EGU General Assembly 2025

EGU General Assembly Vienna, Austria& Online, 27 April-2 May, 2025

NH9.6 Advancing the integration of citizen and stakeholders' knowledge in disaster risk assessment, reduction and governance

Enhancing Resilient Cities under Extreme Disasters due to Climate Change: A Case Study of Yilan County, Taiwan

Mo-Hsiung Chuang[1]*, Chun-Fang Liu[2]

Dept. of Urban Planning and Disaster Management, Ming Chuan University, Taiwan

This presentation includes partial results from Mo-Hsiung Chuang's NSTC project (NSTC 113-2119-M-130-003 -).We thank the NSTC for funding support, the stakeholders for their input.

1. Research Question & Objectives

- **Extreme climate events, driven by global warming, have caused severe impacts worldwide, especially in high-risk disaster areas. These events bring significant challenges to both local societies and the environment.**
- **To address these challenges, our study integrates climate change hazard scenarios with local disaster characteristics. We aim to help local governments develop disaster preparedness and resilience strategies, enhancing Yilan County's capacity to respond to and adapt to climate change.**

Flooding in Qixian Village, Yuanshan Township during Typhoon Nesat (2022)

Landslide Behind Baiyun Temple, Subei Village, Su'ao Township, Yilan County during Typhoon Megi (2010)

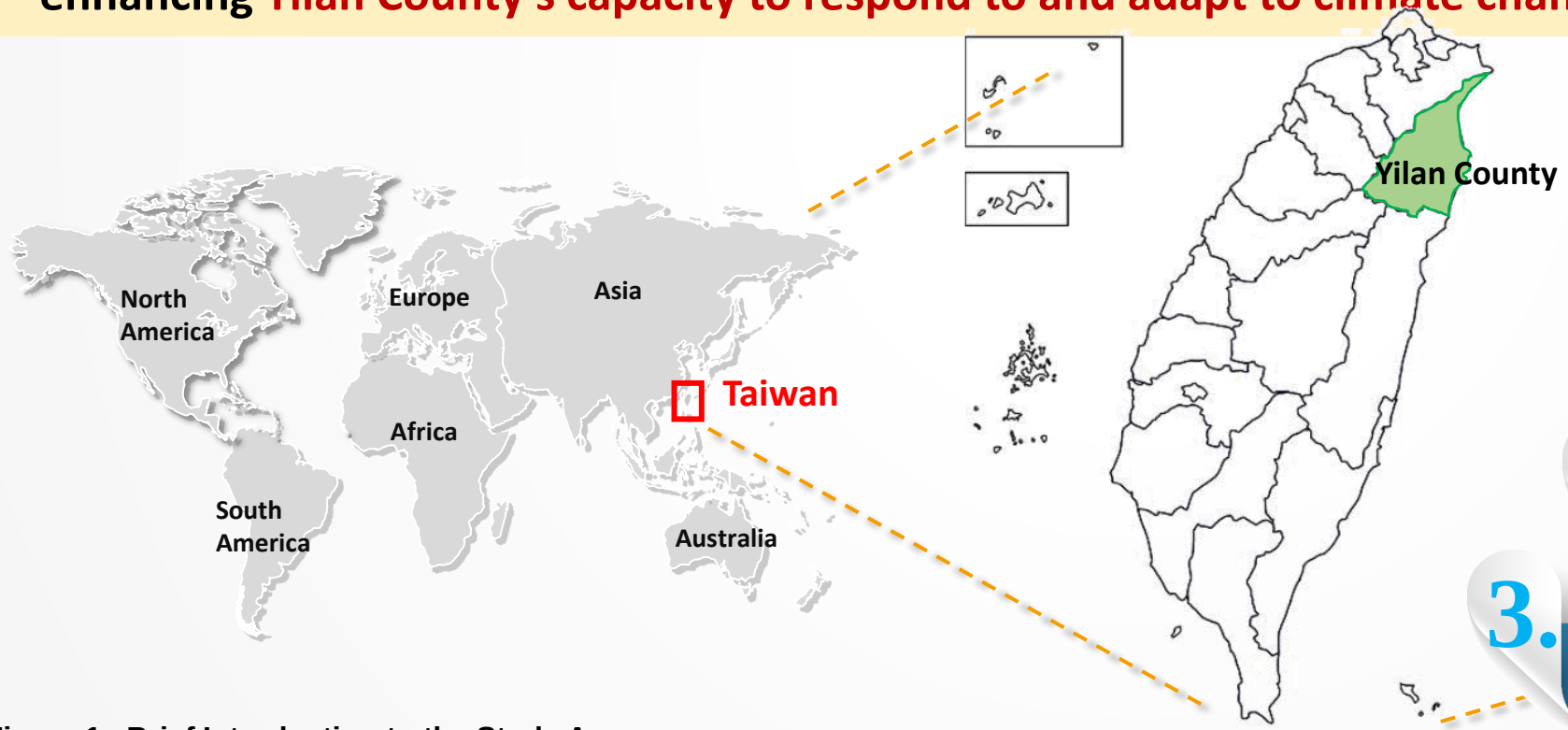


Figure 1. Brief Introduction to the Study Area

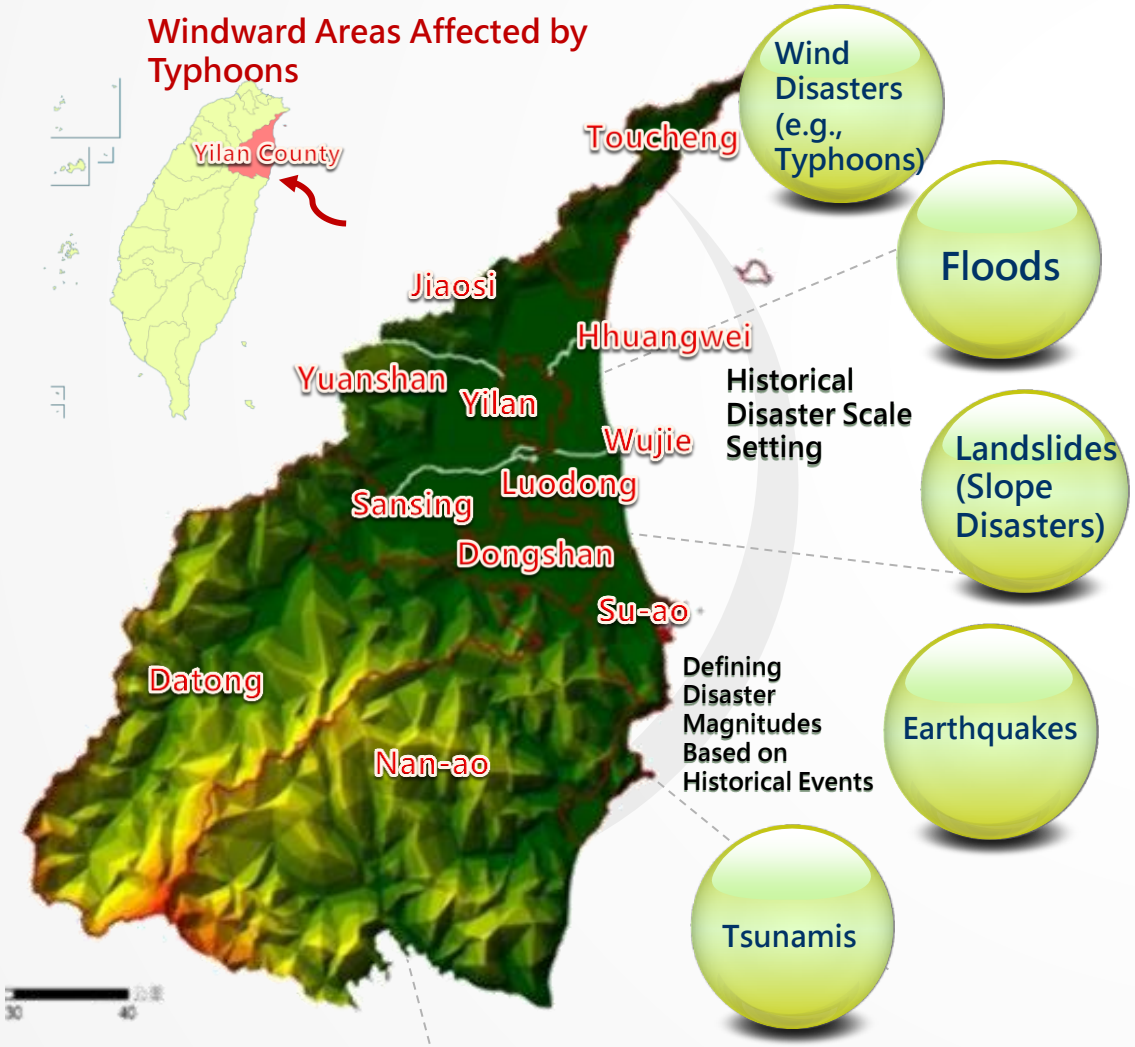
This research focuses on three key aspects:

1. Local Hazard Assessment
2. Integration of Disaster Intelligence
3. Risk Application and Promotion

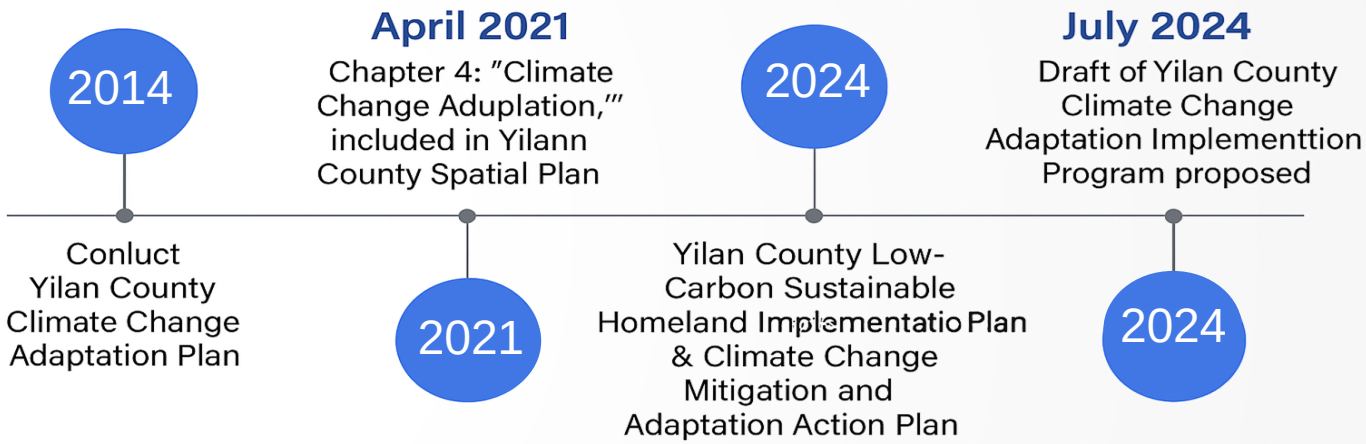
2. Findings & Conclusion

(1) Local Hazard Assessment

- We **analyzed historical disaster events** in Yilan County, **identified hazard-prone areas, and collected data on resilience-based disaster management and response plans**.
- This provides comprehensive disaster preparedness information for the region.



