



CULTURE: Conserving it Together

An ICOMOS conference on heritage conservation across the Pacific



Architectural Heritage under Threat:

- Disaster and the Conservation Difficulty, Using Kinmen Island as a Case Study •••••

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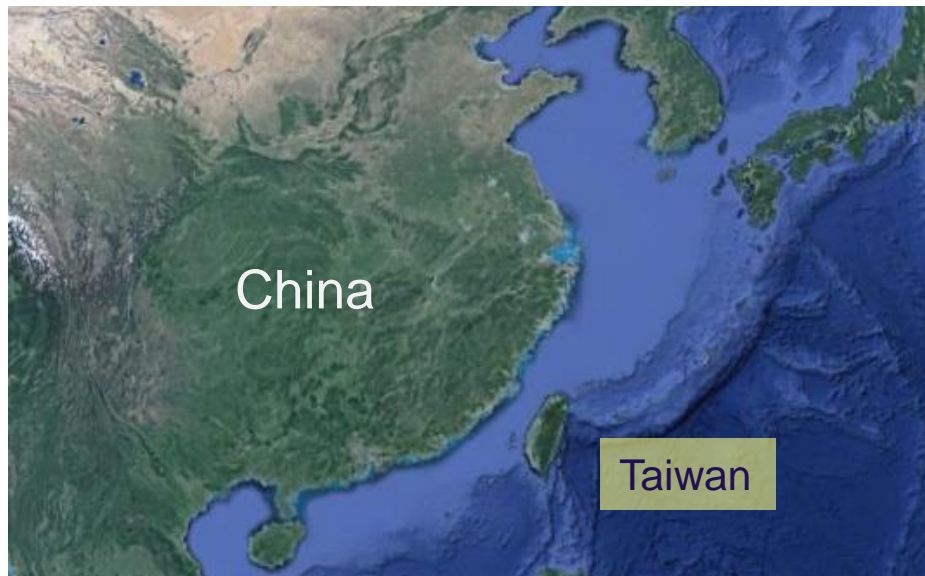
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Outline

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2. Built Heritage and Natural Disasters
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4. Challenges of Disaster Prevention and Maintenance for Built Heritage on Kinmen Island
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Introduction

- ❖ Taiwan's Kinmen Island lies outside of Xiamen in southern Fujian, China.
- ❖ In 1949, China split into two political camps, the Nationalists and the Communists.
- ❖ Kinmen was controlled by the Nationalist and under tight military control for 43 years until 1992.



Introduction



Introduction



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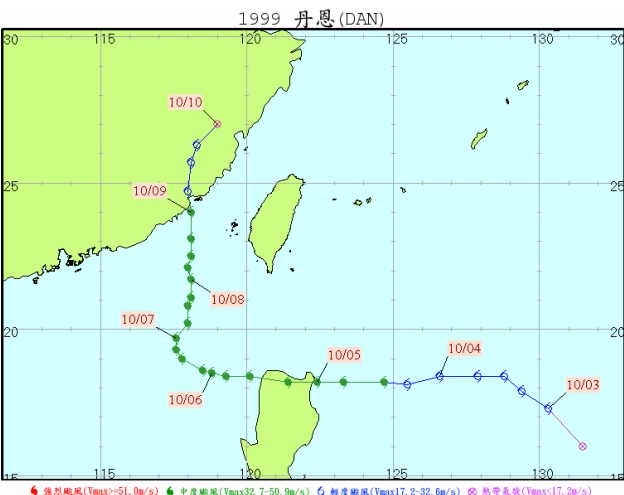
- ❖ By 2018, the small island has 227 architectural heritage sites.
- ❖ In the event of typhoon, traditional architecture are under threat.
- ❖ In September 2016, a strong typhoon hit Kinmen and damaged nearly half of these heritage.



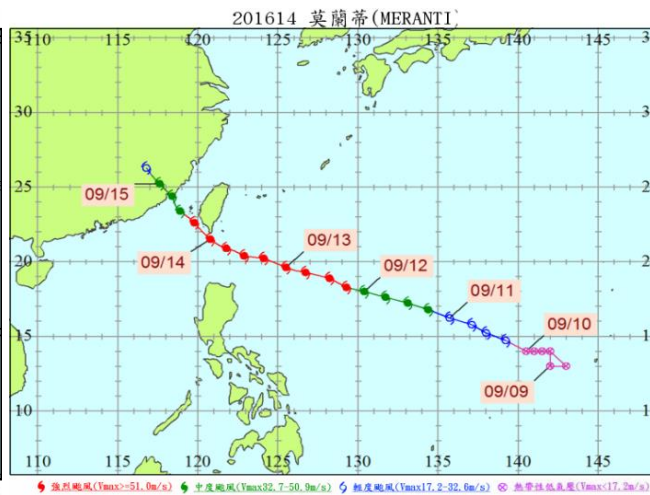
Built Heritage and Natural Disasters

Typhoons and Storms

- ❖ Kinmen, is met with frequent typhoons between July and October each year.
- ❖ Typhoons that follow the path north along the west coast of carry a great amount of humidity with them.
- ❖ They are usually extremely solid if their structures are not broken by higher terrains.



