



# **Enable an Information Supply Chain for Disaster Risk Management**

## **- Innovation, Inclusion and Intelligence**

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# Evolutional Developments on Disaster Risk Management in TW - from 2004 to now



2004 -2009

**Experience-based**

- Leader: emergency responders
- Tools: paper maps, radio, fax.....
- Actions: evacuations, **S&R (during and afterwards)**
- Info source: 911, faxes, news..... (**analog data**)
- Other stakeholders: limited participation

- Low mutual trust
- Trial & error by actions
- Learning by mistakes
- Limited info. exchange

**Risk understanding**

*S&T, Data and GIS make management different!!*

2009-2014

**Science-based**

- Leader: ERs, **scientists**
- New tools: digital risk maps, scenarios, **common operational picture (COP) on GIS**
- Actions: **early warning and evacuations**, deployments of personnel and equipment (**before**)
- Info source: **data**, models, readings, Internet,
- Other stakeholders: invited participation

- Winning mutual trust
- Trial & error by S&T
- Speak common language
- Learning by sharing

**Demands on intelligence for impact assessments**

2014-now

**Information-intelligence-based**

- Leader: ERs, **scientists, general public**
- New tools: social media, real-time data, **big data, IoT, AI (ChatGPT)**
- Actions: risk communication, **impact-based preparedness(before)**
- Info source: live videos, social media,
- Other stakeholders: active participation

- Co-design
- Co-work
- Co-implementation
- DRR + CCA

# Innovations by making use of data and information to make stakeholders connected

## learned lessons actions after Typhoon Marokot in 2009



### Too much or too little information at emergency operations

- **Channels to acquire useful information** – to have multiple sources
- **A system of systems to integrate information** – demand-oriented



### Lack of common operational picture to coordinate actions

- **Potential risk maps for planning** – apply integrated GIS information
- **Situation maps for operation** – keep everyone on the same page