Collected data on resilience-focused emergency response plans



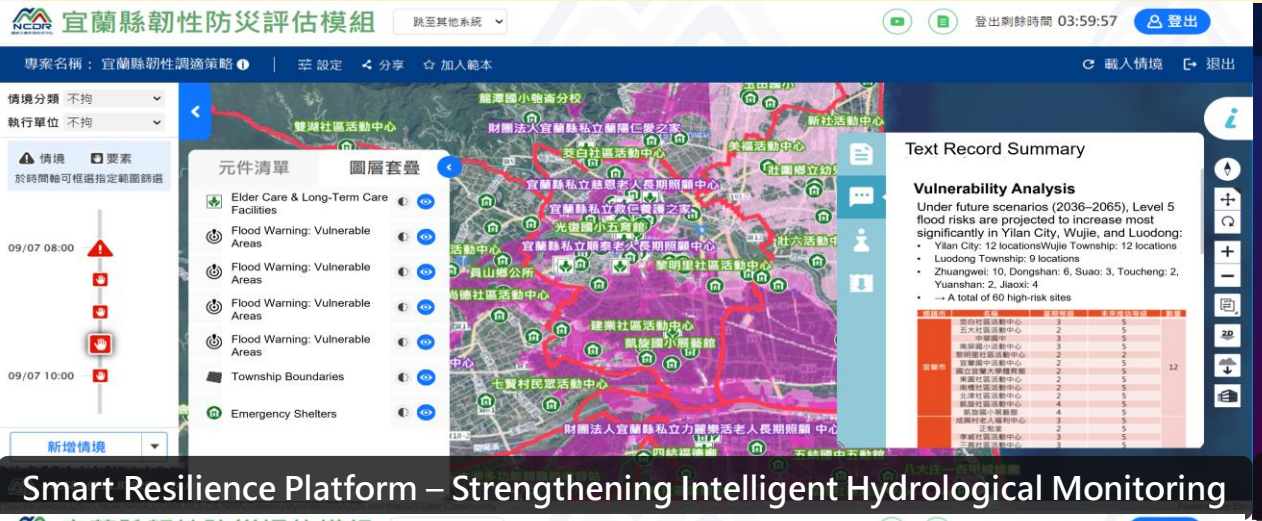
Extreme Disaster Scenarios: Floods and LandslidesTriggered by typhoons and intense rainfall (both short- and long-duration), causing inundation and slope failures.

Developed action-oriented strategies in collaboration with local government authorities.

2. Findings & Conclusion

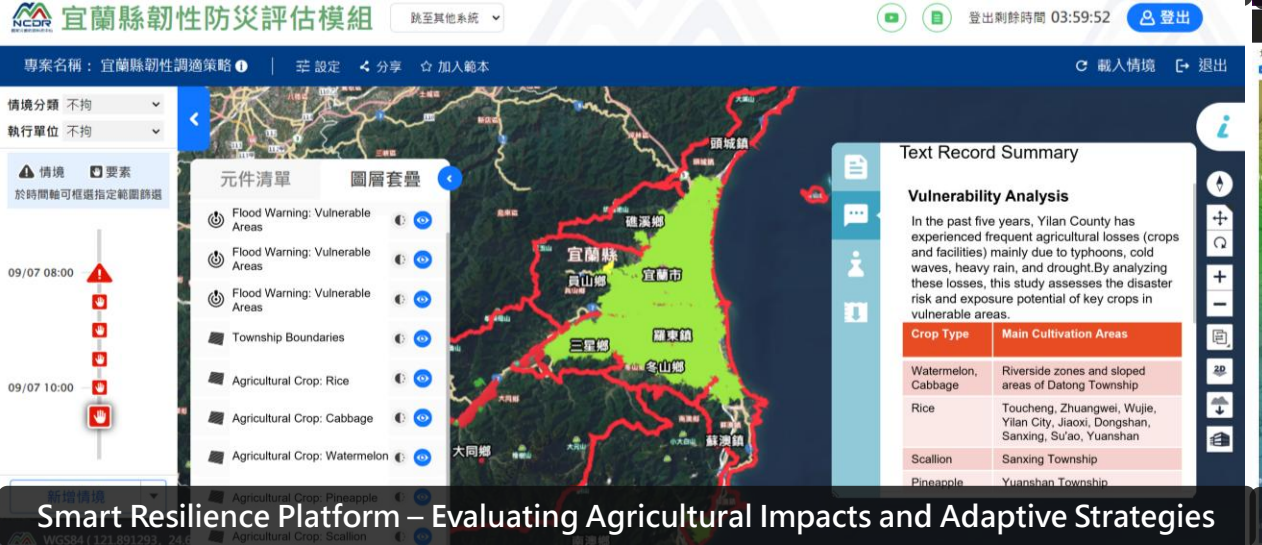
(2) Integration of Disaster Intelligence

- We combined **central and local technological research and development**.
- By using Yilan County's disaster intelligence network and resilience assessment module, we aim to **expand disaster mitigation capabilities and reduce the impacts of extreme events**.



Smart Resilience Platform – Strengthening Intelligent Hydrological Monitoring

Typhoon Impact Tracker – Wind Circle Landfall Analysis System



Smart Resilience Platform – Evaluating Agricultural Impacts and Adaptive Strategies

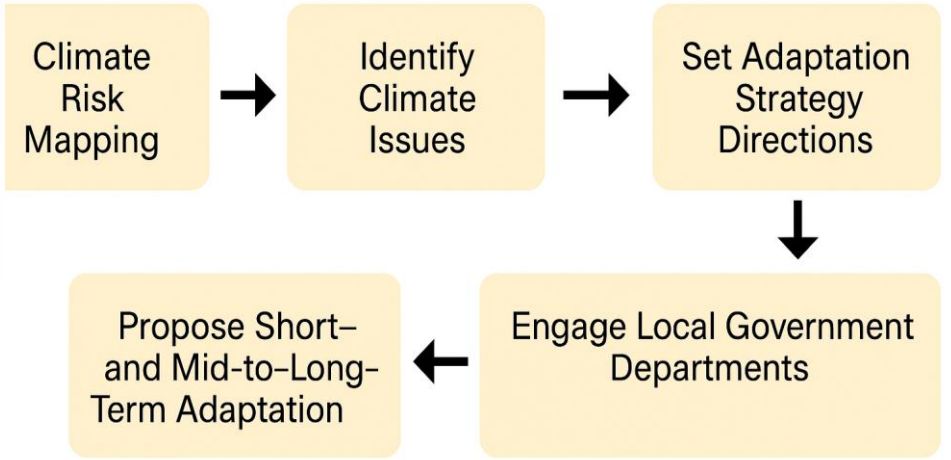
Live Disaster Dashboard – Featuring EMIC and Story Maps of Past Disaster Events

2. Findings & Conclusion

(3) Risk Application and Promotion

- **Based on climate change risk mapping and expert recommendations, we propose short-term and medium-to-long-term adaptation strategies.**
- **Through demonstration projects and promotional activities, we aim to improve local disaster resilience and minimize disaster impacts.**

Figure 1. Climate Adaptation Planning Process



Flood Hazard–Vulnerability Map of Yilan County under Climate Change Scenario (2036–2065)

Table 1. Climate Adaptation Action Table

Issue	Disaster Management Goal	Responsible Departments	Short-term Actions	Mid- to Long-term Actions
Extreme Rainfall and Drainage Capacity under Climate Change	D. Real-Time Disaster Awareness	Water Resources, Construction	- Clean and inspect current drainage systems - Apply smart water monitoring (e.g., sensors) - Launch dedicated flood response procedures - Reserve pumping space during construction for emergency use	- Adjust infrastructure standards based on climate risk and flood assessments - Set up cross-department and cross-regional coordination for flexible response plans - Continue to strengthen risk awareness and training for related personnel
Critical Infrastructure Impact & Risk Assessment	A. Disaster Risk Control	Water Resources, Environmental Protection, Education, Fire Department	- Install flood barriers - Assess risk for key infrastructure exposed to climate threats - Build demonstration areas with risk data integration - Reserve water space during construction - Continue early warning, drills, and staff training	- Update infrastructure standards based on long-term climate risk - Develop cross-agency collaboration and adaptive plans - Strengthen staff knowledge and participation in risk management
Agricultural Impact & Adaptation to Climate Change	A. Disaster Risk Control	Agriculture, Construction	- Enhance crop weather monitoring and alert systems - Include agriculture in land use planning and zoning - Promote crop relocation, crop rotation, and climate-resilient farming - Create smart farming demonstration areas (e.g., irrigation, greenhouses) - Set up platforms for local agricultural adaptation coordination - Promote localized crop risk prevention and farming solutions	- Promote diversified farming systems to reduce monoculture reliance - Encourage farmers to adopt climate-adapted cropping models - Promote eco-farming and sustainable technologies to reduce environmental pressure

2. Findings & Conclusion

(4) Involved local stakeholders

- **We actively involved local stakeholders—including government officials, disaster management teams, and community organizations—through interviews and workshops.**
- **This participatory approach ensures that the strategies are practical and aligned with regional policies.**

Resilient Community Disaster Response Forum

Yilan County 2050 Net-Zero Transition Strategy – Social Communication Focus Meeting and Workshop Discussions

Cross-Departmental Interviews & Discussions

Yilan County Climate Change Adaptation Promotion Committee

Thanks for listening.

