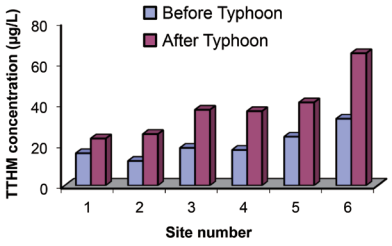
Water utilities should adapt more cautious strategies during extreme weather conditions

Behind the Scenes of Super Typhoons

Typhoons are one of the most catastrophic types of natural hazards, and they can cause severe devastation in coastal regions. Taiwan is one of the most typhoon-impacted regions in the world. The world's strongest storm in 2015, named Typhoon Soudelor, formed in the middle of the Pacific Ocean on July 20, 2015, and became more vigorous when it was well east of Taiwan over open water.



The above figure shows the mean TTHM concentrations (μg/L) in tap water before and after Typhoon Sudelor (2015) at different sampling sites with increasing distance from the source water

High turbidity in raw water in the city of Taipei and the poor quality of tap water in certain areas sparked waves of panic in the city during the typhoon event. Turbidity is not a pollutant, but it reflects the amount of sediment and organic matter in the water. High levels of organic matter in raw water negatively affect the coagulant and chlorine demands, which can increase and potentially form disinfection by-products (DBPs) that area harmful to human health.

Recently, a team led by Prof. Lo of the Graduate Institute of Environmental Engineering (GIEE) at National Taiwan University (NTU) investigated DBP concentrations in tap and drinking fountain water in selected typhoon-affected areas in Taipei before and after the typhoon. This study is important because the effects of extreme weather conditions such as typhoons and heavy rainfalls on drinking water quality are considered an issue of emerging concern, as the magnitude and frequency of such events are increasing in response to climate change.

Their results showed that organic matter increased after the typhoon event, and DBP forms when organic matter reacts with a disinfectant in pipelines. The research team further examined the effect of boiling on DBP concentrations. This was the first investigation of the effects of boiling on DBP levels in extreme weather conditions with high turbidity and organic matter loading. They found that at least 50% of THMs are removed by 2 min of boiling, whereas approximately 70% can be removed by boiling post-typhoon water samples for 5 min.

In Taiwan and most East Asian countries, typhoon rainfall accounts for a significant portion of the total annual rainfall. The research team demonstrated that the increased frequency of typhoon events can be considered one of the driving forces responsible for the global increased DOC trend.

Prof. Lo's research team generated valuable information for use by water treatment authorities in devising effective protocols for reducing DBPs under extreme weather conditions. They proved that an evaluation of the effects of climate change on annual typhoon rainfall and storm intensity is critical for water resources management and a necessary addition to climate change studies.

The study by Prof. Lo and his colleagues was published in Scientific Reports, a journal from the publishers of Nature, and made accessible to the research community on April 29, 2016.

Reference
Hoda Fakour, Shang-Lien Lo, and Tsair-Fuh Lin. (2016). Impacts of Typhoon Soudelor (2015) on the water quality of Taipei, Taiwan. *Scientific Reports*, 6:25228. DOI: 10.1038/srep25228

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