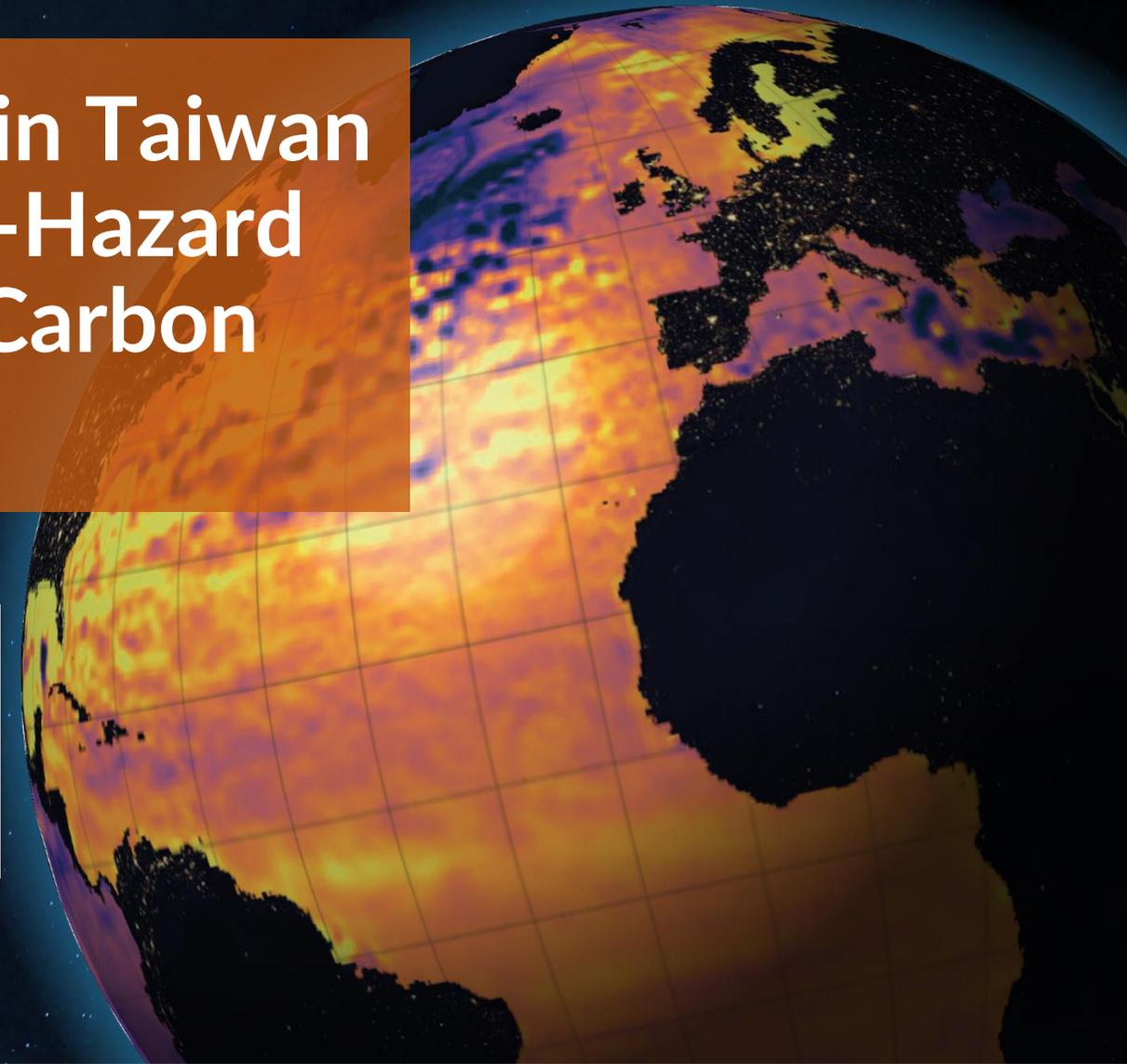


Enhancing Coastal Resilience in Taiwan through Satellite-Based Multi-Hazard Prediction Systems and Blue Carbon Integration

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Department of Environmental Engineering,
Chung Yuan Christian University, **Taiwan**



Introduction



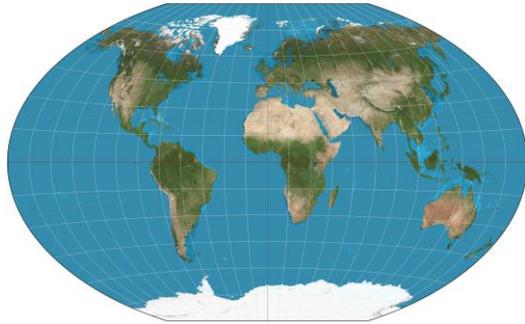
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Coastal Population



± 356,000 kilometers (km)



3 billion people
(2007)



6 billion people
(2025)

Low Elevation Coastal Zones



(2010) 200 million people
worldwide
live in less than 5 meters above
sea level



(2100) 400-500 million people
worldwide
live in less than 5 meters above
sea level

