

Cumulative effects of Increased Climatic and Land Use Changes on Water Resources

Hans Schreier, University of British Columbia, Faculty of Land & Food Systems, Vancouver, Canada

Abstract:

There is considerable evidence that climatic variability is increasing in many parts of the world leading to more floods, droughts and size of wildfires. Land use changes play a key role in exacerbating the extent of climatic events on flooding and droughts, but the effects on hydrology and water quality has received insufficient attention. The cumulative effects of increased climatic extremes combined with land use changes is particularly evident in the urban environment, where densification has resulted in increased impervious surfaces and flooding is now a more frequent phenomenon in several major cities in Canada. A similar problem is occurring in agriculture where intensive production has resulted in soil compaction, organic matter decline and reduced infiltration rates. Given the increases in the frequency of extreme event it is no longer appropriate to rely on historic Intensity-duration-frequency (IDF) curves for precipitation events in flood planning. Similarly, soil water storage declines are influencing the extent of drought, not only because of soil degradation processes, but also in watershed with declining snow cover. The presentation will show the extent of recent extreme climatic event in North America and how land use changes are contributing to the problems of floods and droughts. To cope with these combined effects a series of adaptation options will be presented to show how constructed wetlands, improved riparian buffer zones and designated areas for temporary flood storage can help in reducing the urban flood and water quality problems. In agricultural watersheds, increasing the soil carbon content has multiple benefits by improving the infiltration rates, enhance the water storage and nutrient holding capacity and assist in greenhouse gas reduction. It will be shown that focusing on sequestration of carbon into the soil is one of the most promising rehabilitation initiatives that helps us cope with increased climatic variability.