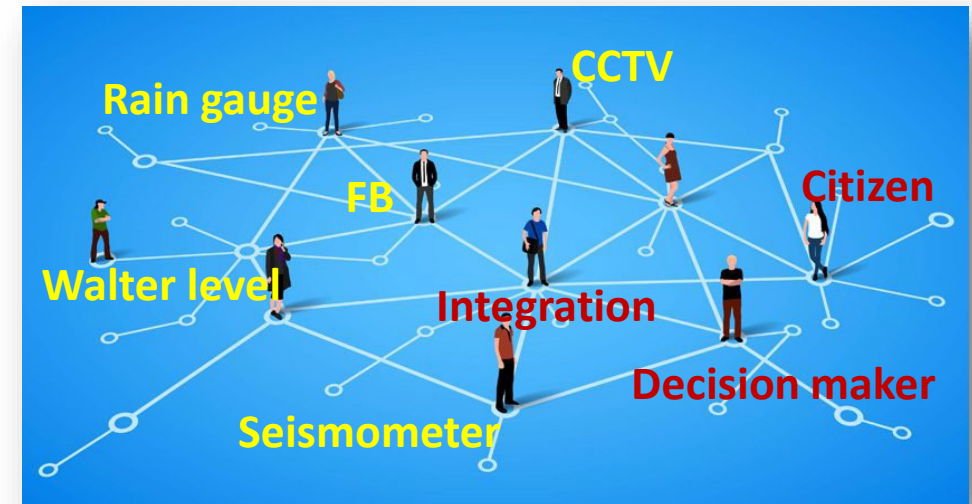


### When and how to make timely operations

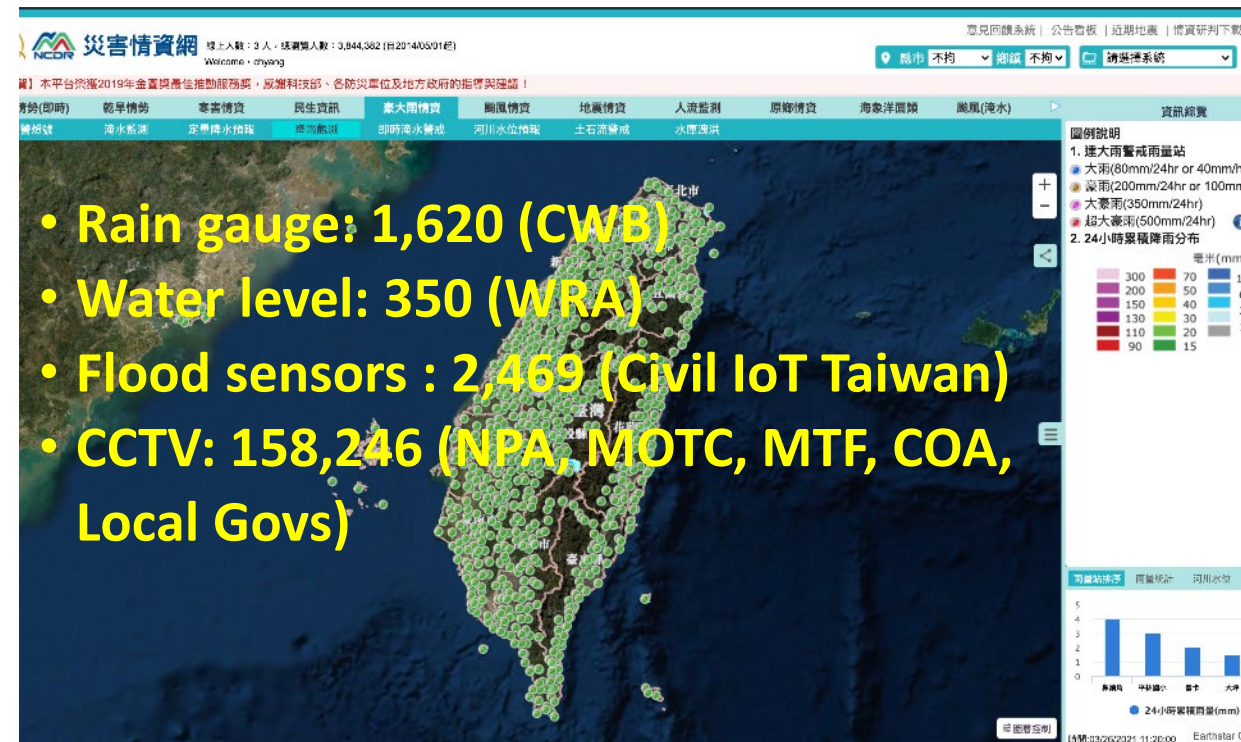
- **Well-organized teams** – evidence-based decisions and actions
- **Digital emergency preparedness** – information sharing and exchange

# **N** (data sources) to **1** (unified operation bidders) to **Many** (diverse users) – DRR information supply chain on early warning

- **End-to-end connection**
  - To bridge over “information gaps” with sharing, integration and innovation
- **N kinds of data sources**
  - Monitoring data, numerical outputs, physical data, statistic data, IoT
  - Social data, geo-data, historical data,
  - **Non-structure data (to foresee trend)**
- **1 unified operation bodies**
  - Integrate inputs for quality outputs
- **Many diverse users**
  - Tailor-made product
  - Citizens
  - Decision makers
  - LNGOs, INGOs
  - **Multiple channels to connect and reach end users by the same info. intelligence**



- **Value-added Integration** of DRR technology for information intelligence
- **Decision-making for central and local governments** on disaster risk management



