TECHNICAL WEBINAR

CLIMATE RESILIENT INFRASTRUCTURE: ARE THE WATER TREATMENT PROCESSES READY FOR CHANGING CLIMATE?

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ABSTRACT Climate change has been a global issue due to its negative impacts on almost every aspect of human life including water resources, water quality degradation, water treatment and drinking water supplies. Most of the countries around the globe treat and disinfect source water to supply drinking water to the consumers. Safe water supply is being challenged by the deteriorating trend of water quality, which can increase disinfection byproducts and impose increased cancer/non-cancer risks to humans. To maintain the quality of drinking water, water treatment processes (WTPs) and/or water desalination plants (WDP) need adaptation to climate change. In this study, implications of climate change and water quality deterioration on the formation of trihalomethanes' (THMs), a class of possible human carcinogen, and risks from 2020 to 2050 were predicted to demonstrate the issues and possible solutions. In 2020, averages of temperature, dissolved organic carbon (DOC) and pH in source waters from Newfoundland (Canada) were 7.92°C, 6.40 mg/L and 6.53 respectively, which were predicted to be 9.95°C, 8.56 mg/L and 7.65, respectively in 2050. Three scenarios of free chlorine and bromide ions [(2.0 mg/L, 10 µg/L), (3.5 mg/L, 25 µg/L) and (5.0 mg/L, 50 µg/L)] were simulated. Two models (Model-1 and Model-2) were applied for predicting THMs, risks and allowable DOC for target risks. For Model-1, DOC in 2030, 2040 and 2050 were predicted to be in the ranges of 4.53 – 4.92, 3.32 – 3.84 and 2.49 - 3.06 mg/L respectively to impose similar risks as of 2020. For Model-2, DOC ranges were 5.02 – 5.95, 3.92 – 4.99 and 3.60 – 4.80 mg/L respectively. The lower ranges of DOC in future years were due to increased effects of pH and temperature. To maintain the risks of 2050 to the levels of 2020, WTPs need to reduce DOC by 64.3 - 70.9% (Model-1) and 43.8 – 57.9% (Model-2). The granular activated carbon filtration is widely used for reducing DOC, which can be further assessed for extensive applications in the WTPs. Despite the study was performed for a specific location, it shades light on the effects of climate change and possible solutions that can be beneficial to the relevant community.

BIO Professor Chowdhury obtained his PhD in Civil Engineering (Environmental Engineering) from Queen's University, Canada in 2009. As a NSERC-CGS (Canada) scholar for PhD and PDF for Post-Doctoral research, and excellent research performance during his academic career from 2010-2026 at the King Fahd University of Petroleum & Minerals, he has an in-depth understanding on water quality, water treatment processes, micro-contaminants in drinking water including disinfection byproducts, modeling, human exposure and risk management, adaptation of water treatment processes in changing climate, and multi-criteria decision making. He also has a strong track of publication records in the high impact journals. Professor Chowdhury has a research interest on the applications of machine learning techniques as an optimization tool to better manage water treatment processes.

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11 AM – 12 PM

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