td>Basaycoras, Masbate</td>
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<td>Zunarraga, Samar</td>
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<tr>
<td>Jibina, Samar</td>
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<tr>
<td>San Remigio, Cebu</td>
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<td>Onalos, Leyte</td>
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<tr>
<td>Merle, Leyte</td>
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<td>Mactan, Cebu</td>
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<td>2</td>
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<tr>
<td>San Sebastian, Samar</td>
<td>2.0 - 3.0</td>
<td>2</td>
</tr>
<tr>
<td>Probastos, Samar</td>
<td>2.0 - 3.0</td>
<td>2</td>
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</tbody>
</table>

The Philippine National Police are on their way—the police are the first responders to ensure that no lives are spared.
Thank You....