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The Impact Assessment Under Warming Scenario for Dai-Ji River Basin in Taiwan

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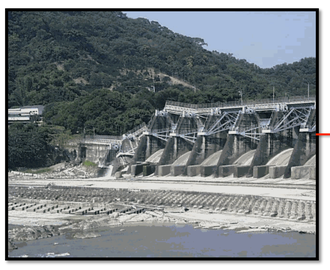
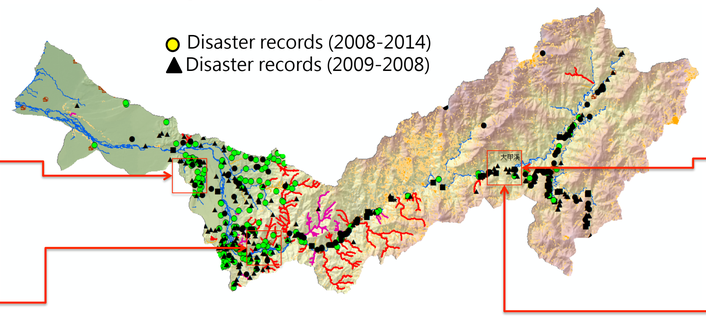
Daj-Ji River Basin Background

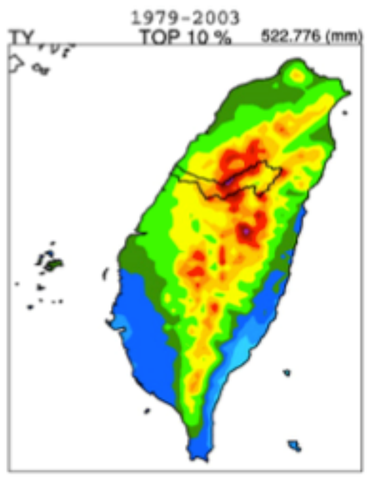
Dar-Ji River Basin is one of the most important hydroelectric area for national electric supply in Taiwan. Typhoon Toraji in 2001 caused amount of landslides and buried many power plants. And the following typhoon events of Mindulle and Aere in 2004 even directly destroyed other power plants, which caused huge economic loss.



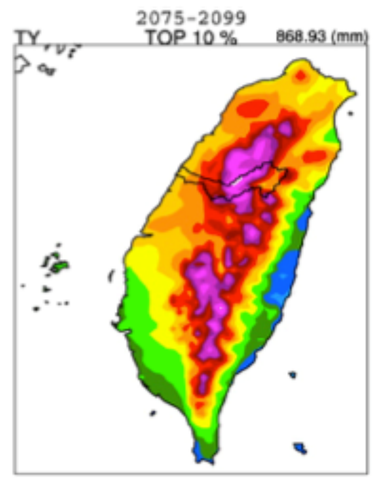


The Climate Impact In The End of 21 Century

For understanding the possible influence of global warming in Dai-Ji river basin. This study used the climate dynamic downscaling data of the end of 21 century which produced by the Meteorological Research Institute (MRI) under the Japan Meteorological Agency (Mizuta et al. 2012). This study selected top 10% extreme typhoon events of climate dynamic downscaling data of the end of 20 and 21 century for comparing the differences. The results showed that the precipitation of the end of 21 century will increase significantly in the upstream of Dai-Ji river basin.



