

Landslide Impact Assessment Under Climate Change

¹Hsin-Chi Li, ²Fang-Yi Chu, ³Ming-Lang Lin

推估資訊與調適知識平台計書

Taiwan Climate Change Projection Information and Adaptation Knowledge Platform

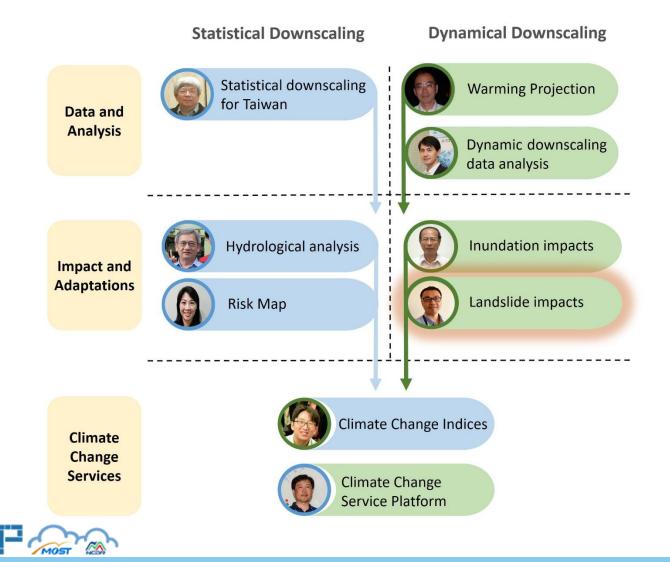
^{1,2}National Science and Technology Center for Disaster Reduction, New Taipei City, Taiwan,