1999 Dan



2001 Meranti



Built Heritage and Natural Disasters

Typhoons and Storms

- ❖ Typhoon Dan in 1999 and Typhoon Meranti in 2016, are categorised as Pattern Seven.
- ❖ Both infrastructure and traditional houses were gravely harmed.



2016 Meranti



2016 Meranti

Built Heritage and Natural Disasters

Architectural Heritage of Kinmen and the Disaster Prevention and Restoration

- ❖ Kinmen's traditional architecture is characterised by red tile roofing and wooden structural frames.
- ❖ The walls are made of bricks or blocks that combine.
- ❖ Without sufficient maintenance, leakage and termite infestation become a common sight.



red tile roofing



brick and adobe wall



Built Heritage and Natural Disasters

Architectural Heritage of Kinmen and the Disaster Prevention and Restoration

- ❖ Traditional Kinmen architecture and villages are typically built on flat.
- ❖ Typhoon represents the most impactful disaster among all, and related preventative work is critical.
- ❖ There is a large number of uninhabited or collapsed buildings in Kinmen.

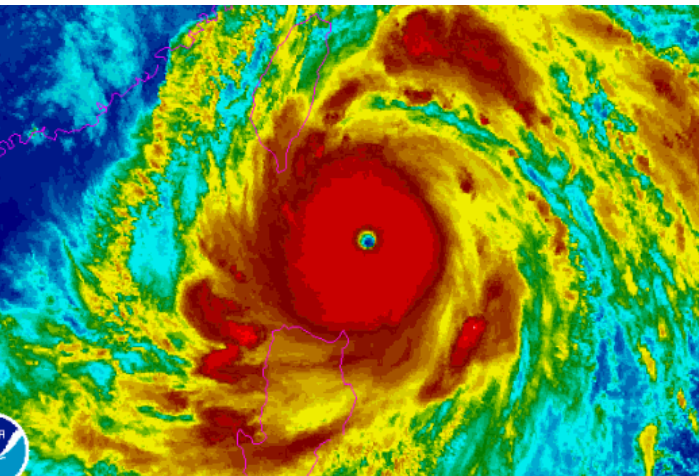


Traditional architecture

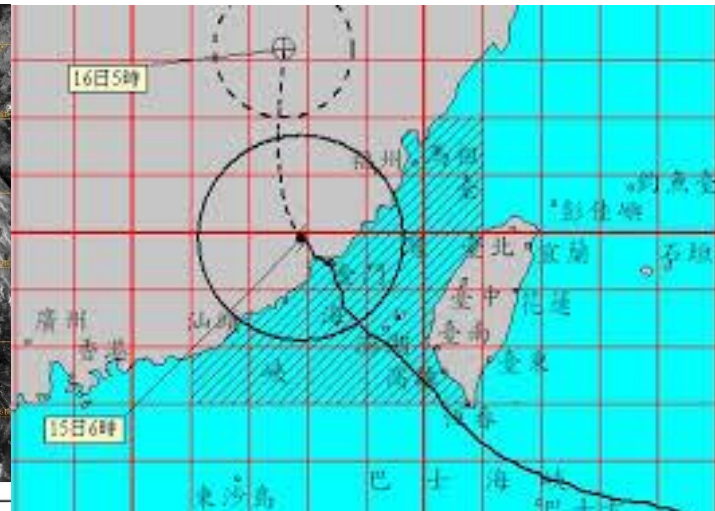
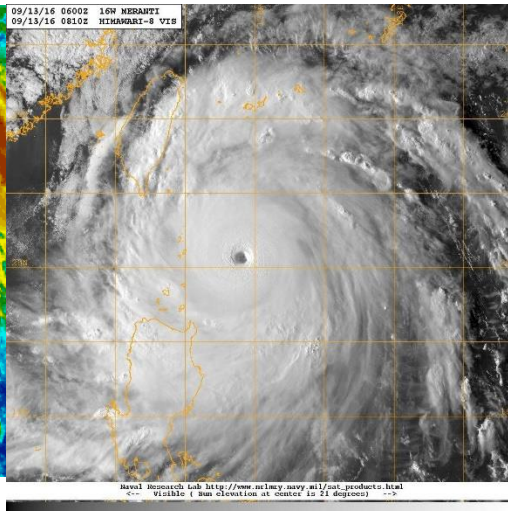
Destruction Resulting from Typhoon Meranti and Disaster Restoration

The Typhoon and its Damage

- ❖ In 2016, Typhoon Meranti was a strong typhoon in recent years.
- ❖ Level 7 storm in the Beaufort scale was 220 km, and Level 10 storm 80 km.
- ❖ With the highest wind speed reaching **60 m/s**, qualifying it as **Level 17**.