Regional Distribution



Up to 50% of
population

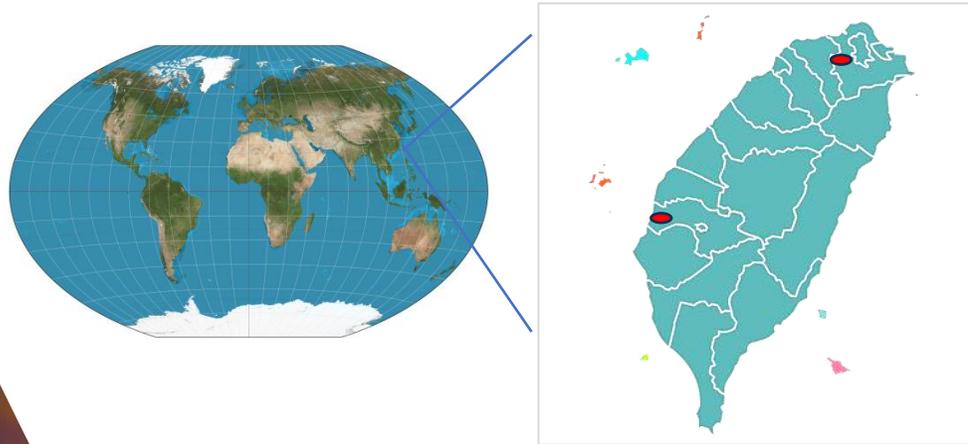


The population
density reaches
500 - 1,000
people/km²

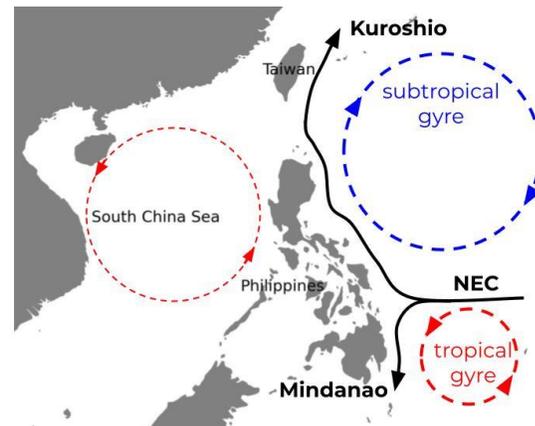
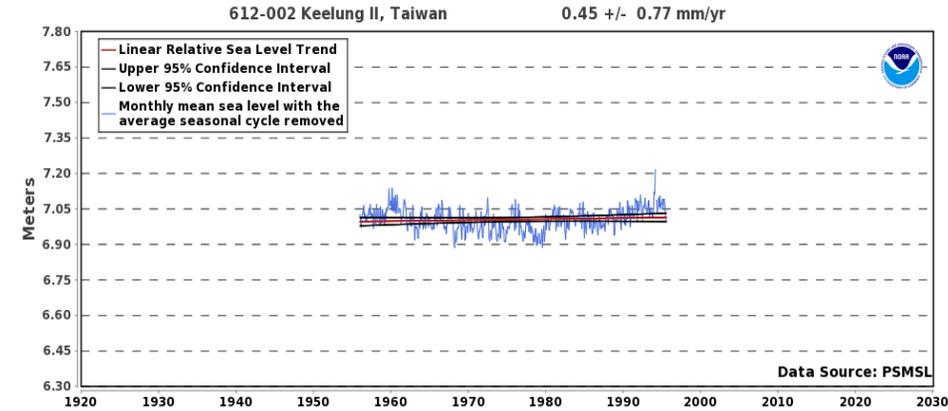


13 million people
would be
threatened by a
sea-level rise of 1
meter

Introduction(2)



± 1,700 km of coastline



Tropical and subtropical climate

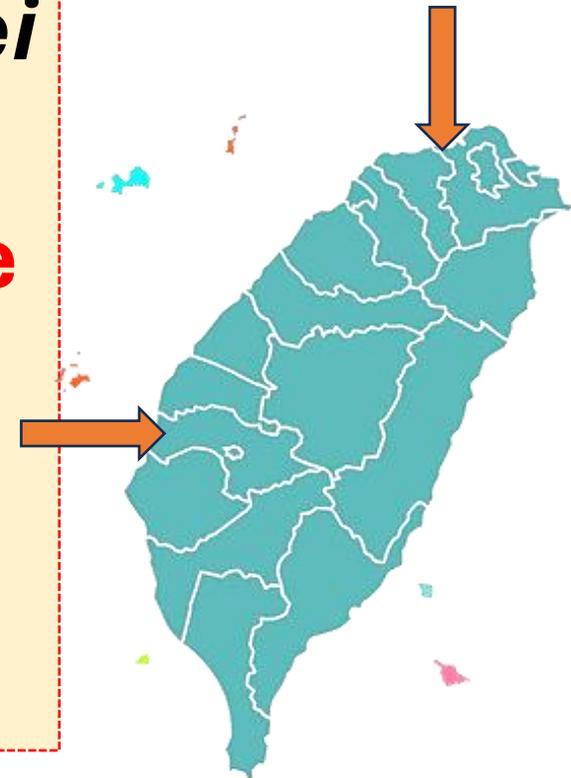


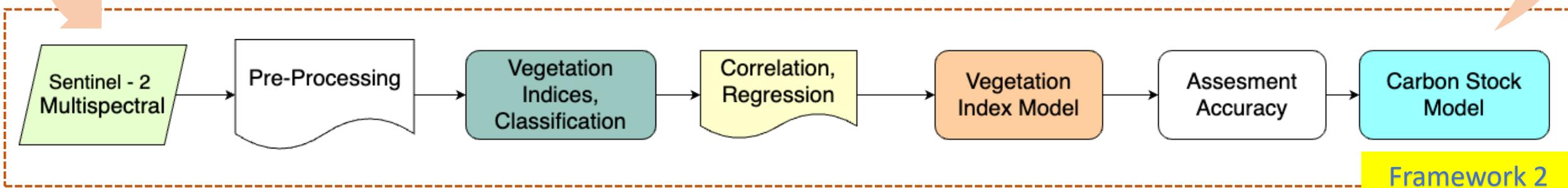
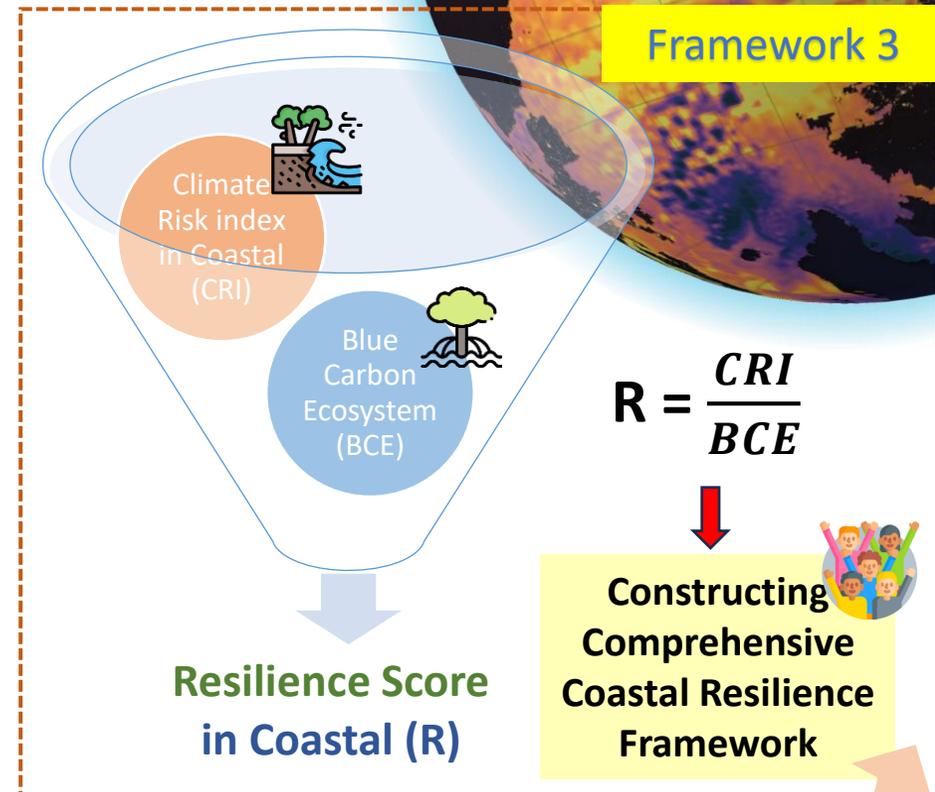
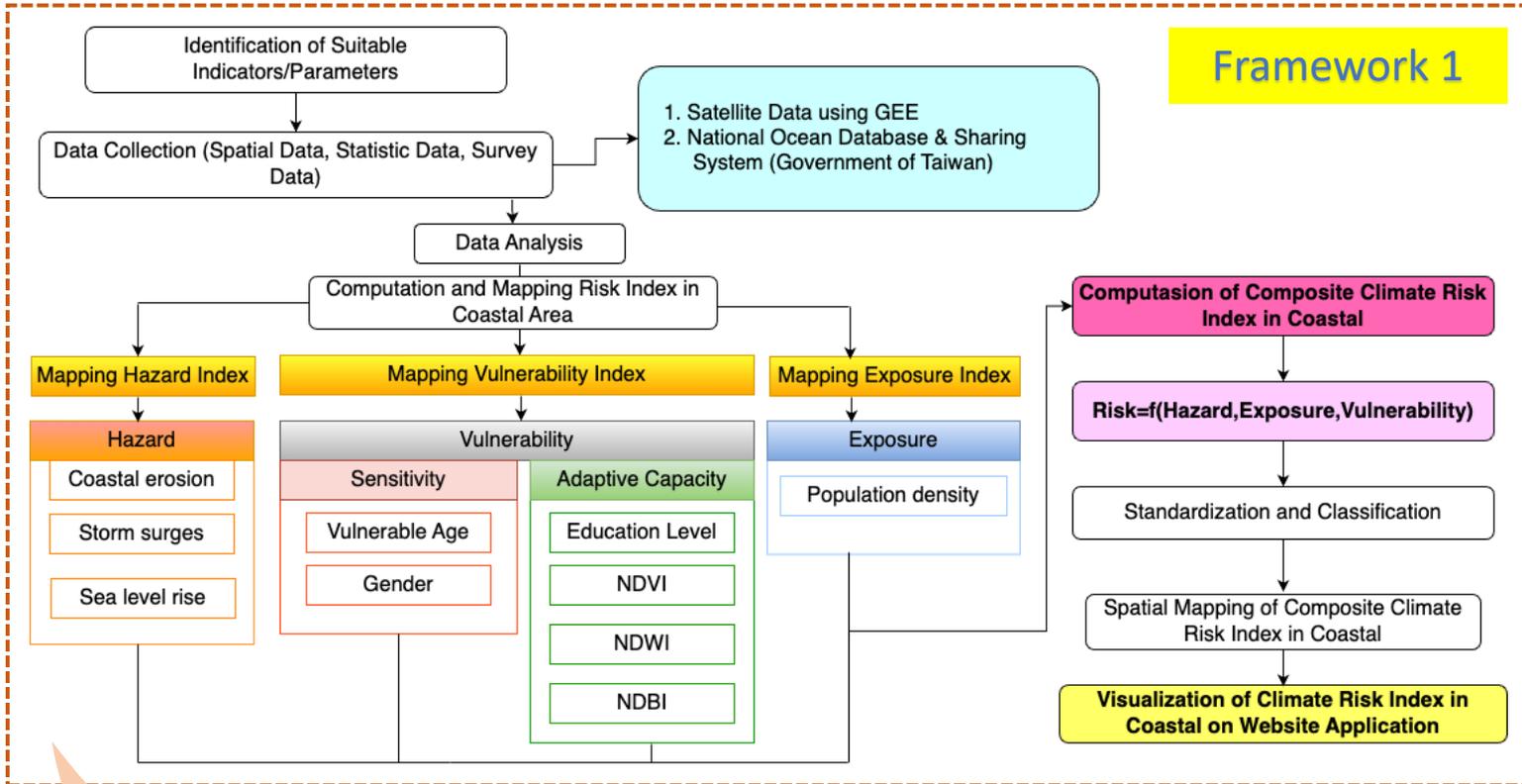
Frequent typhoons