³ National Taiwan University

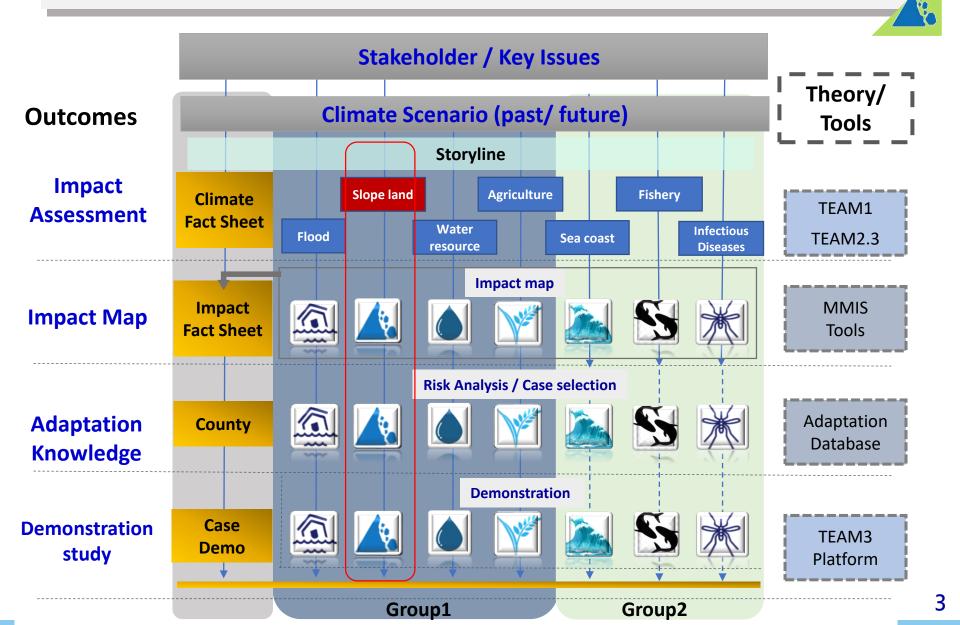


TCCIP Research Road Map

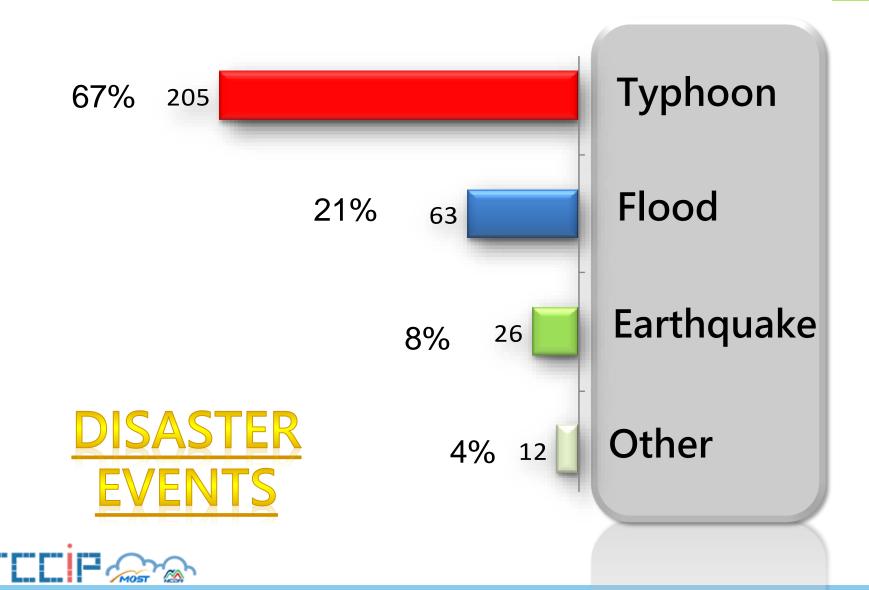
TCCIP Oral Presentation outline



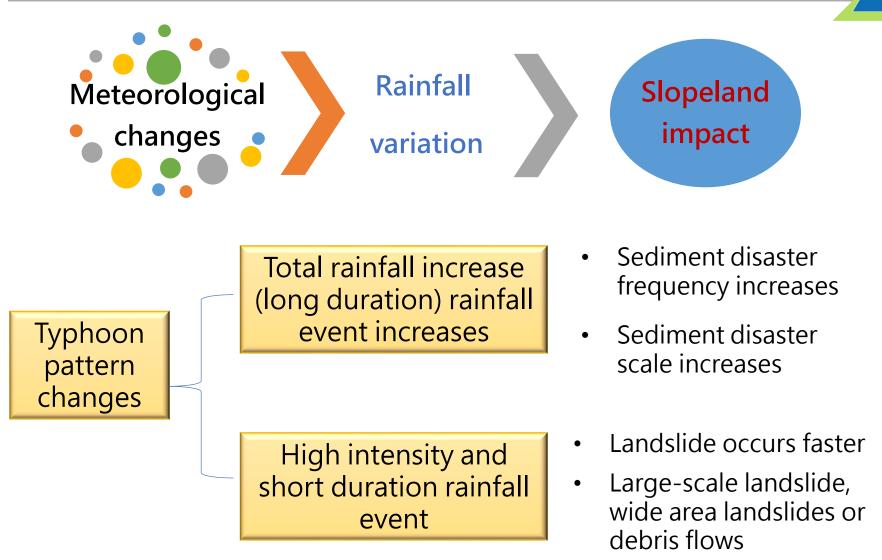
Research Fields of TEAM2



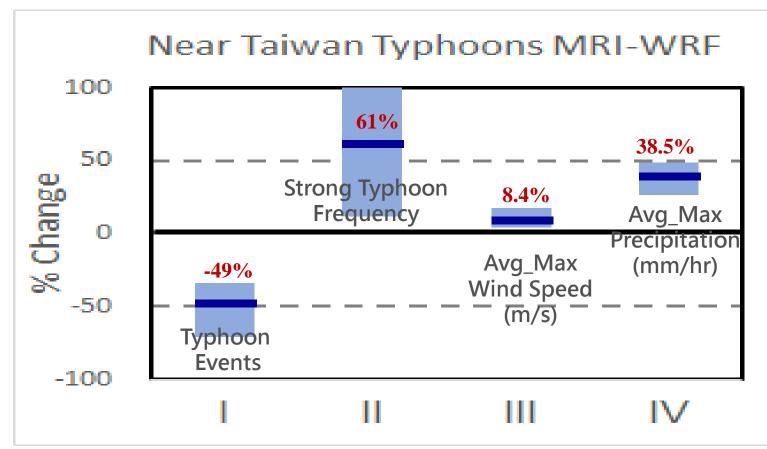
Taiwan Historical Disaster Events (1958-2015)



