



**THE FUTURE OF
GLOBAL
DISASTER
RISK REDUCTION**

STRENGTHENING THE RESILIENCE of MEGACITIES THROUGH SCIENCE, TECHNOLOGY & INNOVATION

Science-driven early warning to reach “end users” for better urban resilience

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Early warning doesn't do anything.

People respond by understanding quality information intelligence

- **Types of early warning**

- Earthquake: Sudden-onset, scale of seconds
- Typhoon: Slow-onset, scale of hours or days

- **Key elements of early warning system**

- **Measurement**
- **Computing**
- **Communications**
- **Actions**

- **Purposes and functions of early warning**

- Actions for protection
- Decision on reducing impacts
- Response to developing situation

- **But to warn our society we need**

- **Comprehensive understanding on early warning system**

Early warning on
physical vulnerabilities

Early warning plus
social vulnerabilities



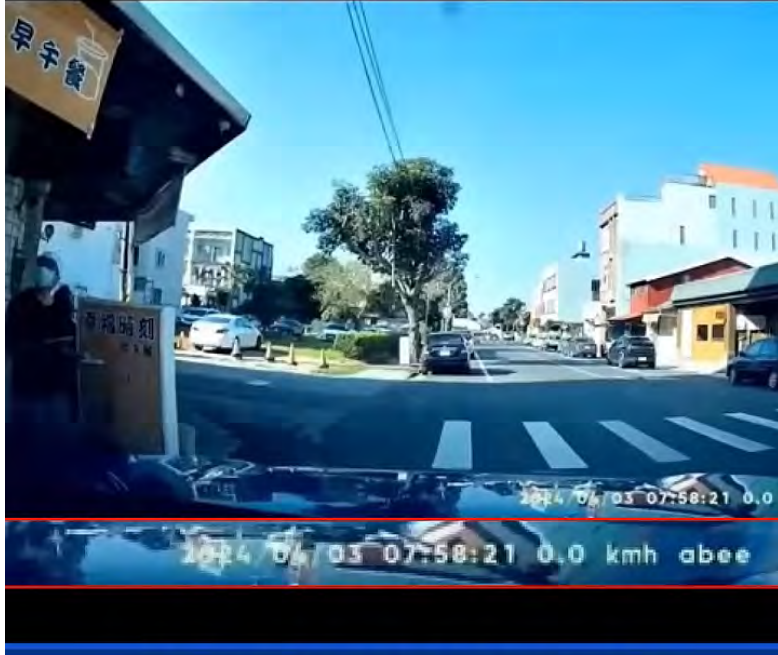
How Earthquake Early Warning System (EEWS) saves lives

- End-to-End to connect the last mile

A breakfast store close to the epicenter

07:58 am, April 03, 2024

開始搖晃



Detection

1. Taiwan Strong Motion Instrumentation Program – **550 stations** by Central Weather Administration (CWA)

Decision

2. Super computing power to estimate earthquake parameters **in 7 seconds**

Dispatch

3. Public Warning System through **Cell Broadcast Service (CBS)** to issue alarm on mobile phones in **0.2~0.4 second**

10~13
Sec

25-year DRR education and promotion on in-time action to save lives



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Devastation by Typhoon Ragasa and the Mataian Barrier Lake

- **Human loss toll:**

- At least **20 people were killed** in Hualien County with dozens injured and others still missing.