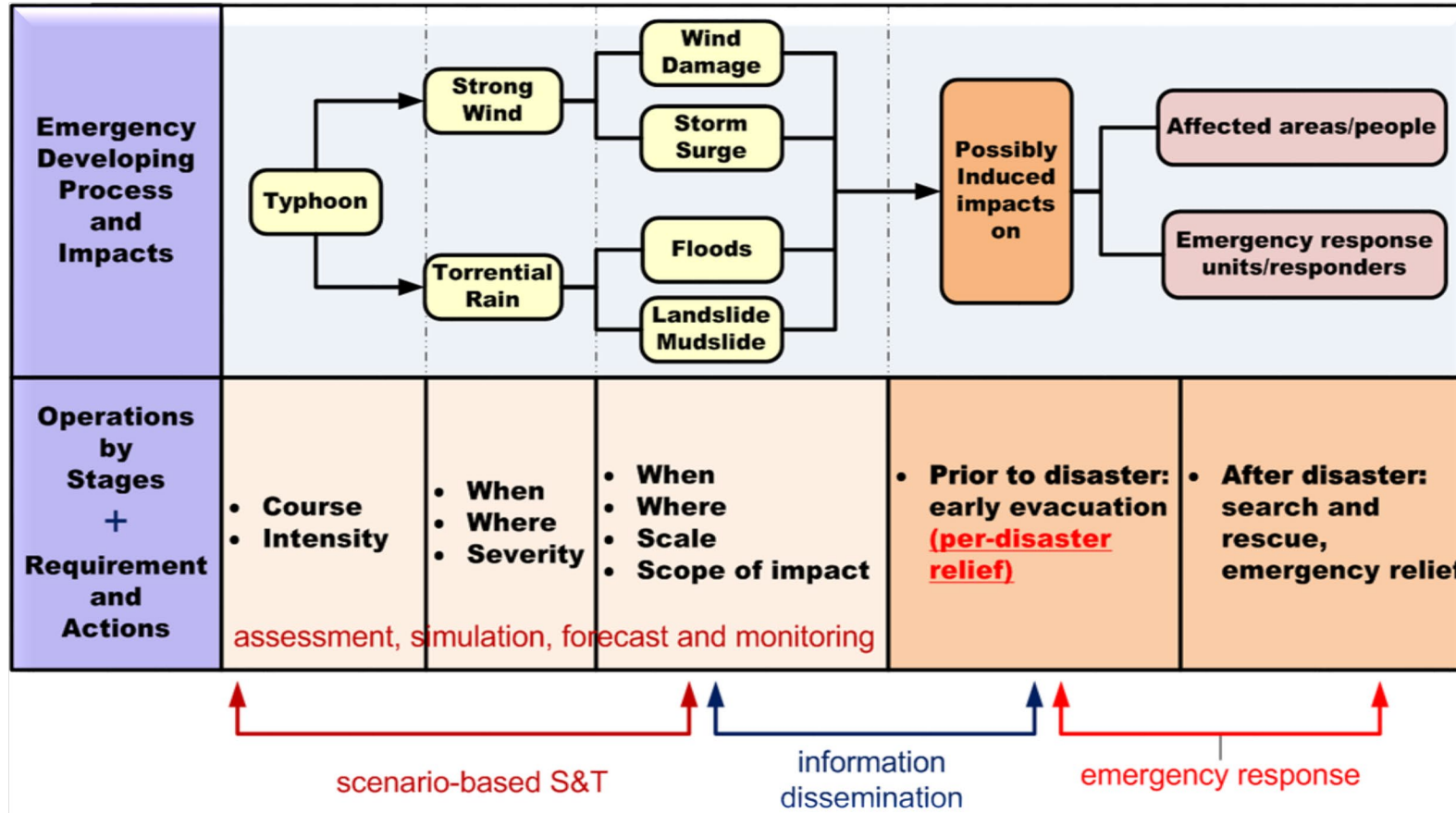
- **Rain gauge: 1,620 (CWB)**
- **Water level: 350 (WRA)**
- **Flood sensors : 2,469 (Civil IoT Taiwan)**
- **CCTV: 158,246 (NPA, MOTC, MTF, COA, Local Govs)**



- ✓ Categories of disaster monitoring data > 620
- ✓ Value-added assessment technologies > 100
- ✓ Crowd-sourcing media data > 20 platforms and 300 channels
- ✓ Participation in disaster events > 80 with number of user over 4.3 million