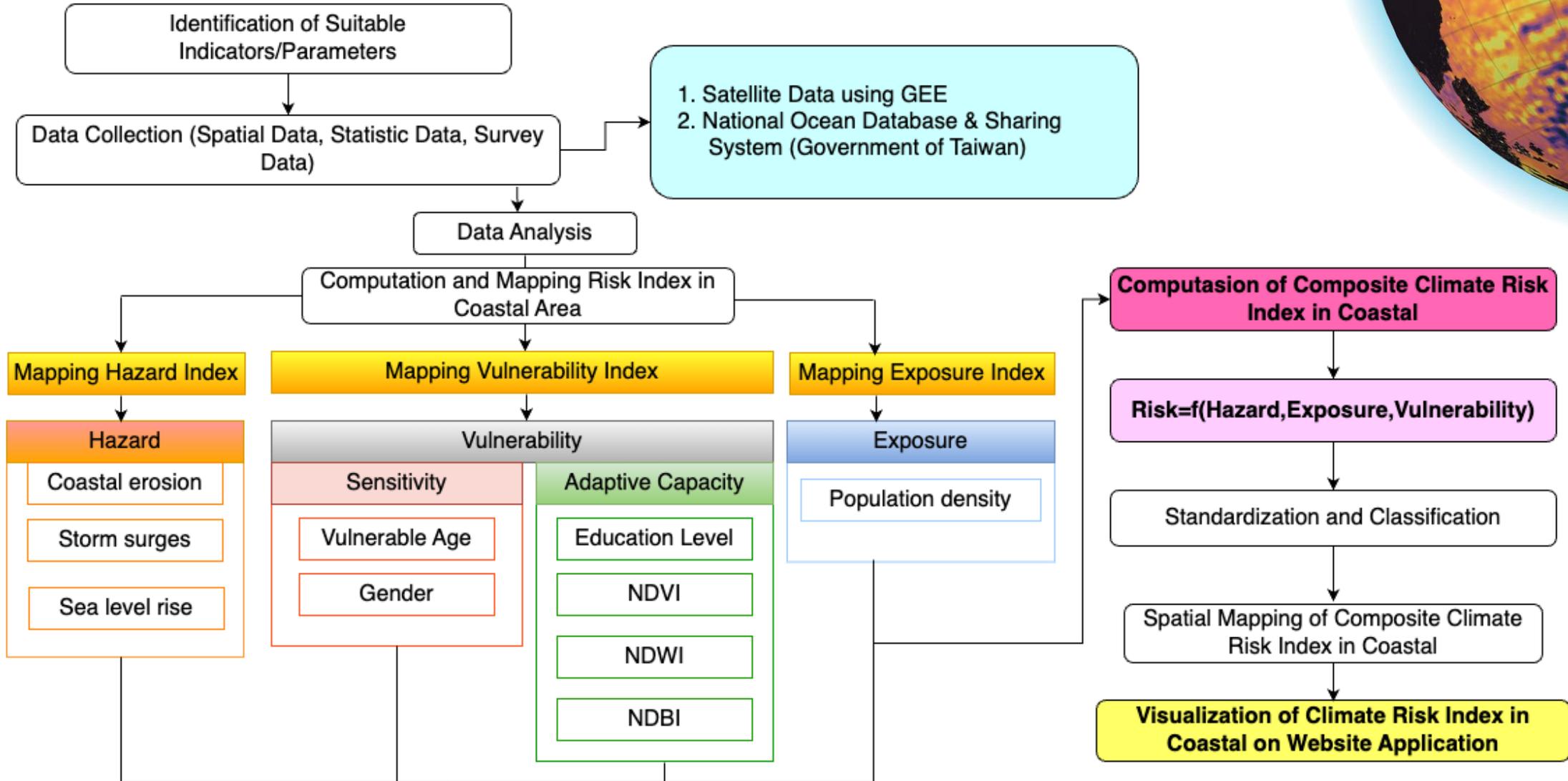
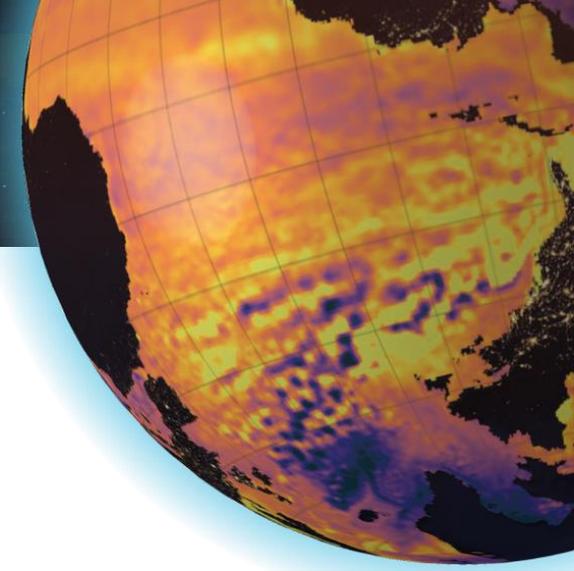


