Data Analysis for Enhancing Infrastructure Integrity and Resilience

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Change Management with Data

Case Studies from Taiwan

Infrastructure Types	Data Sources	Use Cases
Water	Budget & Procurement	Situation Screening
Electricity	Asset Operation	Quality Management
	Climate & Environment	Predictive Maintenance
	Social-economic Data	Resource Optimization

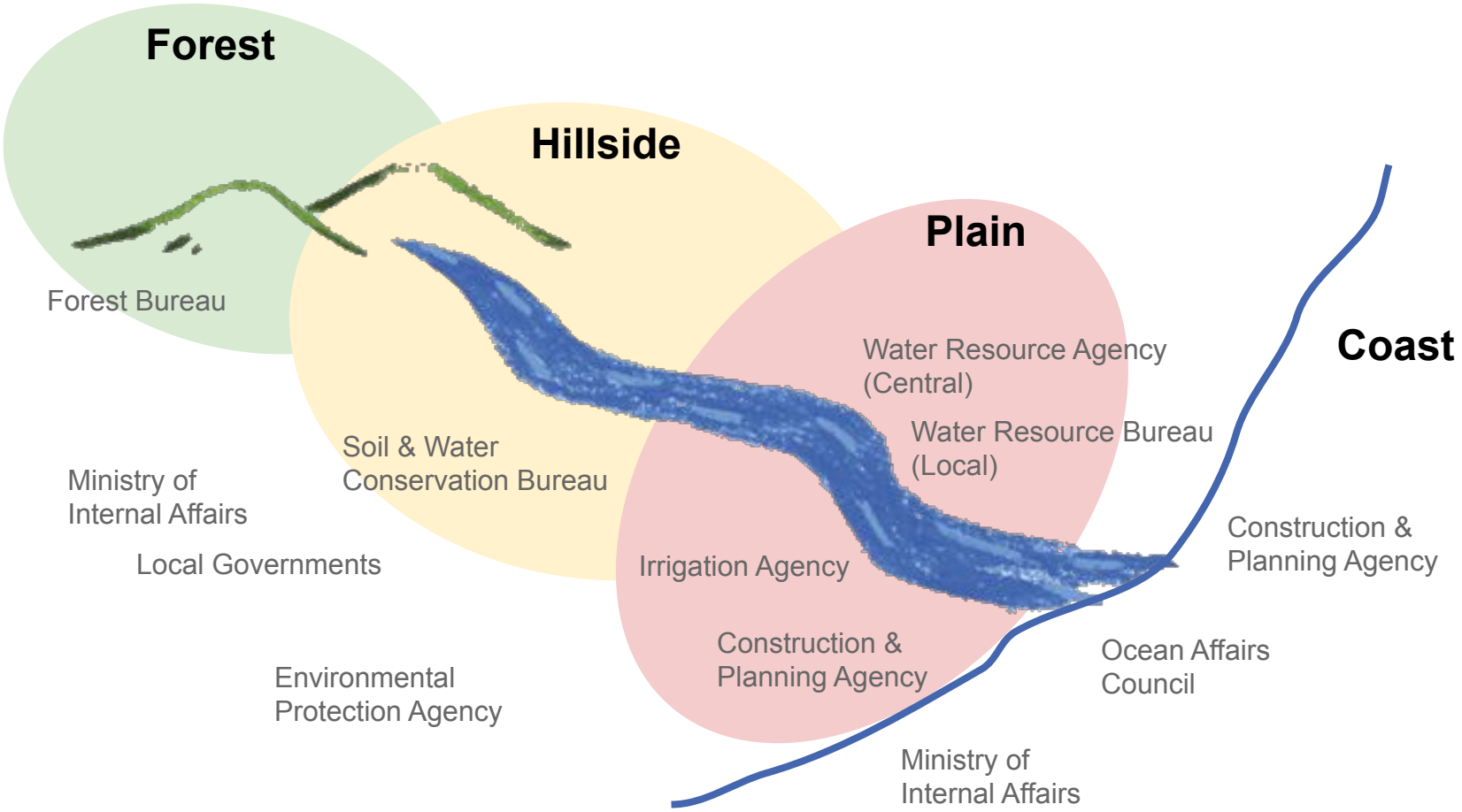
Fast Screening