Mo-Hsiung Chuang
(bigbear@mail.mcu.edu.tw)

Chun-Fang Liu
(ewa886@gmail.com)

Dept. of Urban Planning and Disaster Management,
School of Design, Ming Chuan University, TAIWAN

EGU General Assembly 2025

PICO spot 3 11:02-11:04 | PICO 3.7 | EGU25-6473 |NH9.6 Wednesday, 30 April

Enhancing Resilient Cities under Extreme Disasters due to Climate Change: A Case Study of Yilan County, Taiwan

Mo-Hsiung Chuang[1]*, Chun-Fang Liu[2]

Dept. of Urban Planning and Disaster Management, Ming Chuan University, Taiwan

Abstract

- Extreme climate events driven by global warming severely impact high-risk areas, challenging local societies and environments.
- This study integrates climate change hazard scenarios with local disaster characteristics to help Yilan County, Taiwan, develop disaster preparedness and resilience strategies.
- Using literature review and in-depth interviews, the research focuses on three aspects:

1) Local Hazard Assessment — identifying hazard-prone areas and compiling disaster preparedness plans;
2) Disaster Intelligence Integration — enhancing disaster mitigation through Yilan's disaster intelligence network and resilience assessment; and
3) Risk Application and Promotion — constructing resilient city frameworks via climate risk mapping and expert recommendations.

- The study proposes short- and medium-to-long-term adaptation strategies for high-risk areas and engages local stakeholders to co-create practical, policy-aligned disaster responses.

Keywords: Extreme Disasters, Resilient Cities, Resilience-Based Disaster Management, Localized Adaptation, Disaster Intelligence.

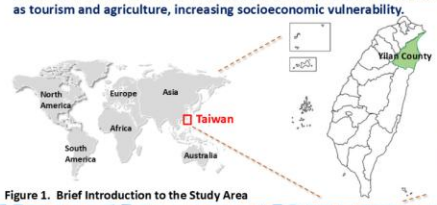
1. Research Background and Problem Statement

Global warming has intensified extreme weather disasters worldwide

- Climate change has led to an increase in both the frequency and intensity of extreme weather events such as typhoons, torrential rains, and droughts, significantly impacting human settlements, infrastructure, and ecosystems.

High-risk areas like Yilan County face severe social and environmental challenges

- Yilan County, located on Taiwan's northeast coast, is highly exposed to typhoons and flood-related disasters. These hazards not only endanger lives and property, but also affect local industries such as tourism and agriculture, increasing socioeconomic vulnerability.




Flooding in Qixian Village, Yuanshan Township during Typhoon Nesat (2022)


Landslide Behind Baiyun Temple, Subei Village, Su'ao Township, Yilan County during Typhoon Megi (2010)

Figure 1. Brief Introduction to the Study Area

There is a growing need to integrate scientific knowledge and local governance for resilience enhancement

Operational Concept for Integrating Disaster Risk Reduction and Climate Change Adaptation

Research Implementation
- Synchronized Intelligence Sharing
- Empowering Local Disaster Research
- Advancing Preparedness through Strategic Data

Intelligence Sharing
- Exploring Resilient Disaster Risk Reduction Strategies through Typhoon and Flood Response
- Central-to-Local Intelligence Sharing: National Planning Data ↔ Local Disaster Feedback
- Case-Based Adaptation Strategies to Strengthen Disaster Preparedness in Yilan County

Bridging Outcomes
- Increasing Climate Change Hazards
- Applying Resilient City Approaches
- Proposing Resilience-Based Disaster Adaptation Measures

Resilient Urban-Rural Development and Disaster Adaptation in Yilan County

Disaster Risk Reduction (Emergency Response Intelligence) + Climate Change Adaptation (Mitigation and Adaptation Strategies)

Disaster Response Operations | Resilience-Based Disaster Adaptation

- Based on Policy Recommendations from the 9th Executive Yuan Advisory Council
- National Plan Implementation & Local Workshop Application
- Developing Resilient Disaster Adaptation Strategies through Scenario-Based Exercises

Yilan County Disaster Information Network | Platform for Resilient Disaster Risk Adaptation | Disaster Information Sharing Map

- National Program: Developed, Maintained, and Provided Free of Charge
- Local Program: Value-Added and Localized for Practical Application

Resilience-Oriented Disaster Database | Climate Change Mapping Data | Sharing and Applying Disaster Risk Intelligence

2. Research Objectives

- Integrate national hazard data with local knowledge to tailor adaptation and disaster preparedness.
- Link climate risk projections with local disaster histories to better target resilience efforts.
- Use participatory planning and scenario training to create solutions matching technical and community needs.
- Support local governments with technical frameworks, decision tools, and policy advice to balance immediate response and long-term resilience.

Integrate climate hazard data with local disaster characteristics for resilience enhancement. → Develop localized operational strategies for resilient cities. → Assist in formulating short- and medium-to-long-term adaptation strategies.

3. Research Methodology

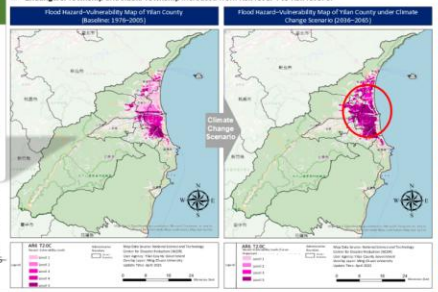
Literature review

- A review of **disaster response literature, government reports**, and **case studies** focused on **Yilan County**.
- Key themes: **institutional adaptation, community resilience, multi-level governance**.

Data Integration and Spatial Analysis

- Integration of **national-scale datasets** (e.g., **AR6 flood and landslide risk maps**) with **local GIS information**.
- **Overlay analysis** supports **vulnerability identification** and **localized adaptation planning**.

- **Wujie Township, Dongshan Township, Yilan City**, and **Luodong Township** remain at **risk level 5**.
- **Zhuangwei Township** and **Jiaoxi Township** increased from **risk level 4 to risk level 5**.



We used the hazard-vulnerability overlay analysis based on the AR6 climate change flood risk maps provided by NCDR, under the 2°C global warming scenario.
We compared the risk differences between the baseline period (1976–2005) and the future projection (2036–2065).

In-depth interviews

- Interviews with **local government officials, disaster management personnel**, and **community representatives**.
- Focused on **practical experiences, challenges**, and **local perspectives** on **resilience strategies**.


Resilient Community Disaster Response Forum




Yilan County 2050 Net-Zero Transition Strategy – Social Communication Focus Meeting and Workshop Discussions



Cross-Departmental Interviews & Discussions



Yilan County Climate Change Adaptation Promotion Committee

4. Research Framework and Three Main Focus Areas

(1) Local Hazard Assessment

- **Identifying high-risk areas through historical disaster inventory.**
- **Collecting resilience-based disaster data and related plans.**
- **Establishing a localized resilience disaster preparedness database.**

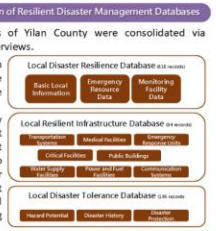
Analysis and Prioritization of Extreme Hazard Types

- An investigation of 22 local hazard types in Yilan County.● indicates hazard potential; △ indicates occurrence within the past three years; ★ indicates local government plans or response measures.

Hazard Type	● Potential Hazard ▲ Historical Disaster Record ★ Local Government Plans or Response Measures	Township/City
Typhoon Disaster Typhoons	●▲★	Entire County
Earthquake (including Liquefaction)	●▲	Entire County
Fire Disaster	●	Entire County
Explosion	●	Entire County
Volcanic Disaster	●	Toucheng, Jiaoxi, Zhuangwei
Mining Disaster	●	Nan'ao, Yuanshan
Flood	●▲★	Entire County
Drought	●	Entire County
Public Gas and Oil Pipeline Accident	●	Entire County
Transportation Line Accident	●	Entire County
Industrial Pipeline Accident	●	Su'ao, Dongshan, Wujie
Air Disaster	●	Entire County
Marine Disaster	●	Near Toucheng, Jiaoxi, Zhuangwei, Wujie, Su'ao, Nan'ao
Land Traffic Accident	●	Entire County
Biological Disease Disaster	●	Entire County
Hazardous Chemical Disaster	●	Entire County
Earthquake Mother Disaster	●▲★	Entire County
Cold Damage (Cold Wave)	●▲★	Entire County
Plant and Animal Epidemic Disaster	●	Entire County
Debris Flow and Large-scale Landslide Disaster	●▲★	Su'ao, Jiaoxi, Toucheng, Yuanshan, Nan'ao, Dongshan, Datong, Sanxing
Forest Fire Disaster	●	Toucheng, Jiaoxi, Yilan City, Zhuangwei, Sanxing, Dongshan, Luodong, Datong, Nan'ao, Su'ao, Luodong
Radiation Accident	●	Entire County
Tsunami	●	Su'ao, Toucheng, Zhuangwei, Wujie
Others	None	None

Compilation and Application of Resilient Disaster Management Databases

1) The foundational databases of Yilan County were consolidated via project analysis and local interviews.
2) A maintenance mechanism was established to enhance local climate change awareness.
3) Data were systematically integrated into the "Resilient Disaster Management Database," categorized into three areas—Local Disaster Resilience, Local Resilient Infrastructure, and Local Disaster Tolerance—covering 138 subcategories.