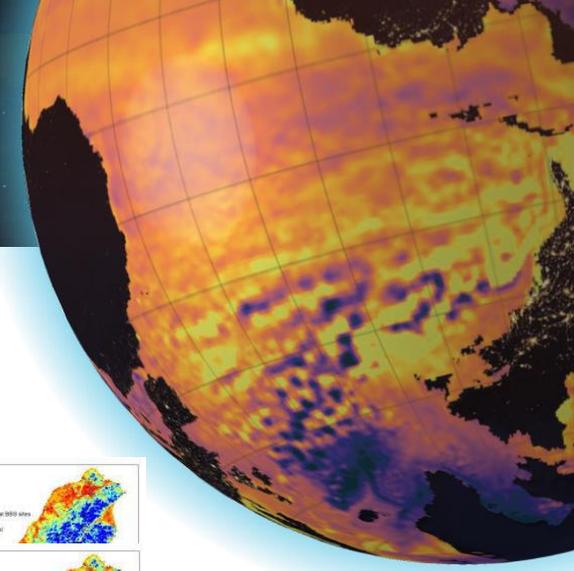
Complex coastal dynamics

1. Estimating the **Climate Risk Index** with multi-hazard in Coastal with the satellite-based in Taiwan (*Study Case in New Taipei City and Chiayi County*)
2. Estimating and Mapping the existing **blue carbon ecosystems**
3. Creating a comprehensive **coastal resilience framework**









Hazard

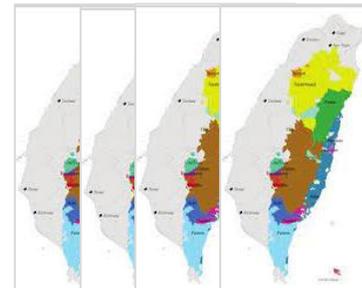
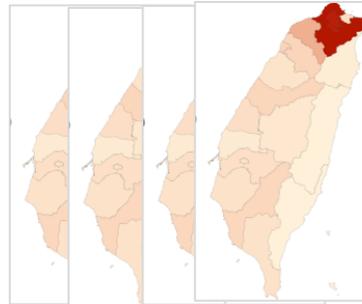
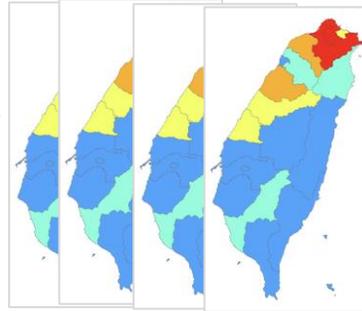
- Sea level rise
- Storm surges
- Coastal erosion