Increasing flood risk over the years

https://udn.com/news/story/6656/3330687

https://www.youtube.com/watch?v=_LJz0lX9RtQ

Complex jurisdictions over water resource management



Water management projects, everywhere & every year

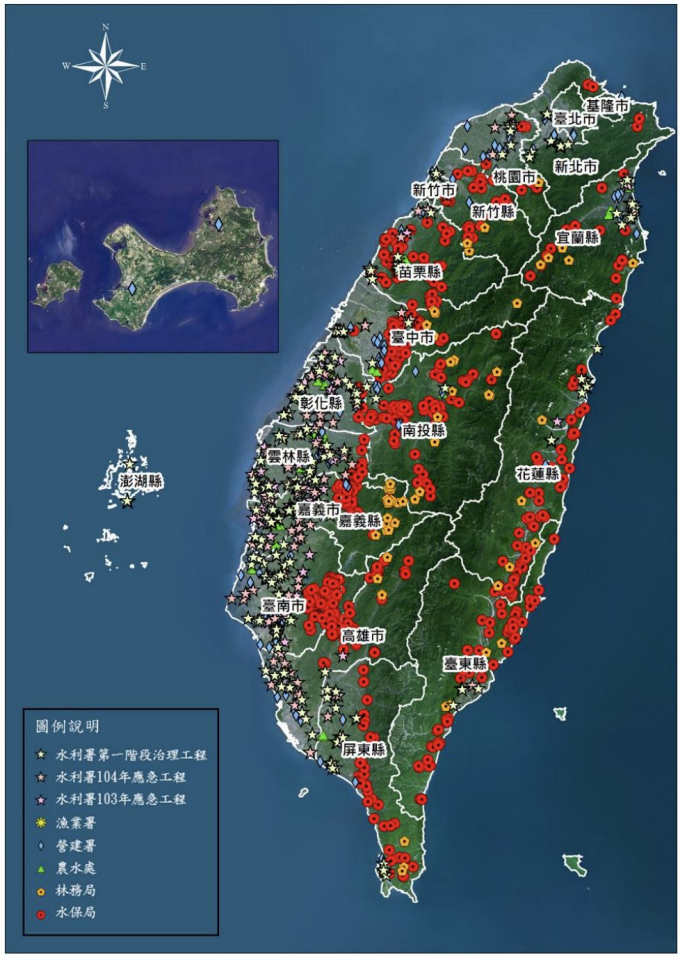
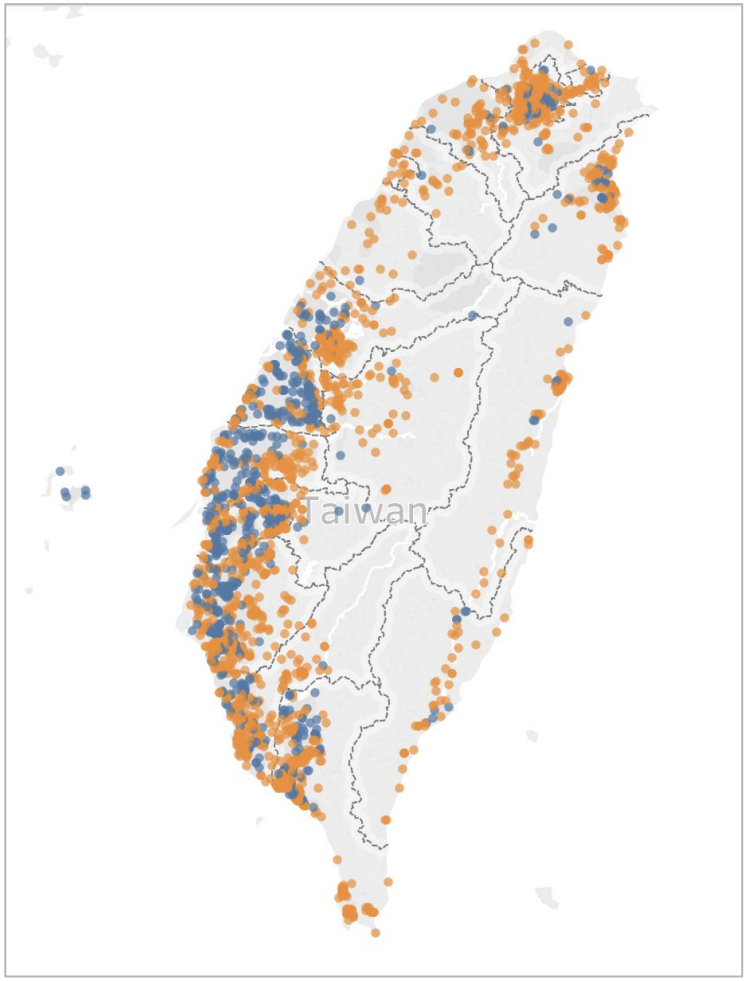


圖4-1　流綜計畫全臺各工程位置分布圖

(Project Locations)

- “NT$80bn in 8 years”
- “NT$60bn in 6 years”
- NT$250bn (US$8bn) earmarked for 2018-24

Flood locations by flood types (2004-2015)