END OF 20 CENTURY



END OF 21 CENTURY

Impacts Assessment

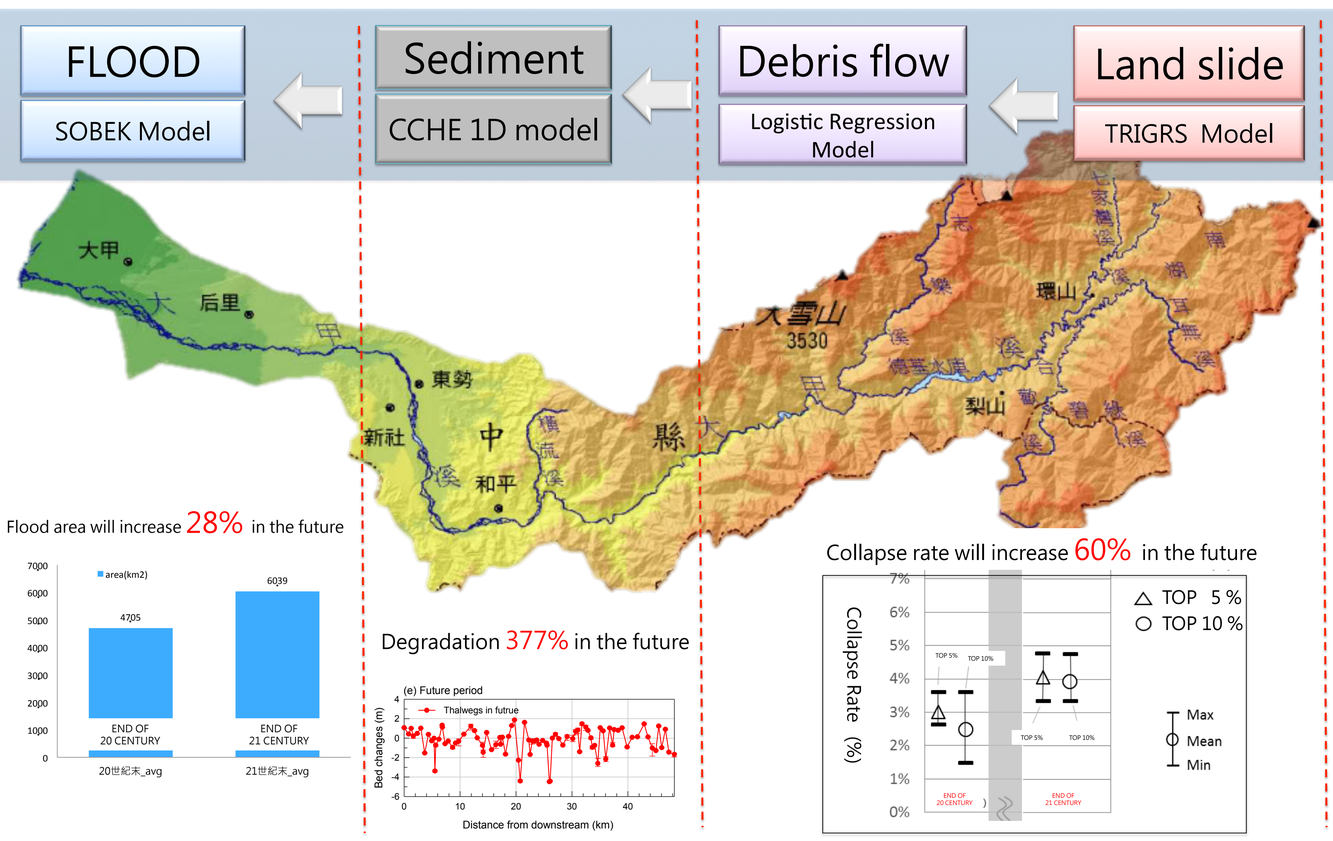
In the upstream, TRIGRS was adapted for simulating the landslide impacts. The Logistic Regression Model was applied to analyze the impact risk of debris flow. According to the analysis, the collapse rate will increase 60% in the future. In the midstream, CCHE1D was used to calculate the delivery situation of sediment. The Degradation will intensify 377% due to run-off increasing in the end of 21 century. In the downstream, the flood area will increase 28% by the flood simulation of SOBEK model. Finally, Taiwan Typhoon Loss Assessment System (TLAS) was applied to evaluate the direct economic loss of flood impact. Based on the results, the average loss of top 10 % typhoon events in the end of 21 century will increase from 11% to 268% depend on different land usages. The results showed that the impacts of climate change in the Dar-Ji River basin will be more serious in the end of this century. The costs of mitigation and adaptation will also increase with the losses.

Direct Economic Loss

TLAS model

Land Type Name	(A) Economic Loss (Million NTD) (End of 20 century)	(B) Economic Loss (Million NTD) (End of 21 century)	(A/B) Increase Rate (%)
Crop	231	447	93
Aquatic product	0	2	268
Livestock	10	16	53
Agri_Facilities	1	2	98
River	84	136	62
Ditch	44	68	55
Hydraulic_structure	6	18	223
Road_Facilities	3	4	21
Forestland Unmanaged	1	1	11
Forestland Managed	0.5	1	19

FLOOD — SOBEK Model ← Sediment — CCHE 1D model ← Debris flow — Logistic Regression Model ← Land slide — TRIGRS Model



Flood area will increase 28% in the future

Degradation 377% in the future

Collapse rate will increase 60% in the future