



Observed and Projected Climate Change in Taiwan

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It has been reported that an increase in extreme weather and climate events has been observed in recent decade. Is this trend a response to the warming climate and going to become more severe and frequent? Two thematic projects supported by the Ministry of Science and Technology have been working on detecting and projecting the climate change in Taiwan since 2011. A national report was released in 2011 and the second report with updated information is scheduled to release later this year.

Warming trend in surface temperature in Taiwan, consistent with the global trend, have been in an increasing trend since the early 20th century, more persistent in summer than in winter. Occurrences of extreme cold temperature in winter has been consistently decreasing since the 1960s, while extreme high temperature event has occurred more frequently in recent two decades although less consistently. Duration of summer has been becoming longer while the winter becoming shorter, a phenomenon observed in many parts of the world.

Rainfall amount did not exhibit a long-term trend but fluctuated in interdecadal time scales. One of the most evident trends is the consistent decrease in number of rain days since the early 20th century, indicating a drying tendency. Occurrence of heavy rainfall and land-falling typhoon did not show a clear trend but fluctuated in interdecadal time scales.

Projection of future climate changes was conducted based on CMIP5 results through both statistical and dynamical downscaling. A more severe warming trend is projected under all emission scenarios with the largest warming in high elevations. Heat wave defined based on current climate will become the norm in the future summer. Cold surge will become infrequent but the temperature drop in 48 hours will be larger when occurring.

Rainfall is projected to increase in wet season and decrease in dry season, indicating an enhanced seasonal cycle. Extreme rainfall will occur more frequently. Frontal activity near Taiwan will likely decrease in winter and spring but increase in Mei-Yu. Number of typhoon that affects Taiwan is likely to significantly decrease but with significantly larger wind speed and rainfall when occurring. Afternoon thunderstorm will likely decrease but with larger rainfall. These projection suggest an enhanced stress on water resources.

These projections have been used in impact study. Total rainfall in the river catchments is projected to increase and impose an increased threat of flooding, land slide, and debris flow. Pseudo-global warming simulation was applied to assess the impact of Typhoon Morakot if occurring again in the end of the 21th century. The simulation suggested a 40% increase in rainfall in southern Taiwan and likely cause property loss that cannot be avoided by the flood-prevention measures that are being planned and implemented. A pure engineering approach may not be able to efficiently reduce the impacts. An assessment on the compounding effect of urban expansion and warming climate by 2036, taking northern Taiwan as an example, suggests that the future urban development should be carefully planned with the concept of climate proof in mind to minimize the heat threat. Impact studies on agriculture, ecology, and public health are being conducted. Preliminary results indicate severe threats on rice production, dengue fever, forest, bird, and coral reef.