**ABSTRACT**

Successful management of controlling deterioration of bridge piers requires the reliable prediction of damage due to an event of scour occurrence. The reliability of the scour prediction process can be significantly improved by integrating past information with information generated from prediction models of future climate change and its corresponding streamflow in river up to year of 2099 AD. Among the vast range of available climate models and their different downscaling methods and climate scenarios, most relevant selection was made to derive future daily and annual change in climate and precipitation and corresponding change in intensity of streamflow in river. This integration of predicted future data leads to a more accurate prediction of the time-dependent damage level caused by scour and, eventually, to a better supported decision-making process to perform mitigation process to prevent failure. In this paper, a probabilistic approach is provided to find an optimum management plan for a bridge with scour-sensitive pier by integrating the available information from prediction of future climate data. The proposed approach utilizes a probabilistic time-dependent scour failure criterion, rebuild, running and time cost associated with failure to find optimum maintenance time under uncertainty. New information of future climate prediction resulting from climate models performed for span of 2016 AD – 2099 AD, is used to update the scour depth and parameters of uncertainty as well as optimization and mitigation procedure. This process results in an enhanced mitigation strategy which can provide managers the ability to make real –time decisions based on probabilistic results of failure. The integration of this future climate information and its impact on the life-time maintenance process of the bridge foundation are thoroughly investigated. In addition, bridge on Interstate Highway I-35 on Red River, Oklahoma is used to illustrate the proposed probabilistic approach.