Super Typhoon Meranti
with winds reaching 297 km/h



Destruction Resulting from Typhoon Meranti and Disaster Restoration

Typhoon Damage to Built Heritage

- ❖ Under the **Level 17 gale**, historic buildings experienced severe destruction.
- ❖ Take the **225 historic buildings** in Kinmen's five townships. This study categorises the degrees of damage of these buildings into four levels.
- ❖ 107 buildings fall under damage levels **B through D, constituting 48% of all.**
- ❖ Damage degree D alone found **40 examples**

Number of Damaged Historic Buildings by Location

Level	Jincheng	Jinning	Jinsha	Jinhu	Lieyu	Subtotal
A (no damage)	46	5	39	21	7	118
B (light damage)	15	2	6	3	2	28
C (moderate damage)	14	4	15	4	2	39
D (severe damage)	10	3	17	5	5	40
Total	85	14	77	33	16	225

Destruction Resulting from Typhoon Meranti and Disaster Restoration

The types of destruction include

❖ **Loosened or fractured tiles:**

Red clay tiles will loosen up or break, causing rain water to enter the structure.

❖ **Roof collapse:**

A roof may collapse when it is hit by trees that are uprooted by the typhoon.

❖ **Disintegration of walls:**

Brick and clay walls are likely to disintegrate when exposed to strong winds.



Loosened roof tiles caused by windstorm



Fallen banyan crashed the roof



Disintegration of wall

Destruction Resulting from Typhoon Meranti and Disaster Restoration

The types of destruction include

- ❖ **Deterioration of plaster walls:** The strong wind of Typhoon Meranti caused the surface of many buildings to peel, exposing the internal structure to rain.
- ❖ **Damage to decorative and architectural elements**
- ❖ **Doors, windows, and lighting fixtures.**
- ❖ **Environmental damage:** This includes damage to the surroundings of historical buildings, for instance if a giant banyan tree next to a historic building were to collapse.



Deterioration of plaster walls



Fragments of a crumbled parapet



Destruction Resulting from Typhoon Meranti and Disaster Restoration

Disaster Restoration

The Kinmen Cultural Affairs Bureau undertook the following three phases of damage review:

❖ **Phase I:** Preliminary Review, quick review in three days.



Collapsed roof



Collapsed roof



Destruction Resulting from Typhoon Meranti and Disaster Restoration

Disaster Restoration

- ❖ **Phase II:** Second Review, advanced damage evaluation of the 107 heritage structures classified as Levels B through D.
- ❖ **Phase III:** Repair or Conservation Plans.



Challenges of Disaster Prevention and Maintenance for Built Heritage on Kinmen Island

Lack of Disaster Prevention Awareness amongst the Public

- ❖ Most people failed to take preventative measures to avoid potential damage.
- ❖ Measures that could have been taken include reinforcement of weaker parts of the building, such as doors, windows, roofs, and other weak spots.



Challenges of Disaster Prevention and Maintenance for Built Heritage on Kinmen Island

Authority in Charge Lacked Disaster Management System

- ❖ The Cultural Affairs Bureau is yet to accumulate enough experience in disaster prevention.
- ❖ The Bureau was not conscious of the possibility of damage.



Challenges of Disaster Prevention and Maintenance for Built Heritage on Kinmen Island

Insufficient preparation of conservation funds

- ❖ The high technical difficulty and relative low profit margin of historic conservation presented low incentive for traditional architecture craftsmen to take part.
- ❖ Most would rather stay with the regular traditional house rebuilding projects.



Before Typhoon Meranti



After Typhoon Meranti

Challenges of Disaster Prevention and Maintenance for Built Heritage on Kinmen Island

The Frequency of Natural Disasters

- ❖ The absence of natural barriers and the rising of sea levels present challenges of ever-greater stringency.
- ❖ The growing frequency and intensity of typhoons are expected to become a common issue.



Before Typhoon Meranti



After Typhoon Meranti

Challenges of Disaster Prevention and Maintenance for Built Heritage on Kinmen Island

Growing Number of Designated Built Heritage

- ❖ Kinmen has also faced the pressure of development.
- ❖ The number of architectural heritage has increased rapidly in recent years.
- ❖ Conservation resources have been insufficient.



Conclusion

- ❖ Many damaged heritage buildings remain unrepaired today.
- ❖ This accentuates the issues:
 1. Inadequate education about disaster prevention for architectural heritage
 2. Predicaments in heritage risk preparedness, disaster prevention, and post-disaster recovery
 3. Restoration under limited resources of the island



Wise use of heritage

- ❖ Risk analysis and mitigation ensure best use of valuable resources.
- ❖ Risk analyses and preparedness need to be conducted.
- ❖ Four phases of work: **prevention, response, rescue, and recovery.**
- ❖ It is essential for setting the correct direction for the future of cultural heritage protection and sustainable development.





Thank You !