(2) Integration of Local Disaster Intelligence

- **Enhancing central disaster data with local feedback mechanisms.**
- **Analyzing the relationship between disaster information and emergency responses.**
- **Utilizing the Yilan Disaster Intelligence Network and resilience assessment modules.**

Compilation and Application of Resilient Disaster Management Databases

1) During the activation of the Yilan County Disaster Response Center, personnel were deployed to participate in coordination meetings and assist in weather data analysis and disaster forecasting to support decision-making.

Typhoon Intelligence Analysis Briefing

2) Local information needs were addressed through self-developed typhoon analysis tools and real-time disaster information systems, enhancing disaster preparedness with localized scenario simulations.

Disaster Response Center Coordination Meeting

3) Typhoon weather analysis reports were provided, including typhoon paths, impact potential and timing, wind and rainfall forecasts, and recommendations for school and office closures.

Outcomes of the County and City Disaster Information Platform

1) To enhance disaster resilience against climate change impacts in Yilan County, the "Yilan Disaster Information Platform" was established.
2) It integrates real-time updates, typhoon/heavy rain, landslide/debris flow, earthquake alerts, hazard potential maps, story maps, and climate projection data.
3) New features will be continuously expanded to strengthen rapid response and disaster management capacity.

(3) Risk Application and Local Promotion

- **Based on climate change risk mapping and expert recommendations, we propose short-term and medium-to-long-term adaptation strategies.**
- **Through demonstration projects and promotional activities, we aim to improve local disaster resilience and minimize disaster impacts.**

Figure 2. Climate Adaptation Planning Process

Climate Risk Mapping → Identify Climate Issues → Set Adaptation Strategy Directions → Engage Local Government Departments → Propose Short- and Mid-to-Long-Term Adaptation

Table 1. Climate Adaptation Action Table

Issue	Disaster Management Goal	Responsible Departments	Short-term Actions	Mid- to Long-term Actions
Extreme Rainfall and Drainage Capacity under Climate Change	D. Real-Time Disaster Awareness	Water Resources, Construction	- Clean and inspect current drainage systems - Apply smart water monitoring (e.g., sensors) - Launch dedicated flood response procedures - Reserve pumping space during construction for emergency use	- Adjust infrastructure standards based on climate risk and flood assessments - Set up cross-department and cross-regional coordination for flexible response plans - Continue to strengthen risk awareness and training for related personnel
Critical Infrastructure Impact & Risk Assessment	A. Disaster Risk Control	Water Resources, Environment al Protection, Education, Fire Department	- Install flood barriers - Assess risk for key infrastructure exposed to climate threats - Build demonstration areas with risk data integration - Reserve water space during construction - Continue early warning, drills, and staff training	- Update infrastructure standards based on long-term climate risk - Develop cross-agency collaboration and adaptive plans - Strengthen staff knowledge and participation in risk management
Agricultural Impact & Adaptation to Climate Change	A. Disaster Risk Control	Agriculture, and Construction	- Enhance crop weather monitoring and alert systems - Include agriculture in land use planning and zoning - Promote crop relocation, crop rotation, and climate-resilient farming - Create smart farming demonstration areas (e.g., irrigation, greenhouses) - Set up platforms for local agricultural adaptation coordination - Promote localized crop risk prevention and farming solutions	- Promote diversified farming systems to reduce monoculture reliance - Encourage farmers to adopt climate-adapted cropping models - Promote eco-farming and sustainable technologies to reduce environmental pressure

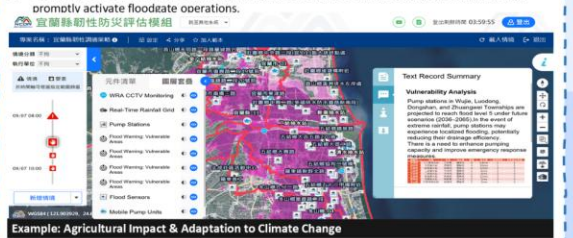
Participated in the Yilan County Climate Change Adaptation Task Force to Formulate Resilient Strategies.

5. Research Results and Practical Applications

- **Apply Yilan Disaster Information Platform and Resilient Disaster Adaptation Platform to enhance real-time flood and landslide early warnings in Yilan County.**

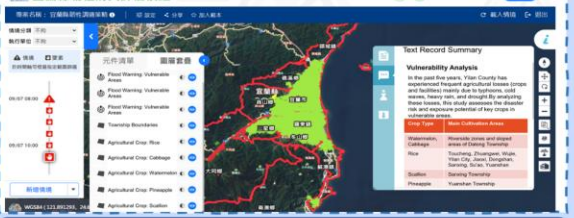
Applying the Resilient Disaster Adaptation Platform — **Example: Extreme Rainfall and Drainage Capacity under Climate Change.**

1) Enhance smart water monitoring and flood sensor applications.
2) Use radar echoes, real-time rainfall grids, and flood sensors to track local flood conditions and promptly activate floodgate operations.



Example: Agricultural Impact & Adaptation to Climate Change

1) Build and boost weather monitoring and early warning systems for crops.
2) Move crops to safer areas and promote crop rotation to stay adaptive.
3) Bring in smart farming tools like spraying systems and mesh greenhouses.
4) Set up local teams to work together on agricultural adaptation.
5) Expand crop insurance programs based on what each area grows best.



6. Conclusion and Contributions

1) The study integrates national and local disaster data for practical use.
2) Yilan County serves as a model for localized resilience governance.
3) The framework provides valuable references for other high-risk regions.

Enhancing Resilient Cities under Extreme Disasters due to Climate Change: A Case Study of Yilan County, Taiwan

Extreme climate events driven by global warming severely impact high-risk areas, challenging local societies and environments.

This study integrates climate change hazard scenarios with local disaster characteristics to help Yilan County, Taiwan, develop disaster preparedness and resilience strategies.

Using literature review and in-depth interviews, the research focuses on three aspects:

(1) Local Hazard Assessment — identifying hazard-prone areas and compiling disaster preparedness plans;
(2) Disaster Intelligence Integration — enhancing disaster mitigation through Yilan's disaster intelligence network and resilience assessment; and
(3) Risk Application and Promotion — constructing resilient city frameworks via climate risk mapping and expert recommendations.

The study proposes short- and medium-to-long-term adaptation strategies for high-risk areas and engages local stakeholders to co-create practical, policy-aligned disaster responses.

Keywords: Extreme Disasters, Resilient Cities, Resilience-Based Disaster Management, Localized Adaptation, Disaster Intelligence.

1. Research Background and Problem Statement

Global warming has intensified extreme weather disasters worldwide

- Climate change has led to an increase in both the frequency and intensity of extreme weather events such as typhoons, torrential rains, and droughts, significantly impacting human settlements, infrastructure, and ecosystems.

High-risk areas like Yilan County face severe social and environmental challenges

- Yilan County, located on Taiwan's northeast coast, is highly exposed to typhoons and flood-related disasters.
- These hazards not only endanger lives and property, but also affect local industries such as tourism and agriculture, increasing socioeconomic vulnerability.