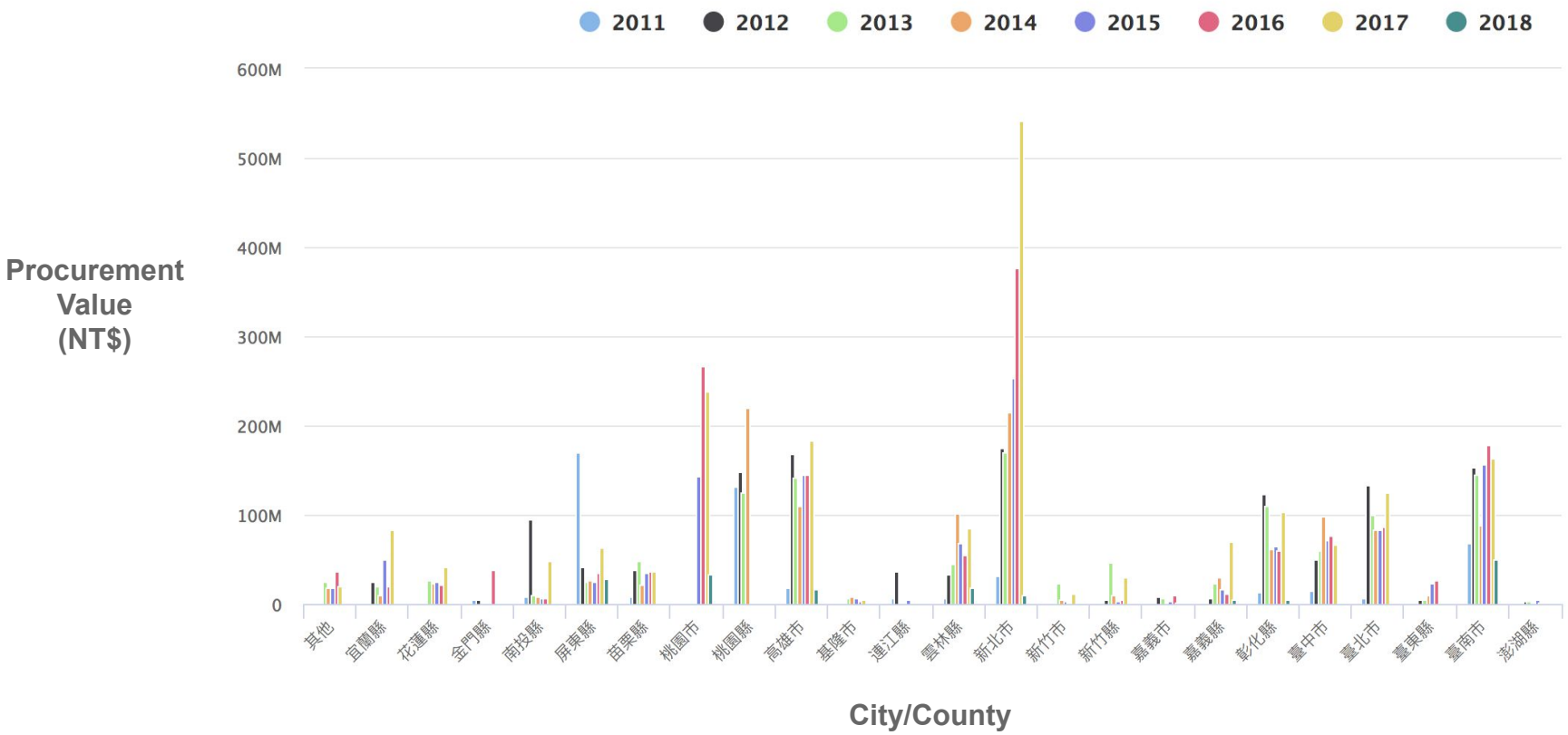


Flood Types

Inland Flooding (29%)

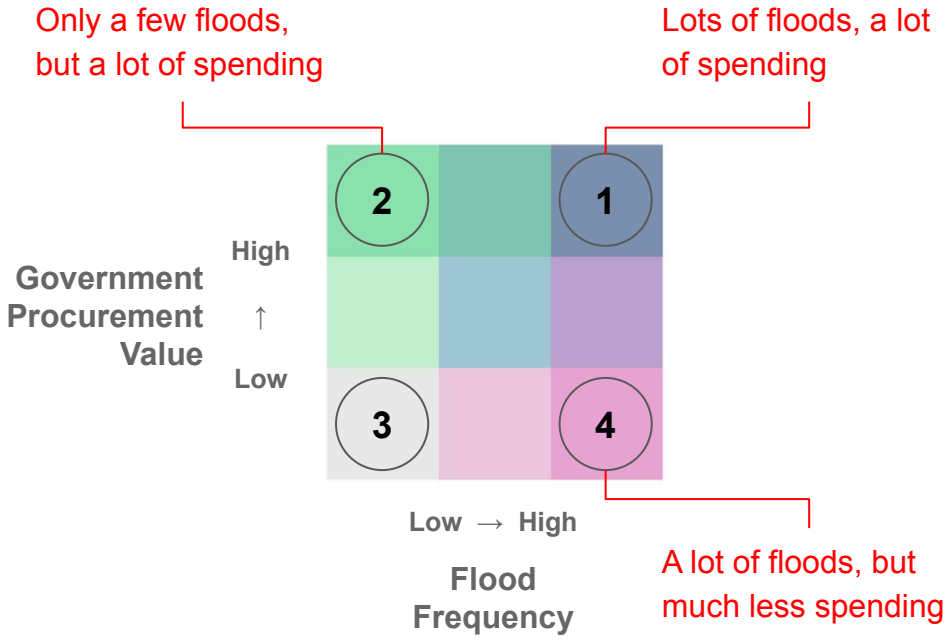
River/Coastal Flooding (71%)