Probable impact of slopeland disaster by climate change



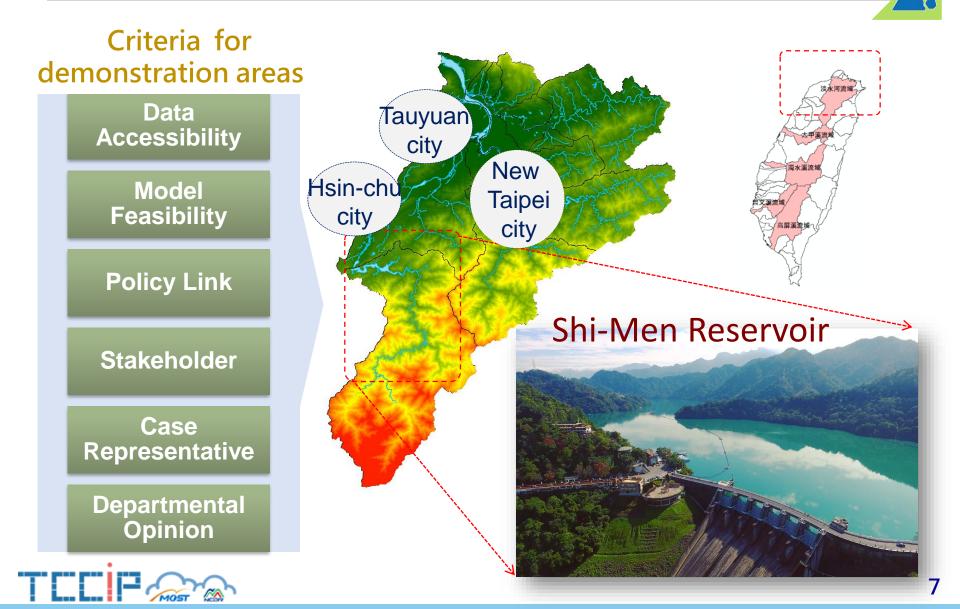
According to MRI-WRF projections



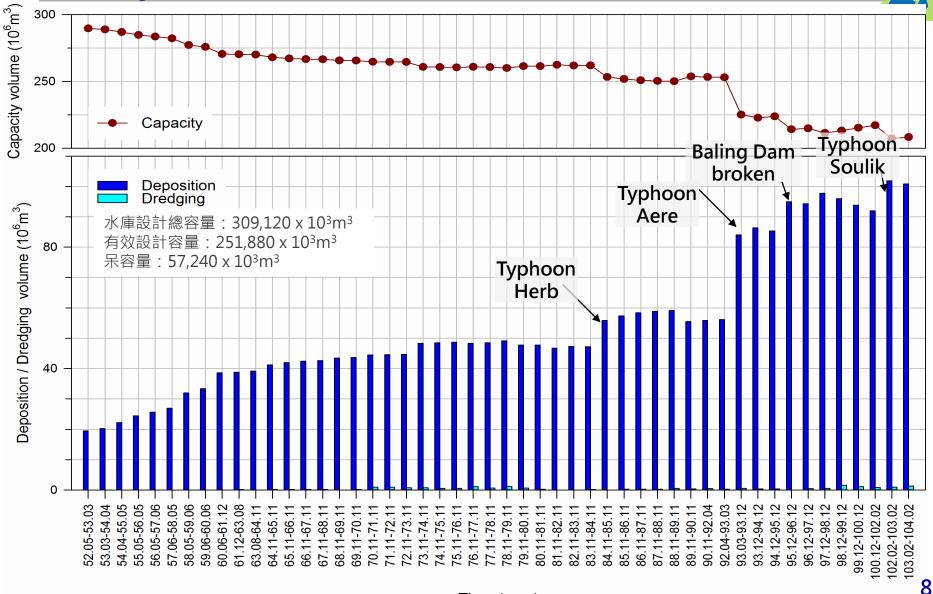
資料來源:臺灣氣候的過去與未來(2018)