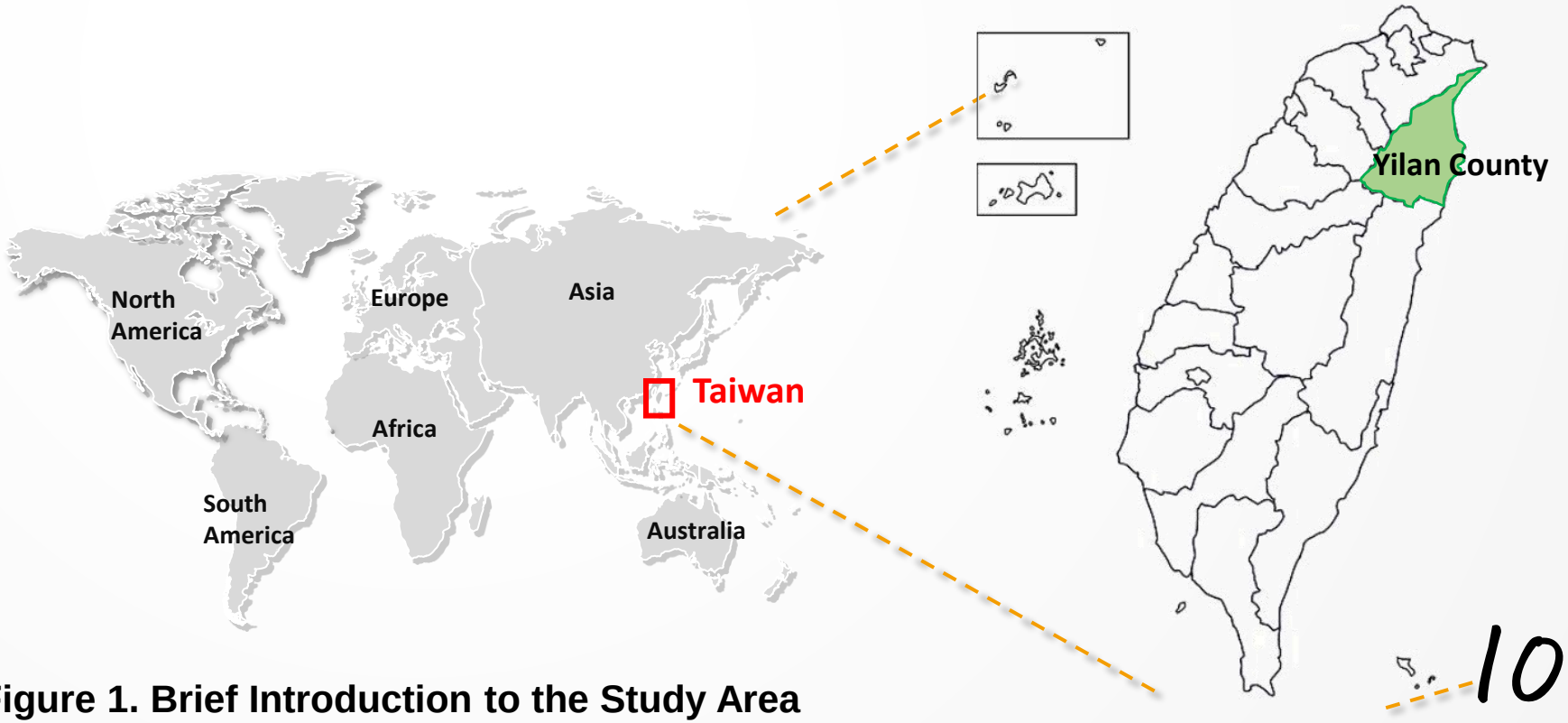
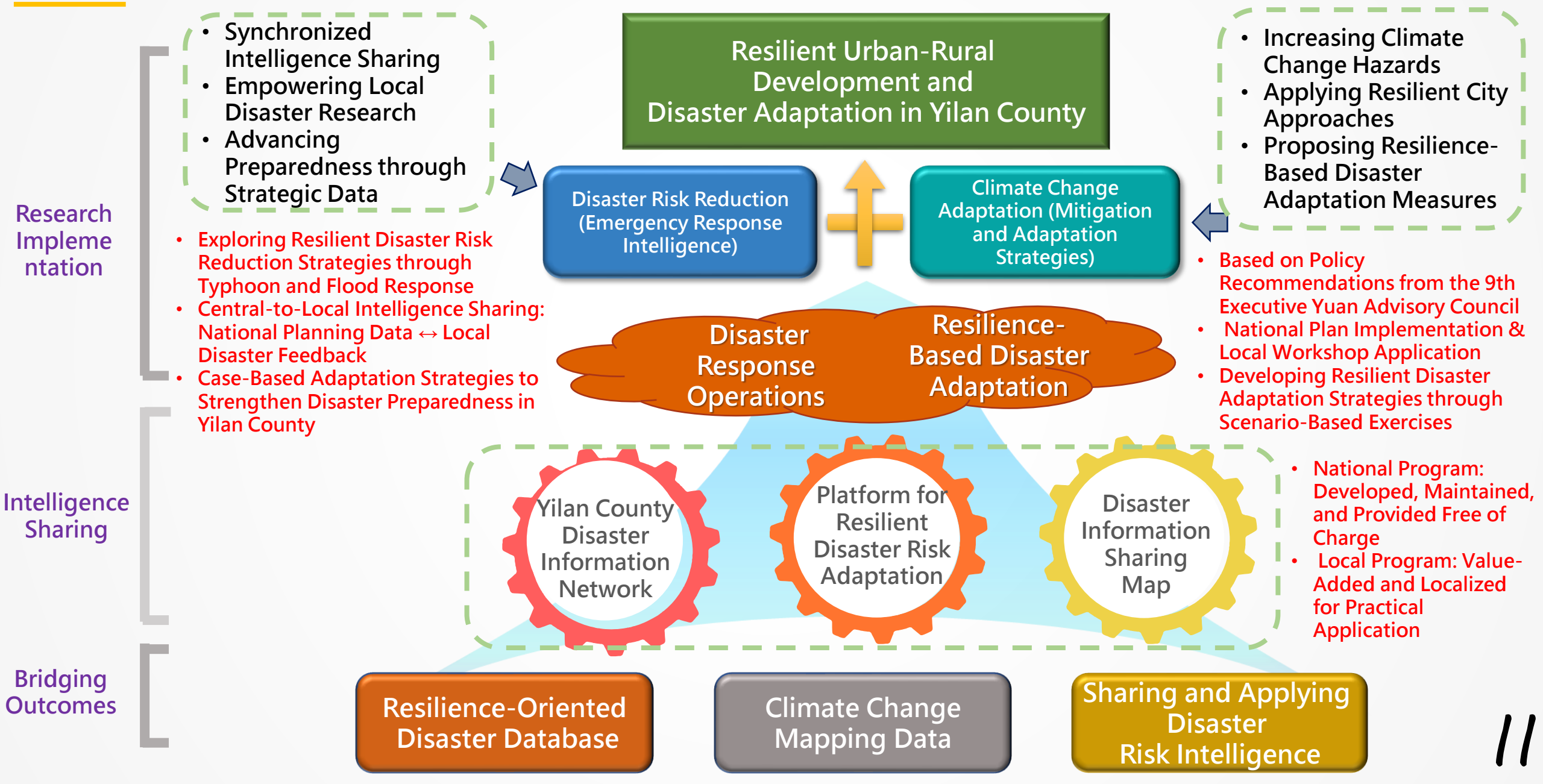


Figure 1. Brief Introduction to the Study Area

1. Research Background and Problem Statement

Operational Concept for Integrating Disaster Risk Reduction and Climate Change Adaptation



2. Research Objectives

1) Integrate national hazard data with local knowledge to tailor adaptation and disaster preparedness.

2) Link climate risk projections with local disaster histories to better target resilience efforts.

3) Use participatory planning and scenario training to create solutions matching technical and community needs.

4) Support local governments with technical frameworks, decision tools, and policy advice to balance immediate response and long-term resilience.

3. Research Methodology

Literature review

1) A review of **disaster response literature, government reports**, and **case studies** focused on **Yilan County**.
2) Key themes: **institutional adaptation, community resilience, multi-level governance**.

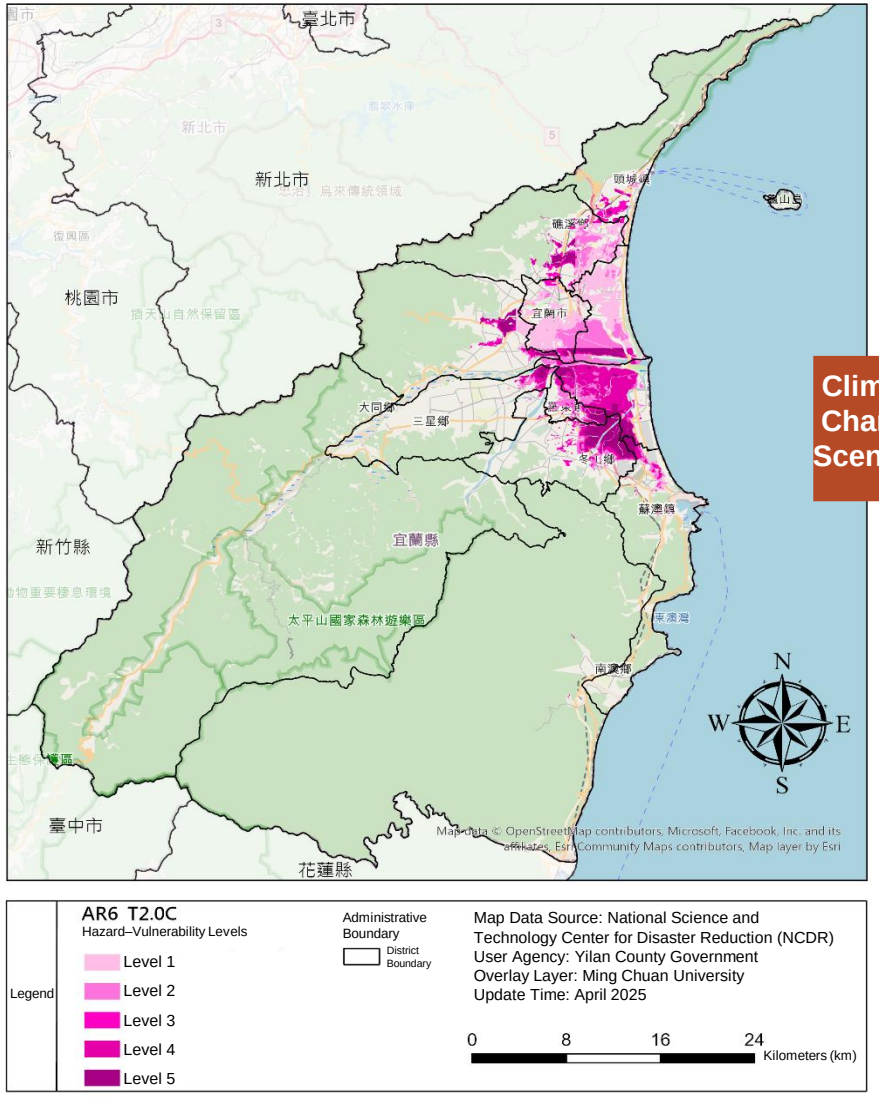
Data Integration and Spatial Analysis

1) Integration of **national-scale datasets** (e.g., **AR6 flood and landslide risk maps**) with **local GIS information**.
2) **Overlay analysis** supports **vulnerability identification** and **localized adaptation planning**.

We used the hazard-vulnerability overlay analysis based on the AR6 climate change flood risk maps provided by NCDR, under the 2°C global warming scenario.
We compared the risk differences between the baseline period (1976–2005) and the future projection (2036–2065).