- **Flash-flood disaster:**

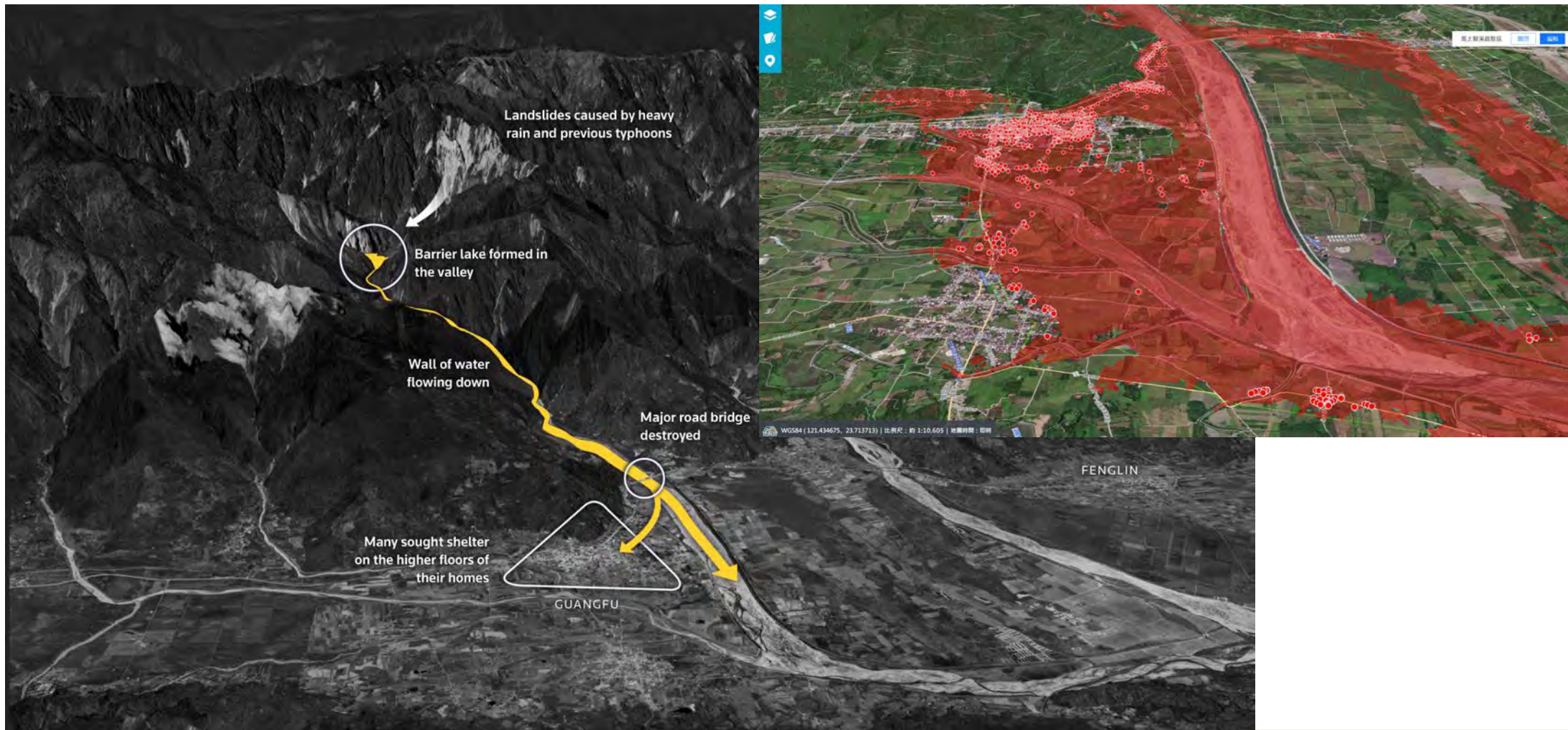
- The worst devastation followed **the bursting of a barrier lake** above Guangfu (Hualien), unleashing **an estimated ~60 million tons of water** that swept away **a bridge on Provincial Highway 9** and inundated nearby towns.

- **Widespread disruption:**

- **8,500 were evacuated or displaced** amid severe flooding and landslides, while emergency teams battled washed-out roads and unstable terrain.



The Mataian Barrier Lake – the ever largest one in Taiwan



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Timeline the Mataian Barrier Lake Cascading and compound impacts

