

Improvement of emergency response with technology-based solutions

- Pre-disaster relief for reducing impacts by typhoon**



Liang-Chun Chen
Chinese Taipei
2010/10/21

Outlines



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- **Collaboration and integration between S&T and emergency response**
- **Demands and supports of S&T according to emergency operation stages**
- **Joint operation among inter- & intra- agencies, media and communities**
- **Conclusions**

Global major disasters in 2009 six in APEC economies



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Natural disasters by number of deaths⁽¹⁾ - 2009

● Earthquake, September	Indonesia	1 195
Flood, July-September	India	992
● Typhoon Morakot (Kiko), August	Chinese Taipei	630
● Typhoon Pepeng (Parma), October	Philippines	539
● Tropical storm Ondoy (Ketsana), September	Philippines	501
● Extreme temperature, January-February	Australia	347
Flood, September-October	India	300
Earthquake, April	Italy	295
Hurricane 'Ida', November	El Salvador	275
● Extreme temperature, May-August	Peru	274

(1): Includes the reported missing persons

● APEC member economies

Source: UN/ISDR, 2010

APEC region a high disaster-prone area



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Earthquake, China
2008



Landslide, Indonesia
2009



Typhoon, Philippines
2009



Flood, Chinese Taipei
2009

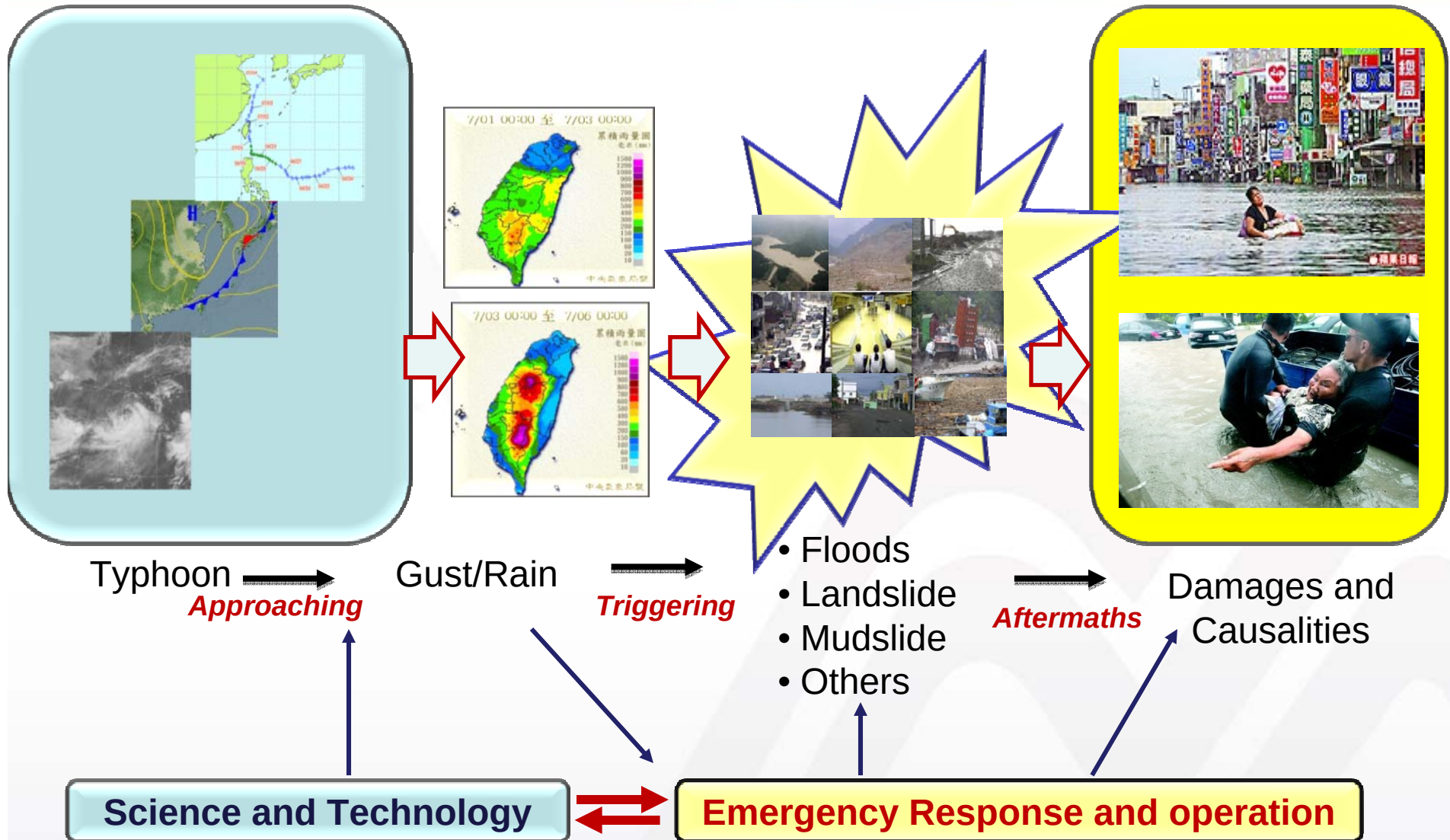


Debris flow, China
2010

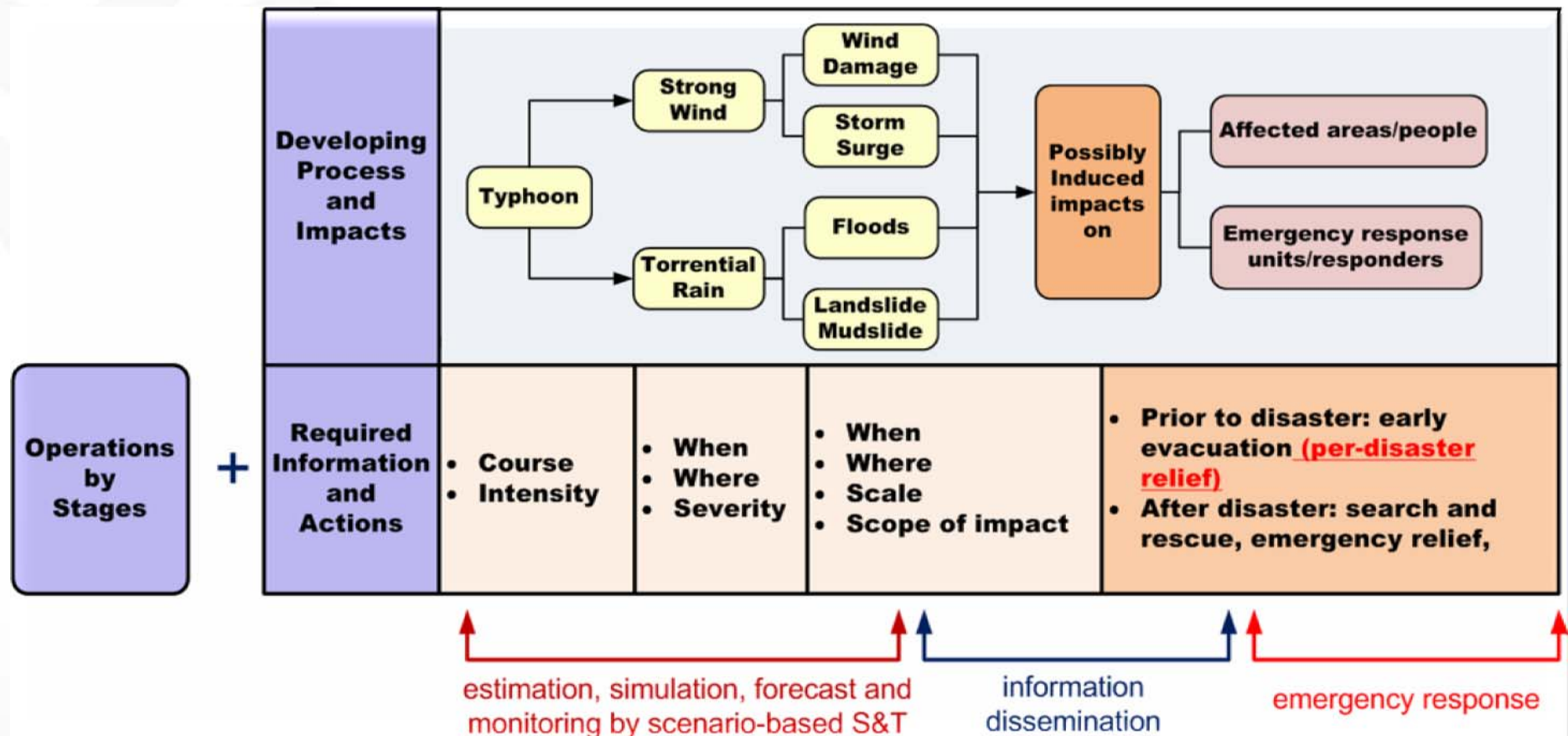
Collaboration and integration between S&T and emergency response