# Using science and technology during typhoon emergency operation

## Teamwork and dialogues among scientists, emergency responders and decision makers



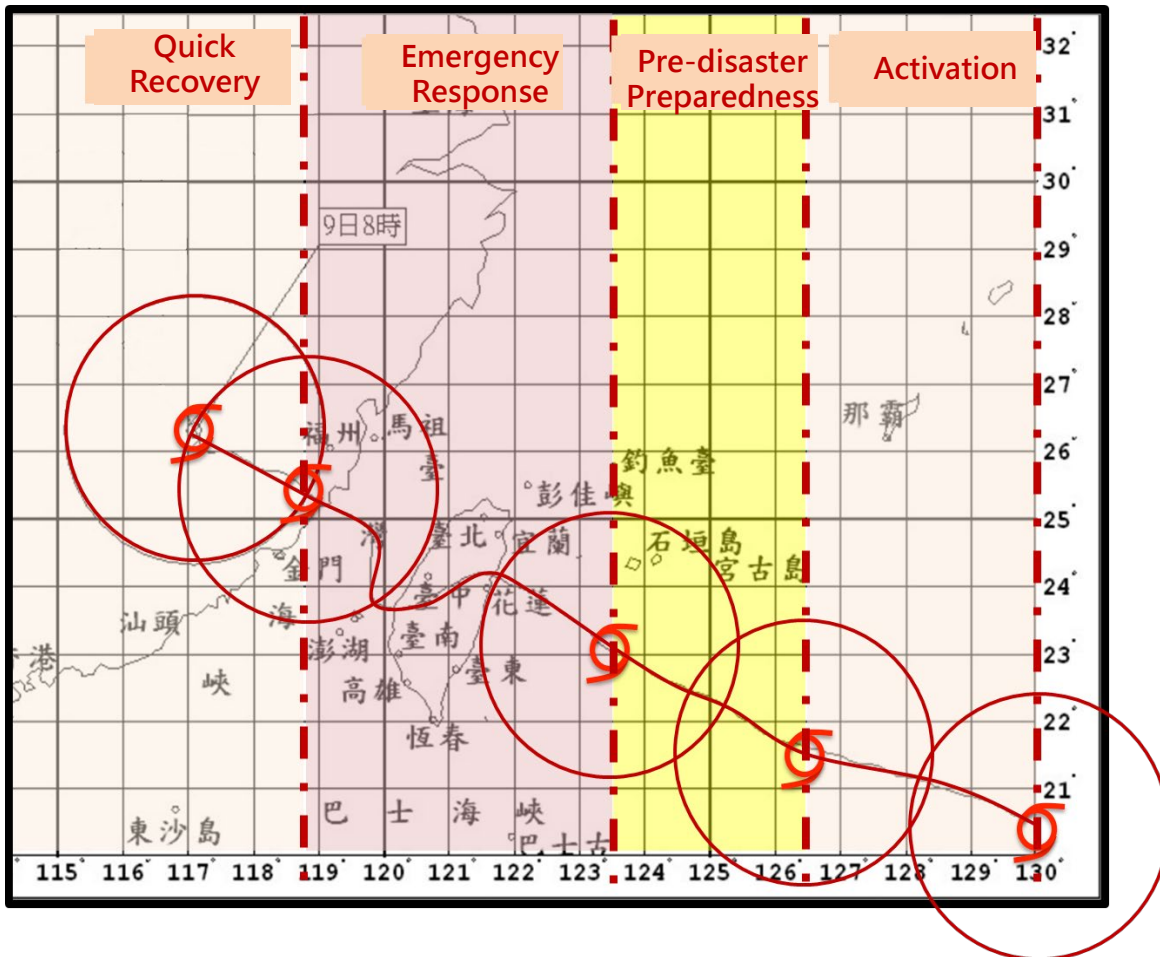
Scientific outputs

Cross-cutting synergies

In-time operations

# Information-based operations according to positions of typhoon – operation stages

④ ← ③ ← ② ← ①



## ① Activation:

After the Central Weather Bureau (CWB) issues a sea warning for the typhoon, Central Emergency Operation Center (CEOC) starts **level-2 operation. (Risks)**

