

## Changes in weathering environment due to clearance of trees in the Angkor temples, Cambodia

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Angkor temples severely damaged were covered by dense vegetation when those were discovered in the mid-19th century. Then trees on building materials have been cleared with the progress of conservation and protection projects for the temples. Tree cutting, however, is possible to generate new weathering environment related to temperature and moisture of the building materials. In order to find such environment, this study carried out the analysis of thermal condition at some sandstone-built temples such as Angkor Wat, Ta Prohm and Banteay Kdei that have different vegetation cover. The sandstone blocks of temples are mainly subjected to weathering processes of wet-dry repetition and salt efflorescence. Air temperatures were measured using about forty data loggers on March and September 2014 under the cooperation of APSARA National authority and with field research workers. In addition, surface temperatures of sandstone block was frequently measured by a thermography during each observation period. As the results, it is found that there is high temperature condition at Angkor Wat temple in which trees were cut at surrounding sanctuary. The surface temperatures of sandstone block reached 55°C in the morning and a temperature difference between the sandstone block and air temperature was more than 20°C in the temple. In the night time, air temperature of the sanctuary showed 5°C higher than air temperature of vegetated area. Such continuous high temperature condition is able to induce desiccation of the sandstone blocks. Namely weathering impacts originating from moisture changes in the sandstone blocks may increase in new environment. Although the tree cutting has progressed since the 19th century to conserve and protect the temples, it may be reduced the function of thermal buffer owing to trees, and accelerate to sandstone weathering.

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