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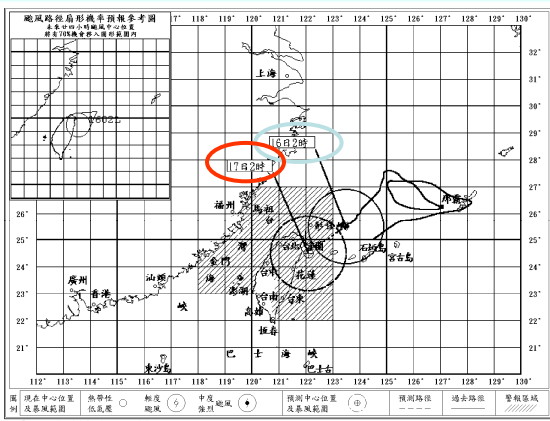
Demands and supports of S&T according to emergency operation stages



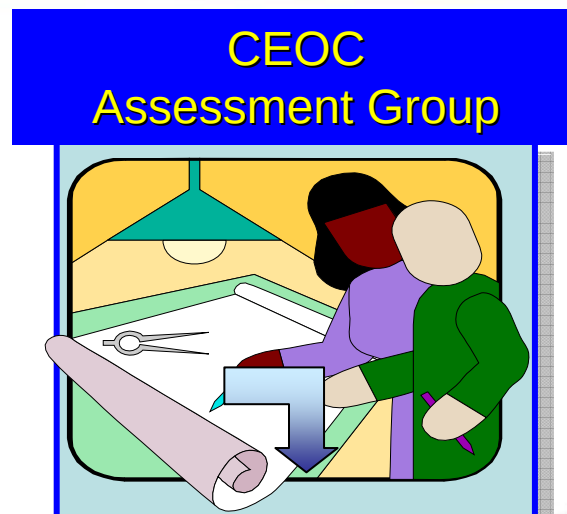
Technology support to reduce possible damage through integrated information



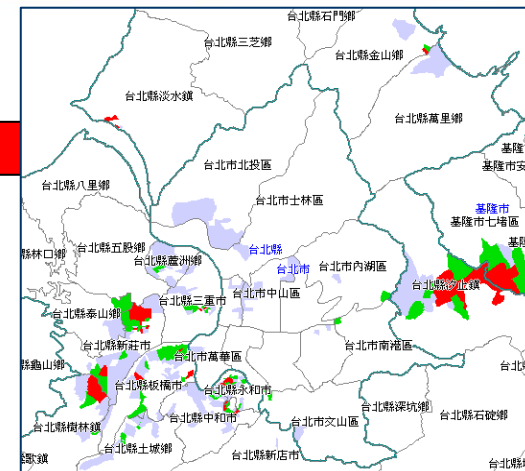
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Monitor & Forecasting of CWB