Demonstration Area



Deposit volume of Shi-Man reservoir over the years (1963-2015)



Stakeholder Interview

- Soil and Water Conservation Bureau, council of Agriculture, Executive Yuan
- Department of Water Resource, Taoyaun City
- Slopeland disaster relevant experts







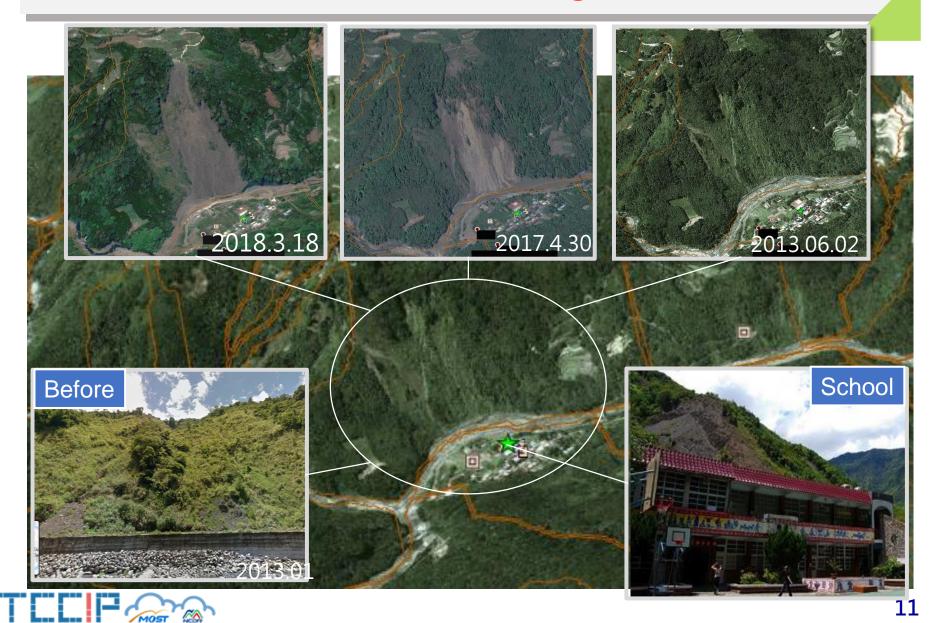


DEMO AREA- Xiuluan village



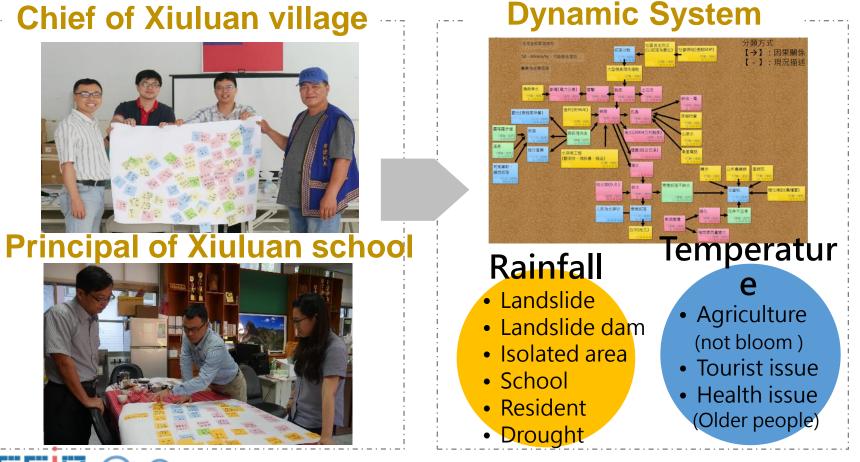


DEMO AREA- Xiuluan village



Stakeholder Interview

Participatory Processes : understand the real needs from the interview of stakeholders