## ② Pre-disaster Preparedness:

After CWB issues a land warning for the typhoon, CEOC upgrades to the **level-1 operation. (Impacts)**

## ③ Emergency Response:

The typhoon's radius comes close to the coast of Taiwan, the intensity of wind and rain will continue to increase. **(Situations)**

## ④ Quick Recovery:

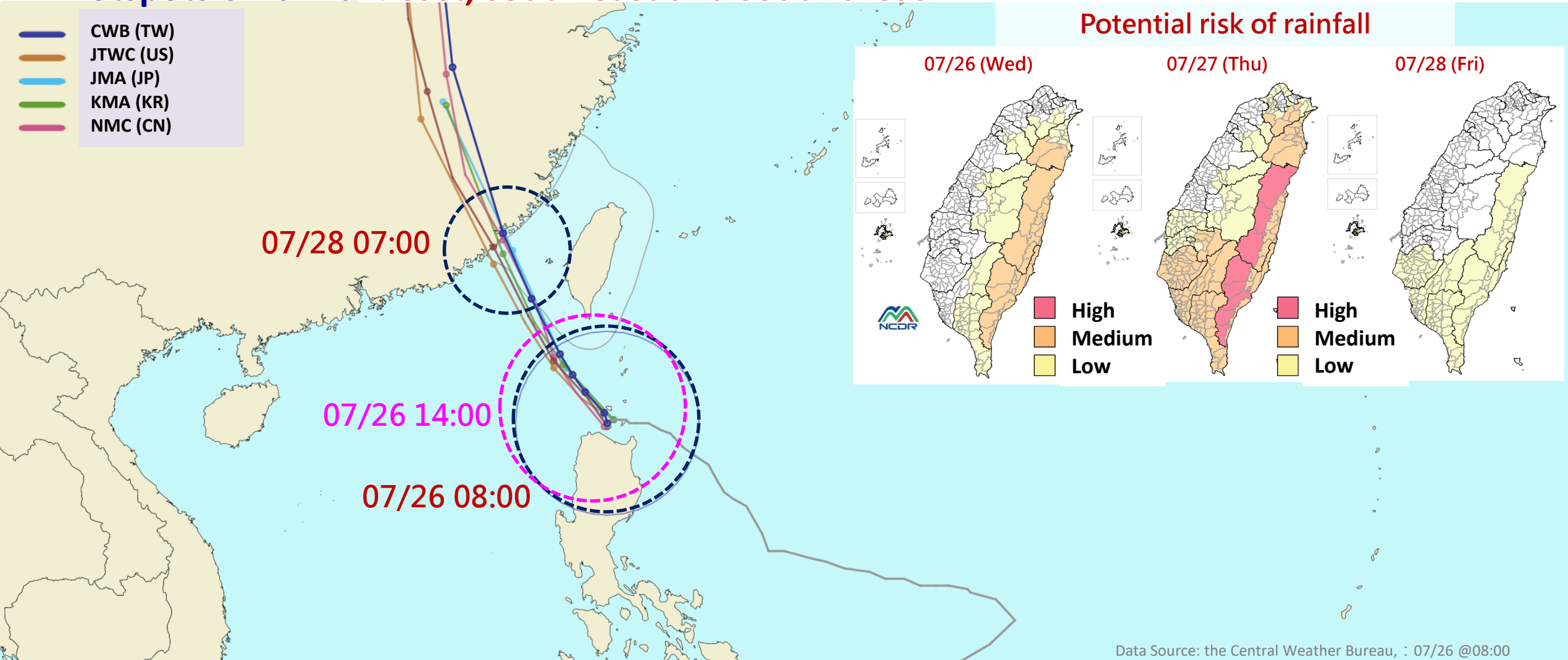
The typhoon's radius is distant from Taiwan, and the wind and rain gradually reduces. **(Maps & quick survey)**