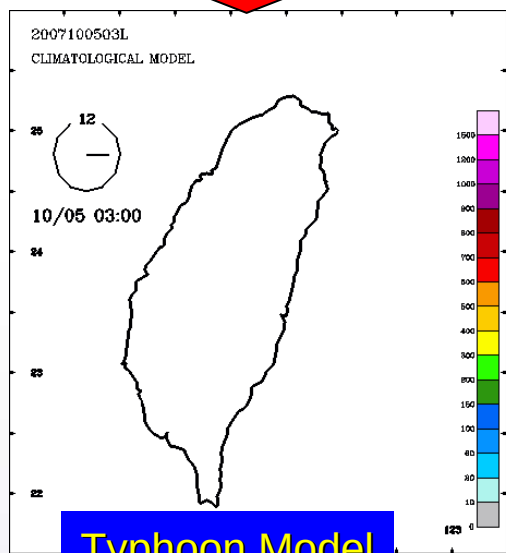


Evaluate the locations & scales of hazards
Early Warning and Evacuating

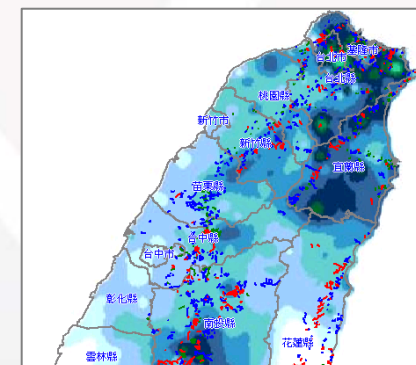
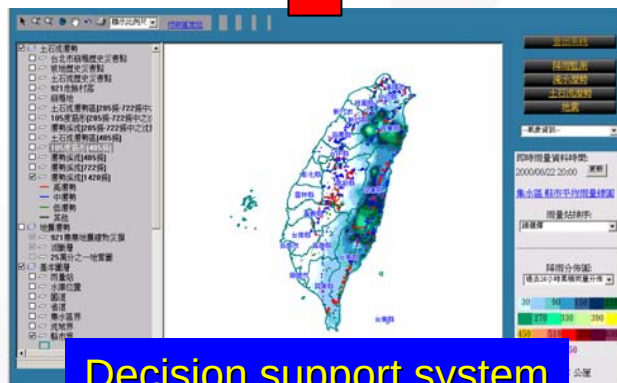


