# Sustainable Management of the Aging Water and Wastewater Infrastructure in the United States

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## Extended Abstract

In the United States of America, more than 75 percent of the population is serviced by water and wastewater treatment systems. The majority of the buried piping networks were constructed following World War II, with an estimated material lifespan of 75 to 100 years. The goal of this research is to identify the most effective solutions for improving the conditions and management of water and wastewater public works infrastructure. As of 2017, the deterioration of aging water mains has resulted in 240,000 water main breaks and two trillion gallons of water wasted annually. According to the 1996 Amendments to the Safe Drinking Water Act, the US Environmental Protection Agency (EPA) is conducts an assessment of all water infrastructure every four years. In 2017, the American Society of Civil Engineers (ASCE) produced its latest infrastructure report card that evaluated America's water and wastewater systems as D and D+, respectively. The American Water Works Association (AWWA) has claimed that the availability of funding is the primary limiting factor in raising the grades of water and wastewater infrastructure. In 2001, the Water Infrastructure Network (WIN) estimated that $1 trillion over the next 20 years is required to finance the rehabilitation of all water and wastewater infrastructure in the United States. The ASCE has proposed several ways by which public and private water and wastewater utilities might obtain the funds needed to sustain adequate water service, which primarily involves raising public rates and lowering capital investments via low-interest loans. It is expected that by using an analytic hierarchy process (AHP) and artificial neural network (ANN) model, local municipalities can assess the conditions of their pipe networks and categories according to risk of deterioration. In addition, municipalities can optimize the value of their investments by selecting the most appropriate action to rehabilitate or replace existing water and wastewater infrastructure. Replacing infrastructure would be the costlier solution and would be applied to failing pipes, while rehabilitation would involve a type of cured-in-place (CIP) process for existing pipes in moderate condition. It is expected that older corroded pipes will need replacement, while newer pipes that are only beginning to fail would need rehabilitation. The objective is to produce a cost-effective plan for public utilities to replace and rehabilitate existing pipes and to update their asset records accordingly via software such as the AHP/ANN model. It is expected that this report will summarize the best available methods and technologies that will help public utilities obtain better proactive knowledge of the conditions of their water and wastewater conveyance networks.