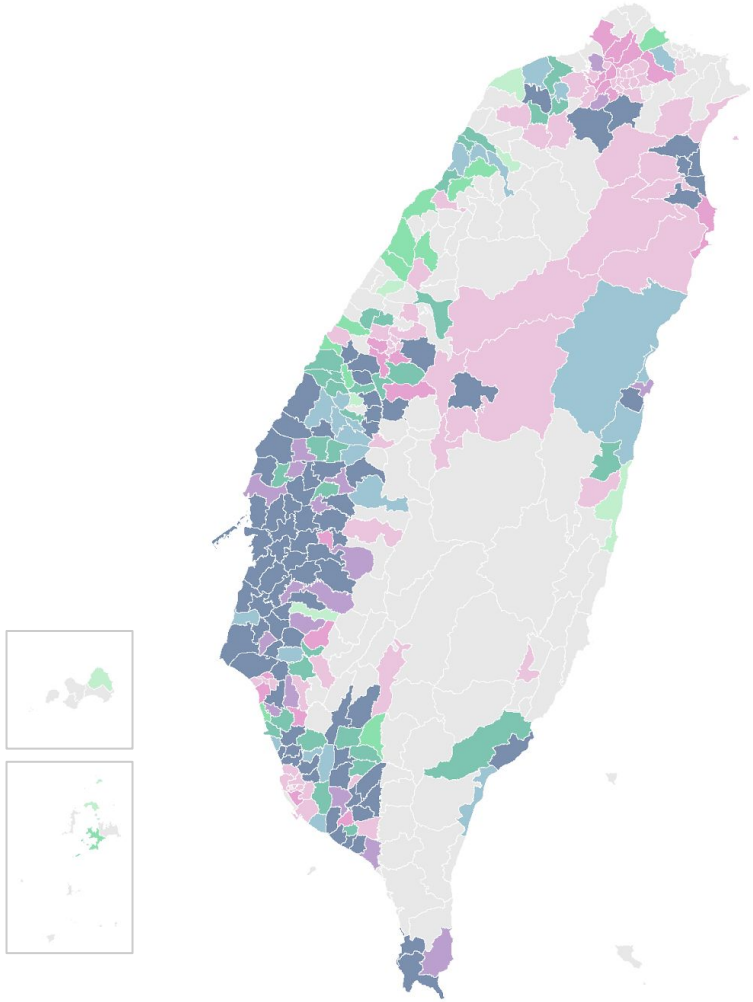
How much money has been spent, and where?



Do we get the priority right?

Flood Frequency vs. Government Procurement (2004-2015)





[Follow the water: Using open contracting data to evaluate the cost-effectiveness of flood management in Taiwan]

Predictive Maintenance

Tap water pipeline leakage at 18% per year

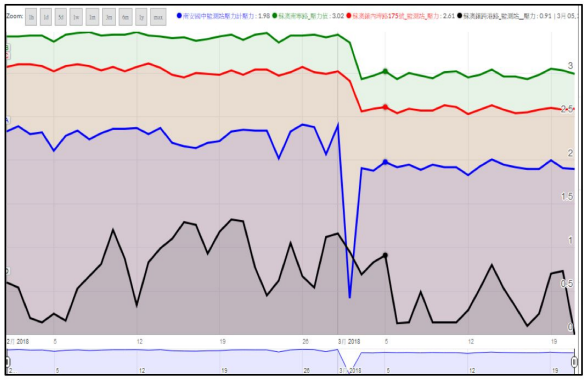
Pipeline Replacement Plan (2013-2023)

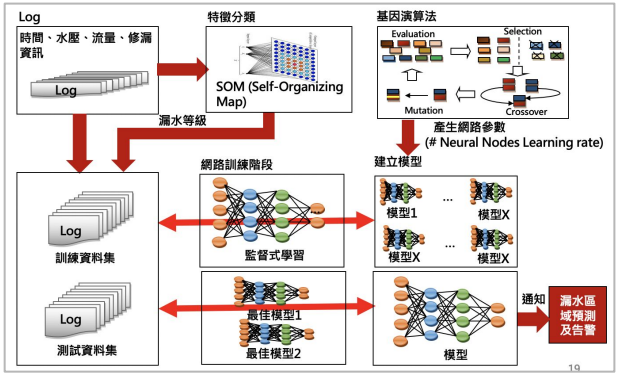
- Budget: US$2.1bn
- Target: <15% by 2023

[Tap water pipelines leak 3 and a half dams of water per year]