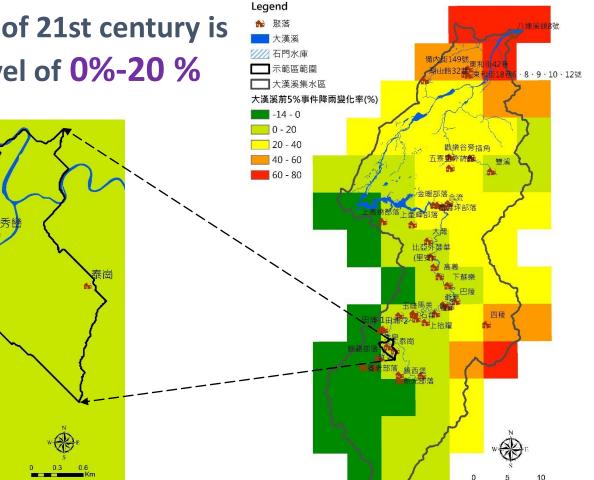
Evacuation Drill- Xiulaun Elementary School





Climate Scenario: MRI-WRF AR5 (RCP 8.5)

The average total rainfall of the 5% events at the end of 21st century is in the increase level of 0%-20 %





Legend

| -14 - 0 | 0 - 20 | 20 - 40 | 40 - 60

60 - 80

降雨變化率(%)

Rainfall change ratio of Top 5 % events

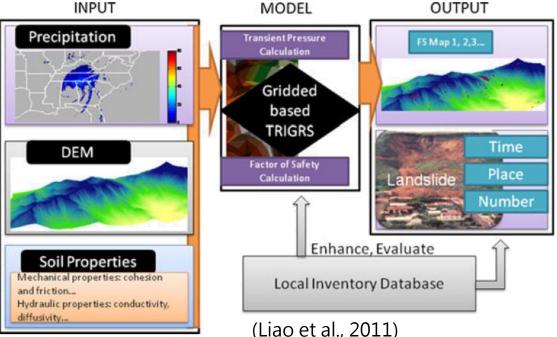
TRIGRS numerical model (Baum et al., 2008)

- Simulate water pressure variation by rainfall infiltration at different depth and the corresponding factor of safety
- Model composition:

Infiltration mode, inflow and outflow mode, slope stability mode

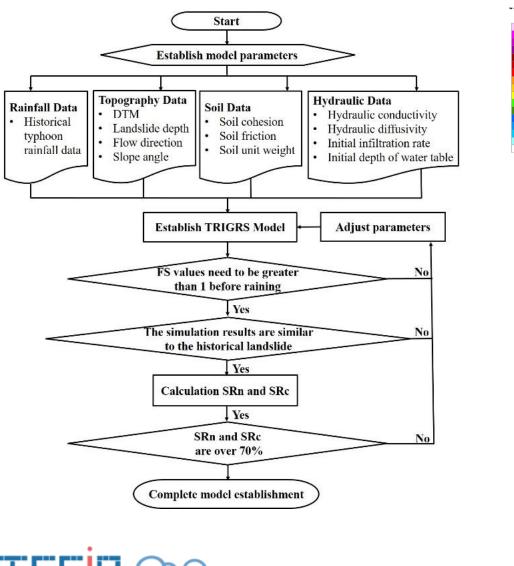
Restriction:

- Soil is saturated, homogenous, and isotropy
- Translational slides
- Shallow landslide

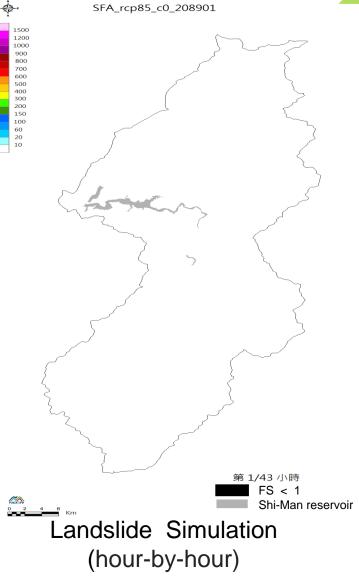




TRIGRS numerical model (Baum et al., 2008)