# Typhoon DOKSURI will mainly influence Taiwan



during 07/26~28

- The outskirts of Typhoon DOKSURI has moved to south-east waters of Taiwan and will contact land area around 14:00 07/26
- Hotspots of rainfall: east, south-east and south areas





# Applications of Civil IoT Taiwan on Disaster Risk Management

## NCDR uses Civil IoT Taiwan for

### Real-time monitoring :

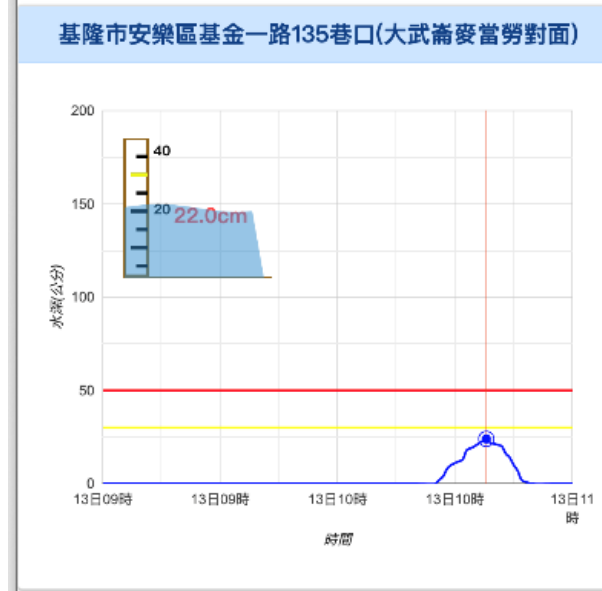
- \* Flood sensors – WRA
- \* Rain gauges – CWB
- \* Digital terrain mode – MOI
- \* CCTV – Multi agencies

### Instant intelligence:

- \* Disaster alters
- \* Up-to-date situation
- \* Necessary actions
- \* Multi channels