Use Machine Learning for Leakage Monitoring and Prediction

台灣自來水公司 TAIWAN WATER CORPORATION





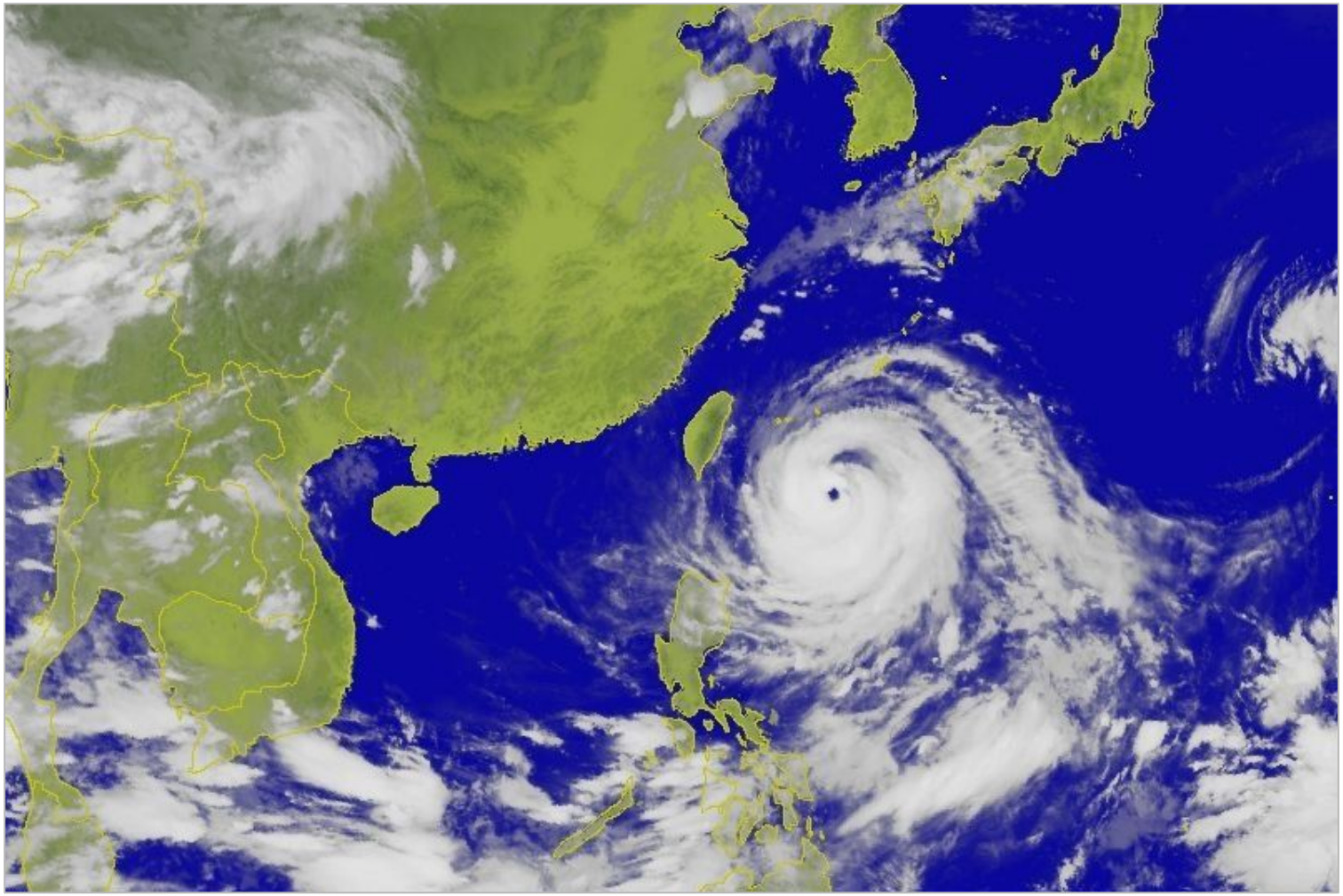
- Area reduction: 90km^2 → 1-2km^2
- Identification time reduction: 90%
- Detection time: 2 months → 1-2 days → 15 minutes

[President Tsai presents awards to innovation hackathon winners]