Flood potential areas

+



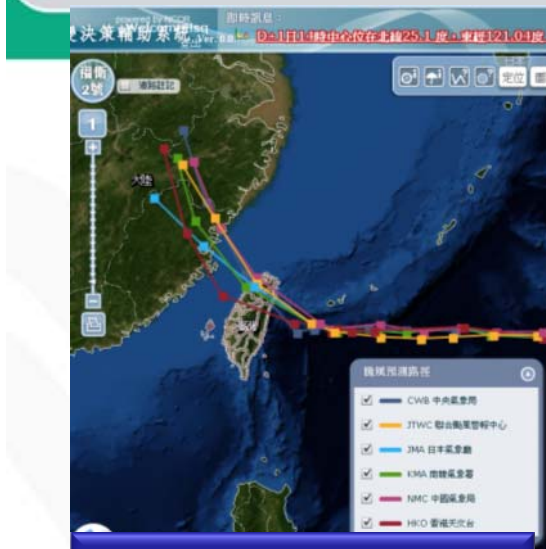
Typhoon Model



Landslide & debris flow
potential areas

Basic elements for information integration 1/3

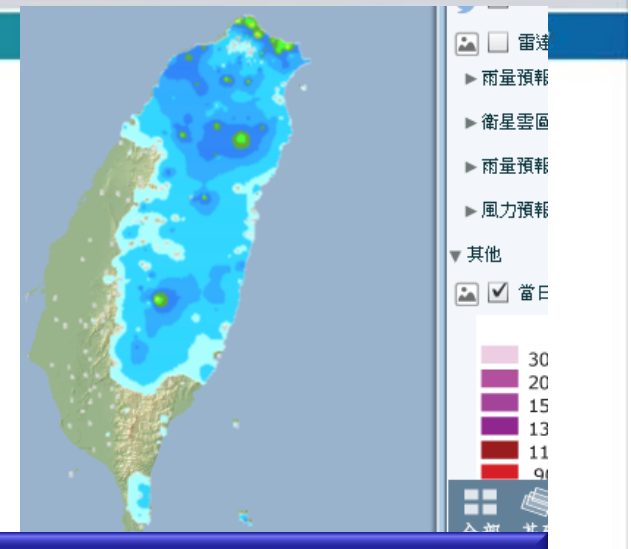
Information module – Weather



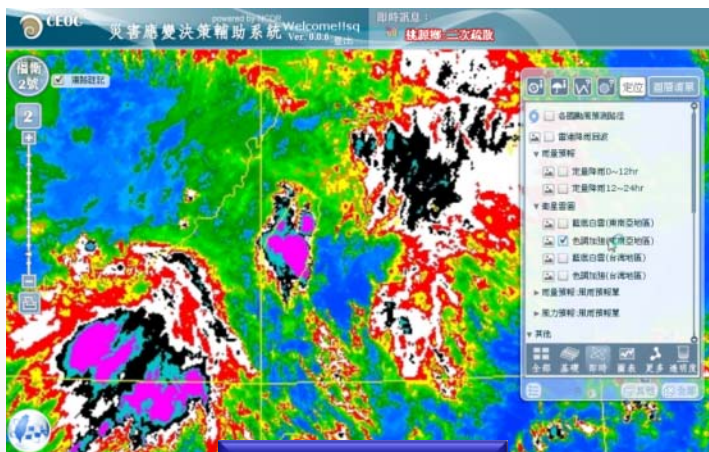
Course Predictions



Radar



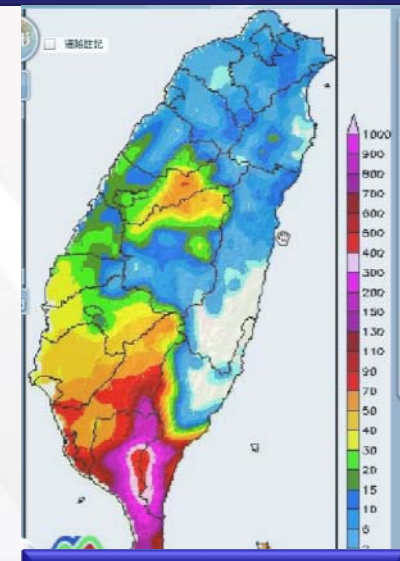
Real-time rain gauge data



Satellite



Climate model



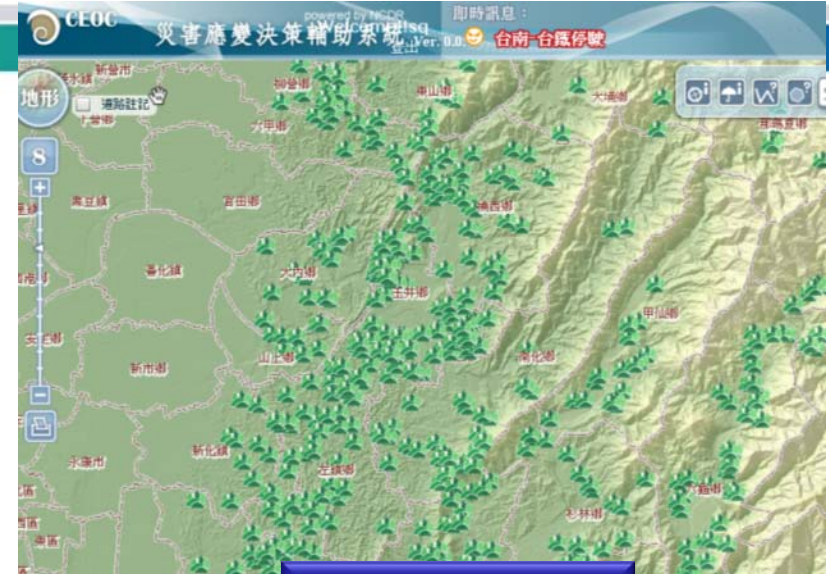
Dynamic model

Basic elements for information integration 2/3

Information module – SlopeLand



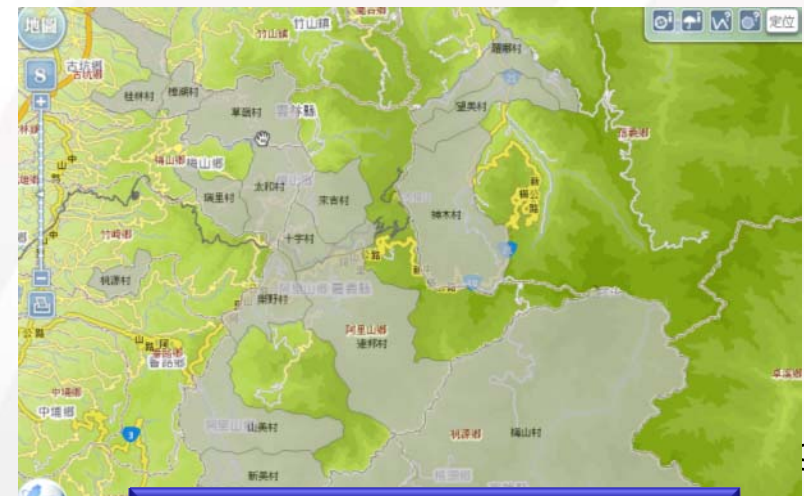
Risk potential



Past events



Debris flow



Highly vulnerable villages

Basic elements for information integration 3/3

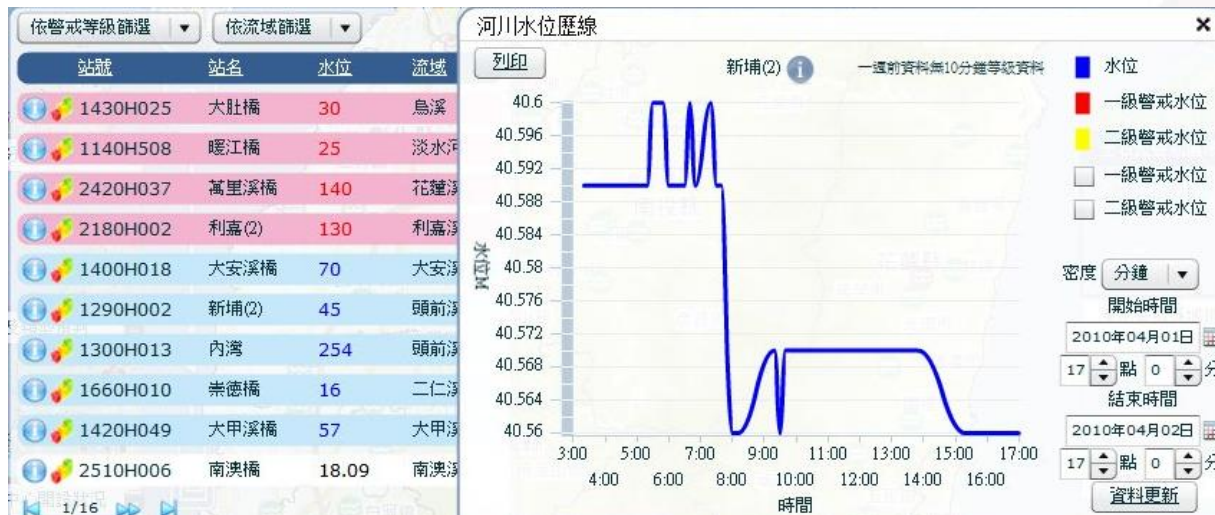
Information module – Floods



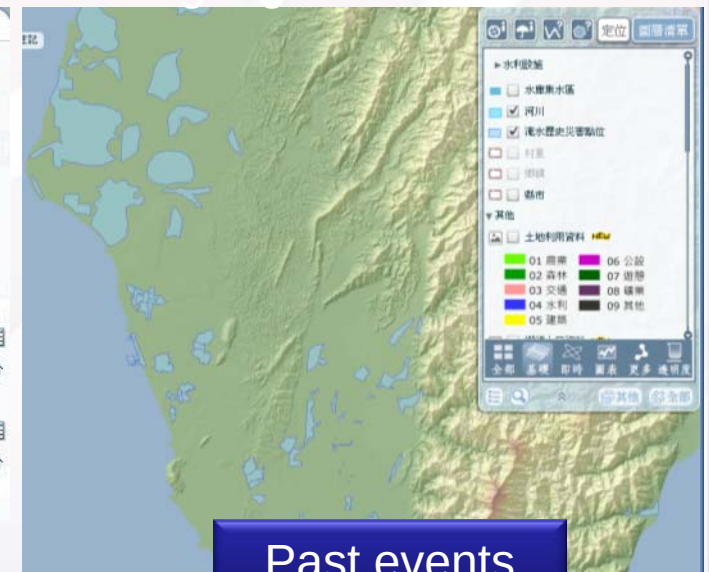
Risk Potential



Tidal gauge

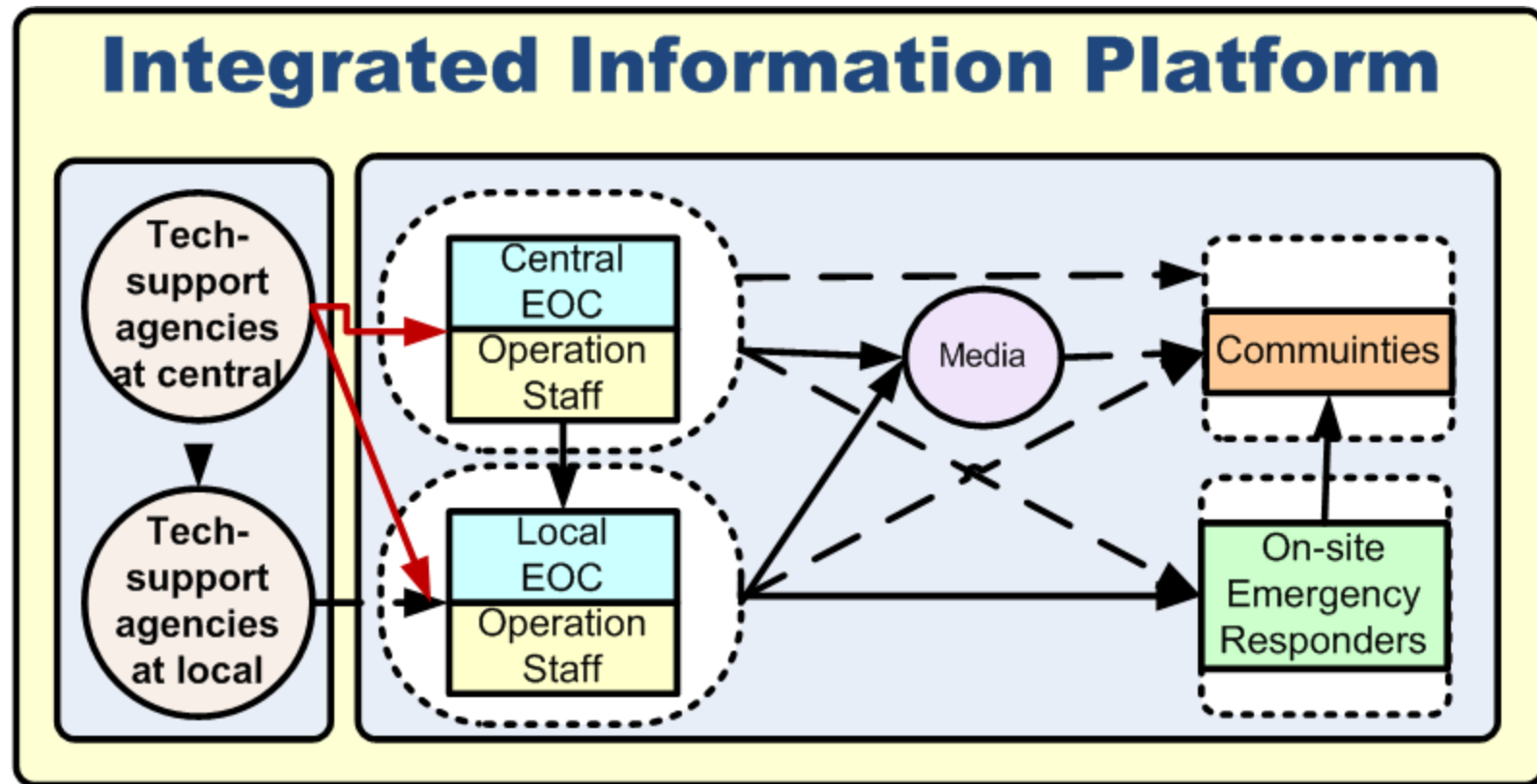


Water level gauge (rives, reservoirs)