Exposure

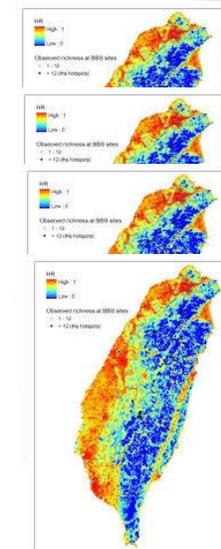
- Population Density

Vulnerability

- Vulnerable Age
- Education Level
- NDVI
- NDBI
- NDWI
- Gender

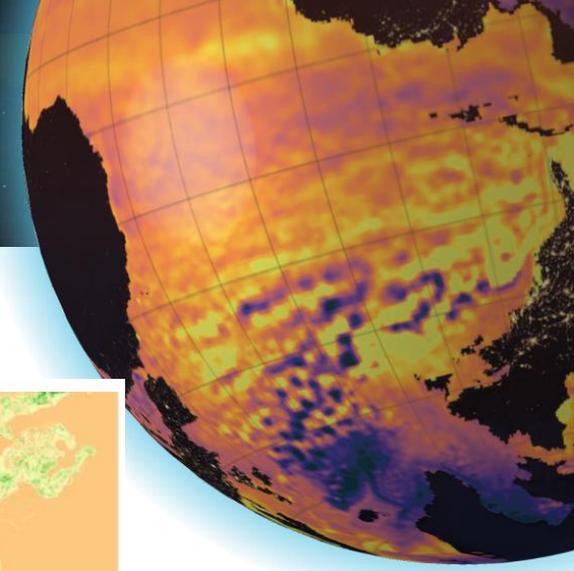


**Additive
Aggregation**

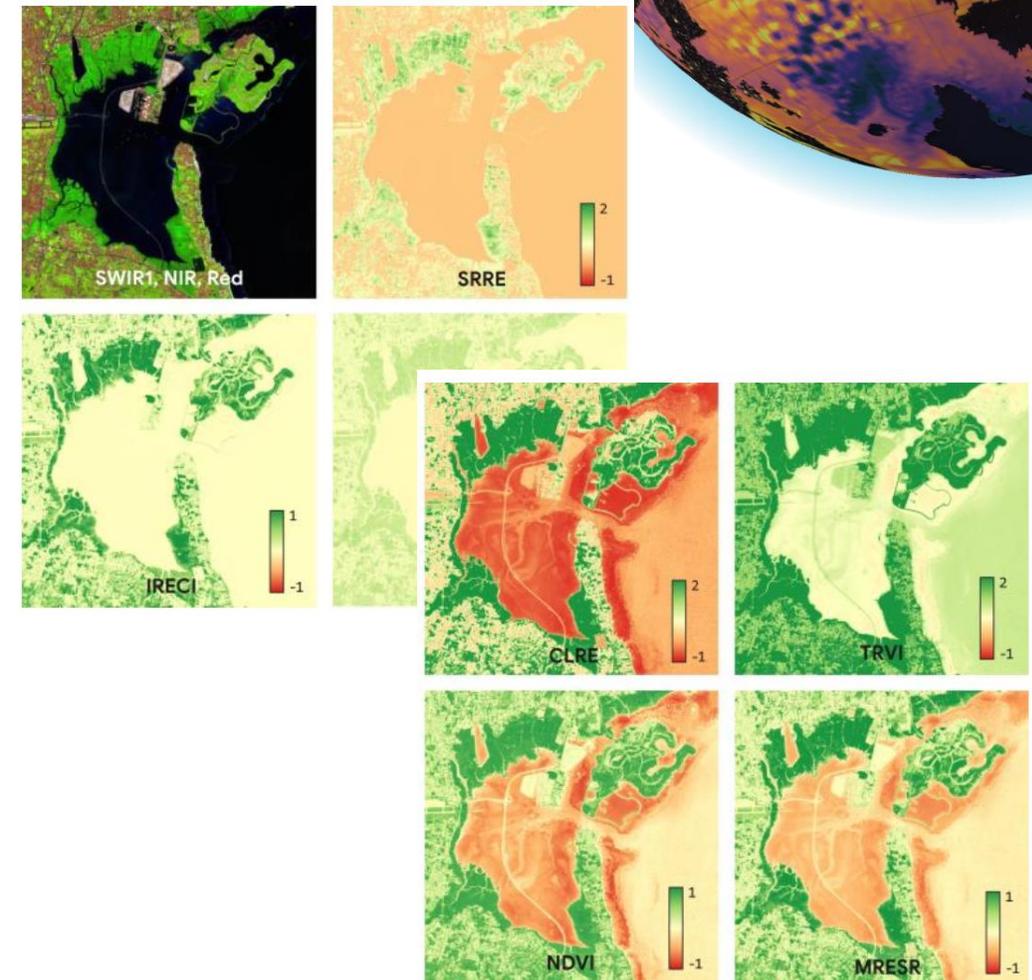
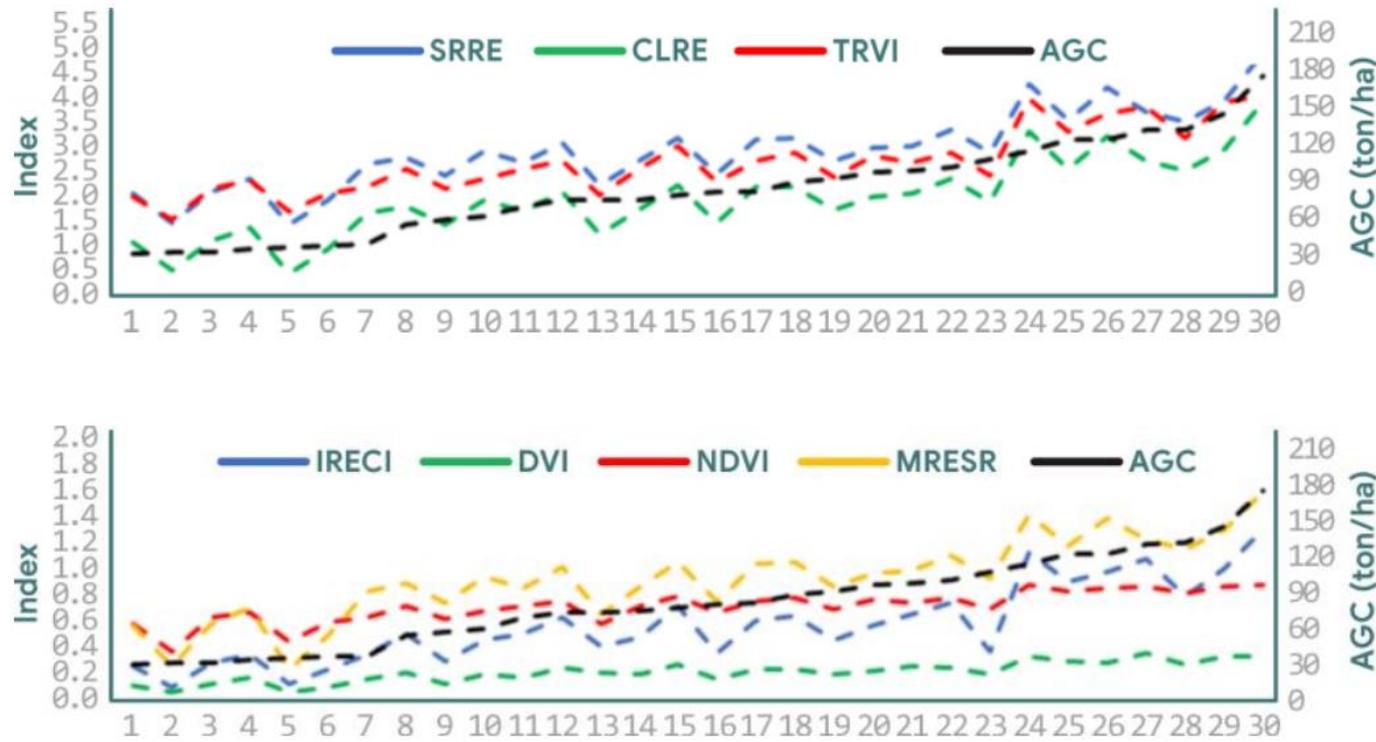


Climate Change Risk Index for Coastal

Calculate Multi-hazard index:
Composite index of Risk = Hazard +
Exposure + Vulnerability



Relationship of Observed AGC with Sentinel-2 Derived Vegetation Indices (Regression Correlation Method)



$$AGC(1) = 13.99 + 104.741 * IRECI + 3.025 * TVRI$$

Accuracy R = **0.95**

(Ananda P. S. et, al, 2023)