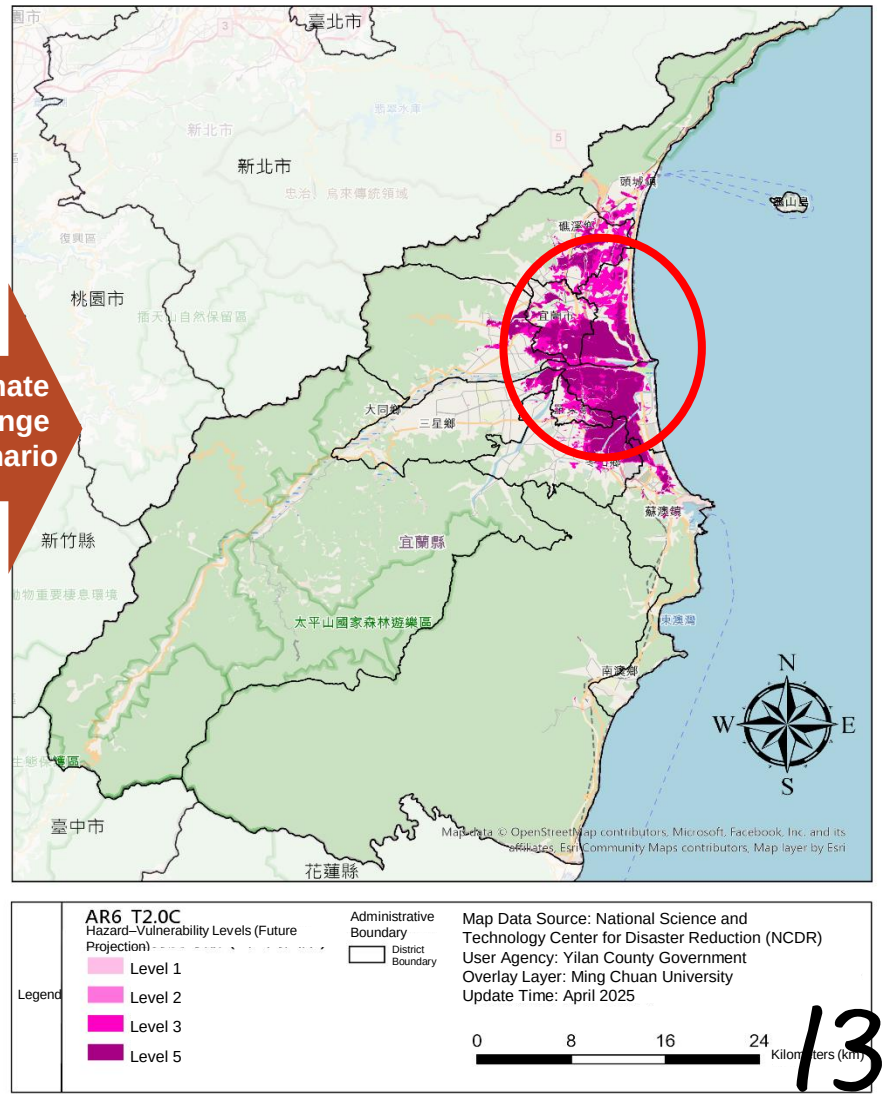
- **Wujie Township**, **Dongshan Township**, **Yilan City**, and **Luodong Township** remain at **risk level 5**.
- **Zhuangwei Township** and **Jiaoxi Township** increased from **risk level 4 to risk level 5**.

Flood Hazard–Vulnerability Map of Yilan County (Baseline: 1976–2005)



Climate Change Scenario

Flood Hazard–Vulnerability Map of Yilan County under Climate Change Scenario (2036–2065)



3. Research Methodology

In-depth interviews

1) Interviews with **local government officials, disaster management personnel**, and **community representatives**.
2) Focused on **practical experiences, challenges**, and **local perspectives** on **resilience strategies**.

Resilient Community Disaster Response Forum

Yilan County 2050 Net-Zero Transition Strategy – Social Communication Focus Meeting and Workshop Discussions

Cross-Departmental Interviews & Discussions

Yilan County Climate Change Adaptation Promotion Committee

4. Research Framework and Three Main Focus Areas

Analysis and Prioritization of Extreme Hazard Types

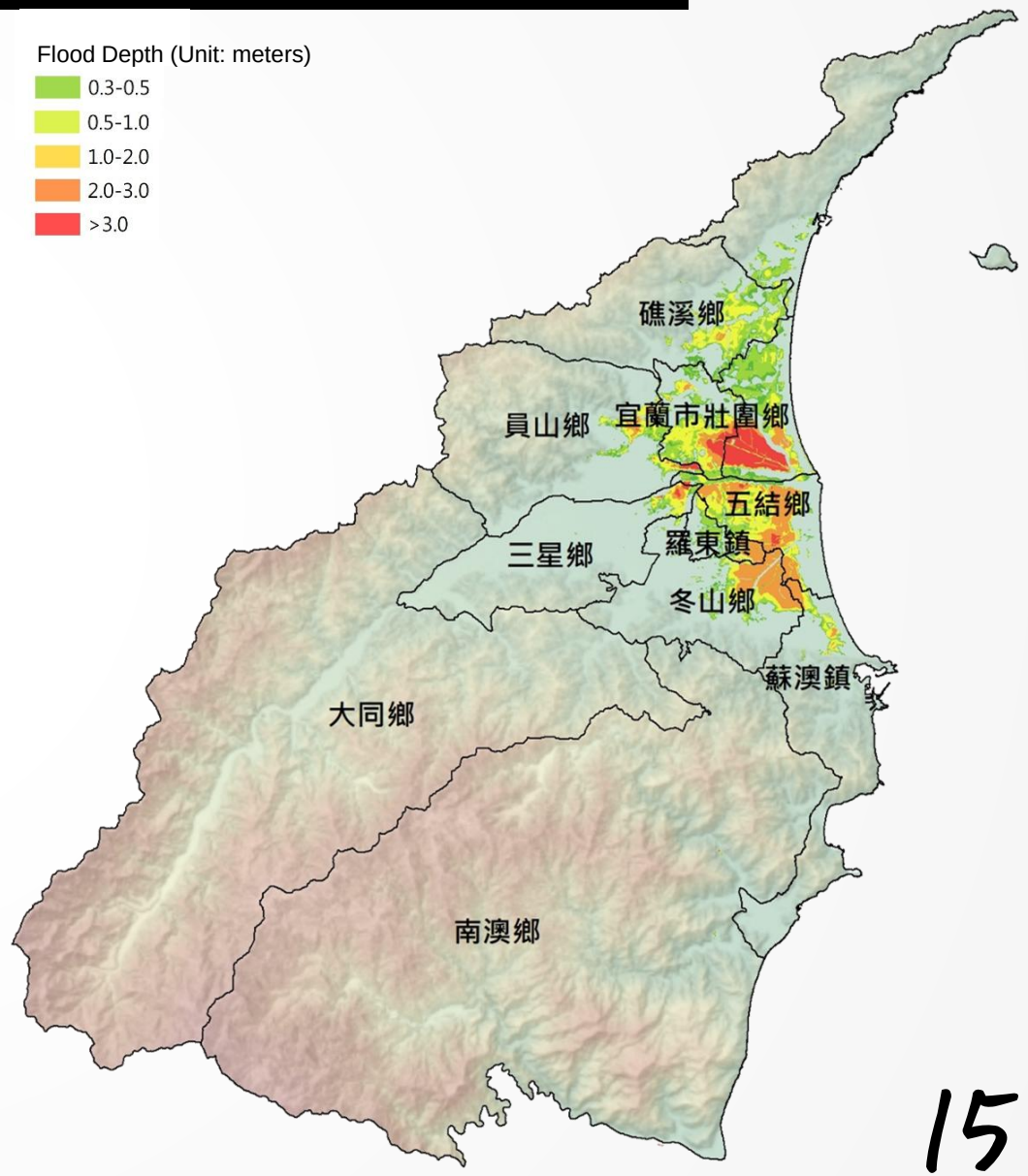
■ An investigation of 22 local hazard types in Yilan County.

● indicates hazard potential; △ indicates occurrence within the past three years;

★ indicates local government plans or response measures.

Hazard Type	● : Potential Hazard △ : Historical Disaster Record ★ : Local Government Response Plan or Action	Township/City
Wind Disaster (Typhoon)	●△	Entire County
Earthquake (Including Liquefaction)	●△	Entire County
Fire Disaster	●△	Entire County
Explosion	●△	Entire County
Volcanic Disaster	●	Toucheng, Jiaoxi, Zhuangwei
Mining Disaster	●	Nan'ao, Yuanshan
Flood	●△★	Entire County
Drought	●△★	Entire County
Public Gas and Oil Pipeline Accident	●△	Entire County
Transmission Line Accident	●△	Entire County
Industrial Pipeline Accident	●	Su'ao, Dongshan, Wujie
Air Disaster	△	Entire County
Marine Disaster	●△	Near Toucheng, Jiaoxi, Zhuangwei, Wujie, Su'ao, Nan'ao
Land Traffic Accident	●△★	Entire County
Biological Disease Disaster	●△	Entire County
Hazardous Chemical Disaster	●△	Entire County
Particulate Matter Disaster	●△★	Entire County
Cold Damage (Cold Wave)	●△★	Entire County
Plant and Animal Epidemic Disaster	●△★	Entire County
Debris Flow and Large-scale Landslide Disaster	●△★	Su'ao, Jiaoxi, Toucheng, Yuanshan, Nan'ao, Dongshan, Datong, Sanxing
Forest Fire Disaster	●△	Toucheng, Jiaoxi, Yilan City, Zhuangwei, Sanxing, Dongshan, Luodong, Datong, Nan'ao, Su'ao, Luodong
Radiation Accident	●△	Entire County
Tsunami	●△	Su'ao, Toucheng, Zhuangwei, Wujie
Others	無	None

24-hour Cumulative Rainfall: 650 mm



4. Research Framework and Three Main Focus Areas

(1) Local Hazard Assessment

Compilation and Application of Resilient Disaster Management Databases

1) The existing foundational databases of Yilan County were consolidated through project analysis and interviews with local government departments.
2) A maintenance and update mechanism was established to strengthen local knowledge and awareness of climate change.
3) The data was systematically integrated into the "Resilient Disaster Management Database," categorized into three major areas—Local Disaster Resilience, Local Resilient Infrastructure, and Local Disaster Tolerance—encompassing a total of 138 subcategories.