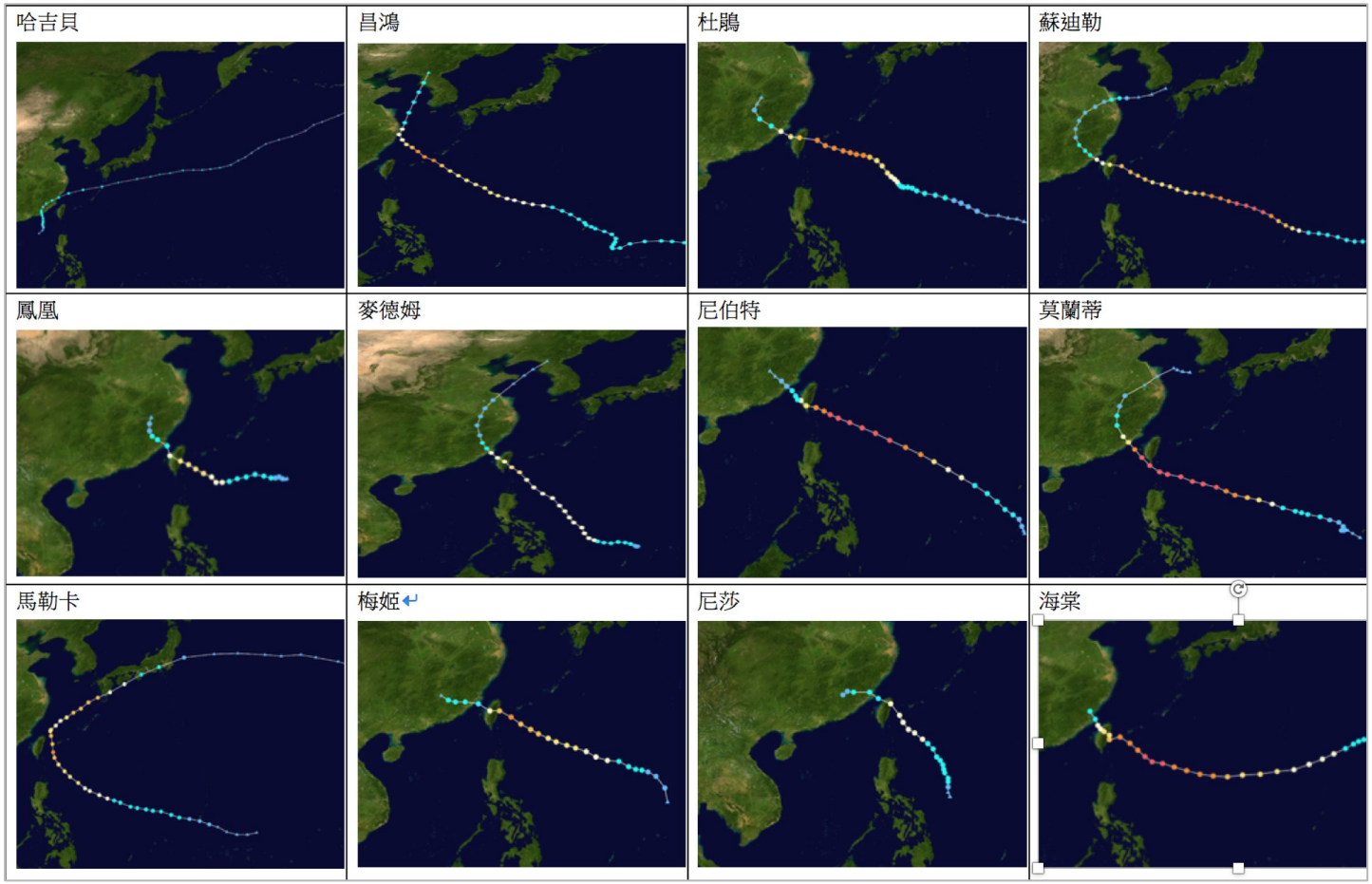
Presidential Hackathon (2019)

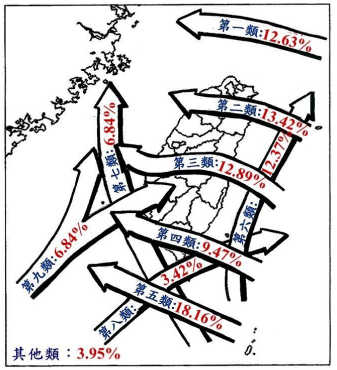
Optimization for
Field Inspection & Resource Planning

Typhoon Soudelor (2015)



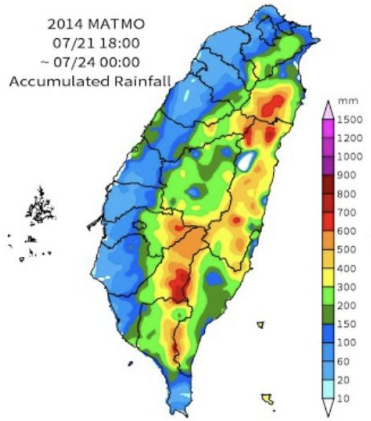
10 popular paths to Taiwan



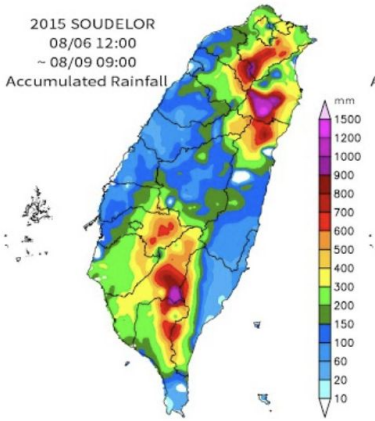


Common Typhoon Paths to Taiwan (1911-2018)

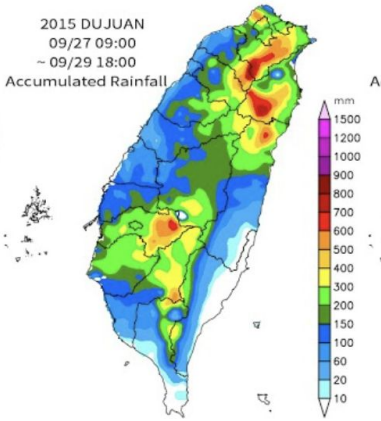
Rainfall brought by typhoons



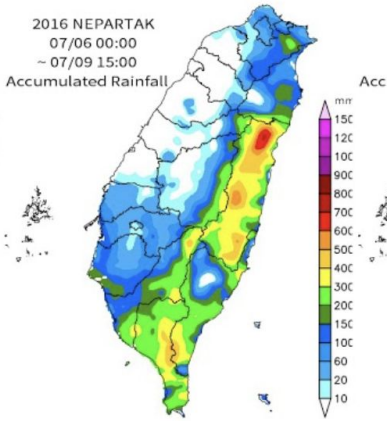
Matmo (2014)