- Underlying causes in 2024

- A 7.2-magnitude earthquake hit Hualien and destabilized mountainous materials

- In 2025

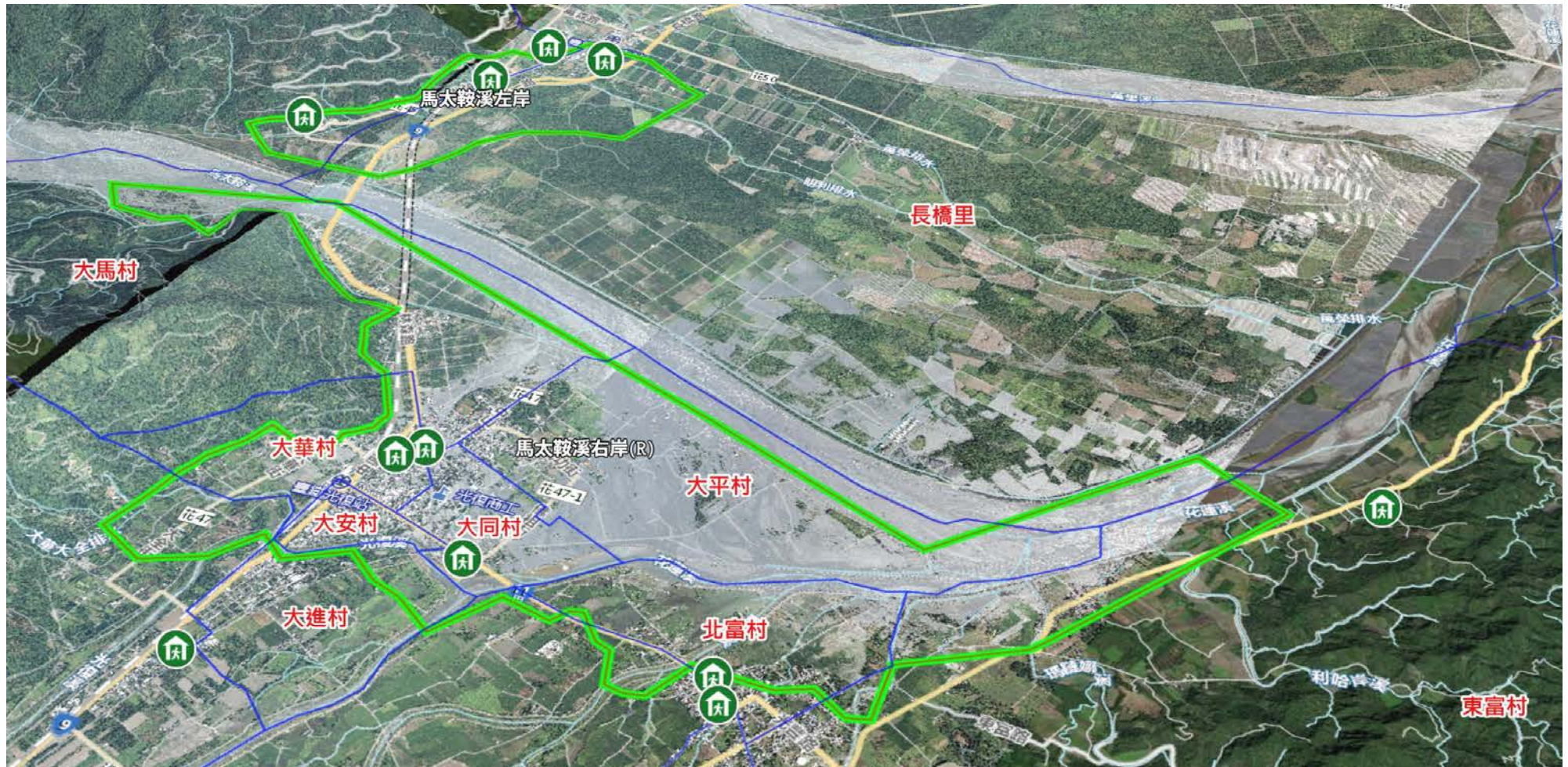
- July - Formation detected. 120 m high, and the lake measured ~500 m × 1,650 m
- Early–mid Aug — Preparedness steps. Aug 12 (Typhoon Podul) saw 697 people evacuated
- Late Aug — Task force. The MOA set up a special task force
- Sept (pre-event) — Mapping & drills. Universities produced updated evacuation maps
- **Sept 21, estimating ~1,800 households might need evacuation**
- Sept 23, 2:50 pm — First overflow.
- Sept 23, 4:30 pm — Second overflow.
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Information intelligence of early warning for decision makers and local residents



Evacuation Zone for the Mataian Creek downstream

- Evacuated 1,800 more households (+8,500 resediments) 48hrs ahead



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Learned lessons

- **Science-driven disaster risk management worked**
 - Multiple sensors for monitoring the rising risk (**rain gauge, water level gauge, CCTV, broadband seismometer**)
 - Worst-case scenario to identify disaster hotspots for evacuation (**1,800 more households evacuated**)
 - Multiple channels to issue early warning (**Cell Broadcast Service, serin, loudspeaker**)
- **Risk communication and perception with the public**
 - Understandable contents, actionable intelligence, time urgency
 - **Especially, a new type risk**
- **Aged and living-alone residents**
 - Special needs, disease, disability, low social status
- **Volunteer management**
 - Logistic support, mission assignment, and coordination
- **Misinformation and disinformation**





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Thanks for your attention

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