Local Disaster Resilience Database (618 records)

- Basic Local Information
- Emergency Resource Data
- Monitoring Facility Data

Local Resilient Infrastructure Database (84 records)

- Transportation Systems
- Medical Facilities
- Emergency Response Units
- Critical Facilities
- Public Buildings
- Water Supply Facilities
- Power and Fuel Facilities
- Communication Systems

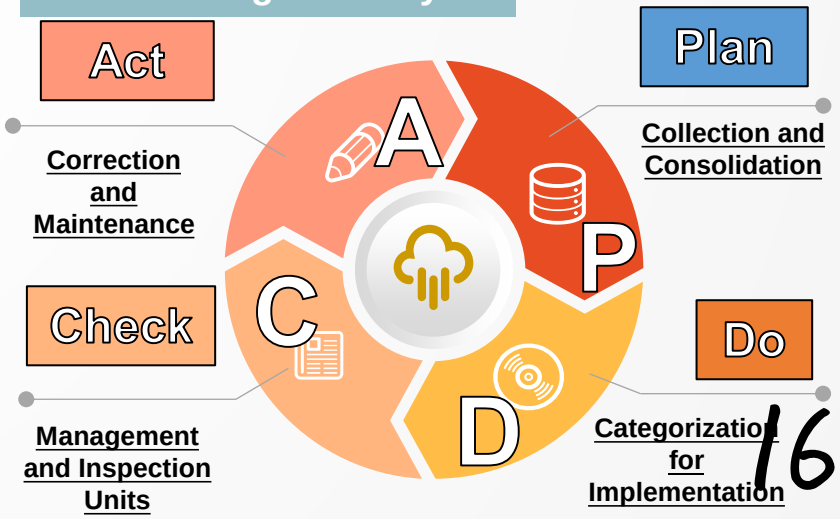
Local Disaster Tolerance Database (195 records

- Hazard Potential
- Disaster History
- Disaster Protection

Continuously conduct the survey and compilation of resilient disaster management data and local resilient infrastructure.

Relevant data are continuously updated and applied to the Yilan County Disaster Information Platform and disaster risk overlay simulations, with data from different formats converted and digitized.

PDCA Management Cycle



4. Research Framework and Three Main Focus Areas

(2) Integration of Local Disaster Intelligence

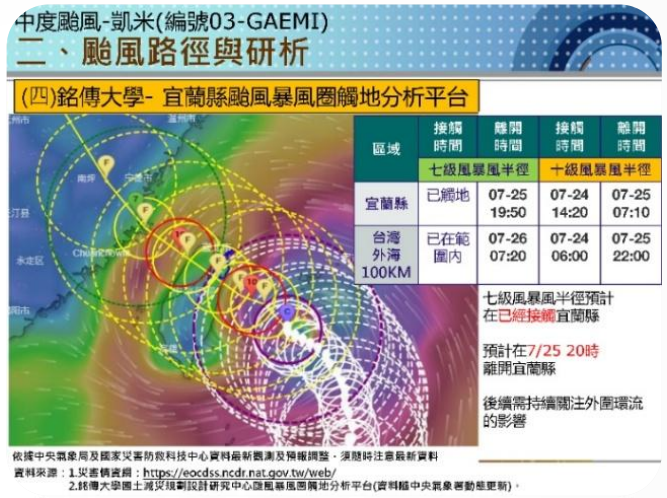
Compilation and Application of Resilient Disaster Management Databases

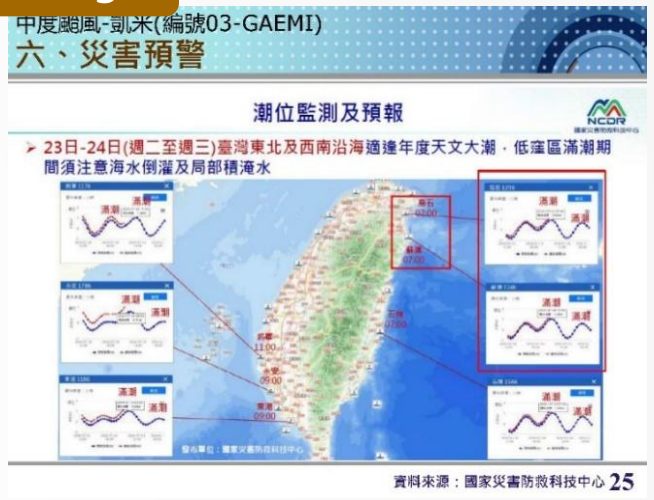
1) During the activation of the Yilan County Disaster Response Center, personnel were deployed to participate in coordination meetings and assist in weather data analysis and disaster forecasting to support decision-making.

2) Local information needs were addressed through self-developed typhoon analysis tools and real-time disaster information systems, enhancing disaster preparedness with localized scenario simulations.

3) Typhoon weather analysis reports were provided, including typhoon paths, impact potential and timing, wind and rainfall forecasts, and recommendations for school and office closures.

Typhoon Intelligence Analysis Briefing





Disaster Response Center Coordination Meeting

Outcomes of the County and City Disaster Information Platform

1) To enhance disaster resilience against climate change impacts in Yilan County, the "Yilan Disaster Information Platform" was established.
2) It integrates real-time updates, typhoon/heavy rain, landslide/debris flow, earthquake alerts, hazard potential maps, story maps, and climate projection data.
3) New features will be continuously expanded to strengthen rapid response and disaster management capacity.

Yilan Disaster Information Platform

Main Page Items

- Real-Time Updates (17)
- Typhoon Info (20)
- Real-Time Imagery (5)
- Landslide Info (5)
- Earthquake Info
- Hazard Maps
- Story Maps
- Climate Projections
- Community Info
- Disaster Potential Analysis
- Shelters
- Projects & Actions
- Disaster Education

4. Research Framework and Three Main Focus Areas

(3) Risk Application and Local Promotion

- **Based on climate change risk mapping and expert recommendations, we propose short-term and medium-to-long-term adaptation strategies.**
- **Through demonstration projects and promotional activities, we aim to improve local disaster resilience and minimize disaster impacts.**

Flood Hazard–Vulnerability Map of Yilan County under Climate Change Scenario (2036–2065)

Figure 1. Climate Adaptation Planning Process

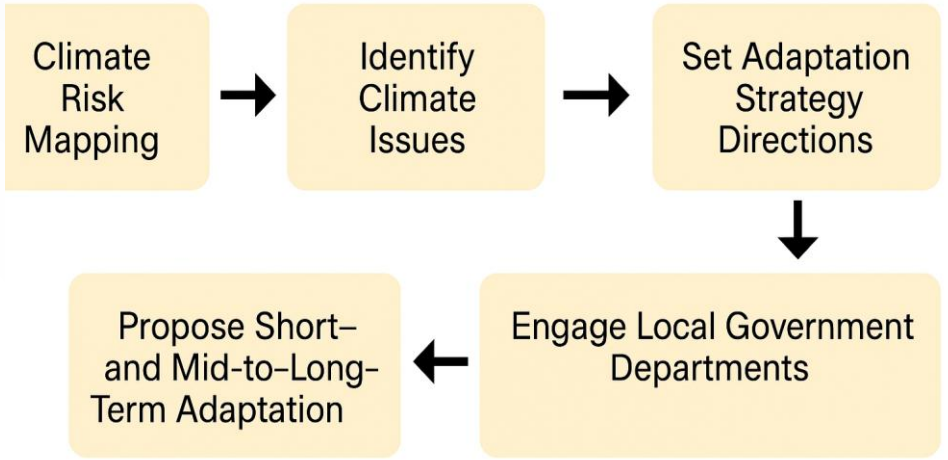


Table 1. Climate Adaptation Action Table

Issue	Disaster Management Goal	Responsible Departments	Short-term Actions	Mid- to Long-term Actions
Extreme Rainfall and Drainage Capacity under Climate Change	D. Real-Time Disaster Awareness	Water Resources, Construction	- Clean and inspect current drainage systems - Apply smart water monitoring (e.g., sensors) - Launch dedicated flood response procedures - Reserve pumping space during construction for emergency use	- Adjust infrastructure standards based on climate risk and flood assessments - Set up cross-department and cross-regional coordination for flexible response plans - Continue to strengthen risk awareness and training for related personnel
Critical Infrastructure Impact & Risk Assessment	A. Disaster Risk Control	Water Resources, Environmental Protection, Education, Fire Department	- Install flood barriers - Assess risk for key infrastructure exposed to climate threats - Build demonstration areas with risk data integration - Reserve water space during construction - Continue early warning, drills, and staff training	- Update infrastructure standards based on long-term climate risk - Develop cross-agency collaboration and adaptive plans - Strengthen staff knowledge and participation in risk management
Agricultural Impact & Adaptation to Climate Change	A. Disaster Risk Control	Agriculture, Construction	- Enhance crop weather monitoring and alert systems - Include agriculture in land use planning and zoning - Promote crop relocation, crop rotation, and climate-resilient farming - Create smart farming demonstration areas (e.g., irrigation, greenhouses) - Set up platforms for local agricultural adaptation coordination - Promote localized crop risk prevention and farming solutions	- Promote diversified farming systems to reduce monoculture reliance - Encourage farmers to adopt climate-adapted cropping models - Promote eco-farming and sustainable technologies to reduce environmental pressure