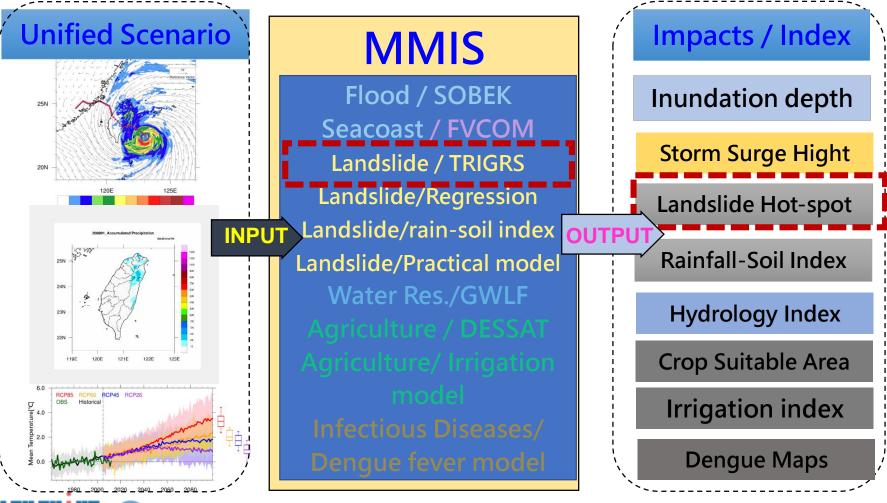


MOS



Impacts Assessment- MMIS TOOL

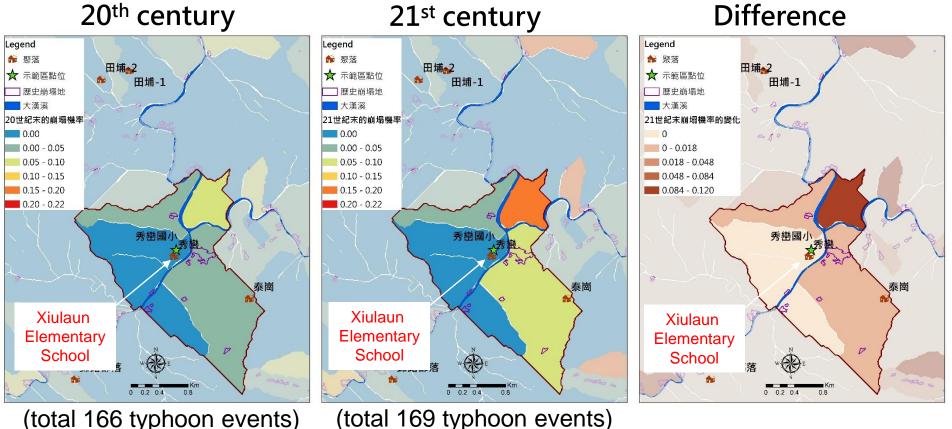
Multi-data Multi-model Integration System



MOS

Landslide incidence rate- Xiulaun Village

LI rate = landslide Incidence events / total events

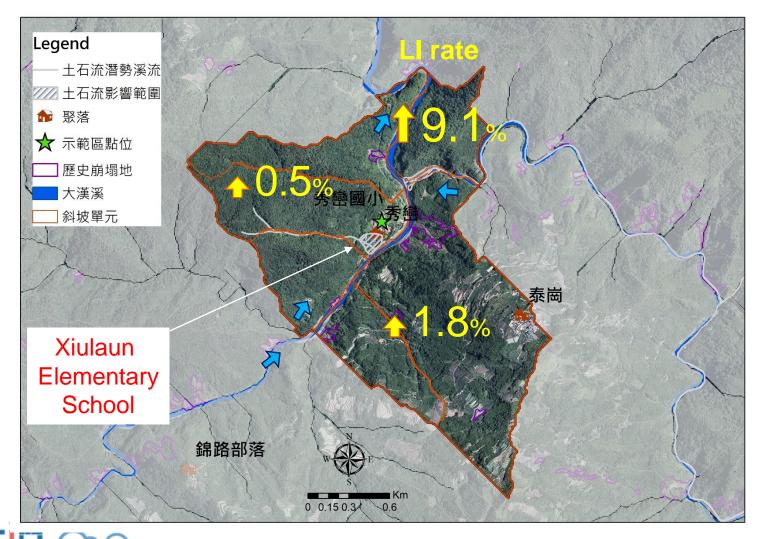


(total 169 typhoon events)