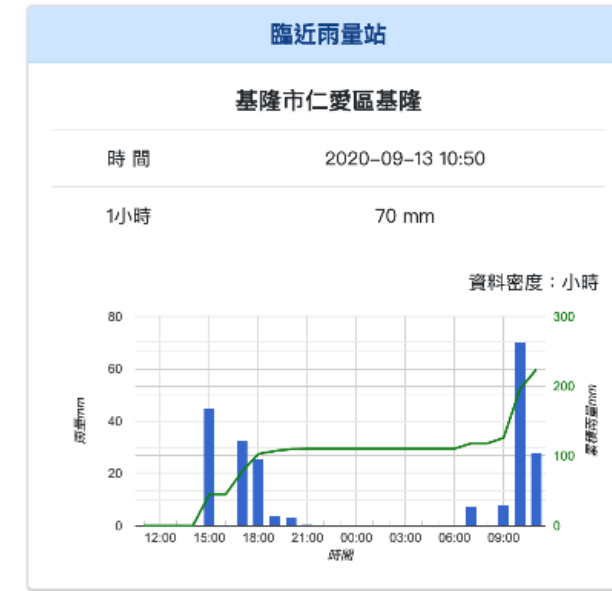
Alert by NCDR LINE



位置：基隆市安樂區 基金一路/基金一路208巷(安樂5號橋邊)  
影像來源：基隆市政府



Water level + CCTV



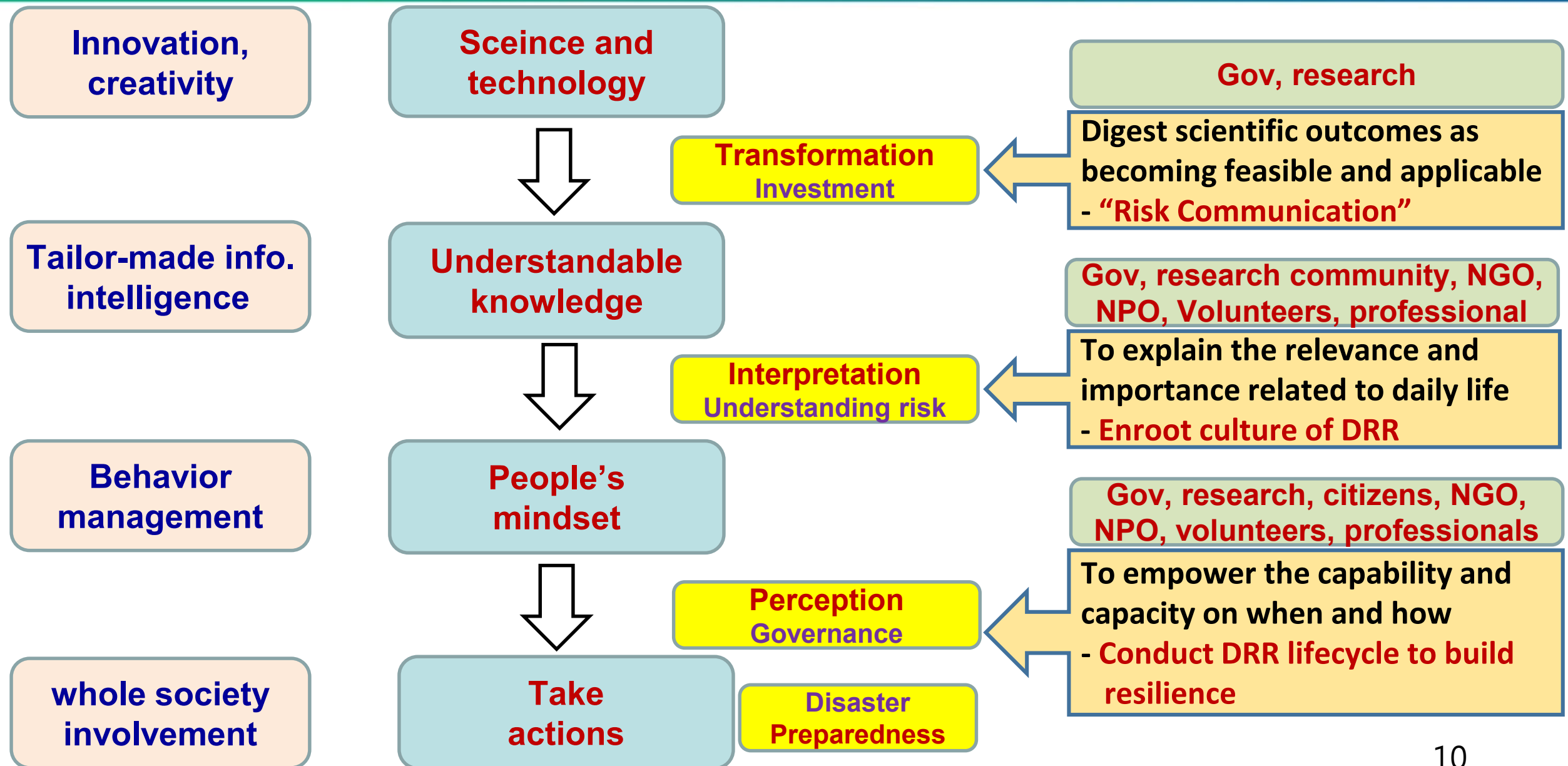
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Rain gauge + CCTV

# Enable, Engage and Empower DRR info. Supply Chain

## - stakeholders, actions, implementations



# DIKW+A for building resilience

## - From science to decision making and actions

D: Data  
I: information  
K: Knowledge  
W: Wisdom  
A: Action

Knowledge, scenario,  
risk & evaluation (K,W)

S&T development and  
innovation (D,I)



Decision making and  
applications (A)

Scientific  
Prediction

Rea-time  
Monitoring

In-time  
Decisions

Key elements to  
succeed

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

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

- 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

- An integration of
- Natural science
  - Social science
  - Engineering
  - ICT, Social media
  - Emergency management
  - Multiple key stakeholders
  - Public-private partnership
  - **Global partners!**
  - .....



# Thanks for your attention

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