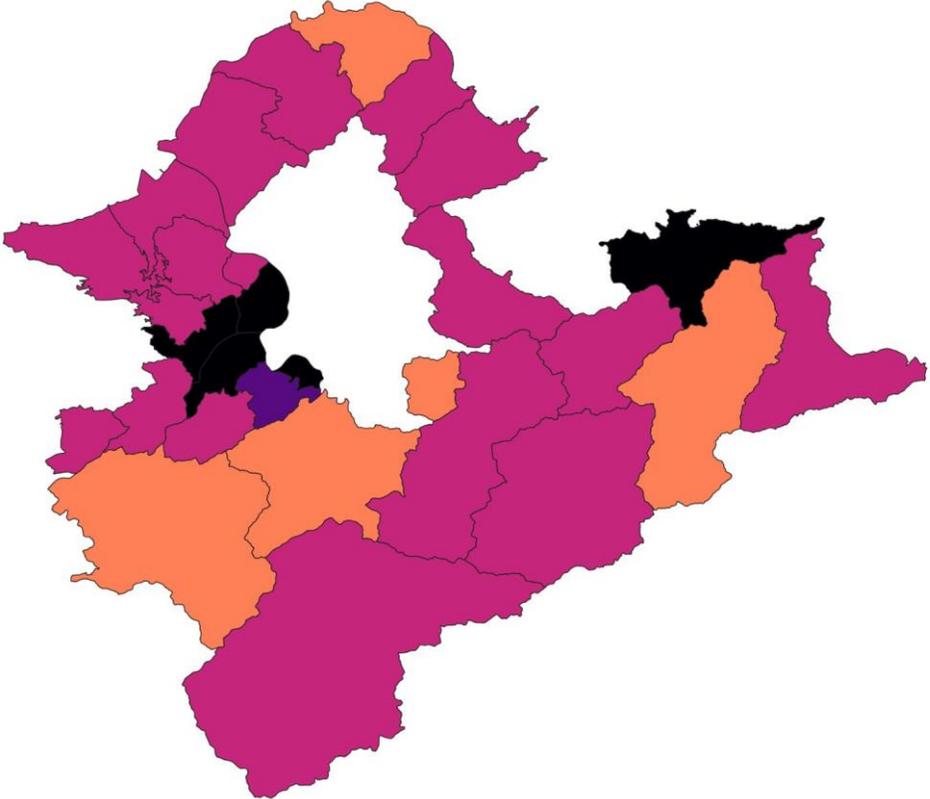
Results (1): Climate Risk Index



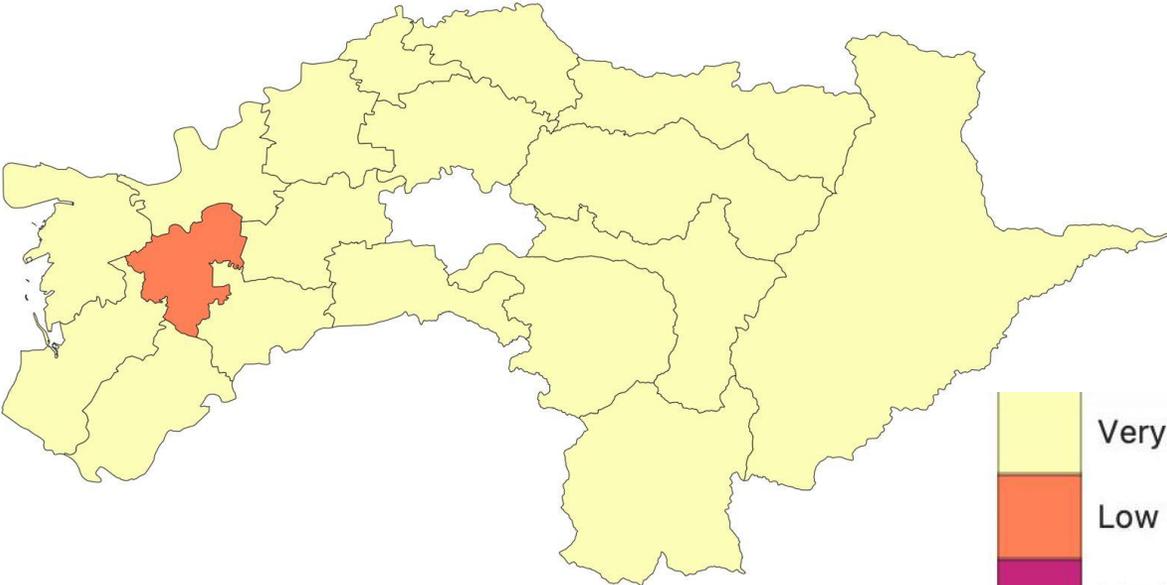
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New Taipei City



Chiayi County



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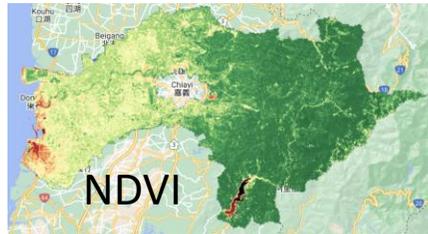
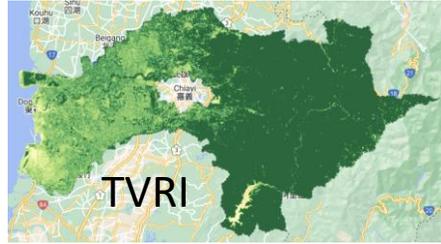