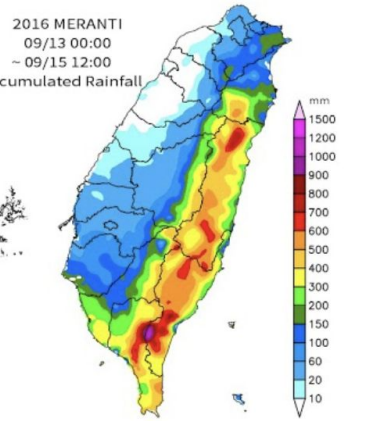
Soudelor (2015)



Dujuan (2015)



Nepartak (2016)

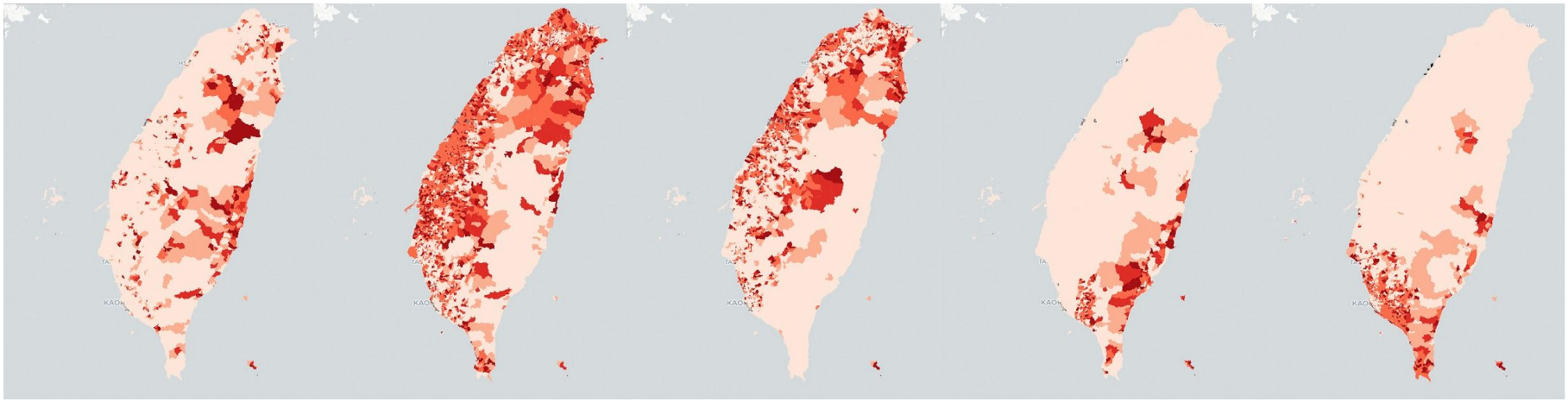


Meranti (2016)