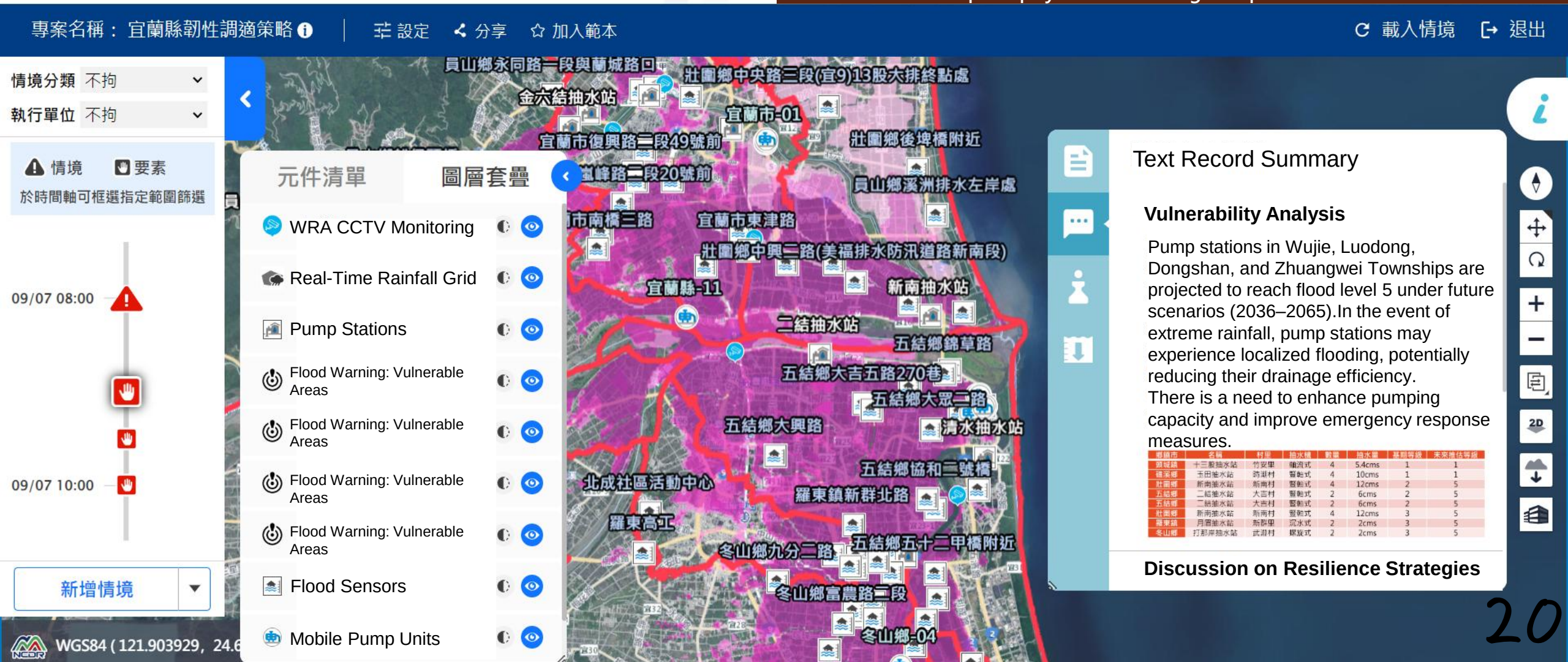
5. Research Results and Practical Applications

(1) Extreme Rainfall and Drainage Capacity under Climate Change

Applying the Resilient Disaster Adaptation Platform

Apply **Yilan Disaster Information Platform** and **Resilient Disaster Adaptation Platform** to enhance **real-time flood and landslide early warnings** in Yilan County.

- Enhance smart water monitoring and flood sensor applications.Use radar echoes, real-time rainfall grids, and flood sensors to track local flood conditions and promptly activate floodgate operations.

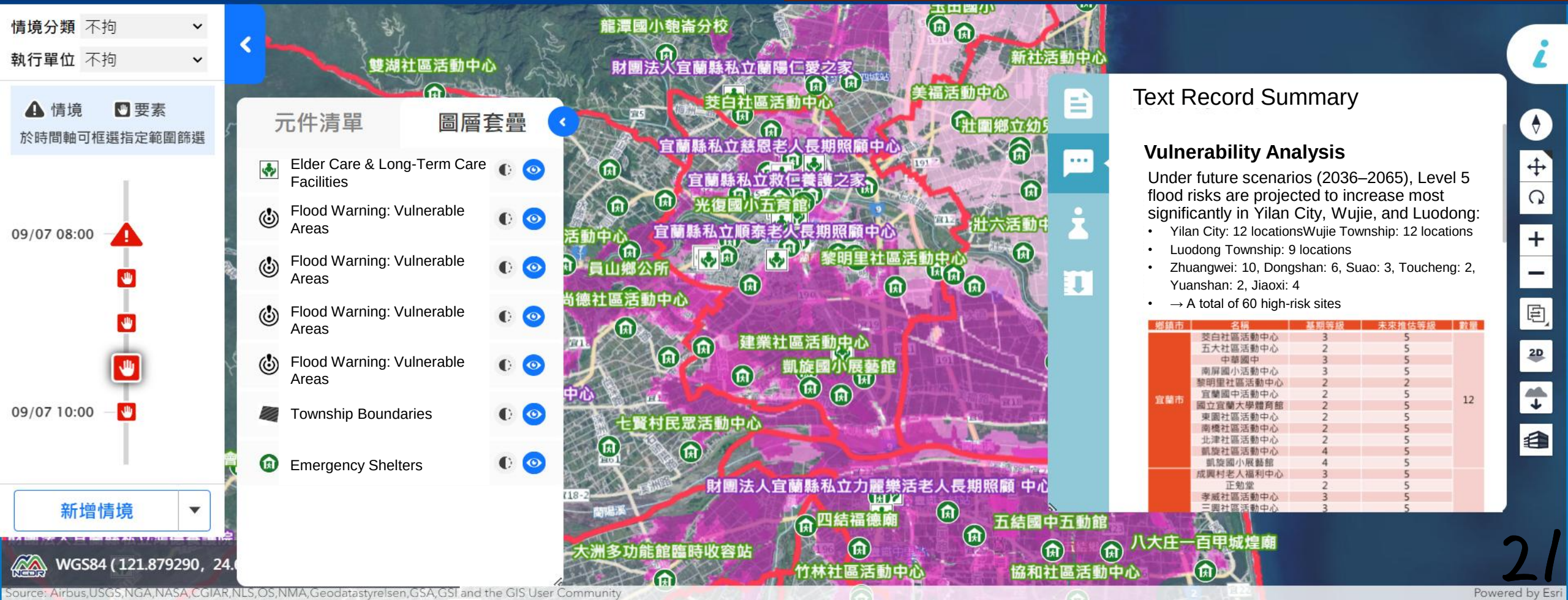


5. Research Results and Practical Applications

(2) Critical Infrastructure Impact & Risk Assessment

Applying the Resilient Disaster Adaptation Platform

1) Help the county government assess if sites are still suitable for flood shelters.
2) If needed, prioritize upgrades to drainage systems and flood response capacity
3) Strengthen partnerships with nearby shelters or find safer alternative locations
4) Regularly check drainage and pumping facilities around shelters, and boost debris clearing.
5) Hold evacuation drills and emergency training from time to time, and ensure sufficient emergency supplies.

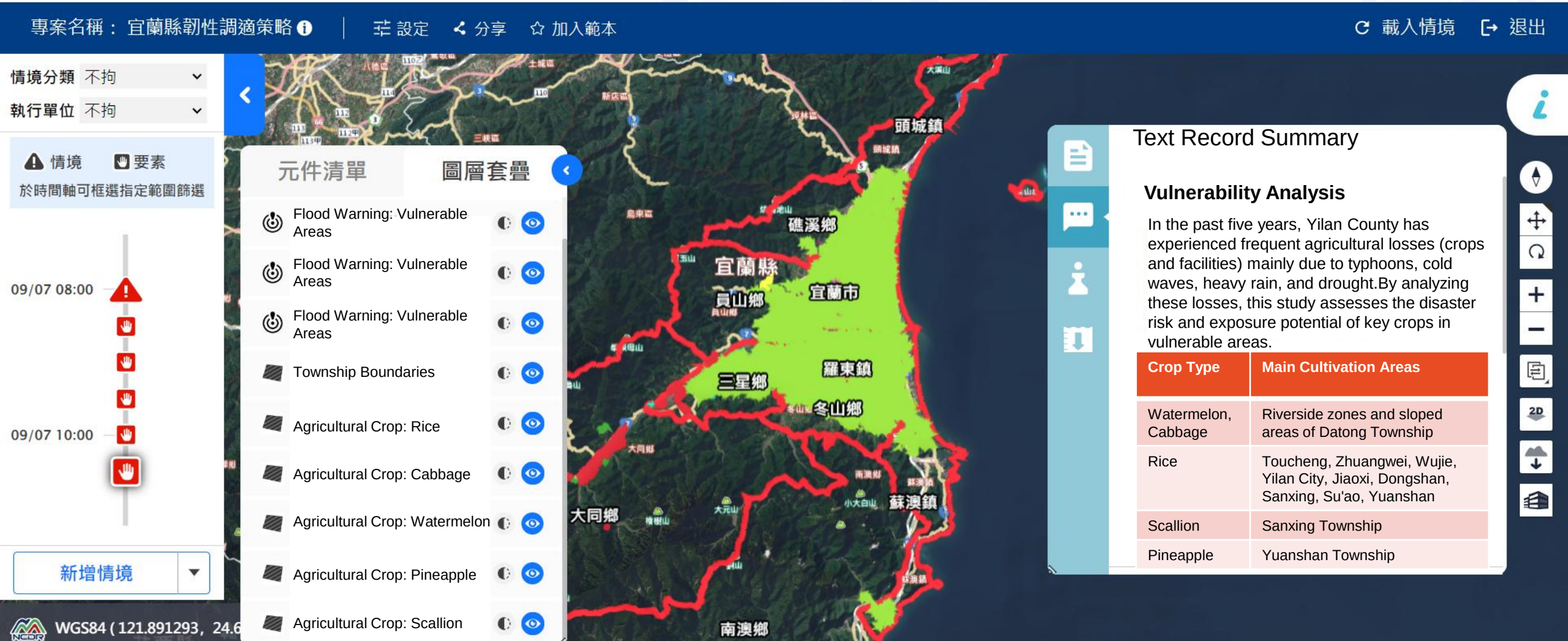


5. Research Results and Practical Applications

(3) Agricultural Impact & Adaptation to Climate Change

Applying the Resilient Disaster Adaptation Platform

1) Build and boost weather monitoring and early warning systems for crops.
2) Move crops to safer areas and promote crop rotation to stay adaptive.
3) Bring in smart farming tools like spraying systems and mesh greenhouses.
4) Set up local teams to work together on agricultural adaptation.
5) Expand crop insurance programs based on what each area grows best.



6. Conclusion and Contributions

1) The study integrates national and local disaster data to support practical applications in disaster preparedness and resilience planning.

2) Through climate risk mapping and expert consultations, it constructs resilient city frameworks tailored to local needs.

3) It also proposes short- and medium-to-long-term adaptation strategies, and actively engages local stakeholders to co-create practical, policy-aligned disaster responses.

4) Yilan County serves as a model for localized resilience governance, offering valuable references for other high-risk regions.