New Taipei City



Overall accuracy: 0.977

Land Cover Supervised Classification
Algorithm with Random Forest



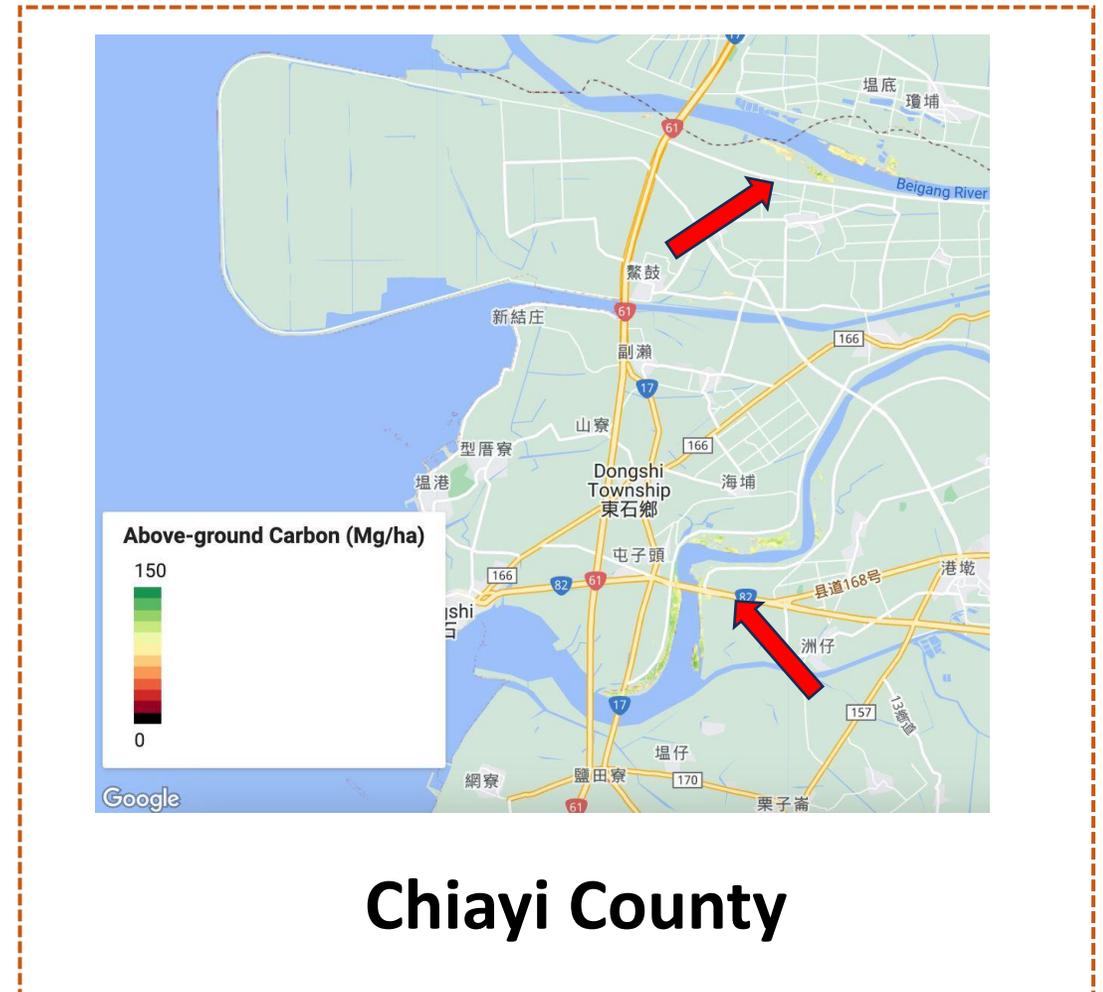
Chiayi County

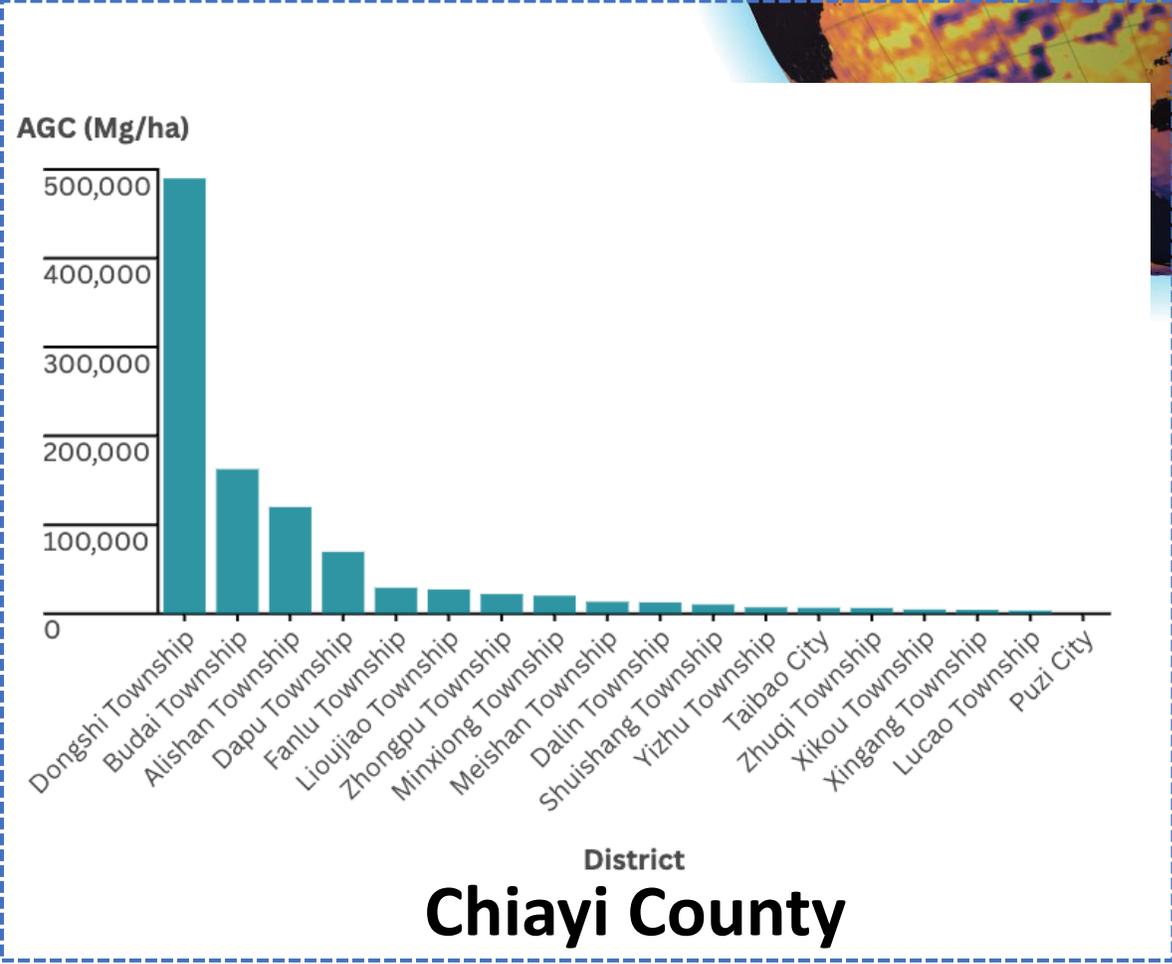
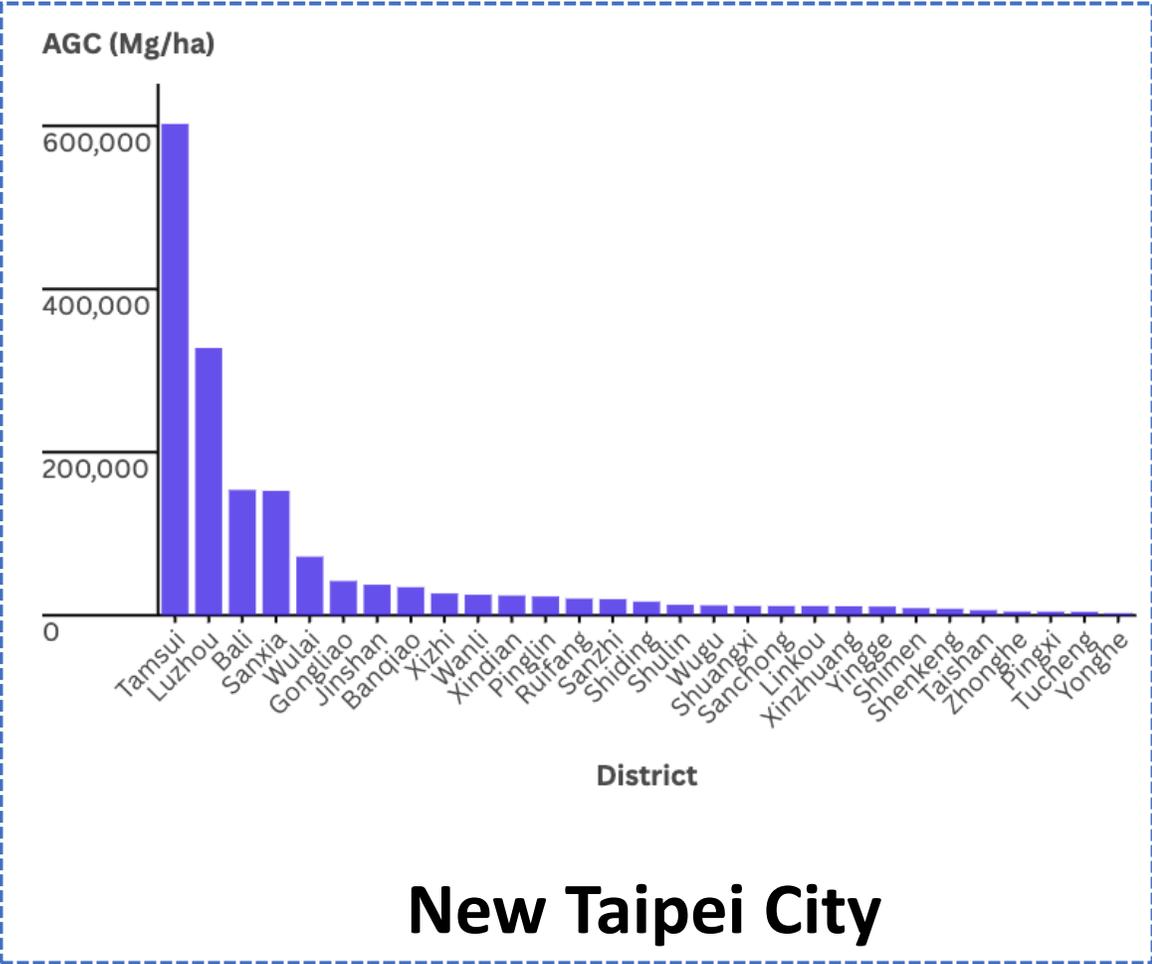
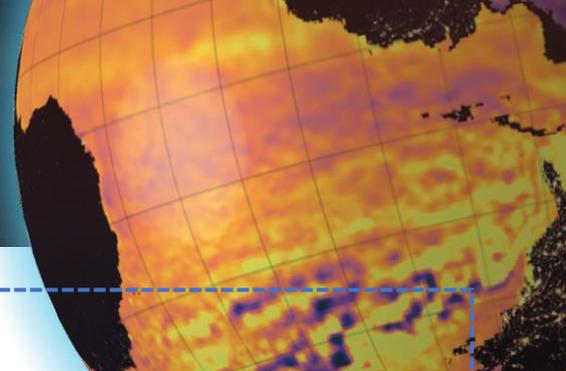