Utility poles knocked down by wind

Typhoon Soudelor knocked down utility poles

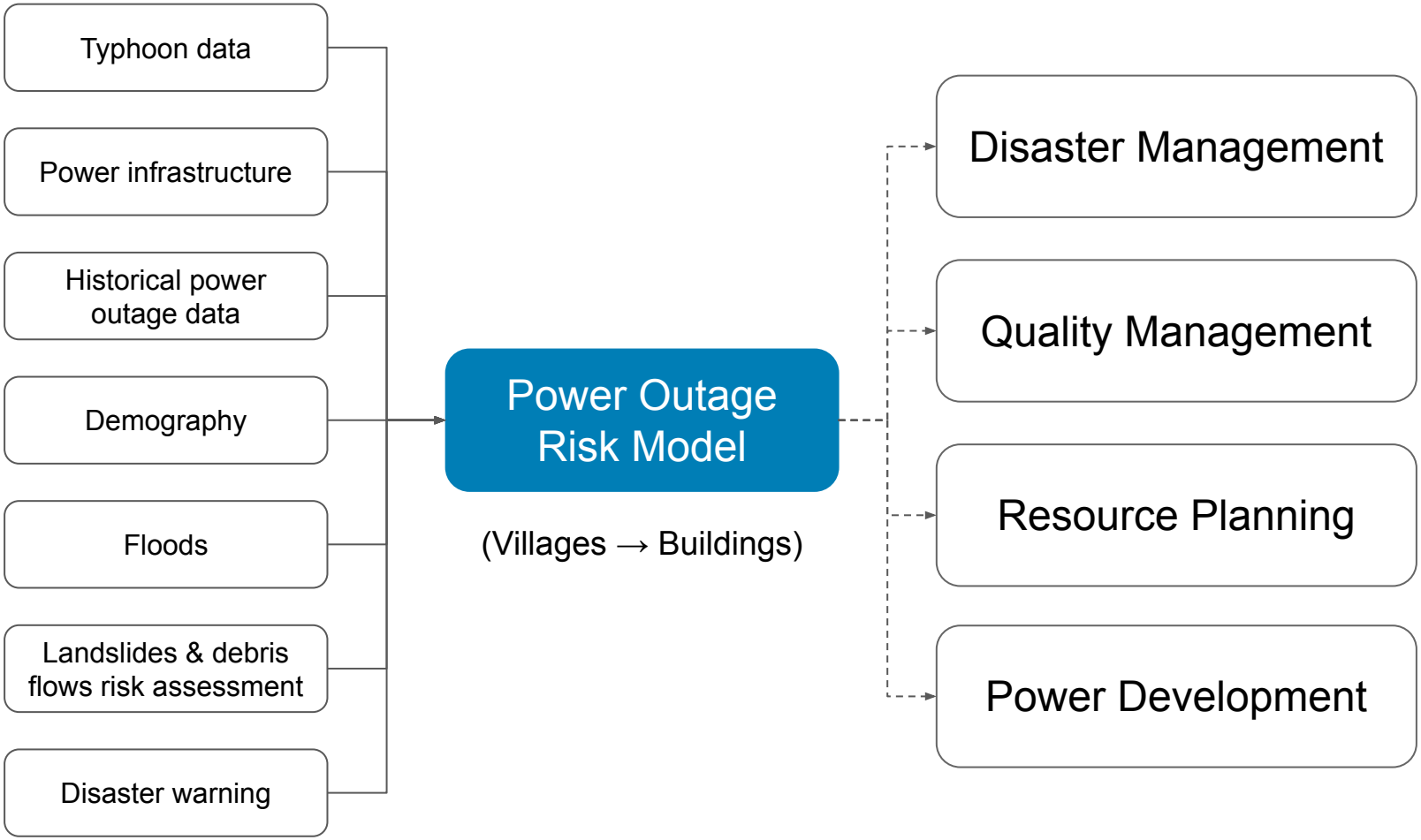
Families left without electricity



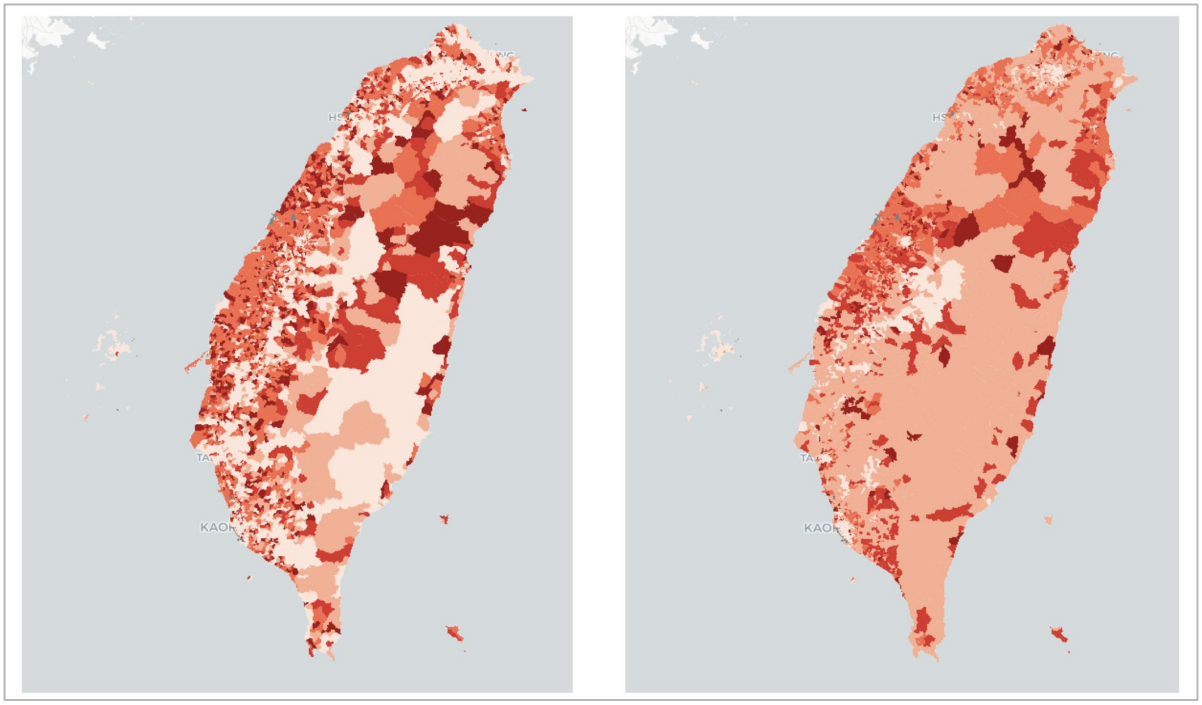
Matmo (2014) **Soudelor (2015)** **Dujuan (2015)** **Nepartak (2016)** **Meranti (2016)**

Source: Taiwan Power Company.

Applications of power outage risk prediction model



Typhoon Megi (2016)



Actual blackouts **Predicted blackouts**

Recap

Lessons Learned in Taiwan:
Data Analysis for Enhancing Infrastructure Integrity & Resilience

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