Past events

Joint operation among inter- & intra-agencies, media and communities



Supports by S&T

Emergency response and operation

Collaboration- S&T and emergency response



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NCDR runs scientific analysis

NCDR

- Internal Meeting every 3hrs
- Provide Analysis
 1. Rainfall estimation
 2. Flood potential
 3. Debris flow potential
 4. Precaution notice



NCDR summons the meeting

CEOC

- Satiation assessment Meeting every 3hrs
- Generate Suggestions
 1. Warning zones
 2. Evacuation
 3. Reinforcement
 4. Bulletin to local government



NCDR reports to commander

CEOC

- Working Meeting
- Overall Review
 1. Situation reports
 2. Readiness report
 3. Assistance and deployment
 4. Emergency response

Technology



Policy



Actions

Progressive Improvements for Typhoons in Chinese Taipei



Typhoon Event	Maximum Intensity (mm/hr)	Total Accumulated Rainfall (mm)	Evacuation (Person)	Ceased and Missing (Person)
2001.07.28 Toraji	147	757	----	214
2001.09.17 Nari	142	1,462	24,000	104
2004.06.30 Mindulle	167	2,005	9,500	41
2005.07.18 Haitang	177	2,124	1,208	15
2005.09.01 Talim	119	766	1207	6
2005.10.02 LongWang	154	776	945	2
2006.07.12 Bilis	95	1,013	409	3
2007.08.16 Sepat	122	1,399	2,531	1
2008.07.16 Kalmaegi	161	1,027	179	26 Compound Disaster
2008.07.28 Fung-Wong	121	830	1,303	2
2008.09.10 Sinlaku	97	1,608	1,987	22 Compound Disaster
2008.09.27 Jangmi	85	1,137	3,361	4
2009.08.07 Morakot	100	2,965	24,775	695 Extreme weather
2010.09.19 Fanapi	125	1,128	16,568	2

Three elements to succeed emergency response by per-disaster relief



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Scientific Prediction

- Provide forecasting based on models
- Tool for pre-disaster deployment
- Reference for decision support
- Limited by technology development

Rea-time Monitoring

- Provide updated data based on gauges
- Tool for pinpointing blind areas by forecast
- Reference for **revising** decision support
- Limited by number, location, transmission

In-time Operation

- Provide reaction based on well-defined plan
- Tool for saving more time before it's too late
- Reference for **allocating** emergency support
- Limited by determination of all-level administrators

Conclusions



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- **Integration & collaboration between S&T and emergency responses**
- **Challenges possibly induced by extreme weather and compound**
- **Future improvements to better prepare for typhoon:**
 - **Enhancing effectiveness and efficiency of S&T for extreme events.**
 - **Deliberating emergency operation and pre-disaster relief for compound disasters.**
 - **Establishing a platform for comprehensive information sharing to support emergency response, situation awareness, decision support and relief.**

Thank for your attention