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Land Cover Supervised Classification
Algorithm with Random Forest

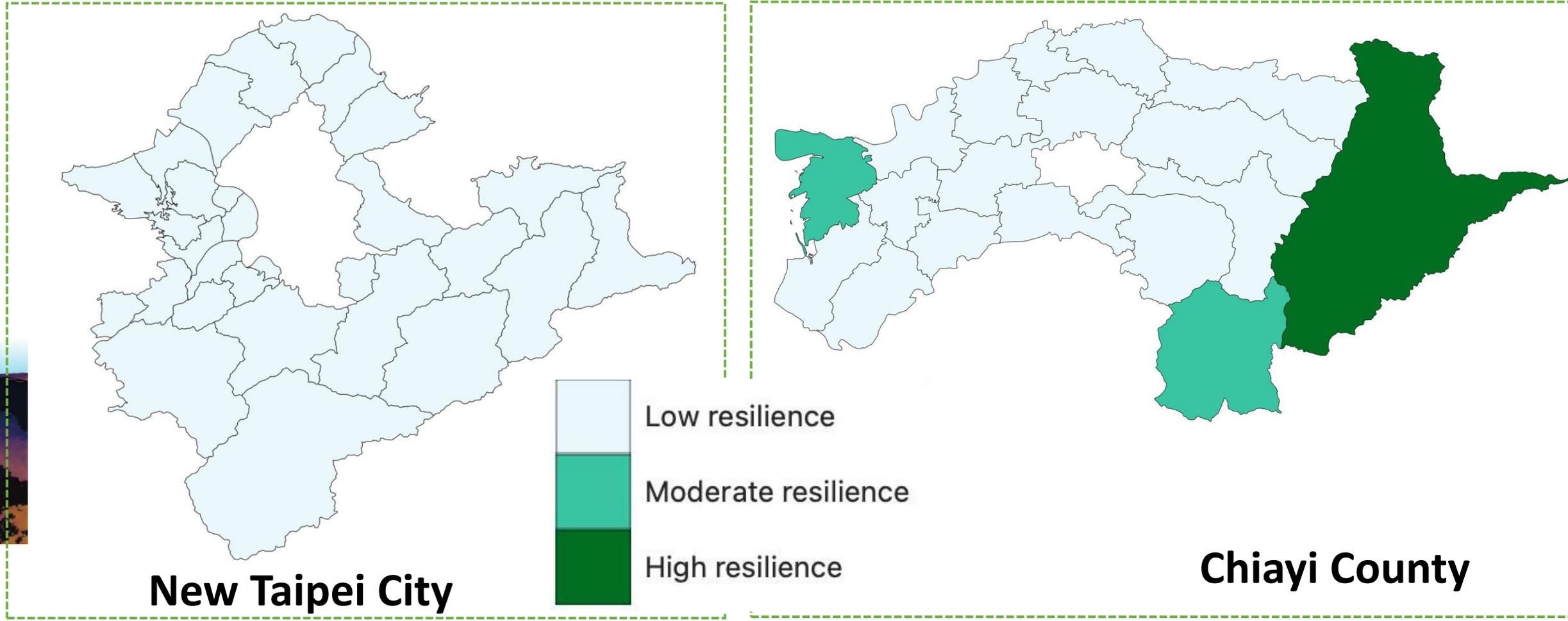
Result (4) Distribution of Above-ground Carbon (Mg/ha)





Above-ground Carbon in study area

Results (6): Resilience Score



Conclusion



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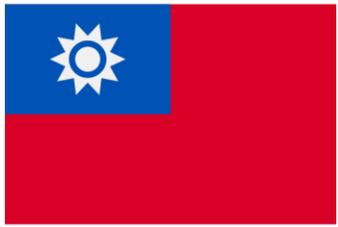
1. New Taipei City faces predominantly moderate to very high climate risks across its districts, while Chiayi County demonstrates remarkably lower risk levels with mostly very low risk zones.
2. Tamsui district in New Taipei City shows the highest Above-Ground Carbon storage (600,000 Mg/ha), significantly exceeding Dongshi Township's peak value (500,000 Mg/ha) in Chiayi County.
3. Despite higher carbon storage, New Taipei City exhibits lower coastal resilience compared to Chiayi County, which demonstrates varied levels of moderate to high resilience in its coastal regions.



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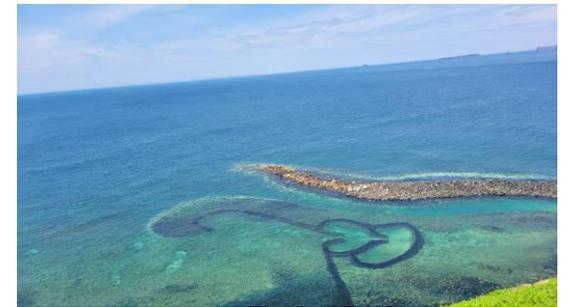
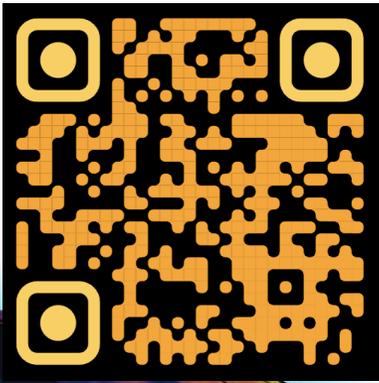


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SCIENCE FOR SOCIAL BENEFITS

Thank you!