Landslide incidence rate- Xiulaun Village

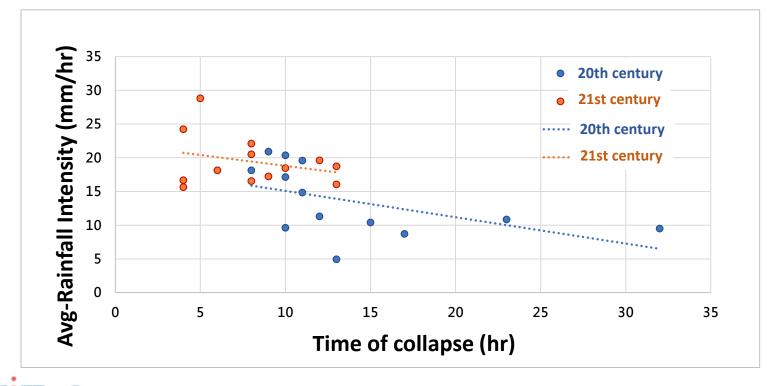
Average LI rate is from 2.74% (20th) to 4.65% (21st)

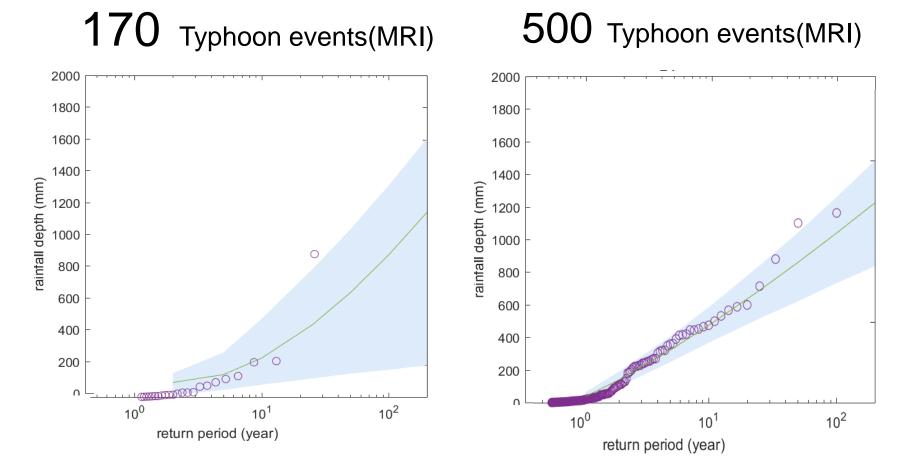


MOST

Rainfall Intensity Analysis

- Based on the typhoon events which really cause landslide, we found that the time of collapse in 21st century was shorter than in 20th century
- The average time of collapse decreases form 14 hours in 20th century to 8 hours in 21st century

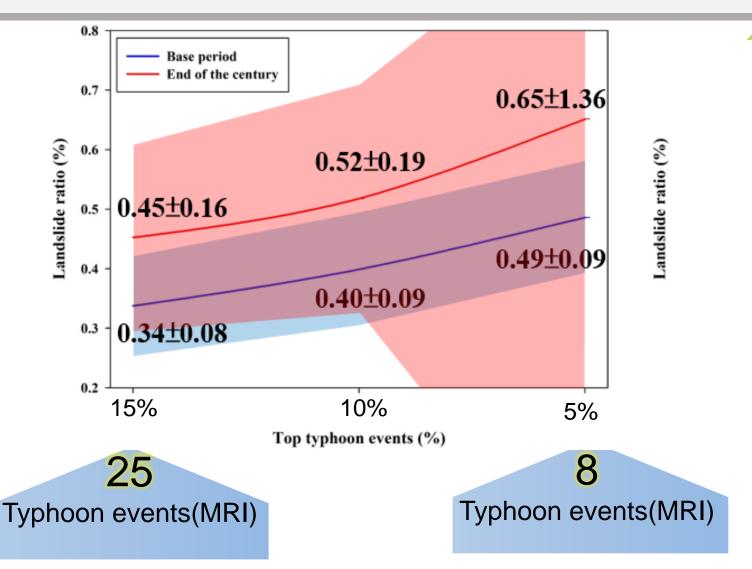




Next step : Uncertainty Analysis (cont.)

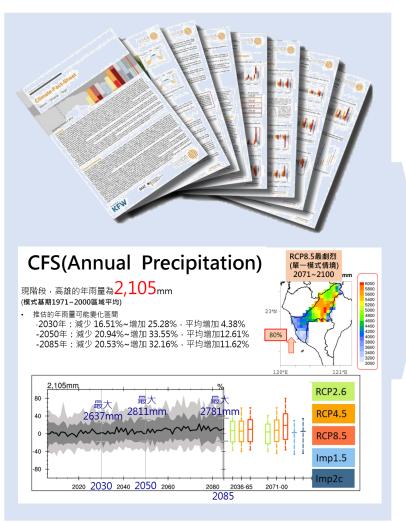


Next step : Uncertainty Analysis



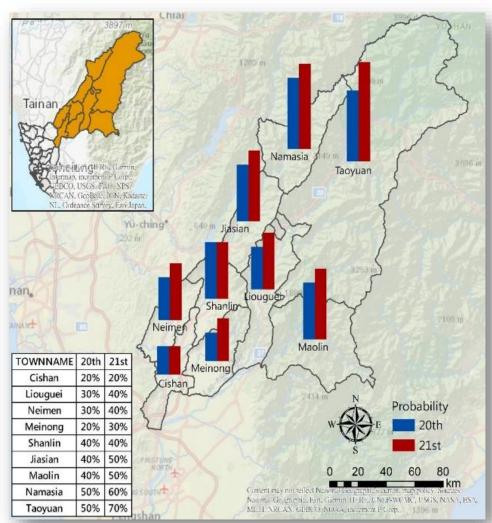
Next step: Impact Fact Sheet

Climate Fact Sheet (GERICS)



MOST

Impact Fact Sheet (TCCIP)



Next step : Adaptation Actions

Structural and physical item

Engineering and environmental creation

Technology

Ecology system

Service

Social item

Education

Information

Behavior

System item

Economy

Law and regulation

Policy and Project promotion



THANKS FOR YOUR ATTENTION







Next step : Adaptation selection

Category	Detailed	Adaptation measures related to slopeland disaster prevention
Structural and physical item	Engineering and environmental creation	Landslide treatment, drainage system, debris flow shelter, river plantation, power plant and power facility adjust
	Technology	Monitoring, pre-warning system, image interpretation
	Ecology system	Green building, increase biodiversity, afforestation, adaptative land management
	Service	Social security network, food bank, emergency medical service, public health, standard contract of large machine
Social item	Education	Improve warning, knowledge share and learning platform, international conference and research network
	Information	Hazard and vulnerability maps, climatic service, adaptation in community scale, scenario assessment
	Behavior	Evacuation plan, drill, soil and water conservation measures
System item	Economy	Insurance water tax, disaster bond, disaster emergency fund
	Law and regulation	Disaster prevention law, design specification, protection area
	Policy and Project promotion	Comprehensive water resource management, climate change adaptation project, urban renewal plan, land use and catchment management
┃ ■ 臺灣氣候變遷推估資訊與調適知識平台		IPCC(2014), Climate Change 2014: Impacts, Adaptation, and Vulnerability, p.27. form
TaiwanClimateChangeProjectionInformationandAdaptationKnowledgePlatform		